The integration of Motorway of the Sea in international transport chains

3rd International Forum on Transportation

March 22nd 2007 - Brussels

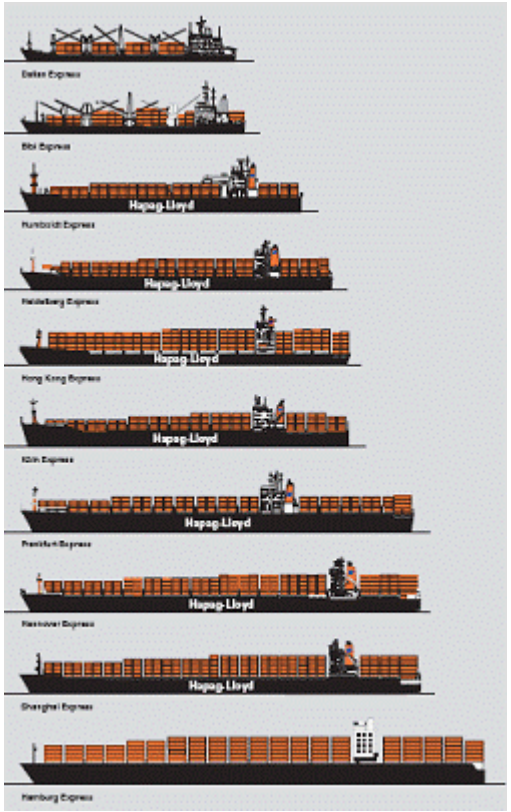
Professor Dr.-Ing. Uwe Clausen,
Director of the Fraunhofer Institute
for Material Flow and Logistics, Dortmund, Germany

Fraunhofer FVV Verbund Verkehr

Fraunhofer IML Institut Materialfluss und Logistik

FVV waterborne

Trends in shipping and international logistics – global transport



- 3.5 billion tonnes of freight loaded and unloaded in EU ports every year
- growth of worldwide container transport is approx. 10% per year since 1992
- enormous growth of international trade started in the 1990ies due to the opening of numerous markets → China!

- significant economies-of-scale by bigger ships
- concentration on main ports → container feeder shipping
- short sea services incl. RoRo connections in the last years increasingly operated with bigger vessels were introduced in Europe

Fraunhofer FVV Verbund Verkehr

Fraunhofer IML Institut Materialfluss und Logistik

FVV waterborne

Trends in shipping and international logistics – arising problems

- bottlenecks in container ports due to the strong increase of deep-sea-container transport, e.g. transhipment points between road and rail
- port areas are located in already developed regions with restricted opportunities to be enlarged
- longer and unreliable transhipment services
- solutions:
  - building new ports (e.g. Jade-Weser-Port)
  - integrating hinterland traffic with hinterland terminals to avoid the storage of containers in highly occupied ports
  - Seamless telematic services (e.g. combination of RFID and dynamic routing)

Fraunhofer FVV Verbund Verkehr

Fraunhofer IML Institut Materialfluss und Logistik

FVV waterborne

„Motorways of the Sea“

- **Definition**
  - high quality Short Sea Shipping transport links
  - high frequency departure of vessels → flexibility for shippers
  - quick transshipment and clearance in the ports
  - easy access for shippers and forwarders (Hinterland-Transport)
- **European Commission’s objectives**
  - environmental protection / modal shift towards SSS
  - reducing bottlenecks / improvement of transport links

Fraunhofer FVV Verbund Verkehr

Fraunhofer IML Institut Materialfluss und Logistik

FVV waterborne

„Motorways of the Sea“ – Preferred Goods and Vessels

- growth in transport is driven by the effect of modern logistic concepts and the increase in transport volume of high-value semi-finished and finished goods
- these goods and the logistics concepts caused growth in Europe especially on road - with a share of 37% in cross-border transport
- mostly transported in containers, semi-trailers or trucks
- potentials for modal shift are identified in these market segments
- definition of EU-Commission: regular, frequent, reliable services with easy access

  - focus on container and RoRo vessels in maritime transport
  - using established loading units

Fraunhofer FVV Verbund Verkehr

Fraunhofer IML Institut Materialfluss und Logistik

FVV waterborne

Integration in transport chains

Goal:

- to achieve a modal shift to Short Sea Shipping

Approach:

- the efficient integration in intermodal transport chains by considering following aspects
  - Economical
  - Technological
  - Organisational and operational
  - Informational

MOSES
Motorways of the Sea European Style

Fraunhofer FVV Verbund Verkehr

Fraunhofer IML Institut Materialfluss und Logistik

FVV waterborne

Core objectives of the project „MOSES“

- produce a comprehensive and validated methodology for developing MoS services through integration of technology with organisational, economic and regulatory aspects.
- assess the impacts of the MOSES innovations and resulting policy recommendations and to develop tools to assess and certify MoS services
- produce a blueprint for designing and implementing efficient, safe and secure MoS, verified and validated through business case Demonstrators
- develop a marketing strategy to make MoS the obvious mode for freight transport by user and key decision makers

2007 – 2010

41 partners from 15 countries

Industry: shipping companies, ports and terminals, shipper

Research: Universities, Research-Centres, consultancies, associations

Fraunhofer FVV Verbund Verkehr

Fraunhofer IML Institut Materialfluss und Logistik

FVV waterborne

Objectives of the research project „MOSES“
Validated concepts for MoS-Services & Impact Assessment

- a methodology for the development of new integrated concepts for the seamless MoS
- identify key global logistics trends and driving forces and establish four scenarios for how European Logistics and Distribution could develop 10-20 years into the future
- define innovative detailed concepts for sea transport, terminal interface and hinterland transport (technical, operational, organisational, logistic, infrastructure, legislative, informational and economic aspects)
- Test and validate the methodologies and tools (application in business cases and to refine them on basis of this experience)
- develop new methodologies for financing
- assess the impact of identified policy recommendations and of the proposed accompanying measures

Fraunhofer FVV Verbund Verkehr
Fraunhofer IML Institut Materialfluss und Logistik
FVV waterborne

Objectives of the research project „MOSES“
Blueprint for designing and implementing MoS

- establish and sustain best practices throughout intermodal networks with a sea component
- identify and define tools for comparative measurement of intermodal chains (MoS)
- develop pricing policies and financing mechanisms that will enable public and private institutions to provide the necessary support for market based solutions
- analyse the feasibility for the deployment of the MoS network
- make recommendations for new and existing policies required for the successful development, implementation and deployment of MoS
- develop training, dissemination and community building action plan and raise awareness, organise training and disseminate results

Fraunhofer FVV Verbund Verkehr

Fraunhofer IML Institut Materialfluss und Logistik

FVV waterborne

Modelling of seaport hinterland traffic – Motivation

Collaborative Research Centre 559
Modelling of Large Logistics Networks

- **Strong increase of containerised transport** over the last decades
- **Approximately 65-80% of the total cost** for the transport of containerised goods **result ashore**
- **Concentration** („Main ports“) and further bundling through ever bigger container ships
- **Bottlenecks** between ports and the hinterland delivery of containers
- Increasing integration of container transports in logistics processes, also for JIT-production

Fraunhofer FVV Verbund Verkehr

Fraunhofer IML Institut Materialfluss und Logistik

FVV waterborne

Necessary infrastructure information for trimodal transport chains

Road Network

- Speed depending on type of road (highway, federal road, etc.
- Intersections
- Distances
- Infrastructure costs (Road pricing)

Rail Network

- Track gauge
- Max. axle load
- Train control system
- Electrification
- Max. train length
- Gradients
- Max. Speed
- Brake type and effort
- Loading gauge
- Intersections
- Distances
- Infrastructure costs (Track access charge)

Inland Waterway Network

- Classification of waterway (max. length and width)
- Location and length and width of sluices
- Operating times of sluices
- Location and clearance height of bridges
- Average draught
- Max. Speed
- Intersections
- Distances
- Infrastructure costs (Fees for channels and sluices)

Terminals

- Location
- Type of Terminal (Rail, Barge, trimodal)
- Length of quay/track
- Max. width of barge / length of train
- Available storage area
- Distance for barge-rail transhipment
- Number of cranes or other handling devices
- Operating hours
- Value-added Services:
  - Empty container depot
  - Stuffing and Stripping
  - Customs

Fraunhofer FVV Verbund Verkehr

Fraunhofer IML Institut Materialfluss und Logistik

FVV waterborne

Goal of the modelling approach: Planning instrument for the design of new transport offers

- **Strategic-tactical planning:**
  Design of new transport offers including departure frequencies, turn-around times and transport means to be used
- Consideration of **bi- or trimodal transport chains** to best utilize capacities
- Examination of **production cost** of transport offer, as well as existing market prices
- **Potential users** of the model:
  Operators of trimodal transport networks for inland container traffic (shipping lines, logistics service providers, intermodal operators, ports)

Fraunhofer Verbund Verkehr

Fraunhofer Institut Materialfluss und Logistik

FVV waterborne

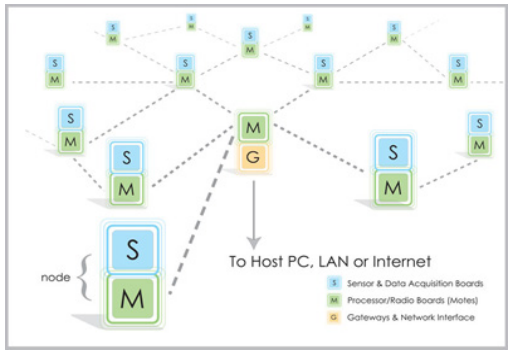
Implications for Inland Terminal Operators

Collaborative Research Centre 559
Modelling of Large Logistics Networks

- Trimodal transport chains are **feasible for a high share of goods** transported in containers
- Future terminal planning should consider their implications on terminal layout
- More important than the transhipment within the terminal is a **good terminal access**, especially for rail transport, to reduce unproductive times of transport means
- **Combination with continental combined transport** should offer even more possibilities for trimodal transport chains

Fraunhofer Verbund Verkehr
Fraunhofer Institut Materialfluss und Logistik
FVV waterborne

Dynamic-Routing enabled by real time information



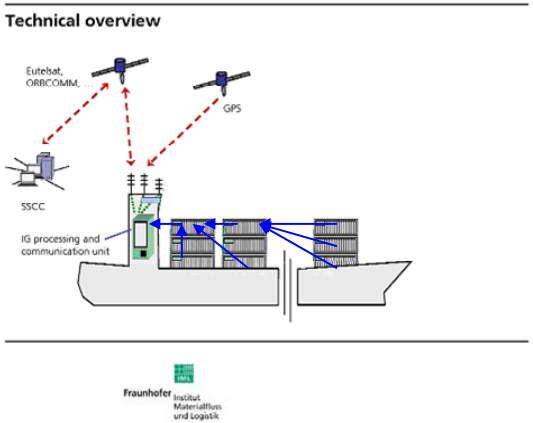
- "Internet of Things" - Vision of the Fraunhofer IML
  - goods (Container) act like packets within a data network
- micro level decision = macro level optimisation
  - automatic routing based on actual situation within the network (capacity optimisation, bottleneck avoidance, etc)
  - minimising costs and delays
- dependency on information flow
  - Up-to-date and precise data, decentrally available
  - Intelligent goods provide necessary information (e.g. extended freight manifest part of Container)

Fraunhofer FVV Verbund Verkehr

Fraunhofer IML Institut Materialfluss und Logistik

FVV waterborne

Intelligent Container



- robust embedded device attached to container / intelligent telematic box (includes RFID-Tag, local communication, small processor)
  - autonomous energy supply
  - shock prove
  - competitive priced, etc
- positioning and worldwide communication provided by gates such as nodes (ports), transport vehicles (vessel, etc.)
- short range communication of Container among them self and to gates (meshed networks, avoiding disadvantageous of position in container vessel)

Fraunhofer Verbund Verkehr

Fraunhofer Institut Materialfluss und Logistik

FVV waterborne

Summary

- Maritime transport is increasing
- Motorway of the Sea is a concept of a intermodal maritime-based transport chain aiming at
  - developing an easy and attractive freight transport
  - modal shift from road to sea
- Optimization of the entire transport chain, interfaces and information flow
- Information on all transport modes necessary
- Research helps to optimize the entire transport chain
  - transport
  - transhipment
  - information flow and interfaces