Rethinking the role of the transport sector in post-COVID's new normal toward China's carbon-neutral goal by 2060

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Background

- The transport sector becomes a key sector for China to accomplish its carbon neutrality target before 2060.
- The outbreak of the novel coronavirus disease 2019 (COVID-19) has been altering the way of life for people across the globe, and human society have substantially adjusted to a post-COVID world and its "new normal".
- Adjustment to the post-COVID's new normal may create both unprecedented opportunities and challenges for the decarbonization of the transport sector.
- The key scientific question asks: **which opportunities could the post-COVID's new normal offer for transport decarbonization and the transition to carbon neutrality?**

Methods

Model

- A **provincial transport energy model** is developed by integrating a **transport model** and an **energy system model**.
- **Asia-Pacific Integrated Model/Enduse** is employed to estimate the energy consumption and emissions from transport.

Scenarios

- **REF**: reference scenario without any lifestyle changes or policies.
- **LC**: lifestyle changes in 2020 such as teleworking, online shopping, social distancing will continue in the post-COVID world.
- **PR**: modal shifts occur from public transport mode to private transport mode because of the COVID-19 pandemic.
- **CR**: the demand for car-sharing services may decline due to lockdown and social distancing.
- **NEW**: the combination of the LC, PR, and CR scenarios to depict a default pathway of the post-COVID's new normal.
- Parameters for representing the changes in lifestyle and mobility due to the outbreak of COVID-19 pandemic were estimated by the **empirical monthly transport data in 31 provinces**:

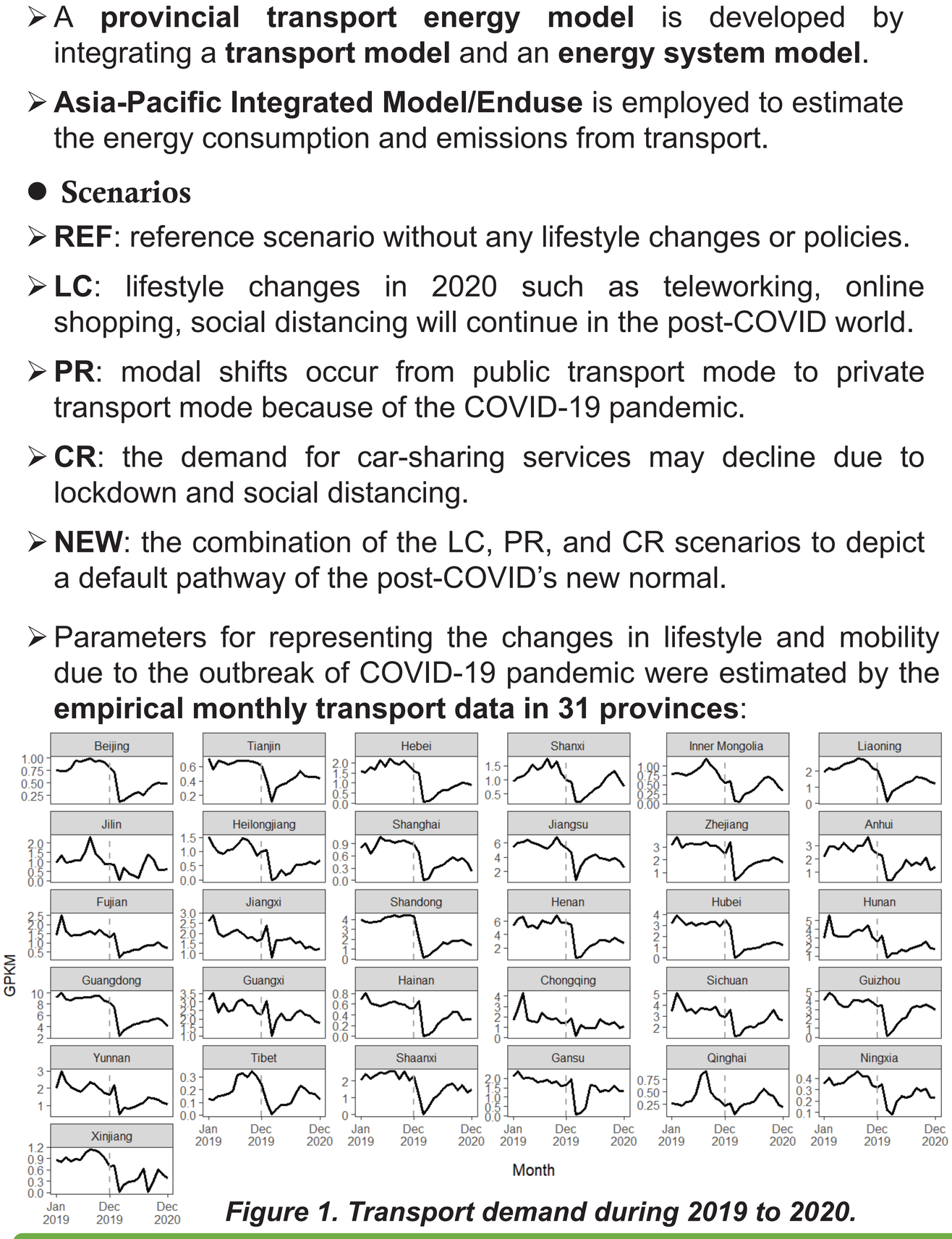

Figure 1. Transport demand during 2019 to 2020.

Results

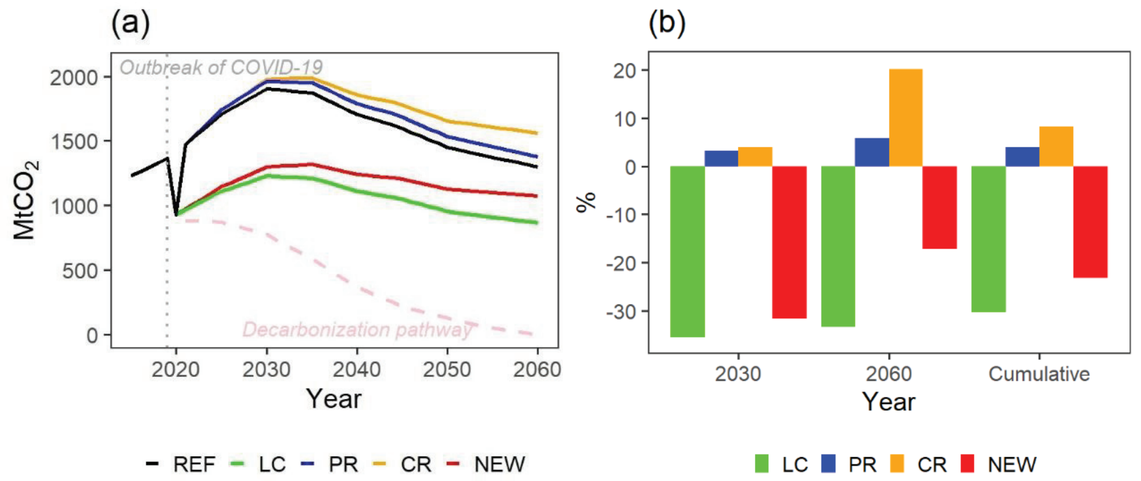

Figure 2. CO_2 emission trajectories from 2015 to 2060 (a) and emission reduction potential (b) under different scenarios .

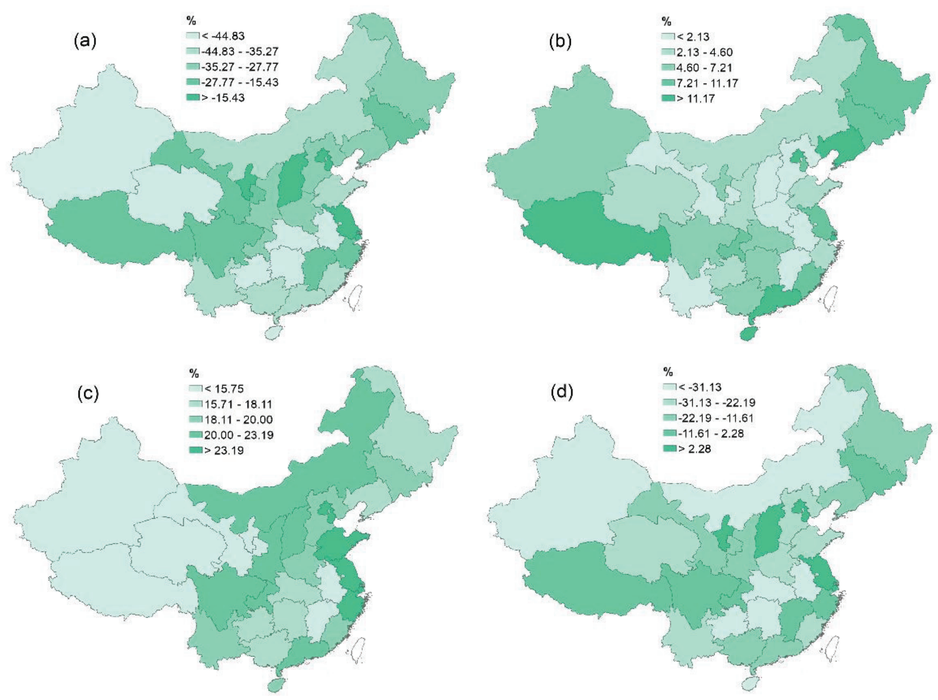

Figure 3. Provincial differentiation of changes in cumulative CO_2 emissions in the LC (a), PR (b), CR (c), and NEW (d) scenarios compared to the REF scenario.

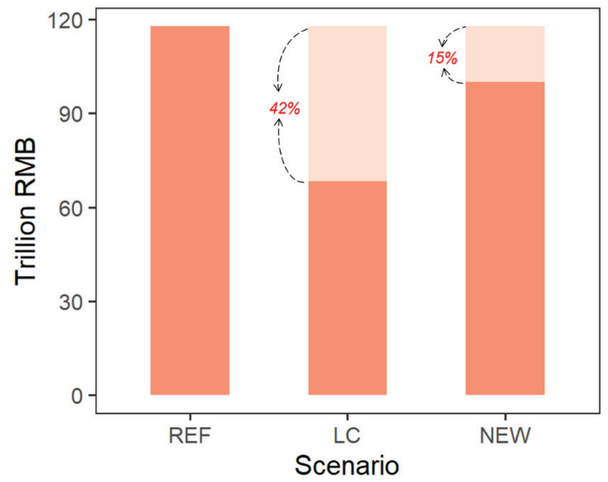

Figure 4. Investment cost for China's carbon neutral target.

- The emission reduction potentials produced by the lifestyle changes would be partially offset by the negative effects stemming from the public transport and car-sharing service reduction.
- The changes in cumulative CO_2 emissions varied spatially across 31 provinces in China.
- It is observed that the investment costs for China's carbon neutral target can be reduced by 42% in the **LC** scenario and 15% in the **NEW** scenario, respectively.

Conclusions

- The carbon neutrality cannot be achieved solely by lifestyle changes due to the post-COVID's new normal.
- The regional disparities in emission reductions across 31 provinces deserve careful attention when making transport policy for achieving carbon neutrality in the post-COVID era.
- Although the net-zero emission reduction cannot be achieved only by lifestyle changes without considering ambitious technology improvements, the arrival of the post-COVID's new normal can help reduce the mitigation cost generated by carbon neutral target.