



“Sustainable Logistics” Framework, Challenges and Opportunities

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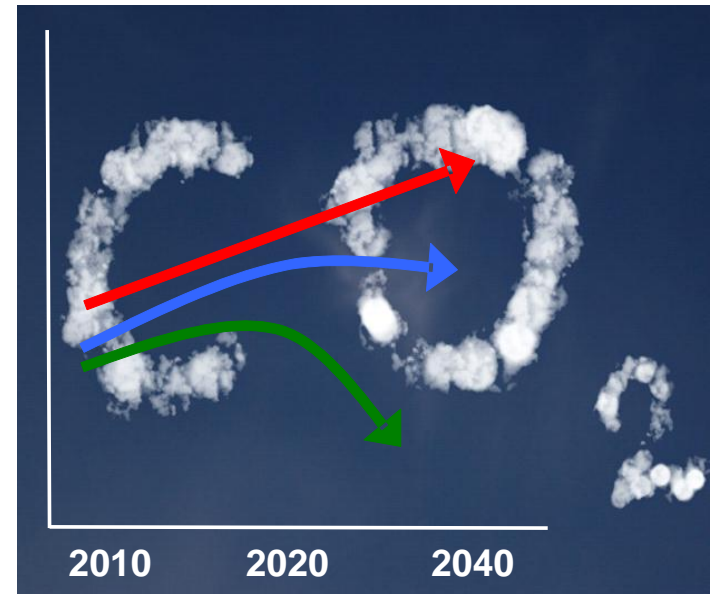


**ECTA Conference
leper, 25. November 2010**



Aim of this presentation

- Outline the importance of “green logistics” in the current political and industry context
- Show where Cefic stands on this topic and what is recommended as an appropriate way forward
- Share details on the calculation method for CO₂-emission from freight transport and levers to reduce the same
- Provide an indication of trade-offs associated with green logistics initiatives
- Answer any of the questions which you may have under this topic!



Members of Cefic IT Sustainable Logistics



IT Sustainable Logistics terms of reference



- **Scan regulatory environment**

Assessment of expected future developments and regulations and their impact on the chemical industry.

- **Develop common method for CO₂ emission measurement**

Development of a common method of calculation to determine individual companies' carbon footprint

- **Identify opportunities for CO₂ emission reduction**

Assessment and promotion of existing industry best practices

- **Establish common political position**

Development of common Cefic and ECTA position and advocacy action on regulatory proposals

Climate Change



The earth's climate is changing.

It always has done.

Most scientists agree that it is very likely that human actions are contributing decisively to climate change.

20 % of GHG emissions originate from industrial production*



*Source: Intergovernmental Panel on Climate Change (IPCC)



14,3 % of global greenhouse gases originate from the transport sector making it the third largest emission source*

*Source: World Resources Institute

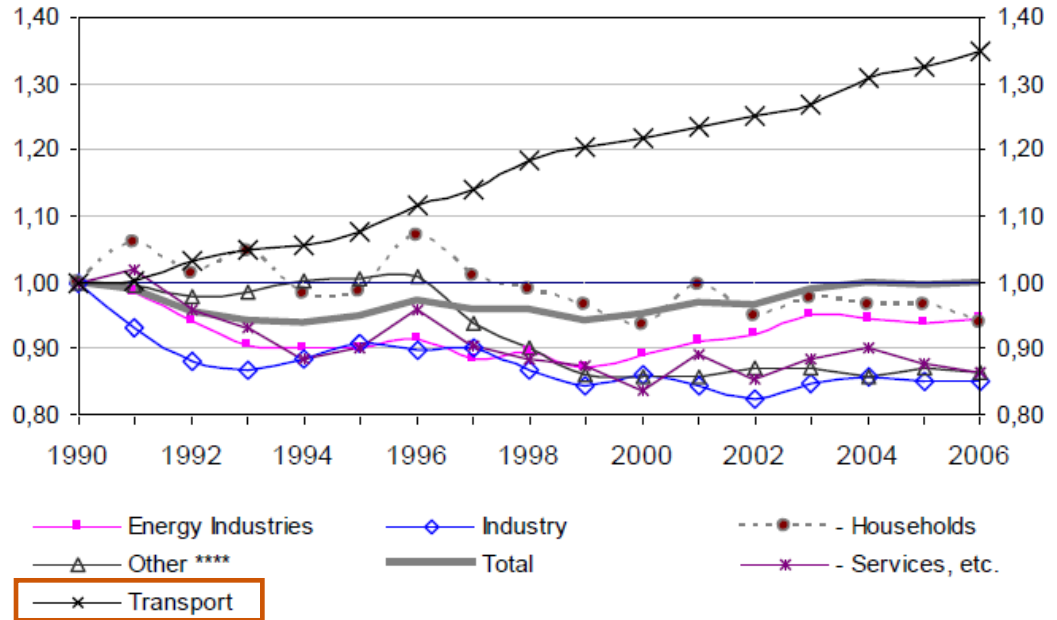
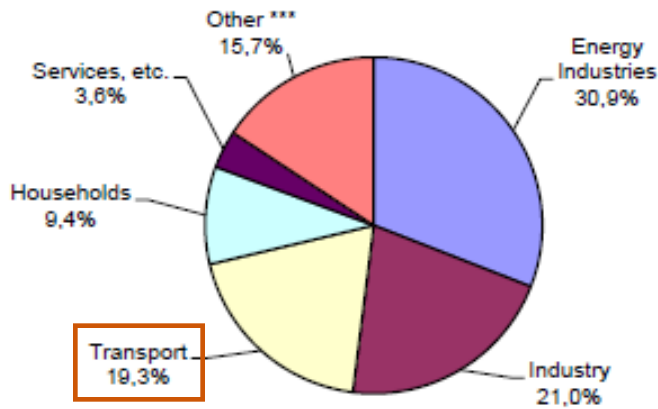


The global demand for energy will double by 2060*

*Source: Royal Dutch / Shell

EU-27 2006

Green House Gas (GHG) emissions by sector



Source: Cefic / European Commission

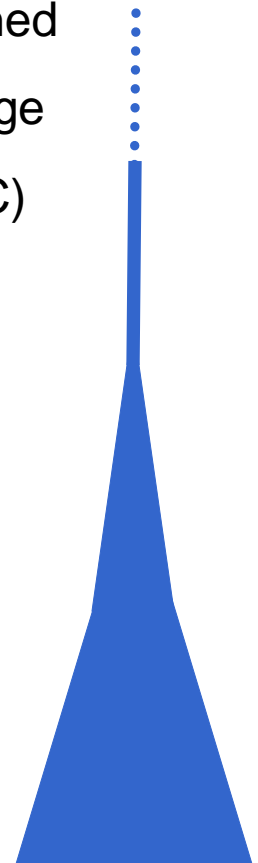
- 19,3% of GHG emissions in 2006 are caused by transport; 1/3 thereof originating from freight transportation
- Whilst GHG emissions from other sectors have leveled out or begun to decrease, GHG emissions from transport have risen steadily since 1990
- 98% of GHG emissions from transport are CO₂

The global climate debate is now firmly on the political agenda and receives increasing society attention



society
awareness

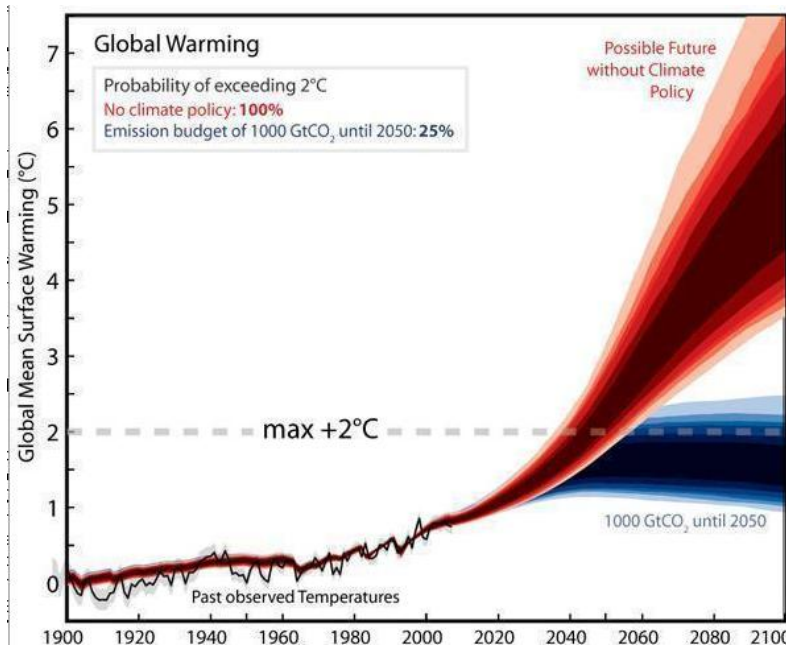
- 1979 ■ First World Climate Conference (WCC)
- 1988 ■ Intergovernmental Panel of Climate Change (IPCC) established
- 1990 ■ IPCC and second WCC call for global treaty on climate change
- 1991 ■ First Meeting of the International Negotiation Committee (INC)
- 1997 ■ Kyoto Protocol adopted
- 2001 ■ IPCC 3rd assessment Report
- 2003 ■ EU agrees Emissions Trading System
- 2004 ■ Russia ratifies Kyoto Protocol
- 2005 ■ Kyoto Protocol enters into force
- 2008 ■ G8 agree to the 2 degree C limit by 2050
- 2009 ■ Copenhagen International Climate Change Congress



Global warming scenarios with and without climate policy



The Intergovernmental Panel of Climate Change (IPCC) is predicting that global warming may be as much as 5,8 °C by the end of this century, if CO₂ emissions cannot be restricted:



Global CO₂ emissions and warming compared to pre-industrial times for:

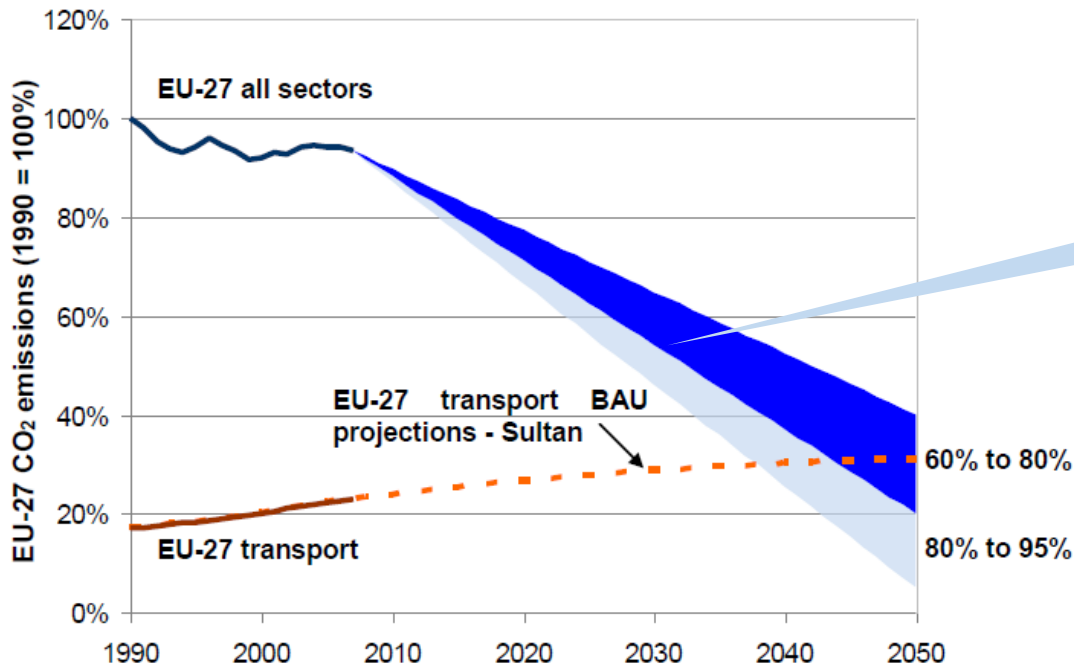
scenarios without climate policy

scenarios with climate policy, restricting CO₂ emissions to 1000 billion tons between 2000 – 2050

Source: ETH Zürich

1,000 billion tons CO₂ seems high, but 234 billion tons have already been flung into the atmosphere between 2000 and 2006!

EU-27 GHG emissions from transport have continued to increase and are projected to continue to do so



Source: SULTAN, Development of an Illustrative Scenarios Tool for Assessing Potential Impacts of Measures on EU transport GHG; www.eutransportghg2050.eu

- Increasing CO₂ emissions from transport have the potential to undermine the EU's ability to achieve its long-term GHG reduction objective
- Without additional policy intervention (BAU), CO₂ emissions from transport are expected to be approx. 25% higher in 2050, compared to 2010

In March 2010, the EC announced that it would make proposals to de-carbonise transport



Siim Kallas, EC Commissioner for Transport

“Decarbonisation is not debatable. We have binding targets for the reduction of emissions by 2020 and we will make the necessary legislative proposals. **We will continue the effort to reduce the carbon content of the transport sector, via legislative targets and via the correct internalization of external cost.**”



Connie Hedegaard, EC Commissioner for Climate Change

“The continued growth in carbon emissions from transport is currently offsetting efforts made in other areas. I will table a comprehensive legislative package on climate change and transport during my mandate. **One of my first initiatives will be to introduce legislation on cutting CO2 emissions from lorries.**”

Source: Cefic / European Commission

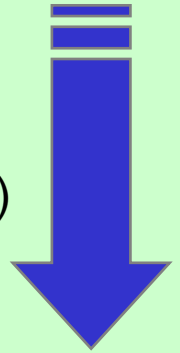
No doubt, the chemical industry and its logistics service providers are committed to take action ahead of legislation

Generic approach in establishing a green logistics strategy and action plan



Key steps

- Establish framework for CO₂-footprint measurement
- Calculate baseline (e.g. CO₂-footprint in 2010 or 2011)
- Determine realistic CO₂-emission reduction target (baseline -> 2020)
- Establish action plan, identifying measures to reduce CO₂-footprint
- Monitor progress, report year-on-year achievement



Plan -> Do -> Check -> Act -> ...

Cefic's Guideline for the Calculation and Management of CO₂ Emissions from Freight Transport Operations provides a simple common method to tailor green logistics strategies

Methods to calculate CO₂ emissions from freight transport



Activity-based approach

In the absence of energy data, it is possible to make a rough estimate of the carbon footprint of a transport operation by applying a simple formula:

$$\text{CO}_2 = \text{tons transported} \times \text{average transport distance} \times \text{CO}_2\text{-emission factor per ton-km}$$

Energy (fuel consumption) based approach

Since almost all CO₂-emissions from freight transport are energy-related, the simplest and most accurate way of calculating these emissions, using the following formula:

$$\text{CO}_2 = \text{fuel consumption (in litres)} \times \text{CO}_2\text{-factor}$$

ECTA recommendations for CO₂ emission calculations & reporting by logistics service providers*



- Carriers with direct access to fuel consumption data are encouraged to collect all consumption data
- Calculation of CO₂ emission should be based on fuel consumption (in liters) x kg/l CO₂ emission factor, regardless of Euro engine classes of individual trucks
- Calculations should take into account the type of fuel being used, using CO₂ emission factors as shown in below table:

| Fuel-type | CO ₂ Factor |
|----------------------------------|------------------------|
| Diesel | 2,629 kg/l |
| Diesel with 7% Biofuel (Germany) | 2,621 kg/l |
| Biofuel | 2,501 kg/l |
| Benzin | 2,632 kg/l |
| CNG | 2,540 kg/l |

$$\text{CO}_2 = \text{fuel consumption (in litres)} \times \text{CO}_2\text{-factor}$$

- In addition, the fuel type mix should be taken into account, leading to different average CO₂ emission factor
- Carriers with split operations e.g. own fleets and sub-contractors are encouraged to calculate their own fleet CO₂ emissions based on the energy based approach
- If access to subcontractors fuel consumption data is limited or incomplete, a calculation based on the activity based approach may be recommended.
- For intermodal operators an activity-based approach may be the best option

*Note: Essence of input received from ECTA by Cefic IT Sustainable Logistics

Cefic recommended common CO₂ emission calculation and reporting template*

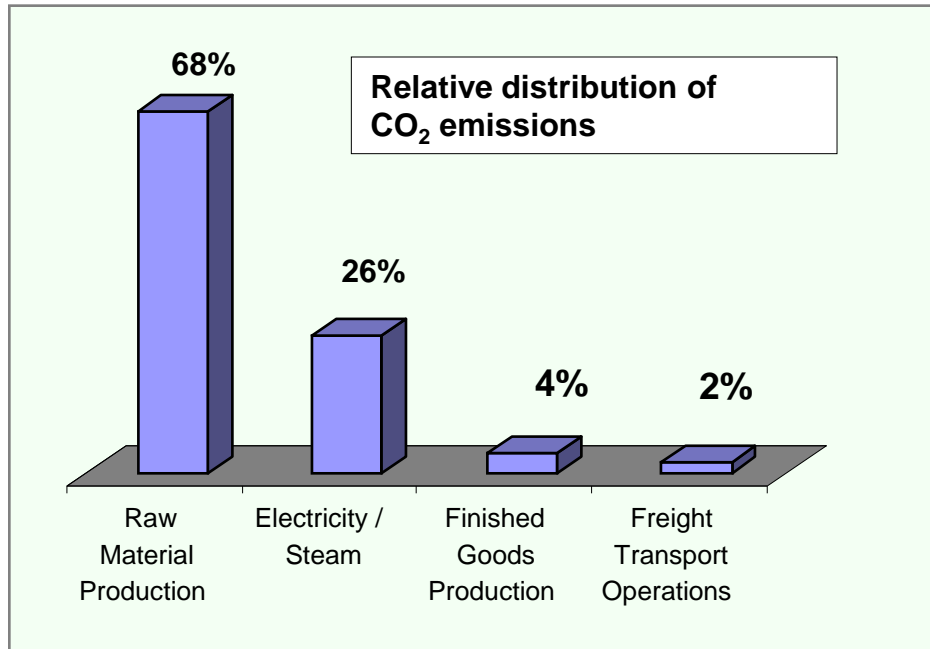


Calculation Template for CO₂-Emissions from Freight Transport Operations

| Mode of Transport | Tons | Avg kms (estimates!) | Ton-kms | g CO ₂ / ton-km | Tons CO ₂ |
|-----------------------------|------------------|----------------------|----------------------|----------------------------|----------------------|
| Road transport bulk | 100.000 | 500 | 50.000.000 | 62 | 3.100 |
| Road transport packed | 100.000 | 500 | 50.000.000 | 62 | 3.100 |
| Rail transport | 100.000 | 500 | 50.000.000 | 22 | 1.100 |
| Barge transport bulk | 100.000 | 500 | 50.000.000 | 31 | 1.550 |
| Barge transport packed | 100.000 | 500 | 50.000.000 | 31 | 1.550 |
| Short sea bulk | 100.000 | 500 | 50.000.000 | 16 | 800 |
| Short sea packed | 100.000 | 500 | 50.000.000 | 16 | 800 |
| Intermodal road / rail | 100.000 | 500 | 50.000.000 | 26 | 1.300 |
| Intermodal road / barge | 100.000 | 500 | 50.000.000 | 34 | 1.700 |
| Intermodal road / short sea | 100.000 | 500 | 50.000.000 | 21 | 1.050 |
| Pipelines | 100.000 | 5 | 500.000 | 5 | 3 |
| Deep-sea container | 100.000 | 5.000 | 500.000.000 | 8 | 4.000 |
| Deep-sea tanker | 100.000 | 5.000 | 500.000.000 | 5 | 2.500 |
| Airfreight | 1.000 | 5.000 | 5.000.000 | 602 | 3.010 |
| TOTAL | 1.301.000 | | 1.505.500.000 | | 25.563 |

Note: 1. Template pending approval by Cefic SIG, 2. g CO₂ / ton-km emission values = average default values by McKinnon

In the typical footprint of most chemical companies, CO₂ emissions from transport operations are negligible



Source: A Cefic SIG member company

- Even a 50% reduction of CO₂ emissions from transport operations would hardly be noticeable in the overall CO₂ footprint of most chemical companies
 - The opposite applies from transport companies' perspective
-
- Being committed to responsible care & sustainable development and considering the magnitude of CO₂ emissions from transport operations in the global carbon footprint, chemical logistics professionals will play their role in contributing to global CO₂ emission reduction targets

In most cases green logistics efforts are a means to reduce costs ...



Increase transport productivity

- Payload optimization (e.g. through VMI)
- Reduce empty running (e.g. advanced transport planning)
- Review just-in-time (JIT) arrangements
- Reduce equipment requirement constraints / increase standardization

Switch to greener transport modes

- Modal shift: road => rail / barge / parcel tanker => pipeline

Reduce transport intensity (e.g through product swaps)

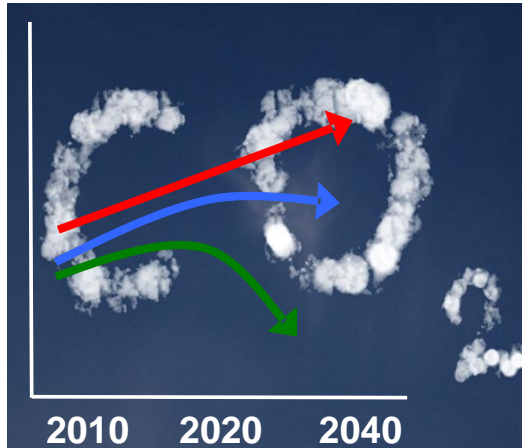
Increase fuel efficiency / reduce carbon intensity of fuels

However, a switch to greener transport modes may also result in:

- an increase of working capital, longer transport times at reduced reliability
- requirement of some investment into site logistics infrastructure, enabling further rail- and barge connectivity



Summary



- Freight transport operations are subject to increasing political and public pressure to significantly lower CO₂-emissions
 - Most chemical companies' efforts were so far primarily driven by cost considerations
 - In most cases, green logistics efforts reduce both CO₂-emissions and costs!
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- Green logistics efforts also have their price / may have negative trade-offs:
 - Longer transit times from modal shift to rail, barge or short sea at potentially reduced on-time reliability
 - Higher working capital associated with regional distribution hubs
 - Will requires investment into site logistics infrastructure and multimodal hubs

To realize the required CO₂ emission reduction targets, shippers, logistics service providers, associations and government bodies need to engage in intensive collaboration



Back-Up



Recommended average default emission factors for freight transport operations



Recommended Average Emission Factors

| Transport mode | gCO ₂ / tonne-km |
|---------------------------|-----------------------------|
| Road transport | 62 |
| Rail transport | 22 |
| Barge transport | 31 |
| Short sea | 16 |
| Intermodal road/rail | 26 |
| Intermodal road/barge | 34 |
| Intermodal road/short sea | 21 |
| Pipelines | 5 |
| Deep-sea container | 8 |
| Deep-sea tanker | 5 |
| Airfreight | 602 |

Carbon emission factors for 40-44 ton truck operations in dependency of payload and empty running 1/2



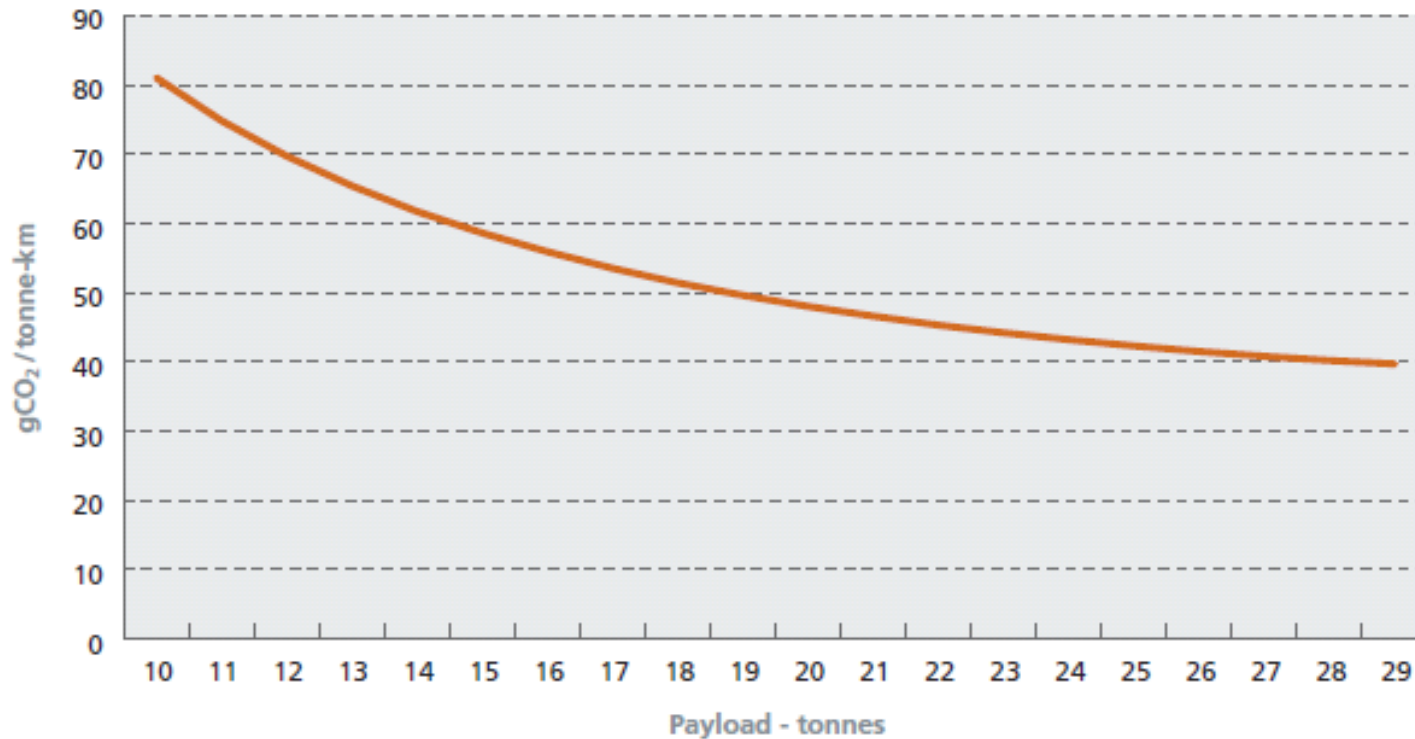
| load tonnes | % of truck-kms run empty | | | | | | | | |
|-------------|--------------------------|------|------|------|-------|-------|-------|-------|-------|
| | 0% | 5% | 10% | 15% | 20% | 25% | 30% | 35% | 40% |
| 10 | 81.0 | 85.2 | 89.9 | 95.1 | 101.0 | 107.6 | 115.2 | 124.0 | 134.2 |
| 11 | 74.8 | 78.7 | 83.0 | 87.8 | 93.2 | 99.4 | 106.4 | 114.5 | 123.9 |
| 12 | 69.7 | 73.3 | 77.3 | 81.8 | 86.8 | 92.6 | 99.1 | 106.6 | 115.4 |
| 13 | 65.4 | 68.8 | 72.5 | 76.7 | 81.5 | 86.8 | 93.0 | 100.0 | 108.3 |
| 14 | 61.7 | 64.9 | 68.5 | 72.4 | 76.9 | 82.0 | 87.7 | 94.4 | 102.2 |
| 15 | 58.6 | 61.6 | 65.0 | 68.7 | 73.0 | 77.8 | 83.3 | 89.6 | 97.0 |
| 16 | 55.9 | 58.8 | 62.0 | 65.6 | 69.6 | 74.2 | 79.4 | 85.4 | 92.5 |
| 17 | 53.5 | 56.3 | 59.3 | 62.8 | 66.6 | 71.0 | 76.0 | 81.8 | 88.6 |
| 18 | 51.4 | 54.1 | 57.0 | 60.3 | 64.1 | 68.3 | 73.1 | 78.6 | 85.1 |
| 19 | 49.6 | 52.2 | 55.0 | 58.2 | 61.8 | 65.8 | 70.5 | 75.8 | 82.1 |
| 20 | 48.0 | 50.5 | 53.2 | 56.3 | 59.8 | 63.7 | 68.2 | 73.4 | 79.4 |
| 21 | 46.6 | 49.0 | 51.6 | 54.6 | 58.0 | 61.8 | 66.2 | 71.2 | 77.0 |
| 22 | 45.3 | 47.6 | 50.2 | 53.2 | 56.4 | 60.1 | 64.4 | 69.2 | 74.9 |
| 23 | 44.2 | 46.5 | 49.0 | 51.8 | 55.0 | 58.6 | 62.8 | 67.5 | 73.1 |
| 24 | 43.2 | 45.4 | 47.9 | 50.7 | 53.8 | 57.3 | 61.3 | 66.0 | 71.4 |
| 25 | 42.3 | 44.5 | 46.9 | 49.6 | 52.7 | 56.1 | 60.1 | 64.6 | 69.9 |
| 26 | 41.5 | 43.7 | 46.0 | 48.7 | 51.7 | 55.1 | 59.0 | 63.4 | 68.6 |
| 27 | 40.8 | 42.9 | 45.3 | 47.9 | 50.8 | 54.2 | 58.0 | 62.4 | 67.5 |
| 28 | 40.2 | 42.3 | 44.6 | 47.2 | 50.1 | 53.4 | 57.1 | 61.4 | 66.5 |
| 29 | 39.7 | 41.7 | 44.0 | 46.6 | 49.4 | 52.6 | 56.3 | 60.6 | 65.6 |

Source: Mc Kinnon / Coyle 2007

Carbon emission factors for 40-44 ton truck operations in dependency of payload and empty running 2/2



Relationship between Carbon Emission Factor and Truck Load (10-29 tonnes)
(based on data from Coyle 2007)



Source: Mc Kinnon / Coyle 2007

Cefic Strategy Implementation Group Logistics Members





Our Vision



The chemical industry is managing its supply chains in such a way that it is at the forefront of logistics development, safety and sustainability, offering a competitive edge in the global environment.

Our Mission



The Cefic Strategy Implementation Group (SIG) Logistics identifies and prioritises key logistics opportunities and challenges for the chemical industry, including societal and political issues and developments, and it develops and steers a strategy and action programme to address these, taking into account legal, political and company boundaries.



Main Objectives of Cefic's SIG Logistics

- Promote cost effective, safe and sustainable logistics
- Promote high safety, security and environmental standards, supporting the chemical industries' Responsible Care Program
- Identify and evaluate societal issues and developments
- Develop and promote industry best practices
- Benchmark the performance of the chemical industry over time and evaluate the impact of initiatives undertaken so far
- Advocate the chemical industries' position in relation to legislative and regulatory initiatives



Cefic SIG Logistics

