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GERMAN CENTER FOR
RESEARCH & INNOVATION

Deutsches Wissenschafts- und Innovationshaus

NEW YORK

CONRUHR
NORTH AMERICA

Global Logistics – challenges and solutions

**efficient and secure logistic chains
- scope of the EffizienzCluster Logistik Ruhr**

BY PROF. DR. UWE CLAUSEN

New York, MARCH 14th

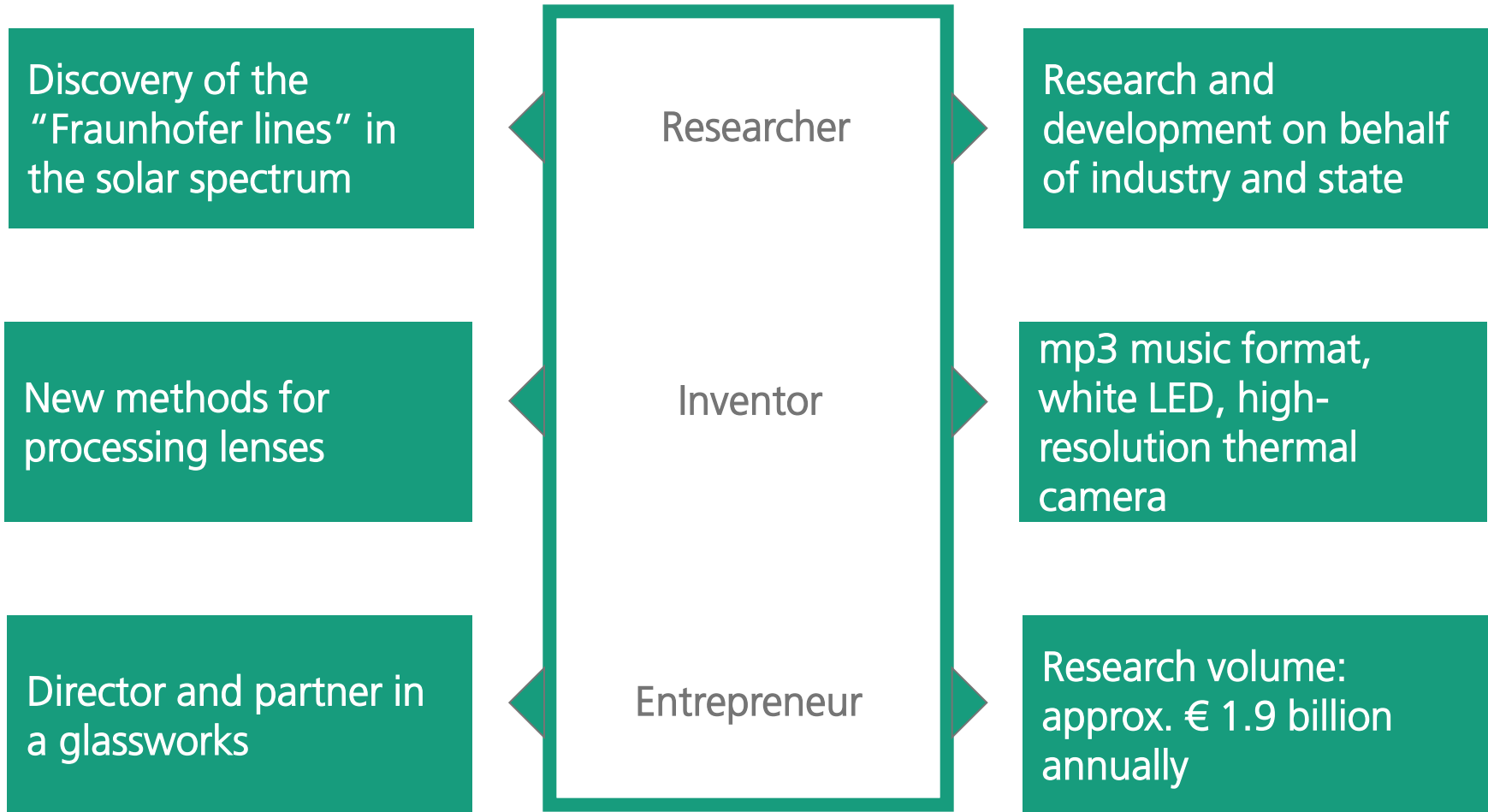**JOSEPH VON FRAUNHOFER
RESEARCHER
AND ENTREPRENEUR**

Joseph von Fraunhofer
1787 - 1826

The Fraunhofer-Gesellschaft
founded 1949

Researcher

Discovery of the "Fraunhofer lines" in the solar spectrum

Research and development on behalf of industry and state

Inventor

New methods for processing lenses

mp3 music format, white LED, high-resolution thermal camera

Entrepreneur

Director and partner in a glassworks

Research volume: approx. € 1.9 billion annually

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Prof. Dr.-Ing. Uwe Clausen

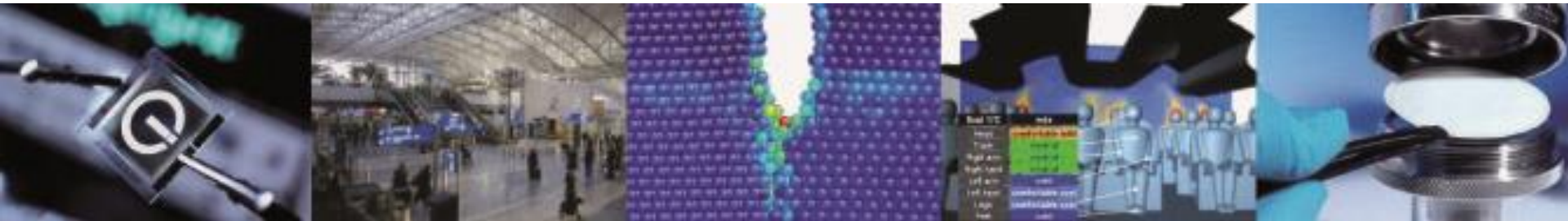**Fraunhofer**
IML

EffizienzCluster
LogistikRuhr

Sheet 1

The Fraunhofer-Gesellschaft
Locations in Germany

> 20,000 employees in 60 Institutes

we conduct research into:

- Health, Nutrition & Environment

- Safety & Security

- Information & Communication

- Transportation & Mobility

- Energy & Living

- Production & Environment

■ Institutes and facilities

▪ Further locations

EffizienzCluster LogistikRuhr – one of 15 winners of Germany´s leading-edge research competition

- Supporting the strategic development of leading-edge clusters in science and economy

- The Leading-Edge Cluster competition is intended to take Germany to the top of the league of technologically advanced nations.

- The high-performance clusters formed by business and science which join into strategic partnerships are set to boost Germany's innovative strengths and economic success.

» three rounds of competition: in each round, up to EUR 200 million will be made available to up to five Leading-Edge Clusters

» "EffizienzCluster LogistikRuhr" includes 30 projects with >120 companies and 11 research institutions including Fraunhofer IML, Fraunhofer ISST, TU Dortmund, University Duisburg-Essen, University Witten/Herdecke, DST, EBS University, FOM, KWI, RISP, Wuppertal Institute

main goals

efficient management of resources

- Efficient production and transport of goods
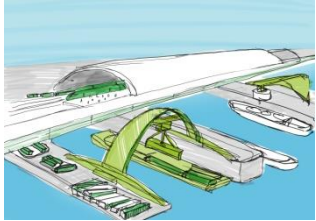- Efficient handling of resources and environment

keep individuality

- Individual supply of goods and information
- Keep individual mobility

urban supply safety

- Solid and save logistics for urban areas
- Urban logistics systems in a global context

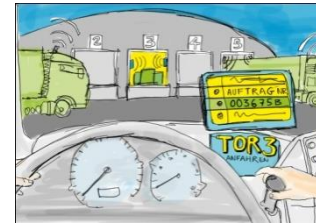# guiding topics EffizienzCluster Logistics

Management of goods traffic

Urban supply

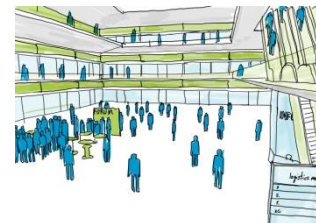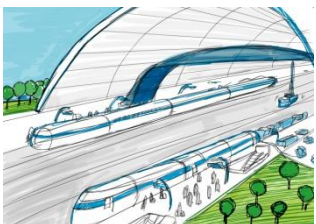Mutable logistics systems

Logistic competencies (education)

Focus on environment

Activation of cluster potential

Logistics-as-a-Service

research project "multimodal promotion" target and methods

- Development of a Web 2.0 tool for the simple design of multimodal door-2-door transport chains without previous knowledge about the combined transport

- Implementation of a company-wide consolidation of transport streams, including drayage and haulage planning

- Bundling small quantities into large volumes

- Improvements of sustainability and efficiency

Trimodal D2D transport chain design

Company-wide consolidation

Evaluation of alternatives (cost, time, CO2e)

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Sheet 6

platform's main functions

- Interface between operators and users
- schedule check
  - the aim is the assignment of appropriate schedules to user´s transportation orders
  - simple or detailed examination of the "own transport volumes"
- timetable formation
  - the aim is to consolidate the transport volumes and to create new transportation alternatives
  - calculations are based on data entered by the users
- local traffic planning
  - reduction of truck trips in pick-up and delivery through comprehensive tour planning
  - building of FTL (full truck load) by bundling smaller volumes

current **prototype** based on zip-codes (Germany) and rail connections from Duisburg and Dortmund

MultimodalPromotion

Bitte beachten Sie, dass es sich hierbei um einen ersten Prototypen gegeben ist. (Weitere Informationen)
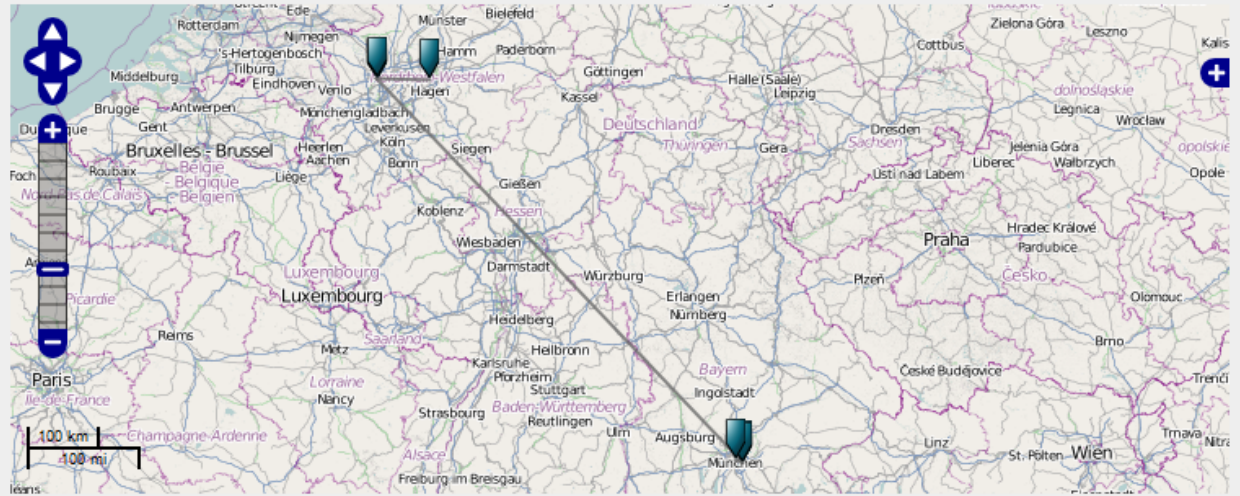
Absender

Land	PLZ
Deutschland	44227

Empfänger

Land	PLZ
Deutschland	80333

frühste Abholung

Datum	Uhrzeit
02.02.2012	09:00

späteste Ankunft

Datum	Uhrzeit
09.02.2012	13:45

Kriterien
- ◉ Kosten
- ○ CO2-Emissionen
- ○ Zeit

Verkehrsträger
- ☑ Schiene
- ☑ Wasserstraße

Kriterium	Abschnitt	Verkehrsträger	von	nach	Abfahrt	Ankunft	CO2 (Gramm)	Kosten (€)
⊟ Kosten								
	1	Straße	44227	Duisburg - DUSS	Do 11:58	Do 22:00	88.92	86.40
	2		Straße	Schiene			0.00	50.00
	3	Schiene	Duisburg - DUSS	München - DUSS	Fr 00:00	Fr 00:00	143.29	356.35
	4		Schiene	Straße			0.00	50.00
	5	Straße	München - DUSS	80333	Fr 02:00	Fr 03:09	894.12	13.05
	5 Abschnitte		44227	80333	Do 11:58	Fr 03:09	1126.33	555.80

Passende Relationen suchen   Buchungskontakt

- web interface to facilitate „modal-choice" by entering transport data
    - load unit short description
    - origin-destination-information
    - time window

- required data is already available from transport orders – routing takes in account
    - handling times in terminals
    - time slots
    - schedules from rail and barge transport

- checking „shift potential" for shippers with no specific „combined transport" knowledge possible

Improving logistics ..
is about structure and processes

- **Analysis of distribution and consolidation strategies**
  Determination of optimal stratification (modes of transport, types of storage, capacities, inventory management etc.)

- **Positioning of logistics facilities:**
  Optimization of # of locations and allocation of facilities

- **Optimization of costumer allocations:**
  Calculation of distribution areas determined by storage capacities

- **Strategical and tactical route scheduling:**
  Determination of solid standard runs and required vehicles

- **Calculation and controlling of transport costs:**
  Calculation of transport costs due to given tariffs, verification of forwarder's bills / tariffs / offers
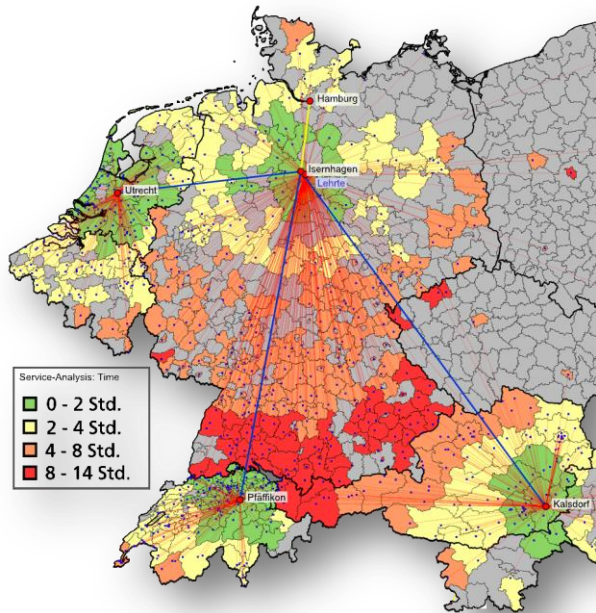
Optimal locations help to cut costs and to improve service ..

In the "HILTI case" Fraunhofer researchers suggested more location for better service and different "national DCs" for the supply from Europe and Asia respectively
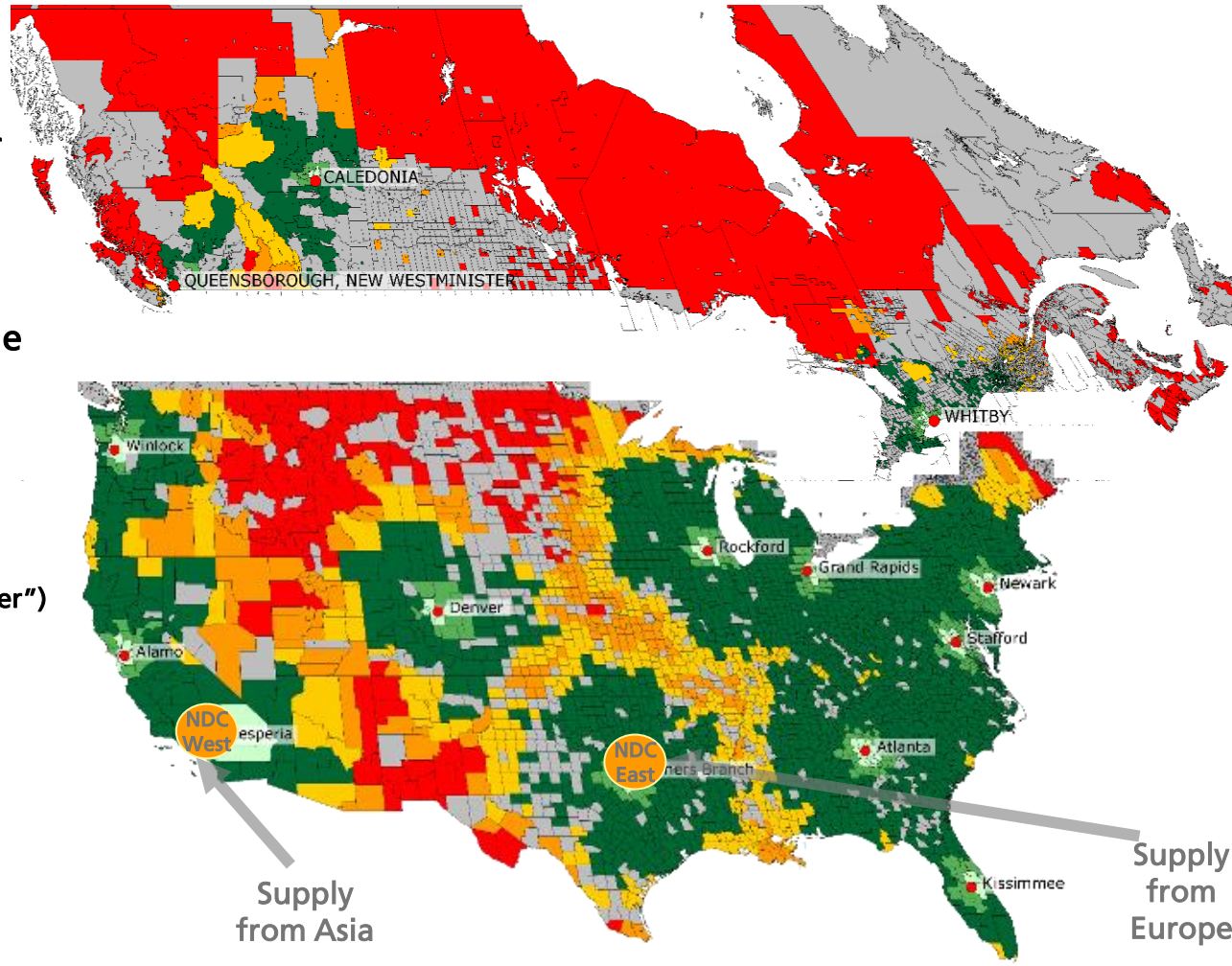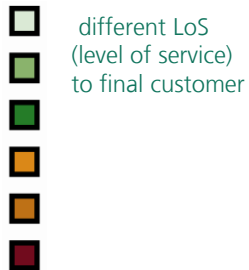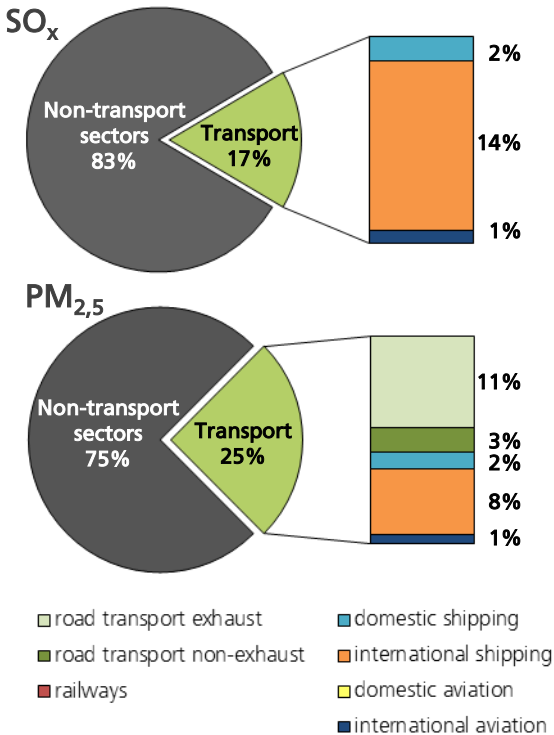
(from 2009, work "before EffizienzCluster")

different LoS
(level of service)
to final customer

NDC West

NDC East

Supply from Asia

Supply from Europe

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but logistics is not only for today´s customers …
.. we need to be sustainable and „serve future generations"

Contribution of transport sector to total emissions of main air pollutants in 2009 (EEA-32) [1]

SO$_x$

Non-transport sectors 83%
Transport 17%

- 2%
- 14%
- 1%

PM$_{2,5}$

Non-transport sectors 75%
Transport 25%

- 11%
- 3%
- 2%
- 8%
- 1%

- □ road transport exhaust
- □ road transport non-exhaust
- ■ railways
- ■ domestic shipping
- ■ international shipping
- □ domestic aviation
- ■ international aviation

(1) TERM 2009

- ■ "Green Logistics" stands for environmental friendliness and resource efficiency

- ■ The environmental impact of logistics covers
  - ■ Its contribution to the global warming, i.e. amount of GHG emissions caused by logistics processes as well as
  - ■ Further pollutant emissions, for example sulphur oxides SO$_x$, particulate matter PM

- ■ Green Logistics focuses on the whole logistics chain, i.e.
  - ■ Transport
  - ■ Intralogistics
  - ■ Logistics real estate
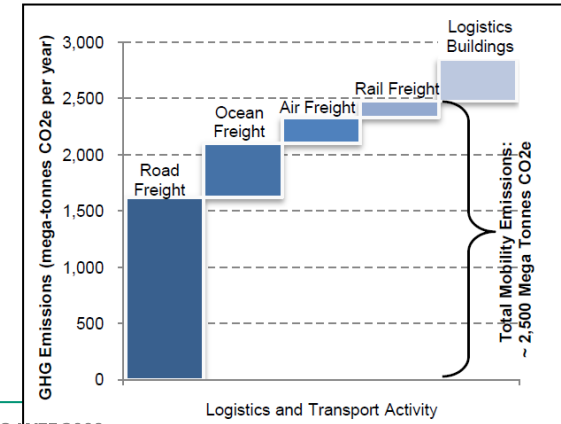
Scope of the „green logistics" project

TRANSPORT

LOGISTICS REAL ESTATE

INTRALOGISTICS

data base and principles for ecological assessment of logistics

key figures, methods, reference processes and technologies, procedures, mathematical model, balance scopes, …

products

TRANSPORT

LOGISTICS REAL ESTATE

INTRALOGISTICS

› certification system
› assessment kit with standard modules

realization

low carbon logistics network

low carbon logistics real estate

low carbon intralogistics

result / benefit

reduction of CO_2 emissions

green revolution within logistics

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Let´s be prepared regarding threats to transportation

Cargo theft / reliability

daily operative relevance

political relevance

Terrorism
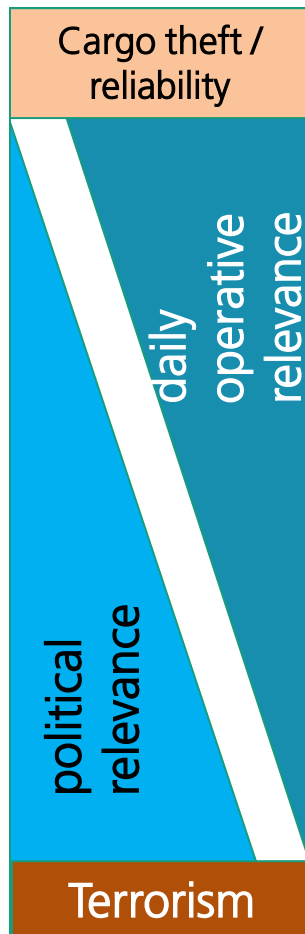
Common threats in the transportation chain

- suppliers no-show
- in-transparency of supply chains
- lack of reliability
- **cargo theft, vandalism and accidents** (highest relevance for the supply chain)

New threats for the transportation chain

- **Cyber-attacks**
- **terrorism** (political challenge)
  - hazard of transport flows by terror acts or other intervention of third parties
  - hazard by using modes of transport as weapons
- **increasing number and / or severances of extreme weather events**
- **organized crime**

main goals

Secure and efficient logistic processes : prevention, identification and coping

- balance logistical requirements with requirements of safety and security (by politics and government)
- "produce security" instead of focus on (repeating) checks & control activities

realized steps & findings

- identification of relevant logistic processes
- most relevant threats appear at stops of the land transport modes (interfaces)
- staff and organization orientated measures count
    - training, awareness of staff
    - transparent and efficient processes
- security "begins with the transportation chain"
- keep security on the achieved level

BAM
Bundesanstalt für Materialforschung und -prüfung

Fraunhofer
IML

BME
Bundesverband Materialwirtschaft Einkauf und Logistik e. V.

KÜHNE+NAGEL

Studiengesellschaft für den kombinierten Verkehr e.V.
SGKV

TUHH
Technische Universität Hamburg-Harburg

duisport

HLI
Hamburger Logistik Institut GmbH

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Sheet 15

aviation - case "Frankfurt Airport"

As of March 25, 2008, source: Fraport

- Frankfurt Airport (FRA) is one of the world's most important international airports
- at the center of the major part of intra-European air service **networks** and offers connecting services to long-haul destinations worldwide
- FRA plans to expand with a fourth runway and a **new Terminal 3**
- modifications of the airport to make it **Airbus A380** compatible have already started
- The overall construction volume is more than **7 billion Euros** in the next 8 years
- Over 400 projects need to be coordinated on the airport area
- **Fraunhofer** helped FRAPORT with supply and disposal concepts (delivery strategies, stock and field management, waste disposal management)
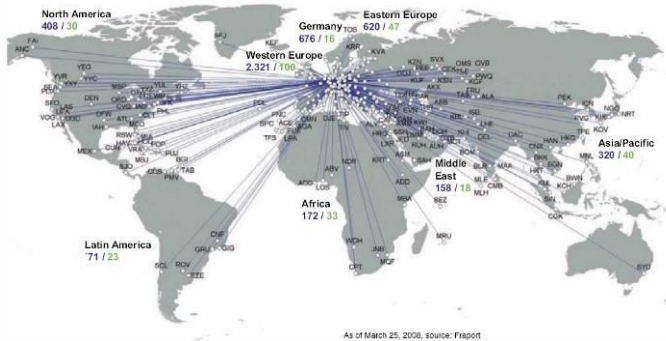
„Secure Advanced Air Cargo Transfer System" (SAATS)
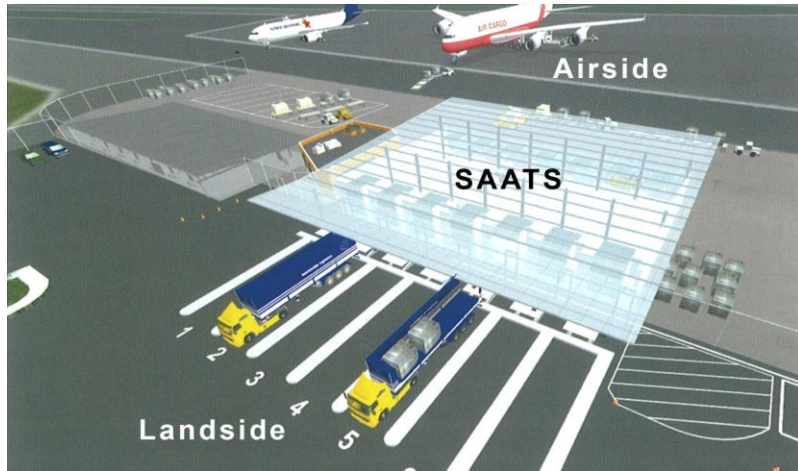
- Reduction of process interfaces
  - Process acceleration and shorter ground times for air cargo at airports
  - Increased security to prevent unauthorized access and manipulation of ULDs
  - Lower risk of damage
- Optimized use of space by centralizing of warehouse and cargo handling areas
- Decoupling of land- and airside transport and transshipment processes
- Reduction of truck gate traffic at forwarder and handling agents

„Secure Advanced Air Cargo Transfer System" (SAATS)

current process

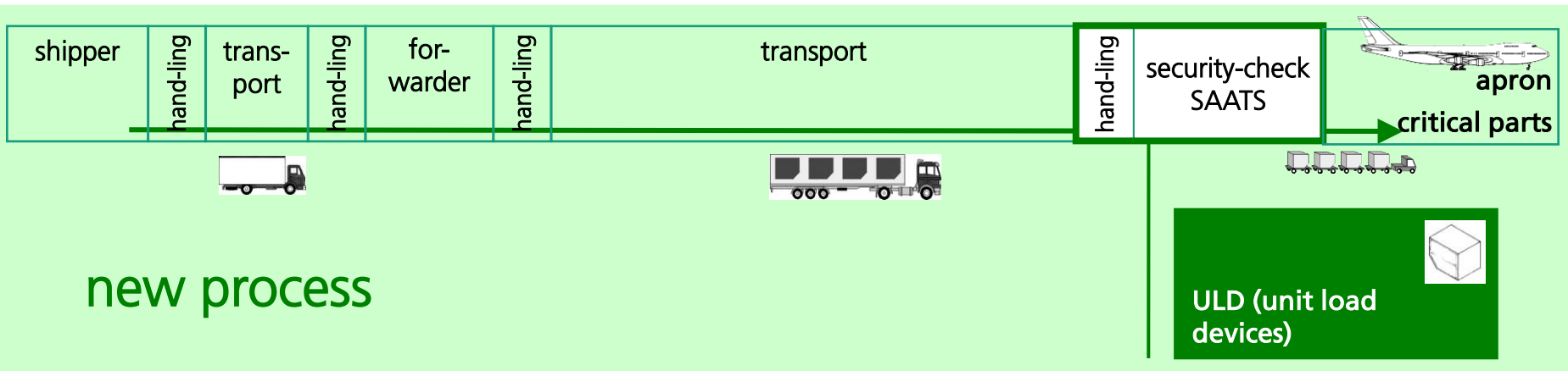ULD (unit load devices), tractor, trailer, driver

| shipper | hand-ling | trans-port | hand-ling | for-warder | hand-ling | trans-port | hand-ling | airline handling-agent | hand-ling | trans-port | security-check CP-Gate | apron / critical parts |

new process

| shipper | hand-ling | trans-port | hand-ling | for-warder | hand-ling | transport | hand-ling | security-check SAATS | apron / critical parts |

ULD (unit load devices)

EffizienzCluster LogistikRuhr

Referenzen Projektzentrum Luftverkehrslogistik

# the future of Air Cargo Security solutions in Europe

- To avoid additional security controls of each shipment air cargo shippers in Europe have to be approved by the National Aviation Authorities as a "known shipper" under EU Regulation 185/2010
with the deadline on 28 April 2013

- Otherwise each package has to be x-rayed or examined in another way in a secured supply chain before it can be taken on board of a flight

- It is expected that in future this more stringent security requirements will be provided in three different ways:

  1. a reduced share of approved known shippers (less than 50%)

  2. an increased share by additional security services to be provided by forwarders and handling agents

  3. a new share by dedicated security services provider

➔ Air Cargo Security in future means: higher expenses, more stakeholders involved and various process variants

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Sheet 19

Summary

globalization is an ongoing process providing challenges and huge opportunities for individuals and institutions.

logistics needs long-term planning as well as short-term flexibility, innovative, and affordable solutions.

logistics of the future will have to be robust, safe and sustainable.
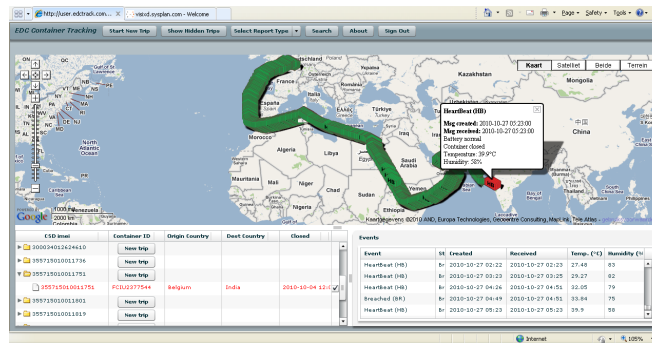
Thank you !

Prof. Dr.-Ing. Uwe Clausen

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Homepage: http:// www.itl.tu-dortmund.de

Director, Fraunhofer-Institute for Material Flow & Logistics (IML) Dortmund
Chairman, Fraunhofer Transport Alliance, Germany
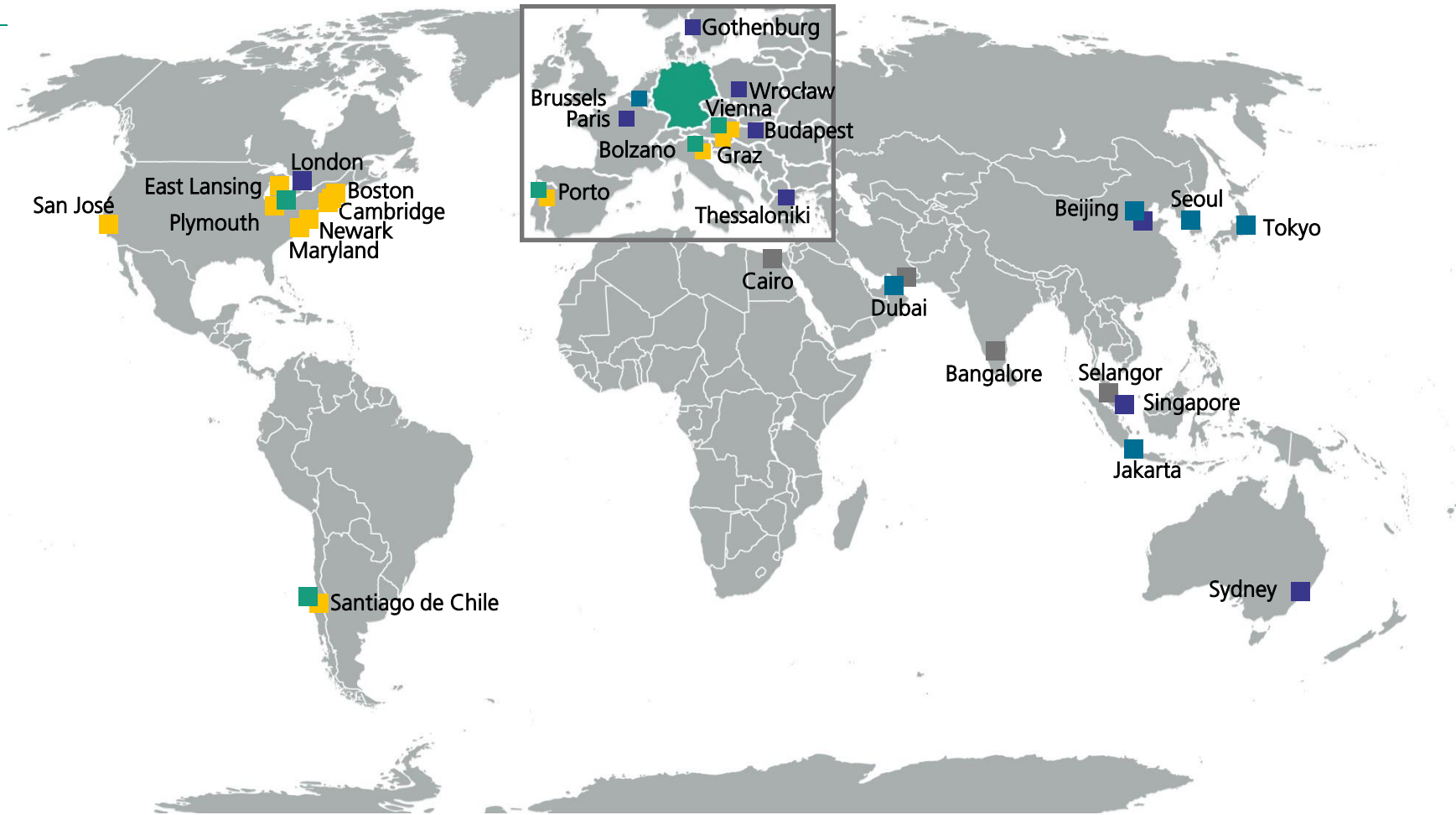
Phone: **+49 231 97 43 400**
Email: Uwe.Clausen@iml.fraunhofer.de
Homepage: http://www.iml.fraunhofer.de

BACKUP

Fraunhofer

IML

Fraunhofer worldwide

Legend:
- ■ Subsidiary
- ■ Center
- ■ Project Center / Strategic Cooperation
- ■ Representative Office
- ■ Senior Advisor

Locations shown:
Gothenburg, Brussels, Paris, Wrocław, Vienna, Budapest, Bolzano, Graz, Porto, Thessaloniki, London, East Lansing, Boston, Plymouth, Cambridge, Newark, Maryland, San José, Cairo, Dubai, Beijing, Seoul, Tokyo, Bangalore, Selangor, Singapore, Jakarta, Sydney, Santiago de Chile

Fraunhofer IML

EffizienzCluster LogistikRuhr

SECTION MATERIAL FLOW SYSTEMS

Quality Management and
Organization Systems,
Intralogistics and IT Planning,
Autonomous Transport
Systems,
Machines and Facilities,
Packaging and Trade Logistics,
Software Engineering

SECTION ENTERPRISE LOGISTICS

Enterprise Planning,
Supply Chain Engineering,
Production Logistics,
Maintenance Logistics,
International Enterprise
Development

SECTION LOGISTICS, TRAFFIC, ENVIRONMENT

Environment and Resource
Logistics,
Traffic Logistics,
Health Care Logistics,
Project Center Airport,
Project Center Traffic,
Mobility and Environment,
Center for Maritime Logistics
and Services

Logistics, Traffic, Environment
Prof. Dr.-Ing. Uwe Clausen

ENVIRONMENT AND RESOURCE LOGISTICS	TRAFFIC LOGISTICS	PROJECT CENTER AIRPORT	PROJECT CENTER TRAFFIC, MOBILITY AND ENVIRONMENT	HEALTH CARE LOGISTICS	CENTER FOR MARITIME LOGISTICS AND SERVICES
Dr.-Ing. Marc Schneider	Prof. Dr. Alex Vastag	Dr.-Ing. Heinrich Frye	Dipl.-Ing. (FH) Wolfgang Inninger	Dr.-Ing. Sebastian Wibbeling	Prof. Dr.-Ing. Carlos Jahn
Disposal and closed loop economy	Distribution logistics and procurement planning	Airfreight handling	Safety and logistics	Pharma-Logistik	Sea Port planning and maritime fleet management
Environment and resources	Network planning and dispatching	Baggage handling	Traffic planning and simulation	Hospital Logistics	Forecast, professional information and strategy
Building logistics	Information and communication systems	Ground handling Services	Mobility, information logistics for traffic and tourism	External Logistics in Health Care	Process- and IT-management
	Multimodal logistics	Check-in control		Pharmaceutical Logistics	
		Air traffic security		Home and Senior Care	
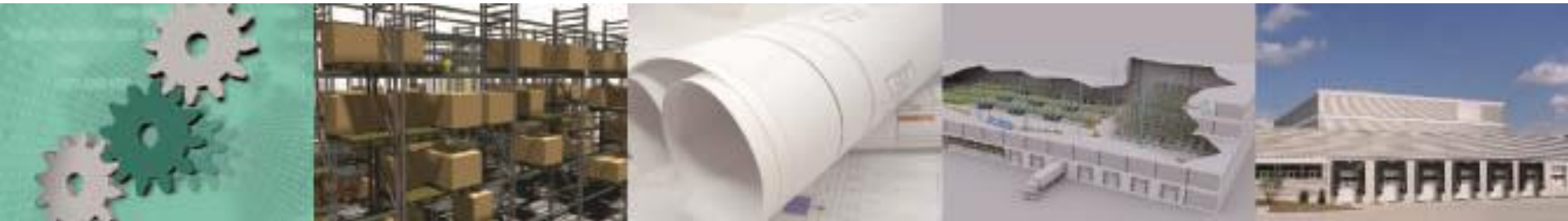
Outlook of Secure Unit Load Transfer via SAATS optimized by „integrated air cargo hub" project (IACH)

Information data base

Information Provider

Applications/ Tools

Control and Optimization

Consignor → Trucker: Pre carriage → Forwarder Hub → Handling Airline → BVD Transport → Air transport
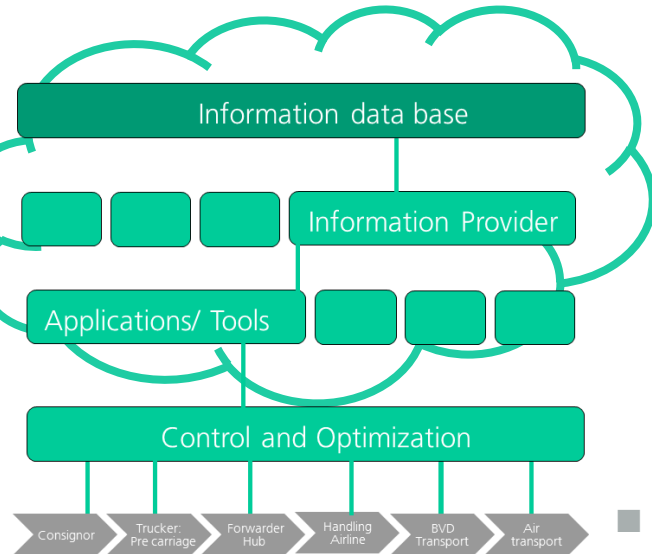
- **SAATS supports a wide variety of processes of the secured supply chain**
  1. Transfer of secured Unit Loads of local handling agents
  2. Transfer of secured Unit Loads of local forwarders
  3. Transfer of secured Unit Loads of remote handling agents (Road Feeder Service)
  4. Transfer of secured Unit Loads of remote forwarders
  5. Transfer of secured Unit Loads of dedicated security service provider

- **SAATS provides mainly the infrastructure for efficient transfer**

- **SAATS enables a high potential for further process optimization**

- **Focus is on integration of stakeholder processes**

- **Key driver is information technology**

Project Objectives

- Process optimization across company borders (from shipper to aircraft)

  - Lowering the resource demand and the process times at the hub airport

  - Integration of processes, planning tools and information flow of the air cargo supply chain participants

- Optimization of the processes between the participants through prototypical implementation of applications

- Development of business models among cost-benefit-sharing aspects
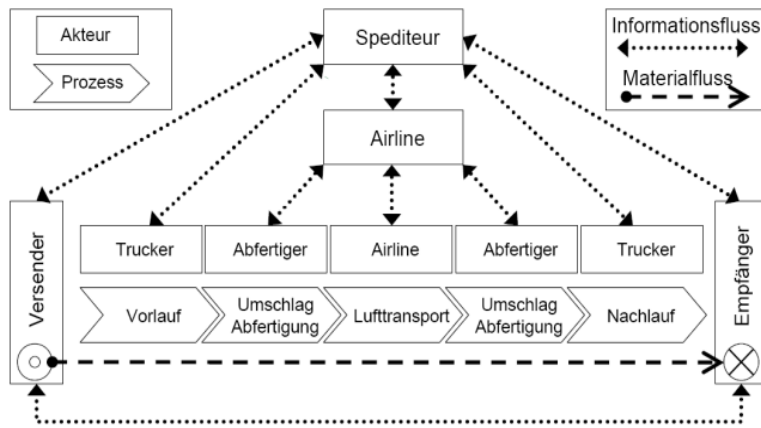
Intermediate results

- Process analysis
- Identification of the starting points
- Clustering into three application fields

In progress

- Development and testing of demonstrators (Apps)
- Evaluation of representative model applications

Aspired utilization

Optimization approaches

Potential area 1 landside/landside	Potential area 2 landside/airside	Potential area 3 information exchange
Design alternative 1-m	Design alternative 1-n	Design alternative 1-p

FRA Airport App

FRA Cargo App

Methods area of application	ELA Projects
Mathematical optimization	A User-guided planning tool to bundle rail products using decentralized delivery points — DB Mobility Networks Logistics
Material flow simulation	Optimal resource control in multi-user distribution centers
Forecast	Intelligent Control in area utilization and supply of contract logistics — LOGWIN
Area utilization and operational strategies	Efficiency of sorting in light of mission properties — AMETRAS nobab
Resource planning	
Layout- und gate allocation planning	A user-guided planning tool for the management of resources on large factory sites / development EcoSiteManager — ESG

Future satellite localisation services will help to improve traffic and security

- market-oriented **research project (MAVO)** »Galileo «
- collaboration with the aim to get into the market for applications of global satellite navigation systems
- focus is on the European system under development »Galileo« which will bring add-ons compared to the US-based GPS

Projects & Labs

- localization technology
- freight traffic
- construction site logistics
- travel assistance
- immission monitoring
- safety

Involved Institutes within Fraunhofer Transport

- FIRST, IFF, IIS , IML, IPK, ITWM, IVI, SCS

Aircargo Master Planning
Cargo 2020+ at Munich Airport

- Long term master plan for cargo handling based on the evaluation of location alternatives and on a cost benefit analysis

- Cargo volume and areal demand development

- Determining the cargo volume of each local handling agent and its specific floor space deficit

- Dimensioning the ULD handling facilities, staging areas, and ULD buffer space

- Developing suitable layouts and defining milestones

Flughafen
München

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.. and Fraunhofer helps globally

Example: Sanshan Logistics Park

➢ Sanshan port lies in the junction of the two important waterways of Dongpin and Chenchun. The two rivers, run through Pearl River Delta District, connecting closely the Sanshan port and Hongkong together. Therefore, Sanshan is a very important logistics hub location in Pearl River delta .

➢ About 13 sq. km land is available for further development of port infrastructure and logistic park.

➢ Fraunhofer IML has made a professional planning for the Sanshan Logistics Park in 2004.

Source: Fraunhofer IML

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.. and turns ideas to reality.

Example: Sanshan Logistics Park
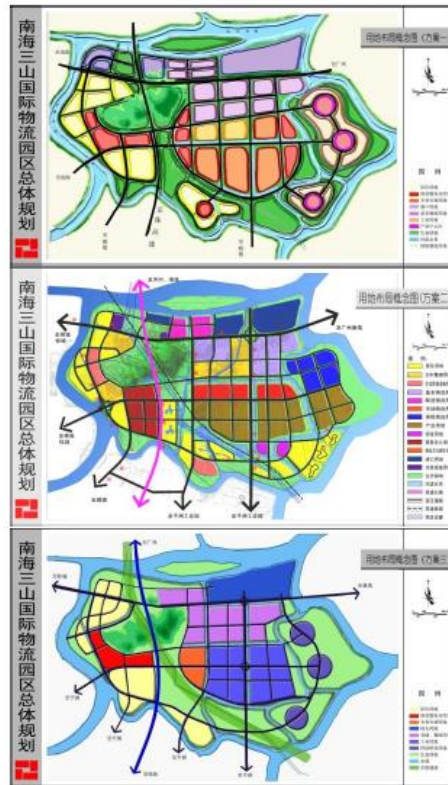
Planning and **Reality**

Sanshan Logistics Park | Sanshan Business and Recreation Center

Source: Sanshan

Example: Sanshan Logistics Park

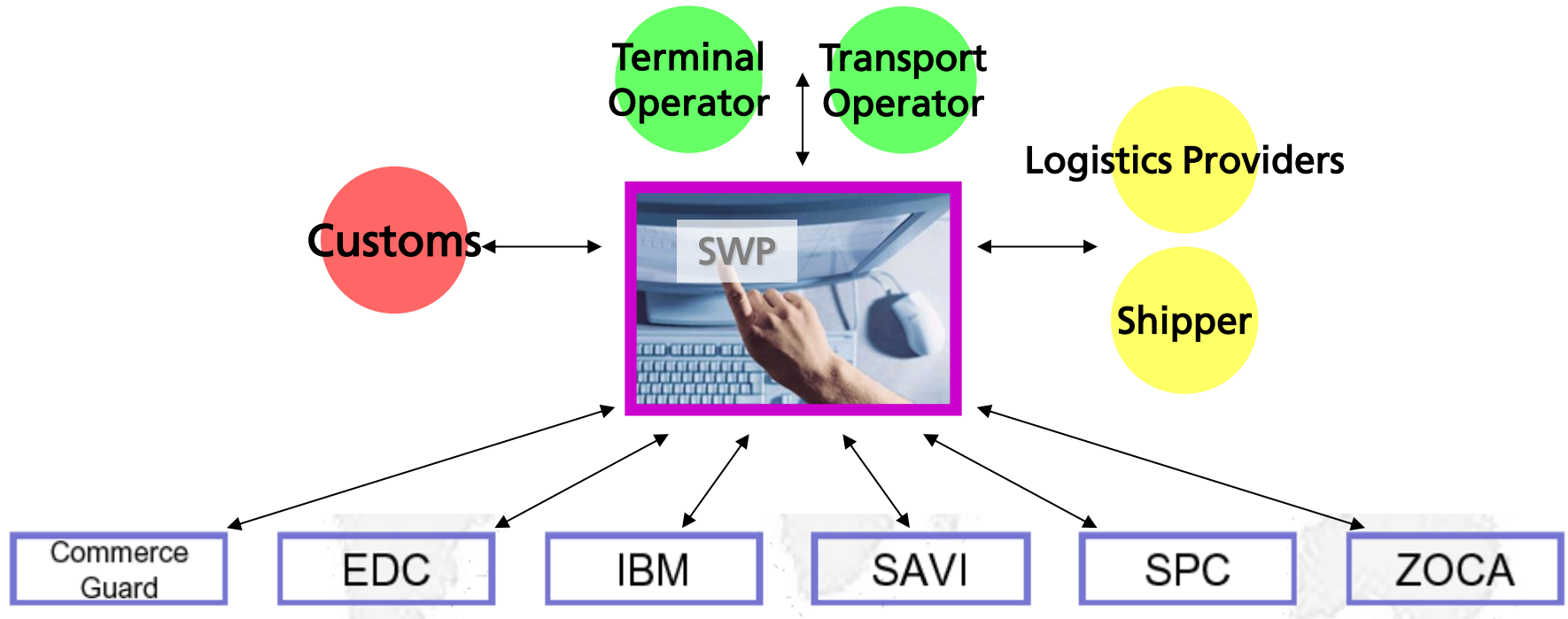Supply Chain Cluster was in focus of the planning of the Sanshan Logistics Park .

Import material进口原材

Buffer 缓存

Processing 剪切加工

Deep processing 深加工 (汽车构件)

Warehousing & distribution 仓储、配送、交付
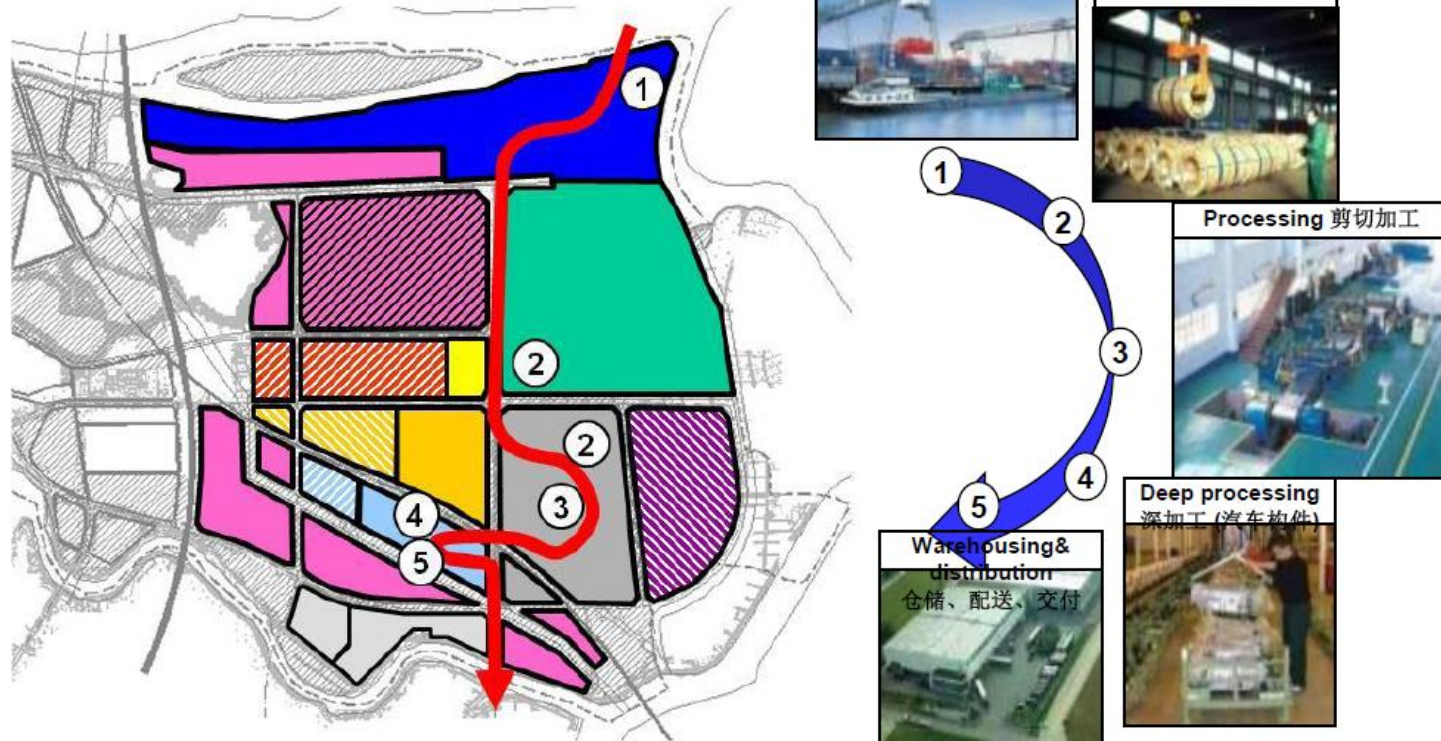
Source: Fraunhofer IML

SMART-CM objectives

- Stimulate **interoperable B2B co-operation** in door-to-door container transport security.

- Develop compliant application of **B2B** and **B2A** container security data solutions with international **Customs** operations.

- Develop a **neutral** approach and **service platform** for secure and interoperable data communications.

- Define **value added services (VAS)** to fulfill operational requirements of actors in managing global container chains.

- Develop prototypes of **advanced applications** in global container management, such as dynamic scheduling.

- Contribute to **standards development** for advancing of interoperability of technologies applied in global container transports.

SMART-CM approach (1/2) "Single Window" platform

Terminal Operator

Transport Operator

Logistics Providers

Customs

SWP

Shipper

Commerce Guard

EDC

IBM

SAVI

SPC

ZOCA

Container Security Technology (CST): active RFID / satellite comms / multi-sensoric units

Fig.: Porthus

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SMART-CM approach (2/2) neutral communication & service platform
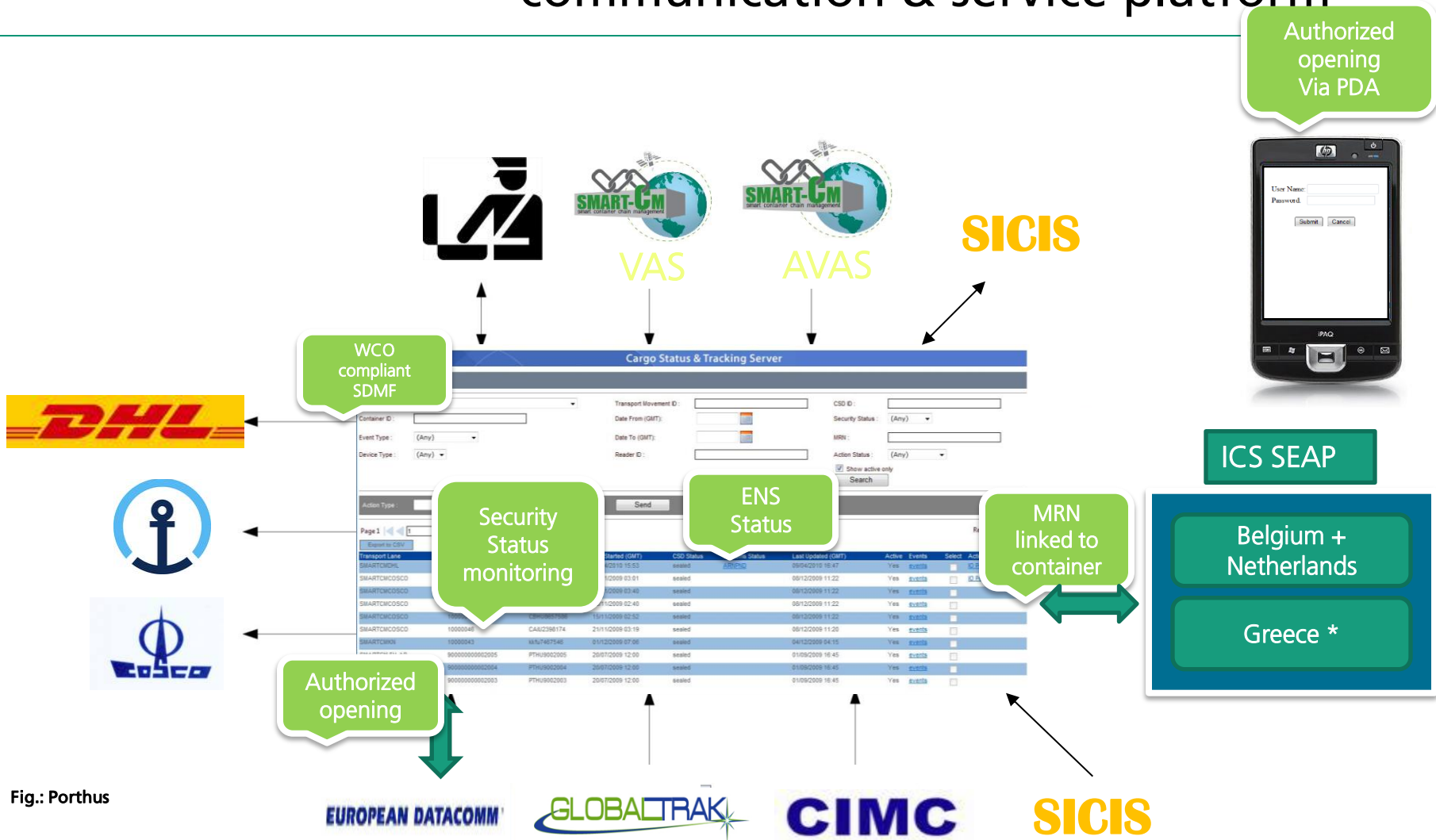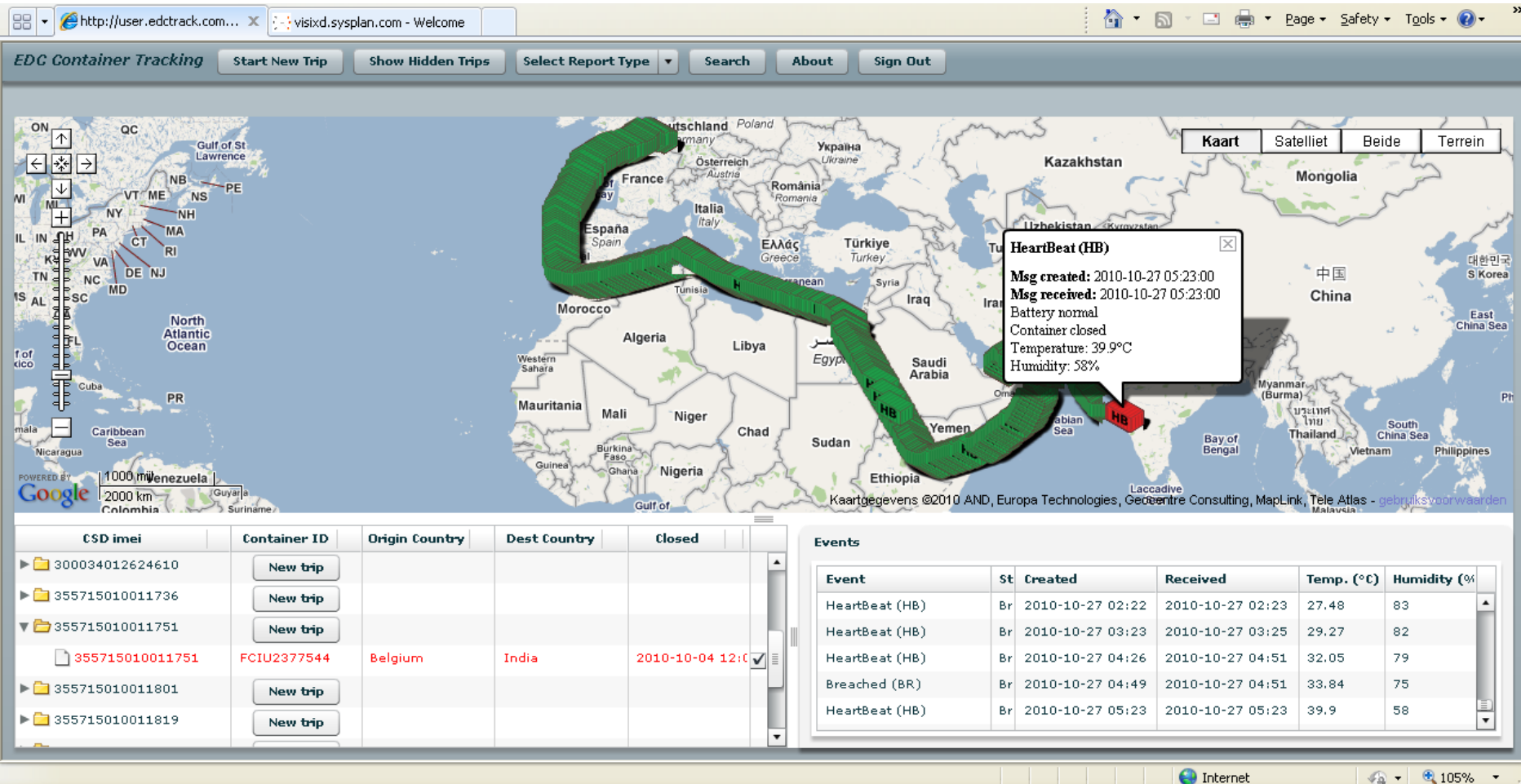

Fig.: Porthus

Permanent, pro-active tracking & tracing / controlling

Fig.: TREDIT

High volumes are ordered

Poor integration

Unable to hold delivery dates

High Stock
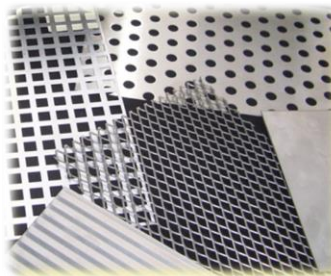
SafeNetworks for Logistics

Expensive ad hoc solutions

// Ensure the supply safety and strengthening the region with robust and efficient Supply Chains

- Increase the delivery reliability by improving the information exchange between partners

- Early recognition of disruptions along the transport chain

- Pro-active notifications when negative effects are detected
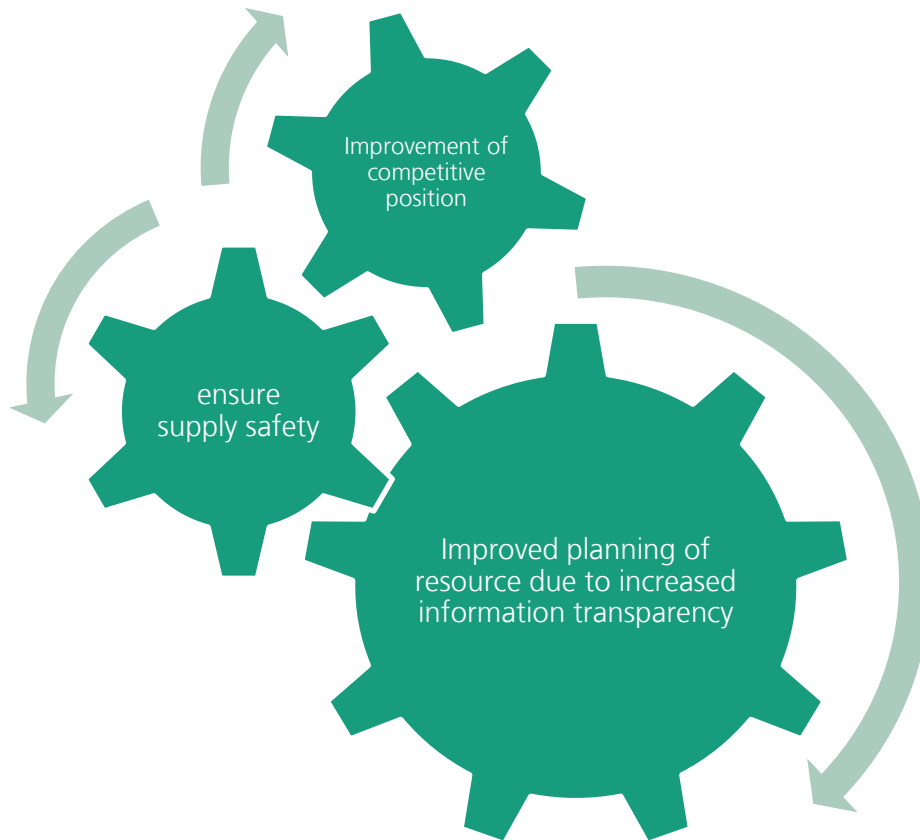
Forwarding information about real demands

Insight into demands and stocks of partners

Virtual consolidation of status and stock information

// **Optimization of logistic flows**

// **Complete monitoring of the Supply Chain**

// **Reduction of stock along the Supply Chain**

- **Reduction of lead times**

- **Lower capital lockup**

// **Increase of customer satisfaction**

Introduction Safe Networks for Logistics
\\ Three solutions are developed in this project

- **Solution 1 – Information Plattform** is used for exchanging information about real demands between partners

- **Solution 2 – Event-Management** is used for the monitoring of orders at item level through the Supply Chain

- **Solution 3 – Steel Service Center** is used for optimizing resources related to stock and value added services