C4R

Capacity for Rail

Capacity4Rail SP3 Sweden

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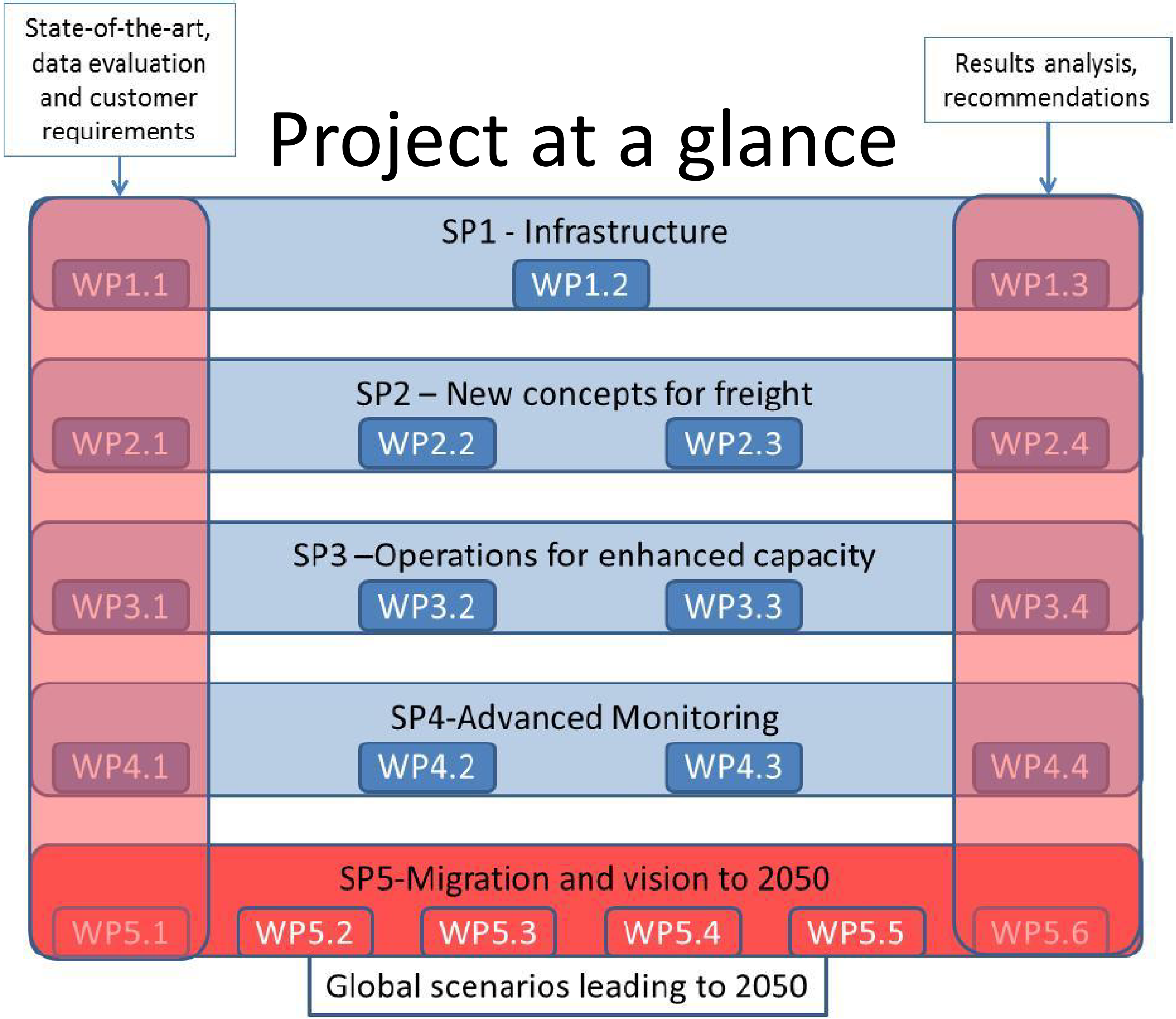
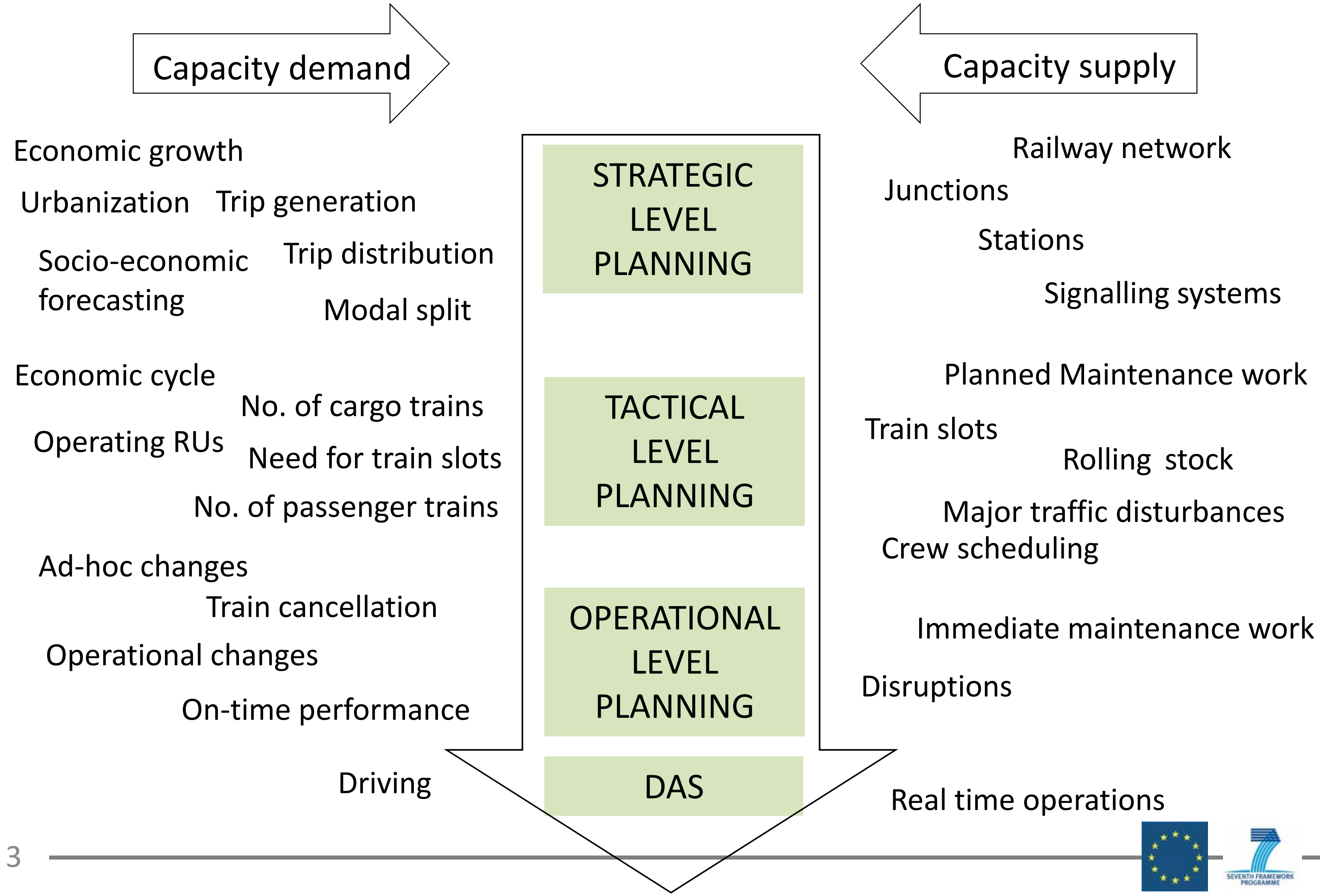
SEVENTH FRAMEWORK PROGRAMME

Project at a glance



Modelling railway capacity



GAP analysis Strategic aspects

- Harmonize the systems used for timetable planning and traffic simulation (European perspective).
- Small number of commercial systems are dominating, in-house developed systems decrease.
- Infrastructure Managers (IMs), Rail Undertakers (RUs) and System Suppliers need to co-operate about developments, methods and measures to improve processes.
- Lack of unified understanding of capacity definitions.

GAP analysis Tactical aspects 1 (2)

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Integration and collaboration between IM and RU

- Better information about on-time performance, train paths, maintenance in timetable process
- Flexibility in the ad-hoc process and major disturbances
- Optimisation methods for how to use residual capacity (saturation problem)

Timetable optimization and on-time performance

- Rules and methods for prioritizing trains in planning and in operation
- Objective is to maximise customer satisfaction
- Knowledge and methods for sufficient on-time performance, robustness and time for maintenance work
- Unified criteria for timetable assessment and evaluation

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GAP analysis Tactical aspects 2 (2)

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Need of better tools for timetable planning :

- Existing tools without decision support and optimisation functions.
- Microscopic level tools to check conflict free timetables.
- Stochastic simulation of disturbances to ensure robustness and resilience.
- Tools to evaluate and analyse the on-time performance and to how the railway system adapts after a disturbance.
- Tools for handling and utilizing flexibility in the timetable, for example with regard to cancelled departures.
- There is a lack of commonly accessible data standards.

GAP analysis Operational aspects 1 (2)

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Models for operational capacity typically deal with re-scheduling of trains, and possibly also other resources (crew and rolling stock).
They often rely on models for estimating delays, which is complicated in large-scale networks. Data collection is an important issue for this.

- Models for perturbation management often act on defined regions of limited size (e.g. a station area, a single line etc.).
- Data models and data exchange processes for the consideration of RU information in the traffic management need to be further developed.

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GAP analysis Operational aspects 2 (2)

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- Rules and objective functions for optimisation processes need to be further examined and harmonized with track access charging systems and delay penalties between railway undertakings and infrastructure managers.
- Data on real-time occupation of passenger trains should be used for dispatching decisions, especially when dealing with situations of heavy disruptions (large events).
- The migration strategy for optimisation of operation needs to be carefully defined.
- Models for short-term forecasts are important and are still not in use to the extent it could.
- Most models for conflict detection and resolution act are based on fixed –block signalling.

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GAP analysis Driving Advisory Systems (DAS)

- Several mature DAS are today available on the market or in a prototype stage.
- Real-time connection to the train control to make the DAS have an important impact on the capacity utilization.
- Systems both optimize the energy and support the traffic flow.
- The challenge is to make connected DAS usable on more than specific lines; this includes both standardizing the communication and data formats.
- The ground systems (or train management system) should provide relevant traffic state data.
- A successful implementation relies on correct traffic forecasts; good short term prediction methods is a key component.

Conclusions research gaps

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1. Improve *processes* and *flexibility* in timetable planning.

2. Improve methods for *traffic simulation analysis* and *evaluation* of on-time performance from historical data.

3. Develop *standards* and *data management* for system simulation.

4. Develop *decision support methods* for timetable planning and operational traffic controlling.

5. Develop automatized operational information systems and *DAS*.

6. Ensure a sound research environment with *open source code* and *open data*.

Next step for the Swedish team

- Short term forecasting
  - Uncertainty
  - Optimality
- Robust timetabling
  - Mixed traffic environment
  - Varying on-time performance and delay costs
- Railsys simulation
  - Verification
- Empirical data
  - Scenario Swedish Southern Mainline, Stockholm – Malmö (–Copenhagen – … – Palermo)

→ capacity increase operation
→ capacity increase tactical planning

Contact information

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