Transport sector data and surveys

EPE-GIZ training on indicators

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Overview of data for indicators in transport

- ➢Stock of vehicles by fuel type by type of vehicles (cars, light duty vehicles, trucks, buses, motorcycles, taxis…)
- ➢Data on cars (specific consumption, kilometres/vehicle)
- ➢Data on trucks
- ➢Energy consumption by fuel by mode (road, rail, air, water)
- ➢Energy consumption by fuel by type of vehicles

1. **Stock of vehicles**
2. Cars
3. Trucks and light duty vehicles
4. Consumption by mode/vehicle
5. Modelling of consumption by vehicle: case study of France
6. Survey of car energy use in France (Secodip)
7. Gas station survey: case of Tunisia
8. Case study: Ireland

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Stock of vehicles: sources of data and definitions

- The stock of road vehicles by type (cars, trucks, light-duty vehicles, buses, two-wheels or motorcycles) is available from national statistics.

- It corresponds to the number of road vehicles registered at a given date (usually at the end of the year or the middle of the year) in a country and licensed to use roads open to public traffic.

- It should refer to the number of vehicles really on the road (i.e. in circulation and that consume motor fuels).

- Cars should also include taxis. Light duty vehicles also called light commercial vehicles have < 3 t useful load. Trucks correspond to heavy trucks (generally > 3 t useful load); trucks should also include road tractors (articulated vehicles, also called trailer truck) .

- Military vehicles are usually excluded from the statistics.

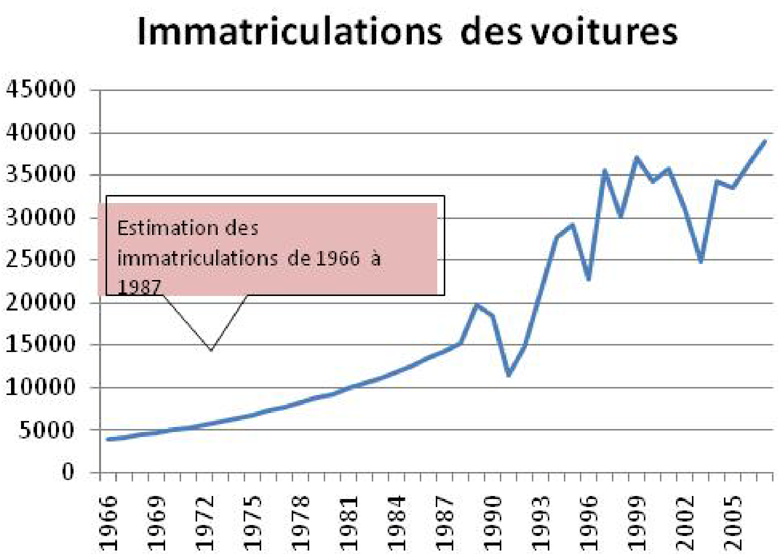
Stock of vehicles: main issue with official sources

- Official data sometimes relate to all registered vehicles (i.e. including vehicle that have been scrapped and are not used any more), as they cumulate all the new registrations to the existing stock of vehicles without retiring the vehicles that are no longer used.

- Such data series usually overestimate the real stock of vehicle on the road, i.e. consuming motor fuels by over 30% (e.g. Tunisia).

- To get the real stock, several approaches
    - Use other sources that better correspond to vehicles in use (from fiscal registry if annual fees are paid)
    - Or modelling using a survival law(“(Gallez law)

Modelling of the stock of vehicule in use



Data needed

- Average age of vehicles (e.g. 15 years for cars)
- Life time of vehicles (e.g. 25 years for cars)
- Annual sales

Modelling of the stock of vehicule in use

Age moyen du parc	Loi		Immat VP	parc 2007		parc 2006		parc 2005		parc 2004		parc 2003		parc 2002		parc 2001		parc 2000
0	1	2007	**39026**	39026														
1	1,000	2006	**36309**	36309	1,000	36309												
2	1,000	2005	**33592**	33592	1,000	33592	1,000	33592										
3	1,000	2004	**34294**	34294	1,000	34294	1,000	34294	1,000	34294								
4	1,000	2003	**24856**	24856	1,000	24856	1,000	24856	1,000	24856	1,000	24856						
5	1,000	2002	**31177**	31173	1,000	31177	1,000	31177	1,000	31177	1,000	31177	1,000	31177				
6	0,999	2001	**35757**	35715	1,000	35752	1,000	35757	1,000	35757	1,000	35757	1,000	35757	1,000	35757		
7	0,994	2000	**34334**	34137	0,999	34294	1,000	34330	1,000	34334	1,000	34334	1,000	34334	1,000	34334	1,000	34334
8	0,981	1999	**37057**	36364	0,994	36845	0,999	37014	1,000	37052	1,000	37057	1,000	37057	1,000	37057	1,000	37057
9	0,954	1998	**30171**	28788	0,981	29607	0,994	29998	0,999	30136	1,000	30167	1,000	30171	1,000	30171	1,000	30171
10	0,909	1997	**35664**	32408	0,954	34029	0,981	34997	0,994	35460	0,999	35622	1,000	35659	1,000	35664	1,000	35664
11	0,844	1996	**22737**	19195	0,909	20661	0,954	21695	0,981	22312	0,994	22607	0,999	22710	1,000	22734	1,000	22737
12	0,764	1995	**29164**	22270	0,844	24620	0,909	26501	0,954	27827	0,981	28619	0,994	28997	0,999	29130	1,000	29160
13	0,672	1994	**27747**	18657	0,764	21188	0,844	23424	0,909	25214	0,954	26475	0,981	27228	0,994	27588	0,999	27715
14	0,577	1993	**21347**	12313	0,672	14353	0,764	16301	0,844	18021	0,909	19398	0,954	20369	0,981	20948	0,994	21225
15	0,483	1992	**14926**	7205	0,577	8610	0,672	10036	0,764	11398	0,844	12601	0,909	13563	0,954	14242	0,981	14647
16	0,395	1991	**11459**	4522	0,483	5532	0,577	6610	0,672	7705	0,764	8750	0,844	9673,7	0,909	10413	0,954	10934
17	0,315	1990	**18480**	5829	0,395	7293	0,483	8921	0,577	10660	0,672	12426	0,764	14112	0,844	15601	0,909	16793
18	0,247	1989	**19825**	4888	0,315	6253	0,395	7824	0,483	9570	0,577	11436	0,672	13330	0,764	15139	0,844	16736
19	0,188	1988	**15212**	2864	0,247	3750	0,315	4798	0,395	6003	0,483	7343	0,577	8775	0,672	10228	0,764	11616
20	0,140	1987	14298	2003	0,188	2692	0,247	3525	0,315	4510	0,395	5643	0,483	6902	0,577	8248	0,672	9614
21	0,101	1986	13439	1358	0,140	1883	0,188	2530	0,247	3313	0,315	4239	0,395	5304	0,483	6488	0,577	7752
22	0,070	1985	12632	882	0,101	1276	0,140	1770	0,188	2378	0,247	3114	0,315	3984	0,395	4985	0,483	6098
23	0,045	1984	11873	537	0,070	829	0,101	1200	0,140	1664	0,188	2235	0,247	2927	0,315	3745	0,395	4686
24	0,026	1983	11160	291	0,045	505	0,070	779	0,101	1127	0,140	1564	0,188	2101	0,247	2751	0,315	3520
25	0,011	1982	10490	119	0,026	274	0,045	475	0,070	733	0,101	1060	0,140	1470	0,188	1975	0,247	2586
26		1981	9859,9		0,011	112	0,026	257	0,045	446	0,070	689	0,101	996	0,140	1381	0,188	1856
27		1980	9267,6				0,011	105	0,026	242	0,045	419	0,070	647	0,101	936	0,140	1298
28		1979	8711						0,011	99	0,026	227	0,045	394	0,070	608	0,101	880
29		1978	8187,7								0,011	93	0,026	214	0,045	370	0,070	572
30		1977	7695,9										0,011	87	0,026	201	0,045	348
31		1976	7233,7												0,011	82	0,026	189
32		1975	6799,2														0,011	77
33		1974	6390,8															
34		1973	6006,9															
35		1972	5646,1															
36		1971	5307															
37		1970	4988,2															
38		1969	4688,6															
39		1968	4407															
40		1967	4142,3															
41		1966	3893,5															
42		1965	3659,6															
PARC RE-EVALUE				469596		450587		432765		416287		397907		387940		370777		348265

hypothèses

1. Stock of vehicles
2. **Cars**
3. Trucks and light duty vehicles
4. Consumption by mode/vehicle
5. Modelling of consumption by vehicle: case study of France
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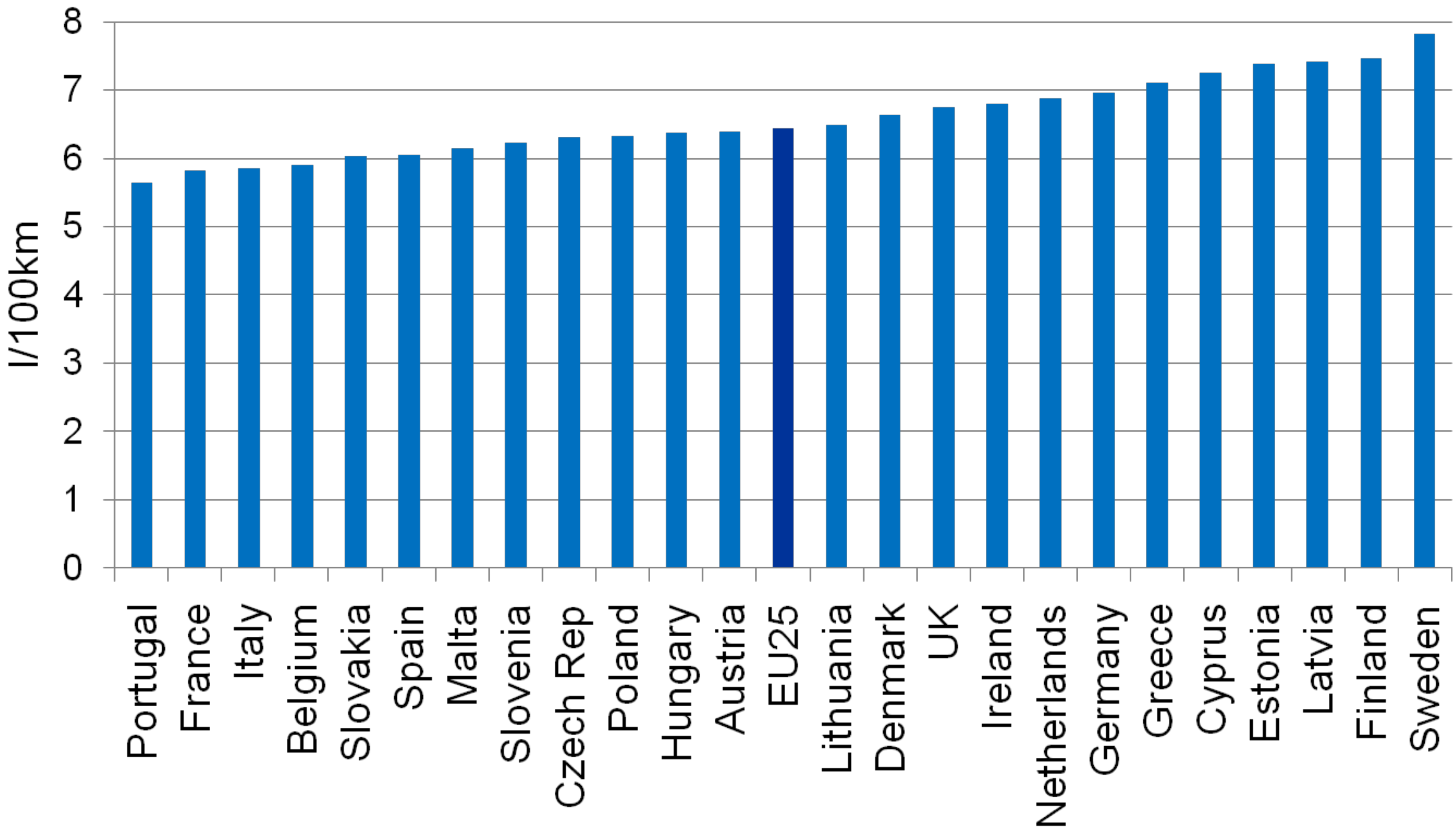
The test specific consumption is traditionally measured for each type of car following standardised test procedures in terms of driving cycles. In the

Specific consumption of new cars

- Vehicle manufacturers usually provide information on the theoretical specific consumption of the vehicles commercialised, according to standardised driving cycles (e.g. European cycle*) and as an average .
- National average: sales weighted average of test values by type of car:
  - for all car sold (EU approach)
  - For the 10 or 20 most sold models (simplified approach)
- Data monitored by the European Commission since 1995 , processed by EEA
- Data also monitored by national car associations (e.g. France)
- For new cars, the actual recorded specific consumption on normal traffic conditions is higher than the theoretical value ("gap factor"**)

**Reference: "Transport indicators: gap factor by Cazzola, IEA

Specific consumption of new cars (litres/100km)



Source: EU Commission from car manufacturers

Average specific consumption of cars

- Specific consumption expressed in litre per 100km or km/l or mpg
- Source:
  - metered with on board equipment
  - from surveys:
    - ✓from driver sheets (e.g.: Secodip survey in France)
    - ✓from driver declaration (e.g.: gas station surveys)
  - or modelled

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Specific consumption: metering

- Principle : from captor on board, from a sample of vehicle
- Advantages : S.E.C. in real conditions of use coupled with very detailed parameters, validation of simulation model, well describes the microscopic mechanisms, influence of parameters on S.E.C. and pollutants
- Drawbacks : expensive, difficult to implement technically, non representative at national level, needs collaboration of manufacturers and drivers, bias due to the driver behaviour.

Specific consumption: survey from driver sheet

- Principle : Division of basic information of purchased quantity of fuel and the metered mileage.

- Sampling methods are comparable to driver's declaration one. Use of households panel is complex.

- Advantages : on road consumption at very detailed level, ensures coherence between S.E.C. and mileage and socio-economic parameters, used for travel survey, fuel price following-up

- Drawbacks : very expensive (weekly follow up), bias for long runners (boring) ie. underestimation and new drivers, low response rate, to dispose of a reference for the sampling.

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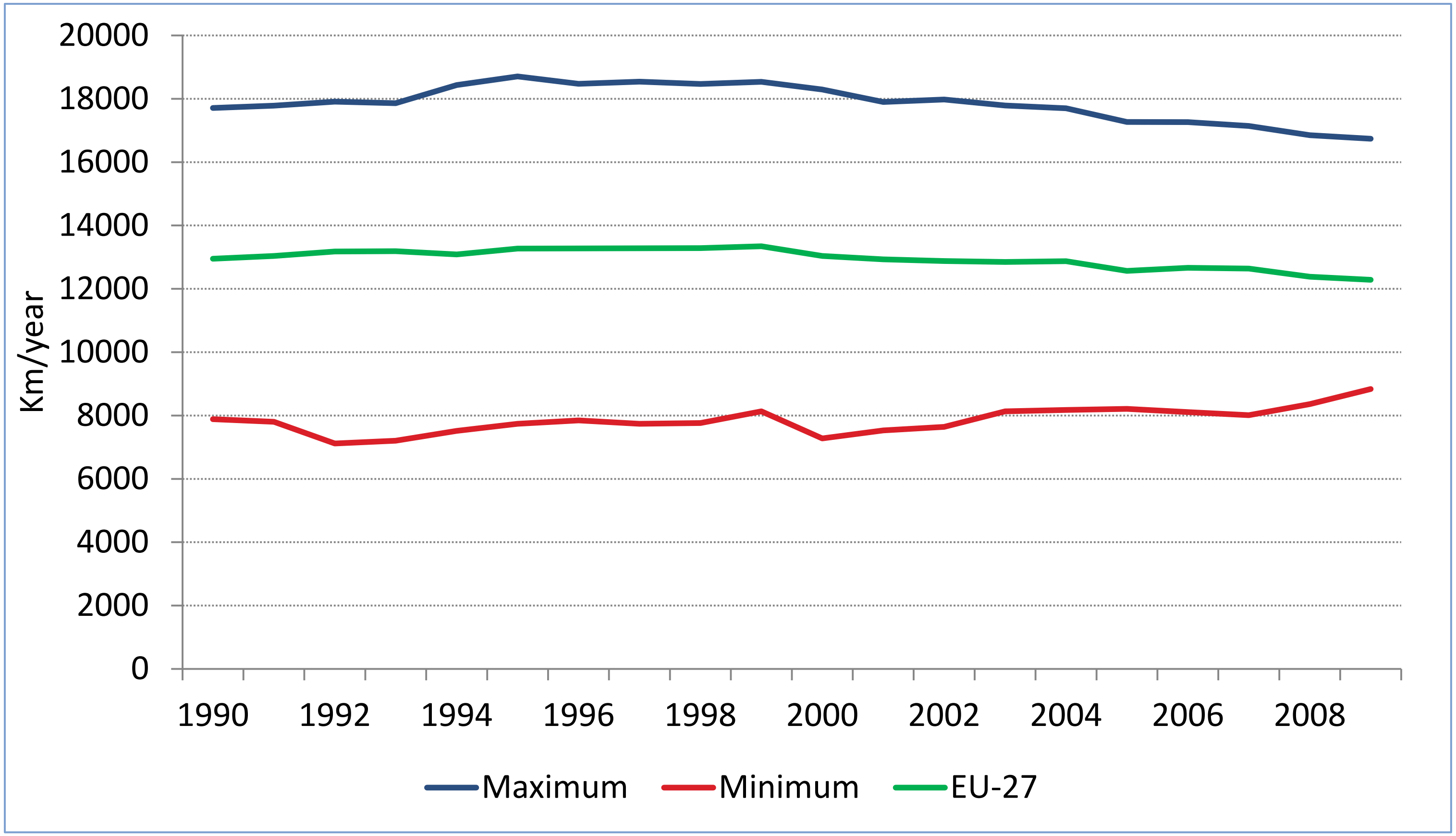
Specific consumption : survey from driver declaration

- Principle : based on "call for memory" from the driver
- Data collection : mailed or self administrated questionnaire, surveyor on board or "gas station survey"
- Sampling : sample or panel of drivers, households, vehicles or companies
- Period : daily, weekly, yearly.
- Advantages : Easier, cheaper, less reliable than driver sheet
- Drawbacks : Maybe underestimate the results. Bias due to implicit calculation between fuel purchase and mileage performed. This bias is as big as the reference period is far.

Data on car use (km/year)

- Data for vehicle use (km/vehicle/year) requires dedicated surveys; several methods:
  - national household surveys (eg France, Germany)
  - panel of representative vehicle owners (eg Secodip survey in France)
  - surveys at gas stations…
  - Collection of data from technical controls (e.g. Ireland)
- The main issue: consistency between the population surveyed and the vehicle stock
- Methods based on vehicles meters are more reliable... if meters reliable

Change in distance travelled by car km/ year



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Specific/unit consumption to assess energy efficiency of trucks: technical and pattern of use

- Data required:
  - Specific consumption in litre per km: from surveys
  - Annual traffic of trucks in ton-km from surveys
  - Annual distance travelled per year per truck (thousand km from surveys
- Survey on transport of goods cover all these data

Surveys of road good transport: case of UK and France

- UK: Continuing Survey of Road Goods Transport (CSRGT)
  - Collects data from 12,000 vehicles per year, each one being monitored during one week over 3.5 t gross weight
  - For articulated trucks > 33 t , the CSRGT sample is around 5000 vehicles

- France: Survey of Road Goods Transport (Transport Routier de Marchandises - TRM)
  - About 15,000 trucks over 3.5 t and 70,000 tractors (< 15 years) surveyed per year
  - The statistical unit of the survey is vehicle activities over one week.

- Both surveys provide annual data about road freight operations carried out by goods vehicles over 3.5 t

- In order to deal with seasonality matters, both the British and French surveys are continuous, and the questionnaires are sent regularly to vehicle users.

- Questionnaires are filled by the driver or the company → allows a very good accuracy

- On board telematics, with sensors registering the fuel use, vehicle weight and distance on a computer, would offer even higher data accuracy (e.g. German toll system)

Surveys of road good transport: TRM survey in France

•**Scope :** French trucks of less than 15 years over 3.5t useful load (trucks and tractors for articulated vehicles)

•**Periodicity : p**ermanent survey to cover seasonal aspects

•**Statistical unit surveyed :** « véhicule-week ».

•**Sampling**
Sampling based on the registry of vehicles (« Fichier central des automobiles »).
Total stock of is 275 000 for trucks and 265 000 for tractors (articulated vehicles).
The sampling is done every quarter with a rotation of half the samples every year
The sampling is based on the activity (APE) and the vehicle age.

Surveys of road good transport: TRM survey in France

- **Questionnaire content and main data collected**

- Activity of company owning the truck ,
- Type of vehicle
-Distance travelled loaded or empty,
- Load factor of the vehicle
- Type of goods carried
- Tonnage carried
-Origin / destination of traffic.

- **Calculation** :

- tonnes-kilometre,

.

Surveys of road good transport: case of UK and France
Key performance indicators and efficiency of all goods vehicles over 3.5 t (2006)

	UK	France
Goods lifted (Mt)	1810	2060
Goods moved (Mtkm)	155762	205279
Vehicle km (million km)	22384	21368
Length of haul (km)	86	100
Empty running (%)	27%	25%
Average load (tkm/load km)	9.5	12.8
Tonne km : vehicle km	7.0	9.6
Ave. fuel efficiency (l/100 km)	34.5	35.7
Total fuel use (million litres)	7712	7624
Fuel use intensity (l/tkm)	0.05	0.04

Source: CSRGT survey (UK) and TRM survey (France)

Surveys of road light duty vehicles : case France

▪**Périodicity:** about every 5 years since 1981 (1986, 1991, 1996, 2000 , 2006 et 2011

▪**Scope :** vehicles below 3.5t useful load

▪**Sampling:** based on the registry of vehicles (« Fichier central des automobiles »). The sampling is based on the activity, the size of the vehicle, the fuel and the vehicle age. ➔ around 25 000 vehicles surveyed

▪**Main variables colected**

-Distance travelled

-Type of fuel,

- Fuel consumption

- Use of the vehicles

Méthodologie: http://www.statistiques.developpement-durable.gouv.fr/sources-methodes/enquete-nomenclature/1543/0/enquete-lutilisation-vehicules-utilitaires-legers-vul.html?tx_ttnews%5Bcatdomaine%5D=873&cHash=62a2ebe8c55a763368f0b76fb7af735c

Résultats 2011 : http://www.statistiques.developpement-durable.gouv.fr/transports/r/utilisation-vehicules.html?tx_ttnews%5Btt_news%5D=22388&cHash=7032728b2364d308c400cd4846f7fc9e

Surveys of road light duty vehicles : case France

Consommation moyenne en 2010 selon la nature du carburant et le PTAC

Classes de PTAC (en tonnes)	**Natures de carburants**					
	Gazole	Super	GPL	GNV	Electricité	**Total**
Moins de 1,5 t	6,4	7,4	7,9	7,4	16,1	6,8
1,5 t à 2,599 t	7,0	9,1	10,3	8,3	16,7	7,1
2,6 t à 3,499 t	9,7	13,0	18,1	11,9	///	9,7
3,5 t	11,4	14,7	17,6	11,9	///	11,4
Total	**8,2**	**8,2**	**11,6**	**8,1**	**16,5**	**8,2**

Unités : l/100km, GNV : kg/100 km, électricité : kw /100 km

Source : SOeS, Enquête VUL 2011 : http://www.statistiques.developpement-durable.gouv.fr/transports/r/utilisation-vehicules.html?tx_ttnews%5Btt_news%5D=22388&cHash=7032728b2364d308c400cd4846f7fc9e

Surveys of road good transport: bibliography

- Overview of UK and French Surveys of Road Goods Transport (CSRGT and TRM)
  - IMPROVING ENERGY EFFICIENCY IN ROAD FREIGHT TRANSPORT SECTOR: THE APPLICATION OF A VEHICLE APPROACH “ http://www.greenlogistics.org/SiteResources/7d476c2c-2574-4890-ae4a-997484b9a443_LRN%20vehicle%20approach.pdf

- Detailed methodology of French survey : http://www.statistiques.developpement-durable.gouv.fr/sources-methodes/enquete-nomenclature/1543/0/enquete-transport-routier-marchandises-trm.html?tx_ttnews%5Bcatdomaine%5D=873&cHash=8ba4ef779963d0102eb250e3c7128d46

- Result of French survey: http://www.statistiques.developpement-durable.gouv.fr/transports/s/route.html

- Road freight surveys in UK: http://www.statistics.gov.uk/hub/travel-transport/roads/freight and http://www.dft.gov.uk/statistics/series/road-freight/

- Methodology of surveys in each EU country: Eurostat “Methodologies used in surveys of road freight transport in member states and candidate countries , 2008 http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-RA-08-009/EN/KS-RA-08-009-EN.PDF

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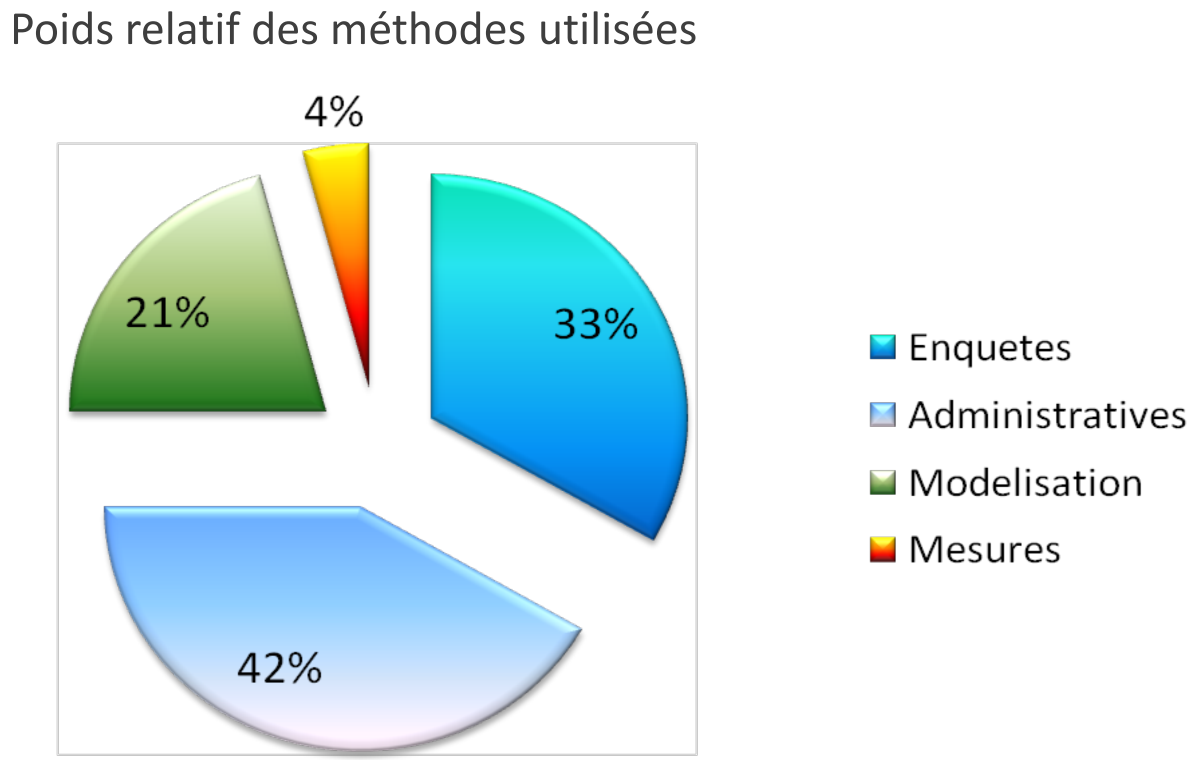
Data on energy consumption

- Data for energy consumption by main transport mode: rail, air, waterways & sea transportation and road usually directly available in statistics
- Data for energy consumption of road transport by vehicle types and services(passenger vs freight) usually not directly available in the statistics, but through estimates and modelling

Source des données de consommation finale par mode et type de véhicules routiers



Source: enquête AIE 2011 (mars 2012), basé sur 24 sources de données

Average specific consumption of cars

- Calculation:
  - ratio calculated from the total consumption of cars, the stock of cars, the average distance travelled by year per car and the average calorific value of motor fuels

cstocvpc=toccfvpc/(nbrvpc*kmvpc)*100* coefvpc (l/100km)

- ✓toccfvpc: total consumption of cars (Mm3)
- ✓nbrvpc : stock of cars (millions)
- ✓kmvpc: average distance travelled per year per car (thousand km)
- ✓Coefvpc: average calorific value of motor fuels (toe/litre)

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•Source: F. Boccara & B. Nanot , SOES, Ministry of Ecology, Energy, Sustainable Development and Country and Town Planning, ODYSSEE-MURE, May 18 – 19th 2009, Paris

And D Bosseboeuf, ADEME

Study case from France

- The official energy balance (Ministry of industry) based on sales data do not provide detailed information by vehicle type.

- A working group, under the statistical unit of the French Ministry in charge of Energy and Transport ("SOES") elaborates such breakdown on a yearly basis based on a modelling (INSEE, SOES, CPDP, Ademe, CFCA)

- Despites some adjustments inherent to this methodology, the fact that the methodology used is similar each year ensures a certain reliability of the estimates.

Study case from France: (1)

- The starting point is the fuels sales. This information, coming from the refiners, is very reliable (0,5%). They will be compared or cross checked with a reconstitution of the transport consumption obtained in multiplying its technico-economic determinants (stock of vehicle, S.E.C., mileage) for each type of vehicle.

- The stock of vehicle is provided by an estimate of the vehicle manufacturer association (CCFA) by vehicle type and energy. This estimates is a consensus among several other sources. It is the stock on duty of French vehicles only.

Study case from France (2)

- The mileage is coming from specific surveys for car (household panel, Secodip), from annual traffic survey for bus and trucks (M.O.T.) and from extrapolation of snapshot surveys for light vehicles.

- This mileage is not perfectly coherent with the definition and disaggregation of the stock. Adjustments are made.

- Then a domestic traffic is calculated in vehicule-km by vehicle type and energy.

- Traffic of special vehicles, and foreign vehicles is estimated from surveys (transit) and a sold including motorcycles is added.

Study case from France (3)

- The specific consumption (L/100km) is coming from same survey used for the mileage. (from driving sheet for car, call of memory for light vehicles, bus and trucks etc.).
- Clearly, adjustement are made at this stage and the reliability is rather weak for trucks and bus.
- The total consumption by vehicle is then calculted, splitting consumption of french vehicles and foreign vehicles.
- A balance is expressed between this estimate and the fuel sales. In 1996, it represents 0% for gasoline and 1,5% for diesel. But is very erratic.

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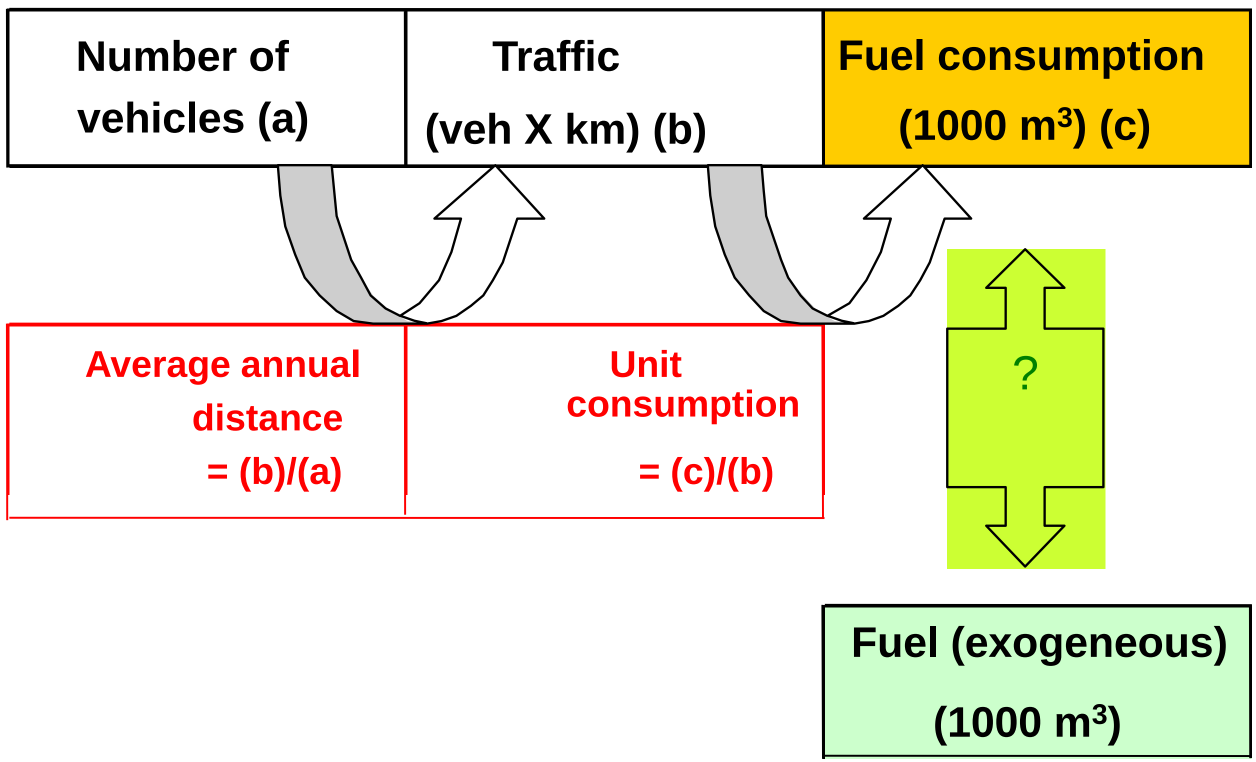
The principle of the method



Sources: Sofres, Inrets, CCFA, Asfa, Setra, Survey TRM, etc.

The calculation (1)

(separate tables for diesel and gasoline)

	Stock of vehicles	Average km	Traffic (veh * km)	Unit cons. (l/100 km)	Consumption (m^3)
Personnal cars	CCFA registration + taxes + modelling	Panels	calculated	Panels	calculated
Light commercial vehicles	CCFA registration + taxes + modelling	Survey (/5 years) + estimation	calculated	Survey (/5 years) + estimation	calculated
Lorries	TRM Survey	TRM Survey	calculated	TRM Survey (additional question)	calculated

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The calculation (2)

	Stock of vehicles	Average km	Traffic (veh * km)	Unit cons. (l/100 km)	Consumption (m^3)
Buses and coaches			Survey (/5 years) + estimation	estimated	calculated
Motorcycles and others					estimated
Lorries (foreign)	TRM foreign surveys	TRM foreign surveys	calculated	estimated	calculated
Cars and light commercial vehicles (foreign)			Surveys (tourism) + estimation		calculated
TOTAL	Addition		Addition		**Energy statistics**

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The interest of the method

- Mixing the different sources improves the global quality : it makes the inconsistencies evident and force to clarify and improve the methodologies. The very good quality of fuel statistics is a relevant input for traffic statistics.

- The method guarantees the consistency of traffic statistics and energy statistics. It is specially useful for the inventories of greenhouse gases emissions.

Detailed energy balance for transport

PARCS MOYENS (véhicules immatriculés en France)

en milliers de véhicules	1994	1995	1996	1997	1998	1999
Voitures particulières	**24 643**	**25 000**	**25 300**	**25 795**	**26 450**	**27 145**
dont essence	18 722	18 378	18 096	18 045	18 131	18 210
dont sociétés	207	205	241	228	236	nd
dont particuliers	18 515	18 173	17 855	17 817	17 895	nd
dont Diesel	5 921	6 622	7 204	7 750	8 319	8 935
dont sociétés	149	160	145	166	166	nd
dont particuliers	5 772	6 462	7 059	7 584	8 153	nd
Véhicules utilitaires légers	**4 495**	**4 555**	**4 606**	**4 697**	**4 822**	**4 934**
dont essence	1 665	1 560	1 494	1 443	1 404	1 356
dont Diesel	2 830	2 995	3 112	3 254	3 418	3 578
Véhicules lourds	**606**	**611**	**617**	**625**	**617**	**622**
dont poids lourds	529	532	536	543	535	541
dont bus et cars	77	79	81	82	82	81
TOTAL VEHICULES	**29 744**	**30 166**	**30 523**	**31 117**	**31 889**	**32 700**

Source : CCFA

PARCOURS MOYENS

km/véhicule	1994	1995	1996	1997	1998	1999
Voitures particulières	**13 832**	**14 005**	**14 030**	**13 985**	**14 037**	**14 103**
dont essence	11 739	11 619	11 505	11 583	11 440	11 359
dont sociétés	23 247	23 558	23 408	23 645	23 570	nd
dont particuliers	11 383	11 484	11 345	11 429	11 280	nd
dont Diesel	20 450	20 627	20 373	19 578	19 696	19 696
dont sociétés	39 797	40 192	40 075	38 434	38 434	nd
dont particuliers	19 951	20 142	19 968	19 165	19 314	nd
Véhicules utilitaires légers	**15 677**	**15 773**	**15 771**	**15 841**	**15 895**	**15 971**
dont essence	9 145	8 887	8 629	8 629	8 629	8 542
dont Diesel	19 520	19 360	19 200	19 040	18 880	18 786
Véhicules lourds	**43 811**	**43 858**	**43 068**	**43 403**	**44 991**	**46 108**
dont poids lourds	45 784	46 037	45 246	45 689	47 533	48 837
dont bus et cars	30 261	29 089	28 565	28 266	28 408	27 896

Sources : SOFRES, panel ADEME-SECODIP et estimations DAEI/SES

CONSOMMATIONS UNITAIRES

(en litre/100km)	1994	1995	1996	1997	1998	1999
Voitures particulières	**7,78**	**7,78**	**7,69**	**7,64**	**7,59**	**7,52**
dont essence	8,43	8,49	8,38	8,30	8,28	8,25
dont Diesel	6,61	6,67	6,72	6,72	6,72	6,65
Véhicules utilitaires légers	**9,71**	**9,73**	**9,74**	**9,74**	**9,74**	**9,70**
dont essence	9,52	9,56	9,61	9,61	9,61	9,61
dont Diesel	9,77	9,77	9,77	9,77	9,77	9,72
Véhicules lourds	**36,12**	**36,39**	**36,66**	**36,93**	**37,21**	**37,34**
dont poids lourds	36,44	36,71	36,99	37,26	37,54	37,69
dont bus et cars	32,80	33,00	33,20	33,40	33,60	33,26

Source : Panel ADEME-SECODIP

Detailed bottom-up energy balance for transport

ACHATS DE CARBURANTS

(en milliers de m3)	1994	1995	1996	1997	1998	1999
Total VP françaises	**26 530**	**27 239**	**27 310**	**27 545**	**28 185**	**28 772**
Total VUL français	**6 844**	**6 988**	**7 073**	**7 245**	**7 464**	**7 643**

Essence						
Deux roues	259	225	227	225	238	286
Voitures particulières	18 527	18 128	17 447	17 349	17 174	17 065
Véhicules utilitaires légers	1 450	1 326	1 238	1 196	1 164	1 112
Total véhicules légers français	**20 235**	**19 679**	**18 913**	**18 770**	**18 576**	**18 463**
VP et VUL étrangers	1 252	1 251	1 251	1 312	1 402	1 393
Total Conso Transpt en France	**21 487**	**20 930**	**20 163**	**20 081**	**19 978**	**19 856**
Achat aux frontières et ajustement statistique	-212	-611	-449	-787	-1 012	-1 001
Vente sous douane	14	14	17	19	17	26
Divers	305	313	319	325	332	340
Livraisons CPDP	**21 593**	**20 646**	**20 050**	**19 638**	**19 315**	**19 221**

Gazole						
Voitures particulières	8 004	9 111	9 863	10 196	11 011	11 708
Véhicules utilitaires légers	5 394	5 662	5 835	6 049	6 301	6 531
Total véhicules légers français	**13 398**	**14 773**	**15 697**	**16 245**	**17 311**	**18 238**
Poids lourds	8 824	8 991	8 970	9 244	9 546	9 948
Bus et cars	764	754	763	774	783	752
Total véhicules lourds français	**9 589**	**9 745**	**9 733**	**10 018**	**10 328**	**10 700**
VP et VUL étrangers	189	198	206	224	247	245
Véhicules lourds étrangers	1 819	1 943	2 064	2 184	2 302	2 382
Total Conso Transpt en France	**24 995**	**26 658**	**27 701**	**28 672**	**30 189**	**31 565**
Achat aux frontières et ajustement statistique	-398	-684	-721	-486	-992	-1 310
Vente sous douane	511	503	487	489	496	515
Divers	813	833	852	867	887	900
Livraisons CPDP	**25 921**	**27 310**	**28 319**	**29 542**	**30 580**	**31 670**

TOUS CARBURANTS						
Total livraisons CPDP	**47 514**	**47 956**	**48 369**	**49 180**	**49 895**	**50 890**

Source : CPDP et estimations DAEI/SES

1. Stock of vehicles
2. Cars
3. Trucks and light duty vehicles
4. Consumption by mode/vehicle
5. Modelling of consumption by vehicle: case study of France
6. **Survey of car energy use in France (Secodip)***
7. Gas station survey: case of Tunisia
8. Case study: Ireland

•Source: D Bosseboeuf, ADEME

Objectives of the Secodip panel on cars consumption

- Yearly monitoring of the on road specific consumption and mileage for private cars since 1988
- Fuel purchased by vehicle, fuel expenditure per household
- Market shares of fuels by distributors
- Seasonal variations
- Co- funding administrations (industry, transport, environment) and ADEME + oil companies for additional questions
- 130 000 euros annually (2002)

Secodip panel: a large diversity of outputs

- Market share by fuel types; by distributors
- Stock of private cars by fuels, by vehicle/drivers, household characteristic
- Yearly mileage per car by fuels, by vehicle/drivers, household characteristic, by traffic, region, monthly variation, ownership
- l/100 km per car by fuels, by vehicle/drivers/ household characteristics, by ownership
- Fuel quantity purchased (abroad 3%) , average consumer prices and household expenditure,

Methodology of the household panel on unit consumption for cars

- 3300 cars, representative of the households french cars stocks
- Drivers are selected from an ad hoc existing household panel of 8000 household, representative of the French population.
- Questionnaire (driving sheet) every 15 days on fuel purshase , every month on refueling and mileage
- Response rate : 84 %

Household panel

- The panel of SECODIP drivers is extracted from an existing household panel
  - volunteers from the household panel
  - each household can provide information for 1 or several vehicles

- This household panel is representative of French resident household and adjusted according to the following geo socio-demographic criteria :
  - Household size
  - Region
  - Age of driver
  - Socio-professionnal category

- The panel is also adjusted based on criteria related to the vehicle :
  - First year of circulation (i.e. age)
  - Power
  - Fuel
  - Brand

Mileage calculation

- The follow-up of annual mileage variation through metering is difficult:
  - The number of panelists decreases along the year
  - New panelists, new cars etc.

- Mileage assessment is obtained by indirect calculation from the specific consumption obtained in the survey as follows
  - l/100 km = Purchased quantity of fuel /mileage traveled between the refueling
  - Average mileage : purchased quantity in one year /l/100 km

Conclusion

- Original information particularly on specific consumption on road (compared to tested consumption)
- Stock, mileage and specific consumption are cross checked with vehicle characteristics and socio economic characteristics of the household
- Is it cost effective?
  - Yes because its answers to various issues (traffic, energy etc)
  - Yes if we can attract others sponsors (car makers, insurance etc.)
  - Yes because cost are infinitesimal compared to the energy bills

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7. **Gas station survey: case of Tunisia***
8. Case study: Ireland

•Source: Bertrand Château, Enerdata, for ANME, 2001

Gas station survey : types of data produced

- ✓ Breakdown of fuel sales of gas station surveys by vehicle types and types of uses
  - ✓Gasoline (regular and premium), unleaded, diesel, LPG
  - ✓Cars (private versus professional; of which <=4CV, 5-7 CV, >7cv), Taxis, Light duty vehicle, Trucks, Tractors etc.

- ✓ Yearly mileage by type of road vehicle

  Gasoline (regular and premium), unleaded, diesel, LPG

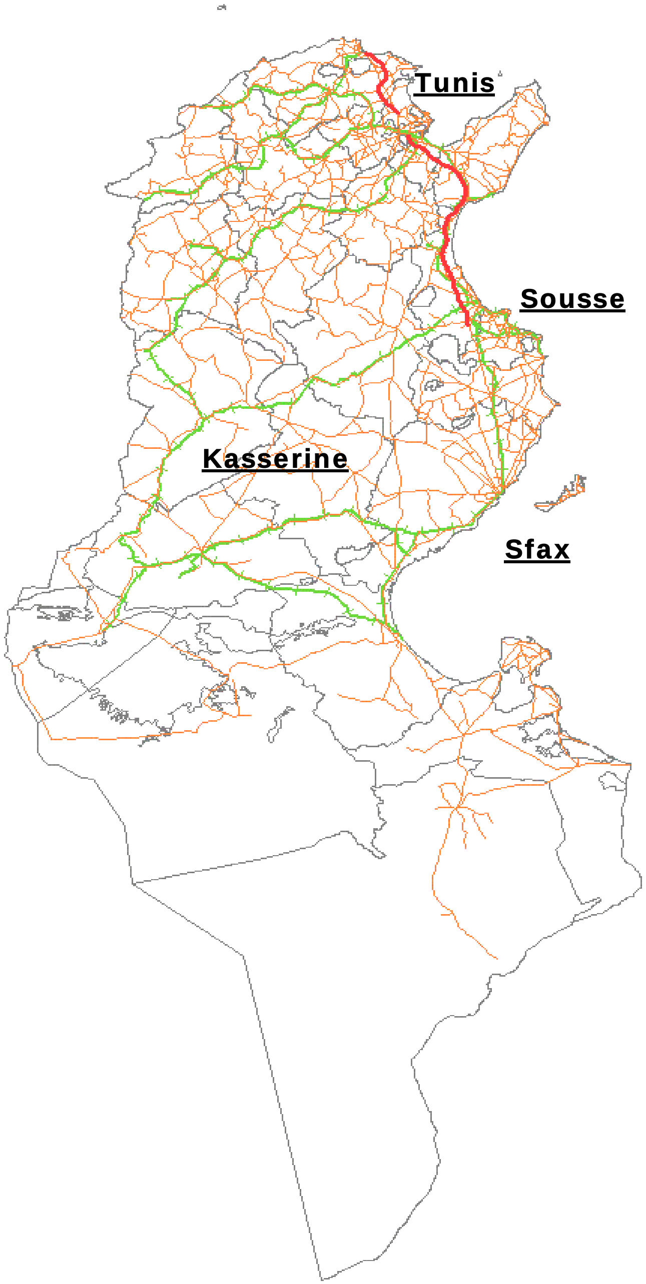
  Cars (private versus professional; of which <=4CV, 5-7 CV, >7cv),

  Taxis, Light duty vehicles, trucks, tractors etc.
  - ✓<1 year, 1-2 years, 2-3 years, 3-5 years, 5-7 years, 7-10 years, 10-15 years, 15-20 years, > 20 years

- ✓ Structure of vehicle stocks

  Gasoline (regular and premium), unleaded, diesel, LPG

  Cars (private versus professional; of which <=4CV, 5-7 CV, >7cv), Taxis, Light duty vehicle, Trucks, Tractors etc.



Tunis

Station	Période	
Mohammed V	April - mai 2006	X
Sokra	July - August 2006	X
Ennasr	September - october 2006	X
Charguia	Total number of surveyed vehicles	**5500**

Sousse - Sfax

Station	Période	
Oued El Kharroub (Khzama)	April - may 2006	X
Oued El Kharroub (Khzama)	July - August 2006	X
Teniour (Sfax)	September - october 2006	
Sagaz	Total Number of surveyed vehicles	**3250**

Kasserine

Station	Période	
(En discussion avec la compagnie)	April - May 2006	
	Juillet - Août 2006	
	September - October 2006	X
	Total of vehicles of surveyed	**1250**

Gas station survey : the adjustement

- Representatives of sampling
  - Representativeness of surveyed gas stations: volumes and structures of fuels, types of traffic, geography
  - Representativeness of customers in surveyed gas stations: volume and structures of fuels, volume and structures of stocks of vehicles.

- Sources of bias to be adjusted
  - Multiple passage
  - Seasonality
  - Over-representativeness of large runners
  - Mistake in the data collection

- Methods of adjustment
  - Structure of fuel sales by vehicle types: scratching of data collection mistakes, seasonality
  - Annual distance travelled: Elimination of multiple passage, weighting of surveyed stocks according to age based on new registrations
  - Stocks structure: idem

Gas station survey : complementary data needed

- ✓ First year of running
  - ✓Cars, Taxis, Taxis, Louages, LDV, Trucks, Urban bus, Autocars
  - ✓Model and fuel

- ✓ Tested specific consumption by vehicle type according to date of running
  - ✓Cars, Taxis, LDV (<= 3,5 tCU, of which <=1tCU, >1tCU), Trucks (of which <6t, 6-12t, >12t), urban buses, interurban buses
  - ✓Model and fuel

Enerdata

Gas stations surveys: representativeness according to the vehicles

	<=3an	3-5 ans	5-10 ans	10-15 ans	>=15 ans	**Total**
Total VP	0,79%	0,65%	0,85%	0,42%	0,09%	0,43%
TCP			0,19%	0,04%	0,02%	0,06%
Camionnette	0,36%	0,28%	0,28%	0,11%	0,04%	0,15%
Camion	0,11%	0,32%	0,12%	0,07%	0,06%	0,09%
Tracteur routier				0,18%		0,03%

- Large drop of the representativeness rate along with age after 10 years: probably a cumulated effect and over estimation of running stocks and under representativeness of small runners

- low representativeness of tractors and others vehicles indicating another mode of refueling

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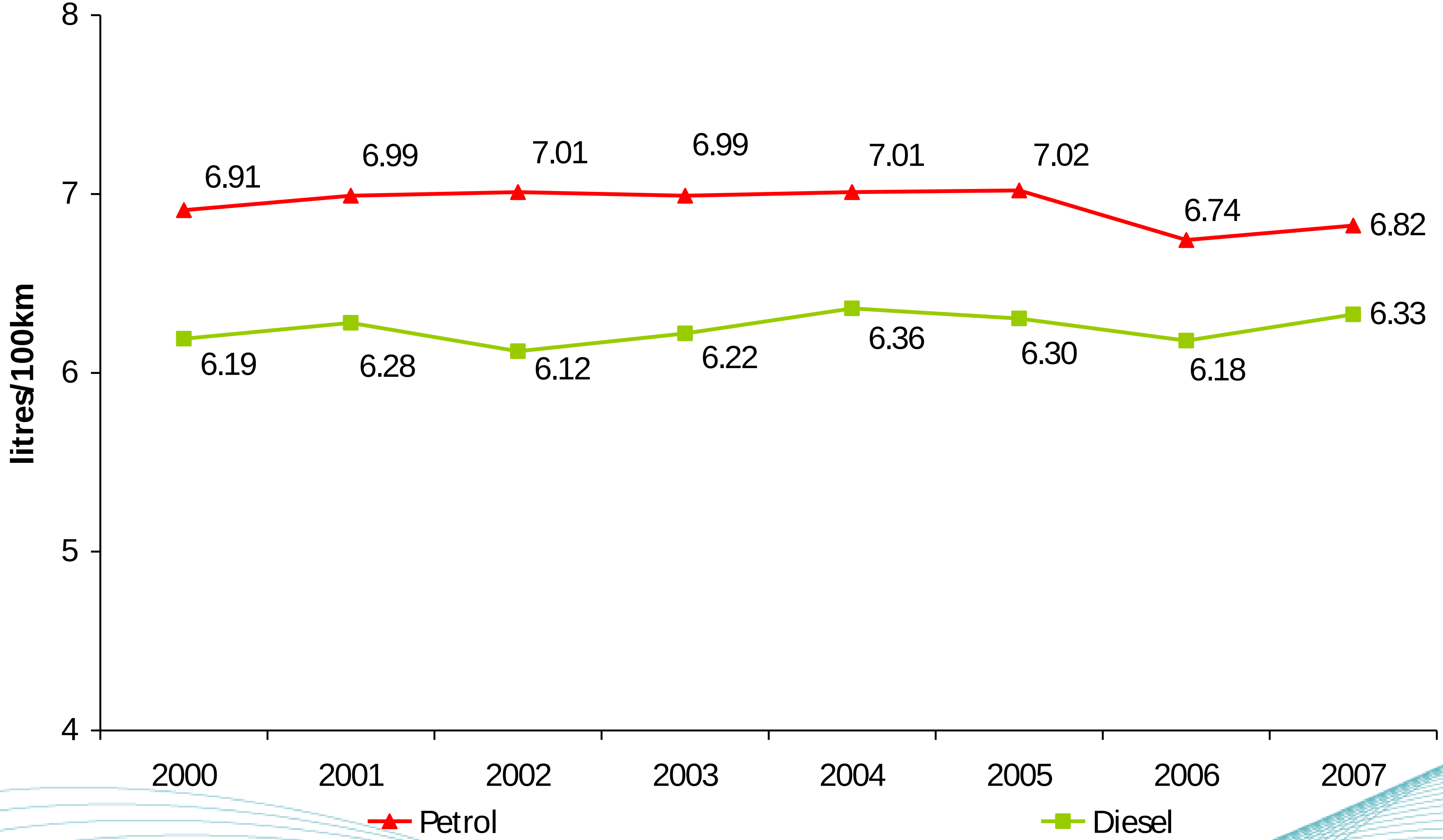
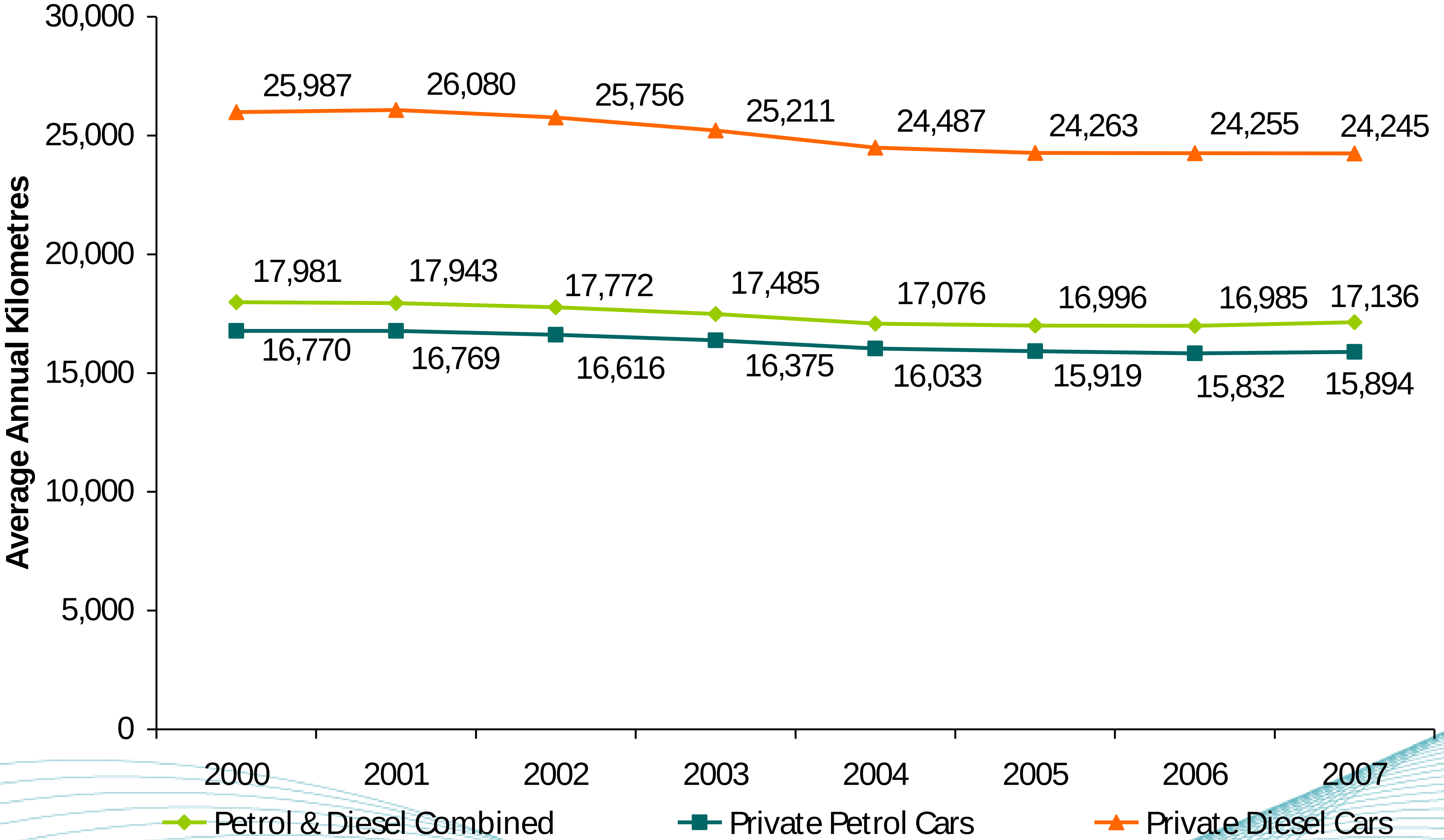
Case Study Private Cars

- Vehicle Registration Database
  - Detailed database on vehicles by size, fuel, use etc
  - Weighted fuel efficiency & CO_2 emissions by engine size by linking with car test database
- National car test – introduced in 2000
  - Mileage recorded first after 4 years and then every 2 years thereafter
  - Possible to calculate average annual mileage by engine size from database
- Bottom-up estimate of petrol & diesel consumption
  - annual mileage x fuel efficiency x estimate of on-road adjustment of fuel efficiency
- Similar calculation for taxis
  - Taxis tested annually and mileage recorded

Indicator 1 - Specific Fuel Consumption of New Cars



Private Car Mileage



Model Energy Use in Private Cars

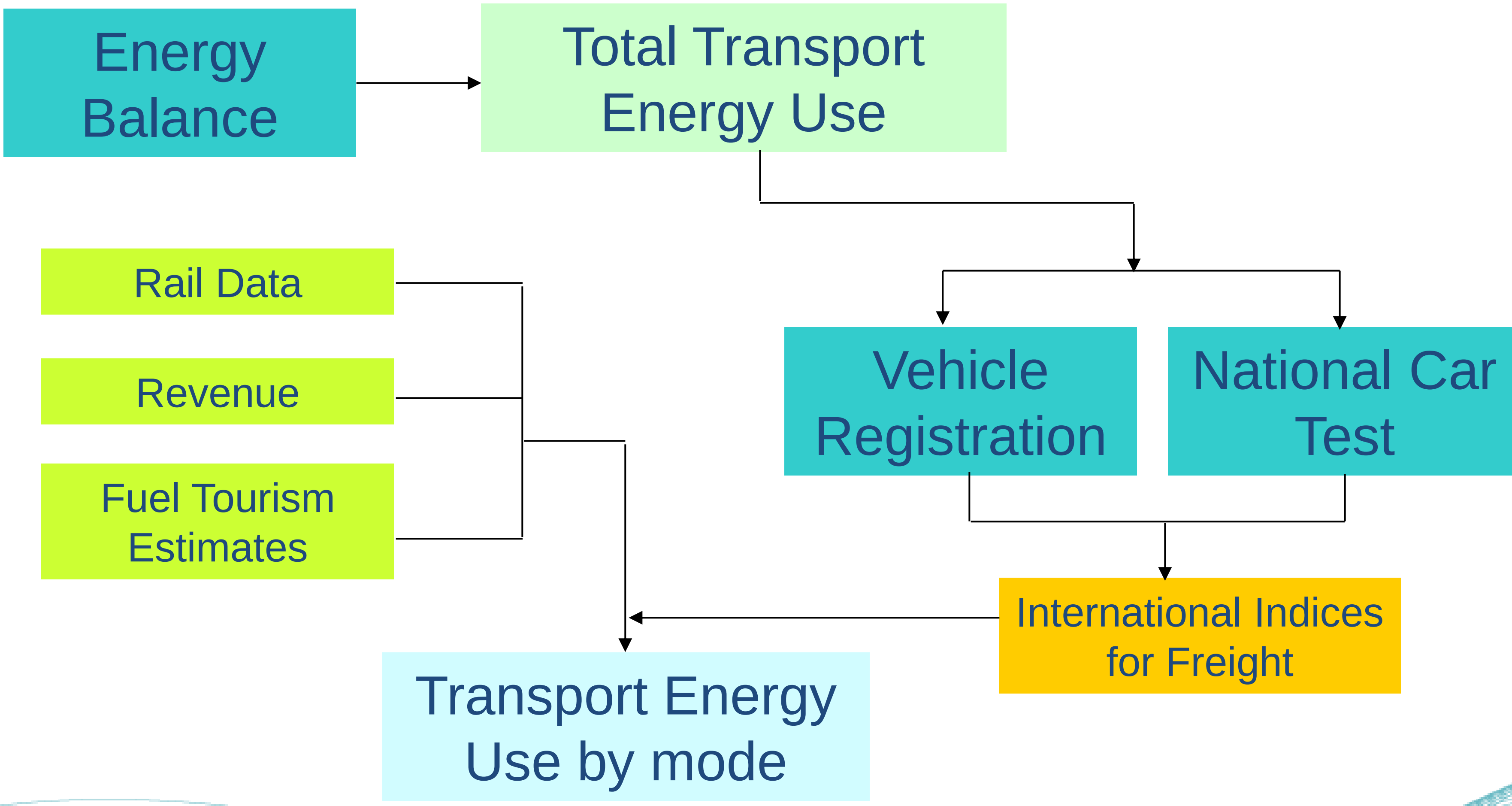
Annual Mileage by engine size and fuel X Fuel Efficiency of new cars by engine size X Fuel Efficiency inflated by 20% for on-road X Numbers of cars in each engine size band

= Petrol & Diesel consumption in private cars

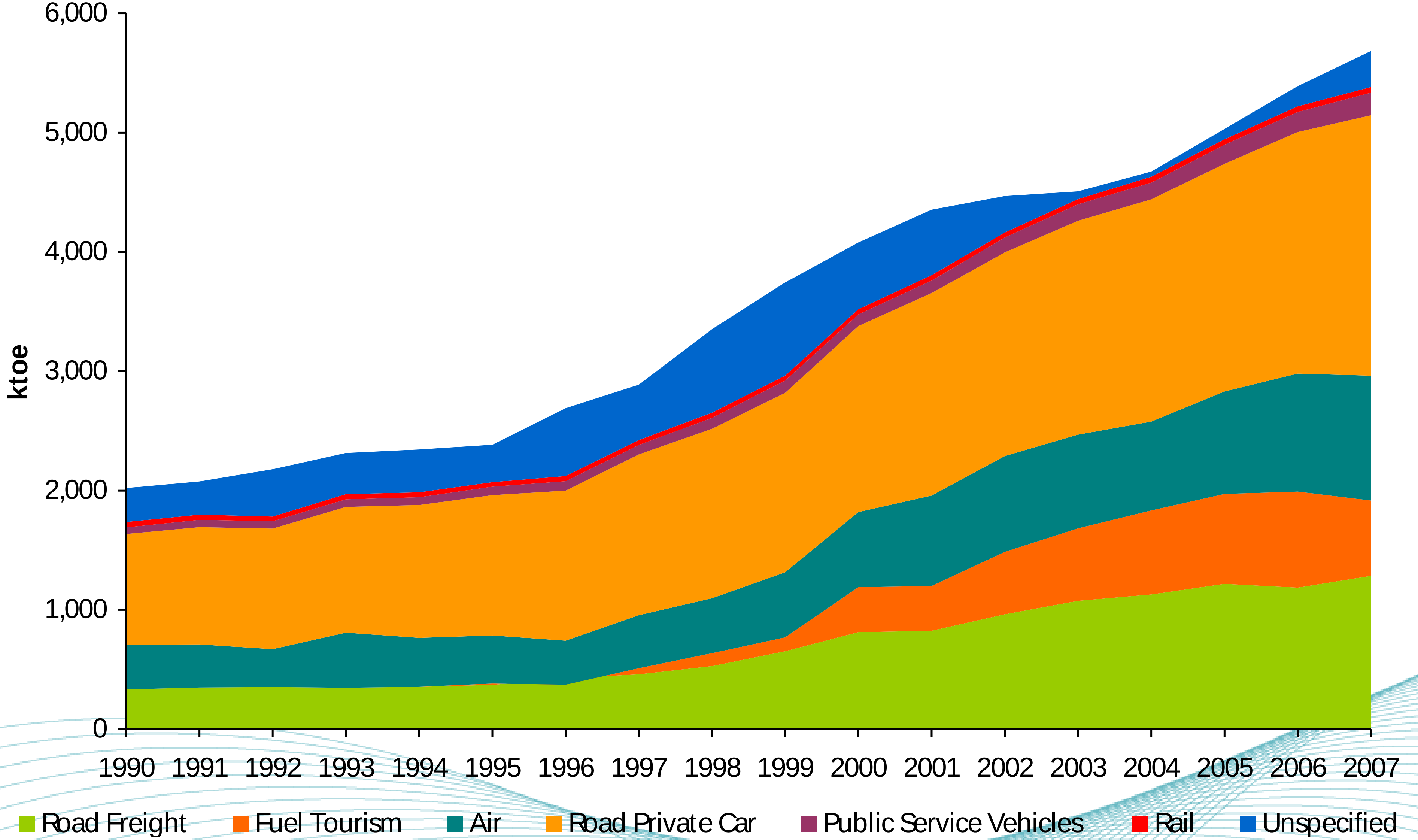
Road Freight Transport

- Vehicle registration data
  - Numbers of vehicles by unladen weight
- Annual Road Freight Survey (Statistical Office)
  - Vehicle kilometres
  - Tonne kilometres
- Used international estimates of fuel use per tonne kilometre and vehicle kilometre to estimate energy use

Putting it all together



Transport Demand by Mode



Costs & Barriers – Car Study

- No additional surveys conducted
- Value added from administration data
- Cost?
  - 3 person months (student work placement)
  - plus database development
- Data access
  - initial resistance
  - bona fida established and added value recognised
- g CO_2/km now recorded on the vehicle file