TEAM-Kenya docs

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# Abstract

This document describes the changes to the modelling framework and data of the Transport Energy Air pollution Model (TEAM) from its original UK instance to the Kenyan instance, developed in 2023 as part of the Climate Compatible Growth (CCG) programme.

# Introduction

The [Transport Energy Air pollution Model (TEAM)](https://ukerc.ac.uk/project/team-model/) has been in active use for the past decade, since it was updated from its precursor model, the UK Transport Carbon Model (UKTCM). Since 2012, TEAM has been primarily funded by the [UK Energy Research Centre](https://ukerc.ac.uk/) (UKERC) and developed at the University of Oxford’s Environmental Change Institute. The project is led by [Dr Christian Brand](https://www.ox.ac.uk/news-and-events/find-an-expert/dr-christian-brand).

TEAM is a strategic transport, energy, emissions and environmental impacts systems model, covering a range of transport-energy-environment issues from socio-economic and policy influences on energy demand reduction through to lifecycle carbon and local air pollutant emissions and external costs. It is built around exogenous and quantified scenarios, covering passenger and freight transport across all modes of transport (road, rail, shipping, air). It provides annual projections up to 2100, is technology rich with endogenous modelling of more than 1,200 vehicle technologies, and covers a wide range of output indicators, including travel demand, vehicle ownership and use, energy demand, life cycle emissions of 26 pollutants, environmental impacts, government tax revenues, and external costs.

The TEAM framework can be adapted to a range of geographical and administrative scales, from city to region, country and global scales. To date, two versions have been developed and used in policy analysis: a UK version, TEAM-UK; and a Scottish version, STEAM. Both were designed to explore alternative transport futures to meet UK and Scottish carbon mitigation, air quality and energy policy goals. As part of CCG, TEAM is being adapted to Kenya. This is the first time the TEAM framework is being used in a country with i) limited data on travel demand and vehicle stocks and ii) a sizeable second-hand imports market. These factors require some steps to re-design the fundamentals of the TEAM framework, which are described in this document.

A selected set of references that describe TEAM-UK and the case studies resulting from its application are [1]–[5]. A full description of the methodology in TEAM is provided in the [2019 working paper](https://ukerc.ac.uk/publications/team-energy-for-mobility/). The UK-level policy impact of research directly involving TEAM includes, by way of citations of those references, include:

* Underpinning the modelling in the Climate Change Committee’s [6th carbon budget recommendation](https://www.theccc.org.uk/publication/sixth-carbon-budget/) (2020) for reductions in energy demand in the transport sector.
* Used as the basis for the [joint CREDS/UKERC joint response](https://www.creds.ac.uk/publications/dft-consultation-ending-the-sale-of-new-petrol-diesel-and-hybrid-cars-and-vans/) to the UK Department for Transport’s consultation on ending the sale of new petrol, diesel and hybrid cars and vans, published in 2020.
* Citation in the [Future of Mobility: the UK passenger road transport network evidence review](https://www.gov.uk/government/publications/future-of-mobility-the-uk-passenger-road-transport-network) published by the UK Government Office for Science in 2019.
* Citation in the [Future of Transport: User Study](https://www.gov.uk/government/publications/future-of-transport-user-study) evidence review published by the UK Department for Transport in 2020.
* Citation in the Intergovernmental Panel on Climate Change (IPCC)’s [Fifth Assessment Report](https://www.ipcc.ch/assessment-report/ar5/) (AR5) (2014).

# Methods

## Second-hand imports

The vehicle stock model (VSM) of TEAM was re-coded to allow for the sale of second-hand imported versions of car, truck and minibus technologies. The changes to these technologies, versus their new equivalents, are:

* A price reduction of 60%
* An availability year of 8 years later than the new equivalent technology

The ‘*new*’ (including second-hand imported) vehicles in a given sector in each year are first split into the new and second-hand import markets. By default, this is 85% second-hand imported and 15% new vehicles for the car, truck and minibus markets. The calculation of technology split in those segments is then the same as per the original TEAM methodology (see the [2019 working paper](https://ukerc.ac.uk/publications/team-energy-for-mobility/)).

The result of this addition is that the number of unique technologies in TEAM-Kenya is over 2,200.

# Data

## Vehicle stock

Vehicle stock in the base year was derived from data from the GIZ TRaCS “Changing Transport” project. The level of disaggregation in the GIZ data was matched to the technologies in TEAM manually by experts at the African E-mobility Alliance (AFEMA) and Strathmore University.

The data is input into the following sheets:

* *Stock\_Data\_NumVeh95*
* *Stock\_Data\_NumVeh*
* *Stock\_Data\_NewVeh95*
* *Stock\_Data\_NewVeh*
* *Stock\_Data\_TotNumVeh95*
* *Stock\_Data\_TotNumVeh*
* *Stock\_Data\_TOT95*
* *Stock\_Data\_TOT*

## Travel demand

Travel demand was derived from 2021 GIZ Trigger data, the 2018 GIZ/University of Nairobi Climate Mitigation report, and the 2013 World Bank State of Cities data.

The data is input into the following sheets:

* *Mode\_Shares\_TripLength*
* *Parameters*
* *Travel\_demand*

## Context variables and macroeconomic drivers

Context variables (GDP, number of households, etc.) are retrieved from a set of online and published sources.

The data is input into the following sheets:

* *Scen\_GDP\_Pop*

# Scenarios

## Scenario Development

## Data inputs

# References

[1] J. Anable, C. Brand, M. Tran, and N. Eyre, “Modelling transport energy demand: A socio-technical approach,” *Energy Policy*, vol. 41, pp. 125–138, 2012, doi: 10.1016/j.enpol.2010.08.020.

[2] C. Brand, J. Anable, I. Ketsopoulou, and J. Watson, “Road to zero or road to nowhere? Disrupting transport and energy in a zero carbon world,” *Energy Policy*, vol. 139, no. January, 2020, doi: 10.1016/j.enpol.2020.111334.

[3] C. Brand, J. Anable, and C. Morton, “Lifestyle, efficiency and limits: modelling transport energy and emissions using a socio-technical approach,” *Energy Efficiency*, vol. 12, no. 1, pp. 187–207, 2019, doi: 10.1007/s12053-018-9678-9.

[4] C. Brand, C. Cluzel, and J. Anable, “Modeling the uptake of plug-in vehicles in a heterogeneous car market using a consumer segmentation approach,” *Transportation Research Part A: Policy and Practice*, vol. 97, pp. 121–136, 2017, doi: 10.1016/j.tra.2017.01.017.

[5] J. Barrett *et al.*, “Energy demand reduction options for meeting national zero-emission targets in the United Kingdom,” *Nature Energy*, vol. 7, no. 8, pp. 726–735, 2022, doi: 10.1038/s41560-022-01057-y.