The EX-TREMIS project

Exploring *non-road* Transport Emissions in Europe

Angelo Martino, Cosimo Chiffi
TRT Trasporti e Territorio

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What is EX-TREMIS?

- It is a web-based reference system and inventory of fleet data, transport activity data, energy consumption factors, emission factors and total emissions for **RAIL**, **MARITIME** and **AVIATION** for **EU27**

- Pollutants covered: CO_2, NO_x, SO_x, CO, VOC, CH_4, NMVOC, PM

- Historical database 1980-2005 and projections at years 2010, 2020 and 2030

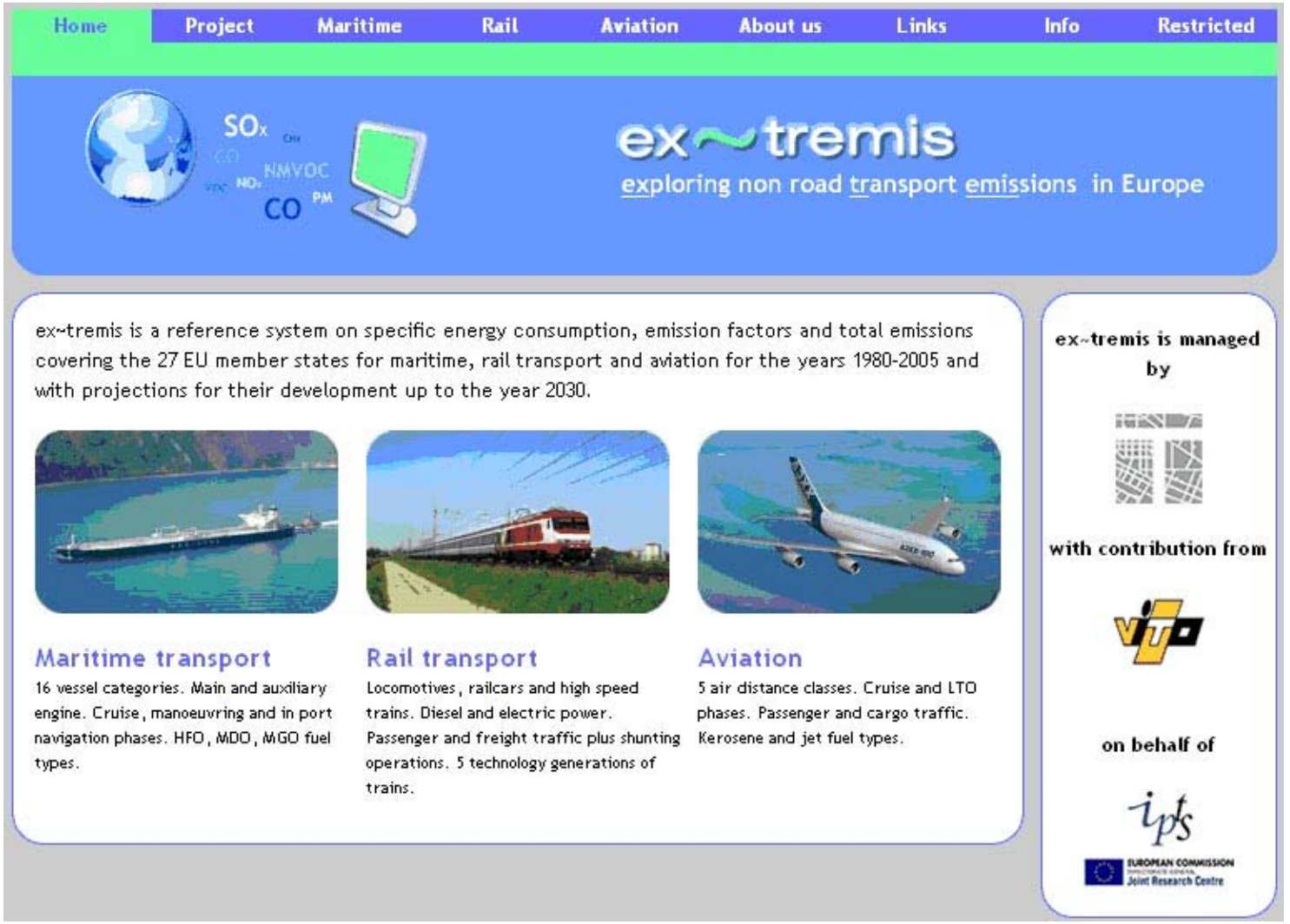
What is EX-TREMIS?

- www.ex-tremis.eu -> download area for modellers (.tsv or .xls files) + main facts condensed in graphs/tables for the general public

- Focus on collection and adaptation of observed data from various sources: EUROSTAT Newcronos, UNECE, World Bank, ECMT, Eurocontrol, UIC, maritime vessel monitoring inventories… and many national sources

- Web site on-line: Spring 2008

www.ex-tremis.eu



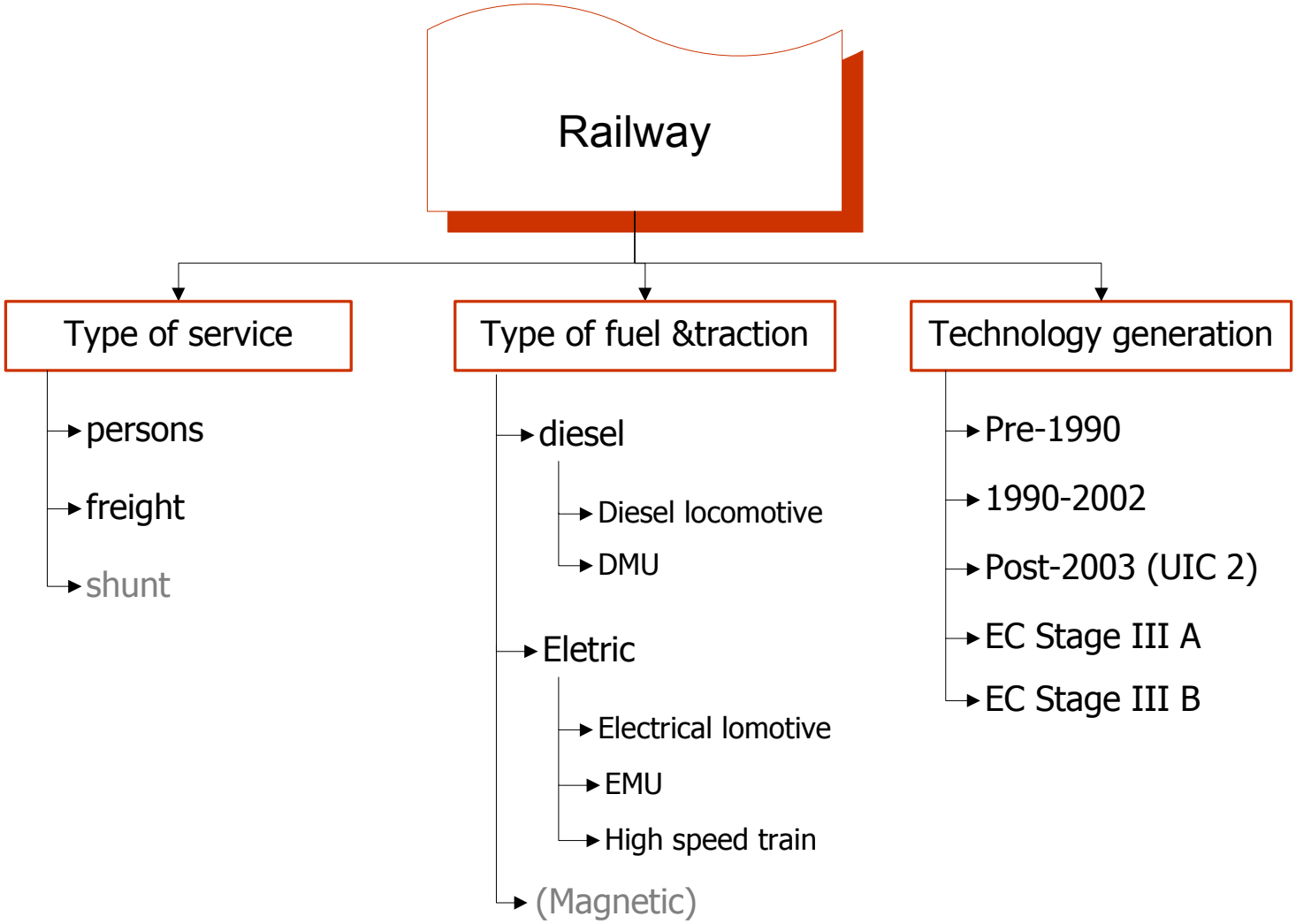
EX-TREMIS methodology

- Transport Mobility Data
- Fleet Composition
- Specific energy consumption and emission factors
- Total energy consumption and emissions

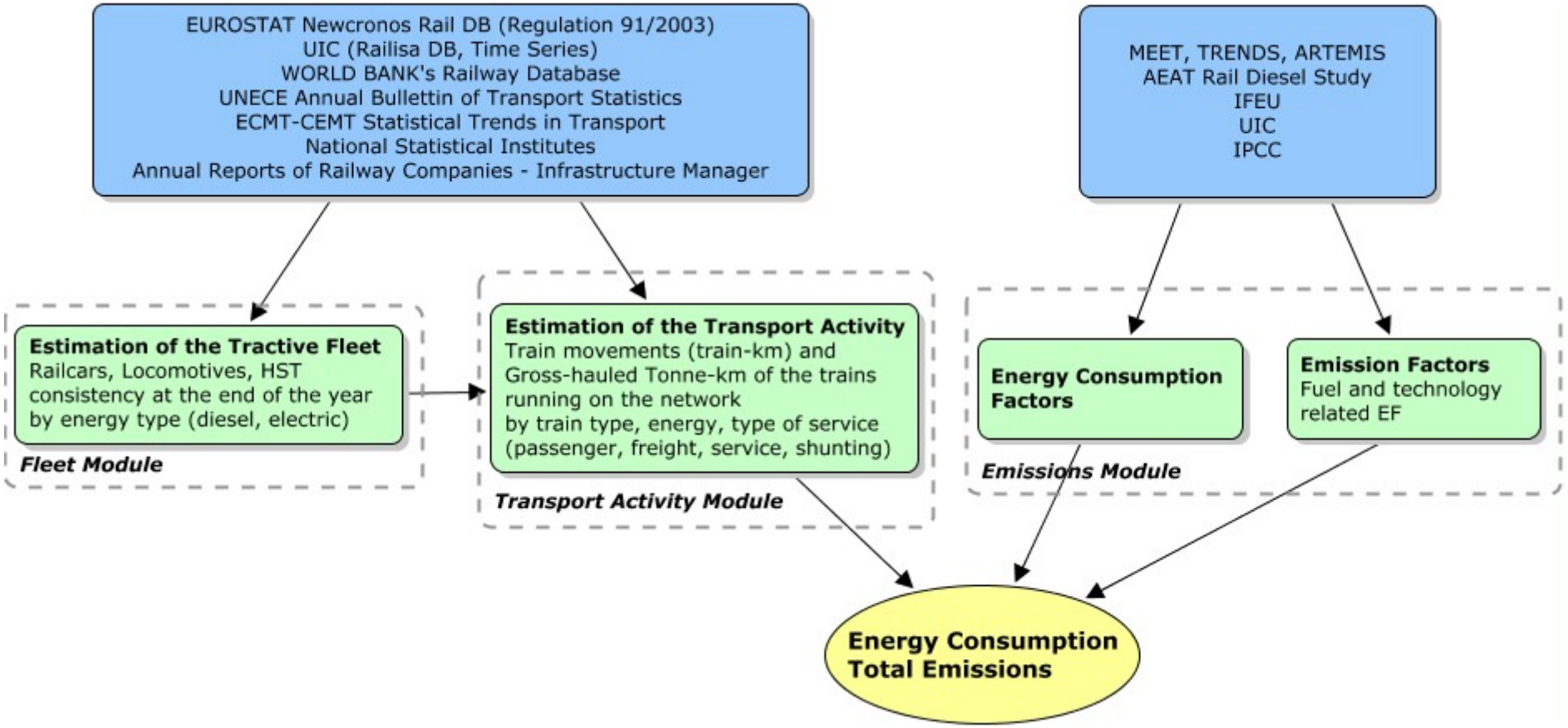
EX-TREMIS approach

- Maximum use of official statistics
- Replicability of the methodology
- Transparency and opennes

Rail: main influencing factors

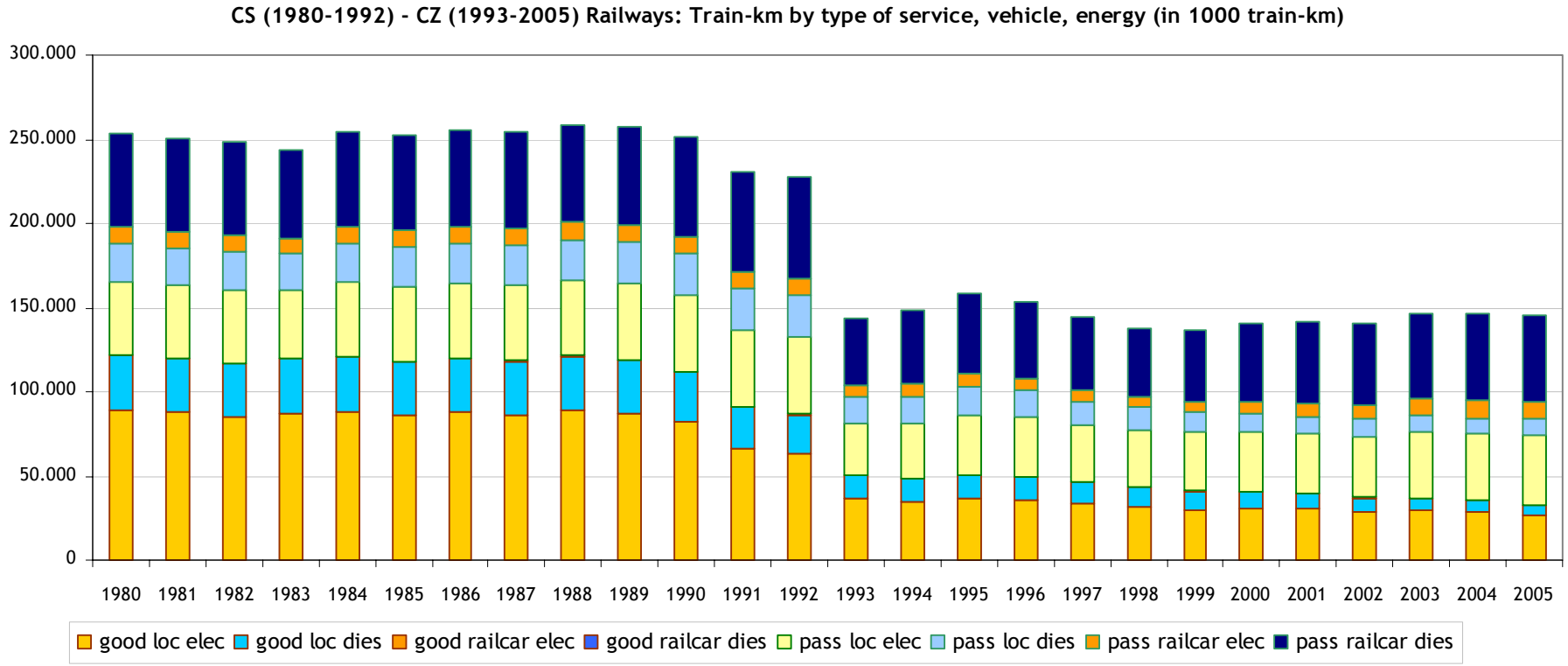


Rail: sources and methodology



Rail: resulting datasets for activity

- Rolling stock consistency
- Train-km
- Gross Hauled Tonne-km



Rail: metadata files

- PDF dowloadable file
- Evidence of data collection process and transparency
- Reference links, methodological assumptions and relevant information in separate notes

EUROSTAT
NATIONA SOURCES
WORLD BANK
UIC Railisa DB
UIC publications
ECMT-CEMT
UNECE

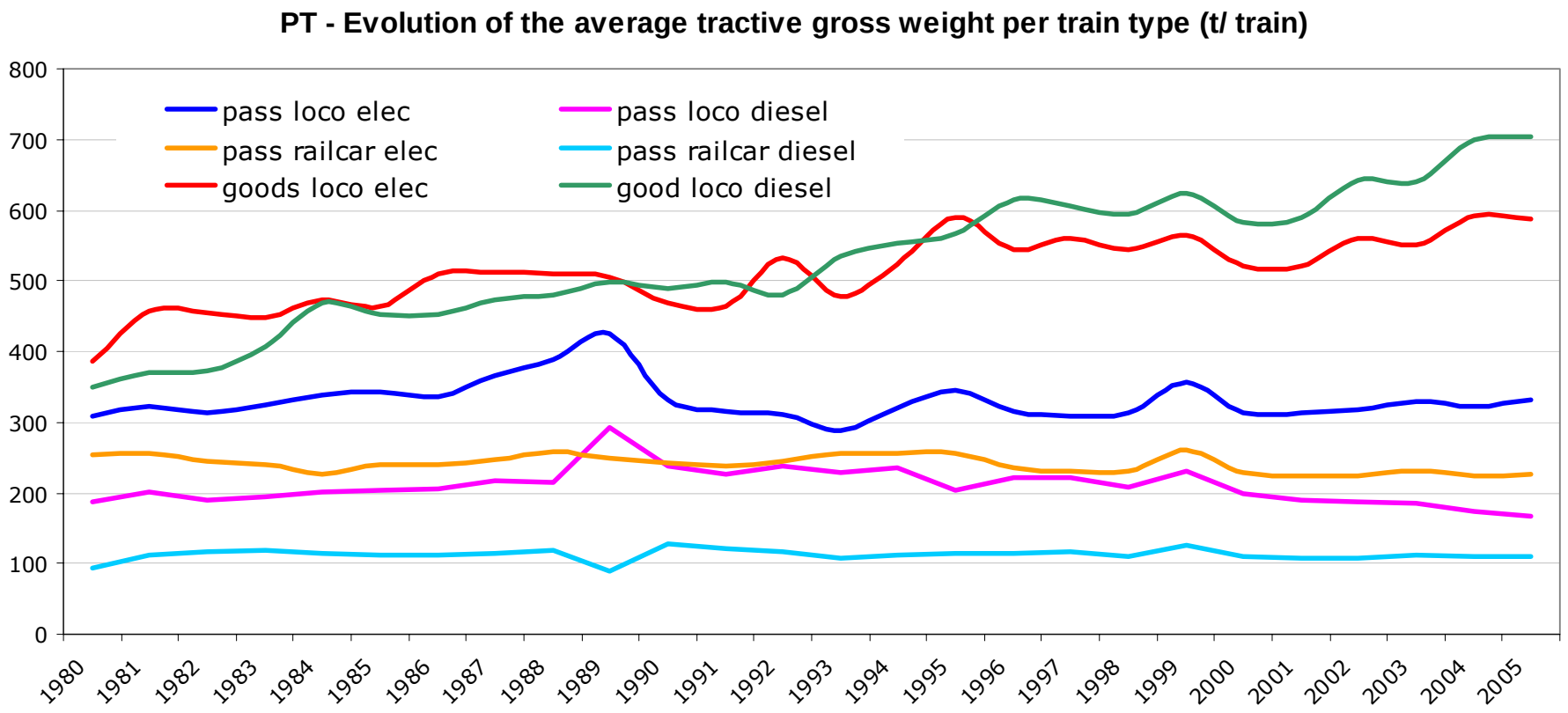
Reporting Country	vehicle	energy	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
			nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr
BG BULGARIA	Railcar	total																										
	Railcar	electric																										
	Railcar	diesel																										
	Locomotive	total																										
	Locomotive	electric																										
	Locomotive	diesel																										

Reporting Country	vehicle	energy	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
			nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr
CZ CZECH REPUBLIC	Railcar	total																										
	Railcar	electric																										
	Railcar	hst																										
	Railcar	diesel																										
	Locomotive	total																										
	Locomotive	electric																										
	Locomotive	diesel																										

Reporting Country	vehicle	energy	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
			nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr	nbr
DK DENMARK	Railcar	total																										
	Railcar	electric																										
	Railcar	diesel																										
	Locomotive	total																										
	Locomotive	electric																										
	Locomotive	diesel																										

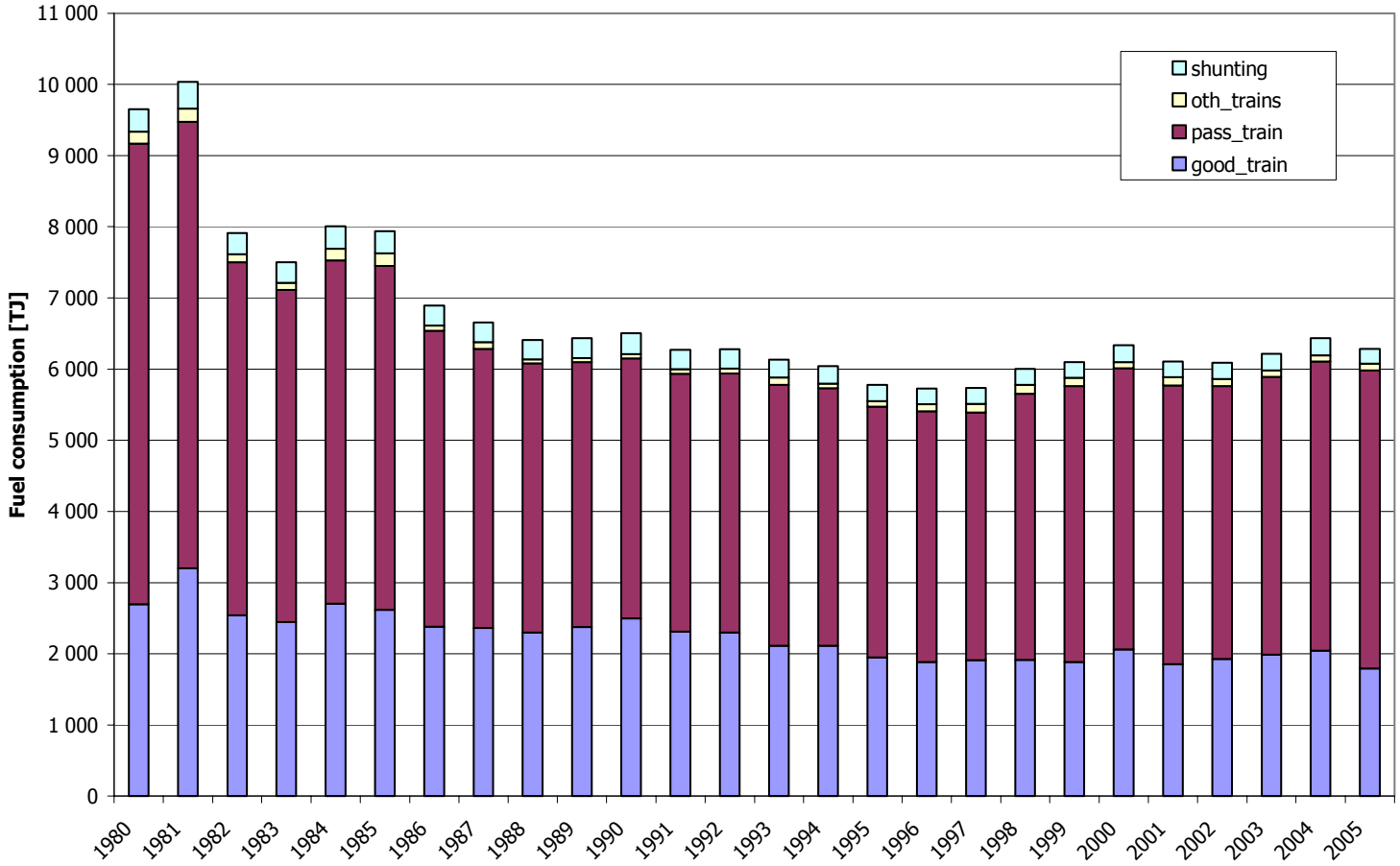
Rail: indicators and factors

- Tractive Effort: GHt-km/Train-km -> Avg gross vehicle weight (GVW)
- Energy Consumption: Avg GVW specific EC factor in kJ per GHt-km



Rail: fuel consumption series

- Energy consumption split (diesel + electricity) by type of rail transport activity in Belgium (in TJ)



Rail: data validation (Belgium)

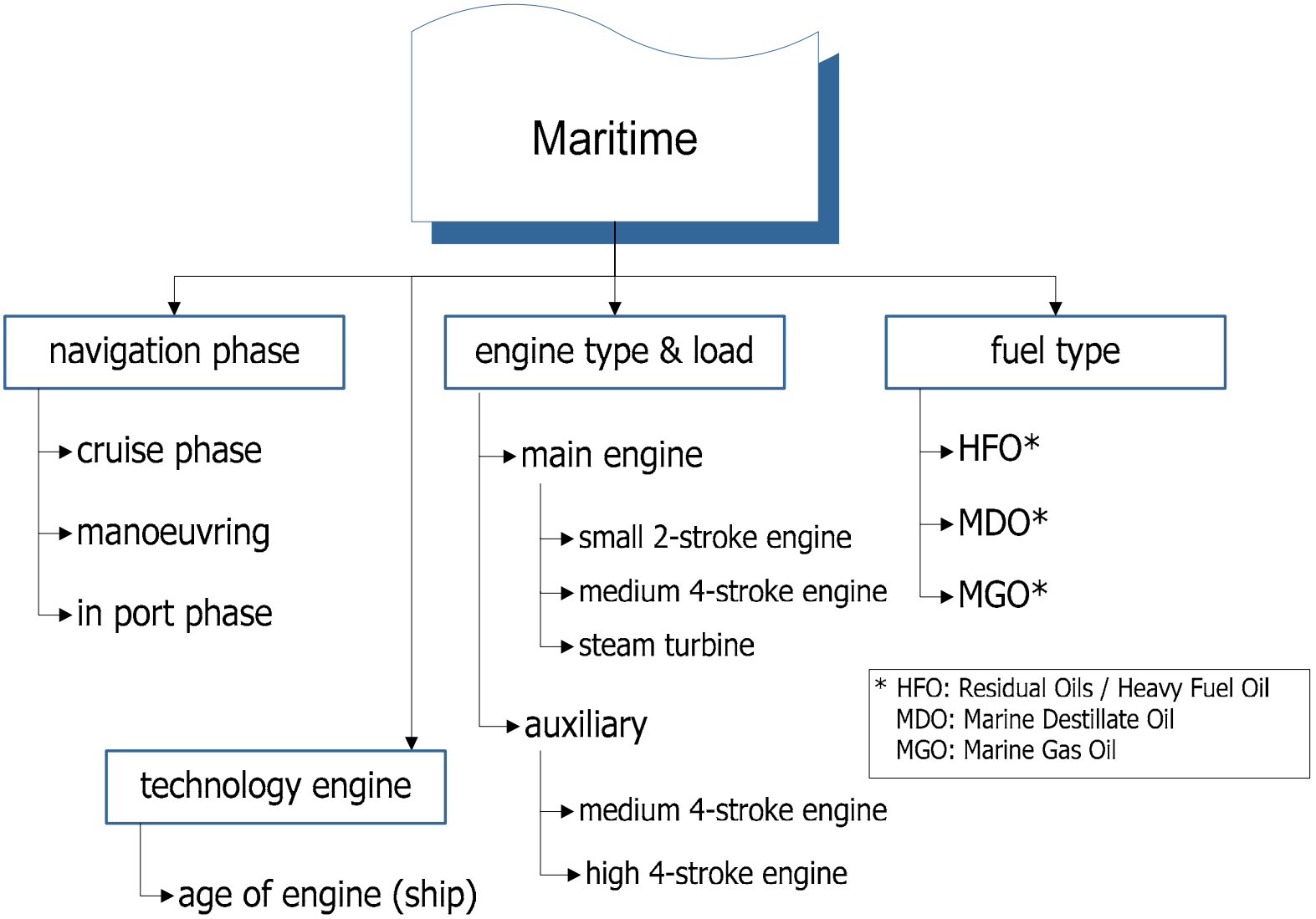
Validation energy consumption (diesel & electric)

Year	EX-TREMIS versus	Diesel (%)	Electric (%)
1980	CEMT	13	-2
1990	CEMT	-1	3
2005	UIC	-6	-26
2005	Belgian Railway Company	-4	-3

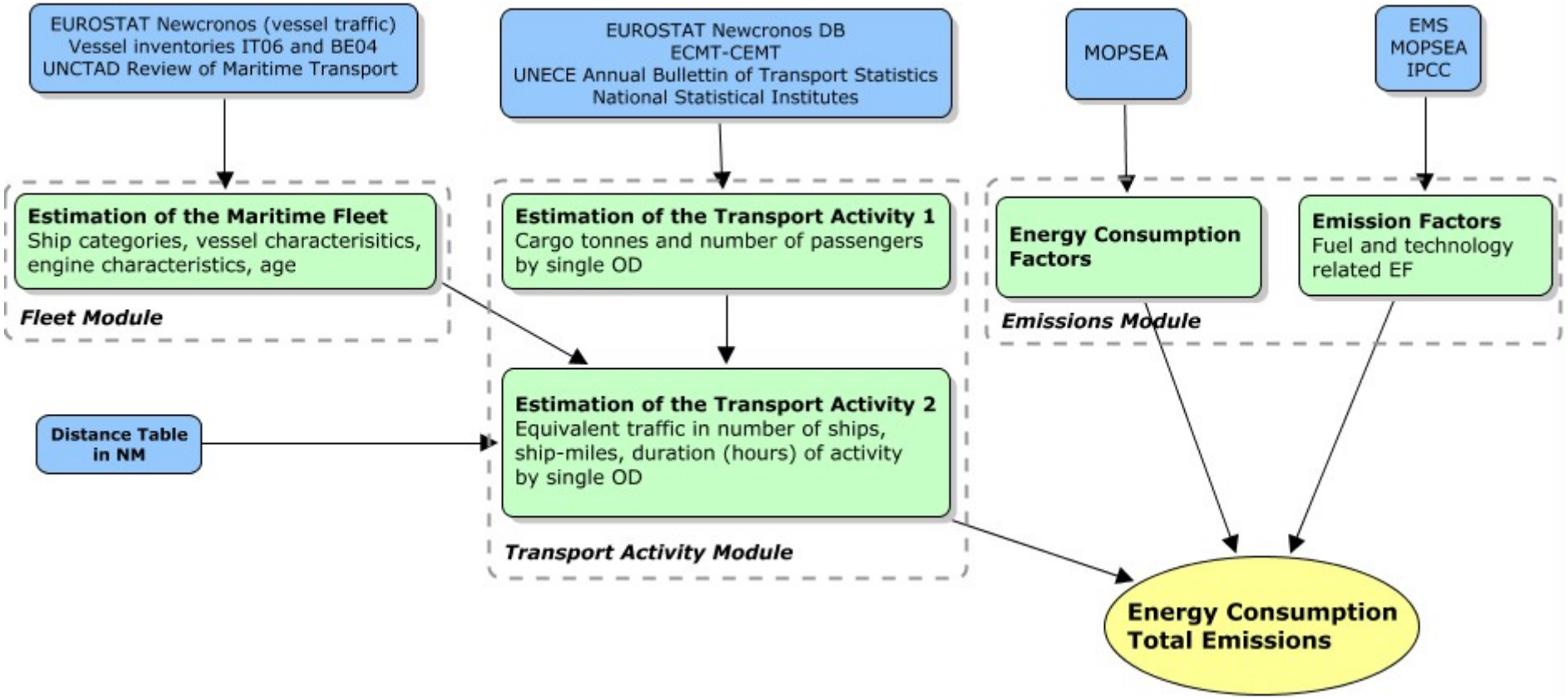
Comparison of NO_x emissions from diesel trains (2005)

In ton	EX-TREMIS	TREMOVE (2006)	SUSATRANS (2005)
NO_x	1 609	1 337	2 971

Maritime: main influencing factors



Maritime: sources and methodology



Maritime: references

EUROSTAT *Newcronos* datasets:

- total maritime traffic of goods and passenger in **all ports**
- the **detailed collections** of **cargo type** and passenger traffic in **main ports** **by destination (partner country)**
- the collection of **sea-going vessels calling at main ports** of the reporting country **by type and size** of the vessel

Two integrated inventories of vessel port calls (IT06 and BE04):

- detailed characteristics of the vessels engaged in the EU seaborne trade, irrespective of their nationality of registration (flag) and visiting the two main continental shelves, namely **the North Sea** and **the Mediterranean Sea**

Maritime: fleet module

classification system

Ship Type categories	Size classes (Length)	Main Engine classes	Age classes (Building year) and type of fuel
Oil Tanker	< 150 m	2-stroke	< 1974 (*Marine Diesel Oil - MDO*)
Chemical Tanker	150 – 250 m	4-stroke	1975-1979 (*MDO*)
LG Tanker (LPG and LNG Tanker)	> 250 m	Steam turbine	1980-1984 (*MDO*)
Bulk Carrier			1985-1989 (*Heavy Fuel Oil - HFO*)
Containership			1990-1994 (*HFO*)
General Cargo			1995-1999 (*HFO*)
Ferry (Ro-Ro Cargo, Ro-Pax, Con-Ro Ship)			2000-2004 (*HFO*)
Passenger Ship (Fast-Ferry, Cruise)			> 2005 (*HFO*)

Maritime: fleet module

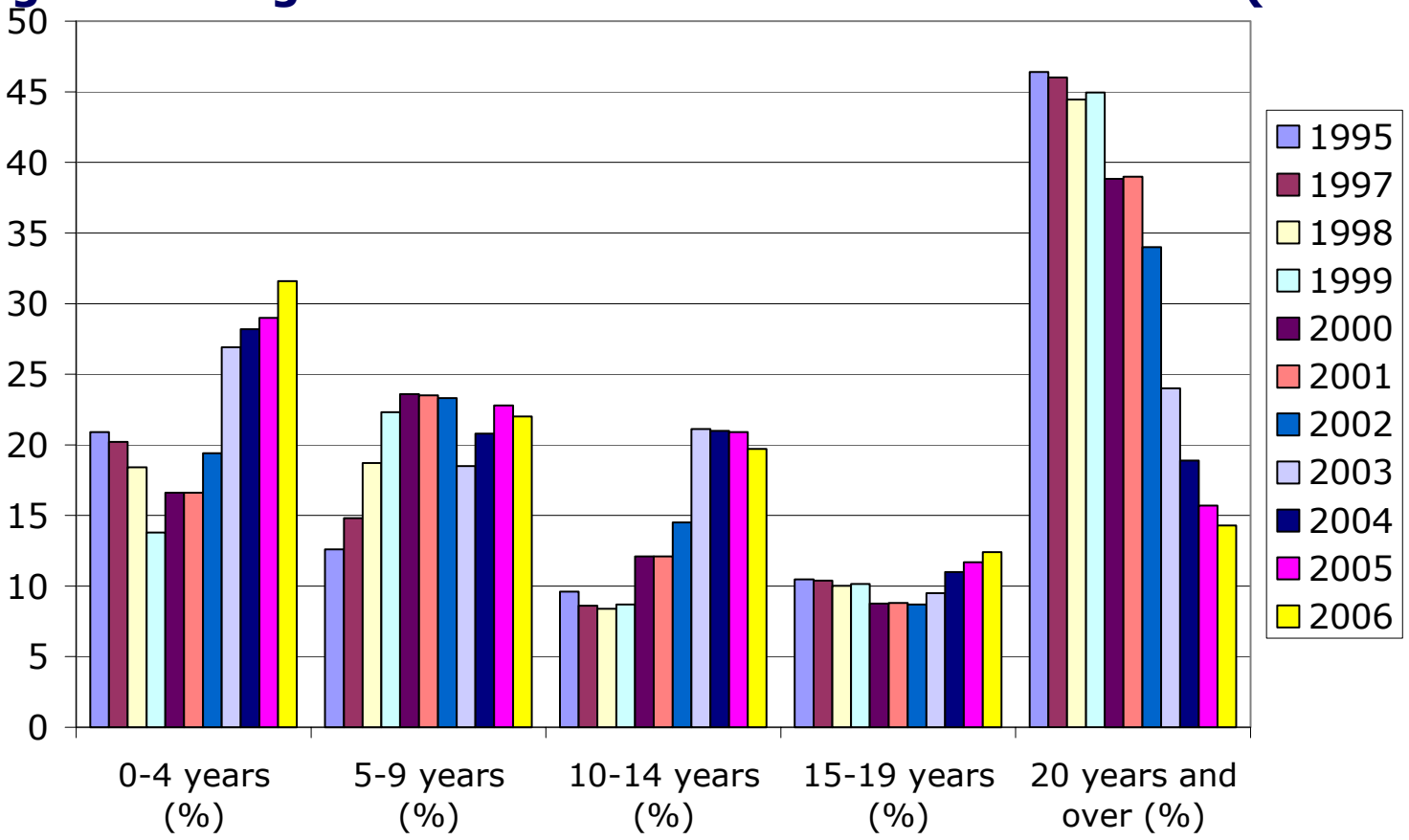
FLEET segmentation by engine characteristics

Ship Type	Length	2-stroke (%)	4-stroke (%)	2-stroke (kW)	4-stroke (kW)
Oil tanker	< 150 m	20	80	3 000	2 000
	150 - 250 m	95	5	10 500	7 000
	> 250 m	96	4	16 000	21 000
Passenger ship	< 150 m	18	82	14 000	13 000
	150 - 250 m	11	89	16 500	26 500
	> 250 m	6	94	58 000	54 500
Ferry (Ro-Ro)	< 150 m	17	83	6 000	6 500
	150 - 250 m	42	58	12 500	12 000
	> 250 m	42	58	24 000	25 000
LG tanker	< 150 m	13	87	4 000	2 500
	150 - 250 m	100	0	8 000	10 000
	> 250 m	100	0	12 000	30 000

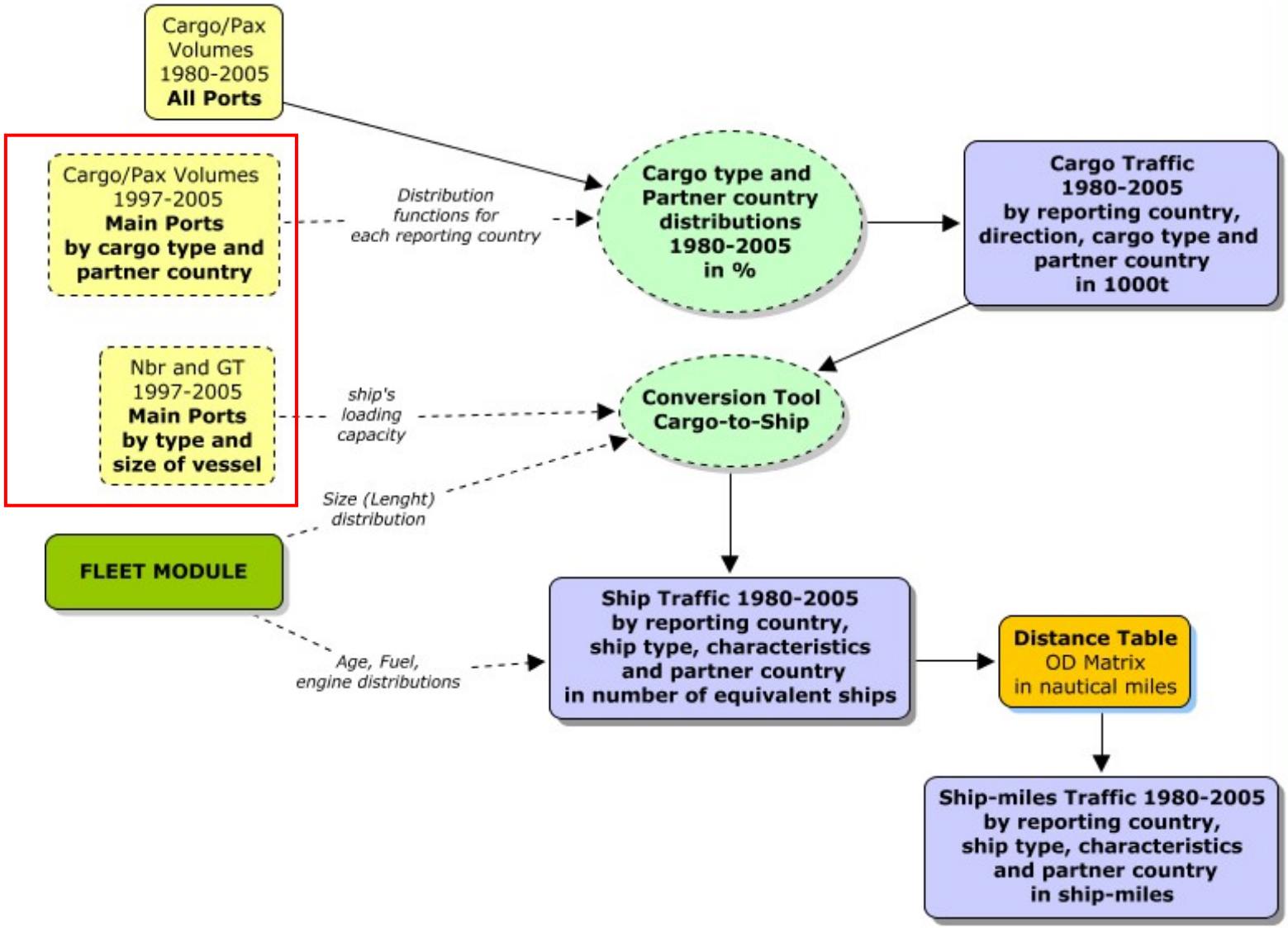
Maritime: fleet module

- The importance of considering technology evolution -> impacts on calculated pollutant emissions

Changeover in Age distribution of the World's tanker fleet (UNCTAD)



Maritime: the "activity-related" inventory



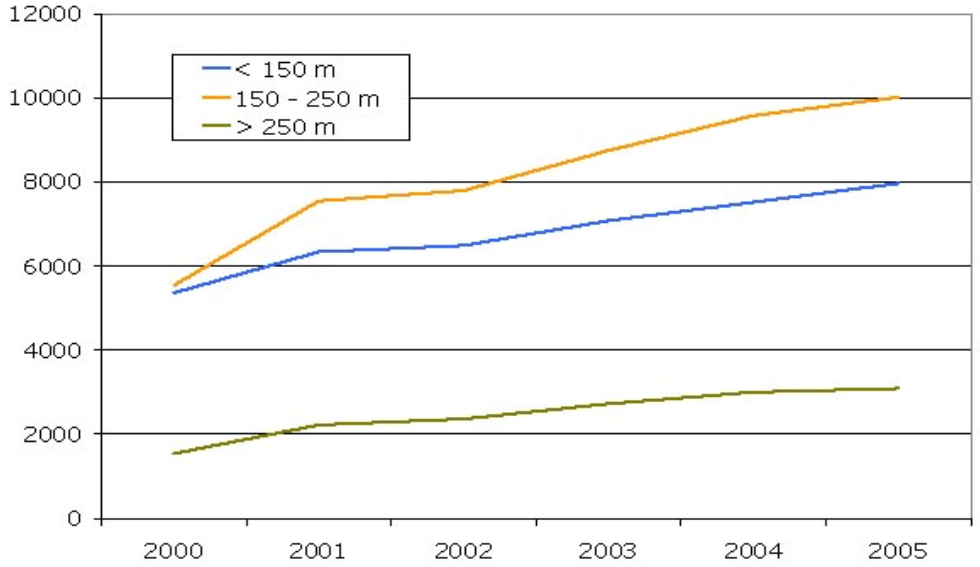
Maritime: distance table in NM

- One reference port for each country or Maritime Coastal Area
- OD pairs (country-to-country) in all European Seas
- Overseas pairs (country-to-zone) for 13 different overseas destinations
- Plus: European Ferry network with service frequency
- Emissions allocation: 50%-50% -> tonne-miles and ship-miles figures calculated considering sailing distance/2

Overseas OD Zone
Black Sea
Arabian Gulf
Red Sea
Indian Sub Continent
Australasia
Far East - China & Japan
South & East Africa
West Africa
US Atlantic & Canada - Great Lakes
Central America - Caribbean
South America - Atlantic
US & Canada - Pacific
South America - Pacific

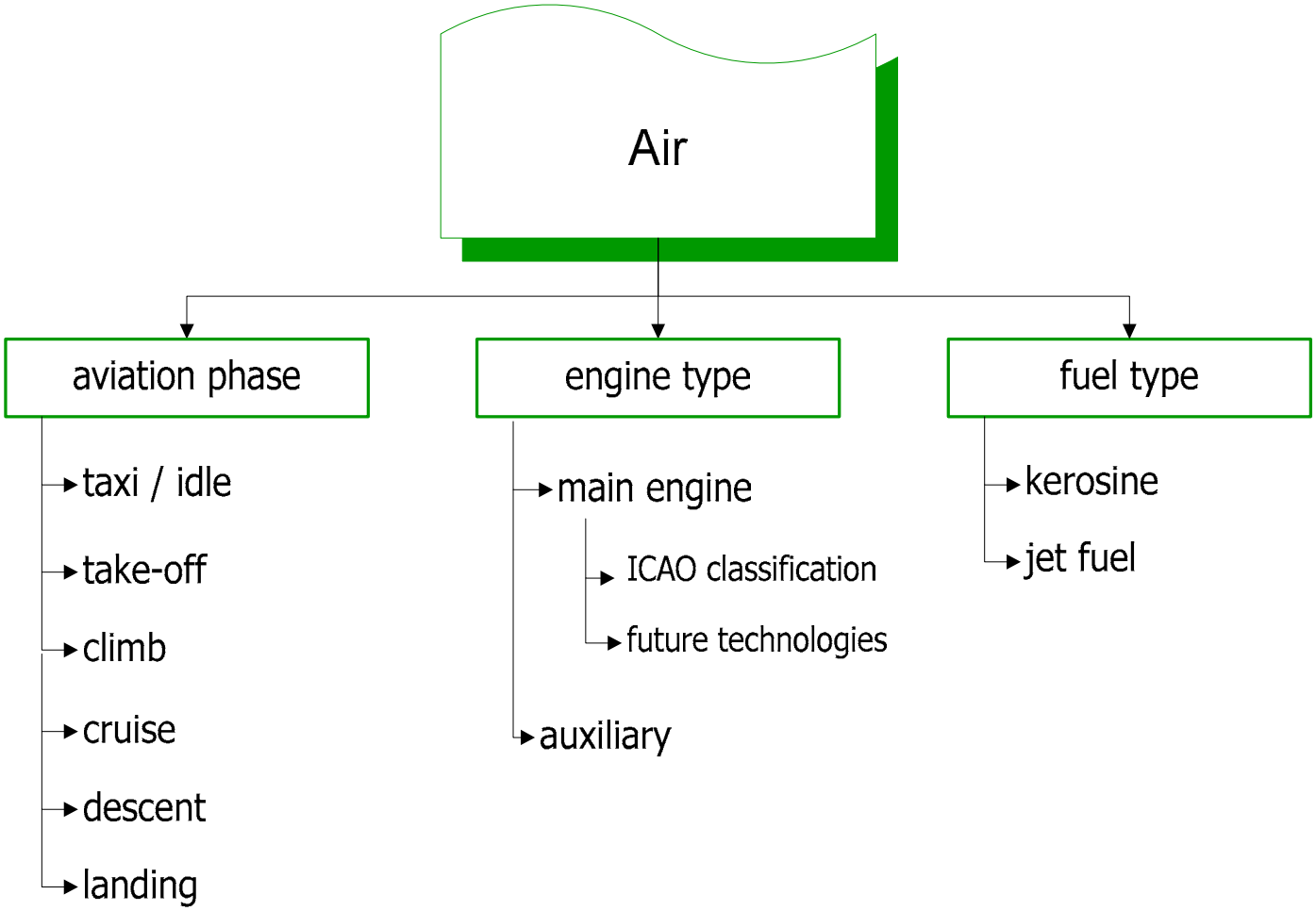
Maritime: preliminary results (Spain)

- Evolution of full ship calls and aggregated NOx emission factors



NO_X (g/kWh)	Size	2000	2001	2002	2003	2004	2005
Container ship	< 150 m	14,0	14,2	14,3	14,0	14,0	14,1
Container ship	150 - 250 m	16,6	16,5	16,5	16,0	15,8	15,7
Container ship	> 250 m	16,7	16,6	16,6	16,0	15,9	15,8
RoRo cargo	< 150 m	14,0	14,2	14,2	14,3	14,4	14,4
RoRo cargo	150 - 250 m	15,1	15,2	15,1	15,3	15,3	15,3
RoRo cargo	> 250 m	15,7	15,7	15,8	15,5	15,4	15,4

Aviation: main influencing factors



Aviation: Eurocontrol data

Aircraft movements segmentation:

- 5 Flight distance categories (in NM)
- Domestic flights: country data/ by aircraft type / by flight distance category / distinction between passenger and freight
- International flights: country pair data / by aircraft type / by flight distance category / distinction between passenger and fret activities
- Years: 1996-2005

EX-TREMIS projections

Main sources for baseline projections are:

- TREMOVE model (EC DG Environment)
- TRANS-TOOLS model (EC DG Transport and Energy)
- Railenergy (6th FP, 2006-2010)
- IIASA-ENTEC-MET.NO

The EX-TREMIS project

Thanks for your attention

www.ex-tremis.eu