People's Republic of China
Poverty Reduction and
Regional Cooperation Fund

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5-е заседание Рабочей группы по железнодорожному транспорту

12–13 декабря 2019 г. | Бангкок, Таиланд

# Government and Railway Sector Relationship - Infrastructure and PSO

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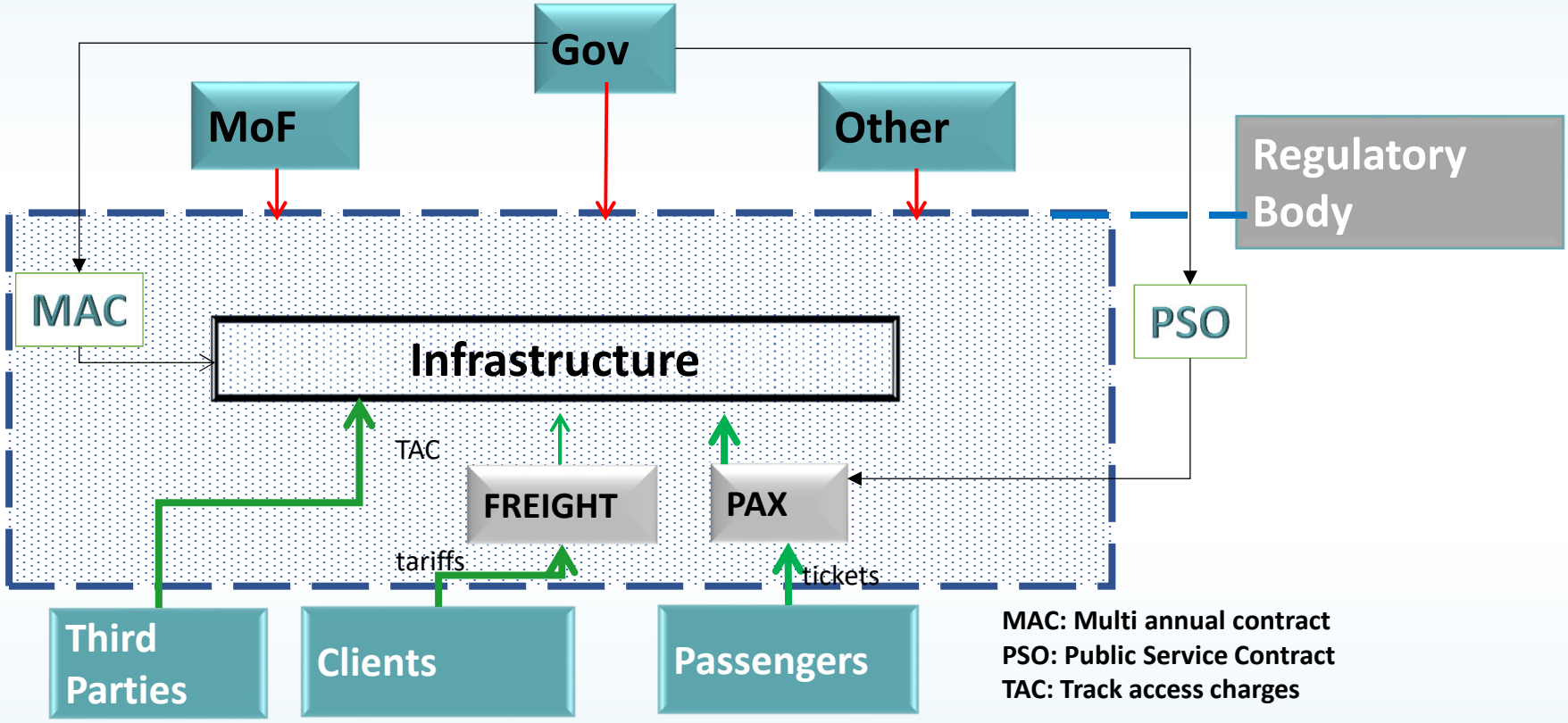
# Infrastructure

## Costs and cost coverage

# Financing infrastructure manager



# Strategic goals: infrastructure manager

- Reliability and Service Quality
- Efficiency
- Sustainability
- Market Orientation
- Safety

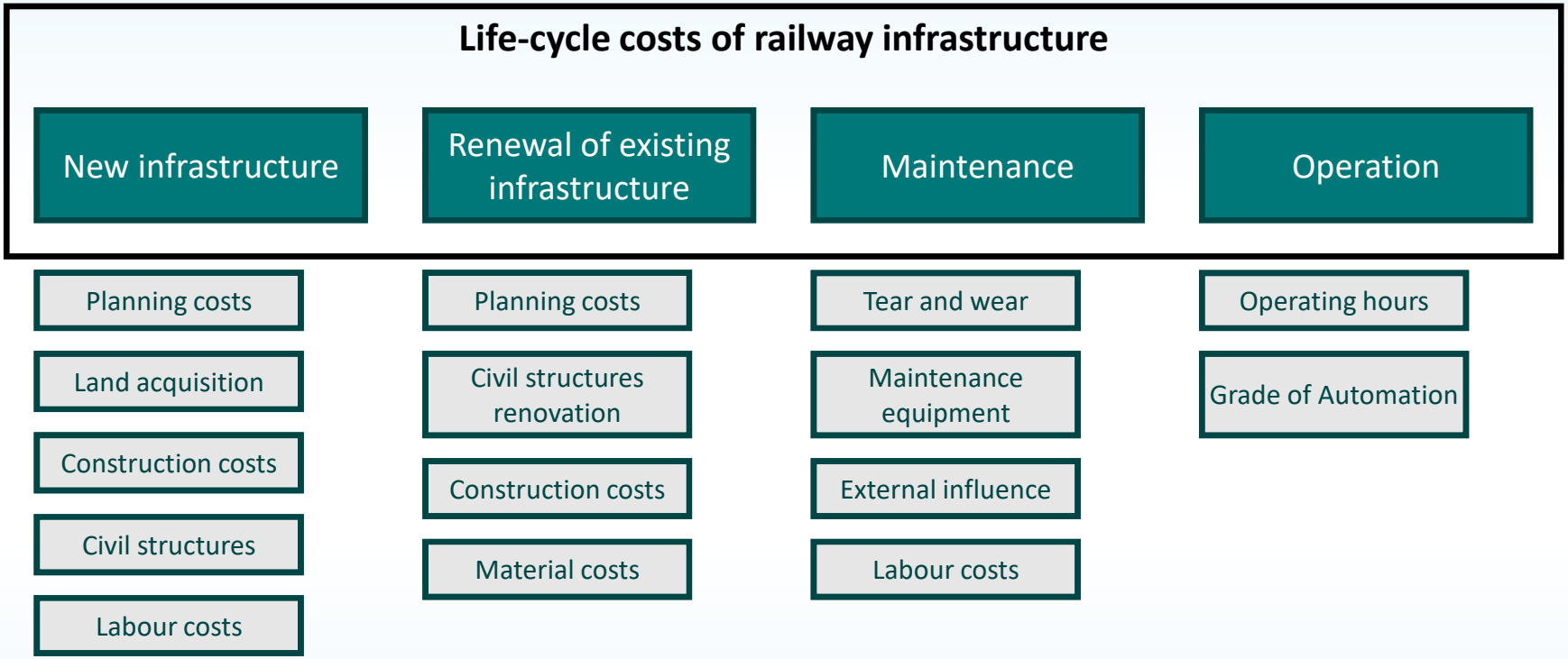
# Costs of maintaining Rail Infrastructure

- OECD in 2006 estimated a worldwide 49-58bn* $ p.a. for rail infrastructure maintenance
- For 1.150.000 km this is means 43.000 – 50.000 $ per km

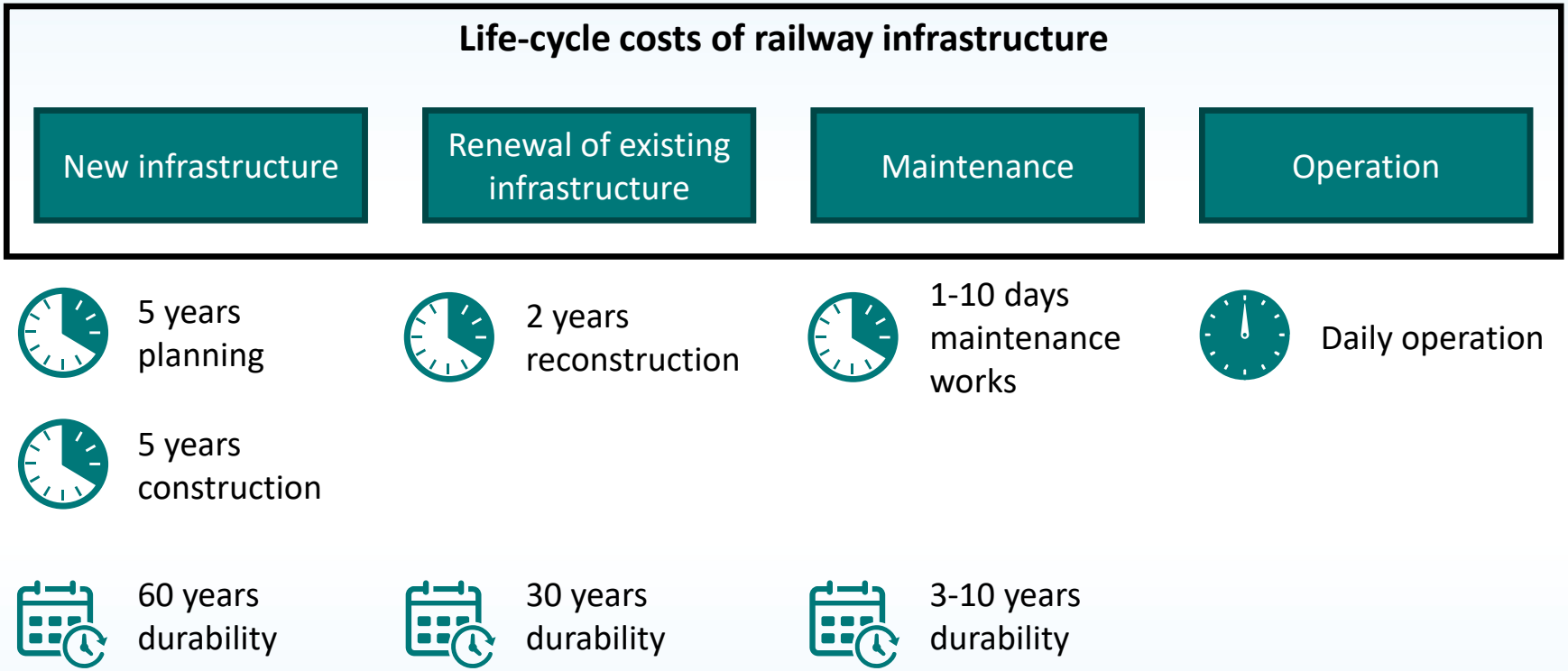
- In Europe 15-25bn € are spent p.a.
- Per km (300.000 km**) this amounts to 60.000 – 80.000 €

***No Metro etc. included**
**high share electrified

# Cost factors of railway infrastructure

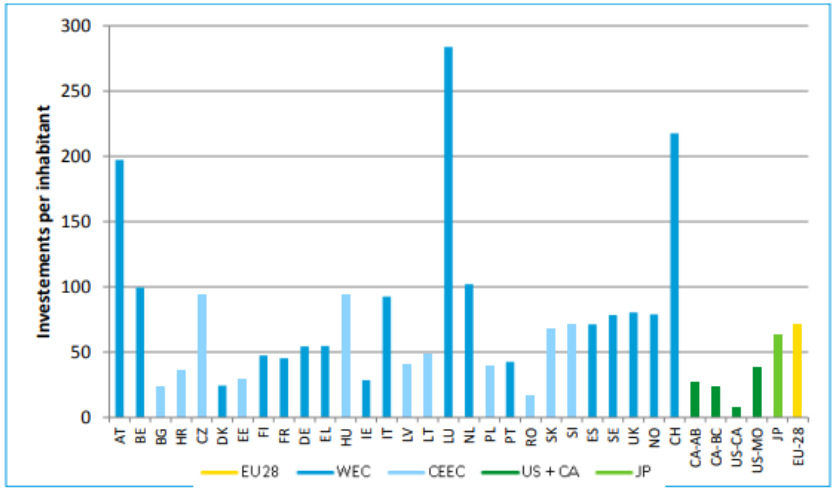


# Cost factors of railway infrastructure



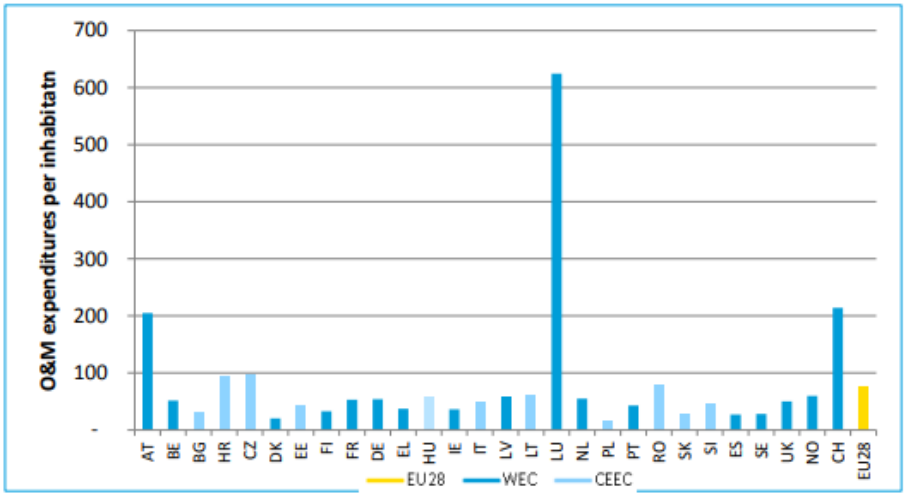
# Cost factors of railway infrastructure

Figure 63 - Investments per inhabitant (average for 1995-2016) per country (€ per inhabitant, PPS adjusted)




Note: There are no railways in Cyprus and Malta.

Figure 65 - O&M expenditures per inhabitant (average for 1995-2016) per country (€ per inhabitant, PPS adjusted)




Notes:

- for the US and Canadian states/provinces as well as for Japan, only data for 2016 were available;
- there are no railways in Cyprus and Malta.

Investment expenditures roughly equal the expenditures for operation & maintenance

# Cost factors of railway infrastructure


Operation costs - What if, …

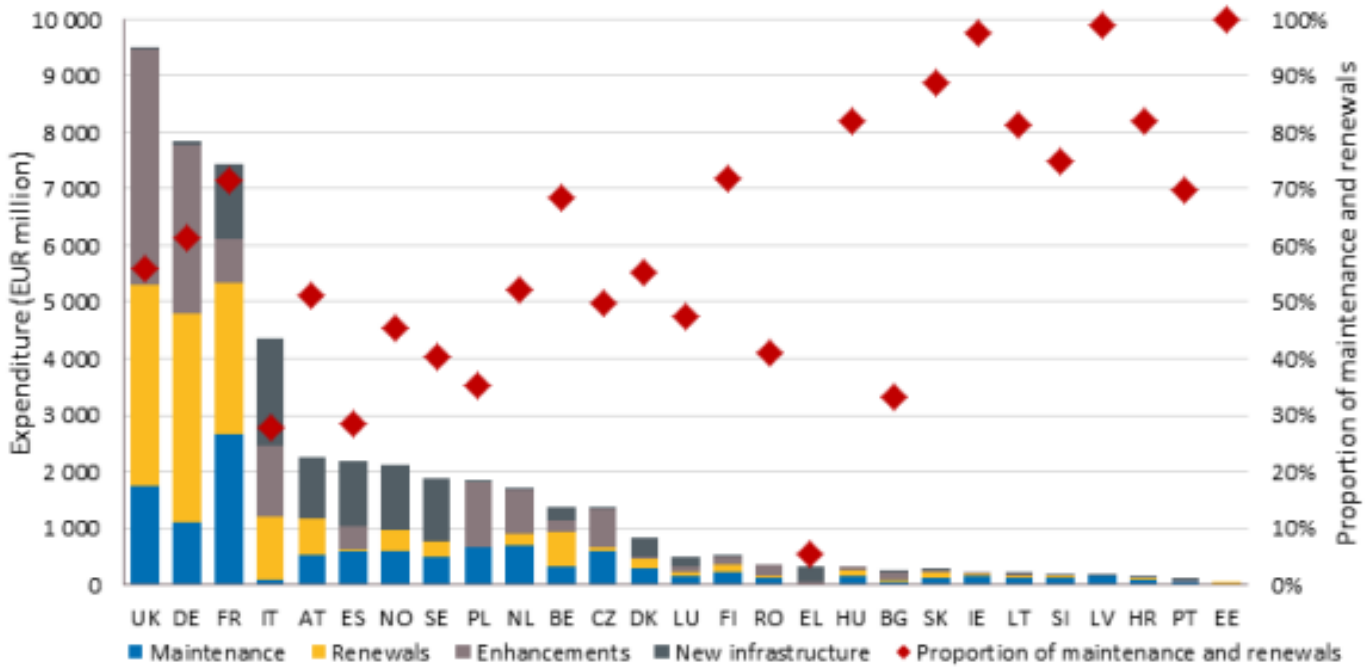
If signalling and interlockings are old, operation costs are high

If traffic is mixed and frequent, operation costs are high

If the network lines are highly interconnected, operation costs are high

# Cost factors of railway infrastructure

Figure 11: Expenditure on infrastructure and proportion on maintenance and renewals per country, 2016



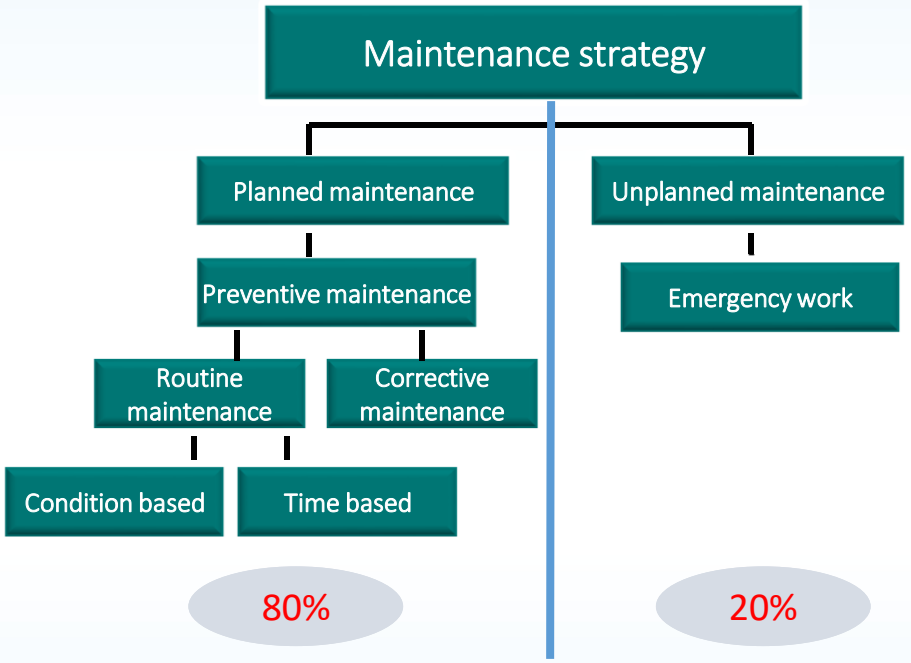

*Source: RMMS, 2018. NO, SE included enhancements with renewals.*

*Enhancements* are renewals with a significant extension of the infrastructure

# Maintenance Strategy

- 1. Strategic Target:
- Dimension the overall maintenance!

- How ‚good' should the Infrastructure be?
- What measures do we need to achieve that?
- How can this be arranged considering traffic, safety, reliability, economy etc.?
- How to balance preventive and corrective maintenance (80/20)?



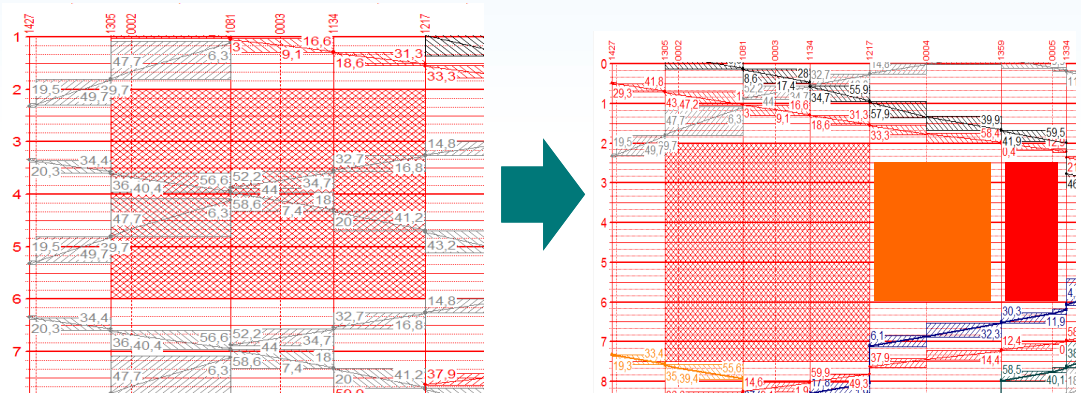
# Examples of track closures

| Component | Possession Time | Interval (Tonnage) | Interval (Time) |
|---|---|---|---|
| Tamping | 4-8 hours | 40 – 70 Mio. tons | 3 – 5 years |
| Track grinding | 4-8 hours | 20 – 30 Mio. tons | 1 – 3 years |
| Track renewal | > 8h | 300 – 1000 Mio. tons | 10 – 15 years |
| Renewal of wooden sleepers | 1 hour – x days | 250 – 600 Mio. tons | 20 – 30 years |
| Renewal of concrete sleepers | 1 hour – x days | 350 – 700 Mio. tons | 30 – 40 years |
| Fastenings | 1-4 hours | 100 – 500 Mio. tons | 10 – 30 years |
| Ballast renewal | 1 hour – x days | 200 – 500 Mio. tons | 20 – 30 years |
| Substructure renewal | 1 hour – x days | > 500 Mio. tons | > 40 years |

Track closures

- All maintenance work will require some closures
- The key to minimising this is by combining work effectively.

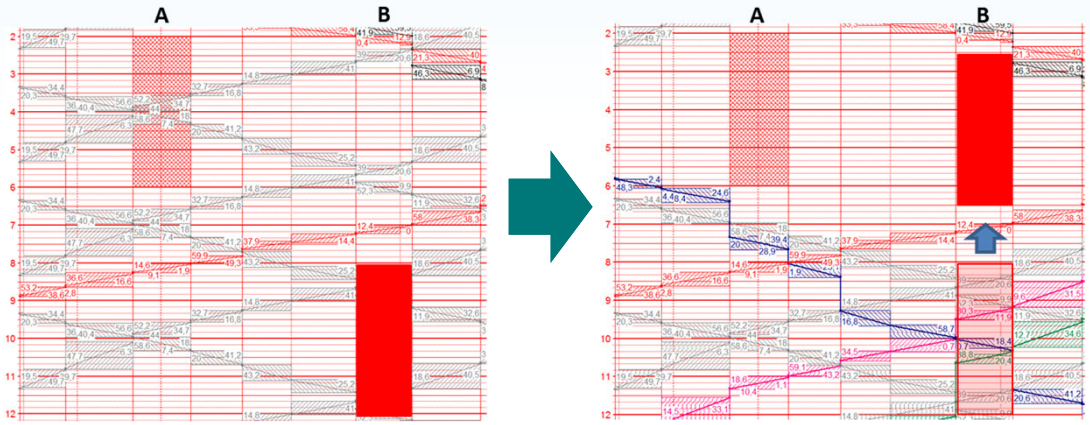
# Examples of track closures



Track closures

- Cancelling of trains or effectively diverting them allows for smaller, less time consuming works to be carried out while the operational impact remains as small as possible.

# Examples of track closures




Track closures

- Cancelling of trains or effectively diverting them can potentially reduce the number of closures needed. This however increases the number of teams needed.

# Cost coverage of infrastructure expenses

How infrastructure expenses can be covered:

| Track access charges (TAC) | Governmental subsidies | Interdepartmental subsidies |
|---|---|---|
| General principle: TAC **must** cover costs of operation, **should** cover costs of maintenance and **can** cover renewal costs in bonanza markets | Governmental subsidies can be part of a multi-annual contract for maintenance and renewal, as direct subsidies, or indirect subsidies (e.g. subsidising TAC) | Interdepartmental subsidies shift earnings for example from freight department to the infrastructure department to cover expenses |

# Other topics related to infrastructure costs and revenues

- Dependence of infrastructure maintenance and life cyle costs
- Direct costs calculation principles
- TAC reimbursement for infrastructure malfuntions
- Infrastructure charges in industrial sidings
- Infrastructure charges on congested infrastructure and capacity building through charges
- Efficient allocation of infrastructure investments for new and enhanced infrastructure