Building a Database of Global Passenger and Freight Mobility

International Transport Energy Modeling (ITEM) Workshop
International Transport Forum (ITF)
Organisation for Economic Co-operation and Development (OECD), Paris
October 26-27, 2017

Andreas W. Schäfer
Mobility Analytics Ltd. and University College London
(a.schafer@ucl.ac.uk)

Outline

- Need for a Global Mobility Database
- The Data Challenge
- Estimating missing Data: 3 Examples
- Database Structure
- Data Release
- Next Steps & Beyond
- Key Publications

Need for a Global Mobility Database

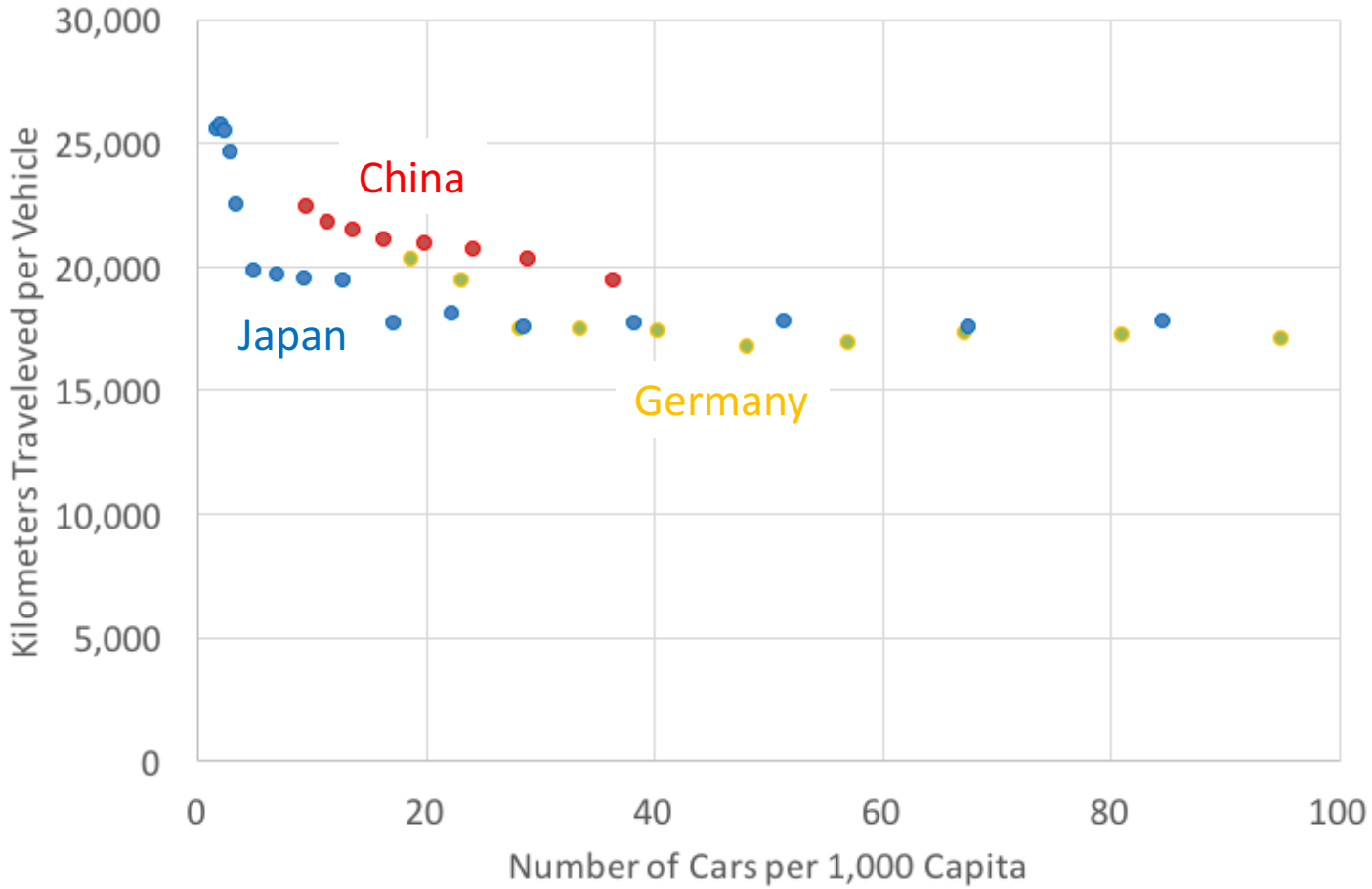
- Academia/Research
  - Develop and estimate demand models for any country and the world
  - Quantify energy use and (global) environmental impacts
- Industry
  - Understand global markets in transportation supply chain (materials, vehicles, fuels, infrastructure)
  - Anticipate future opportunities (technologies, business models, etc.)
- Government
  - Provide transportation infrastructure
  - Formulate national and international transportation policy

The Data Challenge

- Problem
  - Reliable, largely complete data sets exist for only less than 10 countries
  - Compiled data in databooks / databases incomplete (wrt geographic coverage and time) and often of questionable quality
- Approach
  - Estimate generic relationships between key variables from few reliable sources
  - Apply these relationships to all countries
- Objective
  - Assemble / estimate a database for virtually each country of the world
  - Coverage of passenger and freight transportation, by mode, from 1950 to 2015+

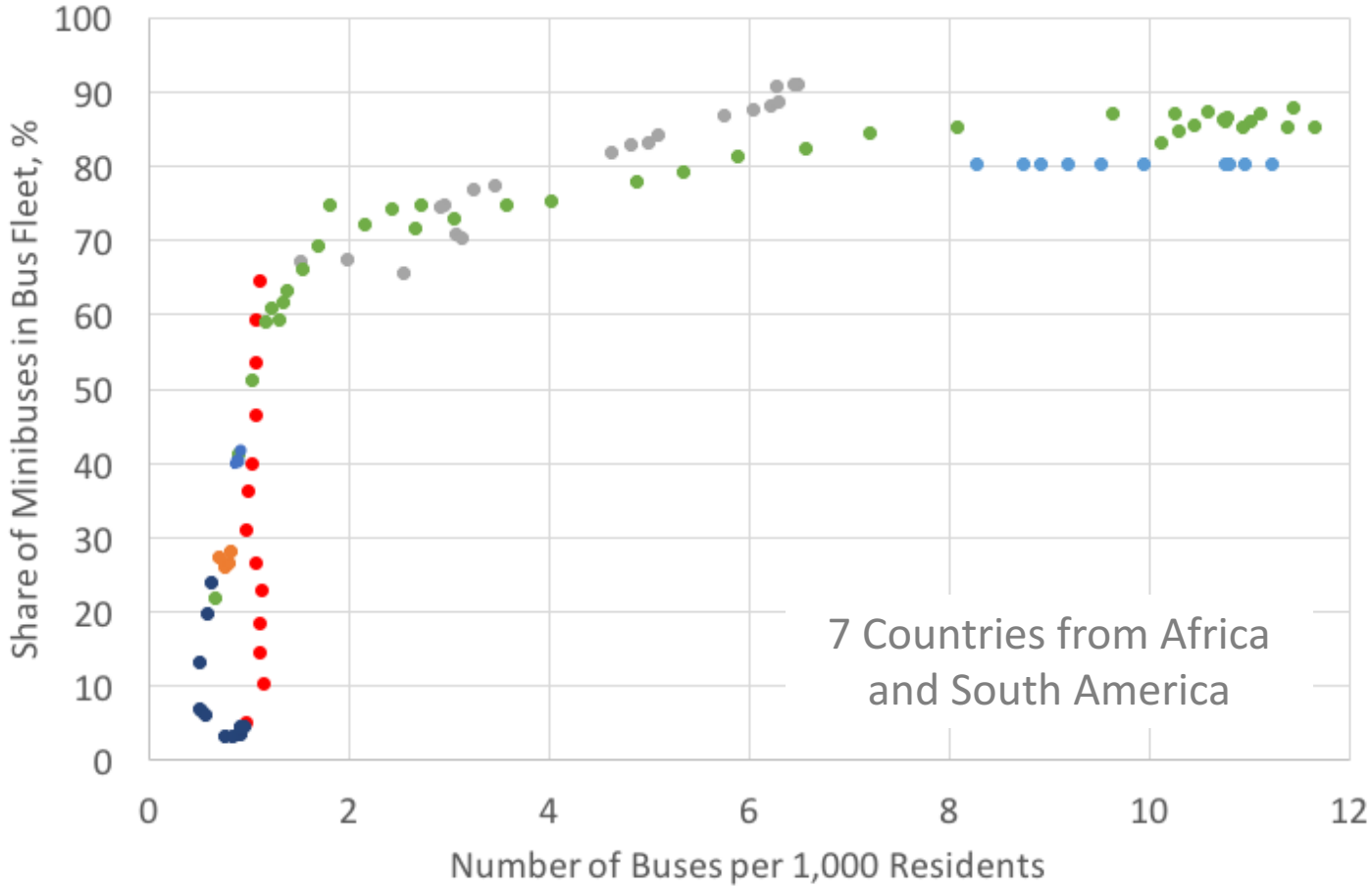
Estimating Automobile Vehicle-km Travelled

- Necessary for estimating passenger-km travelled (PKT)
- Approach: estimate VKT = f(automobile motorization rate)



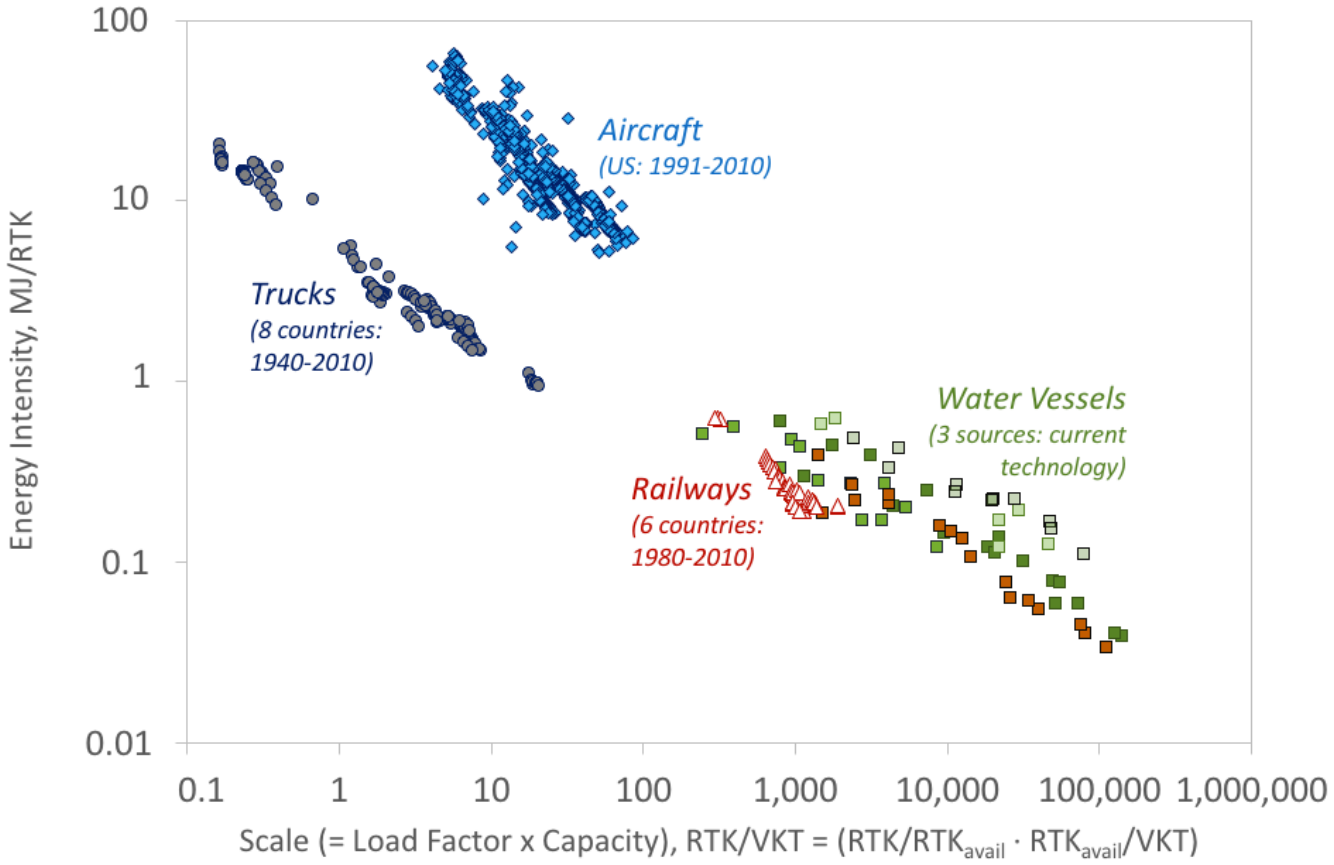
Estimating Share of Minibuses in Bus Fleet

- Necessary for estimating PKT of buses absent passenger trip data
- Approach: estimate Share = f(bus motorization rate)



Estimating Truck Revenue Tonne-km

- Fundamental variable describing road freight transportation activity
- Approach: RTK = f(VKT, energy use)



Gucwa M., Schäfer A., 2013. The impact of scale on energy intensity in freight transportation, Transportation Research Part D: Transport and Environment, August.

Database Structure (example: South Korea)

Road Vehicle Fleet

F68 ='MV Fleet'!N70/1000

	A	B	C	D	E	F	G
1							
2		1000 Vehicles					
3		Automobiles	Motorbikes	Light Trucks	Buses	Trucks	Total
66	2012	14,577.2	2,093.5		970.8	3,285.7	20,927.2
67	2013	15,078.4	2,117.0		947.0	3,353.7	21,496.1
68	2014	15,747.2	2,135.1		920.3	3,432.9	22,235.5
69	2015	16,561.7	2,161.8		892.5	3,492.2	23,108.2

Black numbers: observations
Grey numbers: estimates

Passenger Travel

D68 =SUM('Urban Rail'!B69:C69)+Bus!D69

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1															
2		Mln trips						Bln pkm							
3		Bus	Rail	Mass Transit	Air (S,D)	Air (S,I)		Automobiles	Motorbikes	Bus	Rail	Mass Transit	Air (S&NS,D)	Air (S,I)	Total
66	2012	4,250	1,149	7,952	21	23		299.3		84.5	42.5	61.4	8.7	93.9	590.3
67	2013	4,290	1,225	8,040	21	24		297.2		93.1	38.5	62.2	9.1	96.1	596.2
68	2014	4,230	1,263	8,150	24	27		314.7		84.4	39.5	62.8	9.5	105.0	615.8
69	2015	4,254	1,269	5,600	27	30		327.3		96.1	40.3	36.5	10.7	112.4	623.3

Freight Movements

B68 =Truck!B69/1000

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1														
2		Mln tonnes							Bln tonne-km					
3		Road	Rail	Water (D)	Air (D)	Air (I)	Total		Road	Rail	Water (D)	Air (D)	Air (I)	Total
66	2012	732.9	40.3	119.1	0.3	1.5	894.0		75.6	10.3	25.8	0.1	12.2	123.9
67	2013	721.4	39.6	117.9	0.2	1.5	880.6		82.7	10.5	30.5	0.0	11.3	135.0
68	2014	655.0	37.4	117.9	0.3	1.6	812.2		86.9	9.6	29.8	0.1	11.1	137.6
69	2015	666.3	37.1	128.6	0.3	1.6	834.0		88.4	9.5	32.6	0.2	11.1	141.7

Data Release

- World-regional aggregate data can be downloaded from website free of charge (www.mobility-analytics.com)
- Country-specific data available for purchase, to enable sustainability (OECD countries and Non-OECD countries separately available)

Next Steps & Beyond

- Next steps
  - Complete OECD country data set by end of 2017
  - Complete non-OECD country data set by Summer 2018
  - All data sets to be updated on an annual basis
- Beyond Summer 2018
  - Forecast future levels of transportation demand by mode
  - Assess the impact of autonomous vehicles and new mobility schemes
  - Predict future vehicle sales by type
  - Anticipate future fuel sales

Key Publications

- Schäfer A.W., 2017. “Long-term Trends in US Passenger Travel: The Past 110 Years and the Next 90”, Transportation 44(2):293-310.
- Gucwa M., Schäfer A.W., 2013. “The Impact of Scale on Energy Intensity in Freight Transportation”, Transportation Research Part D 23:41-49.
- Schäfer A.W., Heywood J.B., Jacoby H.D., Waitz I.A., 2009. *Transportation in a Climate-Constrained World*, MIT Press.
- Schäfer A.W., Jacoby H.D., Heywood J.B., Waitz I.A., 2009. “The Other Climate Threat: Transportation”, American Scientist, November-December, pp. 476-483.
- Schäfer A.W., 2006. “Long-Term Trends in Global Passenger Mobility”, The Bridge 36:24-32, The National Academies Press, Washington DC.
- Schäfer A.W., Victor D.G., 2000. “The Future Mobility of the World Population”, Transportation Research Part A 34(3): 171-205.
- Schäfer A.W., 1998. “The Global Demand for Motorized Mobility”, Transportation Research Part A 32(6): 455-477.
- Schäfer A.W., Victor D.G., 1997. “The Past and Future of Global Mobility”, Scientific American, October 1997, pp. 56-59.

more information, soon be available at

www.mobility-analytics.com