

Electric Traction in Railway Operation: Bangladesh Perspective

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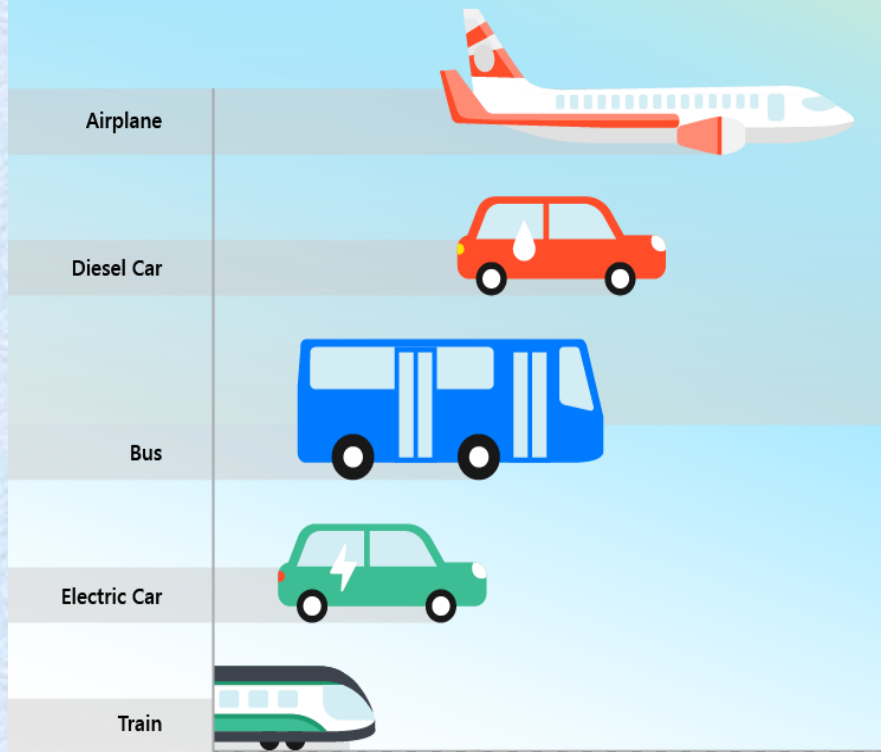
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Comparison among different transport modes

THE CARBON COST OF TRANSPORTATION



Source: www.ourworldindata.org

MODESHIFT

Trains Use Less Energy

- ❑ One of the biggest environmental benefits of trains is that they consume far less energy than other types of transport.
- ❑ It takes a huge amount of fuel to get a plane carrying hundreds of people airborne, whereas trains are streamlined, require much less energy to move, and are increasingly able to run on electricity.
- ❑ Around **50 percent of trains in Europe** are now run on electricity according to Statista.
- ❑ Switzerland comes out on top, **with 100 percent electric-powered trains**.

Reasons for Bangladesh Railway to introduce Electric traction

Time saving

Electrical and Diesel Trip Time Comparison (Minutes)			
	Electrical Loco	Diesel Loco	Savings
Passenger Train	270	330	18.2%
Freight Train	390	465	16.1%

Notes: Trip times given in the table are created on the same route (Tongi-Chattogram, approx. 300km), under the same conditions and with the same stops.

Electrical and Diesel Acceleration Distance Comparison (Meter)			
	Electrical Loco	Diesel Loco	Acceleration Distance reduction
Single Locomotive	400	800	50%
Passenger Train	2500	6500	61.5%
Freight Train	7500	Cannot reach 100km/h*	

Notes: Distances where a speed of 100 km/h was reached were taken.

* The diesel locomotive does not have enough power to reach this speed with the same load.

Reasons for Bangladesh Railway to introduce Electric traction

Energy consumption

Passenger Train:

	Diesel-electric	Electric
Consumption/ 1000 Gross Tonne-Km	3.6 Liter	18.4 KWhr
Cost / 1000 Gross Tonne Km	3.10 USD	1.74 USD
Savings in Electric Traction	43.97%	

Goods Train:

	Diesel-electric	Electric
Consumption/ 1000 Gross Tonne-Km	1.92 Liter	6.13 KWhr
Cost / 1000 Gross Tonne Km	1.65 USD	0.58 USD
Savings in Electric Traction	65%	

Source: 1. Indian Railways Annual Reports and Accounts 2019-2020
2. BPDB Annual Report 2022-23

Reasons for Bangladesh Railway to introduce Electric traction

Carbon emission saving:

Carbon emission will be saved 0.09 g per tonne km in electric traction compared to diesel electric traction.

Time saving:

As average speed in electric traction is higher compared to diesel-electric traction time saving in transportation would contribute in economy. It can be considered as 0.9 USD per hour saving.

Traction System Efficiency

Electric locomotive with hydro-electric power plant	40-45%
Electric locomotive with thermal power plant	32-38%
Diesel- Electric Locomotive	25-30%
Steam Locomotive	10%

Advantages of Electric Traction (Technical)

- **Higher initial torque**
- **Quick acceleration & deceleration**
- **Regenerative braking**
- **Lower inventory**
- **Easier maintenance**
- **Lower operating cost**

Challenges of Electric Traction (Technical)

- **Uninterrupted power supply is required**
- **Sophisticated signaling system is required**
- **Higher initial investment**

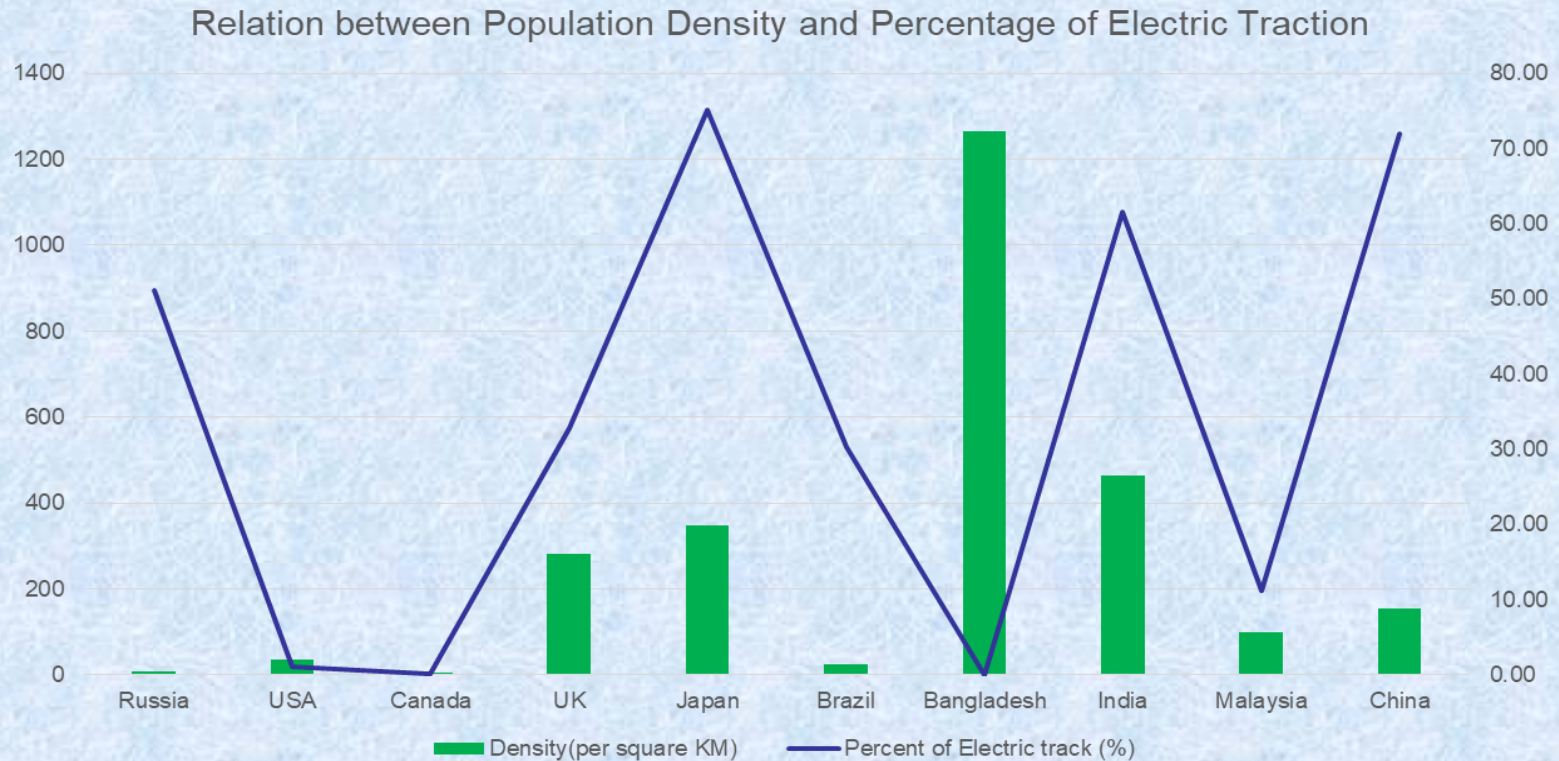
Advantages of Electric Traction (overall)

- **Reduction of Operating Cost (Approx. 35%)** [1]
- **Reduction of Transportation time (Approx. 10-15%)** [2]
- **Increased availability of coaches**
- **Reduction of maintenance cost (30-50%)** [3]
- **Reduction of Carbon emission (20-30%)** [4]
- **Increased Revenue**

Source:

1. Seminar on Electrification prepared by Japan International Cooperation Agency in August, 1985.
2. Seminar on Electrification prepared by Japan International Cooperation Agency in August, 1985.
3. i) Wikipedia (https://en.wikipedia.org/wiki/Electric_locomotive).
ii) Seminar on Electrification prepared by Japan International Cooperation Agency in August, 1985.
4. The Guardian Online news website. (How green are electric trains written by Leo Hickmen).

World Scenario



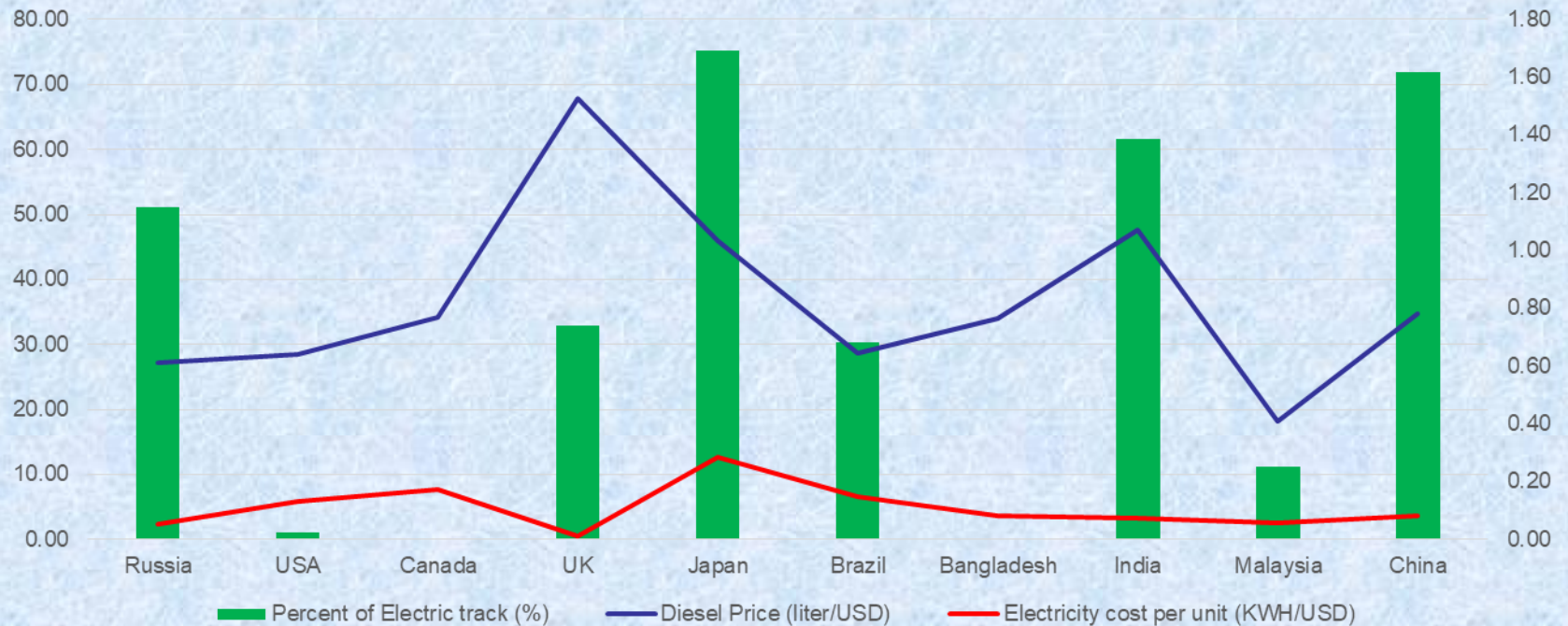
Source:

i) <https://www.worldometers.info/population/>

ii) https://en.wikipedia.org/wiki/List_of_countries_by_rail_transport_network_size

World Scenario

Relation between Percentage of Electric Traction and Price of Diesel & Electricity



Source:

i) https://www.globalpetrolprices.com/diesel_prices

ii) <https://www.statista.com/statistics/263492/electricity-prices-in-selected-countries>

Thank you