Group of Experts on Benchmarking Transport Infrastructure
Construction Costs - rail

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TER Deputy Manager
Leader – PKP Polish Railway Lines JSC

In cooperation with:

➢ UNECE Trans-European Railway (TER)
➢ International Union of Railways (UIC)
➢ Economic Cooperation Organization (ECO)
➢ **individual countries** (Bulgaria, Croatia, Finland, Poland, Turkey)

➢ **TER** (data from annual reports)

➢ **ECO** (ECO-ECE-ISdB GIS project)
<table>
<thead>
<tr>
<th>V&lt;120</th>
<th>120&lt;V≤160 km/h</th>
<th>160&lt;V≤200 km/h</th>
<th>200&lt;V≤250 km/h</th>
<th>V&gt;250 km/h</th>
<th>other speed limit (please specify)</th>
<th>type of line (identified, as well as, number of tracks, gauge)</th>
<th>organization responsible for construction</th>
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<tbody>
<tr>
<td>preparatory work (removal of trees and bushes, demolition etc.) (US$/m²)</td>
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<td>earthwork (US$/km)</td>
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<td>track and track bed (US$/km)</td>
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<td>one-sided turnouts (US$/unit)</td>
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<td>diamond crossing turnouts (US$/unit)</td>
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<td>prestressed concrete turnout sleepers (US$/unit)</td>
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<td>timber turnout sleepers (US$/unit)</td>
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<td>traction electric power engineering (US$/km)</td>
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<td>removal of wired infrastructure collision (US$/km)</td>
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<td>steel bridges (US$/m)</td>
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<td>reinforced concrete bridges (US$/m)</td>
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<td>single tube tunnels (US$/m)</td>
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<td>twin tube tunnels (US$/m)</td>
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<td>viaducts (US$/m)</td>
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<td>retaining structures (US$/m)</td>
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<td>passive level crossings (US$/unit)</td>
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<td>active level crossings – manual (US$/unit)</td>
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<td>active level crossings – automatic with user-side warning (US$/unit)</td>
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<td>active level crossings – automatic with user-side protection (US$/unit)</td>
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<td>active level crossings – rail-side protected (US$/unit)</td>
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<td>pedestrian passages – footbridges (US$/m)</td>
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<td>standard platforms, height≤76 cm (US$/m)</td>
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<td>other platforms (US$/m)</td>
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<td>elevators (US$/unit)</td>
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<td>signalling systems (US$/km)</td>
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<td>signal boxes (US$/unit)</td>
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<td>telecommunications and IT (US$/km)</td>
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<td>passenger information systems (US$/unit)</td>
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<td>passenger infrastructure in ports and terminals</td>
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<td>public stations (excluding facilities for local operations) (US$/m²)</td>
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### Content:

- **Project**, 
- **Start date**, 
- **End date**, 
- **Construction costs of the project**, 
- **Currency**, 
- **Prices of (year)**, 
- **Line speed design**, 
- **Rail work type**, 
- **Type of line**, 
- **Number of tracks**, 
- **Length of the project excluding tunnels and bridges/viaducts in km**, 
- **Number of tunnels**, 
- **Length of tunnels in km**, 
- **Costs of tunnels**, 
- **Number of bridges/viaducts**, 
- **Length of bridges/viaducts in km**, 
- **Costs of bridges/viaducts**, 
- **Total length of the project in km**, 
- **Number of active level crossings**, 
- **Costs of level crossings**, 
- **Number of stations**, 
- **Costs of stations**, 
- **Number of over/underpasses for pedestrians**, 
- **Costs of over/underpasses**.

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<thead>
<tr>
<th>Project</th>
<th>Start date</th>
<th>End date</th>
<th>Construction costs of the project</th>
<th>Currency</th>
<th>Prices of (year)</th>
<th>Line speed design</th>
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<th>Number of tracks</th>
<th>Length of the project excluding tunnels and bridges/viaducts in km</th>
<th>Number of tunnels</th>
<th>Length of tunnels in km</th>
<th>Costs of tunnels</th>
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<th>Length of bridges/viaducts in km</th>
<th>Costs of bridges/viaducts</th>
<th>Total length of the project in km</th>
<th>Number of active level crossings</th>
<th>Costs of level crossings</th>
<th>Number of stations</th>
<th>Costs of stations</th>
<th>Number of over/underpasses for pedestrians</th>
<th>Costs of over/underpasses</th>
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</tbody>
</table>
Bulgaria - cost of upgrades of infrastructure elements expressed in US$/km

120<V≤160 km/h  (US$/km)
Bulgaria - cost of renewal of infrastructure elements expressed in US$/m

V<120 km/h (US$/m)
Data from individual countries - examples

Bulgaria - allocation of costs for projects

- Reconstruction and electrification of Plovdiv - Svilengrad railway line along corridors IV and IX: Phase 2
- Parvomay - Svilengrad section
- Electrification and reconstruction of the railway line Plovdiv – Svilengrad on Transport Corridors IV and IX, Phase I: section Krumovo – Dimitrovgrad
- Electrification and upgrading of Svilengrad - TUR railway line
- Rehabilitation of sections of railway infrastructure along Plovdiv - Burgas railway line
- Modernization of the railway section Septemvri - Plovdiv - part of the Trans European railway network
- Rehabilitation of station facilities along TEN-T: Sofia Central station, Burgas station, Pazardzhik station phase 2

Costs of over/underpasses
Costs of stations
Costs of bridges/ viaducts
Other
Croatia - allocation of costs for new construction projects

- Costs of stations
- Costs of level crossings
- Costs of bridges/viaducts
- Others

Construction of a new railway line for suburban traffic on section Gradec – Sveti Ivan Žabno

Data from individual countries - examples
Croatia - allocation of costs for upgrade projects

Data from individual countries - examples

- Okučani to Novska Railway Rehabilitation and Upgrade
- Zagreb Main Railway Station - reconstruction (modernisation) of signalling and interlocking system, in scope of IPA Fund
- Reconstruction of existing and construction of second track on section Dugo Selo - Križevci, State Border - Botovo - Dugo Selo line
- Modernisation and section upgrade of Oštarije - Knin - Split line

Costs of over/underpasses
Costs of stations
Costs of level crossings
Costs of bridges/viaducts
Others
Finland - allocation of costs for new construction projects

Data from individual countries - examples
Finland - allocation of costs for upgrade projects

Data from individual countries - examples

- Railway project Seinäjoki–Oulu
- Railway project Huopalahti–Vantaankoski
- Railway project Lahti–Luumaki

Costs of over/underpasses
Costs of stations
Costs of level crossings
Costs of bridges/viaducts
Others
Poland - cost of upgrades of infrastructure elements expressed in US$/km

Data from individual countries - examples
Data from individual countries - examples

Poland - cost of upgrades of infrastructure elements expressed in US$/unit

![Chart showing cost of upgrades of infrastructure elements expressed in US$/unit for different speed ranges.](chart.png)
Data from individual countries - examples

Turkey - cost of new construction of infrastructure elements expressed in US$/km

- V<120 km/h
- 120<V≤160 km/h  (US$/km)
Turkey - cost of new construction of infrastructure elements expressed in US$/m
Turkey - cost of new construction projects vs. length

Construction costs of the project (USD)
Length of the project excluding tunnels and bridges/viaducts (km)
Comparison of upgrade of infrastructure elements in Bulgaria and Poland

Comparison of data - examples

- Bulgaria
- Poland (US$/km)

120<V≤160 km/h
Comparison of data - examples

Bulgaria - comparison of cost of infrastructure elements for renewal and upgrade

- Renewal V<120 km/h
- Upgrade 120<V≤160 km/h
Data from TER - examples

Cost of projects vs. length, data of 2012
Data from TER - examples

Cost of projects vs. length, data of 2016

Cost of 1 km

- Cost of 1 km
- Length (in km)
Azerbaijan - cost of projects vs. length

- New railway line Baku-Tabilsisi-Kars (BTK) [renewal]
- Marabda-Akhalkali railway section [renewal]
- Akhalkali railway station [renewal]
- Akhalkali-Kartsakhi section [new construction]
- New railway line Astara (Azerbaijan) - Astara (Iran) [new construction]
Data from GIS - examples

Kazakhstan - cost of projects

Kazakhstan - Total cost of projects

- Costs of rails, bridges and tunnels
- Costs of construction of stations

- Construction of the "Uzen-State Border of Republic of Turkmenistan" railway line
- Construction of the new "Zhetygen-Korgas State Border of Republic of Kazakhstan" railway line
- Construction of the new "Zhezkazgan-Beyneu" railway line
- Construction of the new "Arkalyk-Shubarkul" railway line
- Construction of the new "Borzhakty-Ersay" railway line
- Construction of the new "Almaty 1-Shu" second track line
- Project: "Construction of the ferry complex at Kuryk Port and operation of standardized passenger ferries"
- Project: "Development of the Astana railway station, including the construction of railway platform and facilities"
Data from GIS - examples

Tajikistan - cost of projects

- Rehabilitation / Improvement of Rohri – Sibi Section
- Rehabilitation / Improvement of Sibi – Spezand Section
- Rehabilitation / Improvement of Spezand – Taftan Section

Cost of rails
Costs of tunnels
Costs of bridges/viaducts
Costs of level crossings
Costs of stations
Costs of over/underpasses
Turkmenistan - cost of projects vs. length

Data from GIS - examples
Conclusions

➢ Complexity of the railway system;

➢ Different technical parameters;

➢ Data difficult to compare.
Conclusions

- Excellent example of cooperation (TER, ECO, UIC);
- Very good basis for extending the scope of the costs analysis;
- More focused research on individual projects in the future.
Thank you for your attention