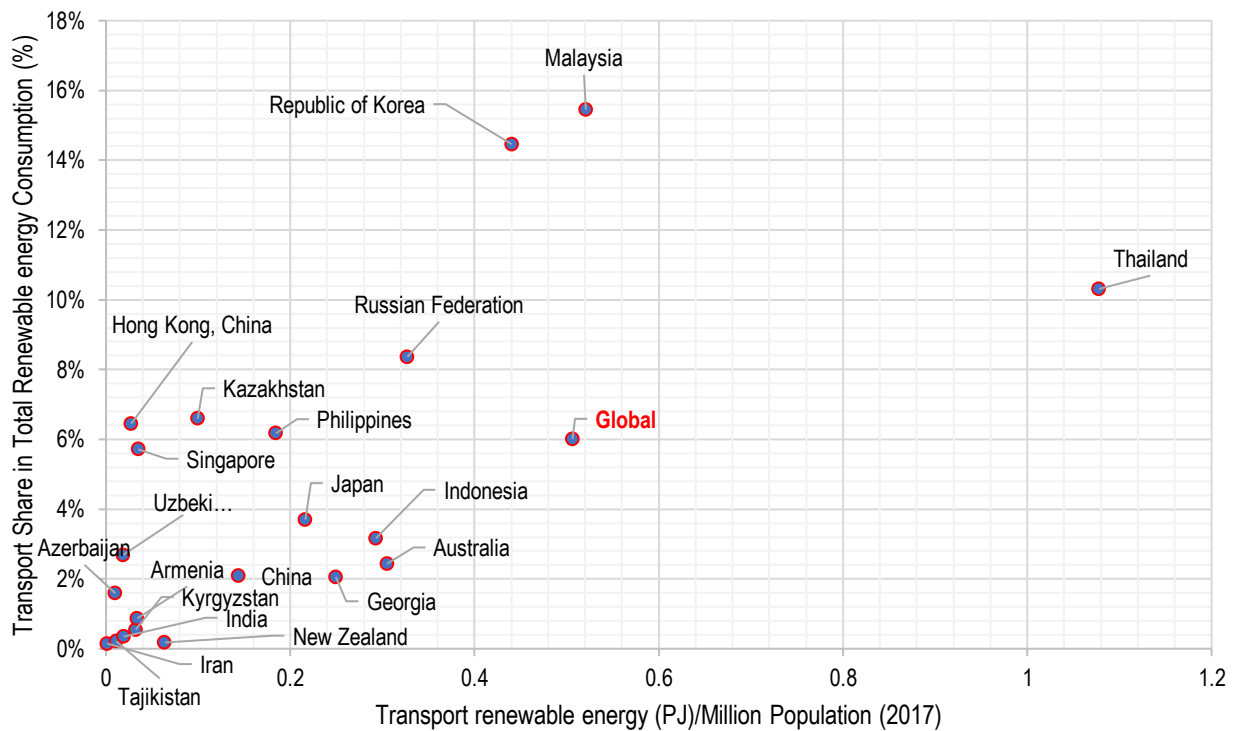


Asian Transport Outlook (ATO)

What is the Status of Renewable Energy in the Transport Sector in the Asia Pacific Region?

Globally, the transport sector is the least diversified energy sector. The primary sources of renewable energy in the transport sector¹ include - electrification of transport modes, renewable hydrogen, synthetic fuels and electro-fuels (when electricity is renewable), biofuels, natural gas vehicles using biomethane etc. Of all the renewable energy consumed in the energy sector, the global transport share is only 6%². In the ATO economies, it varies from 0% to 15% with an average of 3.6%. The per-capita transport sector renewable energy consumption is highest in Thailand with 1078 MJ/capita³ followed by Malaysia with 521 MJ/capita (Fig. 1). The use of renewable energy in the transport sector in the Asia-Pacific region (120 MJ/capita) is well below the global average (500 MJ/capita).

Figure 1: Transport Renewable Energy Use and Transport Share in Total Renewable Energy



Source: 2020 Tracking SDG7, the energy progress report, International Energy Agency (IEA) and UN Statistics Division (UNSD)

ATO Data Used: CLC-VRE-017

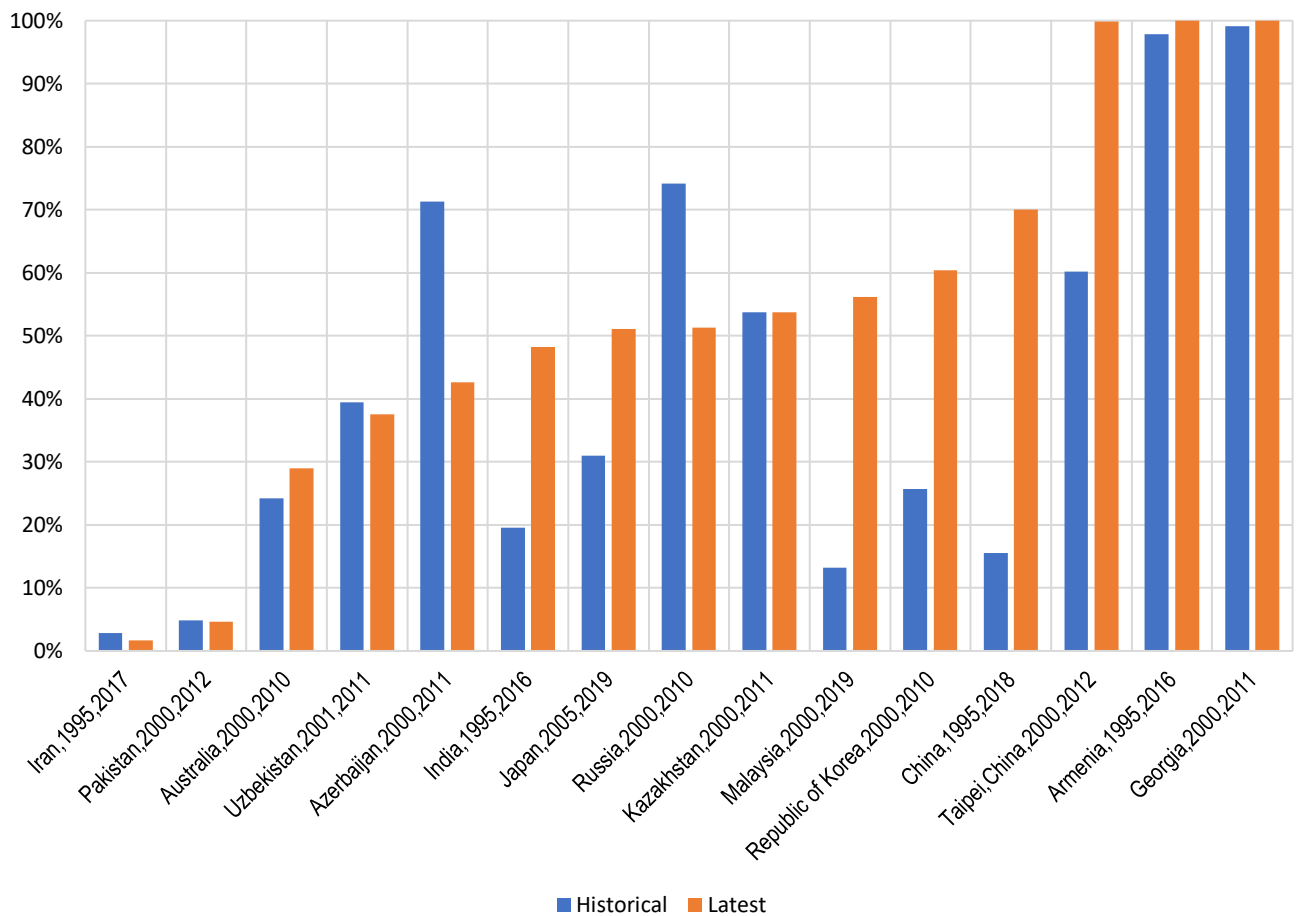
¹ https://www.ren21.net/wp-content/uploads/2019/05/gsr_2020_full_report_en.pdf

² 2020 Tracking SDG7, the energy progress report: results by country for 7.2 - renewable energy

³ IEA estimates that the share of renewable energy in transport in Thailand is 6.5% and globally it was 3% in 2010. https://irena.org/-/media/Files/IRENA/Agency/Publication/2016/IRENA_REmap_Transport_working_paper_2016.pdf

One transport mode where serious penetration of electrification has occurred in the last decade is railways. Globally, three-quarters of passenger rail transport and almost half of all freight rail are now electric⁴. For the ATO economies, disaggregated data on electrification of passenger and freight transport is still missing. However, the aggregated data indicates that electric tracks have significantly increased their share in countries with large rail network such as China and India (Fig. 2). Currently, 70% percentage of the electrified tracks stands at 70% and 50% in China and India, respectively. Since 2000, the electricity consumption in railways in ATO economies has increased by 100%, while diesel consumption has reduced by 40%.

Figure 2: Electrification of Railways in Selected ATO economies



Source: UIC, Country Statistical Yearbooks and UNStats ATO Data Used - INF-AFP-002

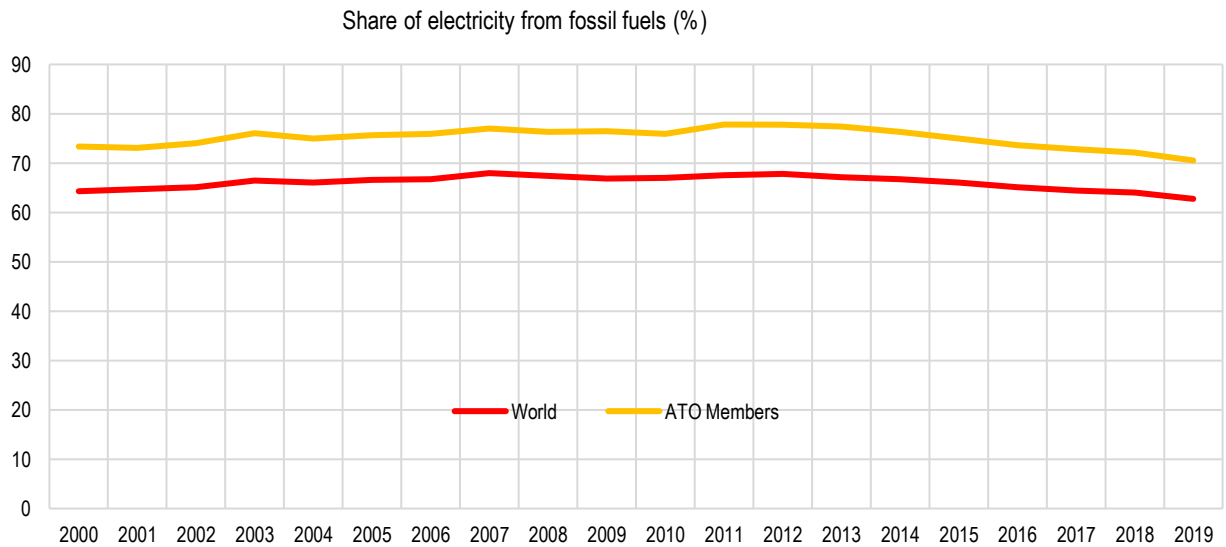
Since 2000, electricity consumption in the transport has increased globally at an annual rate of 4.6%⁵. Electric vehicles have no direct tailpipe emissions, and thus the upstream emissions caused by electricity generation become critical in determining the climate impact of electric vehicles. Fossil fuels continue to dominate the fuel mix for electricity production in the ATO

⁴ <https://www.iea.org/reports/the-future-of-rail>

⁵ <http://data.un.org/Data.aspx?d=EDATA&f=cmID%3AEL>

economies. In 2000, fossil fuels share in total gross electricity production was 73% comparing to 70% in 2019 (Fig. 3). The fossil fuel share in electricity generation increased at an annual rate of 0.4% between 2000 to 2013 and reduced by -1.5% since 2013. If the fossil fuel share continues to reduce at the same rate, by 2030, the fossil fuel share in electricity generation could be about 60% in 2030⁶. The largest reductions in fossil fuel share for electricity generation between 2000 and 2019 were in: Afghanistan (-59%), Kyrgyzstan (-54%), New Zealand (-45%), Cambodia (-33%) and Myanmar (-31%).

Figure 3: Share of Electricity from Fossil Fuels



Source: BP (<https://ourworldindata.org/fossil-fuels>).

ATO Data Used: INF-AFP-009⁷

The current grid emission factor, i.e., a measure of CO₂ emissions intensity per unit of electricity generation in the grid system (gCO₂/kWh) in the ATO economies, is estimated to be in the range of 405 gCO₂/kWh⁸ to 477 gCO₂/kWh⁹. In comparison, the global average carbon intensity of electricity is about 475 gCO₂/kWh¹⁰. The International Energy Agency has estimated that from 1990 till 2013, the CO₂ intensity of electricity generation remained broadly stable. However, with an increase in renewables share in electricity generation since 2013 (fossil share reduced at an annual rate of -1.5% since 2013), the emission intensity should reduce. However, no time-series data is available for ATO economies to corroborate this.

⁶ ADB energy outlook in 2014 had estimated fossil fuel share in electricity generation to be 70% in 2030 - <https://www.adb.org/sites/default/files/publication/29782/energy-outlook.pdf>

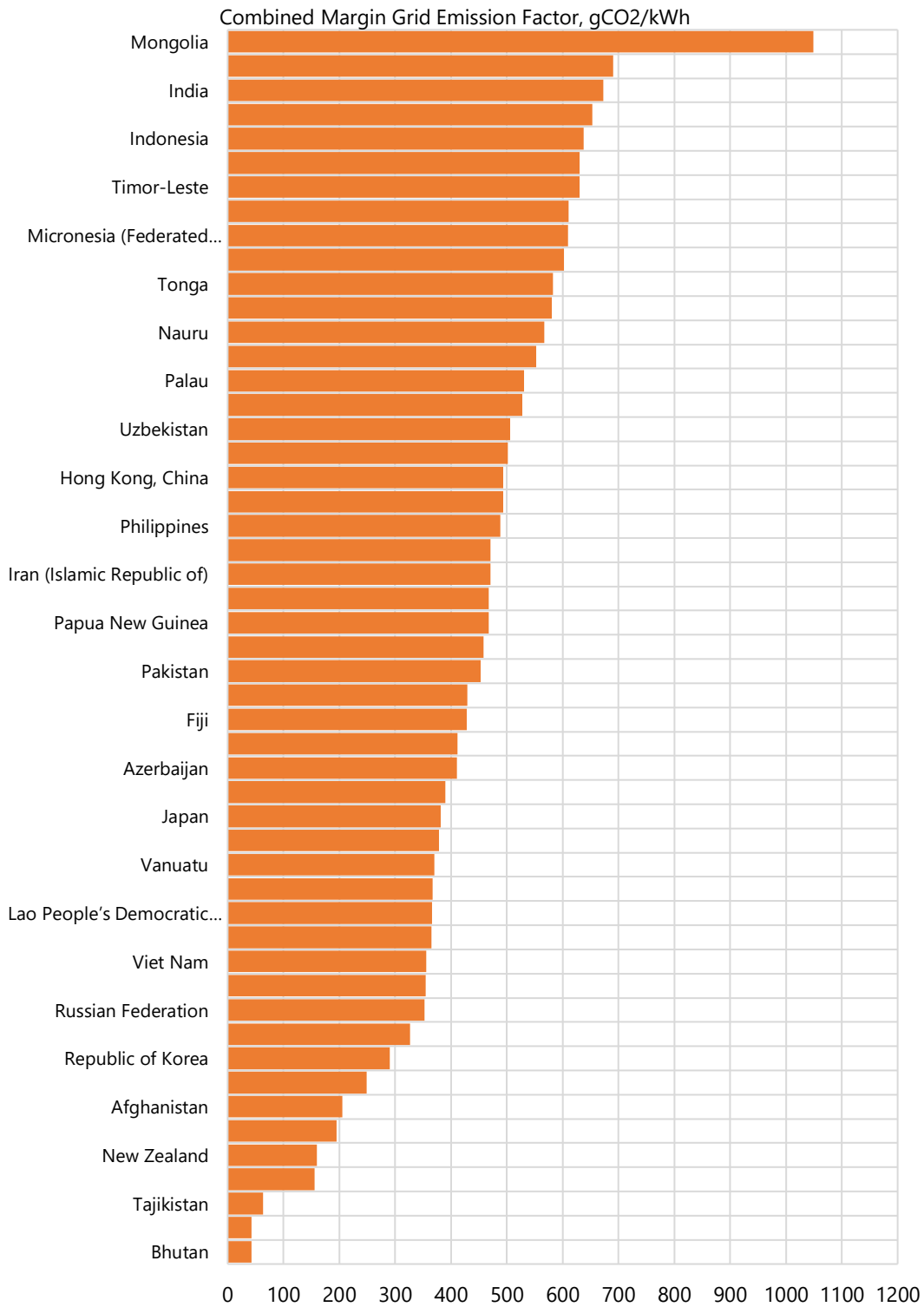
⁷ Weighted average for ATO economies

⁸ <https://www.iges.or.jp/en/pub/list-grid-emission-factor/en>

⁹ The IFI Dataset of Default Grid Factors v.2.0

¹⁰ <https://www.iea.org/reports/global-energy-co2-status-report-2019/emissions>

Figure 4: Combined Margin Grid Emission Factors, Multiple Years



Source: The IFI Dataset of Default Grid Factors v.2.0

[https://unfccc.int/sites/default/files/resource/Harmonized Grid Emission factor data set.pdf](https://unfccc.int/sites/default/files/resource/Harmonized_Grid_Emission_factor_data_set.pdf)

ATO Data Used - INF-AFP-003