EcoTransIT World

Stakeholder Workshop 5th October 2010

UIC Headquarters
Paris

EcoTransIT World: Seaborne Freight Emissions

Öko-Institut e.V.
Institut für angewandte Ökologie
Institute for Applied Ecology

Stefan Seum, Paris, 5 October 2010

Content

- Introduction to Seaborne Freight Emission Calculations
- Methodology of Seaborne Freight Emission Calculations
- Introduction to Airborne Freight Emissions Calculations
- Questions and Answers

Content

- **Introduction to Seaborne Freight Emission Calculations**
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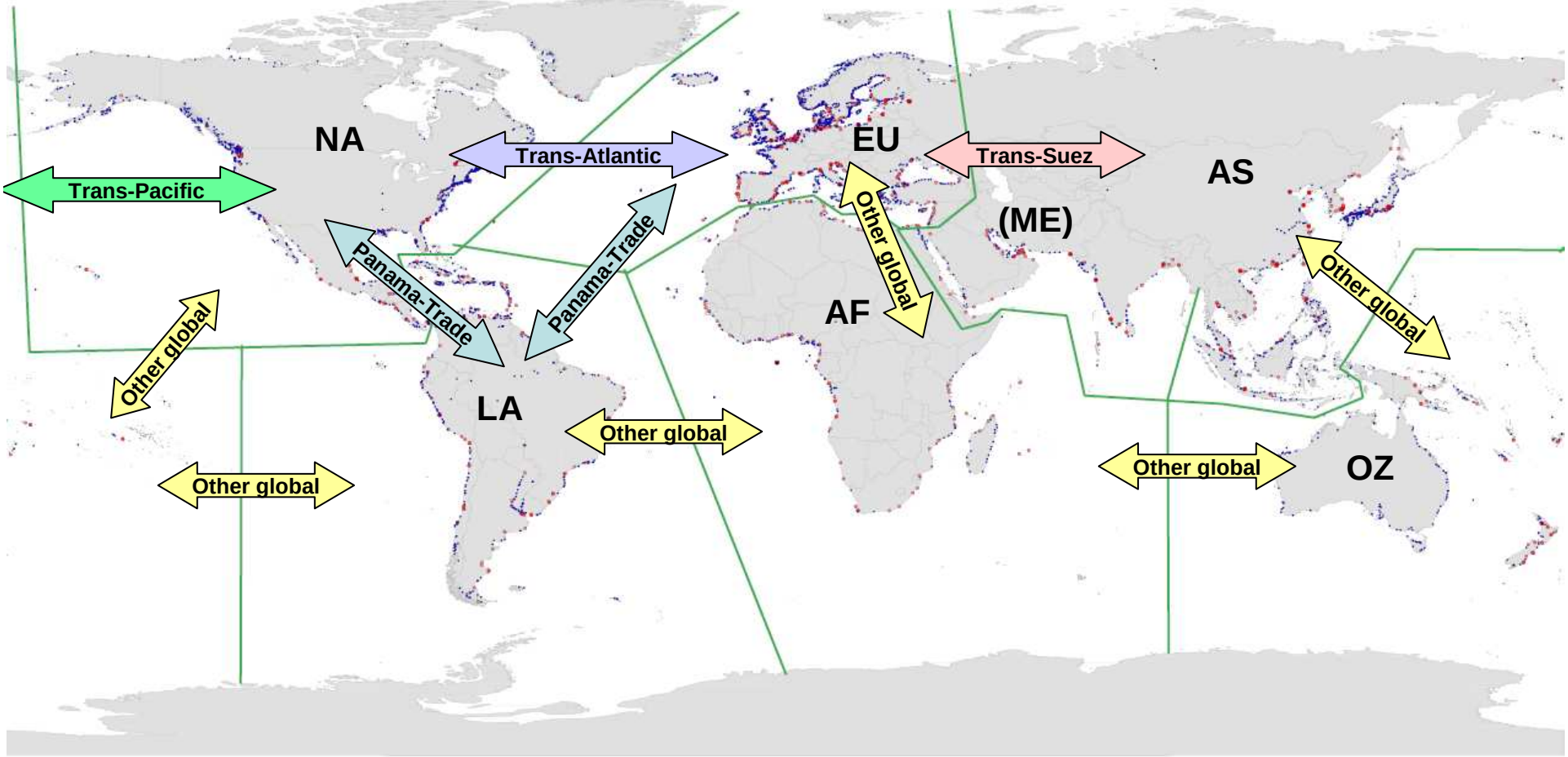
Worldwide seaborne transport emissions modeling differs from other modes in EcoTransIT World

- Sea transport emissions depend most on the vessel type and size, which cannot be allocated to specific countries.
- EcoTransIT World combines sophisticated GIS routing and vessel selection with state of the art emission factors.
- Parameters that determine (default) seaborne trade include:
  - Sending location – receiving location and resulting trade lane.
  - The commonly employed vessels on those trade lanes.
  - The ports suitable to serve the employed vessels.
- Emission calculation is conducted with aggregated emission factors for vessel groups per trade lane or size categories.

The categorization of the ocean trade lanes



Ports

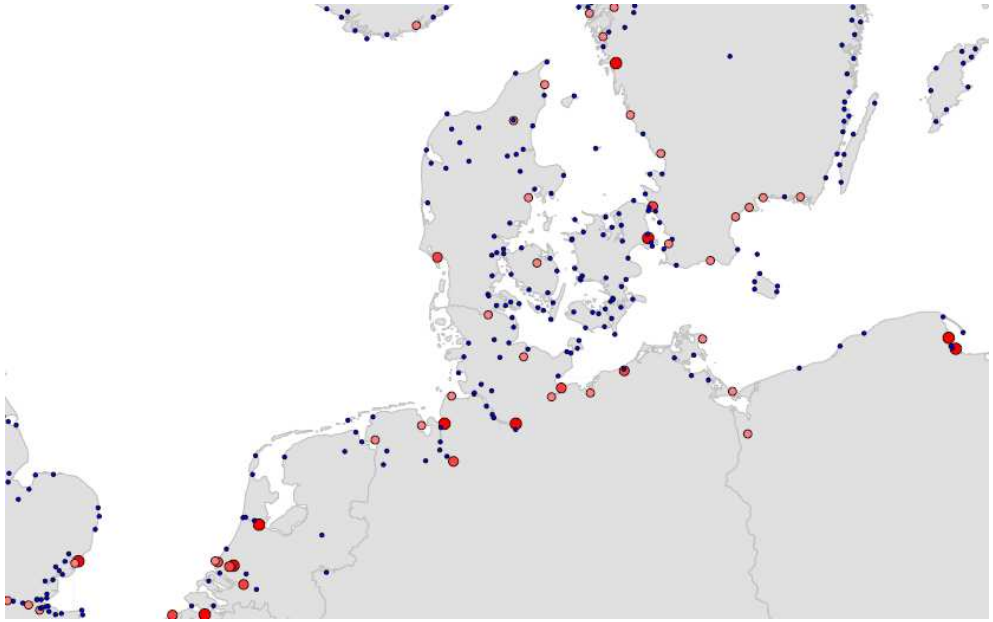
- Worldwide seaports are categorized in small, medium and large ports.
- The use of large vessel sizes is restricted to medium and large ports. Hinterland routing is conducted accordingly.
- Certain other restrictions (e.g. Panama Canal) exist.

Sea ports and marine layer

- 1 054 305 GIS edges
- 7 265 Seaports
  - 79 large
  - 168 medium
  - 370 small
  - 6648 not considered

Inland ports

- 1 133 inland water GIS edges
- 549 inland ports



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The emission factors are based on sample vessels

- For modeling marine emission factors approximately 4600 sample vessels were analyzed.
- For each vessel a theoretical year of transporting goods was modeled and than the emissions per tonne or TEU-km calculated.
- The “standard modus” differentiate automatically according to trade-lanes (e.g. Asia – Europe) for which typical vessels of different sizes are aggregated.
- Transport emissions can be calculated for
  - 3 size categories of general cargo ships,
  - 6 categories of dry bulk carriers,
  - 7 tankers and
  - 6 categories of container vessels.

Emission factor examples

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Table 53: Sample base emission factors for bulk and container vessels on particular trade lanes for emissions from main and auxiliary engines at sea and in port.

Vessel types (BC = bulk carrier; CC = container vessel GC = general cargo ship)	Trade and Vesselcategory names	Main Engine CO_2 g/t-km [cc: g/TEU-km] at sea	Auxiliary Engine CO_2 g/t-km [cc: g/TEU-km] at sea	Auxiliary Engine CO_2 in port [g], normalized to t-km [cc: TEU-km]
BC (liquid, dry, and General Cargo)	Suez trade	4.45	0.14	0.26
BC (liquid, dry, and General Cargo)	Transatlantic trade	6.16	0.28	0.38
BC (liquid, dry, and General Cargo)	Transpacific trade	5.18	0.20	0.31
BC (liquid, dry, and General Cargo)	Panama trade	6.16	0.28	0.38
BC (liquid, dry, and General Cargo)	Other global trade	6.16	0.26	0.39
BC (liquid, dry, and General Cargo)	Intra-continental trade	8.19	0.40	0.54
CC	Suez trade	138.68	6.33	8.21
CC	Transatlantic trade	158.30	10.93	8.58
CC	Transpacific trade	156.21	9.74	8.55
CC	Panama trade	158.30	10.93	8.58
CC	Other global trade	171.42	12.69	8.83
CC	Intra-continental trade non EU	179.83	15.55	9.01
CC	Intra-continental trade EU	214.69	18.09	12.93
CC	EU SECA trade	215.95	18.20	13.01
Great Lakes BC		11.80	0.66	0.62

EcoTransIT world allows trade-lane specific calculations and the modification of parameters

- Slow steaming can be considered and individually altered.
- The emissions are calculated based on fuel consumed (g/kg) or power supplied (g/kWh); Different engine types and fuel types are considered; IMO Sulphur Emission Control Areas are considered.
- The trade-lane specific emission factors take the vessel utilization (cargo load and empty return) into account;
- The vessel utilization is the average over a return trip.
- Emissions of inland ships are modeled similarly.

Slow speed shipping provides an energy efficiency benefit to approximately up to -40% speed

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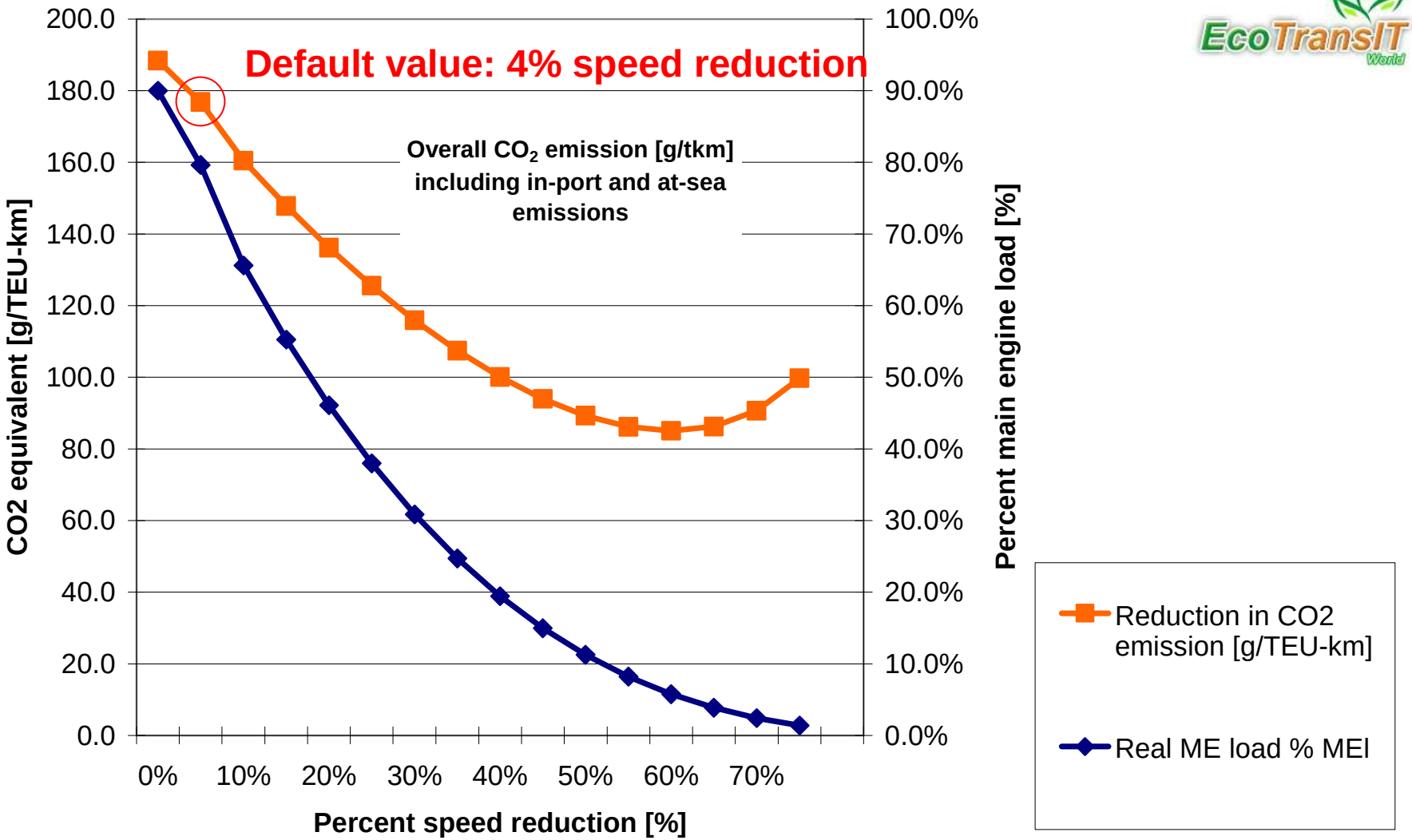
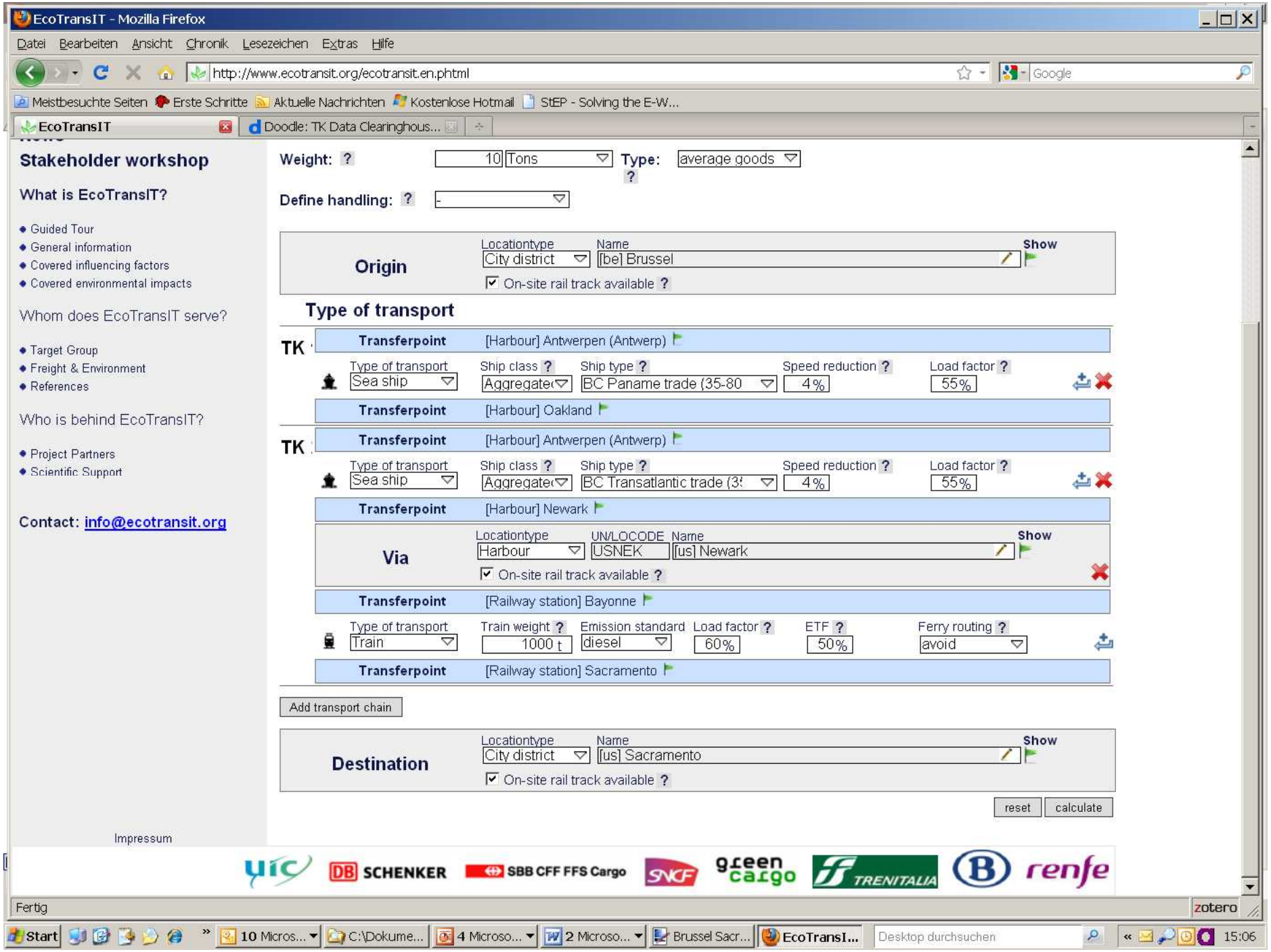
EcoTransIT World



The emission factors behind EcoTransIT World are state of the art

- EF sources (e.g. for CO_2 per kg fuel oil) include:
  - IMO 2009; IMO 2005; MEPC (IMO Environmental Committee)
  - IPCC 2006
  - CARB 2007
  - EPA 2009
- They bring EcoTransIT World in line with the emission baseline developed by IMO!
- The methodology is also compatible with current IMO vessel indexing schemes and industry proposals for calculating emissions.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Doodle: TK Data Clearinghous...
Stakeholder workshop
What is EcoTransIT?
Guided Tour
General information
Covered influencing factors
Covered environmental impacts
Whom does EcoTransIT serve?
Target Group
Freight & Environment
References
Who is behind EcoTransIT?
Project Partners
Scientific Support
Contact: info@ecotransit.org
Impressum
Weight: ? 10 Tons Type: average goods ?
Define handling: ? -
Origin
Locationtype City district
Name [be] Brussel
Show
On-site rail track available ?
Type of transport
TK
Transferpoint [Harbour] Antwerpen (Antwerp)
Type of transport Sea ship
Ship class ? Aggregate
Ship type ? BC Paname trade (35-80
Speed reduction ? 4 %
Load factor ? 55%
Transferpoint [Harbour] Oakland
TK
Transferpoint [Harbour] Antwerpen (Antwerp)
Type of transport Sea ship
Ship class ? Aggregate
Ship type ? BC Transatlantic trade (3
Speed reduction ? 4 %
Load factor ? 55%
Transferpoint [Harbour] Newark
Via
Locationtype Harbour
UN/LOCODE USNEK
Name [us] Newark
Show
On-site rail track available ?
Transferpoint [Railway station] Bayonne
Type of transport Train
Train weight ? 1000 t
Emission standard diesel
Load factor ? 60%
ETF ? 50%
Ferry routing ? avoid
Transferpoint [Railway station] Sacramento
Add transport chain
Destination
Locationtype City district
Name [us] Sacramento
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Meistbesuchte Seiten Erste Schritte Aktuelle Nachrichten Kostenlose Hotmail StEP - Solving the E-W...

EcoTransIT | Doodle: TK Data Clearinghous...

Destination

Locationtype: City district | Name: [us] Sacramento | Show

On-site rail track available ?

change | reset | calculate

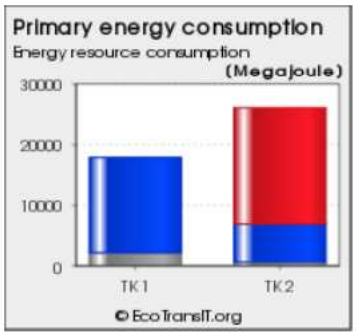
Standard | Graph | Table | Distances

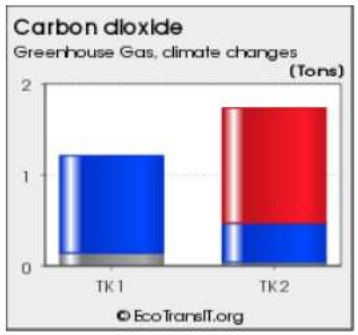
Primary energy consumption and carbon dioxide

Show well to tank / tank to wheel ?

Energy unit: Megajoule | Kilowatthours | petrol equivalents

Train | Truck | Airplane
Inland ship | Sea ship | Intermodal transfer





Primary energy consumption
Energy resource consumption
[Megajoule]

	TK 1	TK 2
Truck	2.163	601
Sea ship	15.723	6.314
Train	0	19.215
Sum:	**17.886**	**26.130**

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Carbon dioxide
Greenhouse Gas, climate changes
[Tonnes]

	TK 1	TK 2
Truck	0,14	0,04
Sea ship	1,07	0,43
Train	0	1,27
Sum:	**1,21**	**1,74**

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Impressum

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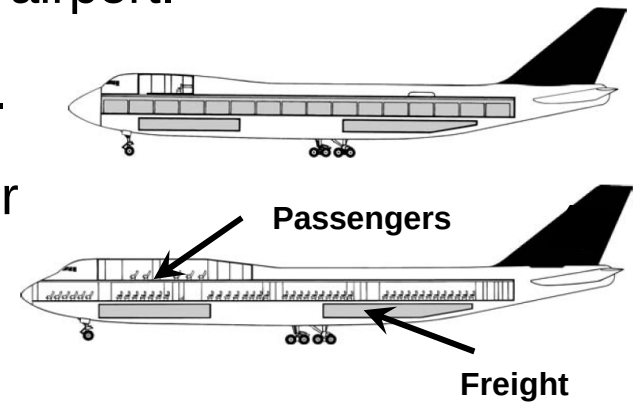
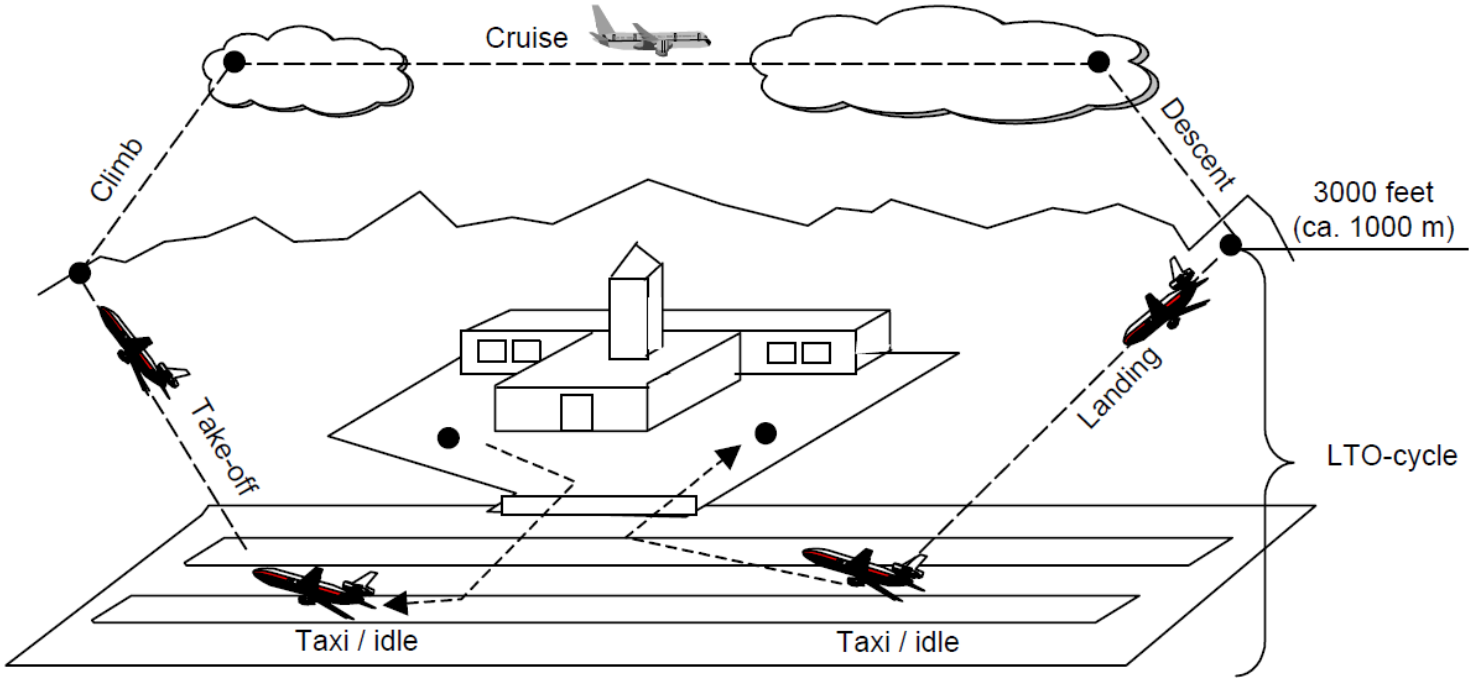
Methode Details

- Aircraft emissions are calculated airport to airport.
- EcoTransIT assumes a typical flying cycle.
- A choice of 15 freighters and 16 passenger aircrafts available (with their specific seat capacity, load capacity etc.).



- „Hybrid“ aircrafts in standard mode merging freighter and passenger aircrafts 60:40 depending on route distance (short, medium, long haul).
- Emissions are distance-dependant and extrapolated for the airport to airport distance.

Standard flying cycle



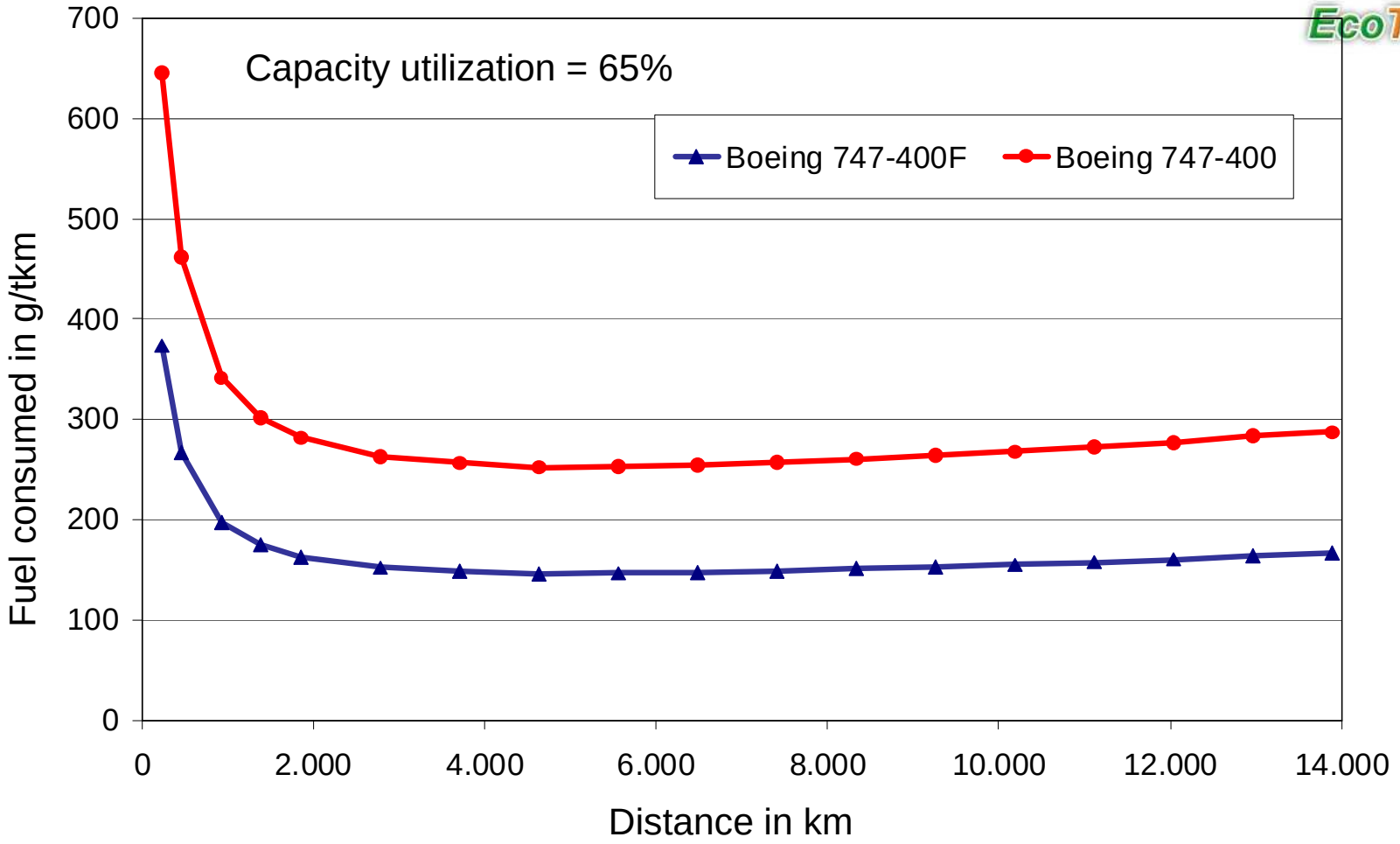
Source: IPCC:

Characteristics of selected aircrafts

- Hybrid aircraft: 60 % freighter and 40 % belly freight
- automatic split of route beyond maximum distance

Type	Distance Group	Type of aircraft	Aircraft code	Design Range (km)	Max. Payload (t)	Typical Seats (number)
Freighter	Short haul	Boeing 737-200C	B732F	2,240	17.3	
Freighter	Medium Haul	Boeing 767-300F	B763F	6,025	53.7	
Freighter	Long haul	Boeing 747-400F	B744F	8,230	112.6	
Belly Freight	Short haul	Fokker 100	F100	3,170	1.0	85
Belly Freight	Medium Haul	Boeing 757-200	B752	7,222	4	200
Belly Freight	Long haul	Boeing 747-400	B744	13,450	14	416
Sources: Lang 2007; Lufthansa Cargo 2007..						

Freighter and passenger aircrafts: energy use related to distance



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Thank you for your interest

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