

Railroad Construction, Rail Network Infrastructure, Geotechnical Planning

The railroad has stood for economic progress, industrial growth, and employment stimulation for over 200 years. The capability to achieve cost-effective, reliable, and swift transportation of goods between provinces, islands, and trading nations operating in integrated supply chains is a key competitive advantage for any G7 country today. Electric rail is at the center of intermodal freight transportation with the lowest costs on a kilometer-tonne (km-t) basis. In countries with significant overland distances and low electricity prices, electric freight rail can be up to 90% cheaper than transportation by trucks 7.5t - 16t. Shifting large volumes of goods from the road to electric freight rail offers multiple benefits, such as reduced congestion of highways, air pollution, and CO2 emissions. Lower expenses for in-house transportation result in lower production costs, improving competitiveness. Success factors are:

- 1) Accessibility: Connection to a railroad, rail network infrastructure, ports
- 2) Reliability Rail Operation: Operational punctuality with 75% of all freight trains arriving on time (Today: 43.4%)
- 3) Competitive Rail Speed: Average freight train speed 56km/h – 120km/h (Today: 19km/h – 38km/h)
- 4) Intermodal Freight Transport: 30% of all freight transport on rail network infrastructure (Today: 15%)

Freight trains operating all seasons of the year must run over mountains, lakes, rivers, marshlands, and deserts consistently while overcoming interruptions caused by storms, floods, collapsed trees, rockfalls, and avalanches. Other reasons for delays can be track repair work caused by outdated rail networks, or service of legacy systems. Missing multi-track capacity and parallelism can result in bottlenecks, forcing freight trains to long detours, wait times, and slow driving speed. An inefficient rail transport network can cause impairments, particularly for the manufacturing sector and producers relying on multi-stage production processes. Modernization of railway infrastructure is therefore key, and with a focus on:

- ❖ Expansion of multi-track capacity, designed for electric freight trains, rail digitalization
- ❖ Construction of new railroad tunnels, resolution of bottlenecks, relocation of railway traffic underground

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