

Line comparaision benchmark

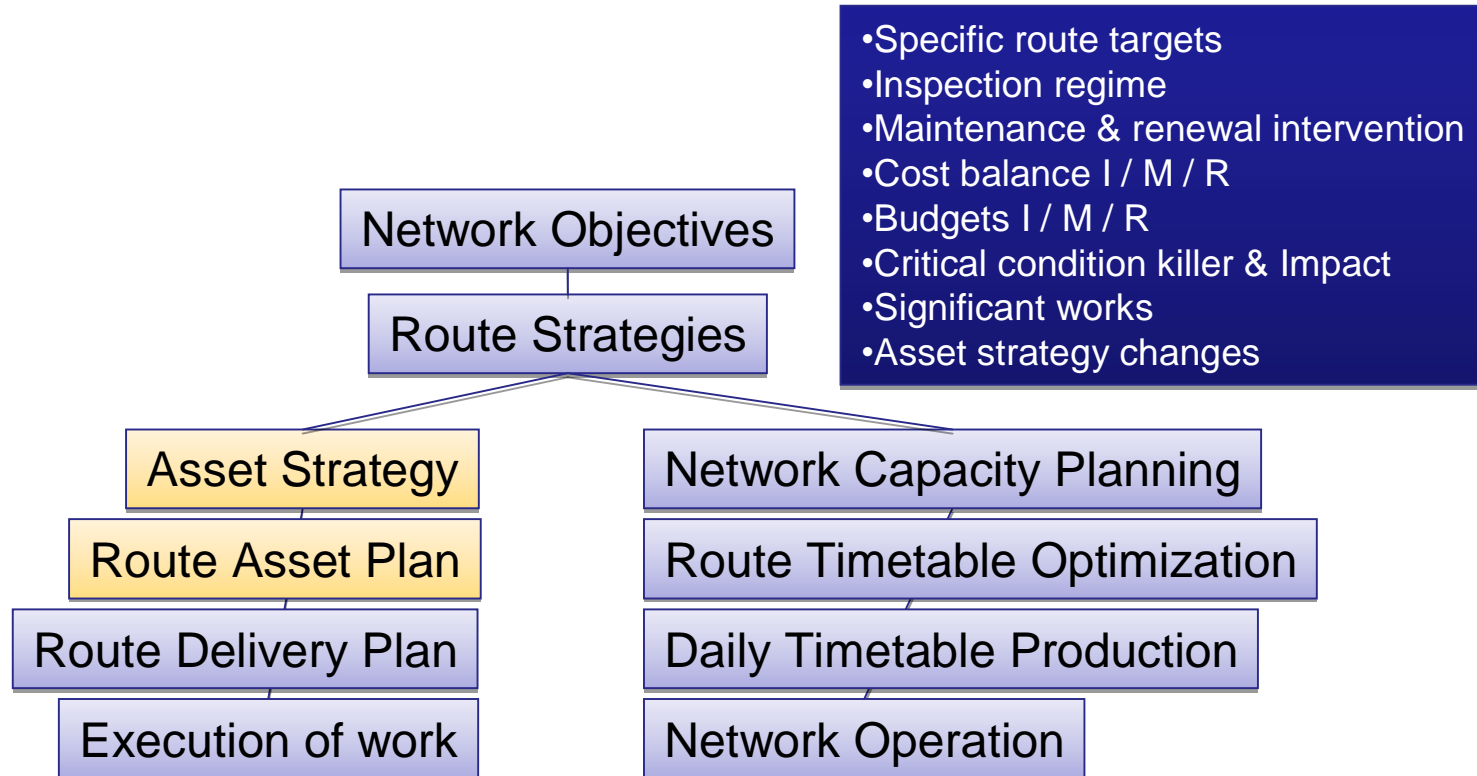
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Goal of the line comparison

- To get a **better understanding** on :
- how different **asset management strategies and methods**
- **Influence of costs and performance** of comparable infrastructures
- **Scope of the study:**
 - Costs and performance on lines of a similar nature.
 - Two types of lines:
 - High Density Lines:
 - Lines serving and converging to capital cities
 - Regional lines:
 - Regular passenger railway services in areas bigger than a city,
 - with low density of population

Topic 1

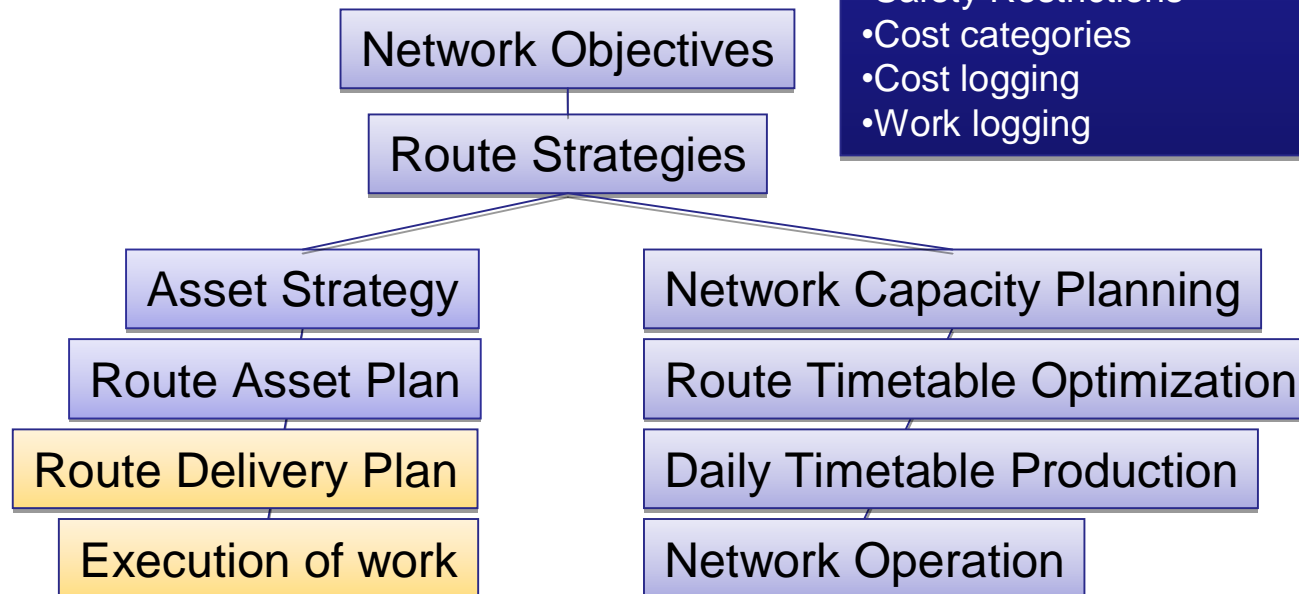
Questions list



Topics 2

Questions list

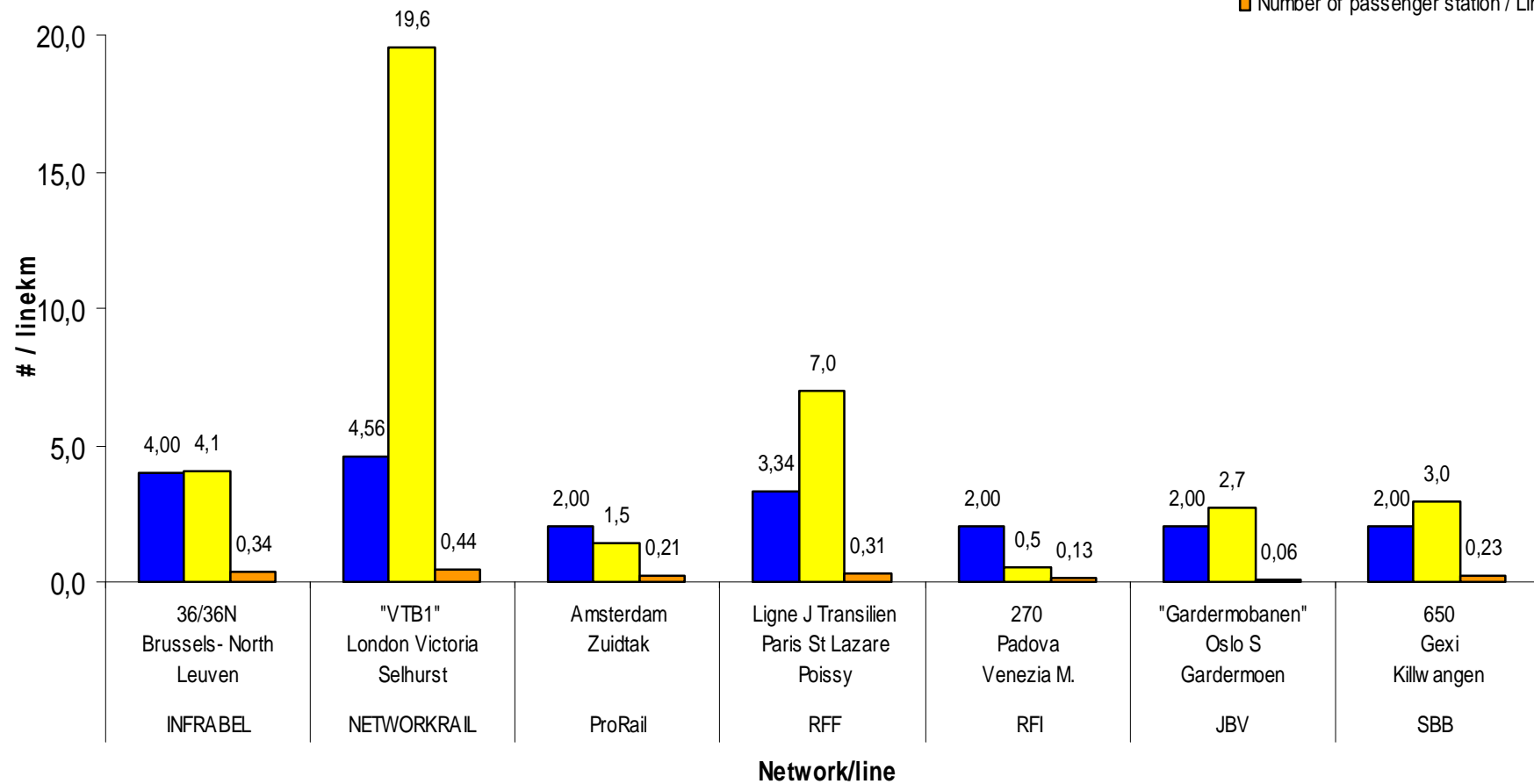
- Work Planning
- Top down approach for volume of work
- Possession planning & claiming
- Planning & Scheduling Tools
- Safety Restrictions
- Cost categories
- Cost logging
- Work logging



High Density
Lines (2)

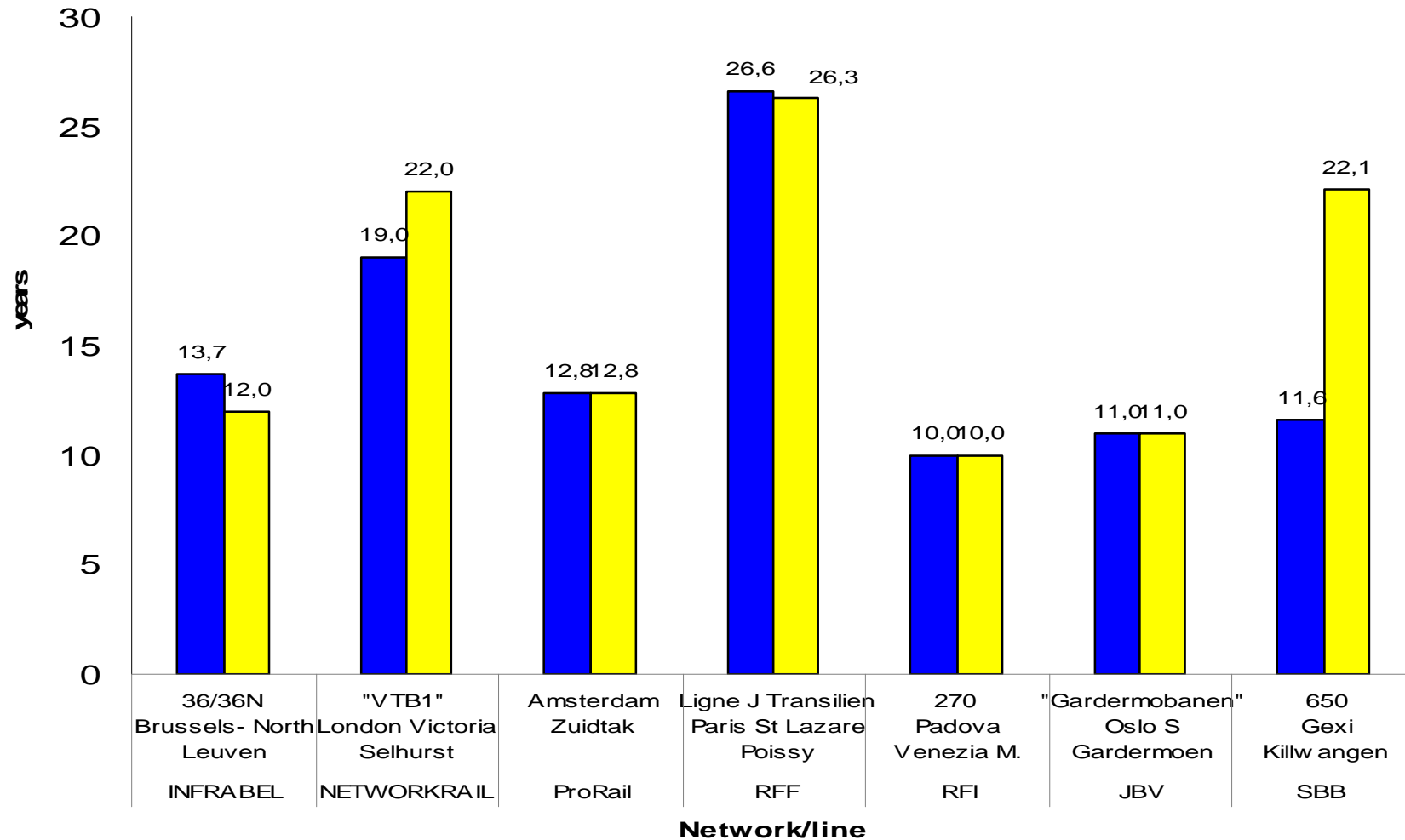
Technical features [objects / linekm]

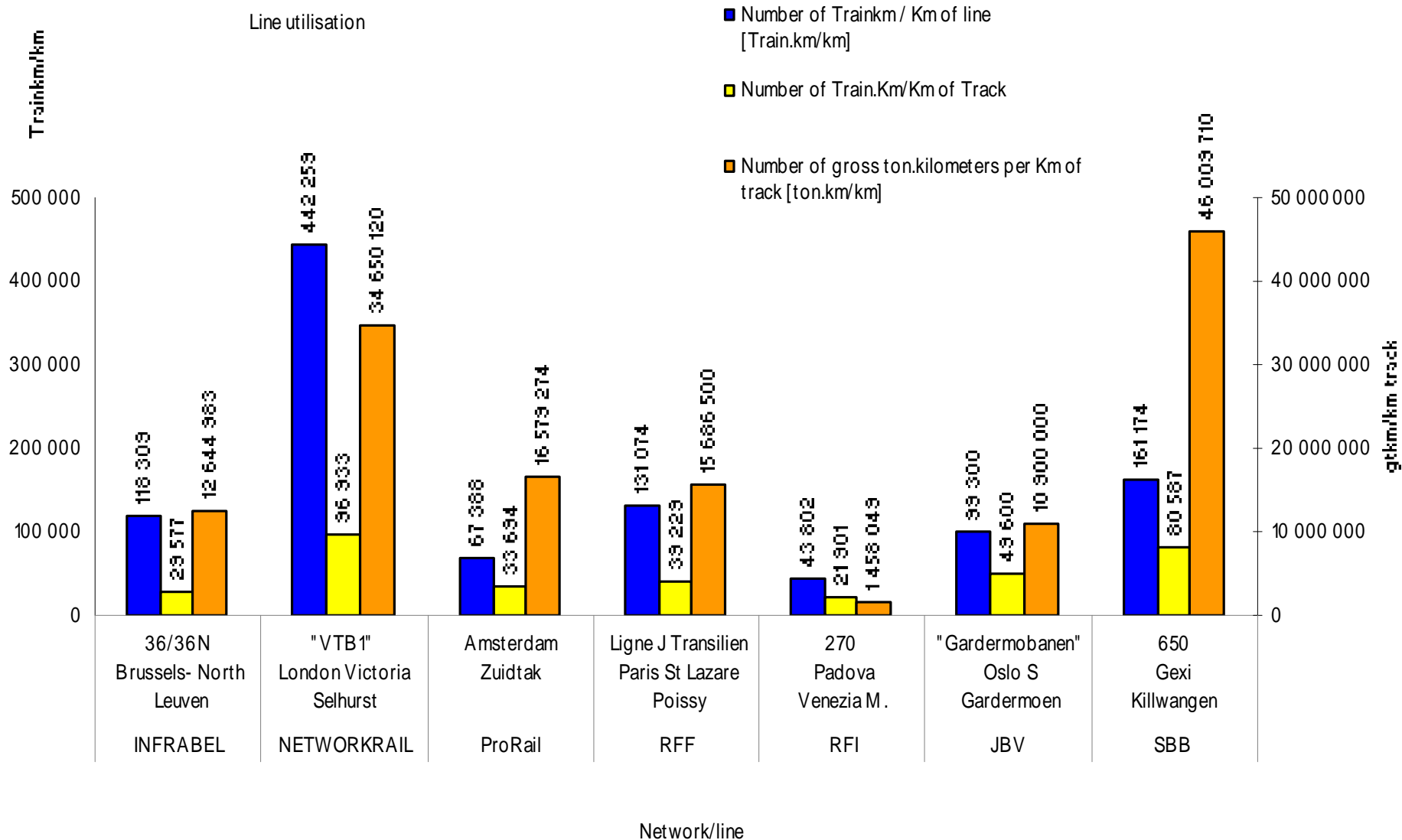
- Length of tracks / Line km
- Number of switches / Line km
- Number of passenger station / Line km



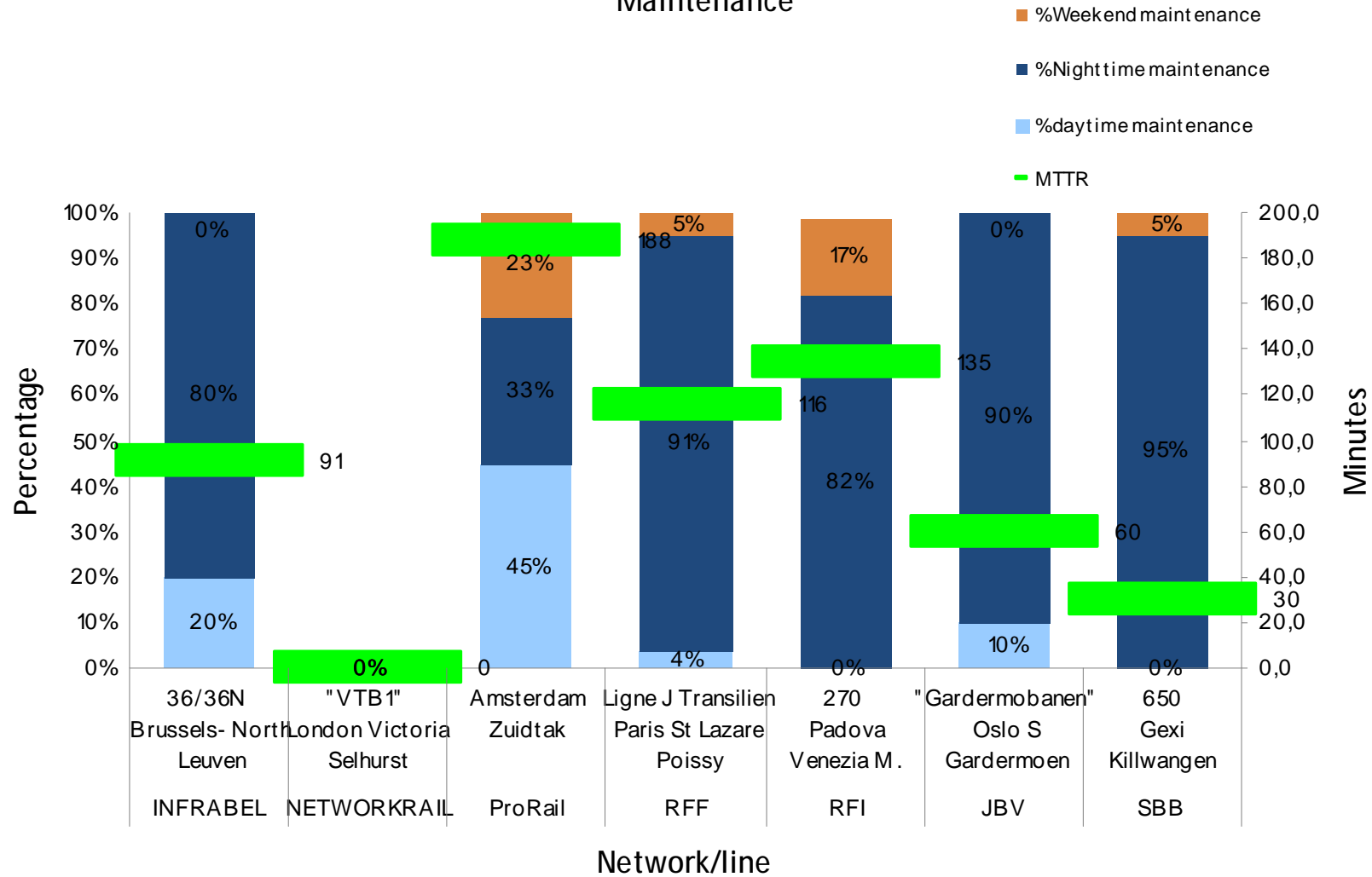
Age of track

- Weighed average age of the rails
- Weighed average age of the sleepers

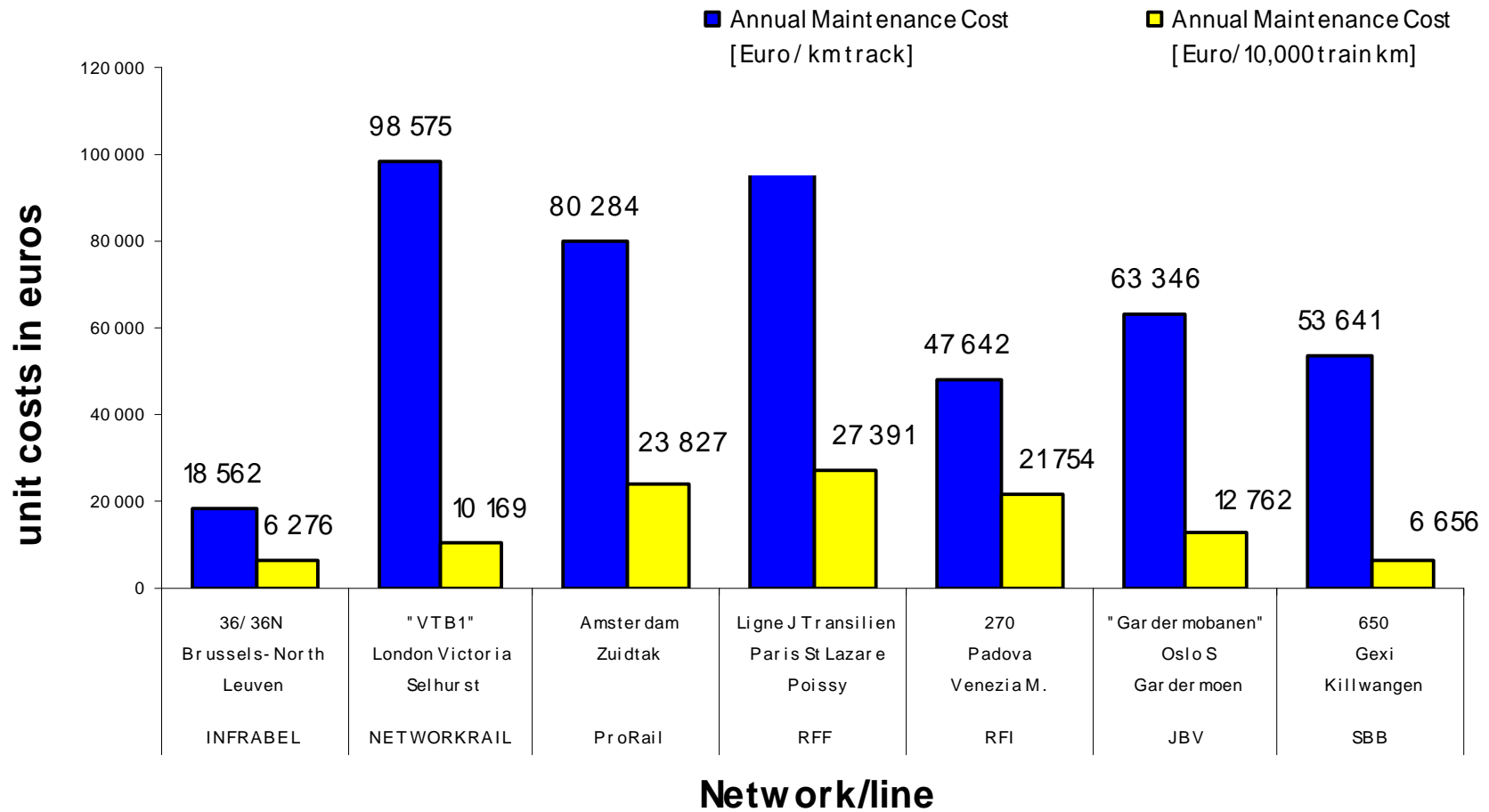




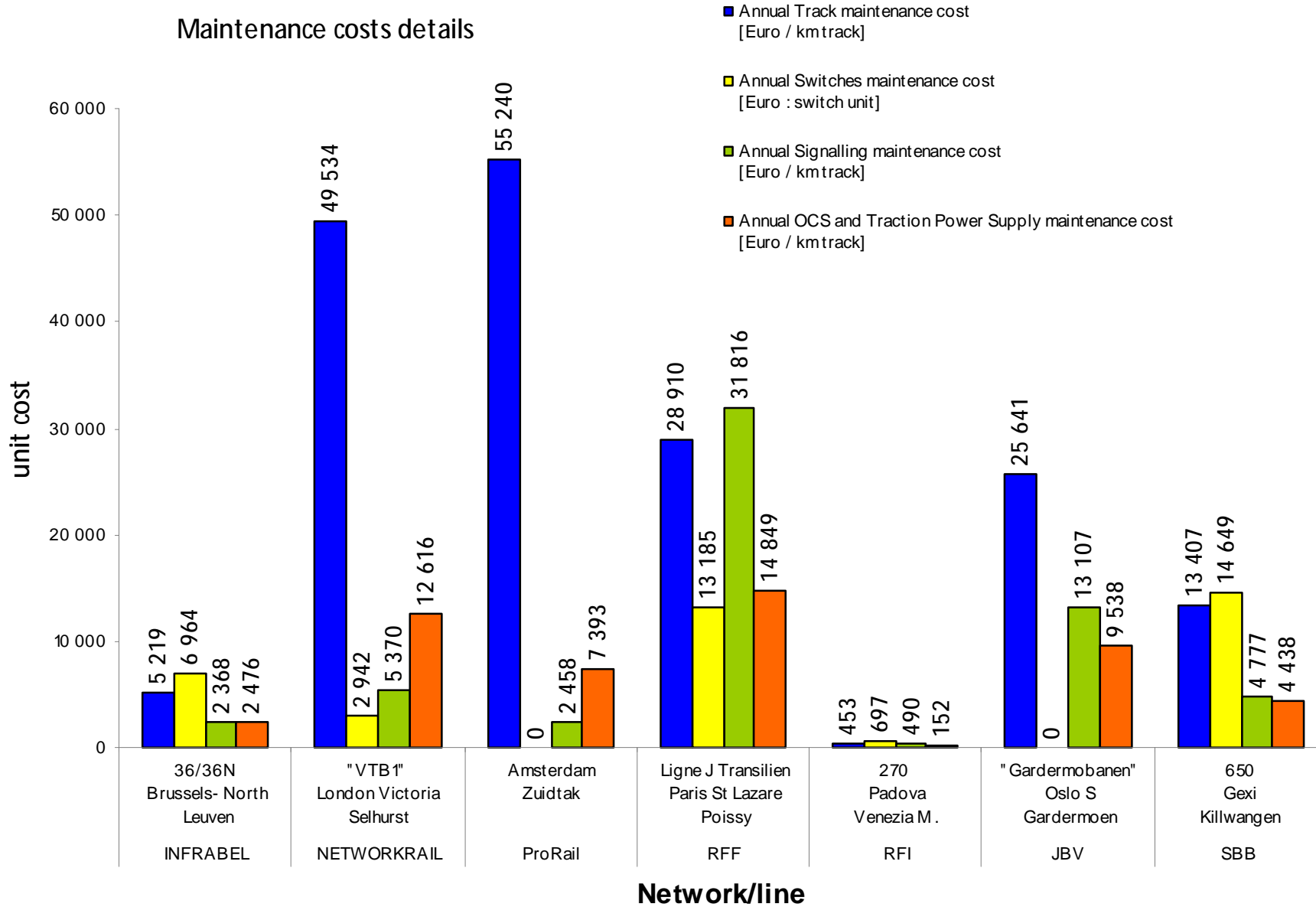
Maintenance



Maintenance costs



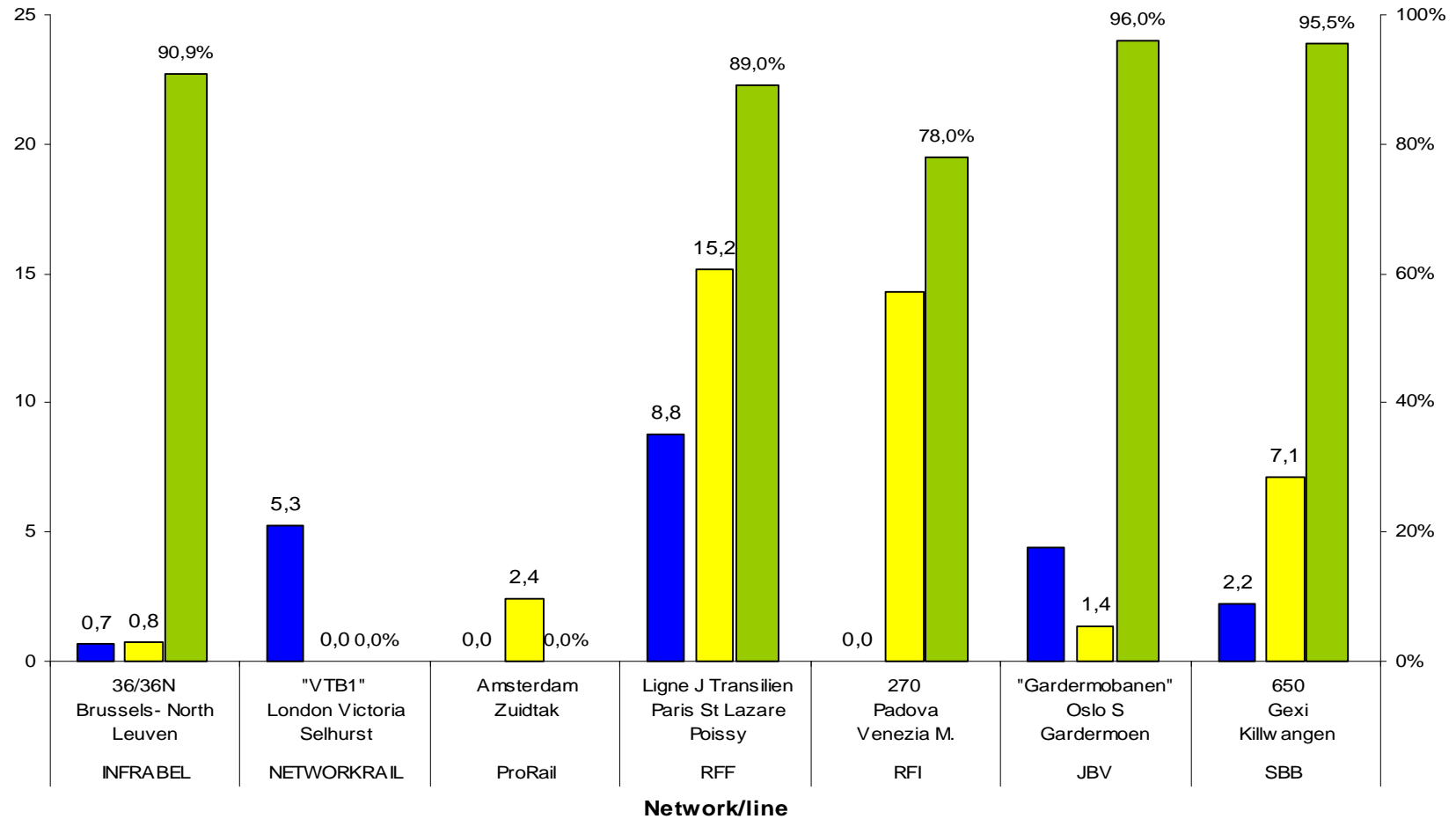
Maintenance costs details



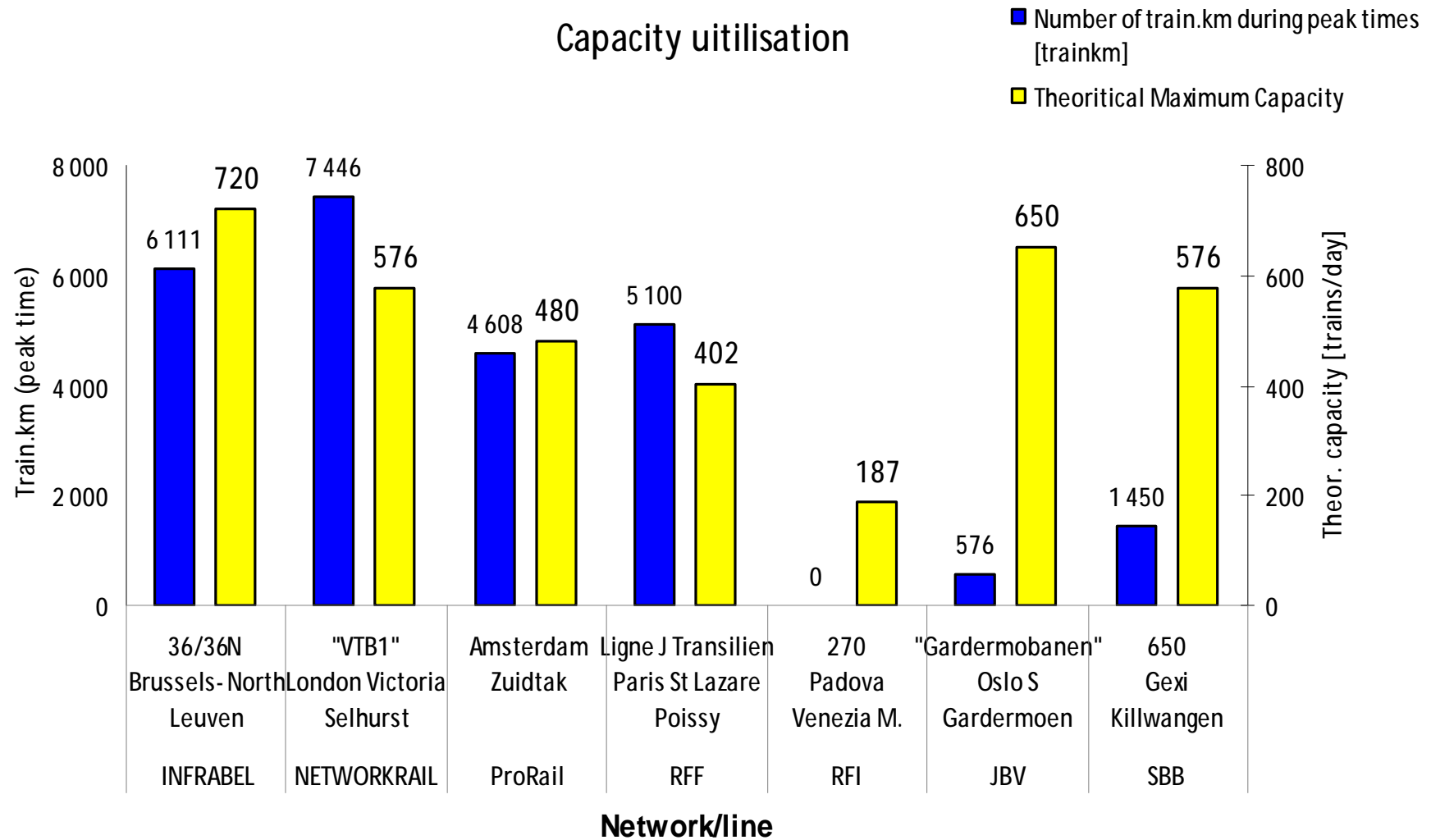
Regularity - Incidents

■ Number of minutes of train delay caused by infrastructure failures
[minutes lost per 10³ trainkm]

■ Number of Infrastructure failure per year per km line



Capacity utilisation



A	Organization recently in place, with top-down approach, AM framework to form the approach	Policies, Route Asset plan, decision tools, all organized at high level, used at operational level. New approach, so still fresh.
B	Infrastructure Department responsible for AM. 10 Local Track Chiefs are responsible at local level, all reporting directly to Infra Director.	AM approach coordinated between 10 local areas.
C	Director of Infrastructure Division reports to CEO. New organization since January: Asset & Technology, responsible to implement AM framework.	AM strategy under development within the new organization.
D	Two directorates: Access to the Network (account management to operators, makes functional specifications) and Infrastructure (all other aspects, including AM Strategy)	Implementation at local level of the Route Delivery Plans. No AM department working on all levels and across the organization.
F	CEO AM is responsible, 4 regions. Contractors work for Company D. Separate departments for small and large scale maintenance (incl. renewal)	
G	Railway A defines renewal policies. Above all maintenance contracts is a 4-year high level contract between Railway A and the former national company.	Old national company CSC Customer Service Contract does Maintenance Engineering for the whole network. DPI in charge of the Maintenance Operations, under a contract from CSC.
H	Infrastructure managed in two departments: Production (Top-down approach like AM Framework) and Investment (improve and update lines)	16 Regional directions carry out Production/Maintenance. Regional directors report to Production Director, who reports to CEO. All processes and tools described in procedures.
I	Conventional and High Speed Network executive directors have highest responsibility for Asset Management (maintenance and renewal).	New Asset Management Model Software implemented in March, to be tested during next year.

1.1 Management and Asset Management

Conclusions

Many IM's are working to introduce new AM organizations

Some are organized on regional basis, some use line, route based strategy.
Sometimes the organization is differentiated based on type of work (small scale, large scale, ...)

It would be good to:

- See organization charts of all countries, going from ownership to execution of the work
- Map this chart on the AM Framework
- Understand how responsibility, tasks are being translated/formulated downwards in the organization.

Distinction between different types of work complicates implementing optimal AM framework: Investment/new lines ; Renewal ; Refurbishment ; Maintenance. There is often a different way of accounting , allocating these costs.
Making the distinction between investment and maintenance is often the cause of too high cost of maintenance. This brings back the discussion on the chosen scope of AM: renewal and maintenance only, not new lines.

Inspection Regime

High Density and regional lines:

1. Frequencies roughly similar, except NR: high frequencies
2. Aspiration for remote surveillance
3. Video inspection / image recognition now being tried
4. Inspection intervals do not depend on Line Category
5. Line category definitions all national, even if derived from UC 714

Intervention Criteria

High Density and Regional:

1. Renewal/maintenance distinction defined differently, no standard exists
2. Politics decide how budgets are allocated to renewal
3. Urge to know how renewal determines maintenance needs
4. Need for modeling, for
 - Deterioration,
 - The effect of maintenance on remaining life
 - Optimization of maintenance and renewal

Budgets for I / M / R

Difficult to compare, not yet normalized

Asset strategy changes

Regional (and HD)

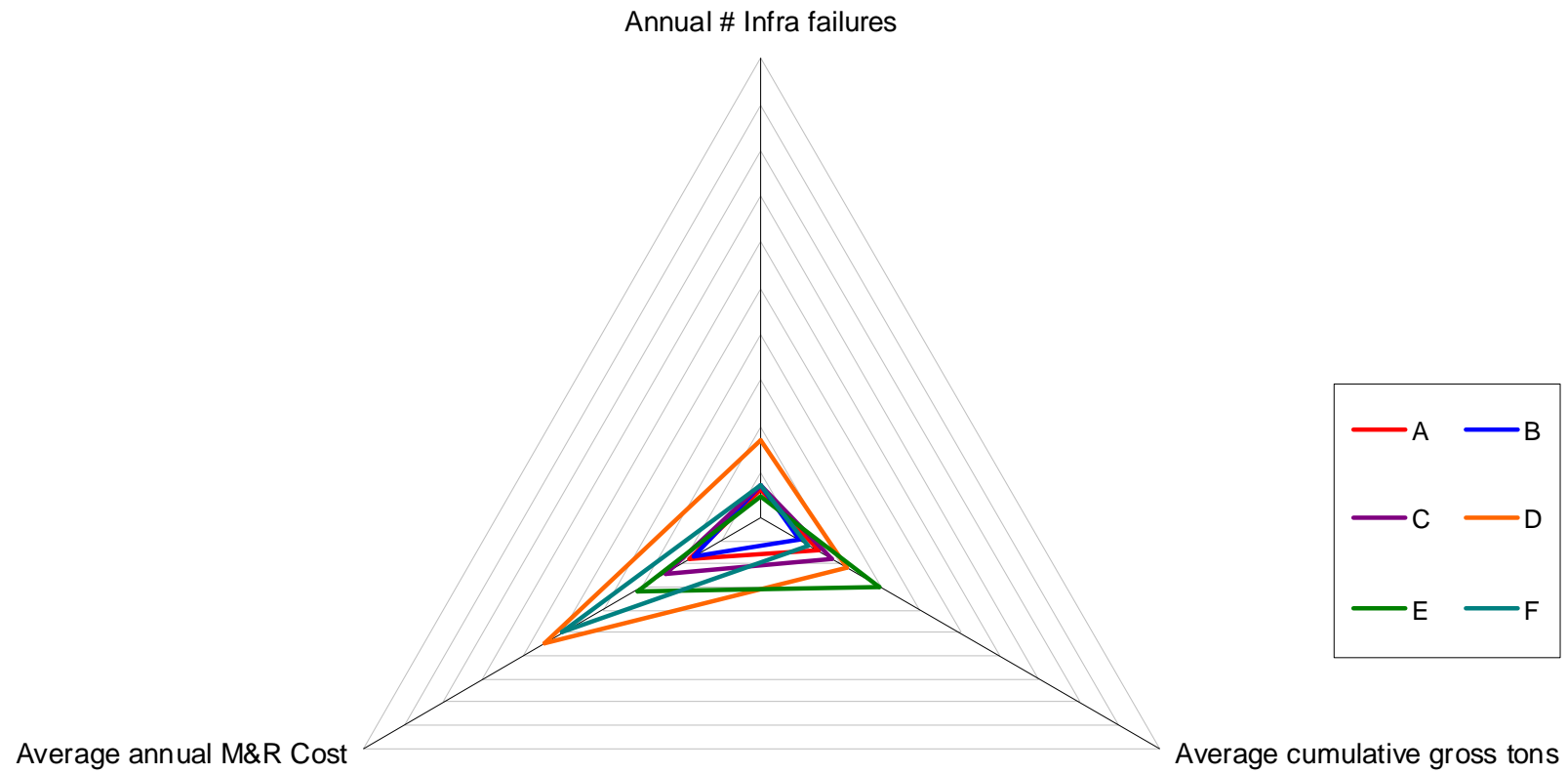
1. Trend: Integrating the components of the AM Framework
2. Trend: further implementation of condition based maintenance
3. Trend: differentiated approaches for :
 - Desired condition
 - Intervention levels
 - Maintenance and renewal strategies

Comparison along 3 axes

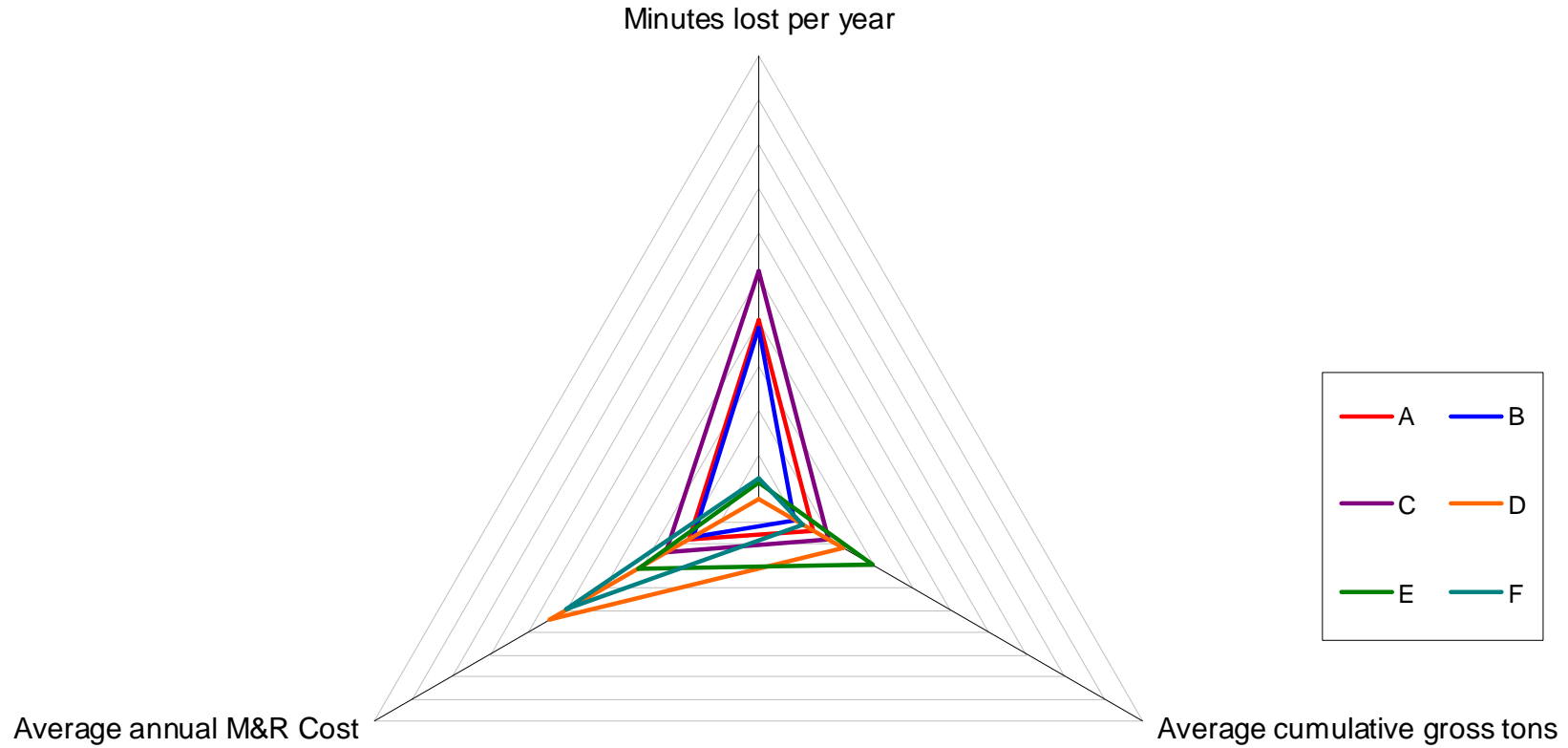
	Cost factor	Usage factor	Performance factor
	Average annual M+R / track km	Average cumulative gross tons	Delay minutes / train km
	Average annual M / track km	Annual train km / track km	Number of failures / track km
		Annual tons km / track km	Comfort
		Cumulative EGTPA (using speed and axle load following UIC714)	Availability (both planned and unplanned)
			Train path realization
Approximation	Use depreciation as indicator for renewal	age x tonnage	

* EGPTA- Expected Gross Traffic Planned Annually

Regional Lines



Regional Lines

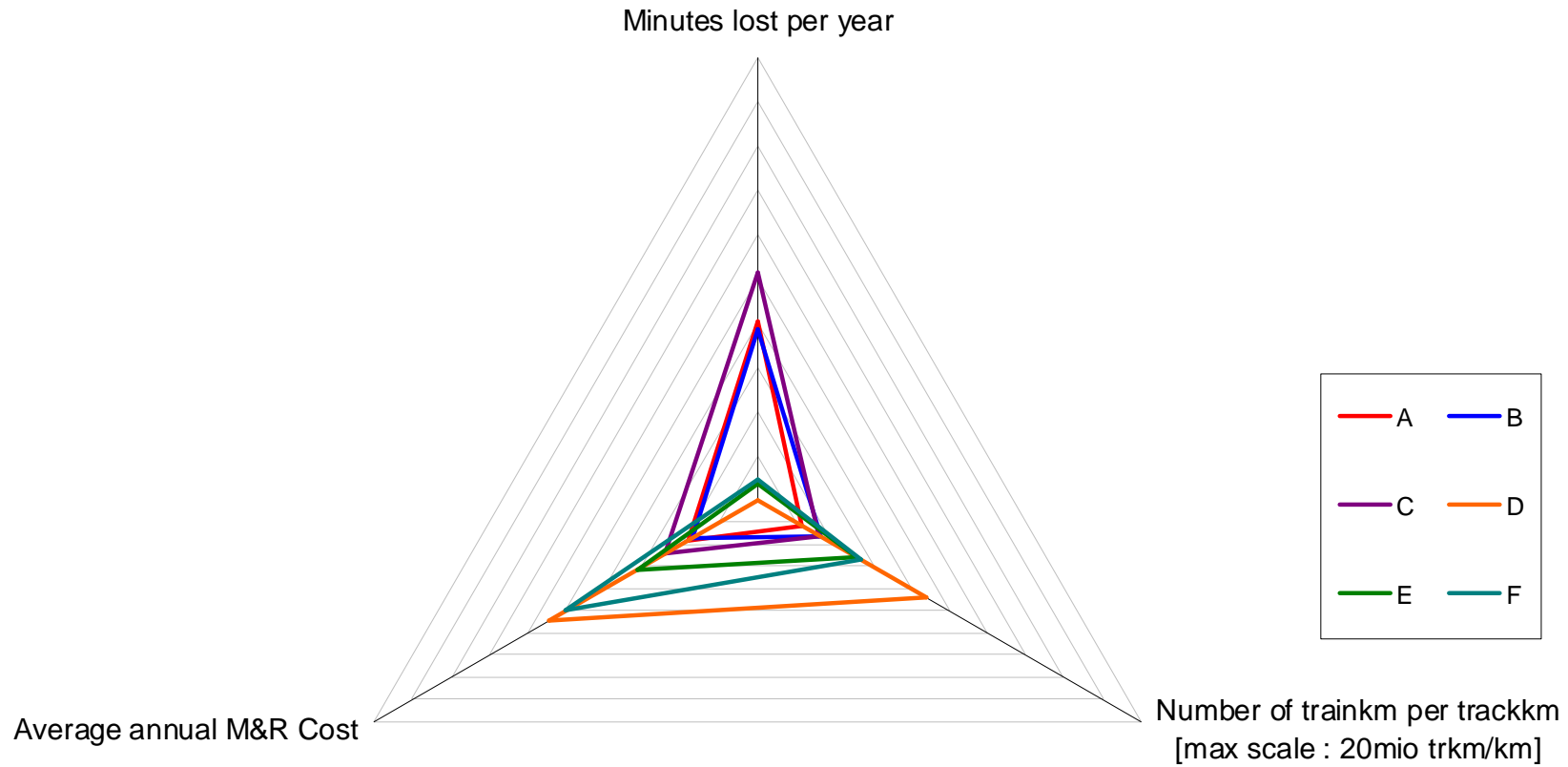


Maintenance cost / Cumul gross tons / a. minutes lost – b. failures

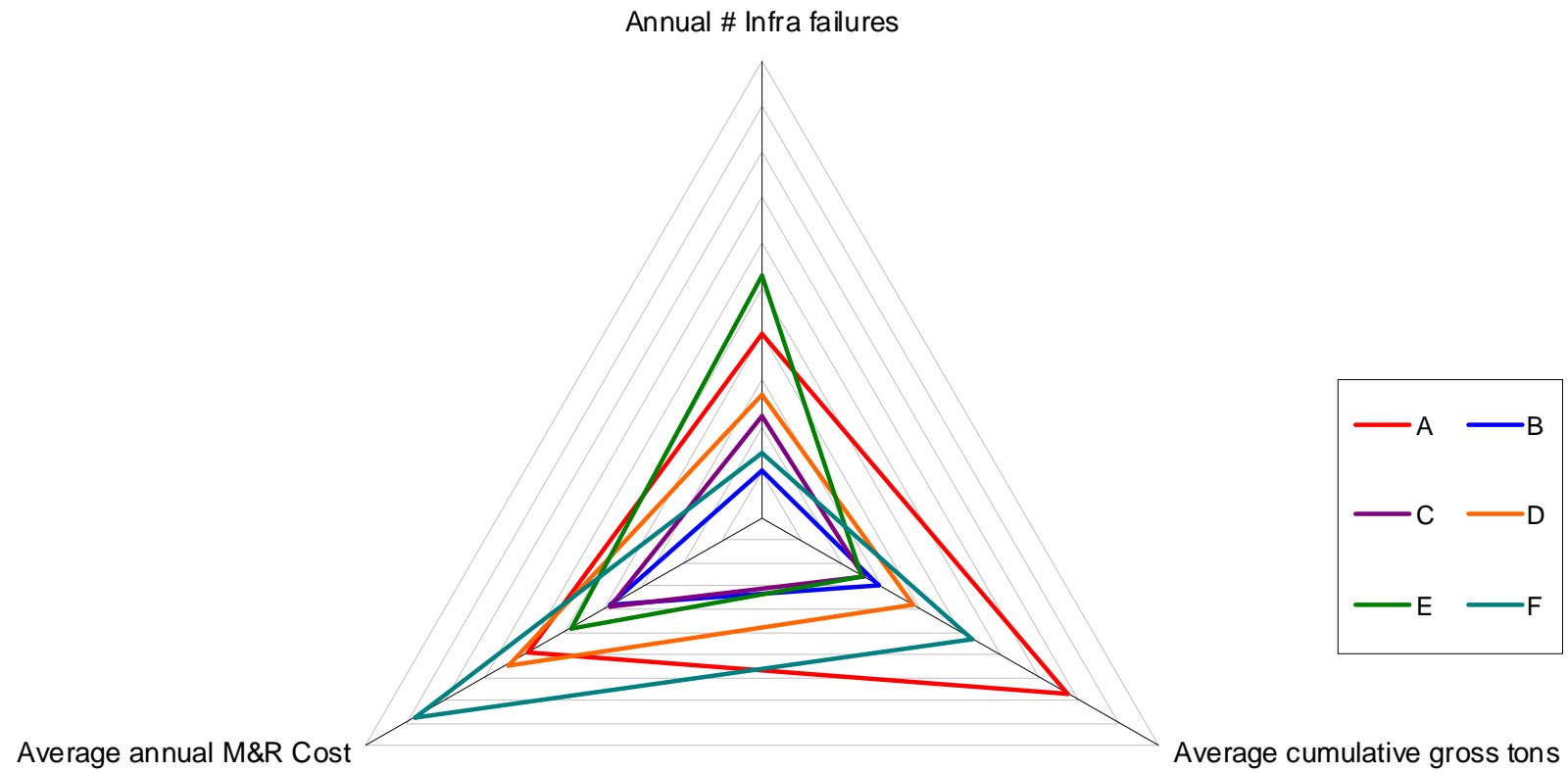
Regional Lines



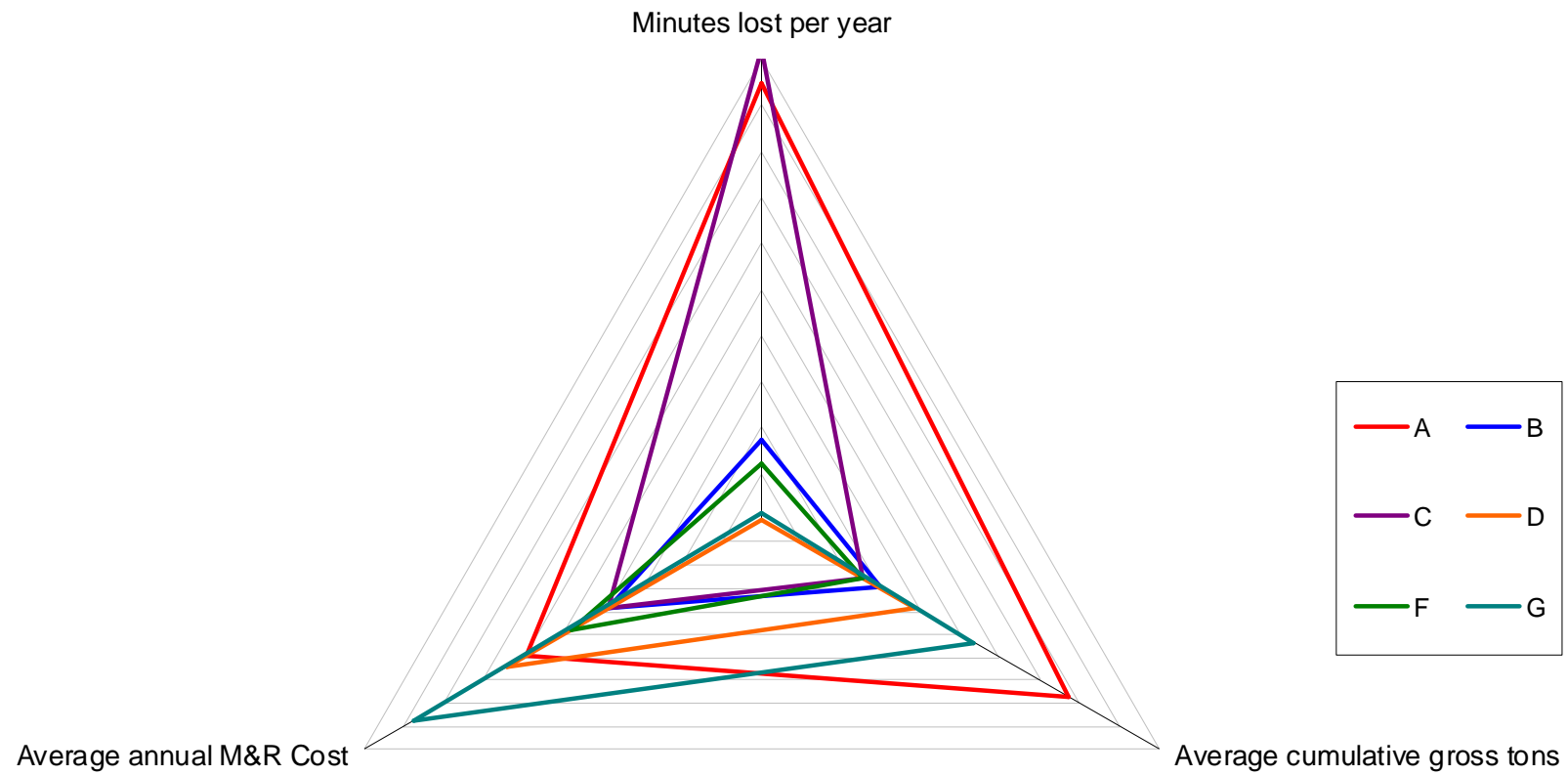
Regional Lines



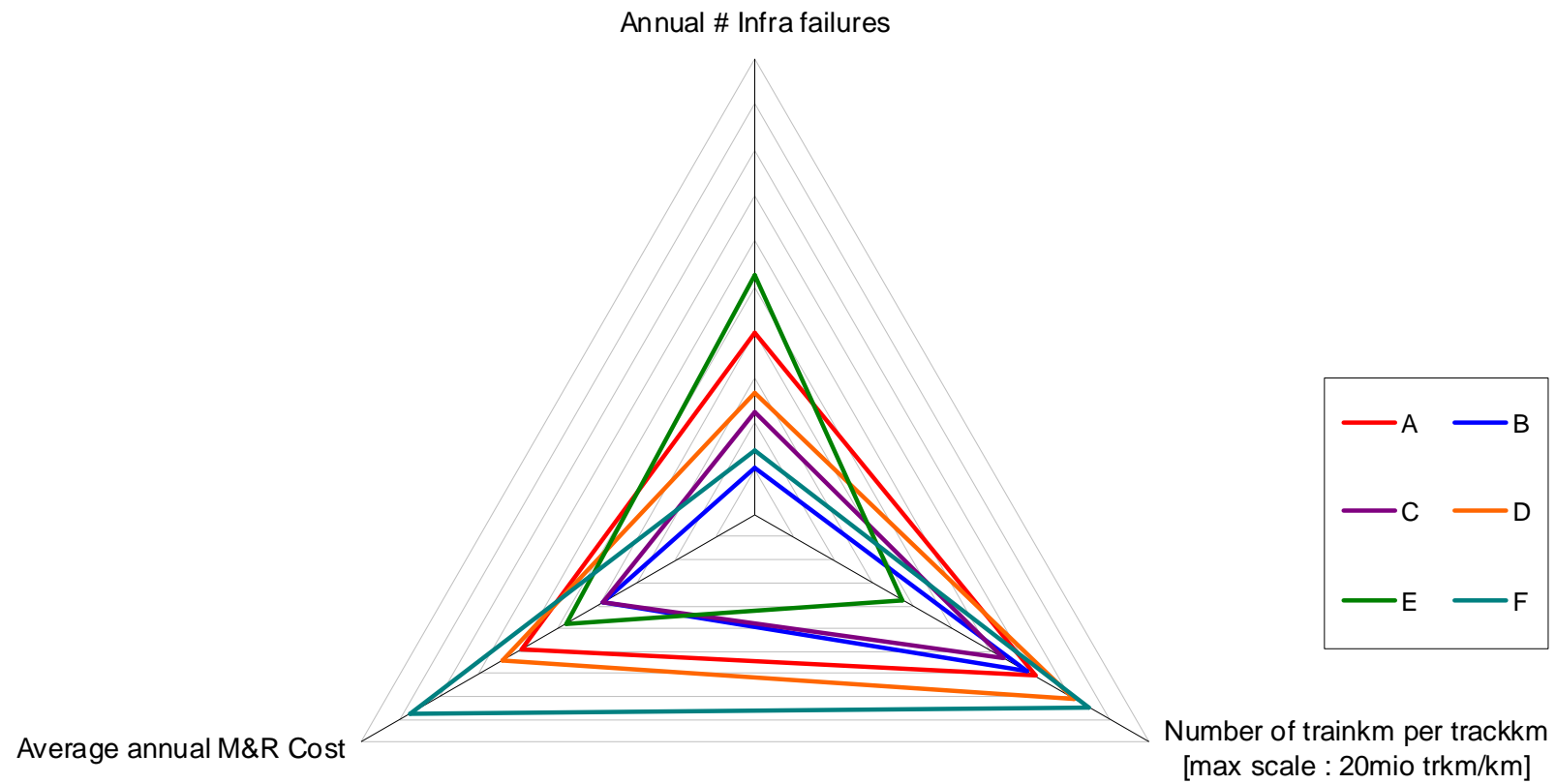
HDL



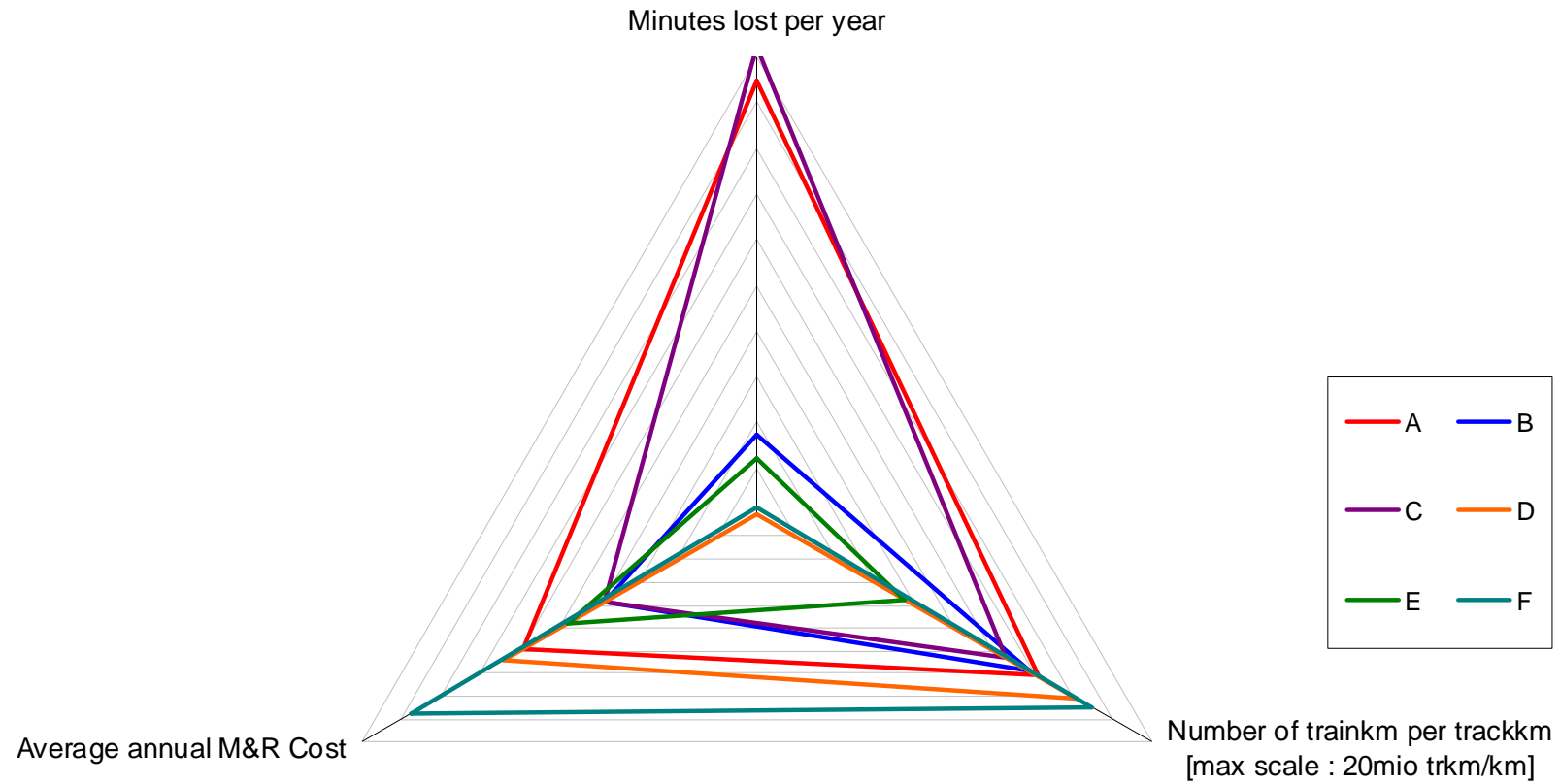
HDL



HDL



HDL



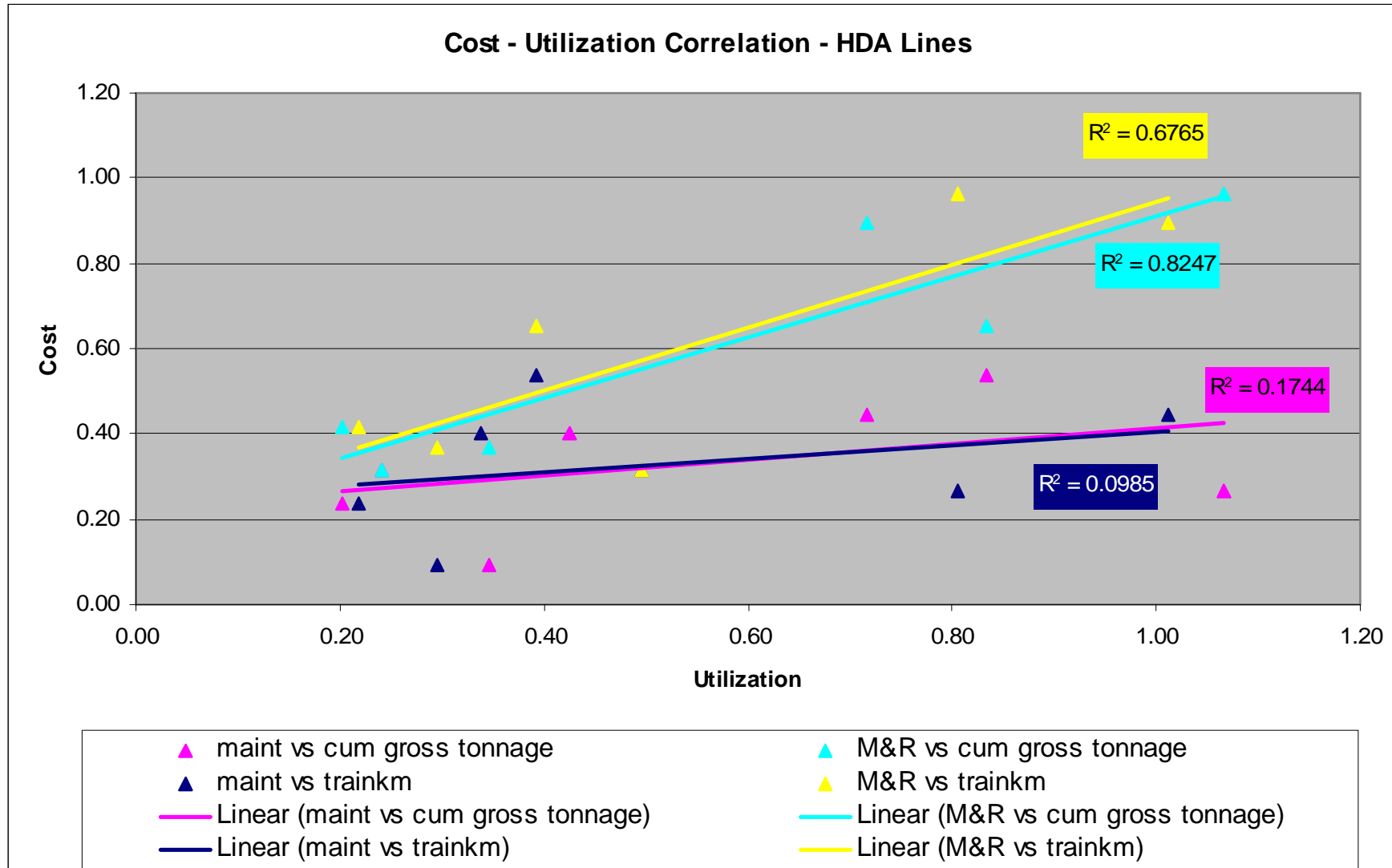
Comparison along 3 axes

Conclusions

Increased understanding in the following areas:

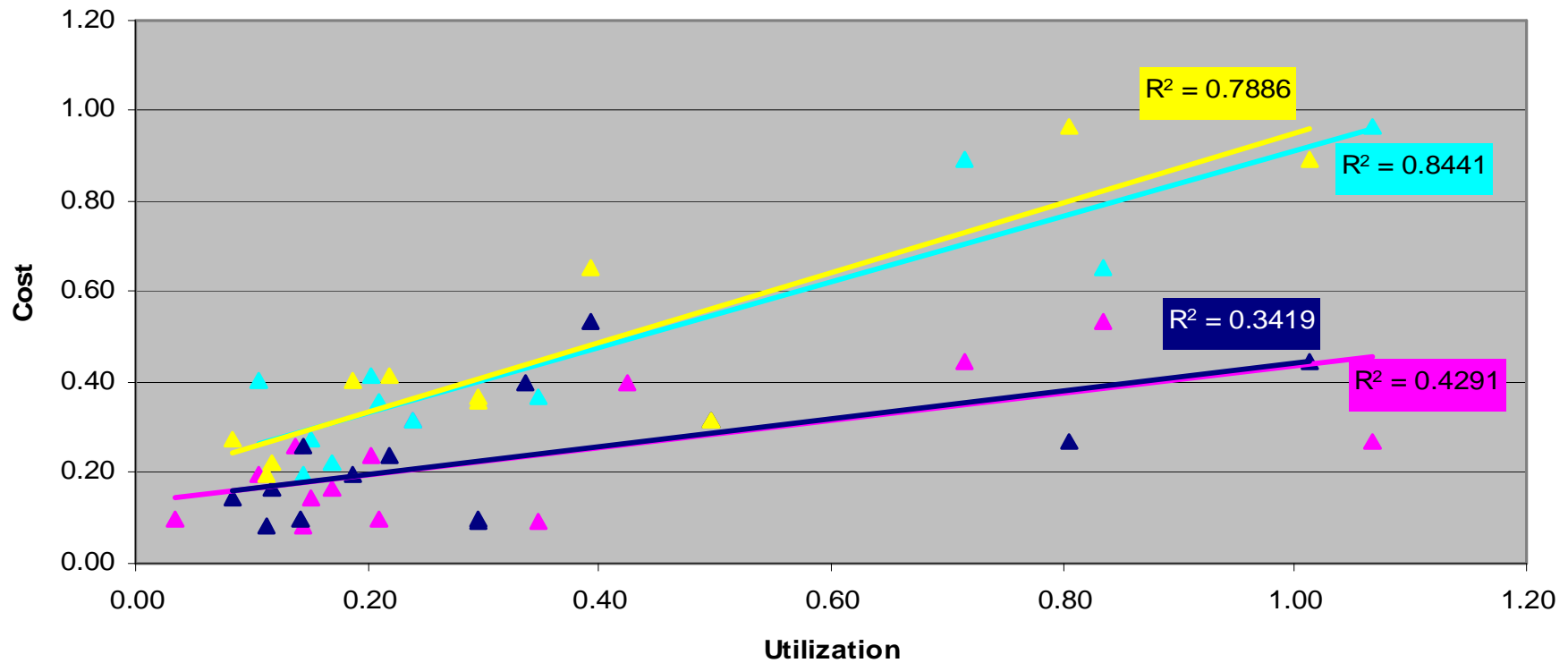
- Insight in how to compare characteristics of lines
- For HD: higher output leads to worse performance
- For Regional line: characteristics of these lines seem to allow optimization: output can be increased without increasing maintenance cost, and without decreasing performance
- For HD and regional lines : higher output lead to higher costs
- Indication that different approaches result in different performance, so reason for wanting to understand better, evaluate how it could work for me

Comparison along 3 axes



Comparison along 3 axes

Cost - Utilization Correlation - HDA+Regional Lines



- ▲ maint vs cum gross tonnage
- ▲ M&R vs cum gross tonnage
- ▲ maint vs trainkm
- ▲ M&R vs trainkm
- Linear (maint vs cum gross tonnage)
- Linear (M&R vs cum gross tonnage)
- Linear (maint vs trainkm)
- Linear (M&R vs trainkm)

Conclusions High Density lines comparison

General conclusions

1. Differences are interesting, useful suggestions for new ideas to explore
2. Utilization figures are quite consistent, especially when normalized for track length km
 - inspection regimes & frequencies, vs. maintenance & renewal expenditures,
 - failures and delays as a function of traffic volume
3. HD Lines turn out to be well chosen in terms of their function, importance and size in the network.
4. Similar aspirations for improvement, but all feel they are still about to begin. The comparisons will help feed that process. Benchmarking allow each participant to 'experiment' with new ideas.

Conclusions Regional lines comparison

Trends

1. Further integrating condition based maintenance
2. Differentiated approaches (for desired condition, intervention levels, maintenance and renewal strategies) for different categories.
3. Integrating the components of the asset management framework.
4. Systems approach rather than component approach.
5. The political importance of regional lines has gone up in the last years, e.g. driven by environmental and congestion ambitions and regional disclosure initiatives.

General conclusions

1. Similarities and differences are both interesting, and there is a lot to learn.
2. Qualitatively, this has already brought a good comparison between the lines and countries.
3. Using the comparison as a mirror to evaluate your own performance and cost is a useful experience.
4. The regional lines chosen are not as homogeneous as the HD lines, “regional” is a wider term
5. Cost, performance and safety: safety levels can be regarded as a precondition.
6. It would be interesting to compare HD and R for some items, e.g. maintenance cost per train km seems close to 2 €/ train km for both.

■ ■ ■ Thank you for your kind attention

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