

DEMASST WP2 – Threat analysis

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DEMASST WP2 Threat analysis - Objectives

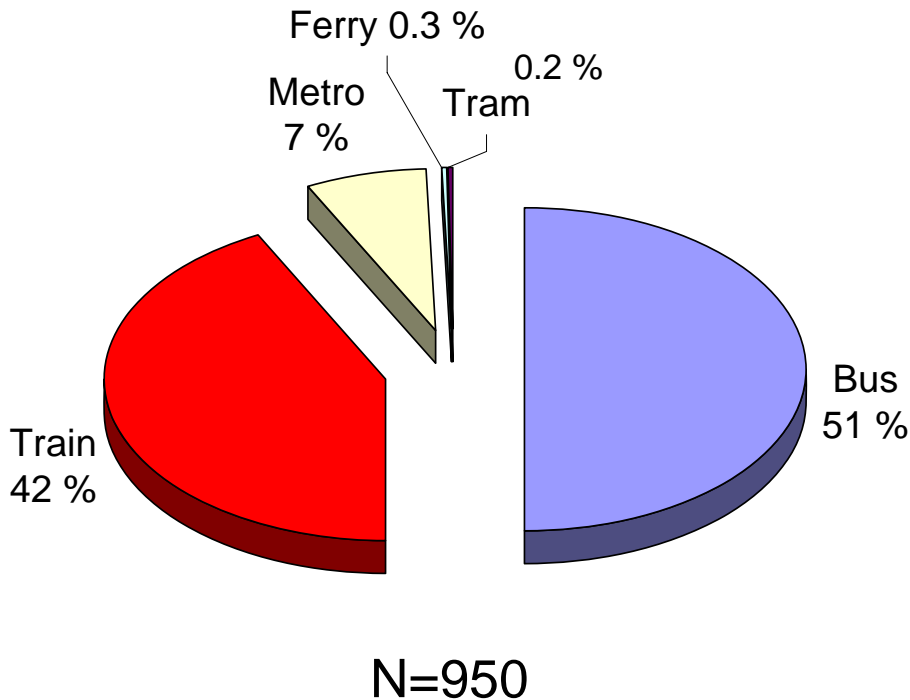
- Systematic identification and evaluation of
 - existing and emerging terrorist threats
 - natural disaster threats
 - accident threats
- Threat characterisation from mass transportation point of view
- Assessment of the relevance of different threats – risk estimation
- Building a mass transportation threats database
- Elaborating threat scenarios for Phase 2

WP2 – work content

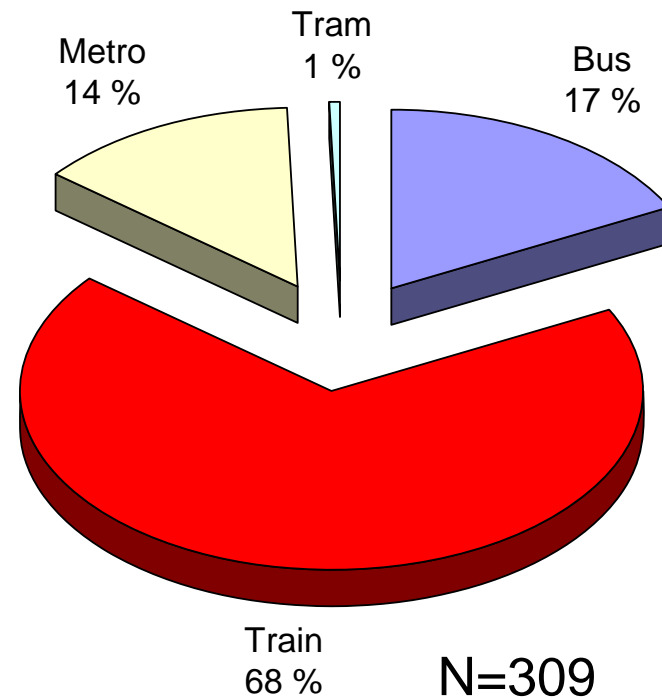
1. Collection of threat scenarios
 - Interviews and workshops with stakeholders
 - Partners
 - Open literature: attacks, accidents
2. Ranking of scenarios
3. Morphological Analysis – an advanced tool for generating threat scenarios
4. Building a threat database

Targets on attacks of MT systems

Mass transport targets globally 1970-2010



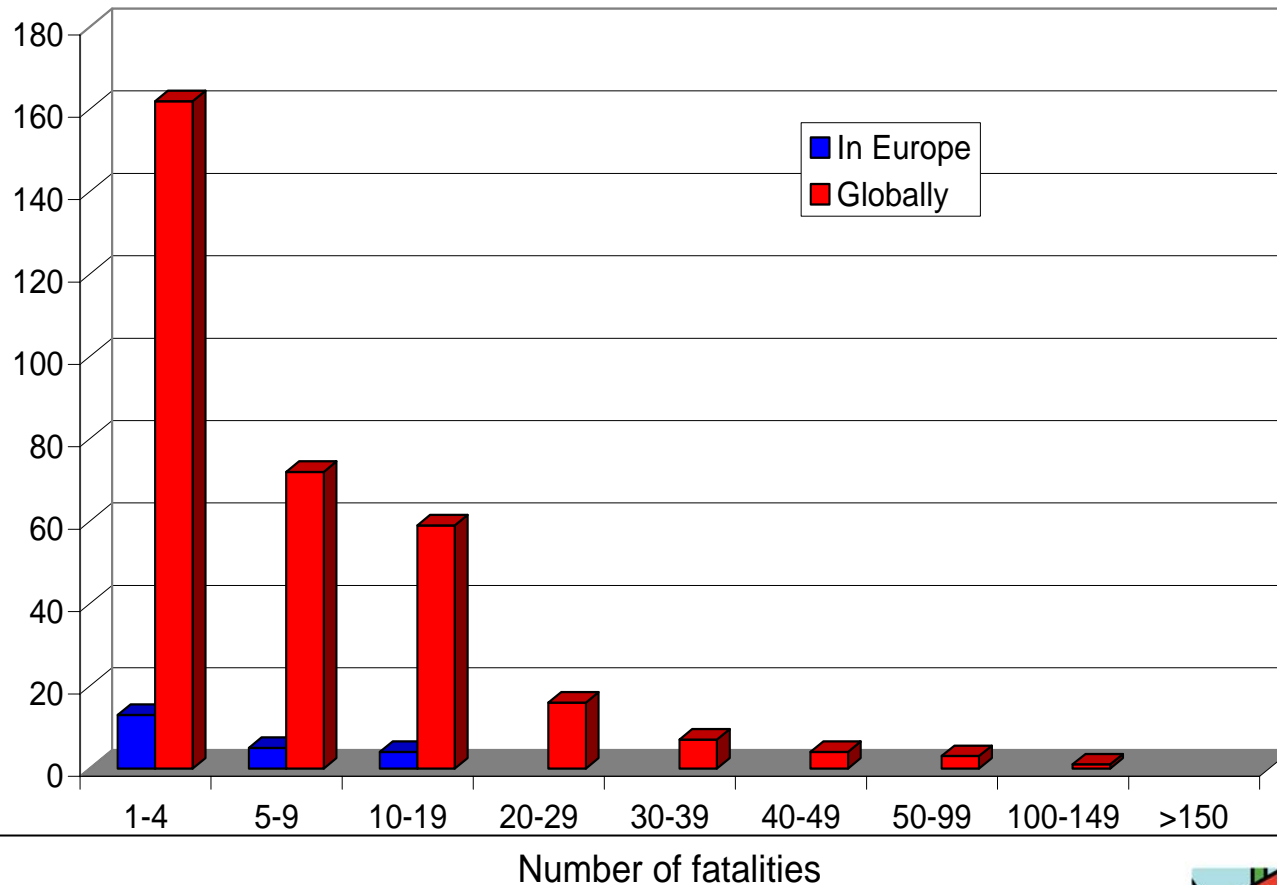
Mass transport targets in Europe 1970-2010



Data from attack database

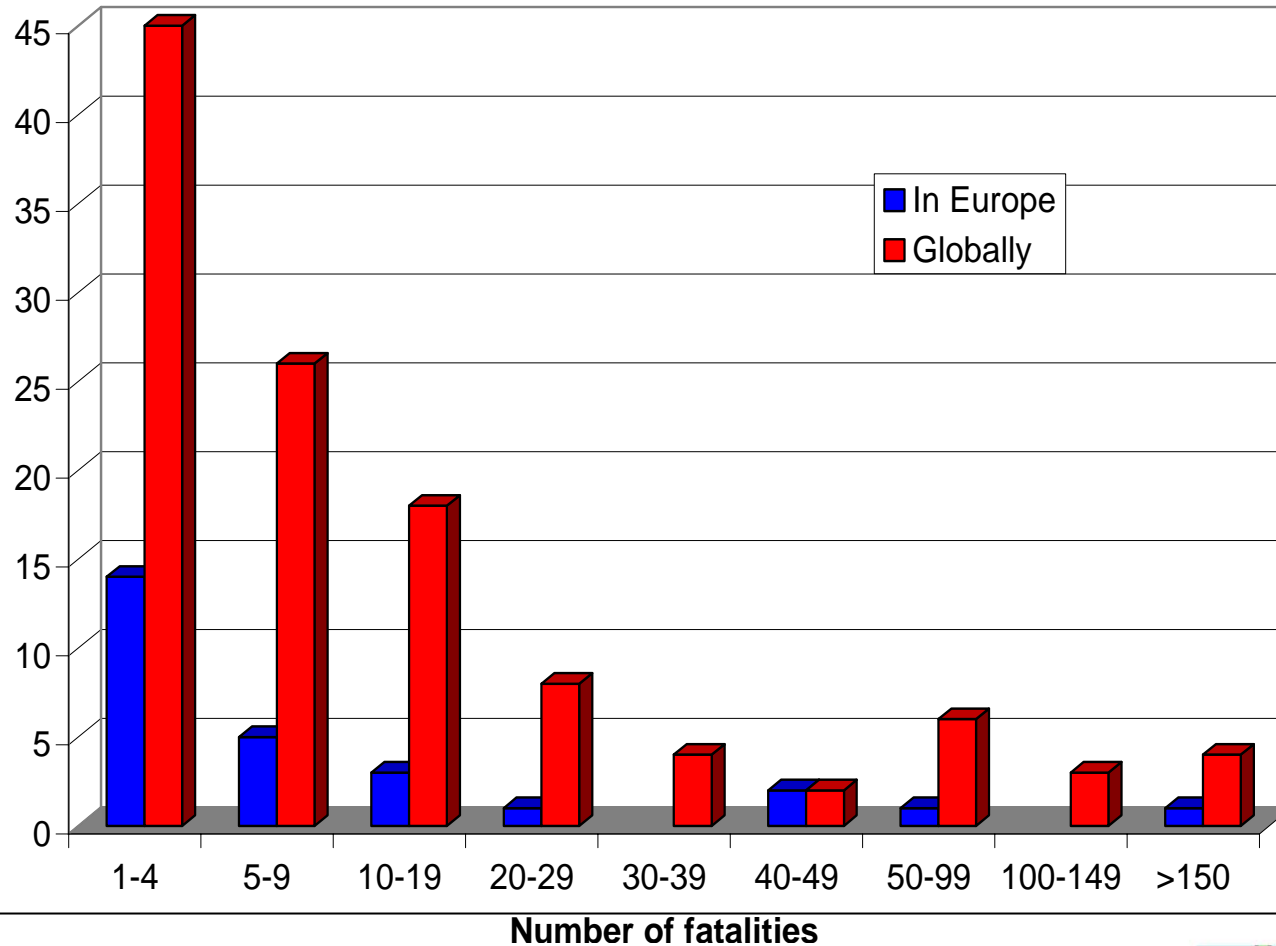
Distribution of fatalities – buses database information 1970-2010

Attacks on buses



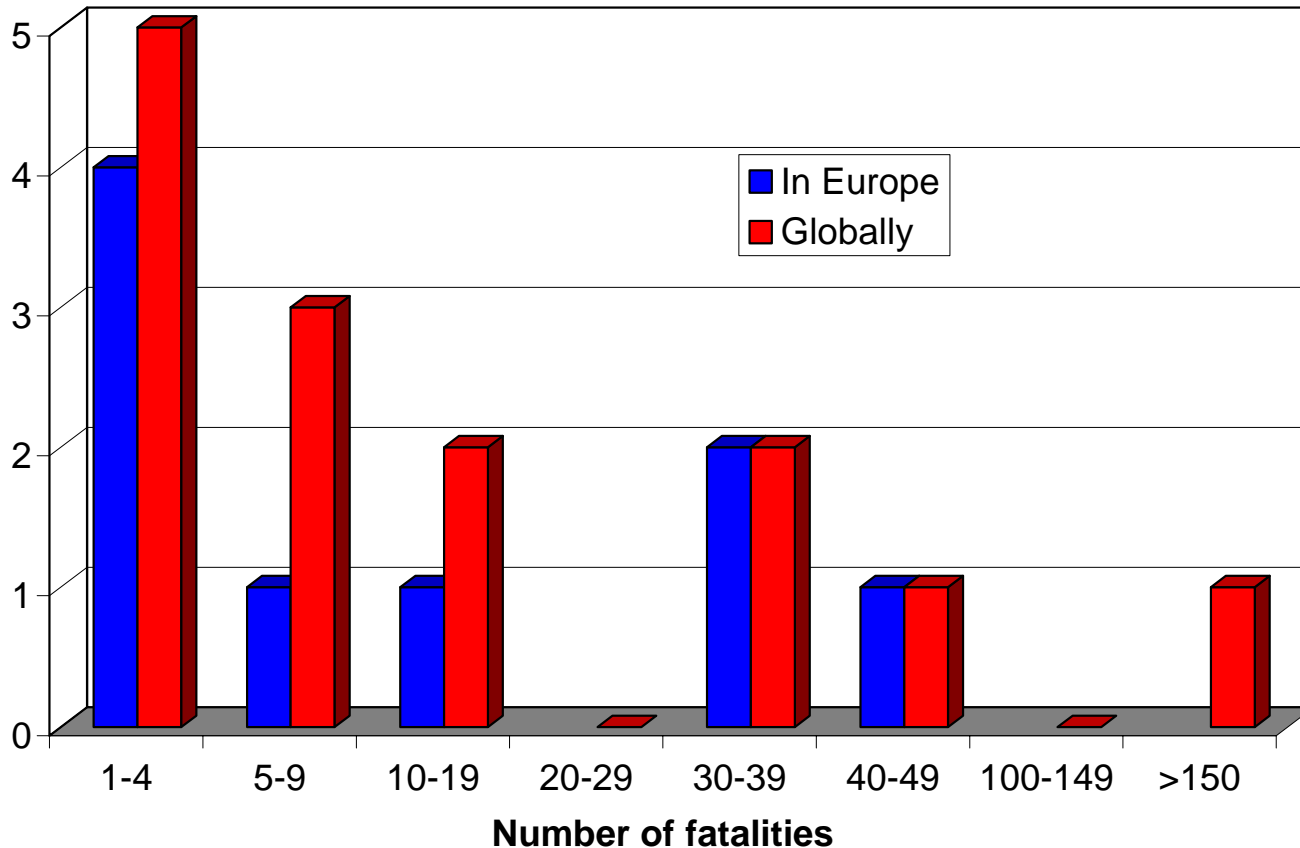
Distribution of fatalities – trains database information over 1970-2010

Attacks on trains



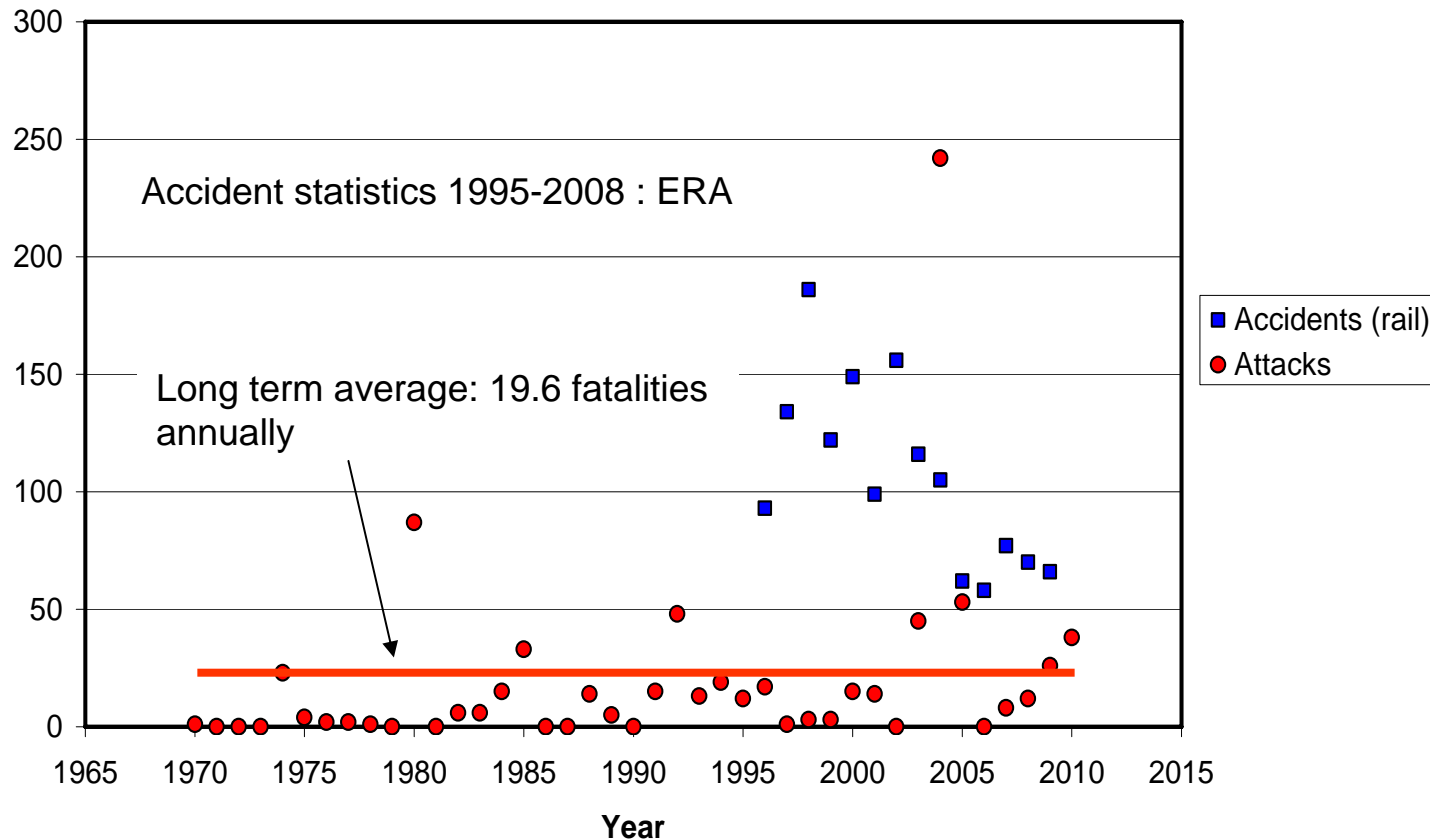
Distribution of fatalities – metro database information over 1970-2010

Attacks on metro



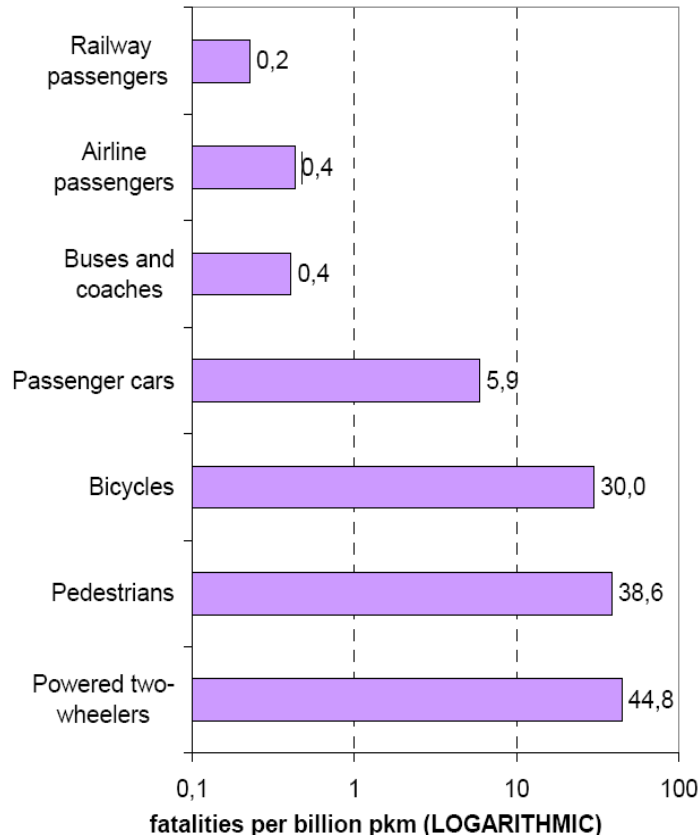
Risk estimation – relevance of threats

Fatalities in mass transport incidents in Europe



Accident fatalities – only passengers killed, other fatalities excluded (suicides, damage to other parties like unauthorised passes and level crossing accidents)

Risk estimation – comparison of transport modes accident fatalities



Mass transport is safe !

Source: EEA 2005. TERM 2005 09 – Number of transport accidents, fatalities and injuries

Examples of perceived threats

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- PB explosives detonated on a vehicle
- Release of poisonous agent in underground space
- HazMat transport explosion
- Car bomb explosion near central station
- Fires in underground spaces
- Sabotage causing derailment
- Human-technology interaction causing collision

Interviewed stakeholders

- Fire in metro tunnel
- Suicide or vandalism: e.g. stopping car at a level crossing
- Leakage of HazMat
- Car or vehicle in fire
- Fear of pandemic causes avoidance of public transport
- Failure in software updating causing failure in control system operation
- Blackouts: failures in energy systems

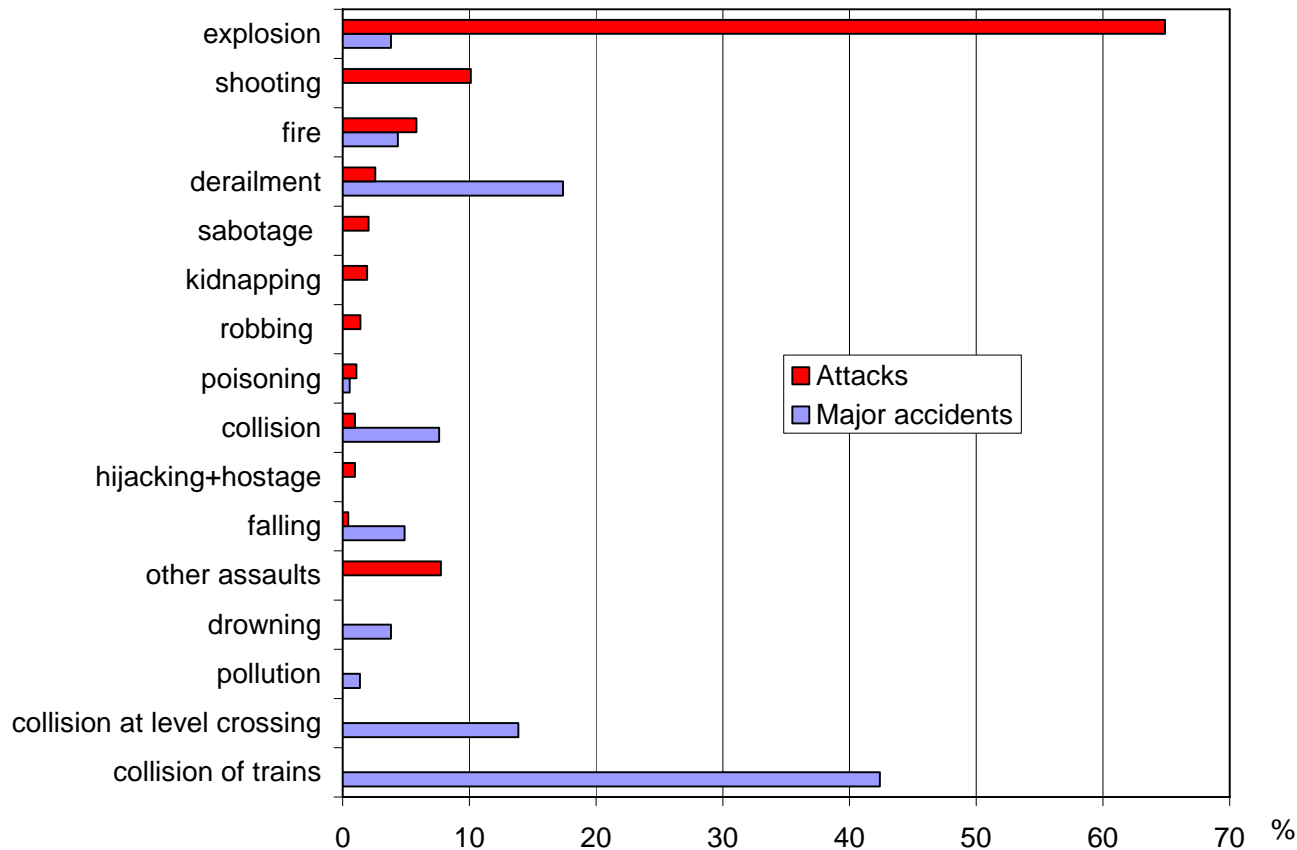
Threat scenarios

Classification by main mechanism of damage to the mass transport passengers and system

- Explosive blast – includes air pressure and objects/debris caused by blast
- Bullet hit - being shot by firearm
- Collision – crashes with vehicles or other objects
- Fire - contact with fire or flame, inhalation of smoke from burning object/substance
- Poisoning – exposure to chemical or other substances including microbes (inhalation, skin contact, ingestion, eyes), ionising radiation
- EMP/HPM – intense ElectroMagnetic and High-powered Microwave Pulses
- Electrocutation
- Interruption of operation
- Pollution – environmental damage
- Other – stampede, drowning, falling, assaults on passengers or staff, robbery, hijacking, kidnapping, blackmailing

Damages can be caused intentionally, accidentally or by natural disasters

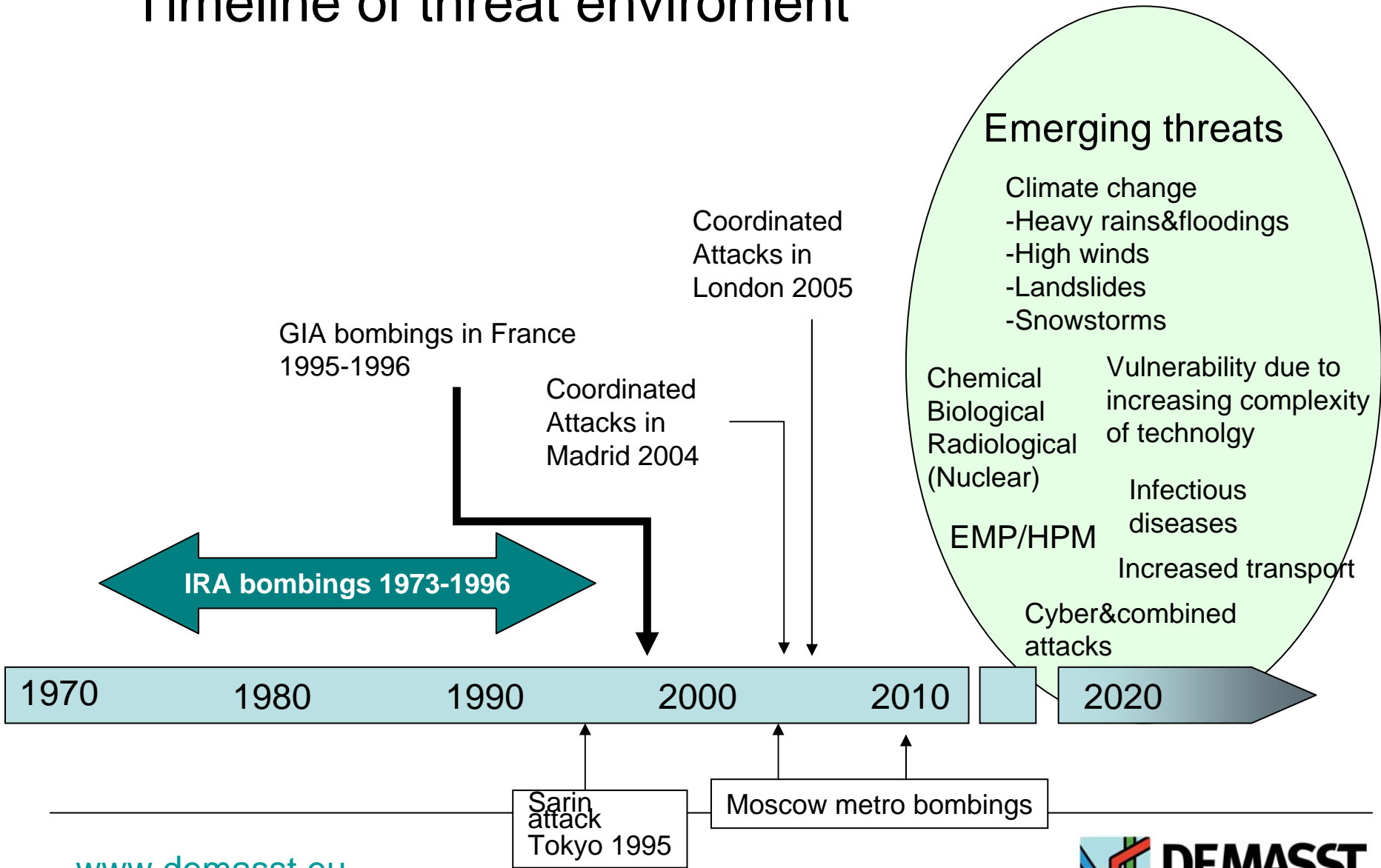
Comparison of threat profiles – top events data over 1970-2010



Attacks – reported malevolent acts or foiled plans against MT systems

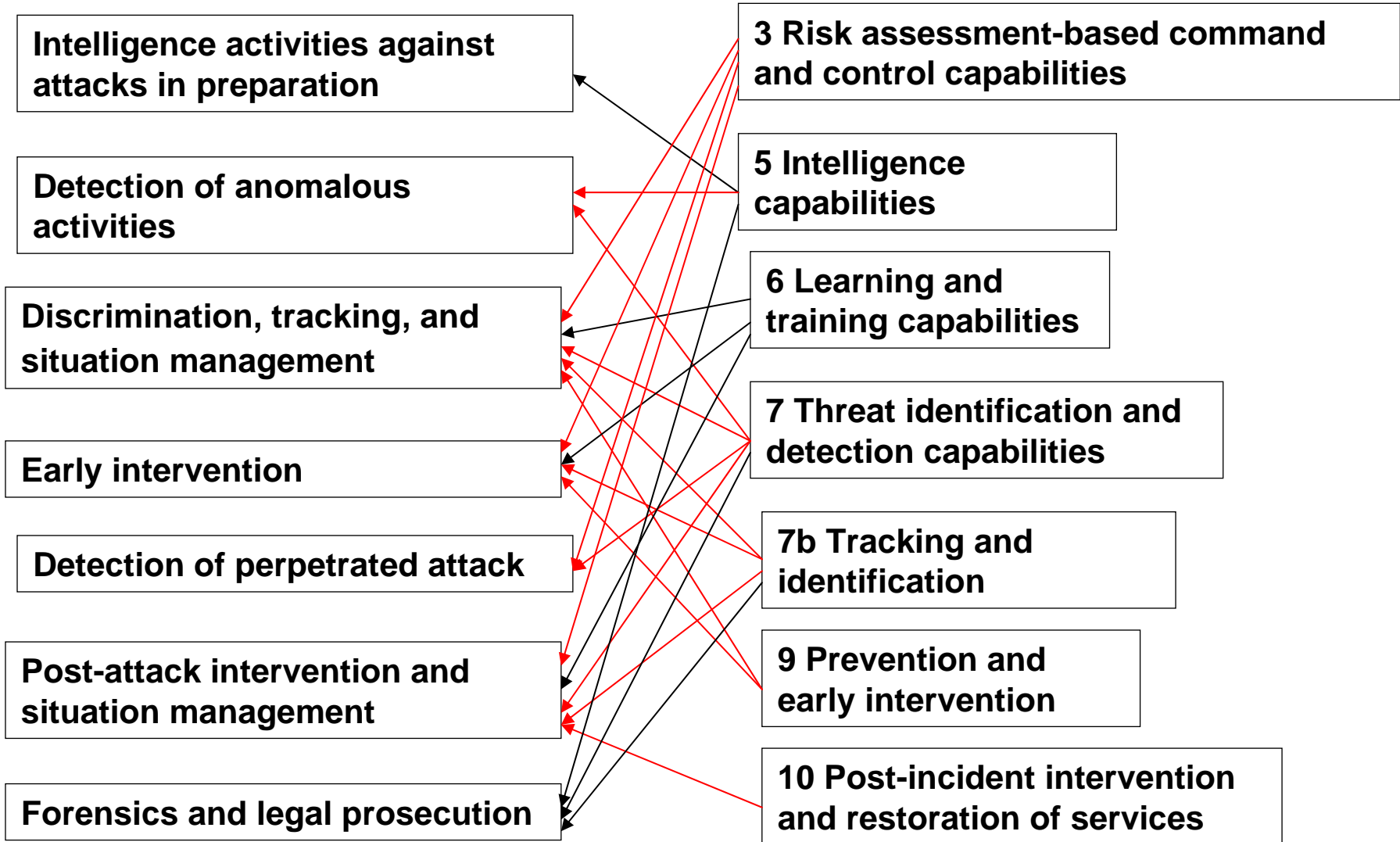
Major accidents – accidents which have caused 5 or more fatalities/extensive environmental damage

Timeline of threat environment



Security tasks/
situational scenarios

Capabilities



Morphological analysis

- A tool for structuring, analyzing, facilitating multi-dimensional problems in the decision-making process
- Example of a multi-dimensional problem is the process of generating new elaborated threat scenarios
- Threat scenarios include both attacks (intentional) and accidents (non-intentional)
- Morphological analysis fields consist of variables and states, which can be varied and compared to each other
- The different combinations of states generate new elaborated scenarios

Building a database for identifying emerging threat scenarios to mass transportation

- Merging empirical knowledge on threat scenarios with the ability of systematic generation of new and novel threat scenarios
- The database will facilitate generation of new scenarios with link to empirical knowledge
- It will be possible to map new novel threat scenarios to existing attacks or accidents

The database: Constituents 1

Attacks and accidents: Empirical facts

Date	Place	Summary	Top event	MT system	Imp. assets	Above/below	Injuries	Fatalities	Responsible party	Ref.	Suicide attack
7/7 07	London	...	Exp.	Bus/subw	...	A/B	~ 700	56	y	..	Yes
2/15 10	Halle	..	Coll.	Train	..	A	>160	18	..	.	No
..											

The database: Constituents 2

Attacks: Generation of new scenarios via morphological analysis

Agent Method	Agent Strategy	Target
IED	Person borne	Intermodal station area
Chemical	Left behind	Station
Biological	Vehicle borne	Inside vehicle
		Physical infrastructure

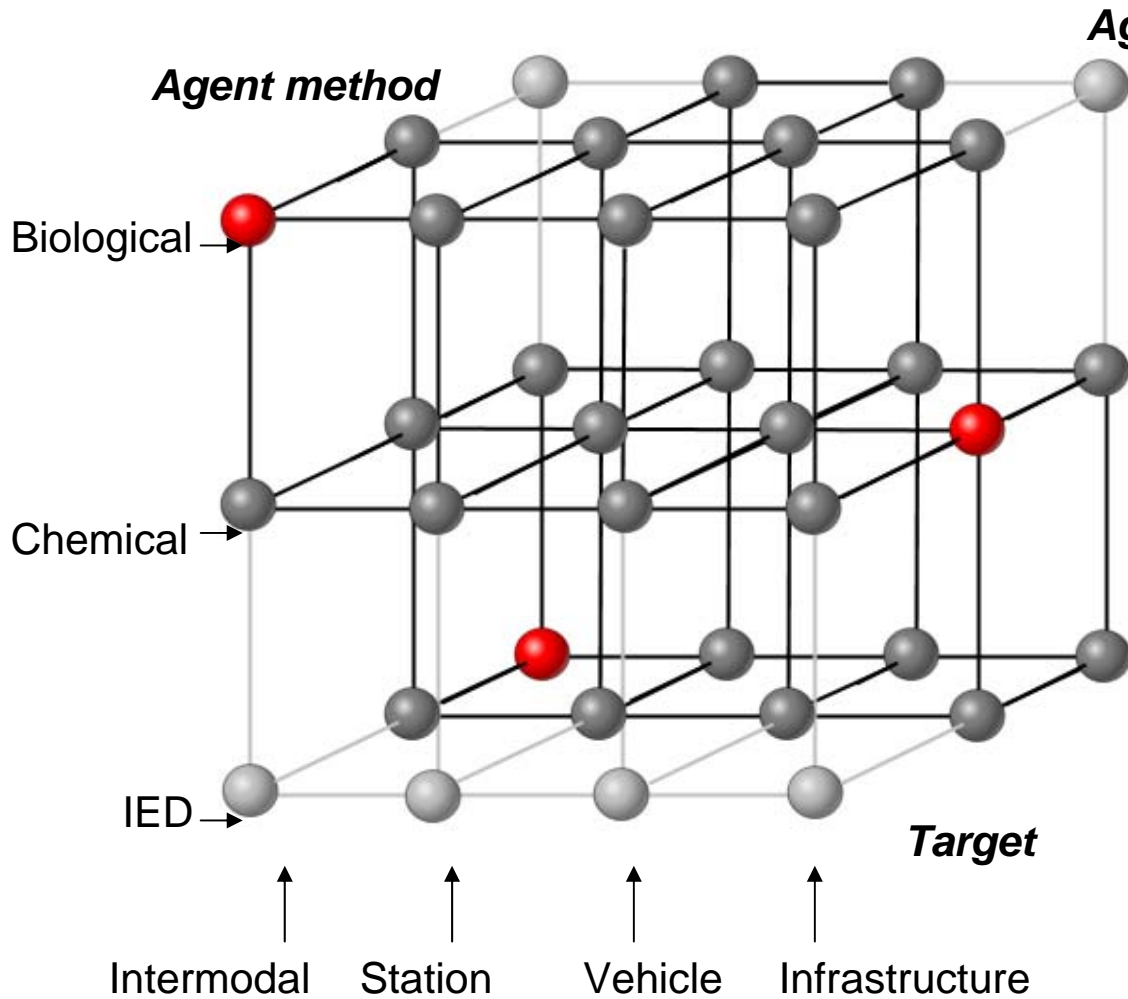
One scenario

Another scenario

The database: Constituents 3

Accidents: Generation of new scenarios via morphological analysis

The scenario space (for visibility only 3D)



3 different scenarios

Conclusions

- Rail and bus are safe modes of transport, much safer than car
- Globally, the most attacks on mass transport systems are against buses, but against metros and trains in Europe
- Train and metro attacks have the potential for very large scale damage
- Attacks mostly explosions, others shootings, arsons, sabotage to e.g. derail trains, kidnapping and robbery
- One completed attack with CWA, some attacks planned or foiled
- More multiple risk profiles of accidents than those of attacks
- Future threats:
 - explosions continue to be the main mode of attack,
 - Catastrophic consequences due to CB agents
 - Climate change resulting extreme weather events: floodings, landslides, strong winds
 - Increasing vulnerability due to technology development (cyber attacks, EMP/HPM)
 - Increasing transport increases risk for accidents
 - Infectious diseases and pandemics