

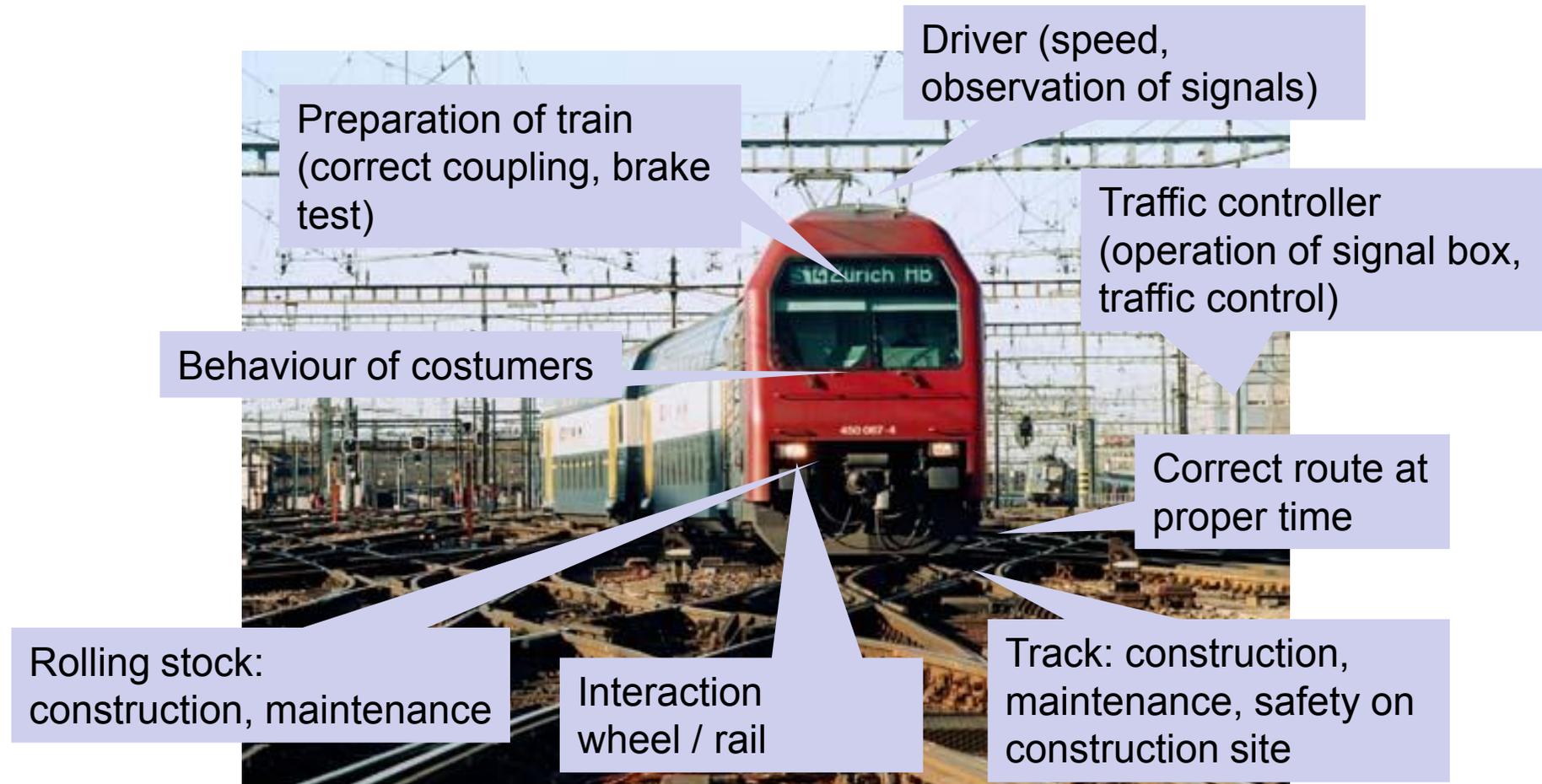
SASCON '12

**Safety Performance
Indicators in Railway
Transport**

Dr Jonathan Shaha
Swiss Federal Railways SBB
Central Safety Department
Bern

14 November 2012

Outline



- The railway system is complex (many interacting systems and subsystems)
- Safety performance indicators are used in all areas within the railway system where safety risks can arise

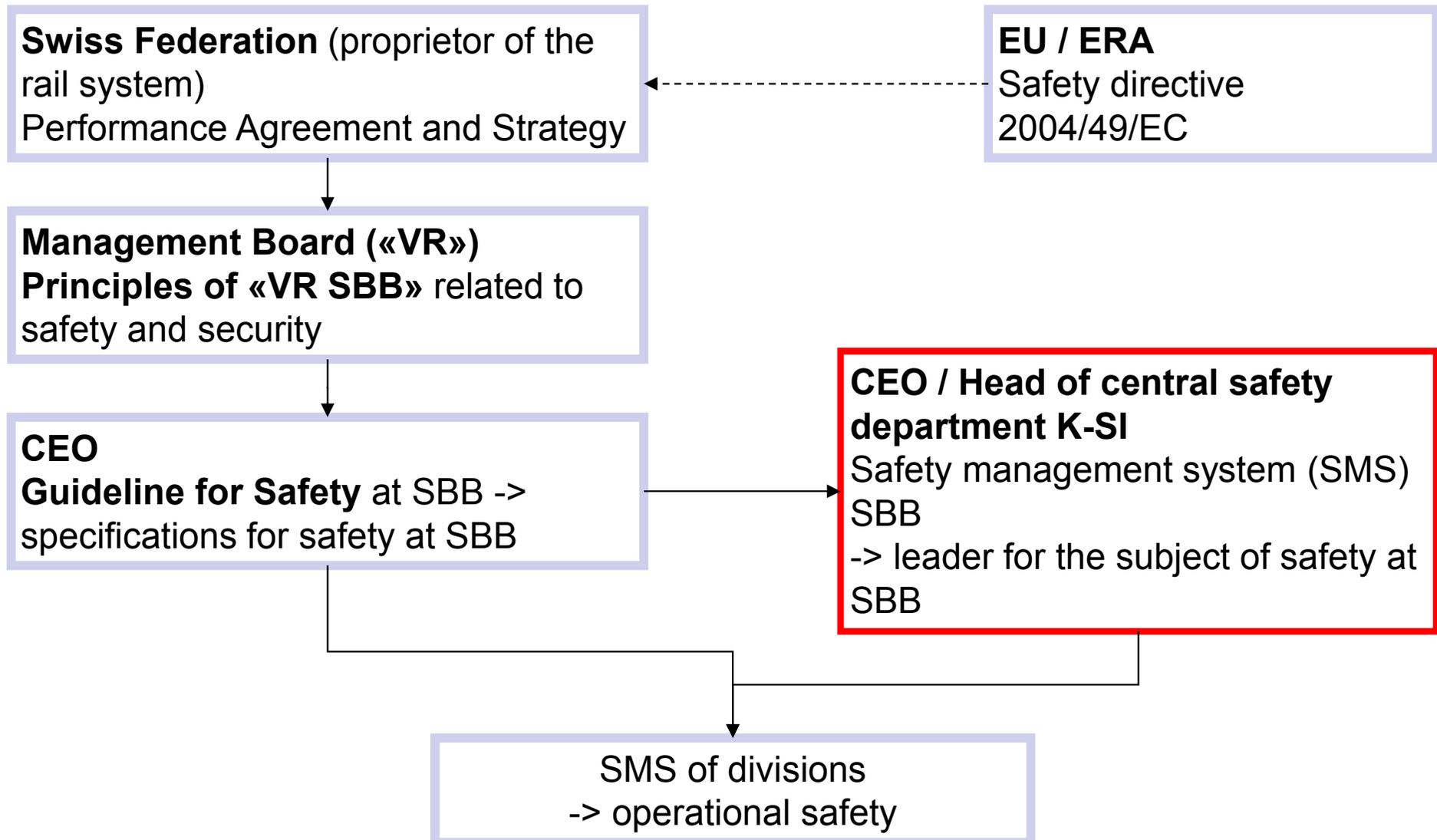
Objectives

This presentation aims at illustrating the meaning of safety performance indicators SPI in railway transport, specifically at SBB.

The detailed objectives are as follows:

- To provide an overview of the safety organisation implemented at SBB
- To present the role and relevance of SPI at SBB
- To present and discuss a selection of the most important SPI
- To show future development of SPI

Safety Organisation at SBB



Mandate of SBB's Central Safety Department

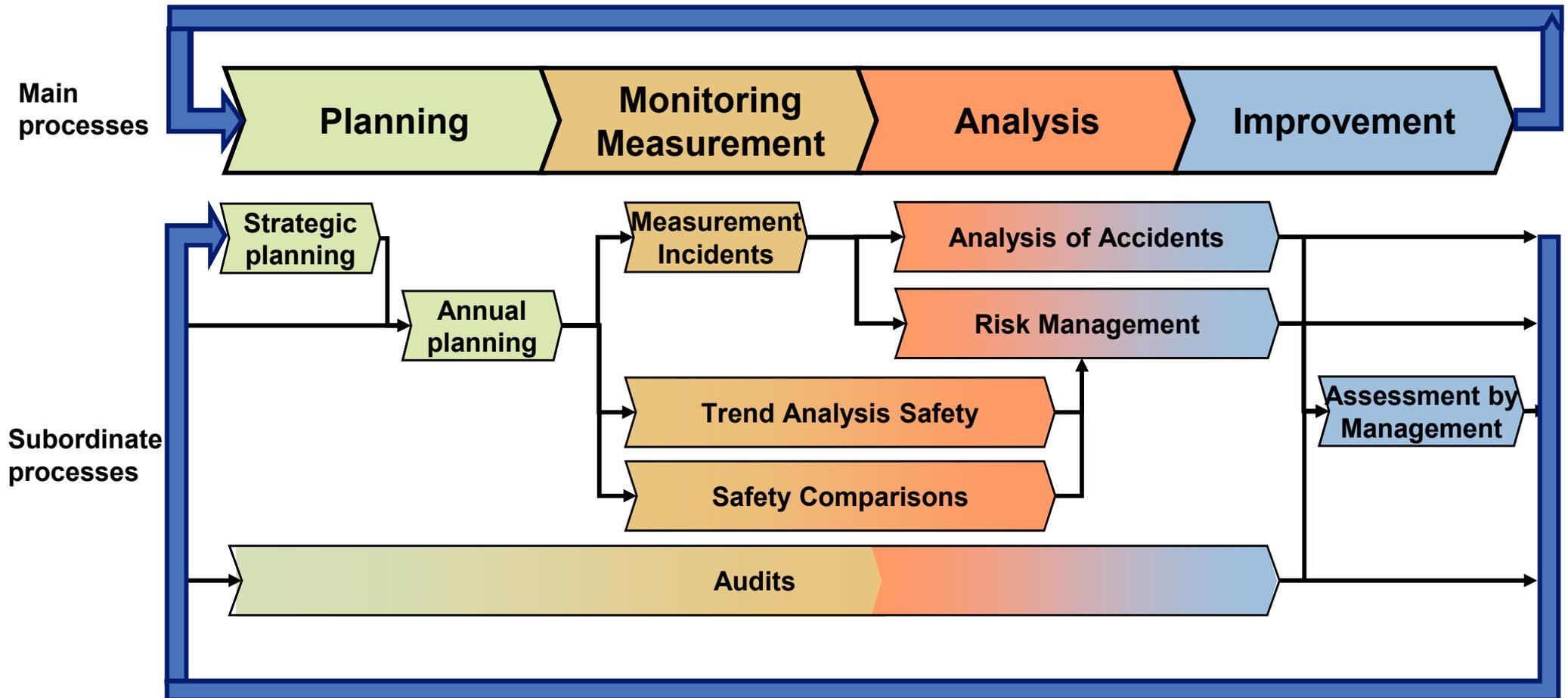
The central safety department contributes to the achievement of the strategic goals by ensuring

- That SBB operates a safety management system embracing the divisions.
- That the required safety level is efficiently maintained and continuously improved on the basis of cost-benefit analyses.
 - > leading role of K-SI for the relevant safety issues
- That, by means of supervising activities, the specifications from the SMS are fulfilled, the relevant safety processes and the safety performance are being checked.
- That maintenance and further development of a sustainable safety culture supporting the required safety level are ensured.
- That the publication of SBB-internal safety regulations embracing the different divisions is being co-ordinated within the company.

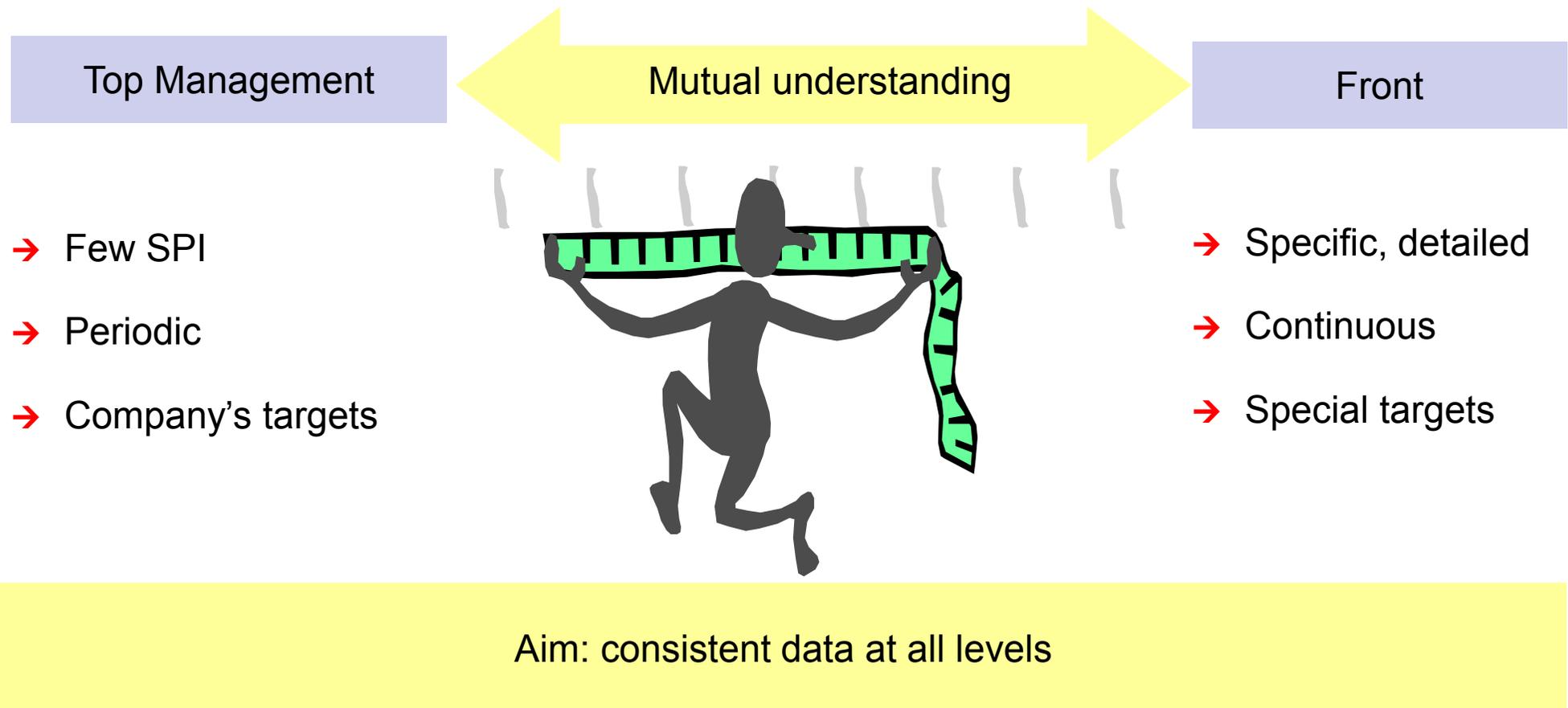
Safety

- Safety means the measures used to prevent the occurrence or mitigate the consequences of accidents (collisions, derailments, fires, release of dangerous goods, etc.) not caused by intention. The causes for such accidents can be weaknesses/deficiencies resulting from human action or technics.
- Safety does not deal with accidents caused by malicious intention (security).

Safety Management System



Principles for SPI



The variety of SPI

Accidents

Near accidents

Unsafe actions

Surroundings with direct influence

Surroundings with indirect influence

e.g.

- Accidents with trains or shunting movements
- Work accident

e.g.

- SPADs (signals passed at danger)
- Results from train control equipment
- Inspection of trains
- Damage of rails
- Maloperation of signal box
- Audit of trains with dangerous goods

Z.B.

- Safety culture (e.g. measurement DuPont)
- Age structure, stress of staff
- Safety training
- → Interpretation difficult, because there is often poor correlation in the data. As a consequence expert opinion is more important.

Reporting about SPI

FOT (Federal Office of Transport)

- Proprietor's targets for safety
- Safety in access to railway network

Top Management SBB

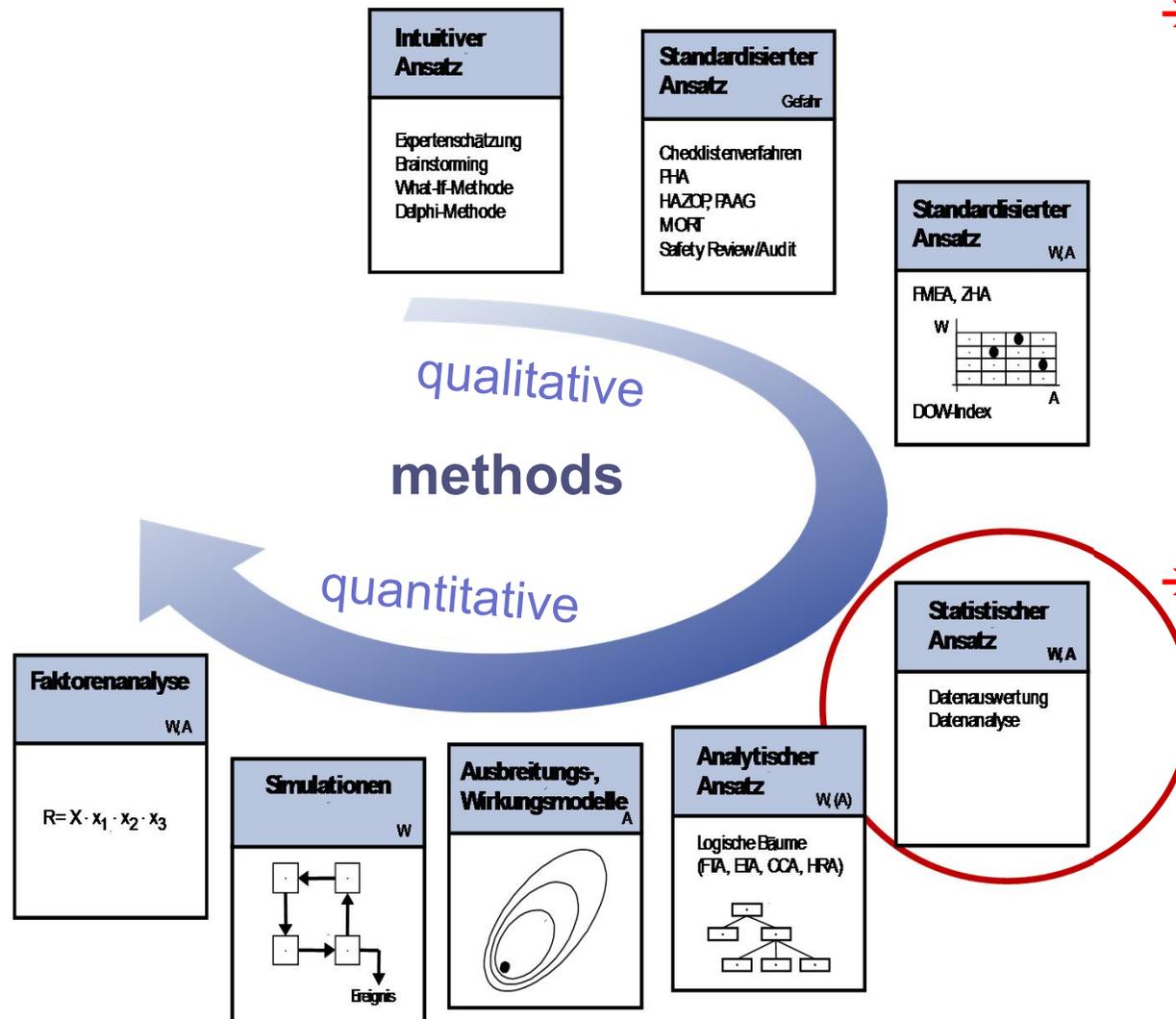
- Safety index SBB (work accidents, accidents with trains or shunting movements)
- Quarterly report on safety: parameters in the safety programme, affiliated companies, access to network

Divisions / Front Safety experts

- As above +
- Analysis in business divisions and subordinate units
- Unsafe actions
- Analysis of causes

- Selected SPI are reported along with other safety relevant data and findings towards different recipients

Input for risk estimation



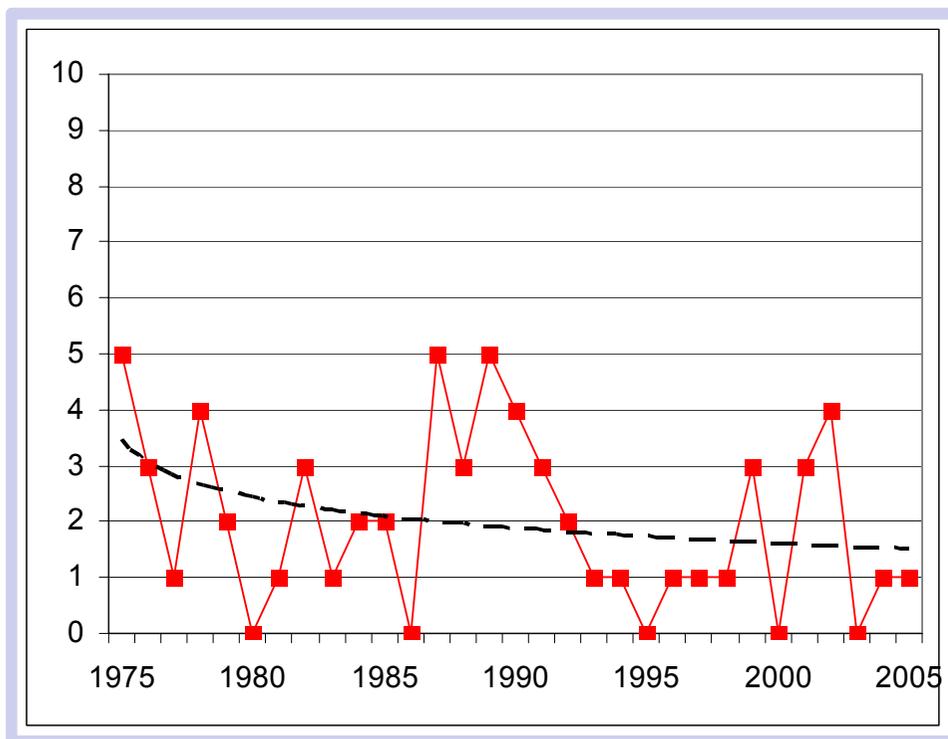
→ various methods

- Hazard identification
- Identify dominating hazards
- Estimate risks: frequency/probability, outcome

→ Tool safety database ESI

Risk estimation: frequency

Example:
Derailments of passenger trains per year



- Statistics of accidents as a relevant basis
- Note: risk analysis cannot be reduced to statistics
- Problem of small numbers
- Take into account trends and future development
- Correct interpretation of data

Example:

- Trend value 1975 bis 2005: 1.5 acc/y
- Trend value 2003 bis 2006: 0.5 acc/y

Risk estimation: damage

Types of damage

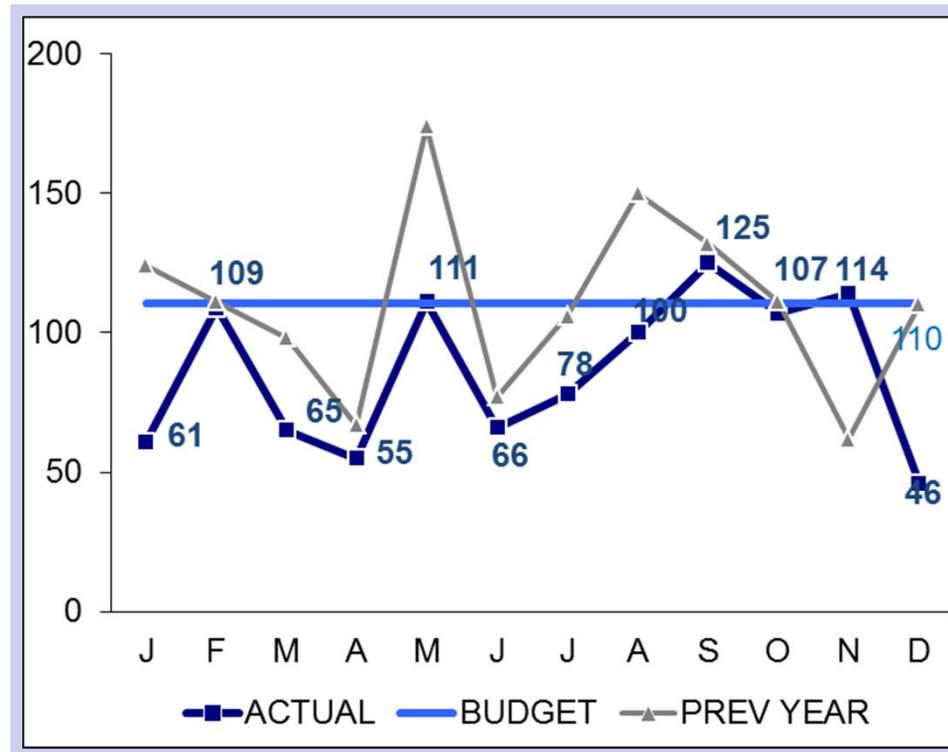
- Damage to persons: dead persons, injuries
- Damage to material / financial impact: in CHF
- Damage to environment: polluted water beneath surface, groundwater
- Operational breakdown: number of minutes delay, cancelled trains
- Damage to image: loss of income, ...
- ...

Estimate damage

- Similar to methods for determining frequency of accidents
 - Statistics
 - Analytical approaches
 - Estimate

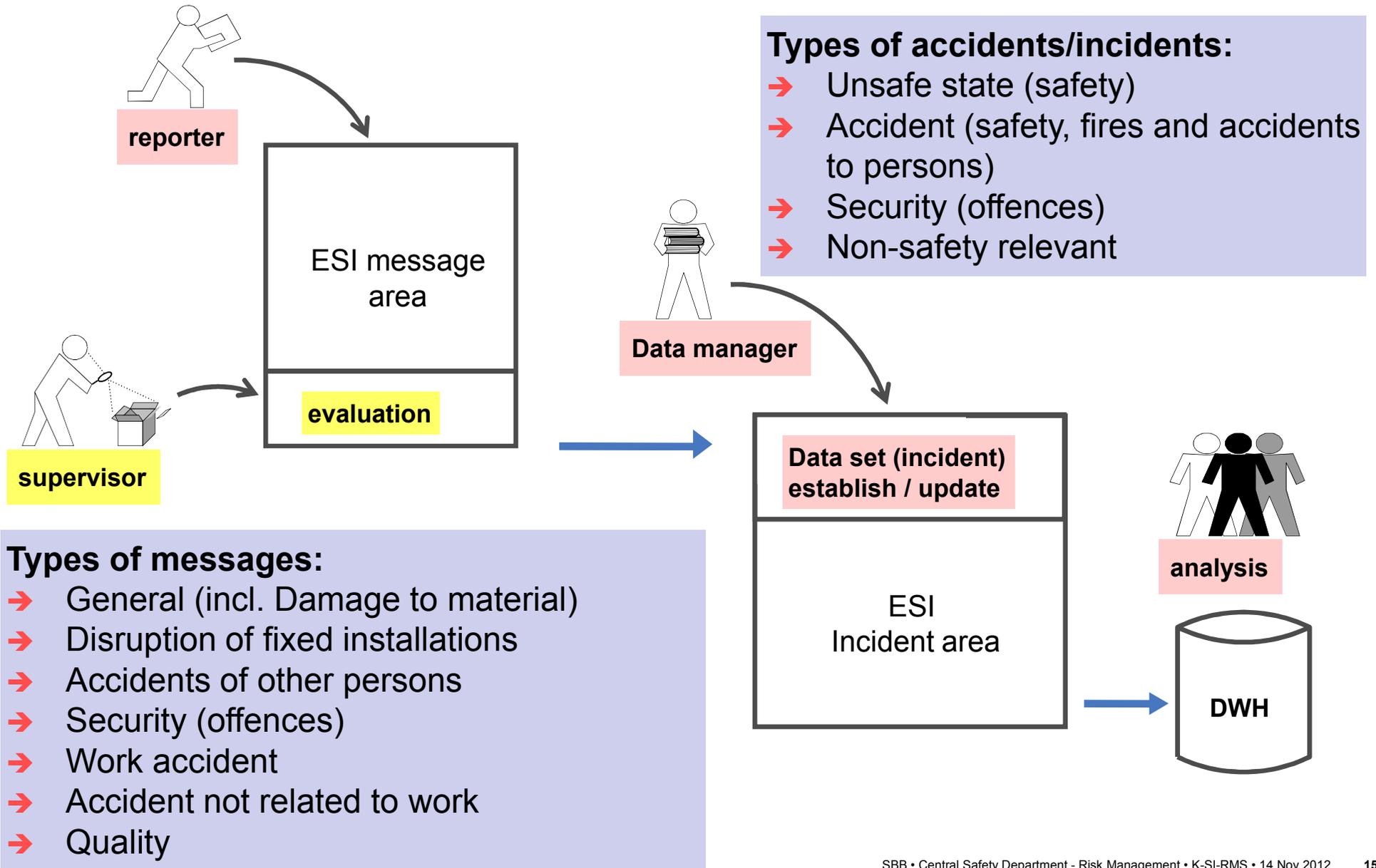
Example SPI:

Safety Index SBB (Sicherheitskennzahl Konzern)



- Monthly report
- Safety index SBB composed of derailments and collisions of trains and shunting movements, occupational accidents
- Focus: performance per single month and the running year

Source for SPI: Database for safety relevant information «ESI»



SPI in the European Context: the role of ERA

- The development of railway systems has long been (and still is) driven from a national perspective.
- In recent years there has been an intensive effort for harmonisation at an international level. In Europe the ERA (European Railway Agency) is mandated by the European Commission to regulate and supervise in this process.
- A set of SPI has been defined and implemented known as CSI (common safety indicators). Information on CSI has to be delivered by NSAs to ERA based on data from RU (railway undertakings) and IM (infrastructure managers) and comprises (excerpt from list of CSIs):
 - Total and relative (to train-kilometres) number of significant accidents of several types: collisions, derailments, etc.
 - Total and relative (to train-kilometres) number of persons (passengers, employees, etc) seriously injured and killed by type of accident.

Conclusions

- A large set of SPI are established at SBB (some required by the authorising body FOT). Nowadays it is state of the art to report such SPI as part of a safety management system.
- At an international (i.e. European) level, there is a shift towards internationally harmonised SPI (interoperability).
- SPI are a vital source of information about the safety performance in safety relevant areas (e.g. accidents and incidents, conditions of rolling stock and equipment, etc) for railway companies themselves as well as towards their authorising bodies. They add to the basis to ensure that «the safety level is maintained and improved as far as practicable».
- For trustworthy SPI it is inevitable to have an active safety management system with the necessary processes and databases with up-to-date input data (on accidents, incidents, unsafe conditions, etc.).