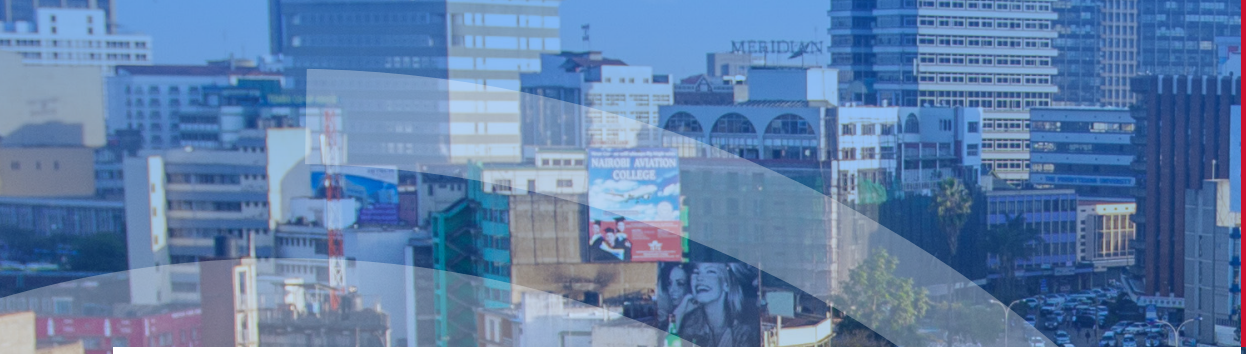

Climate Compatible Growth

COP28

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Towards equitable climate-compatible transport pathways in Kenya: modelling co-created scenarios using a socio-technical approach

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Summary

Through the co-development of a set of Kenyan transport pathways and a transport-energy systems model, TEAM-Kenya, we present a decision-support tool to assist policymakers at regional, national and international levels. The tool can help create policy, project and finance pipelines to support the realisation of climate-compatible development objectives in the transport-energy sector. We quantify the impacts of pathways on transport-energy system outcomes including vehicle stock, energy consumption, emissions, fiscal implications of changing fuel tax revenues and grid implications of e-mobility uptake. It was found that Kenya can vastly expand transport services to a growing population in a manner compatible with improving equitable access to mobility and limiting future emissions to comply with its nationally determined contribution (NDC) to the Paris Agreement. This transition is only possible if policy recommendations, applicable to both Kenyan and international policymakers, are met.

Key Policy Recommendations

- Kenya can **vastly increase access to transport** services to a growing and prospering population in a **manner compatible with its climate mitigation targets**.
- To deliver this goal, transport policymakers should take **strong policy action** on **public transport**, while providing targeted support for the **electrification of road vehicles** and taking measures to **increase equitable access to mobility** (including the provision of non-motorised transport infrastructure).
- Favourable pathways result in **significant e-mobility uptake**, which demands close collaboration between the Ministry of Transport and:
  - Ministry of Finance to offset the limited impact on **taxation revenues** from the sale of petroleum fuels, expected to reduce by 6–13% by 2040; and
  - Ministry of Energy to accommodate the significant anticipated impact on electricity demand, representing a 12–63% increase in **electricity demand** by 2040 compared to the IEA's Africa Energy Outlook 2019 *Stated Policies* scenario [1]
- The **international community** should support Kenya in facilitating access to the **affordable finance** needed for individuals, businesses and the government to implement the most favourable pathways.

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Introduction

Kenya's past and present contribution to climate change is negligible. Nonetheless, it can capture the benefits of green growth in transport, which can serve to increase transport service provision to a growing population and meet Kenya's commitment to the Paris Agreement. At the same time green growth can provide a wealth of co-benefits, including improved public health outcomes from better air quality, economic opportunities from better access to passenger mobility and increased trade, and improved energy security from a reduced reliance on imported petroleum.

This brief gives an overview of a larger project and its forthcoming report. In this project, we present:

1. A set of narrative pathways for the Kenyan transport sector based on engagement with 41 expert stakeholders across Kenyan government, academia, NGOs and the private sector.
2. A transport-energy system model, TEAM-Kenya, to be used as an open-access decision support tool allowing policymakers to build policy, project and finance pipelines in the realisation of Kenya's vision in climate-compatible growth.

Scenario development

Scenarios were developed to encapsulate the spread of desirable and likely outcomes of the Kenyan transport sector and sectors that influence it and are influenced by it.

Plausible scenarios relate to a set of economy-wide trends, such as population growth, urbanisation and digitalisation (e.g. mobile money), and a series of levers of change that were identified to be actionable by Kenyan decision-makers. These include:

(i) fiscal incentives for adoption of certain technologies, such as the removal of VAT for electric cars, trucks, buses or motorcycles (as announced for the latter by the Kenyan president in 2023 [2]);
(ii) the provision of infrastructure for the supply of low-carbon energy vectors to the Kenyan transport-energy system, including road freight, rail, shipping and aviation [3];
(iii) extension of public transport projects, such as segregated bus lanes, bus rapid transit (BRT) systems [4] and other mass-transit passenger transport; and
(iv) urban transport projects to encourage the utilisation of sustainable modes, including public transport and non-motorised transport (NMT) [5].

Scenario development was done via one-on-one interviews and an interactive workshop with 41 expert stakeholders across Kenyan government, academia, NGOs and private businesses (**Figure 1**), using an established methodology for scenario development [6] (**Figure 2**).

Figure 1 Workshop for transport scenario development in Nairobi, Kenya, March 2023

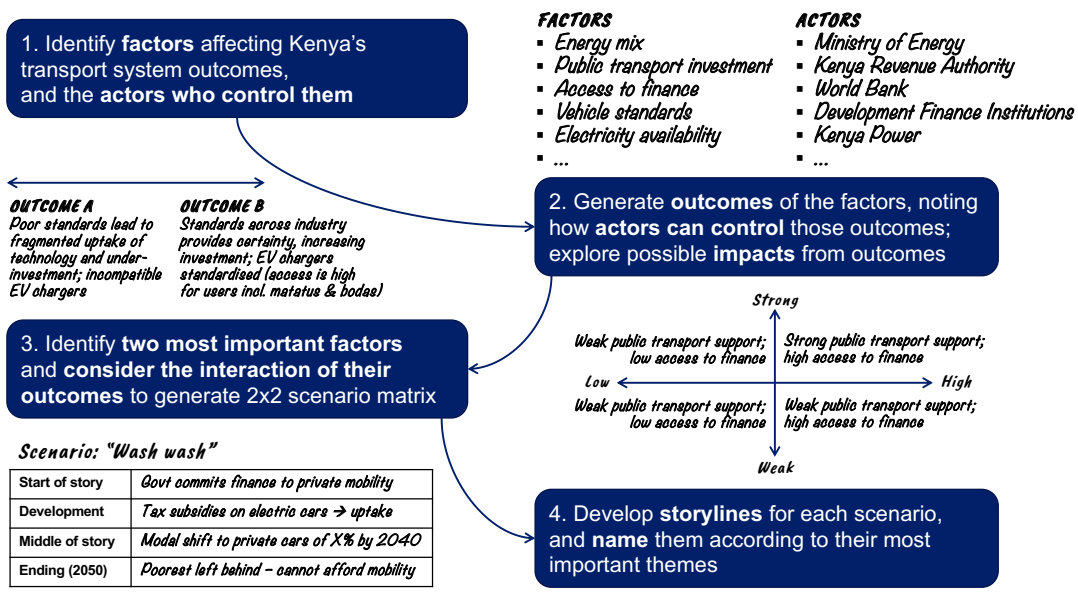

Figure 2 Workshop activities for scenario development based on method presented in Ramírez & Wilkinson, 2016 [6]

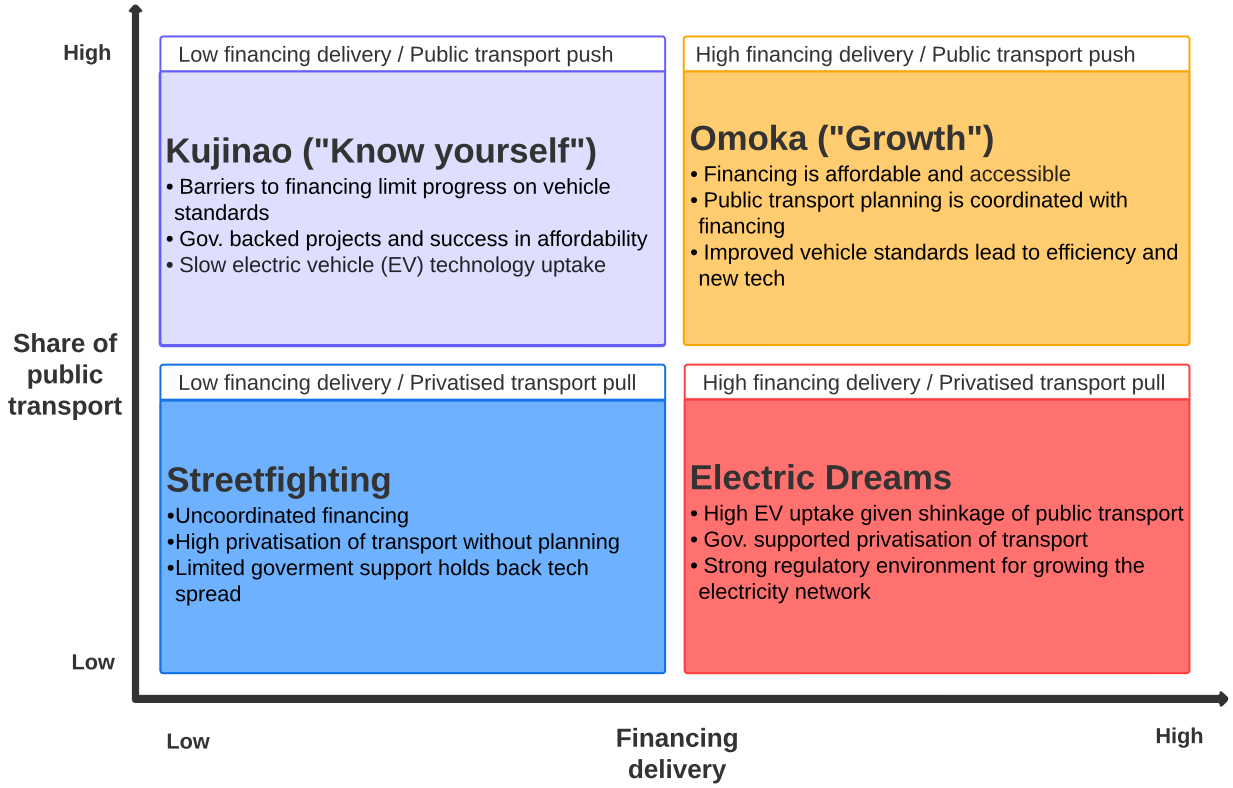

Figure 3 Scenario matrix based on two most important factors: financing delivery and share of public transport

Four separate indicative pathways were the result of these engagements: Omoka, Electric Dreams, Kujinao and Streetfighting (**Figure 3**).

Transport-energy system modelling: a socio-technical approach

TEAM (Transport Energy Air pollution Model) [7] is a strategic systems model, covering a range of transport-energy-environment dimensions, originally developed at the University of Oxford under the auspices of the UK Energy Research Centre (UKERC). TEAM-Kenya is the result of a research collaboration in 2023 between Strathmore University, University of Nairobi, the Africa E-mobility Alliance, University of Oxford and University of Strathclyde. An online results visualisation dashboard is available at climatecompatiblegrowth.github.io/team-kenya. Results from TEAM-Kenya detailing the impact of the scenarios on vehicle stock, vehicle-kilometres, emissions and energy consumption are shown in **Figure 4**. Implications of these results on taxation revenues and energy demand are shown in **Figure 5**.

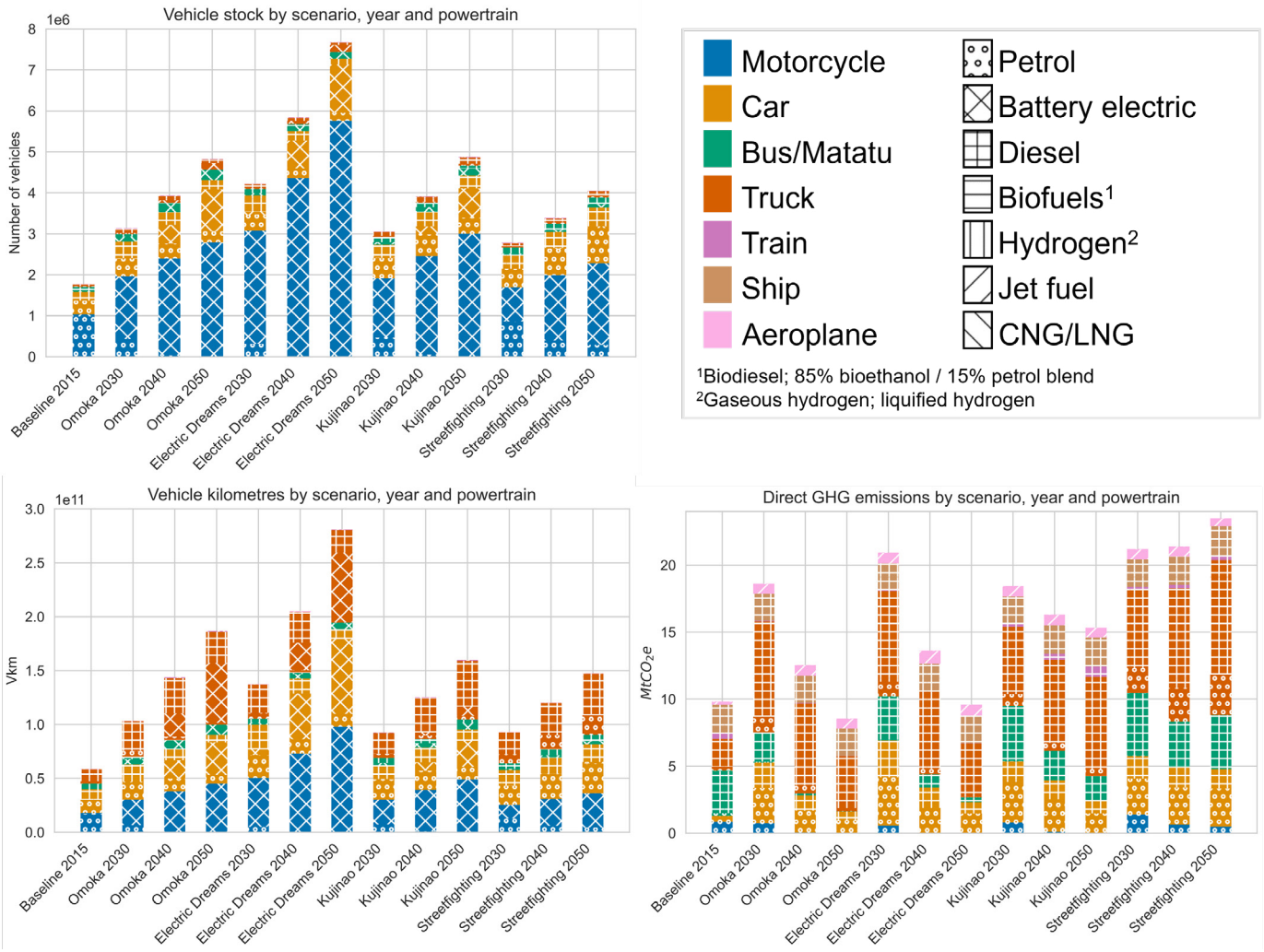

Figure 4 (anti-clockwise from top left): vehicle stock, vehicle-kilometres and direct GHG emissions for four scenarios in 2030, 2040 and 2050 compared to the baseline year (2015).

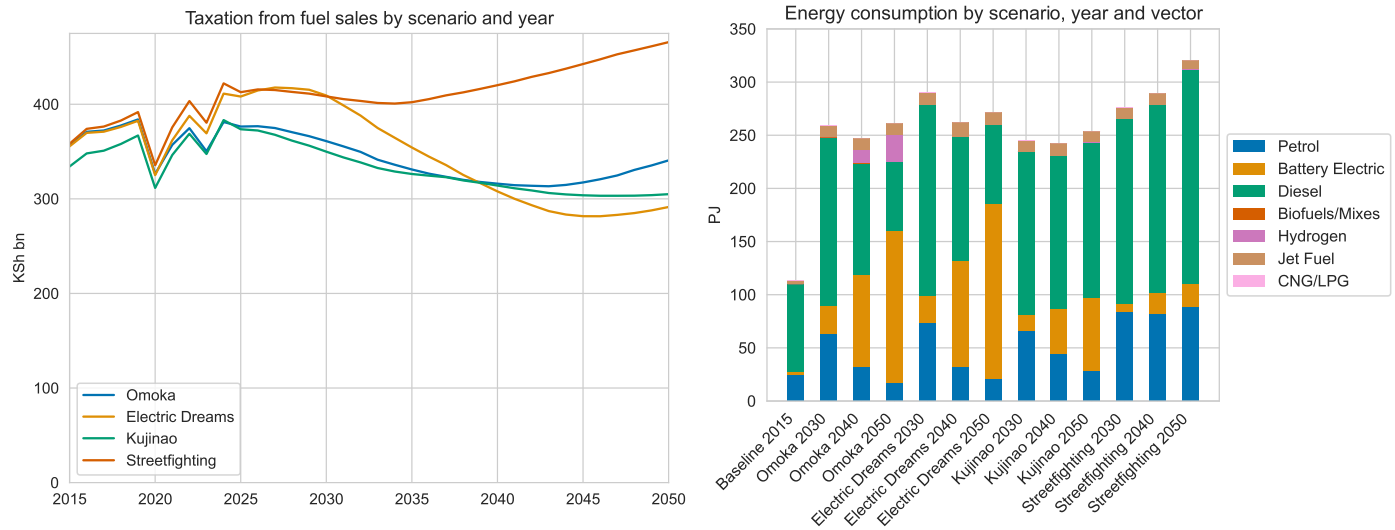

Figure 5 (left) taxation from fuel sales, including electricity, based on current rates used by Kenya Revenue Authority (KRA) and Energy & Petroleum Regulatory Authority (EPRA) for four scenarios from 2015 to 2050 and (right) total energy consumption in transport by scenario by source.

The results presented above are discussed in more detail in the forthcoming publication, Dixon et al., 2023 [8]. The key conclusions from the results are that:

1. The Kenyan transport system can evolve in a climate-compatible manner, vastly expanding passenger and freight services whilst maintaining a level of overall emissions within an acceptable level for the realisation of Kenya's climate mitigation goals as per its NDC. This requires strong policy decisions in public transport and targeted support for the electrification of road vehicles.
2. In the high e-mobility and high public transit scenario, *Omoka*, dwindling tax revenues from petroleum sales are largely compensated for (they fall 4% from 2015 to 2050) by increasing tax revenue from electricity sales as transport service demand increases.
3. E-mobility uptake in the presented scenarios will cause electricity demand in Kenya to increase 12–63% by 2040 relative to the IEA's *Stated Policies* [1] scenario for Kenya, which in total represents a 4–6 times increase relative to consumption in 2022. Therefore, unprecedented investment in generation and network infrastructure is needed to support this transition.
4. The scenario with the highest emphasis on public transport *(Omoka)* had a higher impact in reducing walking compared to other scenarios, which also indicates a higher level of transport access and affordability.
5. The most favourable scenarios rely on good access to international finance, which was identified as a crucial axis in the future of the Kenyan transport-energy system. Kenyan policymakers can leverage international development finance to lock in international support for the infrastructure required to support this transition, but the onus must also be on the international community to make those funds available for Kenya.

A way forward

The scenarios co-developed in this project can be used as a basis to draft specific policies for the Kenyan transport sector, including for the Kenyan Government's upcoming E-mobility Strategy. In the long term, TEAM-Kenya will be maintained by Strathmore University (Nairobi) and the Africa E-Mobility Alliance (AFEMA), and its use will be promoted for adaptation to other sub-Saharan African states. By building capacity in transport-energy system modelling in Kenyan institutions and equipping Kenyan decision makers with the support tools to assist them in building favourable pathways for the future, Kenya will be well-placed to build its own equitable pathways for green growth in the transport sector and beyond.

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COP28

AUTHOR STATEMENT:

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