International Transport Energy Modeling (iTEM)

Pierpaolo Cazzola, UCD Institute of Transportation Studies, USA
François Cuenot, United Nations Economic Commission for Europe, Switzerland
Lew Fulton, University of California, Davis
Paul Kishimoto, international Institute for Applied Systems Analysis (IIASA), Austria
Luis Martinez, International Transport Forum (ITF)-OECD, France
Page Kyle, Pacific Northwest National Laboratory, USA
David McCollum, Oak Ridge National Laboratory, USA
Joshua Miller, International Council on Clean Transportation, USA
Jacob Teter, UCD Institute of Transportation Studies, USA
Sonia Yeh, Chalmers University of Technology, Sweden

7th International Transport Energy Modeling (iTEM) Workshop - TDC
18th September 2024, United Nations Economic Commission for Europe, Palais des Nations, CH-1211 Geneva 10, Switzerland

About iTEM…

- A consortium of groups that:
  - use models to project future transport activity,
  - globally and inclusive of all modes,
  - with a focus on energy use and GHG emissions (minimum), and other
  - environmental impacts.
- Groups contribute their model outputs as data for inter-comparison and
- participate in interpretation.
- Inaugural iTEM workshop: Davis, CA, US — October 2014.
  - Four models included: US DoE/PNNL GCAM, IIASA MESSAGE, IEA MoMo, ICCT Roadmap.
  - Described in “Detailed assessment of global transport-energy models’ structures and projections” (Yeh et al. 2016)
- https://transportenergy.org

Key feature of iTEM

- Including a wide set of participants brings benefits, but can complicates the process of comparison in ways alien to other model intercomparison efforts:
- A mix of groups:
  - National and international government organization—e.g. U.S. DoE PNNL, IEA.
  - NGOs, non-profits & think-tanks—e.g. ICCT.
  - Research/academic—e.g. IIASA, MIT, Chalmers.
  - Firms—e.g. BP, Shell, Exxonmobile.
- Diverse research foci & scenarios (business strategy, IPCC support, academic), core model logic, methods, resolution, & sectoral/regional aggregation.
- Model source code, input data, and full-resolution outputs may each be either public or proprietary, or in between.

Method

https://github.com/transportenergy/database

Establish common template for submissions

Dimensions Variable — Scenario — Region — Mode — Technology — Fuel.

Units prescribed for each quantity.

Mandatory and optional entries.

Teams prepare & submit data for scenarios

Some rescaling, aggregation and unit conversion happens at this stage.

Textual notes on model idiosyncrasies to aid in comparison.

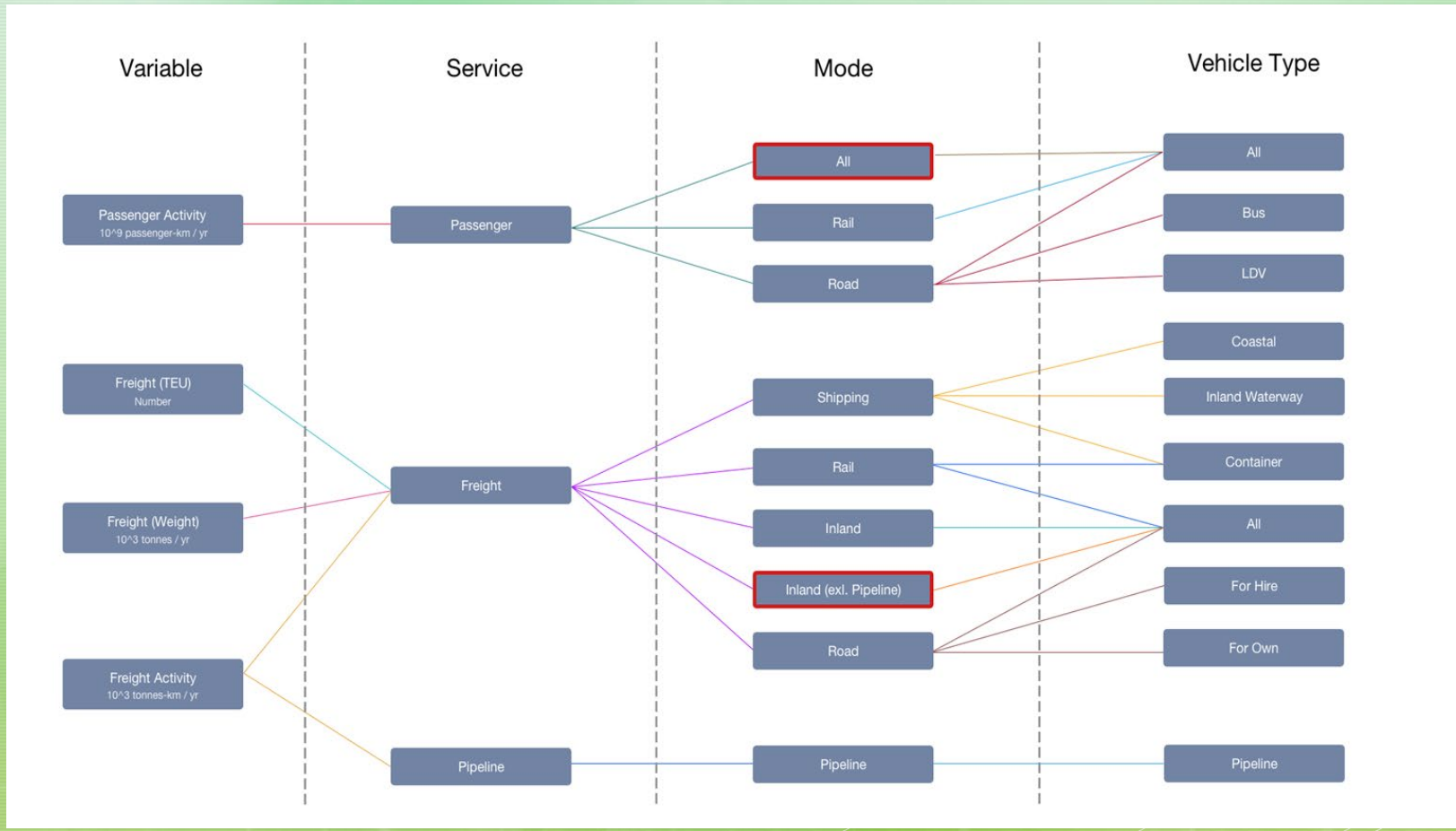
Clean input data, check for consistency, and rescale into common regions

Derive quantities from base variables

e.g. energy-intensity of passenger activity [MJ/pass.-km]

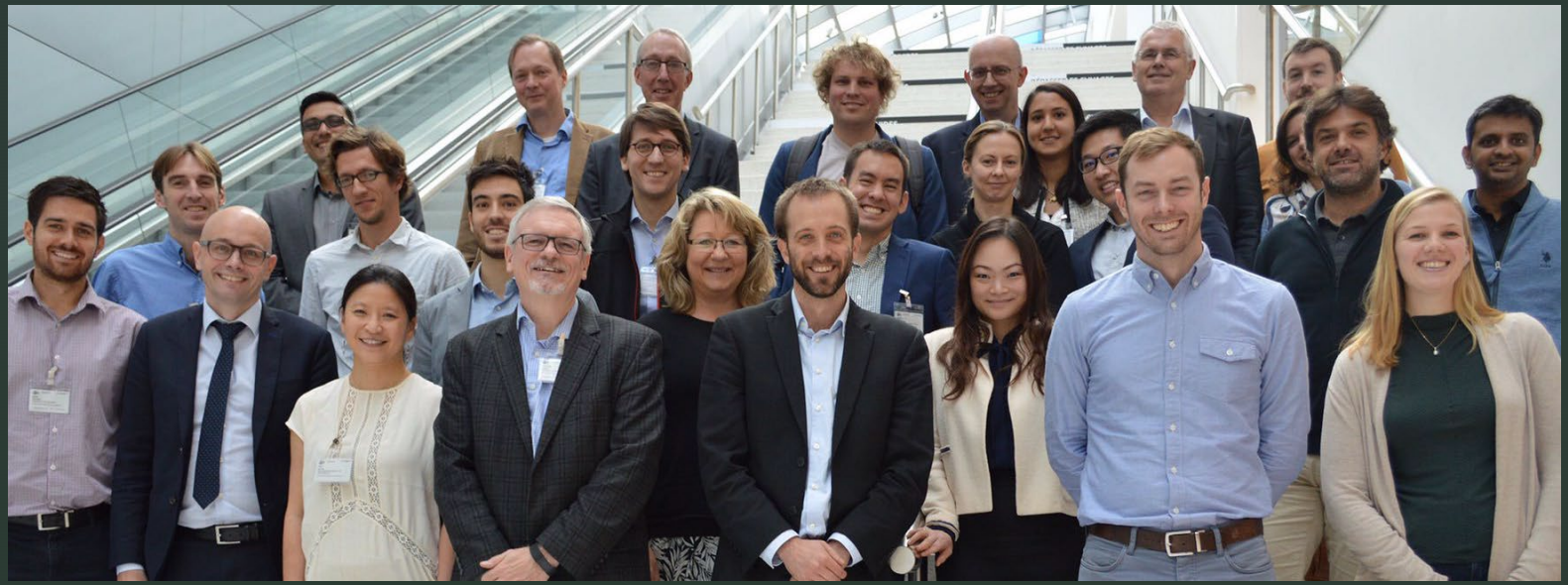
Prepare plots, calculations and tables as objects for discussion between modeling teams

Data Architecture



Challenges and Issues

- Aggregation/disaggregation of
  - Regions, Technology set, Activity, Fuels…
- Incomplete or unreported data
- Input assumptions are hard(er) to collect but important to recognize the inconsistencies in the historical data



Selected results

How Much Do People Travel? How Certain Are We?

*International Transport Energy Modeling (ITEM) comparison, thousand PKM/capita/yr, all modes, **2015***

Australia	Brazil	China	U.S.
26.2	5.4	5.0	23.1
21.7	8.3	8.4	26.6
33.7	6.9		15.2
43.5	5.4	4.5	27.7
	4.2	6.3	19.7
17.5	8.4	6.5	26.8

Pacific Northwest NATIONAL LABORATORY

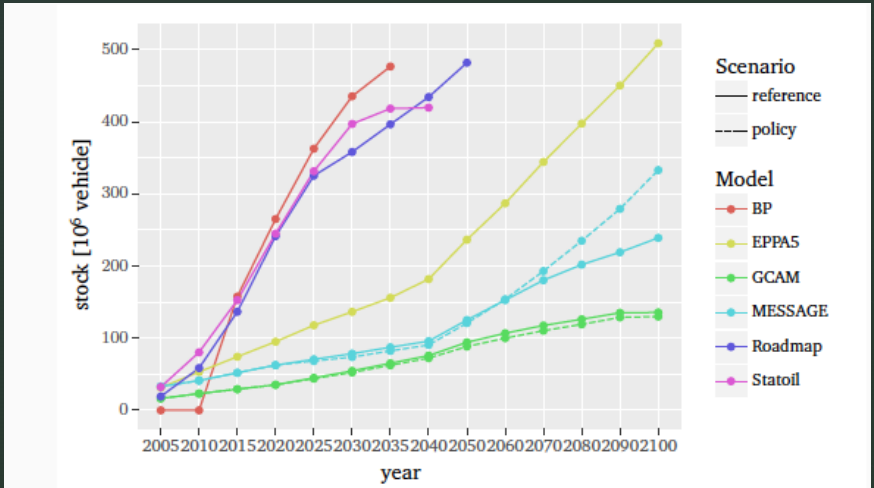
International Transport Forum

International Institute for Applied Systems Analysis IIASA

iea International Energy Agency

icct THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

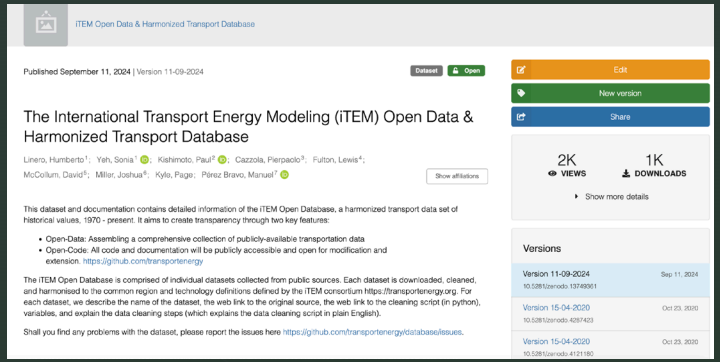
Huge uncertainty about China: China's LDV stock

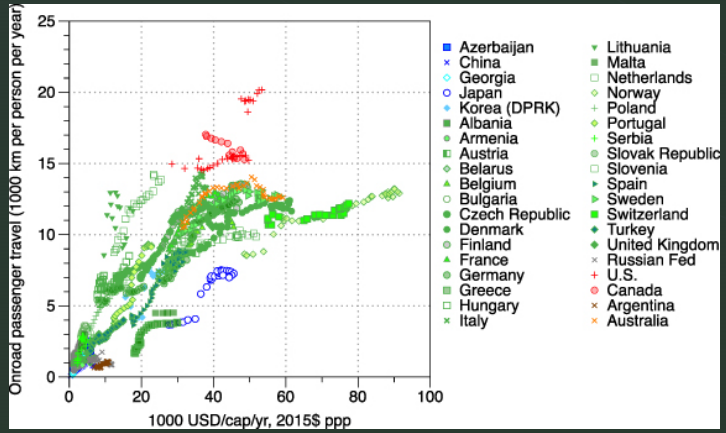


- Will there be 90 million cars or 500 million cars in China by 2050?

iTEM2 (2017)

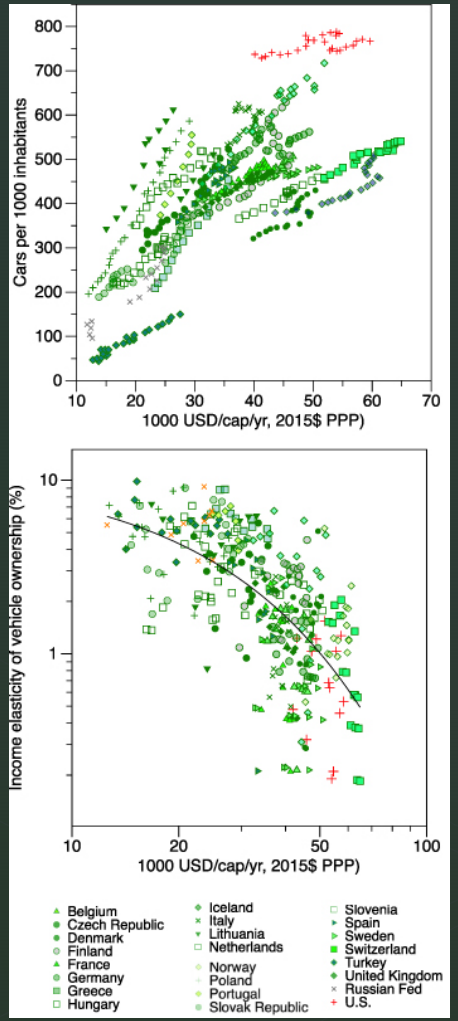
iTEM Open Data (2020, 2024)





iTEM Open Data, onroad passenger travel distance and GDP, 1980-2018

iTEM Open Data, passenger car ownership and GDP, 1980-2018



iTEM3

Progress in **Energy**

PERSPECTIVE • OPEN ACCESS

Improving future travel demand projections: a pathway with an open science interdisciplinary approach

Sonia Yeh[13,1], Jorge Gil[1], Page Kyle[2], Paul Kishimoto[3], Pierpaolo Cazzola[4,12], Matteo Craglia[4], Oreane Edelenbosch[5], Panagiotis Fragkos[6], Lew Fulton[7], Yuan Liao[1]

Show full author list

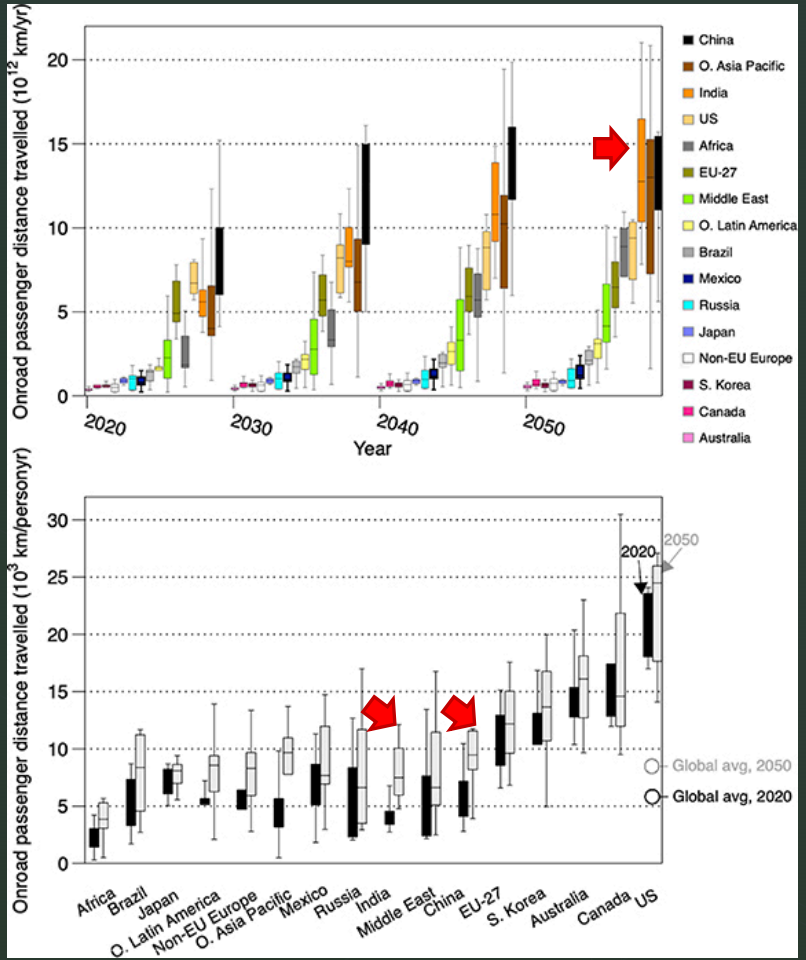
Published 17 August 2022 • © 2022 The Author(s). Published by IOP Publishing Ltd

Progress in Energy, Volume 4, Number 4

Focus on Transport Electrification

Citation Sonia Yeh *et al* 2022 *Prog. Energy* **4** 043002

DOI 10.1088/2516-1083/ac86b5



iTE3 onroad passenger distance travelled per country/per person

Concluding Remark

- **Vision:** robust knowledge for all about the world's transport system, based on open data and models that are scientific and continually improved.
- **Mission:** to facilitate production of this knowledge, by supporting an active community of stakeholders, organizing events, and coordinating joint research projects.
- **Administrative:** active members of iTEM + ITF-OECD as permanent secretariat
- **Activities**: iTEM Workshop, iTEM Modeling Comparison, iTEM Open Data