TOWARDS SUSTAINABLE FREIGHT TRANSPORT: PERSPECTIVES FROM EUROPE

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Organization of Presentation

- EU Rail Freight Sector Policy Context
- EC Directives of Rail Infrastructure Package
- Barriers to Implementation
- Evaluating Market Potential of New Services and Operational Changes: REORIENT CORRIDOR
  - Network modelling platform
  - Border crossing time improvements
  - Terminal improvements
  - Infrastructure improvements
  - Scheduling constraints and priorities
- The take-away: potential of operational changes
- Lessons for the US?
EU Freight Sector Policy Context

- Major motivation: heavy costs of road congestion in terms of productivity, energy, air quality and carbon footprint
- **Freight sector policy driven by improving sustainability through shifts from road to rail: increase rail market share, recognizing role of intermodal and sea-based transport**
- Key instrument: Legislation in 2001, updated in 2006–EC Directives of the Rail Infrastructure Package:
  - Intended as “coherent set of legislation fundamentally reforming market access rules in view of integrating the European rail service market”
Rail freight sector in Europe not well developed compared to rest of world

Modal share of rail freight in Europe has decreased over the past decade

Difference in Modal split between the transport modes 2006 versus 1995
Intermodal fastest growing component of rail freight

1995
- Heavy industry: 7.3%
- Fertilizers and chemical products: 10.0%
- Intermodal: 11.1%
- Agricultural products, foodstuffs and various products: 71.6%

2005
- Heavy industry: 9.0%
- Fertilizers and chemical products: 13.5%
- Intermodal: 14.4%
- Agricultural products, foodstuffs and various products: 63.1%
1. Historically dominated by government or quasi-government entities, with exclusive use of network
2. Priority for passenger services; freight secondary (often can run only at night)
3. Congestion common occurrence; slow speed, low priority for freight, unreliable service, not competitive with road
4. Technology incompatible across countries in EU, especially Eastern Europe; considerable variability in maintenance and operational practices across countries
5. Labor rules and administrative practices often incompatible with harmonized seamless services
Vision Guiding EU Rail Policy

1. Private, competitive rail and intermodal service operators providing targeted services to specific industries in priority freight corridors

2. Achieve interoperability, common standards and open access across all EU

3. Contain dominance of former government rail undertakings; separate infrastructure owner from service provider

4. Innovation in service provision to promote competitiveness with road transport; novel business models reflecting developments in logistics industry

5. Define and enhance rail freight network with priority services around selected international corridors

6. Targeted public investment in infrastructure enhancements, technological innovation and business model experimentation
Vision Guiding EU Rail Policy

Be more like the US (Competitive services, innovative offerings, high and reliable service levels) but on a historically different platform with established government monopolies ....
EC Directives of Rail Infrastructure Package

Seek far-reaching impact on regulatory framework for rail business in the EU through 3 key elements:

1. Separate infrastructure owner/manager from rail service provider (carrier): guarantee access rights for international freight services; incumbent railway undertakings (typically government owned) required to allow non-discriminatory access to the network.

2. Common conditions across EU for obtaining a railway licence and a safety certificate; common principles and procedures for the allocation of infrastructure capacity and the setting of infrastructure charges.

3. Independent national rail regulatory bodies to monitor competition and non-discriminatory access.
Barriers To Implementation of Directives

1. Technological: incompatibilities in gauge, electrification, communication, standards
2. Operational: different practices in different countries, border crossings, scheduling constraints, passenger priority
3. Institutional: entrenched government bureaucracies; incumbent undertakings resistant to change
4. Legal and administrative: laws and regulations remain to be harmonized to comply with interoperability directives
5. Financial: private capital skittish to invest in risky business
6. Social/cultural: varying degree of support for EU policies, for sustainability goals (red vs. blue states…)
Priorities for Operational Improvement

1. Improve efficiencies
2. Increase speed
3. Improve reliability
4. Transition industry from government-dominated bureaucracies to nimble providers of logistics services
5. Carrot approach to entice new entrants
6. Targeted corridor improvements to enable competitive new private intermodal rail-based services
7. Still major issue with freight vs. passenger priority: consideration of freight-only networks
MARCO POLO PROGRAM FOR SERVICE PROVIDERS (~$500M): FIVE KEY ACTIONS

1 – Shifting freight from roads to more environmental-friendly modes of transport
2 – Creating synergies between companies willing to overcome structural market barriers
3 – Making a more effective use of the motorways of the sea in combination with other modes
4 – Promoting traffic avoidance by targeting practices of transporters and the industry at large
5 – Encouraging cooperation amongst the key logistic players
Assessing the Market Potential of New Services and Lower Barriers REORIENT CORRIDOR

6th Framework Coordinated Action Program

Consortium
TOI (lead)
Maryland
Bologna
Napier
DLR
Demis bv.
Consolidation at Origin: Shipments to trucks.

Intermodal Terminal: Shipment transfer from trucks to railcars.

Shuttle Service (for traditional trains): From terminal to classification yard.

Classification Yard: Train assembly process. Not required for intermodal block trains.

Border Station: Train is delayed.

Classification Yard: Train is disassembled. For intermodal block trains, this process is not required.

Port: Transfer of shipments from railcars to ferry. Ferries move based on given timetables.

Shuttle Service (for traditional trains): From classification yard to port.

Destination: Unloading shipments.

Simulation-assignment method:

- processes simulated to determine processing costs and times at nodes and links of path
- Shipments assigned using joint mode-path choice assignment
- Detailed representation allows us to test various policies, such as infrastructure improvements, service frequency changes, and improvement in border crossing procedures.
The REORIENT corridor spans 23 countries.

<table>
<thead>
<tr>
<th>Network</th>
<th># of Nodes</th>
<th># of Links</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail part</td>
<td>5577</td>
<td>5753</td>
</tr>
<tr>
<td>Road part</td>
<td>4713</td>
<td>5460</td>
</tr>
<tr>
<td>Sea part</td>
<td>54</td>
<td>21</td>
</tr>
<tr>
<td>Total</td>
<td>10344</td>
<td>11234</td>
</tr>
</tbody>
</table>
### Demand and existing freight tariff scheme

- **3.2 million shipments per week (2006)**
- ✔️ **5.8 million for forecast year 2020**
- ✔️ **Source: ETIS**
- **117 x 117 O-D zone pairs**
- **11 commodity types**
- **2 manifestations (‘bulk’ and ‘unitized’)**

<table>
<thead>
<tr>
<th>Description</th>
<th>Ton/TEU</th>
<th>Import Flows</th>
<th>Export Flows</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>€/ton</td>
<td>s.d.</td>
</tr>
<tr>
<td>Agricultural products and live animals</td>
<td>12.74631</td>
<td>192.11</td>
<td>440.11</td>
</tr>
<tr>
<td>Foodstuffs and animal fodder</td>
<td>13.31296</td>
<td>276.13</td>
<td>661.47</td>
</tr>
<tr>
<td>Solid mineral fuels</td>
<td>18.40739</td>
<td>116.72</td>
<td>1678.30</td>
</tr>
<tr>
<td>Petroleum products</td>
<td>14.92787</td>
<td>109.93</td>
<td>228.82</td>
</tr>
<tr>
<td>Ores and metal waste</td>
<td>16.14077</td>
<td>89.04</td>
<td>269.82</td>
</tr>
<tr>
<td>Metal products</td>
<td>15.25173</td>
<td>212.82</td>
<td>487.00</td>
</tr>
<tr>
<td>Crude and manufactured minerals, building materials</td>
<td>15.07911</td>
<td>321.49</td>
<td>2461.83</td>
</tr>
<tr>
<td>Fertilizers</td>
<td>18.45192</td>
<td>58.91</td>
<td>147.86</td>
</tr>
<tr>
<td>Chemicals</td>
<td>14.04991</td>
<td>957.13</td>
<td>5955.17</td>
</tr>
<tr>
<td>Machinery, transport equipment, manufactured articles and miscellaneous articles</td>
<td>9.290191</td>
<td>805.45</td>
<td>4090.65</td>
</tr>
<tr>
<td>Crude oil</td>
<td>16.23117</td>
<td>159.30</td>
<td>1526.82</td>
</tr>
</tbody>
</table>

Source: ETIS
Validation of model split

<table>
<thead>
<tr>
<th>Weekly Flow in Tons (57,616,633)</th>
<th>Road only</th>
<th>IM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>47,327,745 (82.14%)</td>
<td>10,288,888 (17.85%)</td>
</tr>
</tbody>
</table>

This model

European Commission 2005: 17.4%
Four proposed service routes

T1 = Green (Bulk)
Swinoujscie -
Vienna/Bratislava - Budapest

T2 = Yellow (Unitized)
Trelleborg-Swinoujscie-
Bratislava/Vienna

T3 = Red (Unitized)
Gdansk/Gdynia-
Bratislava/Vienna-Budapest-
Beograd-Thessalonica

T4 = Blue (Bulk and Unitized)
Bratislava-Budapest-
Bucharest- Constantia
If we build it, will they come?
Proposed Services

- New rail services on current network
- New rail services on improved network
  - Multi-voltage locomotives
  - Improved signaling (e.g. ERTMS) along route from Gdansk to Thessaloniki
  - ICT for improved border station performance
  - 20% increase in speeds in Poland
  - Electrification of all tracks on proposed services
Potential Market for Proposed Rail Services

Weekly flow on new services in ton-km

Scenario 2 (Current)

Scenario 9 (Best)
Services: Catchment Area
(Origins of shipments using new services)
Illustrative results: barrier reduction at borders

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Border crossing times</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conservative</td>
<td>3-4 hours</td>
</tr>
<tr>
<td>Sophisticated</td>
<td>15-45 min</td>
</tr>
</tbody>
</table>
Illustrative results: Infrastructure improvements

• A bundle of infrastructure improvements:
  – 20% increase in rail maximum speeds in Poland
  – that would result from improvements in the track, electrification of track along all newly proposed services,
  – terminal processing time improvements

Increase serviced flows by 33%
Relaxing Time of Day Scheduling

<table>
<thead>
<tr>
<th>Level</th>
<th>Scheduling Constraint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>Night time only</td>
</tr>
<tr>
<td>Level 2</td>
<td>Additional day time operations with strict priority for passenger trains.</td>
</tr>
</tbody>
</table>

14.9% increase in intermodal flows

Flow on new services in ton-km

X $10^6$
**Sum of Parts**

- Services attract more freight when offered together
The take-away

- Improved border operations, infrastructure improvements, greater access to services, relaxing scheduling constraints have considerable potential to increase intermodal rail share.
- Further improvement possible through more sophisticated operation of the rail network to allow more efficient priority allocation to different services.
- Managing the rail system in the 21st Century will require new management models. Most promising models will be based on collaborative decision-making architectures.
Summary and conclusions: Lessons for US?

- Role for coherent national-level freight sector policy

- Possibly interesting models for passenger sector in the US, where there is traditionally greater public investment and ownership

- Targeted investment to encourage private sector engagement and innovation in areas of social/national significance: without picking winners or losers, facilitate engagement through open platforms and clear, transparent rules

- Watch development of public-private collaborative frameworks as public investment is increasingly contemplated to enhance essentially private infrastructure

- Role of methodological tools: simulation-assignment framework for regional and national-level application