Results of smart ICT benchmarking

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BASIC QUESTION

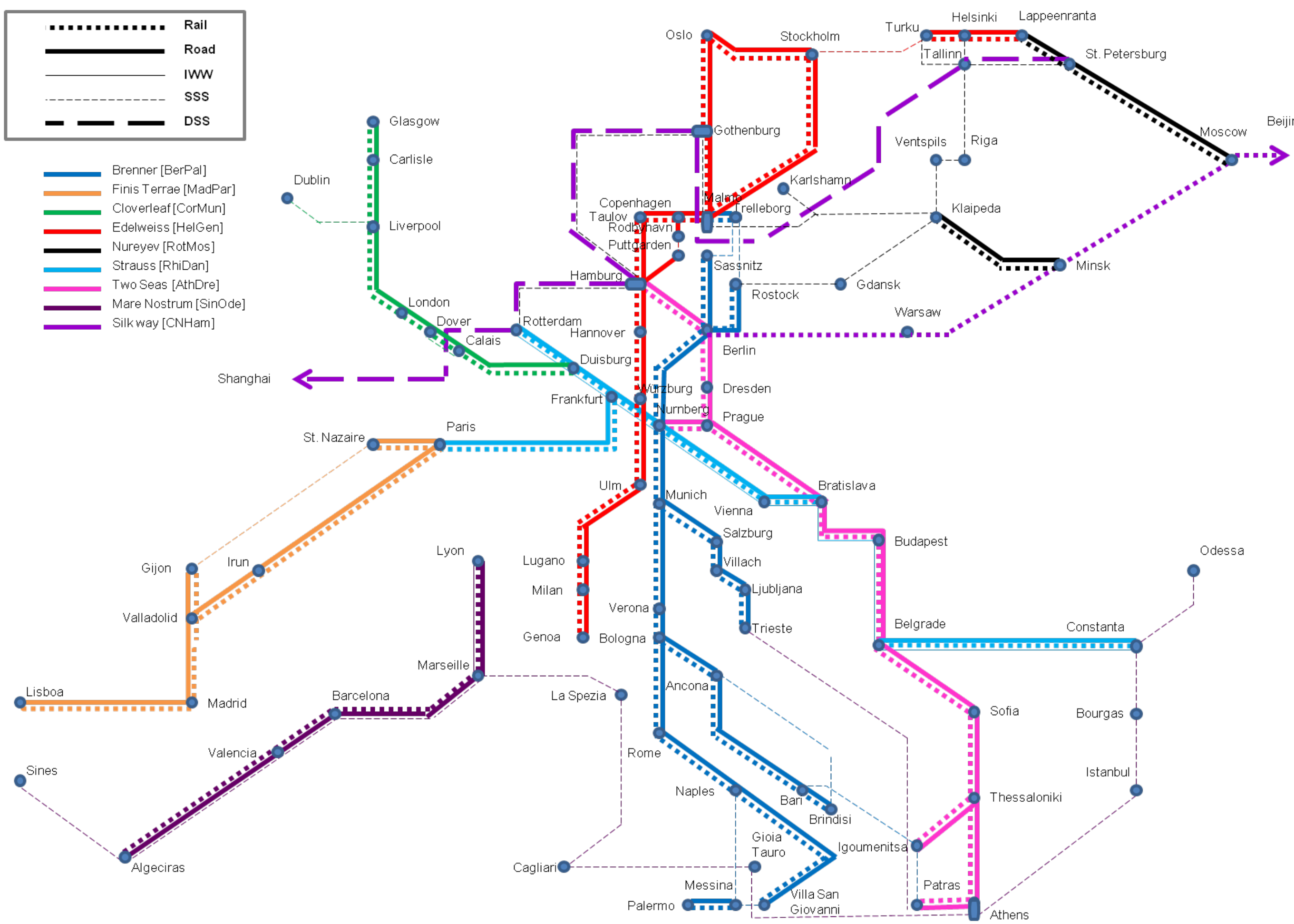
- How can ICT make a corridor greener?
- It can do so by improving one or more of the corridor's KPIs.

- *(ask not what a corridor can do for ICT, but what ICT can do for the corridor)*

A few examples

- A ‘traffic control’ ICT can reduce congestion, bottlenecks and thus emissions
- An ICT like ERTMS can improve rail interoperability and therefore reduce transport time and cost
- Advance ‘dynamic’ info on port congestion can make ships go slower and therefore emit less CO2
- An ‘expert charging system’ ICT can change user behaviour, induce modal shifts and reduce emissions
- Same with an ‘emissions measurement’ ICT
- An ICT system can increase reliability
- Also safety and security

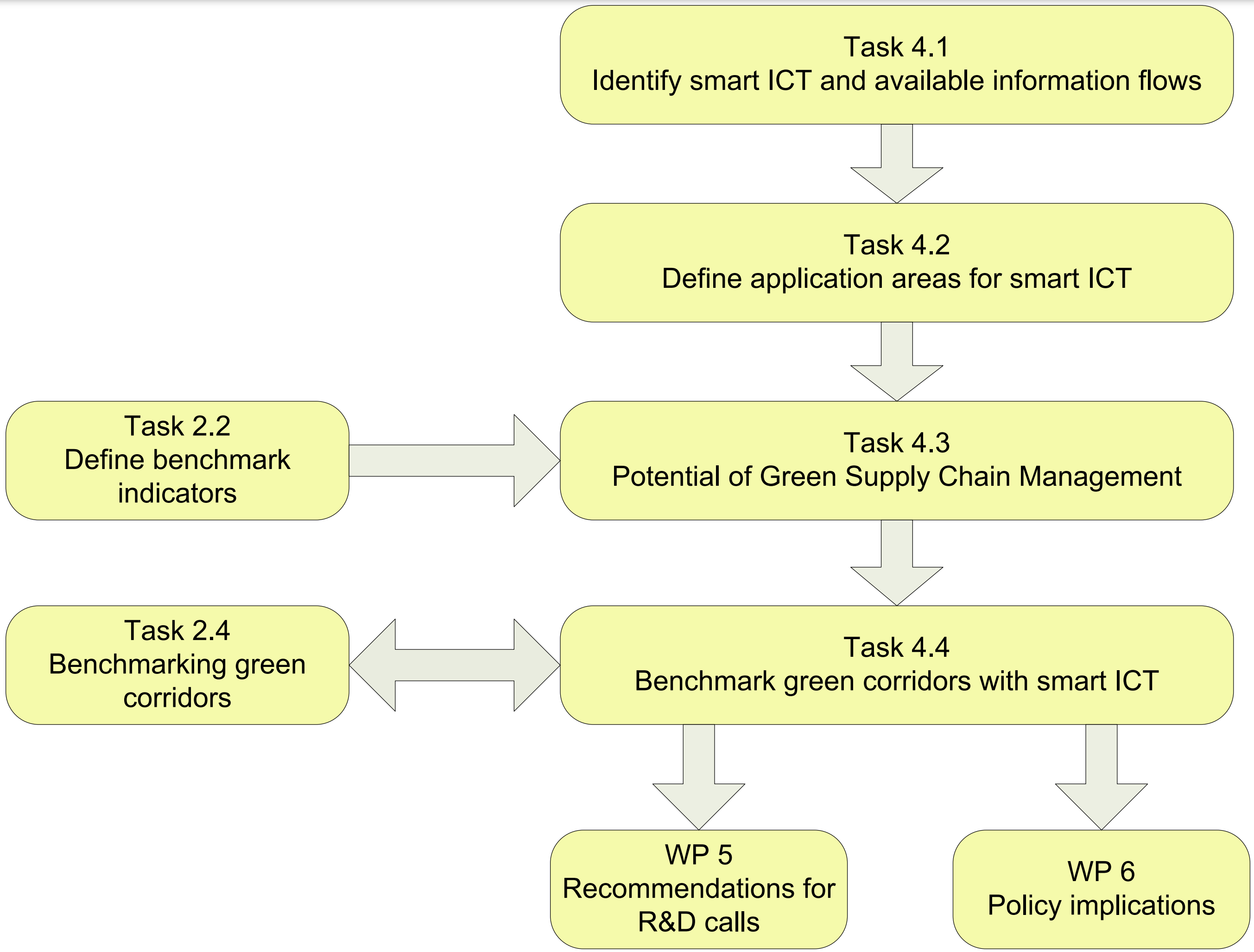
The corridors (once again)



The KPIs (once again)

KPI	Input unit	Output unit	Grading of importance for Supergreen
Efficiency			
Absolute costs	ton, €	€/ton	3 Can manage without
Relative costs	ton, €, km	€/ton-km	1 Must have
Service quality			
Transport time	hours	hours	1 Must have
Reliability	Total number of shipments, On-time deliveries	%	1 Must have
ICT appl.	Availability, integration & functionality of cargo tracking & other services	graded scale	2 Prefer to have
Frequency	Services per week	number	1 Must have
Cargo security	Total number of shipments, Security incidents	%	2 Prefer to have
Cargo safety	Total number of shipments, Cargo safety incidents	%	2 Prefer to have
Environmental sustainability			
CO_2 emissions	ton, km	g/ton-km	1 Must have
NO_x emissions	kg, km	g/1,000 ton-km	2 Prefer to have
SO_x emissions	kg, km	g/1,000 ton-km	1 Must have
PM emissions	kg, km	g/1,000 ton-km	2 Prefer to have
Infrastructural sufficiency			
Congestion	ton, km, Average delay	hours/ton-km	2 Prefer to have
Bottlenecks	number & category	graded scale	2 Prefer to have
Social			
Corridor land use	Share of distance per area type	percent	2 Prefer to have
Traffic safety	Traffic safety incidents	percent	2 Prefer to have
Noise	Share of distance above level	percent	2 Prefer to have

Enter WP4: Smart exploitation of ICT flows



Genoa ICT workshop

(Sep. 12, 2011)

- Workshop session that debated this basic issue:

- How important you think a specific ICT technology is to a specific KPI? (for a specific mode and corridor)

Workshop: **INPUT**

Set of KPIs (same)

KPI	Unit
CO2 emissions	g/ton-km
SOx emissions	g/1000 ton-km
Relative transport cost	€/ton-km
Transport time	h
Frequency, services per year	number
Reliability, on time deliveries	%

List of corridors:
All 9 corridors

List of ICT Technologies:
7 ICT clusters
13 ICT systems

Number of corridor/mode/ICT scenarios: 15

7 ICT Clusters

- Expert charging systems.
- Centralised transportation management systems.
- Decentralised transportation management systems.
- Broadcasting, monitoring & communication systems.
- Safety systems.
- E-Administrative Systems.
- Emissions footprint calculator systems.

7 ICT clusters cont'd

TABLE A: ICT CLUSTERS

ICTs	ICT cluster
Unified Electronic toll system (CHD) , Congestion Charging, Toll amount depending on the pollutant category of the truck (German highway truck toll system),	Expert charging systems
ERTMS, traffic flow optimization, Caesar (or systems of individual operators like kombiverkehr, ökombi,...), VTS/VTMIS Electronic Traffic Management, River Information Service (RIS), Fairway Information Service (FIS), Information for Law- enforcement (ILE), Traffic control systems (TMC pro/TMC Plus, GPS/GSM), OPTIMAR, International networking of national traffic control centres, ICT: How to assign icebreakers to other vessels, Traffic signaling optimization,	Centralized traffic management systems
Platooning, Intelligent Speed Adaption (ISA), Speed limits on the highway depending on CO2 emission values (VBA Umwelt Tirol),	Decentralized traffic management systems
Conducted communication systems, Broadcasting systems (TMC, TMCpro, TPEG, DVB, DAB), Mobile radio systems (GSM,SMS,GPRS,UMTS), Car-to-X-Communication, ENC/ECDIS, Broadband communication (WiFi/WiMAX, digital VHF...),	Broadcasting, monitoring & communication systems

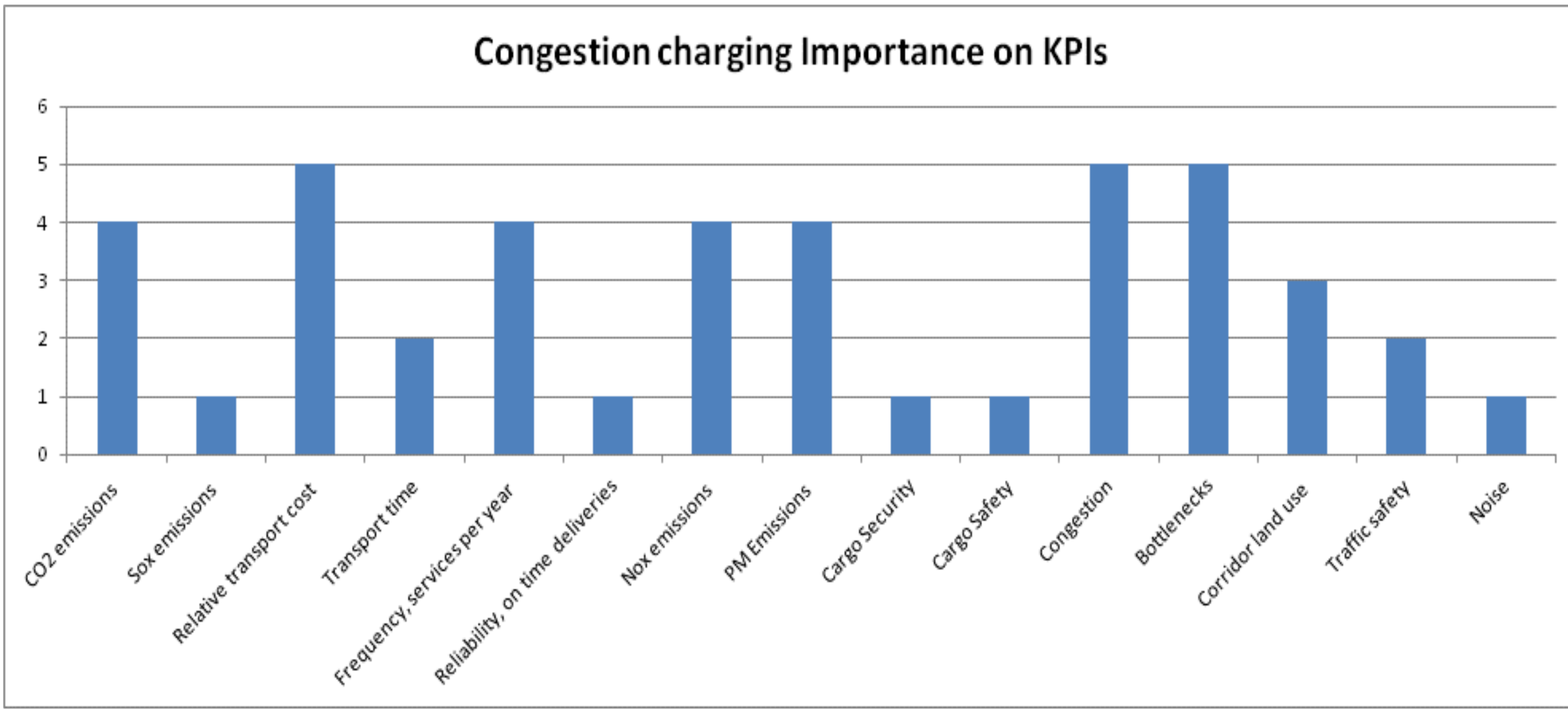
ICTs	ICT cluster
GNSS (GPS, Glonass, Galileo), Automatic Identification System (AIS), LRIT – Long Range Identification and Tracking, radar, SafeSeaNet, AGHEERA, RFID, SCHENKER SMARTBOX , Route Guidance systems Personal navigation assistant (Navigationssysteme), Head-up display (HUD), Navigation system for trucks: Map & guide professional,	
Road-weather-information systems (SWIS, AWEKAS, GFS Europa, Coupled general Circulation Models Eumesat Polar Systems (EPS)), Speed limiter, Night Vision System , Distance control systems, Collision warning systems, Braking assistant systems, Lane Departure Warning (LDW) , Lane keeping assistant	Safety systems
Single Window solutions, JUP, Fretis, ShortSeaXML, Port Community Systems,	E-commerce systems
anonymised sensor data gateway	Emissions footprint calculation systems

Proposed list of ICTs per mode and per corridor (15 scenarios)

	Corridor	Transportation Modes	ICT Cluster (Application)
1	Mare Nostrum	SCM	Broadcasting, monitoring & communication systems (SMARTBOX)
2	Brenner	Road Rail	Expert charging systems (congestion charging) Centralised transportation management systems (ERTMS)
3	Two Seas	Maritime	Broadcasting, monitoring & Communication systems (Broadband communication: WiFi/WiMAX, digital VHF, GNSS: GPS, Glonass, Galileo)
4	Silk Way	Maritime Rail	Emissions footprint calculator systems (emissions sensors) Centralised transportation management systems (ERTMS)
5	Edelweiss	Road	Emissions footprint calculator systems (Speed limits on the highway depending on CO2 emission values)
6	Finis Terrae	Maritime Rail	E-Administrative Systems (JUP) Centralised transportation management systems,(ERTMS)
7	Strauss	Inland waterways	Centralised transportation management systems (RIS) Expert charging systems (river tolls)
8	Nureyev	Maritime	E-Administrative Systems (fretis) Centralised transportation management systems (assign icebreakers to ships)
9	Cloverleaf	Road	Decentralised transportation management systems (platooning), Safety systems (adaptive speed control)

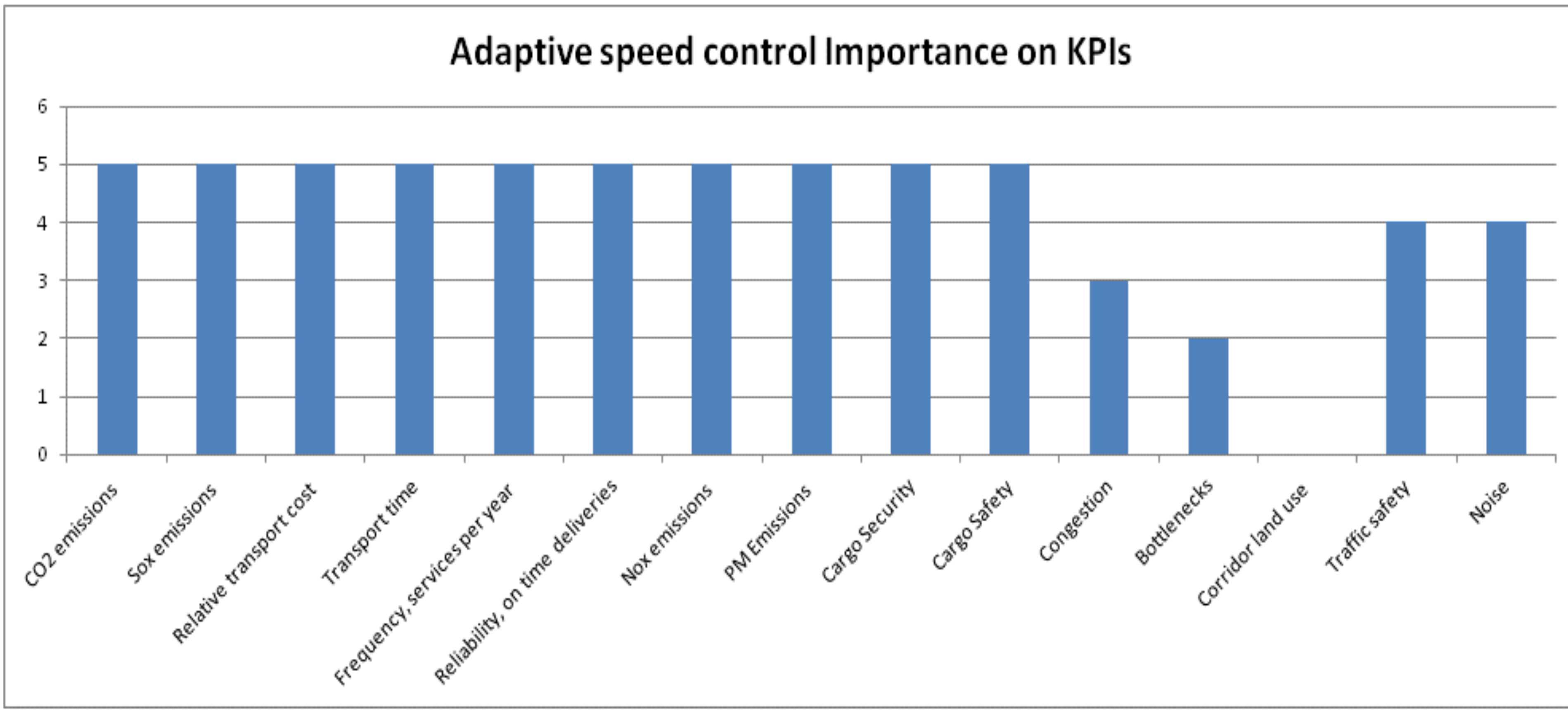
Impact of ICTs on KPIs

Results (Sample**)**



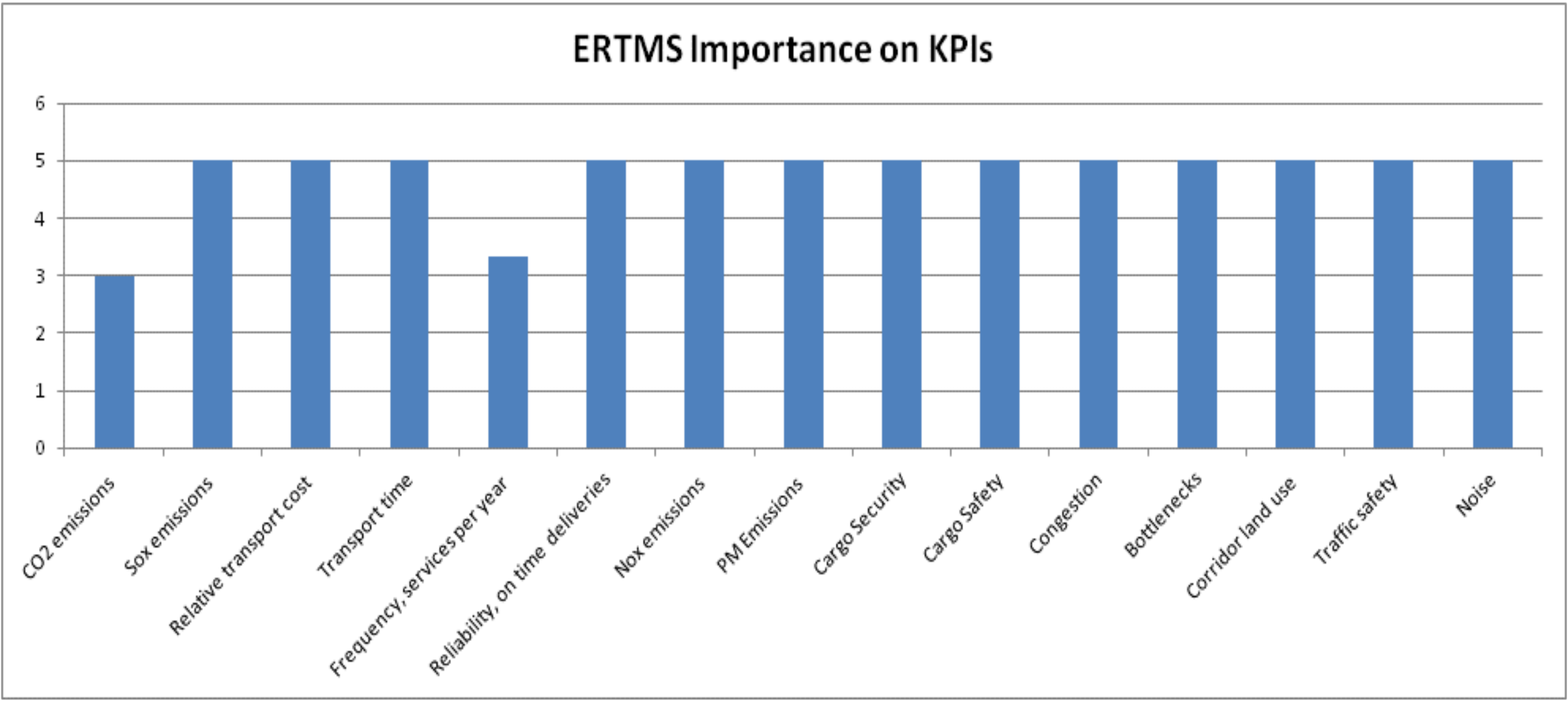
Impact of ICTs on KPIs cont'd

Results(Sample**)**



Impact of ICTs on KPIs cont'd

Results(Sample**)**



Quantitative vs qualitative

- Ideally, one would like as much quantitative results as possible
- However, we found that in many cases a precise quantification proved difficult or impossible

Elusive data

- In many cases, data necessary to compute the impact of a specific ICT on the KPIs of a corridor generally proved to be difficult or elusive to obtain.
- Reasons:
  - general unavailability or lack of collection of such data
  - unwillingness of operators or other sources to reveal such data in case it exists
  - non-homogeneity in the quality of the data

ICT is different

- Non-ICT technologies can have a direct and tangible impact on the KPIs of a corridor
  - A special engine, truck or ship emits less CO_2, a certain fuel results in less SO_x, etc.
- But the impact of ICTs on the greening of a corridor is of a different nature
  - A **broadcasting ICT** can result in no CO_2 reductions in and of itself, but it could do so if the information provided by it is appropriately used by the operator.

ICT is different ii

- A ship may reduce speed if it is known that there is congestion at the next port of call
- A truck may use a different route if an expert toll system is used.
- The same is true for systems such as ERTMS, expert charging systems, single-window systems and other ICTs.

- The way such information is used (if actually used at all) is at the discretion of the human operator and as such does not lend itself to ease of measurement.

Impact on KPIs

- The potential performance of these systems (KPIs) depends more on the way these systems are used and less on the systems themselves.
- Role of human element (training, acceptance, etc) critical
- Still, in some cases we managed to get some quantitative results, but these are only indicative and case-specific.

Example: virtual arrival

- Potentially connected to **single-window systems**
- *"In a trial voyage, in September 2009, Maersk's 37,000-dwt tanker Bro Elizabeth sailed from Batumi in the Black Sea to the Isle of Grain in the UK. The voyage took 14 days in total to meet the prearranged discharge slot. The weather-routing company that was used to provide the routing also calculated the bunker savings as compared with its "virtual arrival" if it had sailed at full speed to the destination. It was reported that the delay of 2 days saved 58.83 metric tonnes (and 183.2 mt of CO2), a 27% reduction. In that case the demurrage was 18,000 USD and the bunker savings reached 24,800 USD (and split into half between BP and Maersk). In total the owner improved the TCE earnings by 6% and the charterer saved 3% of the total freight bill. Regarding emissions, 183.2 mts CO2, 4.39 mts NOx and 3.49 mts SOx were saved (Maersk Tankers, 2010)."*

Virtual arrival cont'd

- Significant quantifiable benefits can be achieved in a maritime or multi-modal corridor's KPIs by appropriate implementation of such a system, and use of ICT is critical in that regard.
- In particular, the CO_2, SOx and NOx KPIs are expected to improve, with a parallel improvement in the cost KPI due to reduced fuel consumption. Improvements are also expected in the bottlenecks and reliability KPIs.
- The precise amounts of improvements are case-specific and cannot be predicted with certainty. The overall transit time KPI may or may not degrade, or it may actually improve, depending on the specific congestion situation at the port in question.

Expert charging systems

Scenario 2:

Corridor: *Brenner*

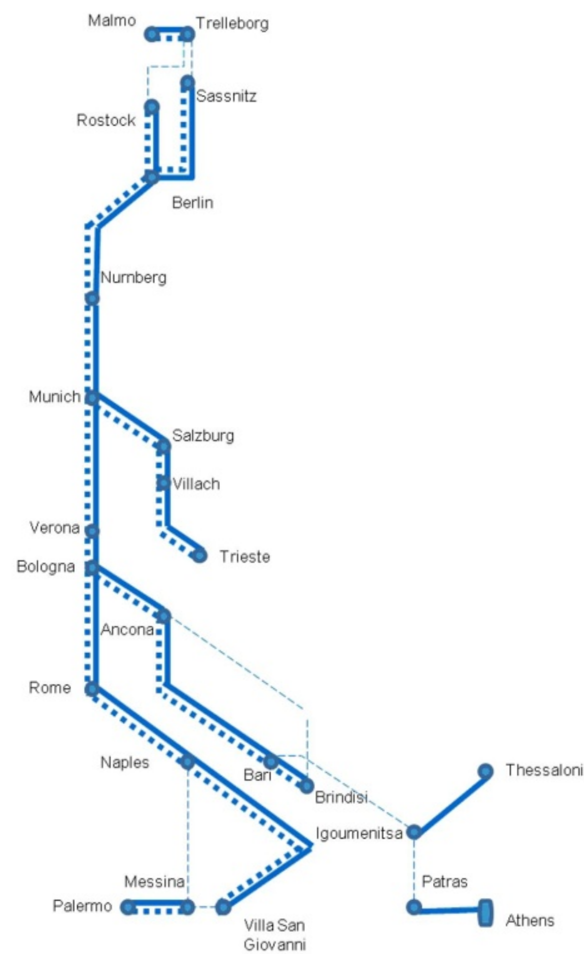
ICT: *Expert charging*

Mode: *Road*

ICT State: *Partially exists*

(mainly in German and Austrian segments)

Brenner [BerPal]



Expert charging systems ii

Scenario 2

Benchmarking highlights:

Positive:

•Provide 100% free-flow attributes

•6% decrease in the number of empty runs

•6% modal shift to rail from road freight mode

•Increase security and cargo integrity and many more

Negative :

•Additional noise and congestion on non central roads

ERTMS

Scenario 3:

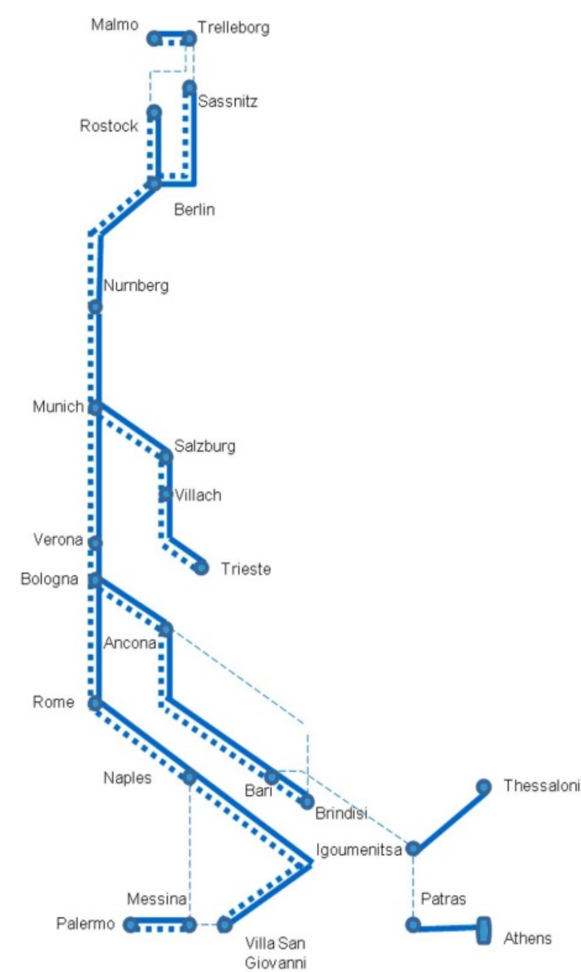
Corridor: *Brenner*

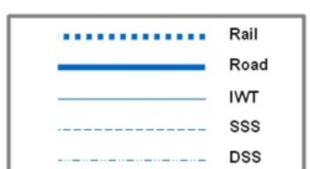
ICT: *ERTMS*

Mode: *Rail*

ICT State: *Partially exists or there are plans for future implementation*

Brenner [BerPal]





ERTMS ii

Scenario 3 Benchmarking highlights:

Positive:

- *Provide 100% free-flow attributes*
- *Transportation time can be decreased up to 70%.*
- *Enhance transportation modal shift towards rail.*
- *Enables up to 40% more capacity on existing infrastructure.*
- *Headways between trains can be reduced to 110 seconds*
- *Train per hours can be increased by 12%*
- *Increase reliability over 98%*
- *Decrease of freight insurance fees up to 90%*

Negative :

- *Additional social - public cost for system development and implementation*

River Information System (RIS)

Scenario 10:

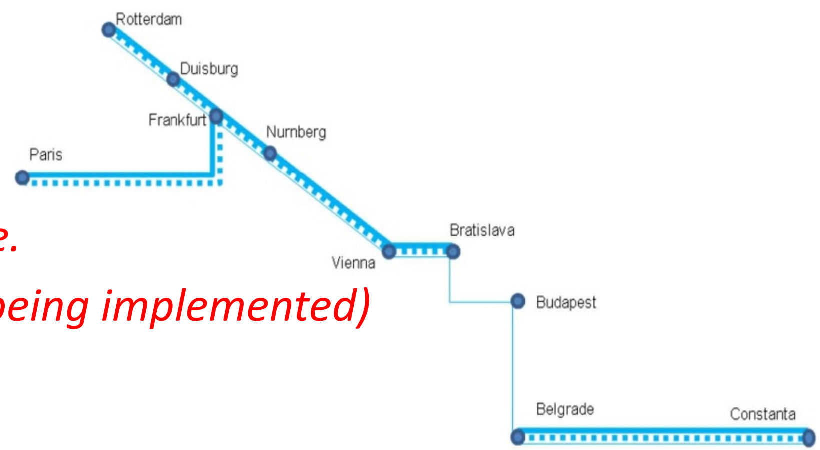
Corridor: *Strauss*

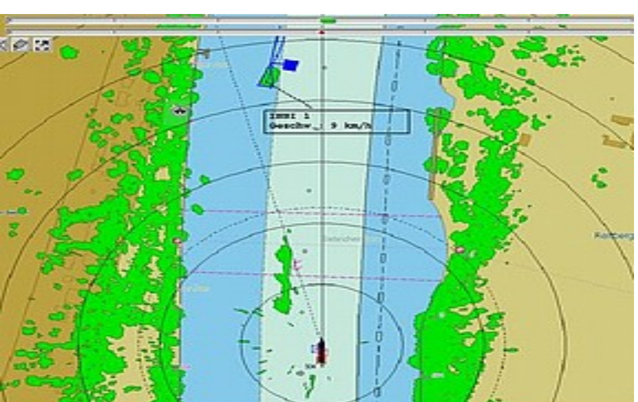
ICT: *RIS*

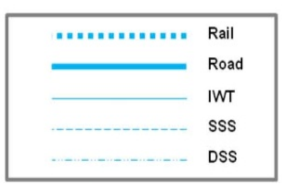
Mode: *IWT*

ICT State: *Present in all waterways within the Strauss corridor except the Croatian and Serbian part of the Danube. (Within Serbia however RIS is currently being implemented)*

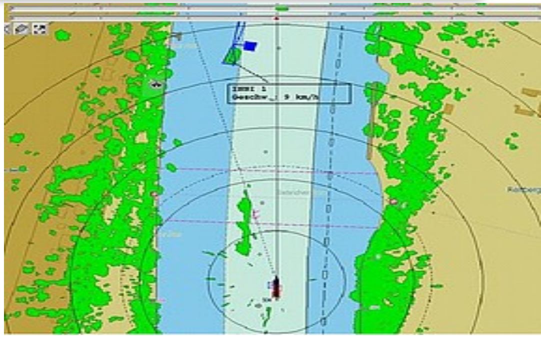
Strauss [RhiDan]







River Information System (RIS) ii



Scenario 10

Benchmarking highlights:

Positive:

- *Reduce fuel consumption up to 8%*
- *Reduce delays during operation up to5%*
- *Reduce waiting times up to 10%*
- *Reduce accidents up to 5%*
- *Reduce logistics costs up to 1€ per ton*
- *Provide 100% free-flow attributes*

Negative :

- *Additional cost for system development implementation and use.*

The 15 scenarios

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General conclusions

- ICT technologies have the potential to make logistics greener and constitute a “win-win” option for logistics stakeholders.
- The benefits would mainly affect fuel economy (→cost), emissions, time, safety and reliability.

- *At the same time, it was also seen that there are cases in which deployment of ICTs may have adverse impacts on some KPIs. Caution is necessary in these cases.*

Thank you!