Upgrading of freight railways to meet operational and market demands
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Upgrading of railway lines is the economical way to support rail freight traffic. Some highlights are given below from a guideline from the EU FP7 Project Capacity4Rail

- Globally, new railway lines are built for high speed operations while existing lines are left for freight
- The existing lines were built for old traffic demands
- Railways now have to upgrade lines to meet new demands
- This is key to a modal shift of freight transports to railways within reasonable limits for economy, environment and time.
- There are challenges and limitations, but also possibilities to upgrade freight lines to improve performance!
- Upgrading guidelines based on research and development are lacking. This study fills this gap.
- The table below shows the influence improvements of different parts of the track has on upgraded operations.

<table>
<thead>
<tr>
<th>Structure / Upgrading scenario</th>
<th>Substructures</th>
<th>Bridges</th>
<th>Tunnels</th>
<th>Culverts</th>
<th>Retaining walls</th>
<th>Track</th>
<th>Switches &amp; crossings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Longer trains</td>
<td>Some</td>
<td>Some</td>
<td>No</td>
<td>Some</td>
<td>No</td>
<td>Some</td>
<td>Some</td>
</tr>
<tr>
<td>Increased train weight</td>
<td>Some</td>
<td>Some</td>
<td>No</td>
<td>Some</td>
<td>No</td>
<td>Some</td>
<td>Some</td>
</tr>
<tr>
<td>Increased axle and meter loads</td>
<td>Great</td>
<td>Great</td>
<td>No</td>
<td>Great</td>
<td>Some</td>
<td>Great</td>
<td>Great</td>
</tr>
<tr>
<td>Higher speeds of freight trains</td>
<td>Some</td>
<td>Little</td>
<td>No</td>
<td>Little</td>
<td>Little</td>
<td>Some</td>
<td>Some</td>
</tr>
<tr>
<td>Increased loading gauges</td>
<td>No</td>
<td>No</td>
<td>Great</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

The study is based on results of European projects now reaching TRL8–TRL9.

Substructure
Assess substructure conditions and effects of subgrade improvements.
Left: Tamping operations associated to sudden track stiffness variations.
Right: Injections in an in-service track.

Bridges
Work processes and most bridge types are described. A structured approach of upgrading to meet new demands is proposed.

Forso bridge in Sweden after strengthening from 22.5 to 30 tonnes axle load.

Strengthening areas of trough

Track and Switches & Crossings
Two-stage assessment of consequences of upgrading on increased deterioration including proposals for improved maintenance.