Updates in LCI of transportation services in view of mobitool v2.0

Rolf Frischknecht, treeze Ltd.

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Motivation and goal of study

- Update of mobility solutions consulting hub «mobitool»
- LCI data of fuel supply to be used in national directive
- Update of life cycle inventories of road, rail, air and water based transport

Main features of modelling, data and indicators

- scope of LCIs: manufacture, operation and waste management of transport equipment, incl. infrastructures (e.g. road, rails)
- focus of update:
  - fuel demand and emission factors during operation
  - load factors
  - utilisation factors
- ecoinvent data quality guidelines v2
- background data KBOB LCA data DQRv2:2016

Road transport
scope of the LCI study

- Passenger cars
  - various fuels, including electric, hybrid and plug-in hybrid
  - various emission standards
- Two wheelers
  - Motorcycle (new)
  - Scooter (ICE and electric)
  - Bicycle (standard and electric)
- Public transport
  - Minibus & Bus
  - Coach, Tramway & Trolleybus

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Road transport
scope of the LCI study II

- Lorries
  - 32-40, 40-50 and 50-60 tons gross weight
  - various emission standards
  - lorry fleet mixes
- Light commercial vehicles
- Non road vehicles
  - building machine
  - hydraulic digger
  - with/without particle filter

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Road transport
Key features

- Main data sources
  - Handbook Emission Factors for Road Transport
  - Swiss non road database
  - EMEP/EEA air pollutant emission inventory guidebook
  - ecoinvent data v3.1
- Fuel demand and emission factors include
  - real life fuel consumption and emissions
  - updated fuel and electricity supply
  - road, tyres and brake wear
  - refrigerant losses from air conditioning
  - noise

Road transport
Key features II

- Update of fuel supply (petrol, diesel etc.)
  - supply situation in Switzerland and Europe 2014 / 2015
  - New LCI on oil production in Azerbaijan (offshore) & Kazakhstan (on- & offshore)
  - 2017: new LCI data on oil production in USA and Mexico
  - main focus on country specific flaring and venting data
- LCI of LiIon battery
  - Data published by Ager-Wick Ellingsen et al. (2014)
  - real data from manufacturer Grenland Energy and suppliers
  - efficient production scenario (full capacity production)

Rail transport: Scope of the LCI study

- Rail transport in Switzerland
  - Intercity trains
  - Regional and metropolitan trains
  - Freight trains
- Rail transport in neighbouring countries
- High speed trains (DE, FR, IT)
- Electricity mixes of railway operators

www.20-minuten.ch/Keystone

Rail transport
Key features

- Main data sources
  - Swiss Railways (SBB), ZVV (regional carrier Zürich region)
  - German Railways (DB)
  - International Union of Railways
- Energy demand and emission factors include
  - Regular transport and shunting activities
  - Electric/Diesel split
  - Diesel exhaust
  - Abrasion (heavy metals to air, water and soil)
  - Refrigerant losses from air conditioning
  - Noise

Scope of the LCI study: air transport

- Aircrafts
  - Passengers and freight
  - Domestic and intercontinental
  - Economy, business, first
- Helicopters
  - Passengers and freight
  - 1 and 2 motors
- Cable cars

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Air transport
Key features

- Main data sources
  - Lufthansa
  - Swiss Federal Office of Civil Aviation, FOCA
  - ICAO Carbon Emissions Calculator Methodology
- Fuel demand and emission factors include
  - LTO and cruise fuel demand and exhaust emissions
  - noise

Air transport
Key features II

- Allocation
  - passenger and freight: based on weight
    160 (166) kg per passenger (based on ICAO methodology)
  - economy/business/first: m^2 occupied (0.4/0.8/1.2m^2)
- Impact assessment of stratospheric emissions
  - Additional GWP caused by contrails, water vapor and aviation induced cirrus clouds
  - **1.35** – 1.95 kg CO_2-eq/kg stratospheric CO_2
  - '0' impact of stratospheric NO_X and PM10 emissions in ecological scarcity method
  - presentations by Thomas Peter and Niels Jungbluth

Scope of the LCI study: waterborne transport

- Transoceanic transport
  - Oil tanker
  - Freight ship
  - Container ship
- Inland water transport
  - Freight
  - Passengers

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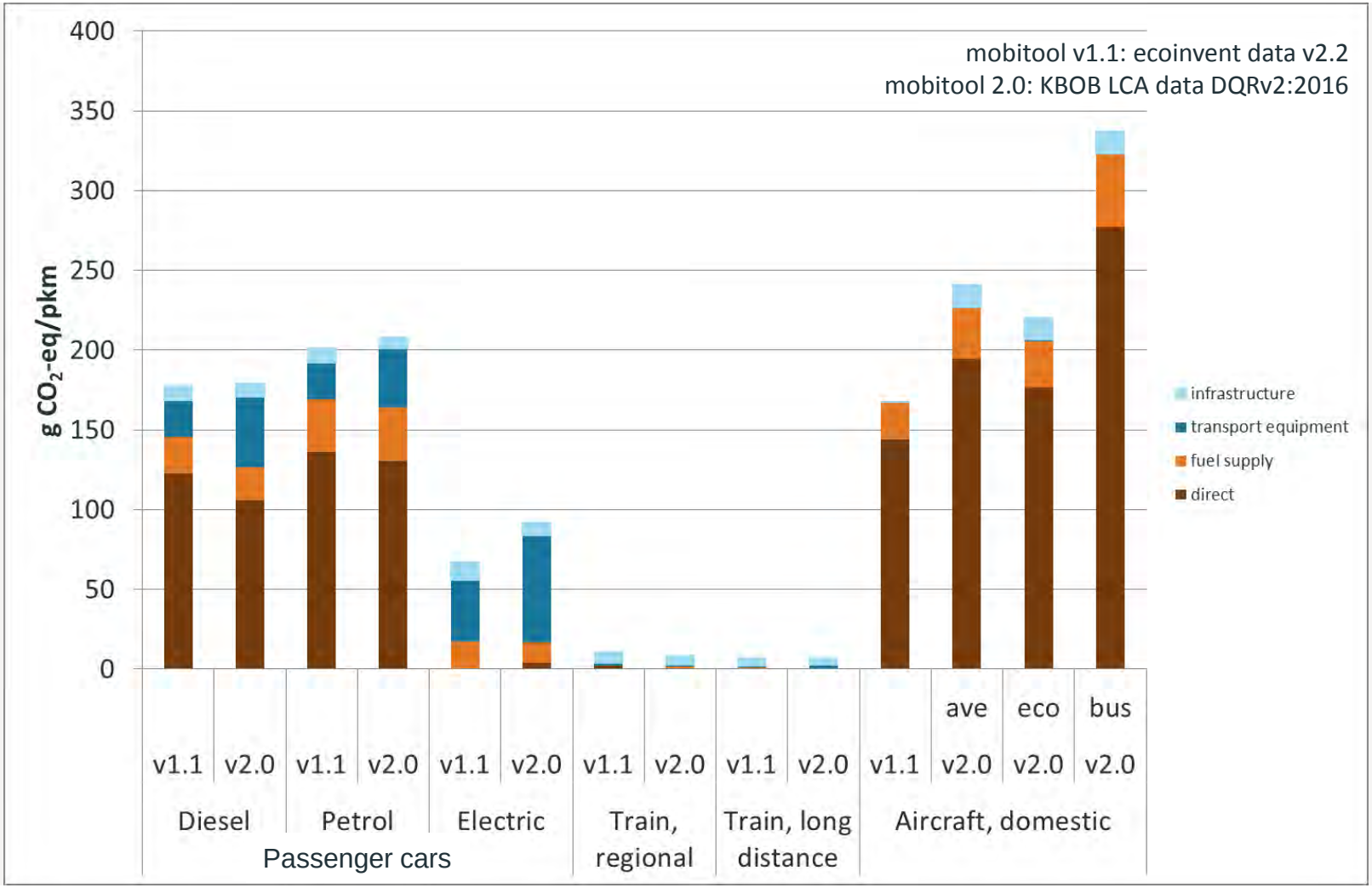
Waterborne transport
Key features

- Main data sources
  - International Marine Organisation
  - International statistics (Journal of Maritime Affairs, EMEP/EEA emission inventory guidebook)
  - Manufacturers
  - Shipping companies
- Fuel demand and emission factors include
  - transport volume weighted average fuel consumption and air- and waterborne emissions (tanker, freight, container ship)
  - Antifouling losses
- Efforts and emissions of ship wrecking at end of life

Effects of data update
Climate change



mobitool.ch service hub

mobitool factors v2.0

Données environnementales & facteurs d'émissions de mobitool : effet de serre potentiel

L'émission nocive de gaz à effet de serre se mesure en effet de serre potentiel: les principaux gaz responsables de la pollution comme le CO2 ou le méthane sont comparés entre eux puis convertis en «g équivalent CO2», la grandeur de référence.
Désormais, conformément à la norme DIN 16258, les émissions de gaz à effet de serre sont également indiquées en «tank to wheel» (du réservoir à la roue) et «well to wheel» (du puits à la roue).

Les informations contenues dans ce document proviennent de sources sûres ou ont été regroupées méticuleusement par treeze. Néanmoins, ni la société treeze ni les organisations participantes ne peuvent être tenues responsables en cas de pertes ou de dégâts engendrés par l'utilisation de ces données. La responsabilité incombe entièrement à l'utilisateur.

Un engagement de: SBB CFF FFS, swisscom, öbu

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Données & méthodologie: treeze fair life cycle thinking, ecoinvent

Moyen de transp	Motorisation	Caractéristiques	Charge [Personnes / Tonnes]	Capacité [Personnes / Tonnes]	Charge [%]	Ø Consommation [Litre / 100 km]	Ø Consommation [kWh / 100 km]	Poids du véhicule [kg]	Poids de la batterie [kg]	Nombre de changements des accus au cours de la vie du véhicule
à pied	-	-								
en vélo	-	-								
E-Bike	Électricité	Mix d'éco-électricité CH					1.0		2.6	0.5
		Mix de consommateurs CH					1.0		2.6	0.5
		Mix de consommateurs spécifiques à l'entreprise (voir plus bas)					1.0		2.6	0.5
Scooter	Essence	-	1.3	2		3.4				
Scooter électrique	Électricité	Mix d'éco-électricité CH	1.3	2			3.0		32	1.0
		Mix de consommateurs CH	1.3	2			3.0		32	1.0
		Mix de consommateurs spécifiques à l'entreprise (voir plus bas)	1.3	2			3.0		32	1.0
Tram	-	Flotte moyenne	34	116	29%					
Trolleybus	-	Flotte moyenne	19	100	19%					
Autobus	-	Flotte moyenne	10	60	17%					
Voiture	Moyenne	Flotte moyenne	1.6	5		7.5		1510		
	Diesel	Flotte moyenne	1.6	5		6.0		1700		
		EURO 3	1.6	5		6.6		1700		
		EURO 4	1.6	5		6.3		1700		

Summary

- Passenger cars:
  - real life fuel consumption: 1.36 to 1.43 * NEDC consumption
  - latest findings regarding real real life NO_X and PM emissions not included
- Rail transport:
  - updated electricity mixes, updated share of PM filters
- Air transport:
  - economy, business and first class LCIs
  - increased GWP applied on stratospheric emissions
- Ship transport:
  - Container vessels

Thank you very much for your attention!

Contact:
frischknecht@treeze.ch

Website:
www.treeze.ch

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