EAST WEST TRANSPORT CORRIDOR

REPORT

Intermodal Terminals in the Western Part of the East West Transnational Transport Corridor

Reaserch Report

August 2007 Vladas Sturys

East West TC VILNIUS

REGION BLEKINGE

East West TC | Biblioteksgatan 4 | 374 36 Karlshamn

Tel. +46 455 305000 | kansli@regionblekinge.se | www.eastwesttc.org

Part-financed by the European Union

EAST WEST TRANSPORT CORRIDOR

REPORT

Title: Intermodal Terminals in the WESTERN part of the East West Transnational Transport Corridor

Publication 2007:WP4_REPORT
Publishing date: August 2007
Publisher: Region Blekinge

Contact: Mattias Alisch mattias@eastwesttc.org
Scriptwriters: Vladas Sturys

Layout: East West TC Secretariat
ISSN:
Distributor: Region Blekinge, Ronnebygatan 2, 371 32, KARLSKRONA, Sweden
Telephone: +46 30 50 00, Fax: +46 30 50 10, E-mail: kansli@regionblekinge.se

CONTENT

CHAPTER 1

PROJECT
"EAST WEST TRANSNATIONAL TRANSPORT CORRIDOR"
AND PRESENT RESEARCH

1.1. Current research is performed as part of activity 7 of the Working Package 5 (WP) of the project East West Transport Corridor.

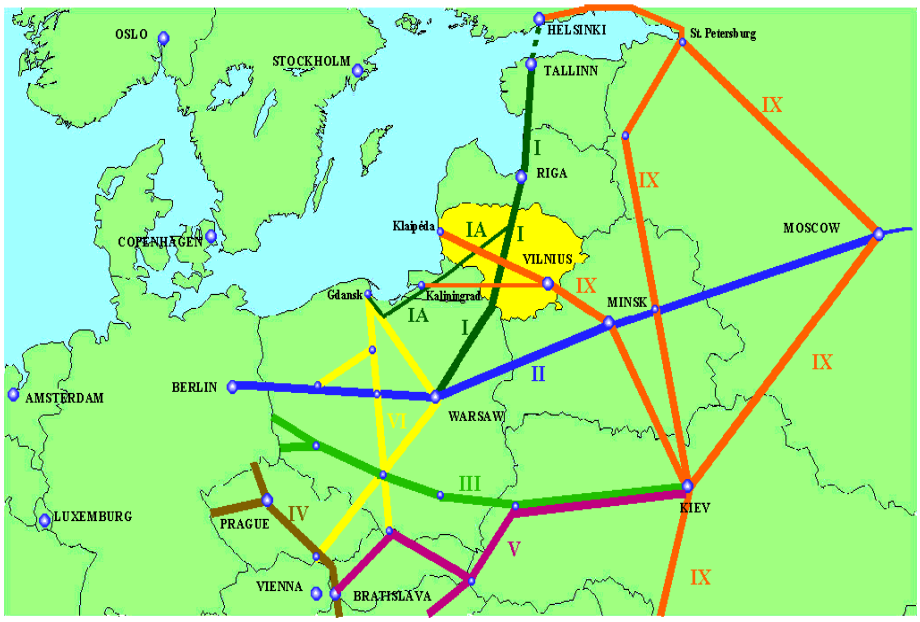
1.2. The purpose of the research is to compare intermodal terminals in the western part of the East West Transport Corridor with terminals from the eastern part of the corridor, then analyse the interoperability of them and their ability to cooperate in one transport corridor.

1.3. The East West Transport Corridor is shown on the following map:

CHAPTER 2

SELECTION OF TERMINALS.

2.1. The physical transportation network that makes up the EWTC on the eastern part of the Baltic Sea Region is well connected to surrounding areas either by rail or by roads. Particularly the road system Transeuropean Transport corridors – branch line of the corridor IX b - Klaipėda – Minsk and further branch lines: towards Moscow (corridor 2) and Odessa (corridor IX b – IX).



Map source: Klaipėda state seaport Authority

2.2. The selection of terminals from the western part of the corridor was made by the Port of Karlshamn. The terminals are linked to the East West Transport Corridor via existing or planned shuttle trains to/from the Port of Karlshamn.
2.2.1. There are plans plans to start a shuttle train between Karlshamn and Nässjö (Hoeglandsterminalen).
2.2.2. A shuttle between Karlshamn and the Port of Gothenburg starts to operate in August 2007.
2.2.3. Olofstroem and also Aelmhult are part of the planned South East Link between Karlshamn and the main railroad Malmoe - Stockholm, where the segment between Olofstroem and Karlshamn is missing today. Olofstroem is basically a terminal for Volvo Cars today, but there is a potential to link that terminal to the port of Karlshamn via a new railroad.
2.2.4. Cargonet is the main intermodal rail operator in Sweden and Norway. There might also be a shuttle between Karlshamn and Oslo in the future, or one can use the shuttles Karlshamn - Gothenburg and Gothenburg – Oslo in combination with one another with reloading in Gothenburg.

2.3. As a result of selection, the following terminals were involved in the research:

SWEDEN:

1.Cargonet Gothenburg
2.Hoglandets terminal AB
3.Port of Gothenburg
4.Port of Karlshamn
5.Volvo Olofstroem

NORWAY
1. Cargonet Oslo

2.4. Geographical positions of those terminals are indicated on the following map:

Source: Blekinge Institute of Technology

2.5. 11 terminals were selected and analised earlier in the study:

Belarus
1. Belarusian Railways. Kaliadichi (Minsk).

UKRAINE
1. LISKI Kiev.
2. LISKI Odessa.
3. Port of Illjichevsk (Ro-Ro terminal).

LITHUANIA

1. Port of Klaipėda:
   Klaipėdos Terminalo Grupė
   JSC Klaipėda Stevedoring Company (KLASCO) - Ro-Ro terminal
2. Lithuanian Railways.
   Station Draugystė (Klaipėda).
   Station Kaunas
   Station Paneriai.
3. Vilniaus Tranzitas (AD REM group)

All figures are based on content of interviews with representatives from the 16 above listed terminals. On rare occasions data was not available in one or other terminal and this is reflected accordingly in the data.

CHAPTER 3

METHOD OF RESEARCH

3.1. The methods used to research intermodal terminals were interviews performed following a dedicated questionnaire.

3.2. Information and data were collected during visits to selected terminals, and to different institutions concerned with activities of terminals.

3.3. The questionnaire contains six sections:

PART A: GENERAL DESCRIPTION OF THE TERMINAL

In this part, details of the status of the terminal are presented, characteristics of the location and access to the terminal are assessed, and other related issues are stated.

PART B: TERMINAL OFFER

In 10 chapters of the section data are collected regarding the capability of the terminal to offer services to customers: size of the terminal, opening hours, scope of activity, offered services, terminal infrastructure, available transhipment equipment and assessment of technologies, speed of transhipment operations, character of relationships with customers, supporting IT systems and communication.

PART C: TRAFFIC FLOWS AND TRANSHIPMENT

In 5 chapters of the section data are collected regarding the character of traffic flowing through the terminal: types of transhipments in 2005, transports organized at inland terminal, utilisation of terminal, safety & security.

PART D: INNOVATION AND INVESTMENT

In 5 chapters of the section data qualifying the role of innovations and investments in terminal development policy are collected: assessment of impact of innovative equipment and technologies used / tested at the terminal, pointing out anticipated most significant investments and expected results (increase in terminal capacity, accessibility etc.).

PART E: EMPLOYMENT POLICY

Data collected in this section characterise the number and structure of the personnel, and the influence of innovations on the same.

PART F: TECHNICAL INTEROPERABILITY ASSESSMENT

In 5 chapters of the section the interoperability of equipment and technologies to operate

Intermodal Transport Units, according to ISO standards and beyond them, as well as conventional transport modes are assessed. In addition compatibility with network operating forms is evaluated.

CHAPTER 4

RESULTS OF THE RESEARCH

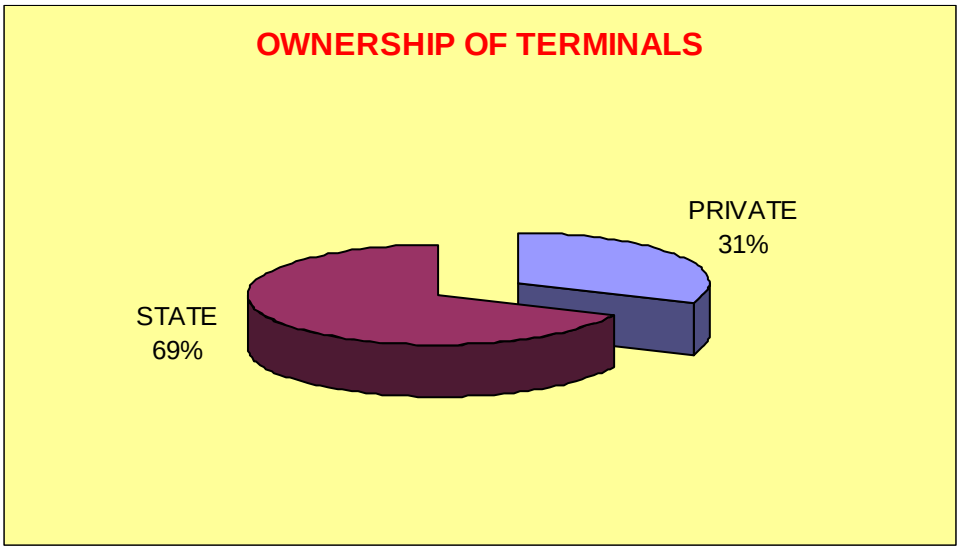
PART A: GENERAL DESCRIPTION OF TERMINALS

A.1 GENERAL INFORMATION

A.1.3. Legal status of interviewed terminals – they are all acting as limited liability companies.

A.1.4. Ownership of terminals interviewed.

69% of researched terminals are directly or via subsidiaries owned by the state.

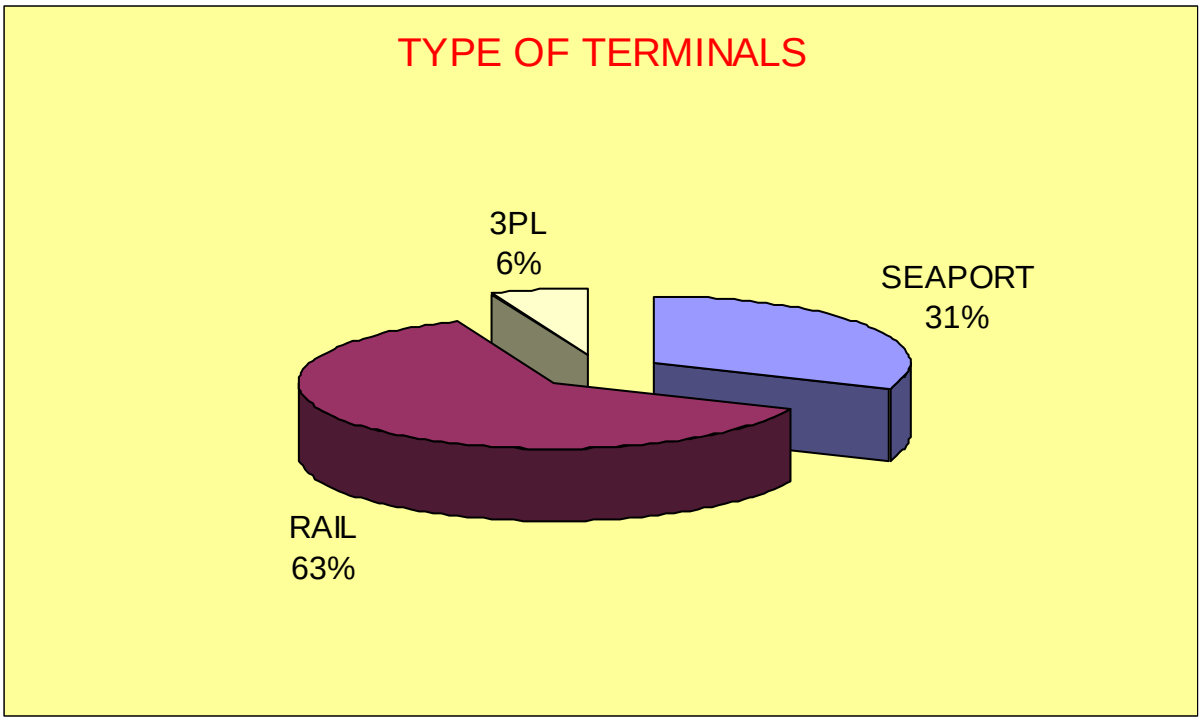


A.1.5. Operator.

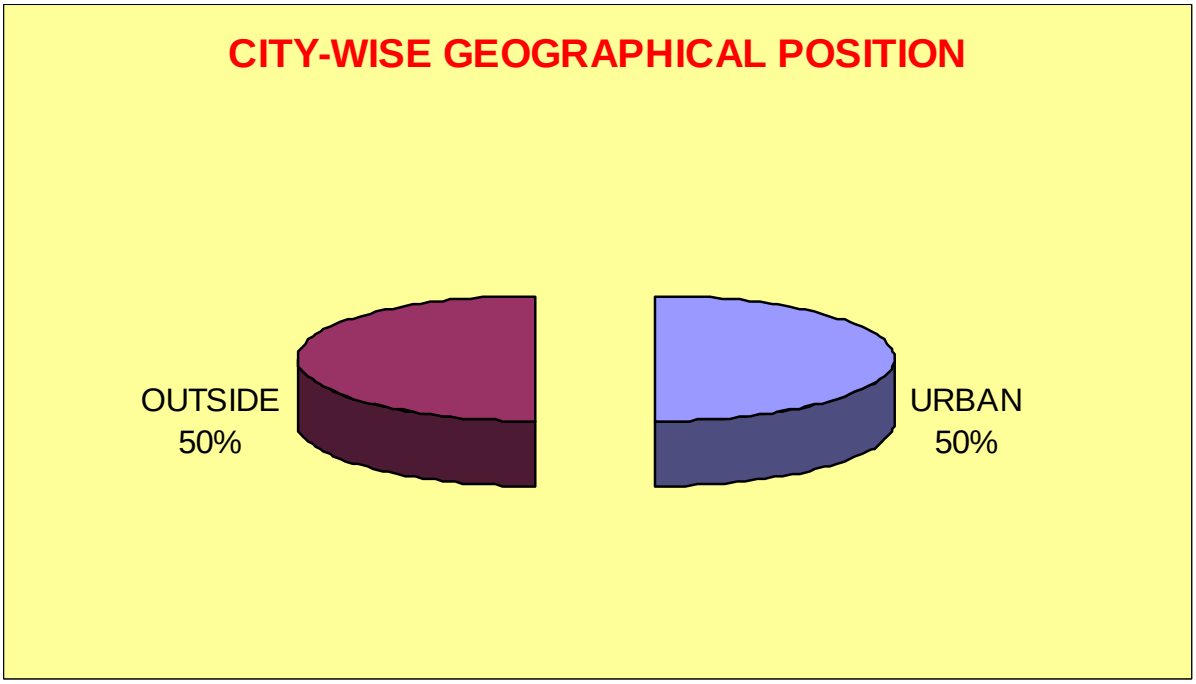
All of interviewed companies are currently operators of owned terminals.

A. 1.6. Type of researched terminals:

Concentration most of intermodal terminals in railway companies reflects common picture of the market.



A.2. GEOGRAPHICAL LOCATION OF TERMINALS IN RELATION TO CITIES

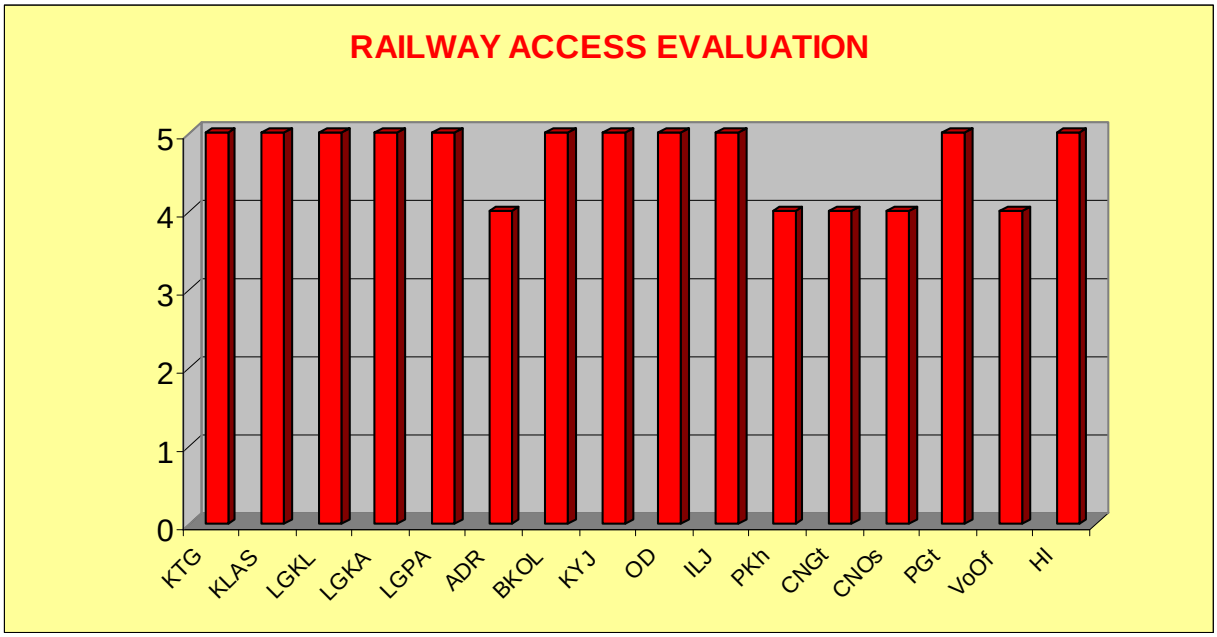


It is essential that situation with road access even to terminals, identified as "outside urban area", is becoming more and more complicated. Reconstruction of streets and highways drops back of the dramatically increasing traffic flow on the roads, which are at the same time equally employed by

public and freight transport. This circumstance highlights the importance of placing intermodal logistic centres in special zones.

A.4 TERMINALS' ACCESS TO NETWORK:

A.4.1. General assessment of rail access



On the eastern side of the East West Transport Corridor no new intermodal terminals have been constructed in decades and most of the existing ones originated from former national railway structures.
Thus integration into railway network is mostly perfect. On the other hand, this circumstance determines a low level of modern logistical services in the market.

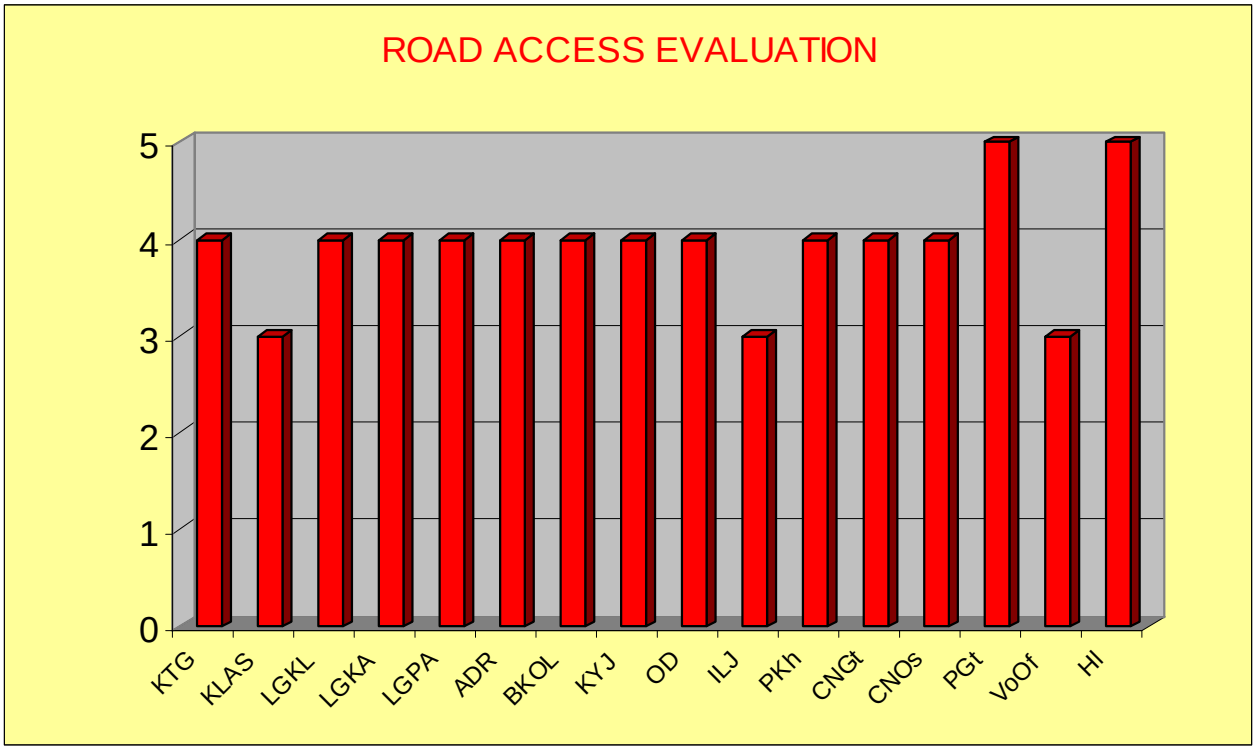
Also railway access in the ports is usually well developed (see photos below).

Cargonet Gothenburg. Source: Blekinge Institute of Technology

Alnabru, Oslo. Source: Blekinge Institute of Technology

Source: Blekinge Institute of Technology

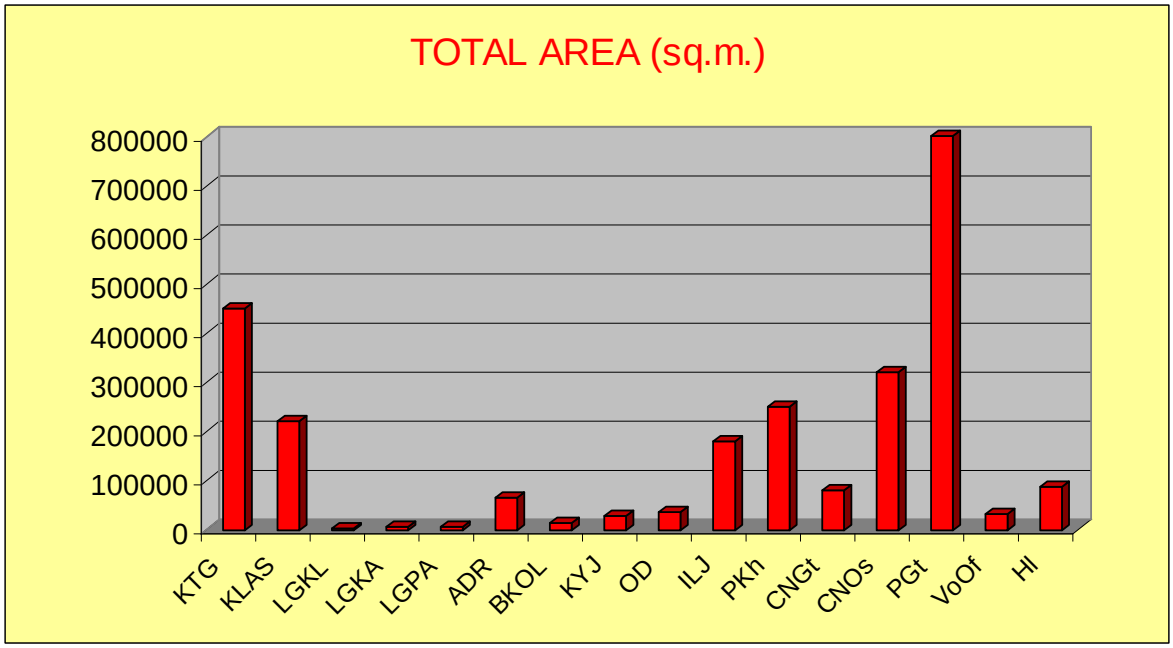
A.4.2. General assessment of road access



PART B: TERMINAL OFFER

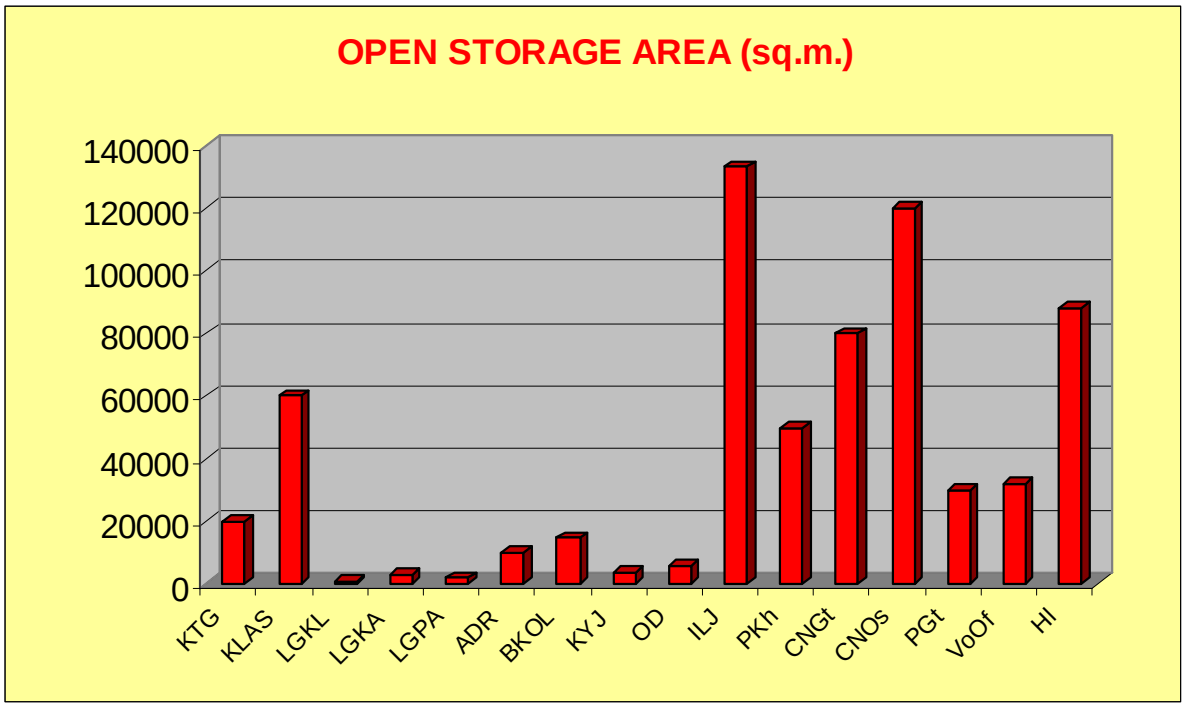
B.1 SIZE OF THE TERMINAL

B.1.1. Total terminal area.



Marine terminals naturally require larger space proportionally to the scope of transport units served at the terminals.
Increasing containerships' size and intensification of the cargo flows on land will require new territories to fit the market demand.

B.1.2. Open storage area

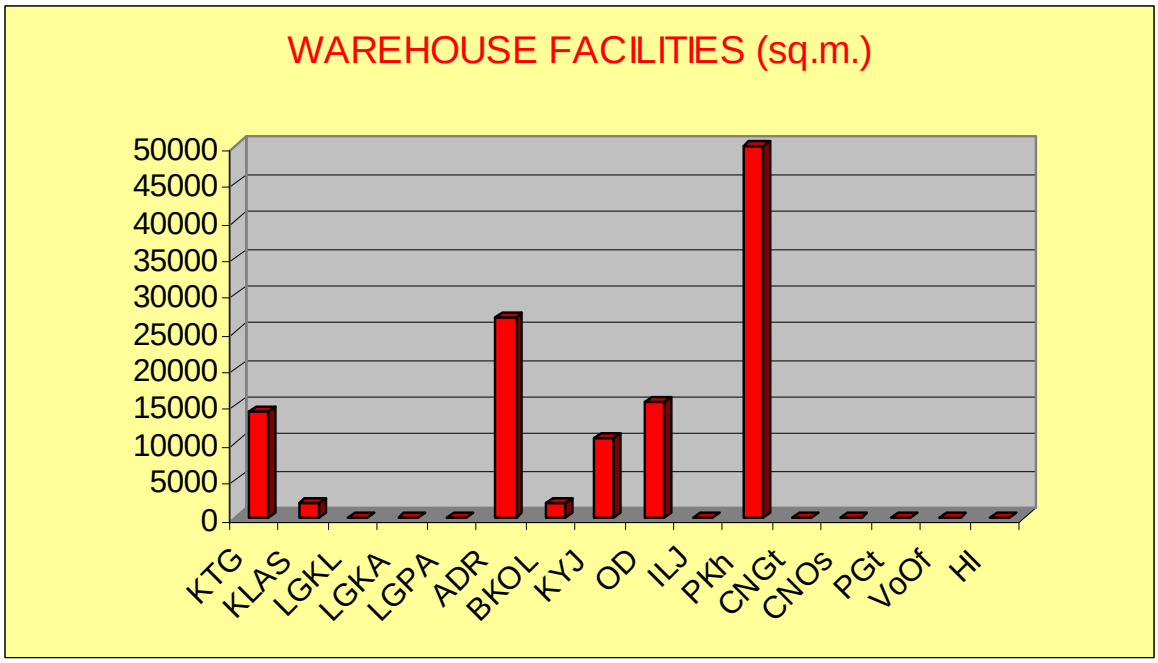


Open storage area of the port of Iljichevsk stands out because of specialised spaces dedicated for storage of 5500 cars as category of goods.

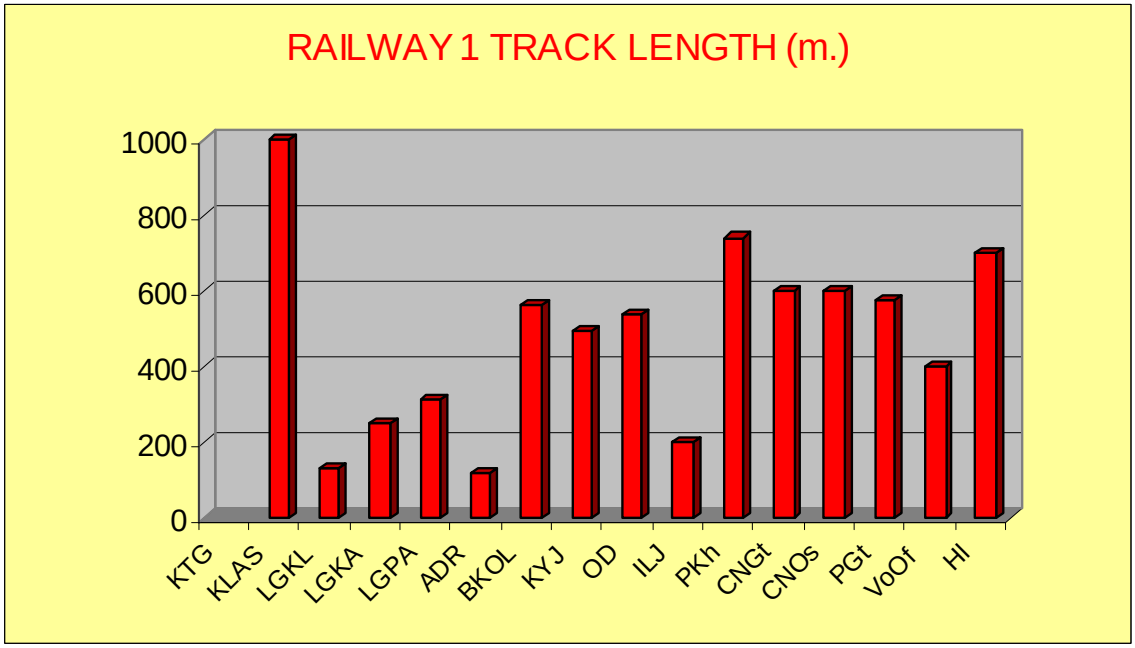
B.1.4. Warehouse facilities

Warehouse facilities are indicated as one of the weak points along the corridor. In ports they are mainly dedicated to handle massive bulk cargo (metals, fertilizers etc.) and still not prepared to generate added value from logistical operations (cross docking, packing, labelling etc.).

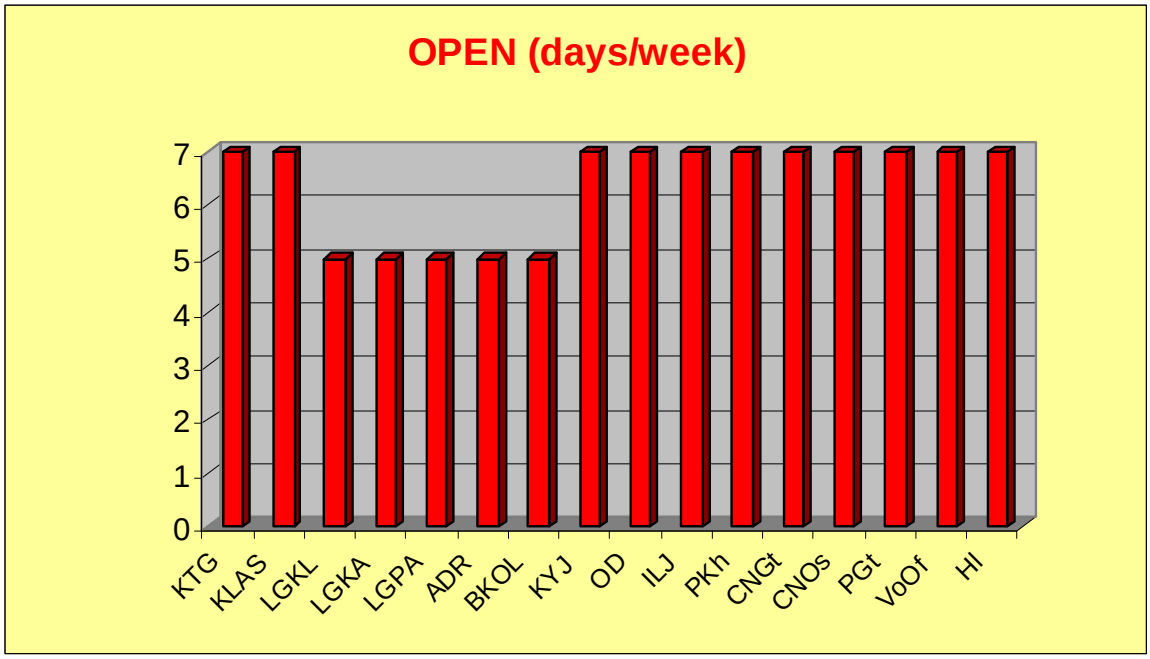
Feature of railways operators as well is interest for massive cargo. Warehouse offer is illustrated below in the part B10.



B.1.5. Railway 1 track length.



B.2 OPENING HOURS



B.3 SCOPE OF ACTIVITY

All researched terminals are connected with road and rail modes of transport. Five of the terminals are marine ones.

B.4 TRANSHIPMENT EQUIPMENT IN 2005

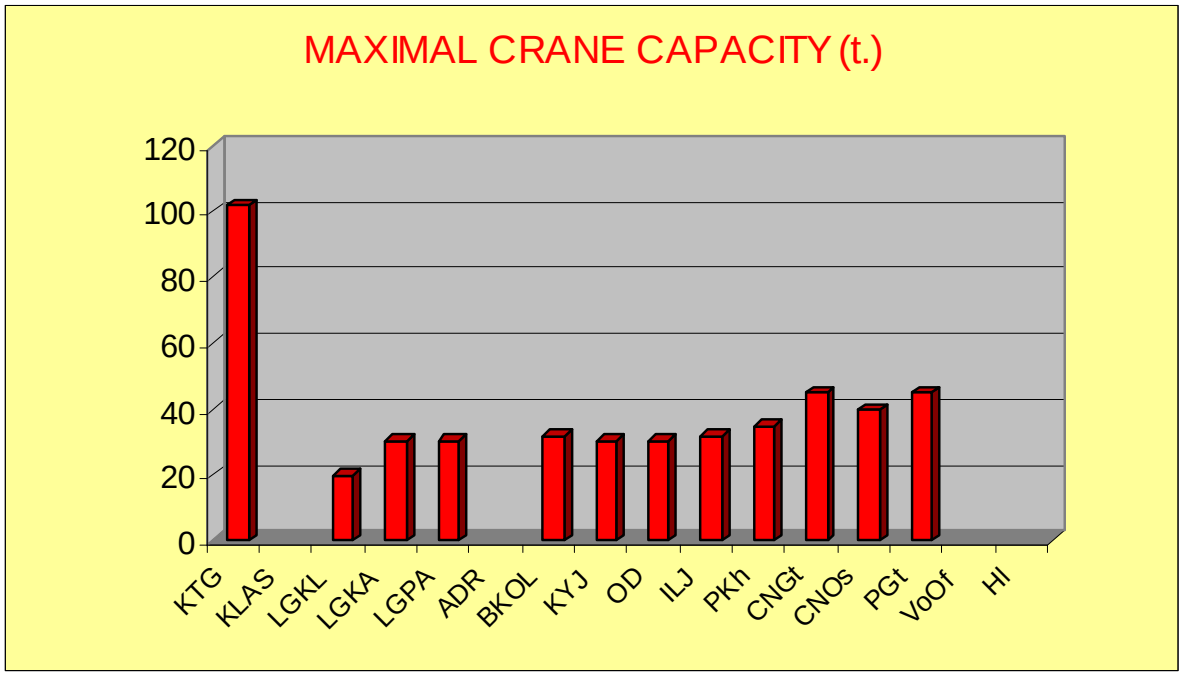
B.4.1. Cranes.

Cranes in the port of Gothenburg. Source: Blekinge Institute of Technology

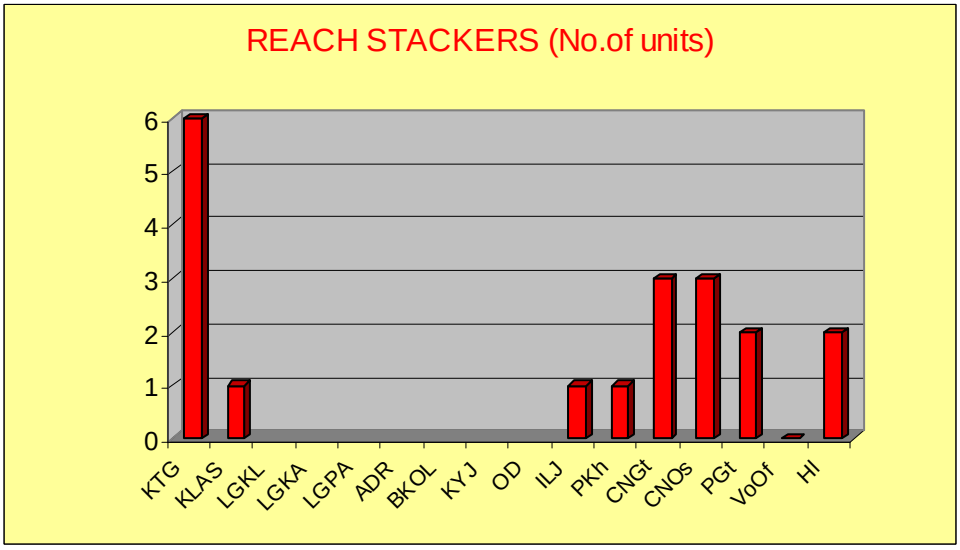
Port of Karlshamn. Source: Blekinge Institute of Technology.

There are different ranges of cranes used in terminals. Railway terminals in eastern part of the corridor are using cranes acquired in CIS countries e.g. "Sokol", KK -10/20/32. In port terminals the cranes park is renewed in accordance with market demand.

B.4.2. Maximal crane capacity.



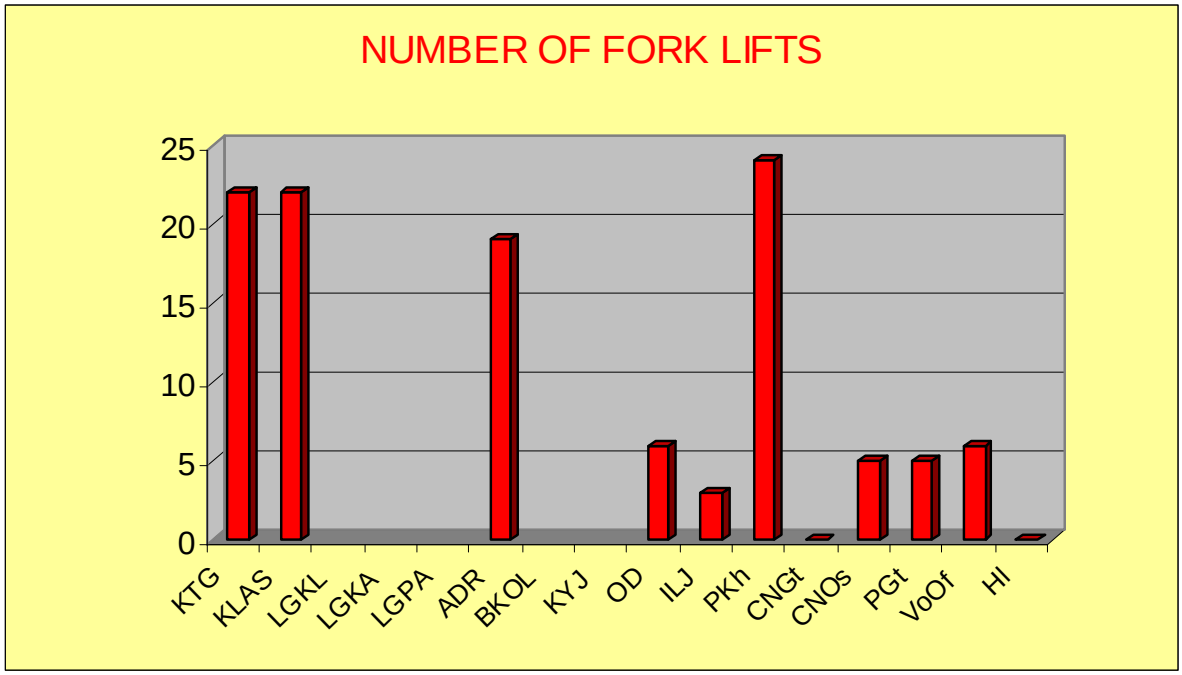
B.4.3. Reach stackers

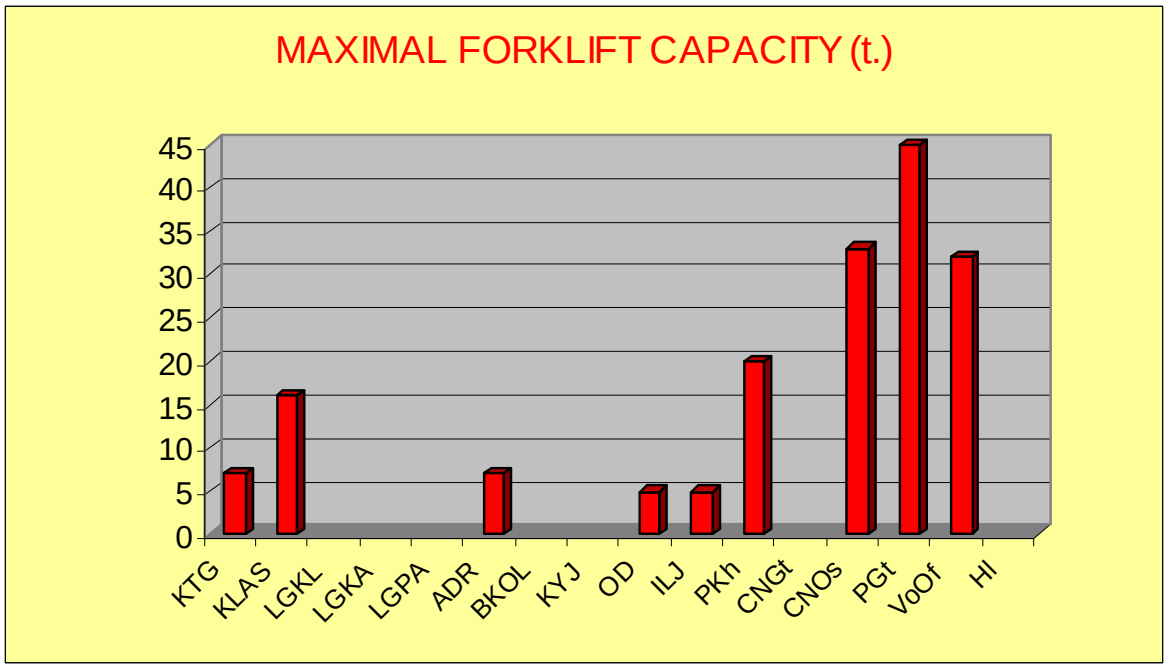


A reach stacker is an important piece of equipment for stacking containers in the terminals.

Hoeglands terminal. Source: Blekinge Institute of Technology

B.4.4. Fork lifts





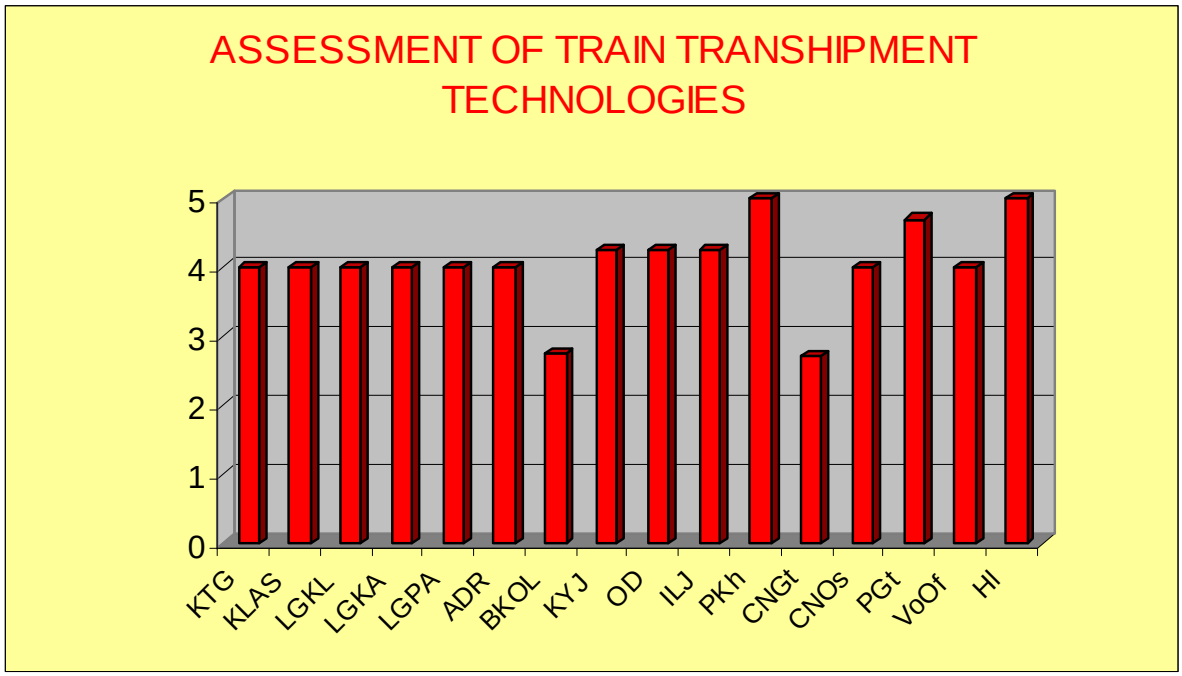
B.4.5. Avarage age of equipment .

Average age of equipment differs from oldest 20-25 (KK cranes, forklifts in railway terminals) to brand-new (mobile cranes, reach stackers in ports).

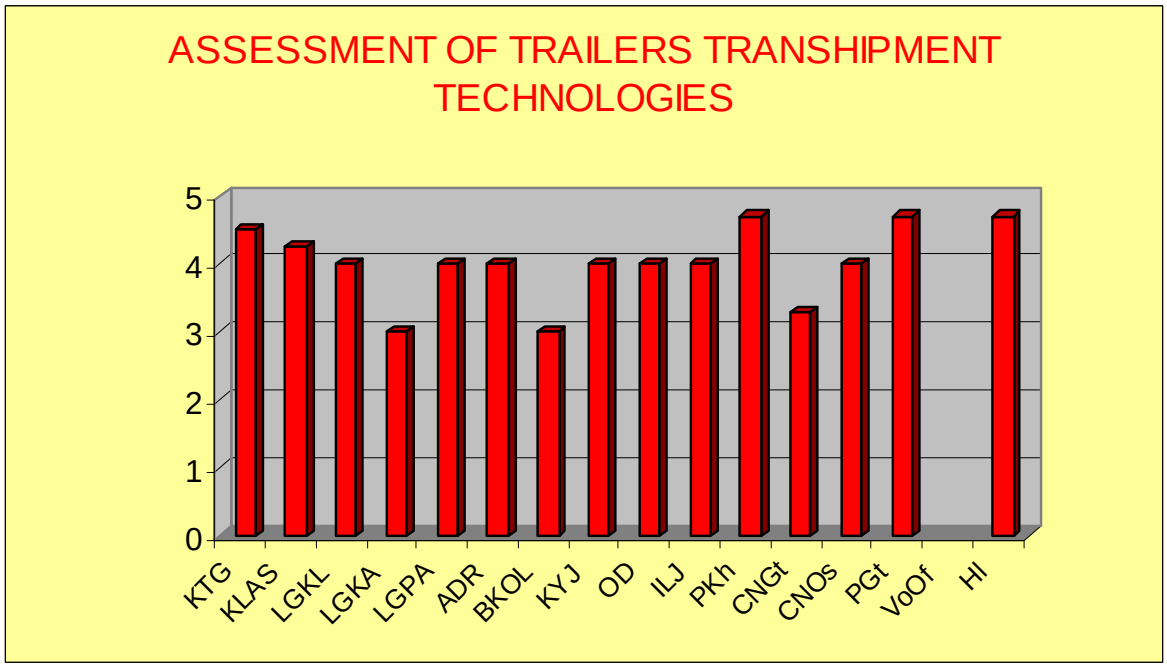
According to recent employment of terminals, faults of equipment are not an important factor, but if cargo flow will increase significantly the oldest equipment may need to be repaired up to 60 unscheduled days/year.

B.6 ASSESSMENT OF TECHNOLOGIES

B.6.1. Assessment of train transhipment technologies.

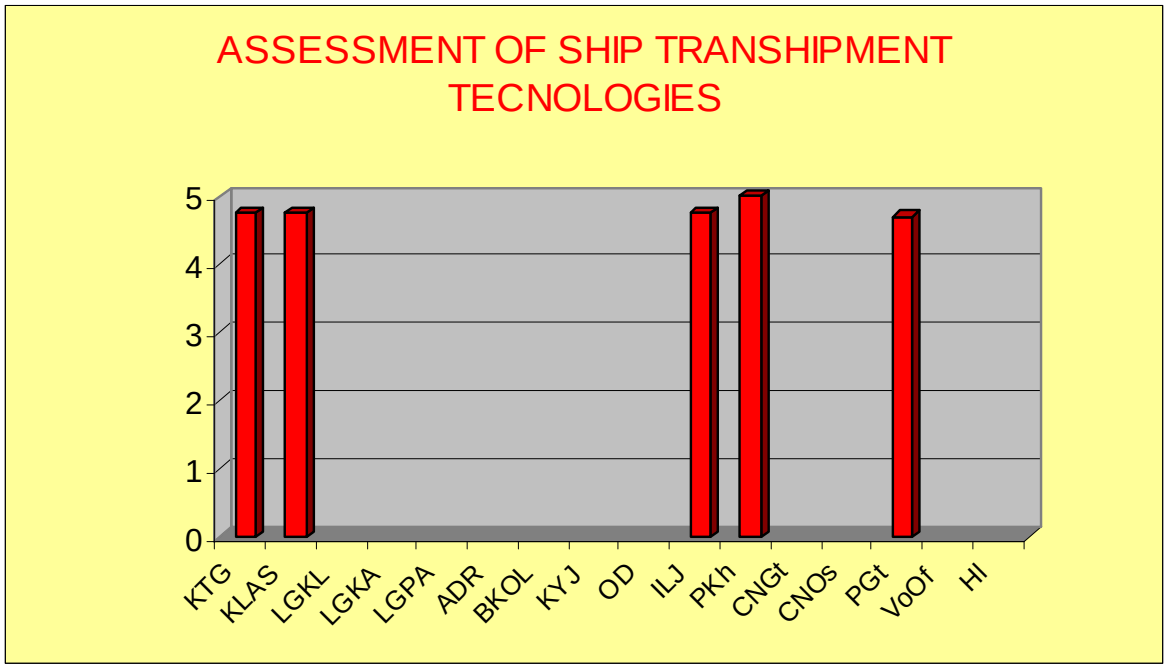


B. 6.2. Assessment of trailers transhipment technologies.



Alnabru, Oslo Source: Blekinge Institute of Technology

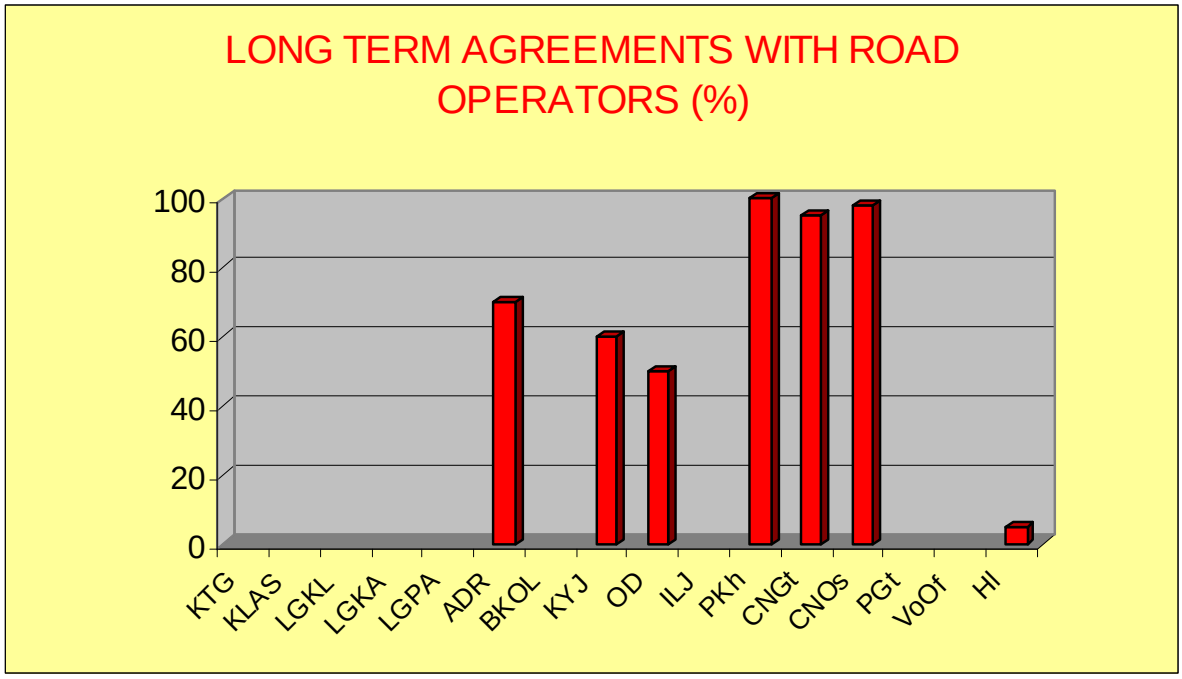
B.6.3. Assessment of ship transhipment technologies.



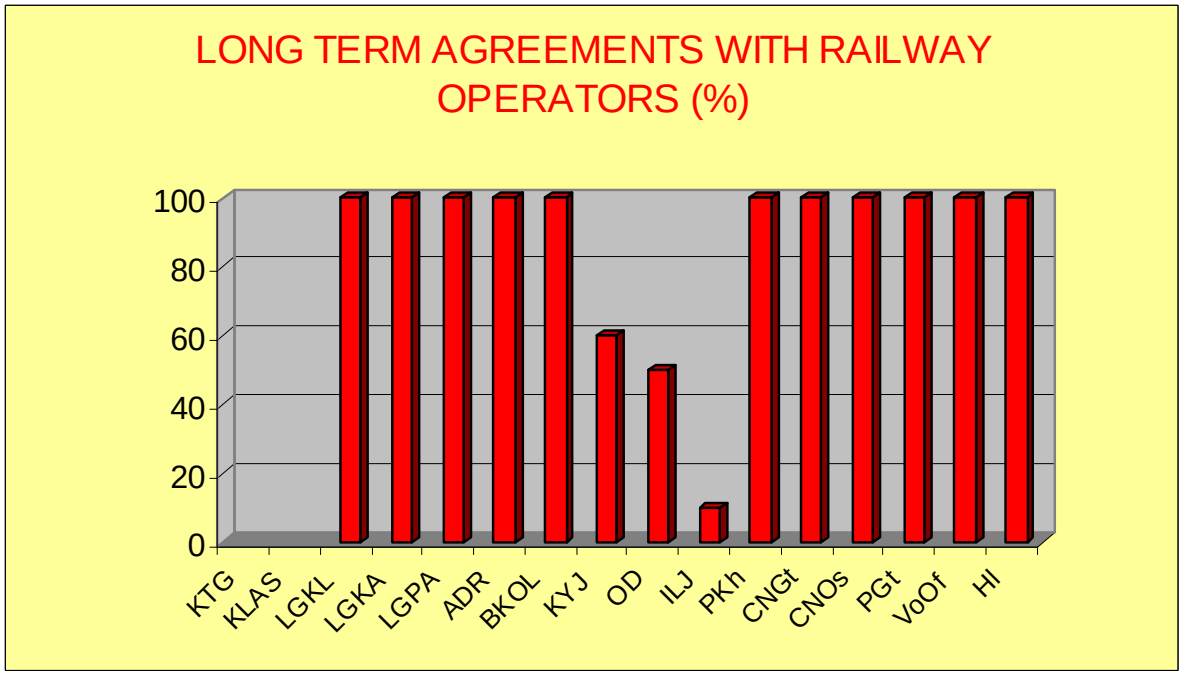
B.7. RELATIONSHIPS WITH CUSTOMERS

Three types of structures of operator's agreements were analyzed: ad hoc requests, short-term agreements (for a period of less than one year), and long-term agreements (more than one year). The conclusion is that rail transport operators are more regularly using intermodal transport than road transport operators.

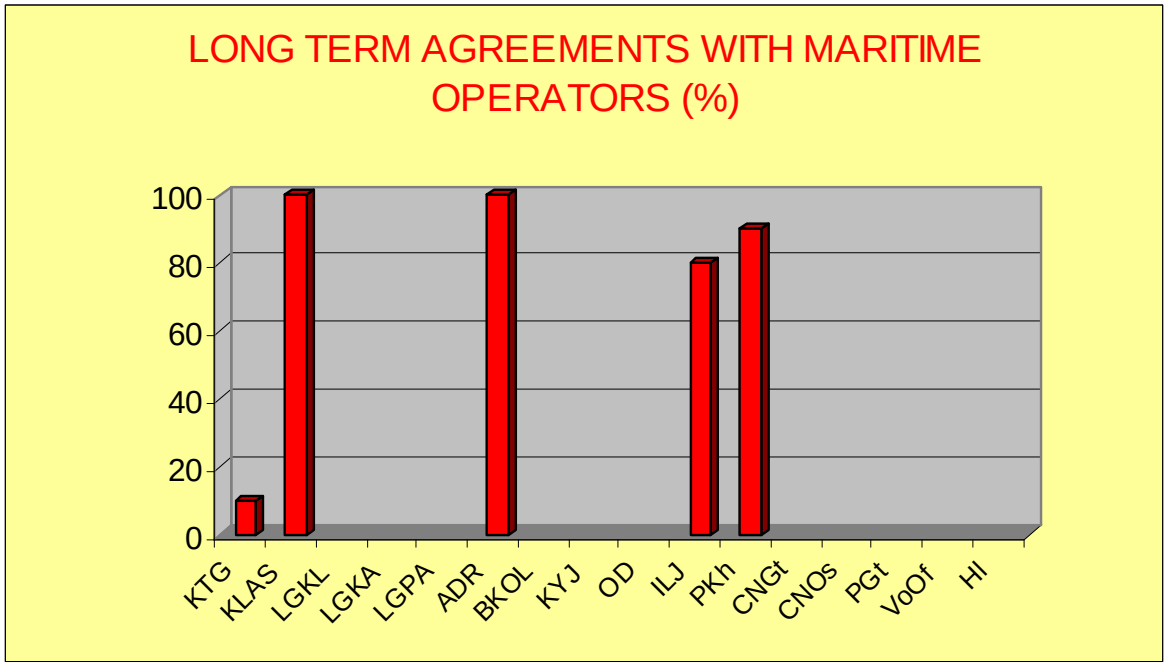
B.7.1. Percentage of long term agreements with road transport operators.



B.7.2. Percentage of long term agreements with railway transport operators.



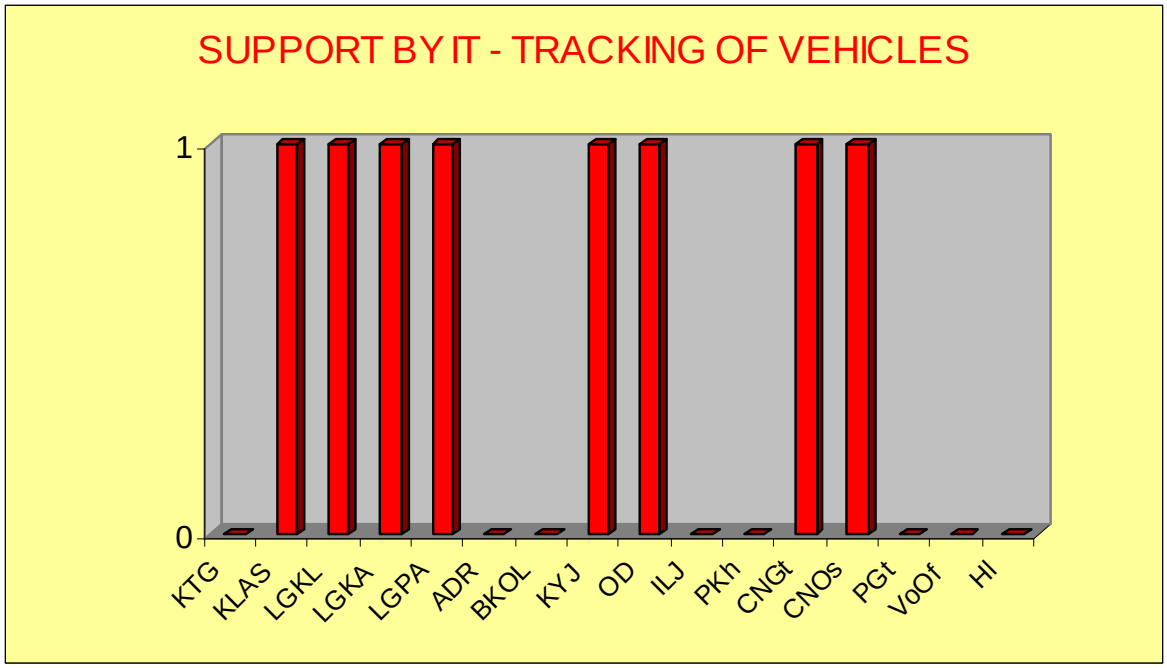
B.7.2. Percentage of long term agreements with marine transport operators.



Nearly all marine transport operations are based on regular agreements (agreements of Klaipėdos terminalo grupė are signed on a yearly basis).
Urgent requests usually are asked to be ordered in 24 hours.

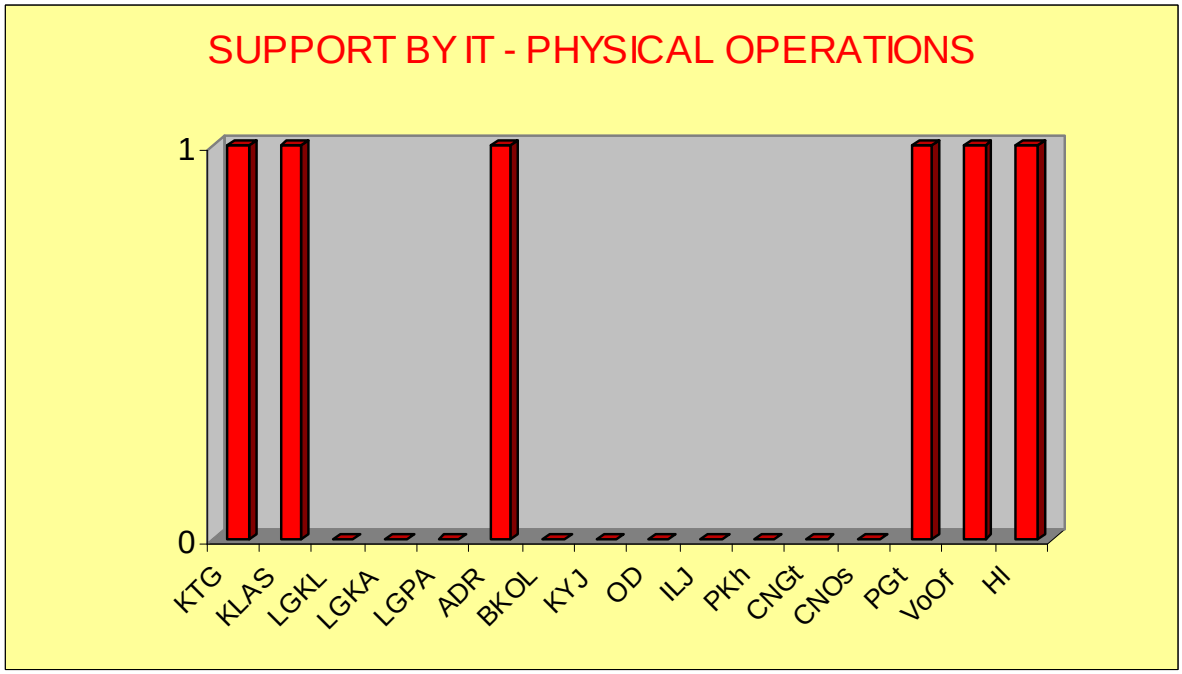
B.8 IT SYSTEMS AND COMMUNICATION

B.8.2. Support of tracking of vehicles by IT systems.



Only railway operators and KLASCO, which is operating railway wagons loading to ferries are integrated into IT – based tracking systems.

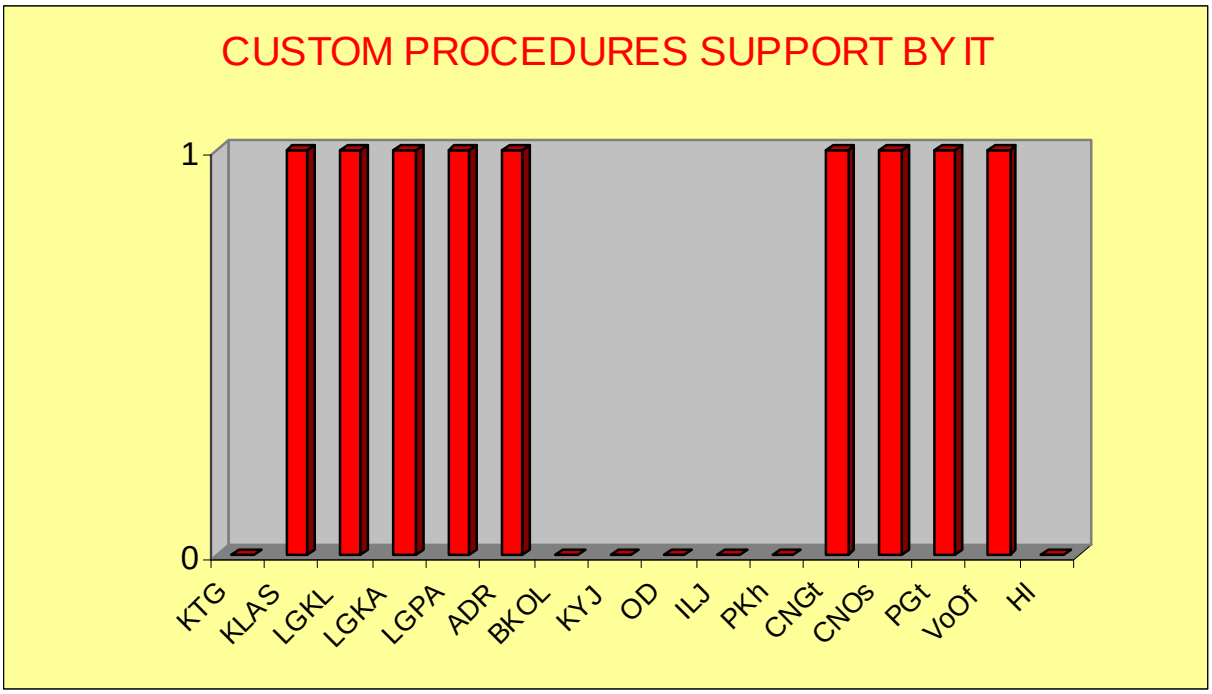
B.8.1. Support of physical operations by IT systems.



It was analysed how steering transhipment equipment, stacking process control, loading and unloading of trucks, and storage control are standardised and supported by IT systems.
Those operations are supported by IT systems only in Klaipėdos Terminalo grupė, KLASCO and AD REM in the eastern part of the corridor and in port of Gothenburg, Volvo Olofstroem and Hoglandets terminal AB in the western part.

Different programs are used : VISION (AD REM), AUTOSTORE, CTMS (KTG), TIKS (port of Gothenburg, Hoglandets terminal AB), and internally designed (KLASCO), Volvo Olofstroem.

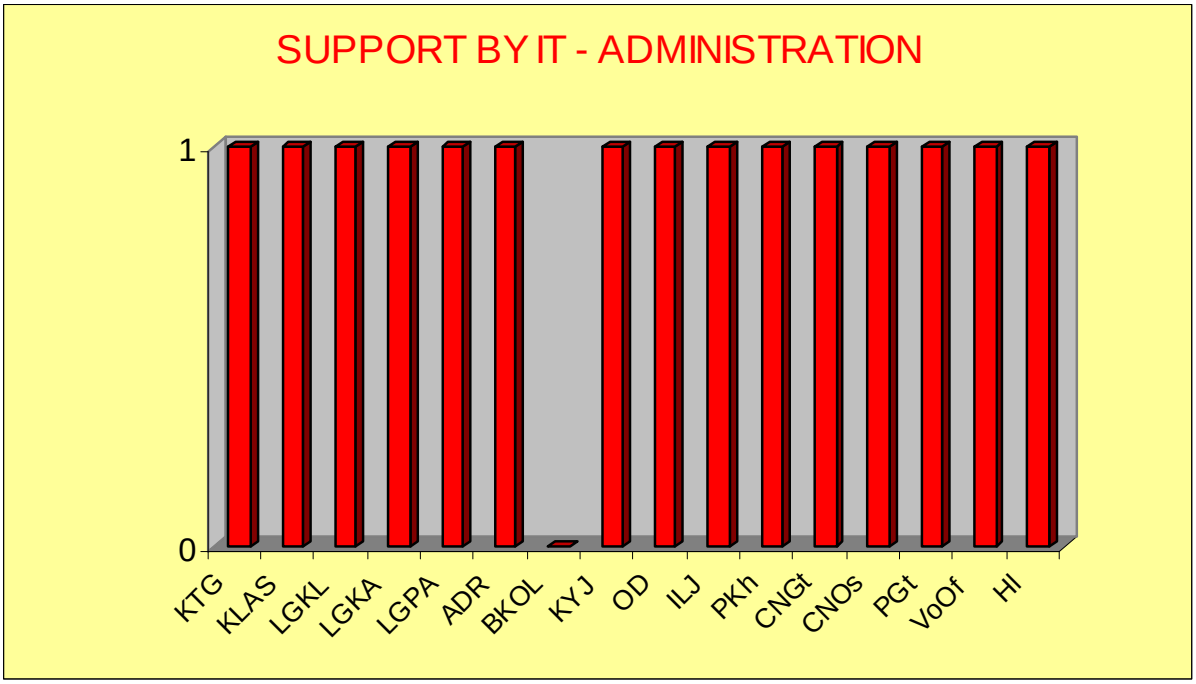
B.8.3. Custom procedures support by IT systems.



56% of researced companies have implemented IT support of custom procedures. Programs AVILDA (AD REM), SMTPS – Lithuanian Railways, Customs TDS (Cargonet, Volvo Olofstroem), TICKS TDS (port of Gothenburg), are used.

But most of other interviewed companies are preparing to implement software into custom procedures.

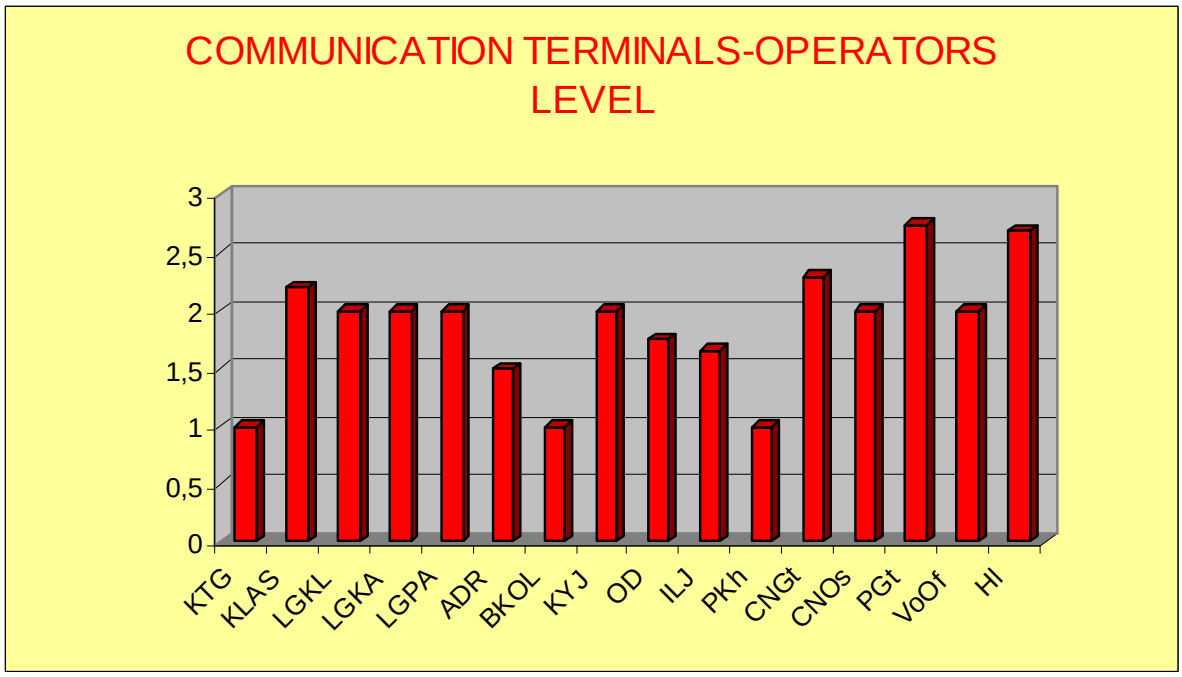
B.8.4. Support of administration by IT systems.



Administration is supported by IT in all terminals except Koliadichi.

Summarizing the analysis of support by IT research, it is important to stress that evident scattering in programmes used for IT support of operations is found.

B.8.5. Level of communication between terminal and operators



Level of communications between terminal and operators (rail, maritime, road operator, forwarder, other) was evaluated and the following numerical values were assigned to the options:

0 = no communications
1 = non-standardised communications by phone, fax, email
2 = standardised communications by phone, fax, email
3 = fully automated communications

Seen above, the presented indicators are relative averages characterising levels of standardisation of communications.

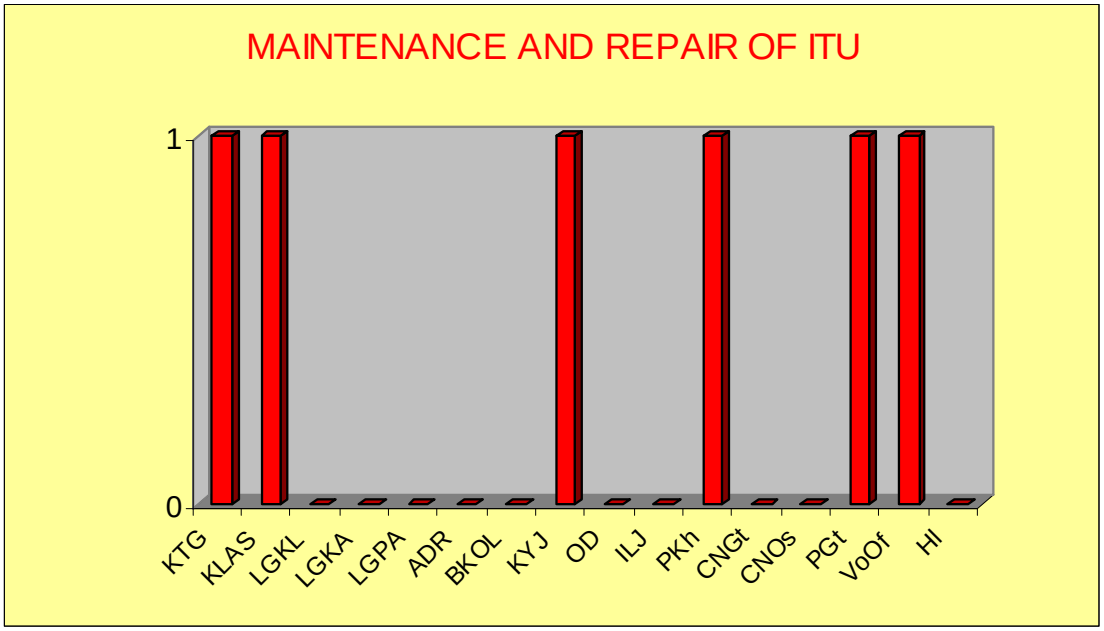
B.10 SERVICES OFFERED AT TERMINAL

B.10.1. Warehouse offered.

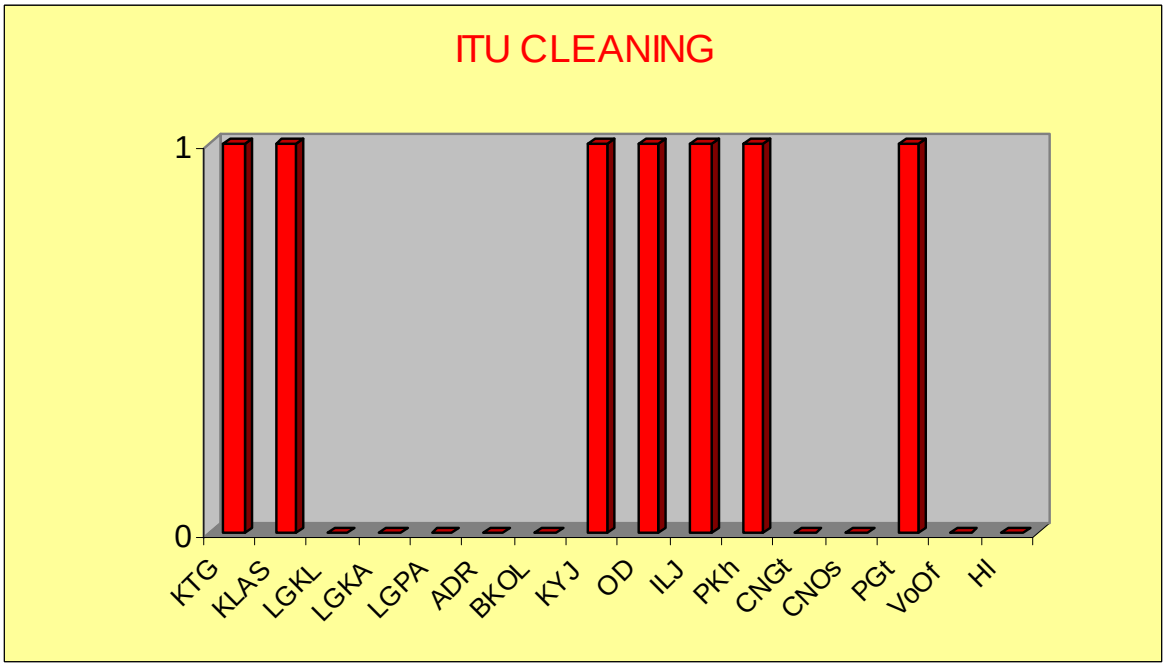
The lack of warehouses along the East West Transport Corridor means that generally the corridor needs significant improvements in this area.

Warehouse in the port of Karlshamn. Source: Blekinge Institute of Technology

B.10.2. Maintenance and repair of ITU offered.



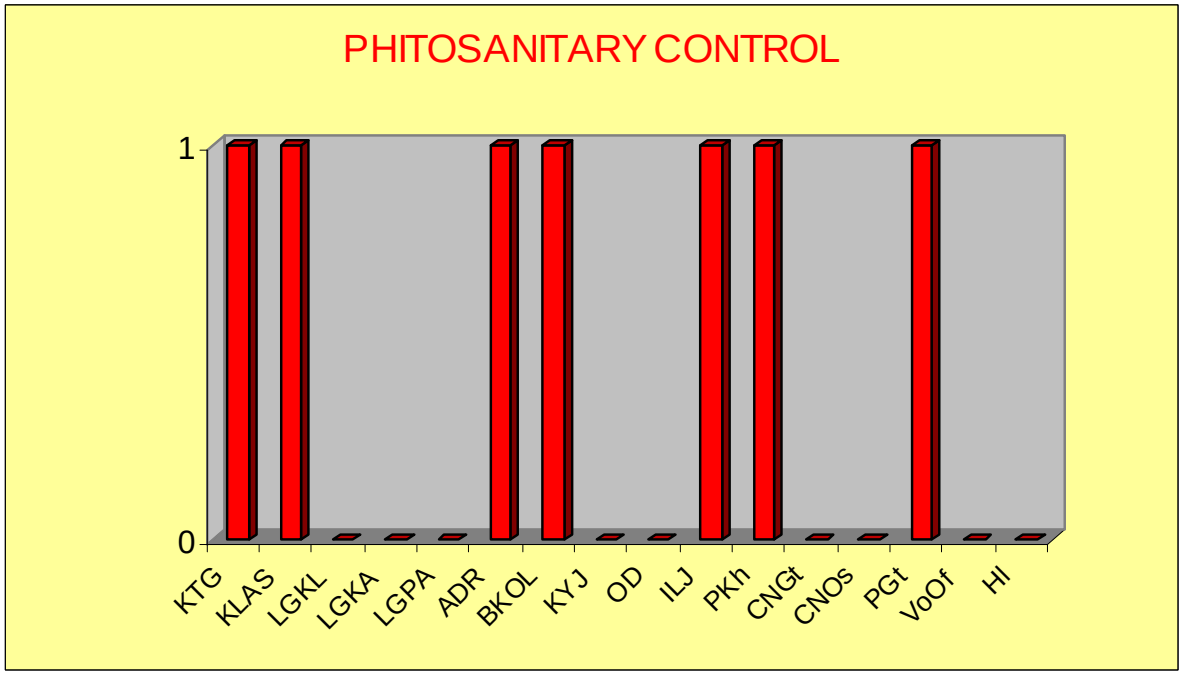
B.10.3. ITU cleaning offered.



B.10.4. Processing of goods offered.

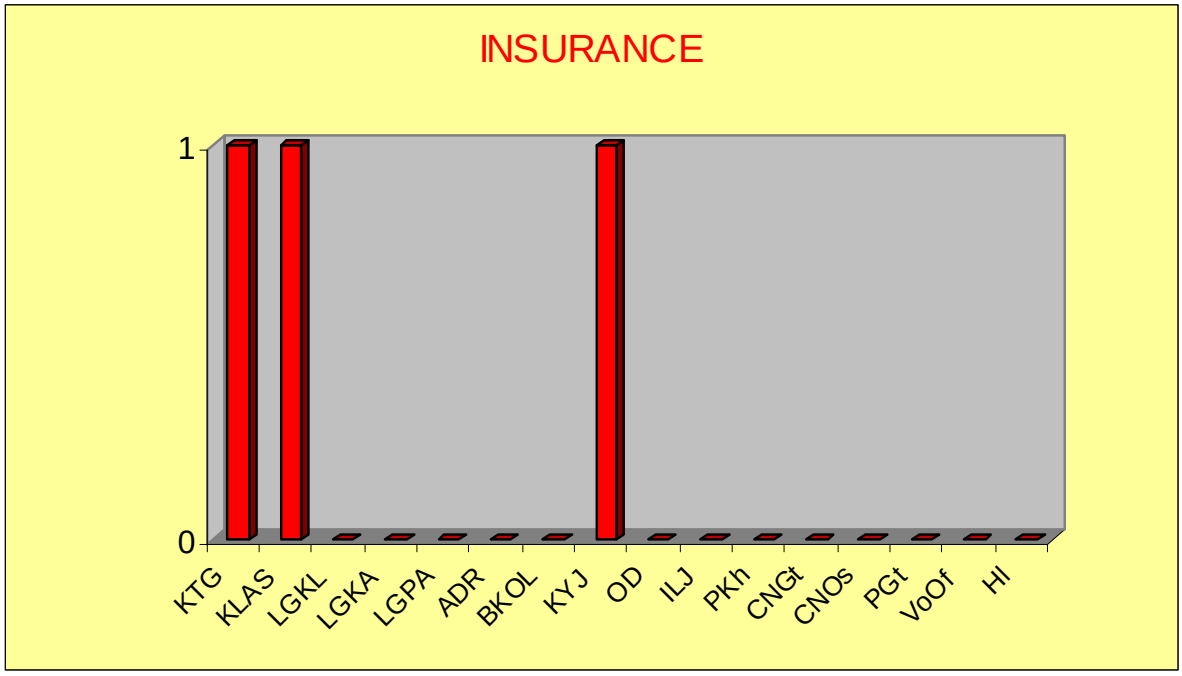
The most commonly offered value added services are cross-docking, repacking and labelling, and assembling (Klaipėdos terminalo grupė).

B.10.5. Phitosanitary control offered.

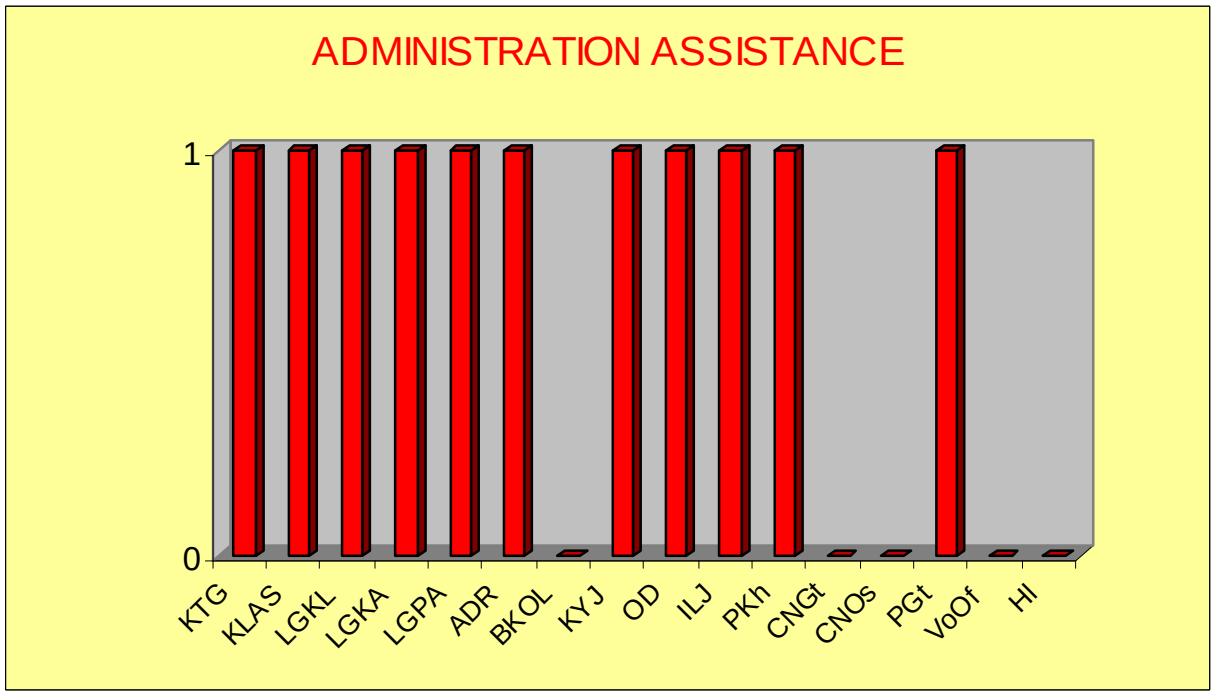


This is an important indicator, as in the future the ability of the chain to serve foodstuff may be questioned.

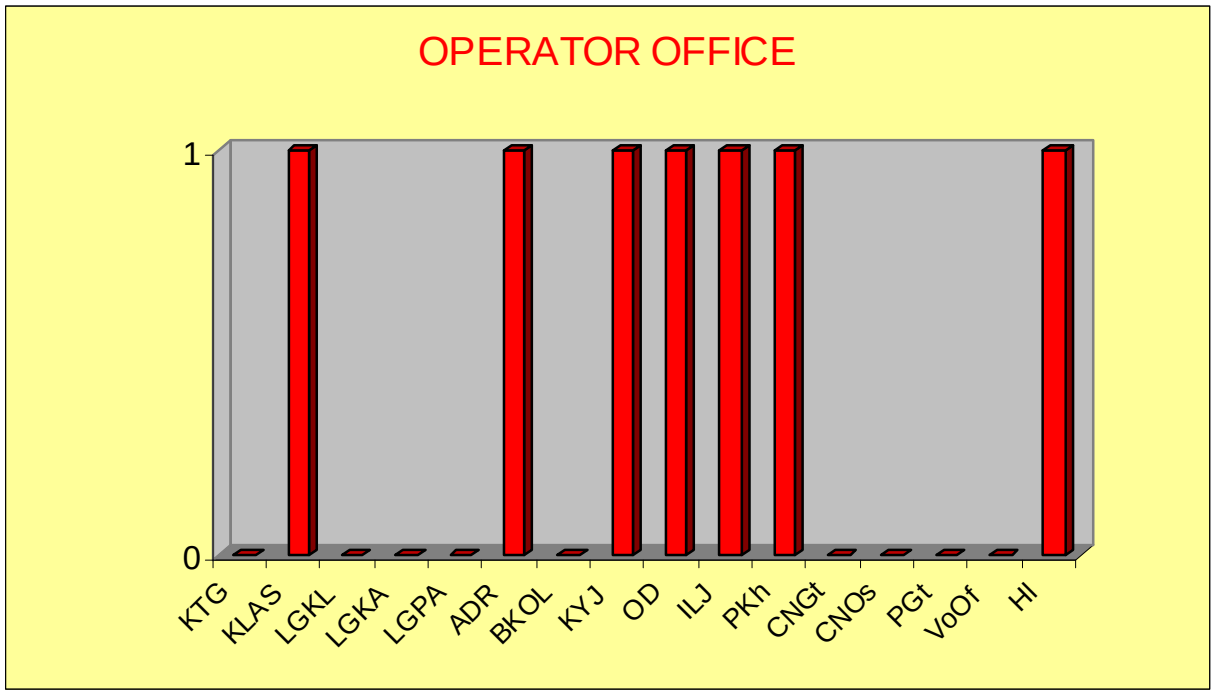
B.10.6. Insurance offered.



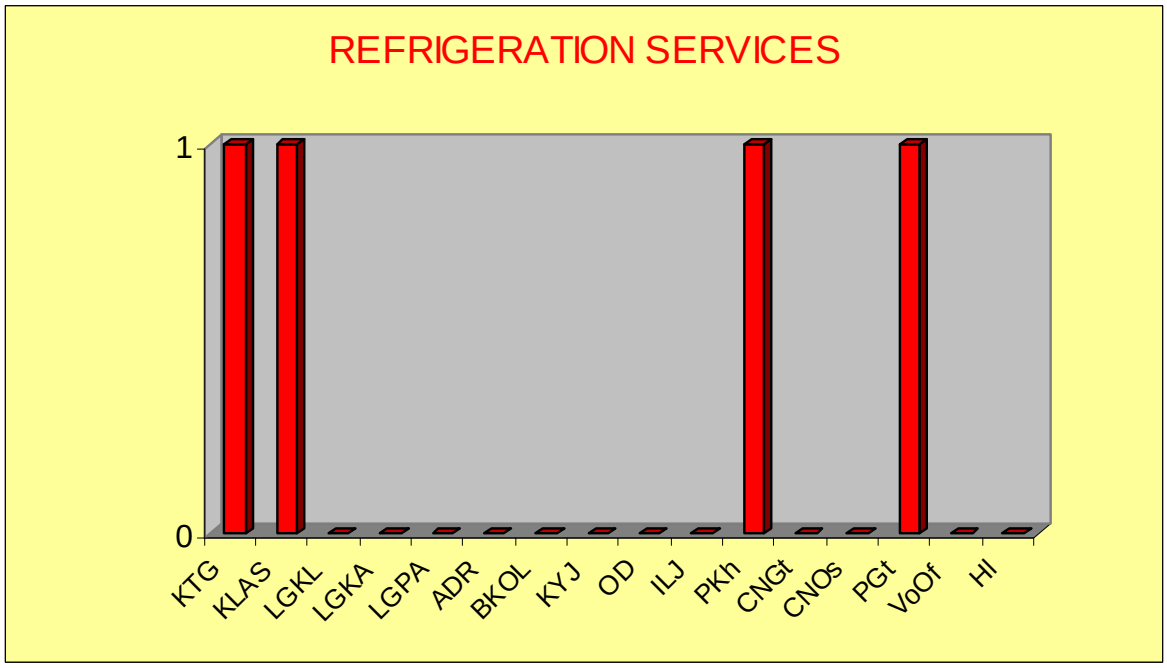
B.10.7. Administration assistance offered.



B.10.8. Operator office offered.

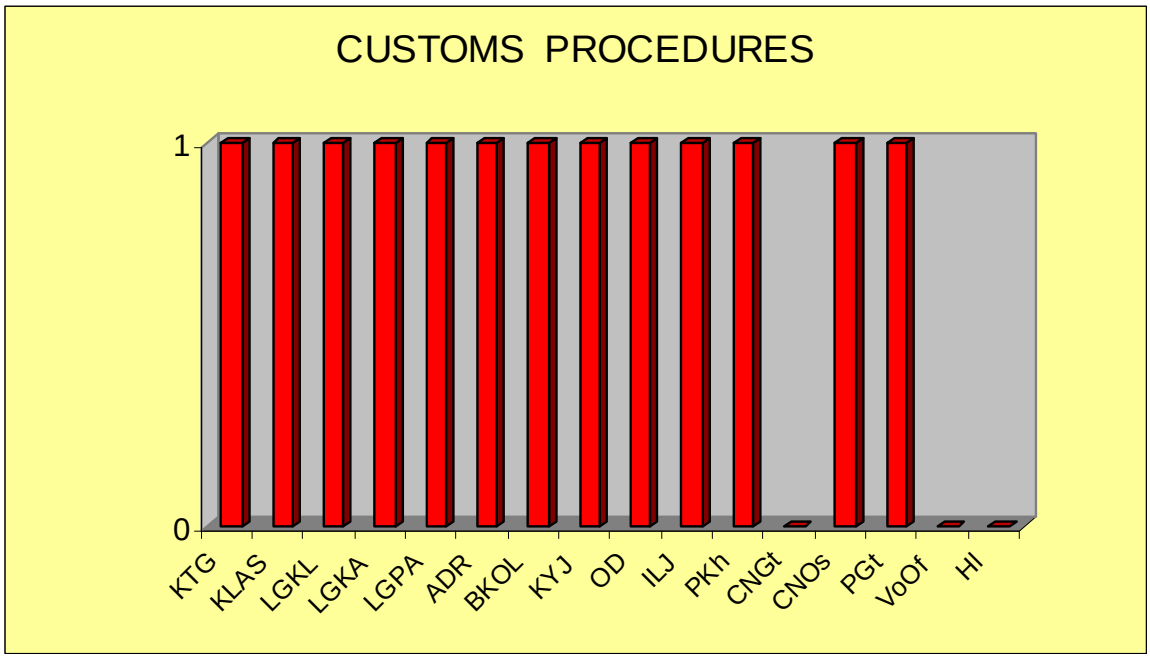


B.10.9. Refrigeration services.



Food products are a significant type of cargo for the East West Transport Corridor (e.g. the main export products of Norway are fish and related products) and refrigeration services are of high importance.
The above figure demonstrates that supply of refrigeration services should be significantly improved.

B.10.10. Customs services.



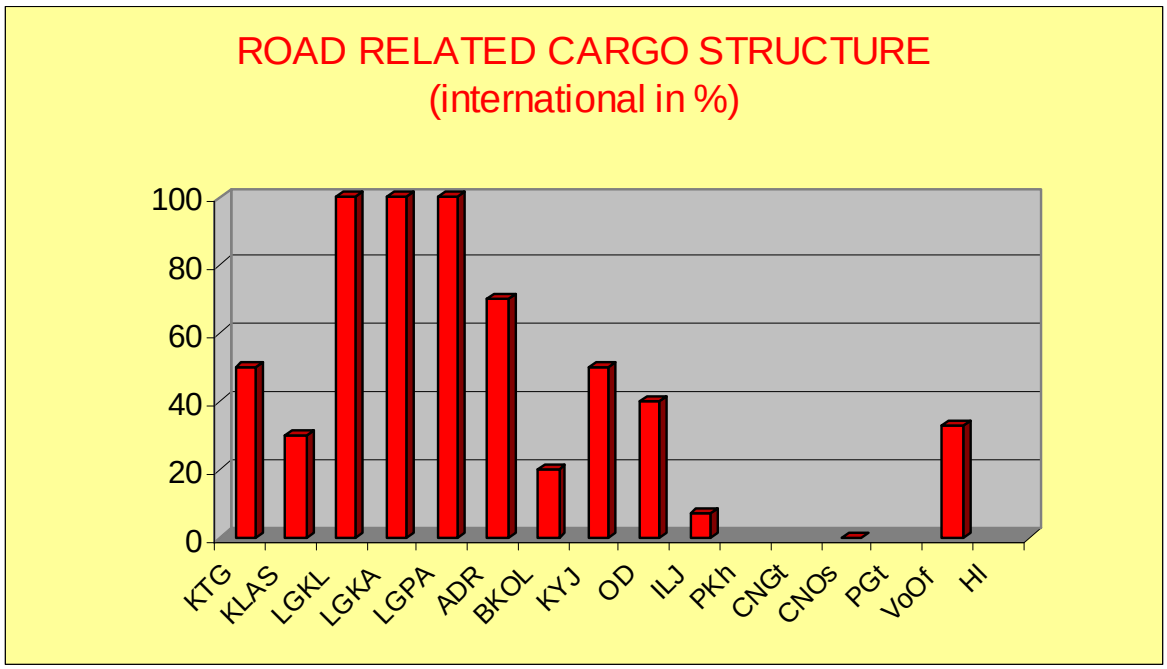
Main terminals positioned on the borders are supplying customs services, or those services are supplied close to the terminals.

PART C: TRAFFIC FLOWS AND TRANSHIPMENT

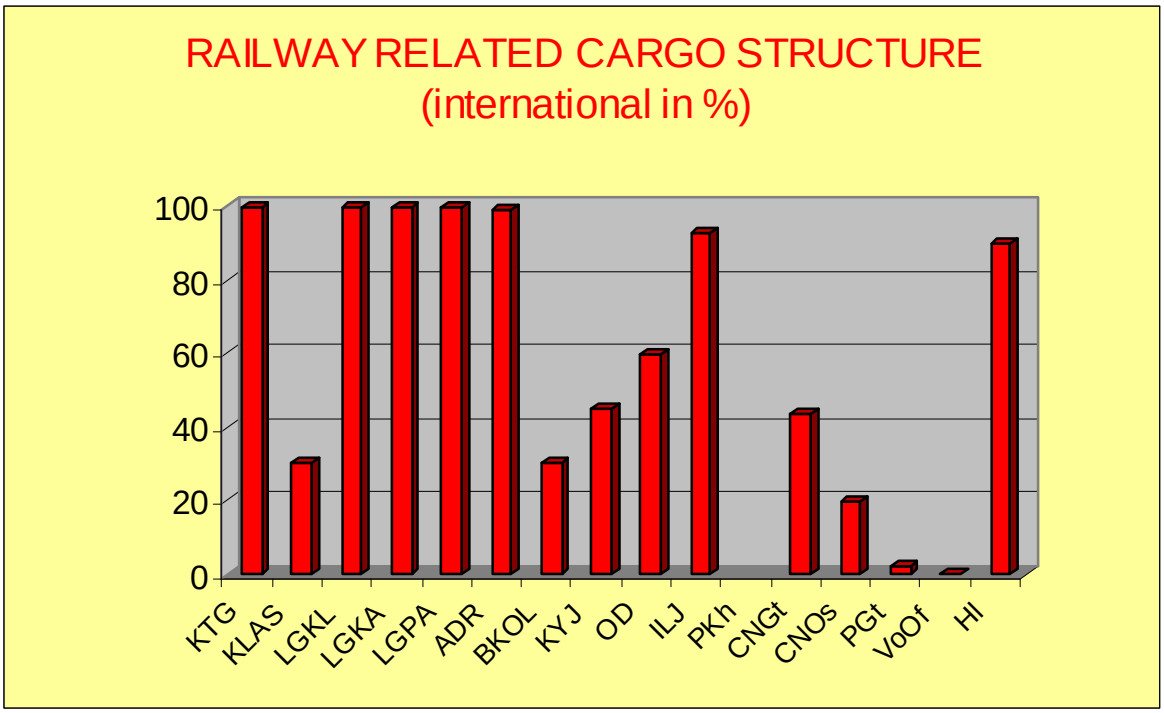
C.1 TRAFFIC FLOWS STRUCTURE

The structure by origin of cargo (national; international) handled in terminals was analysed. Results are as follows.

C.1.1. Road related cargo structure

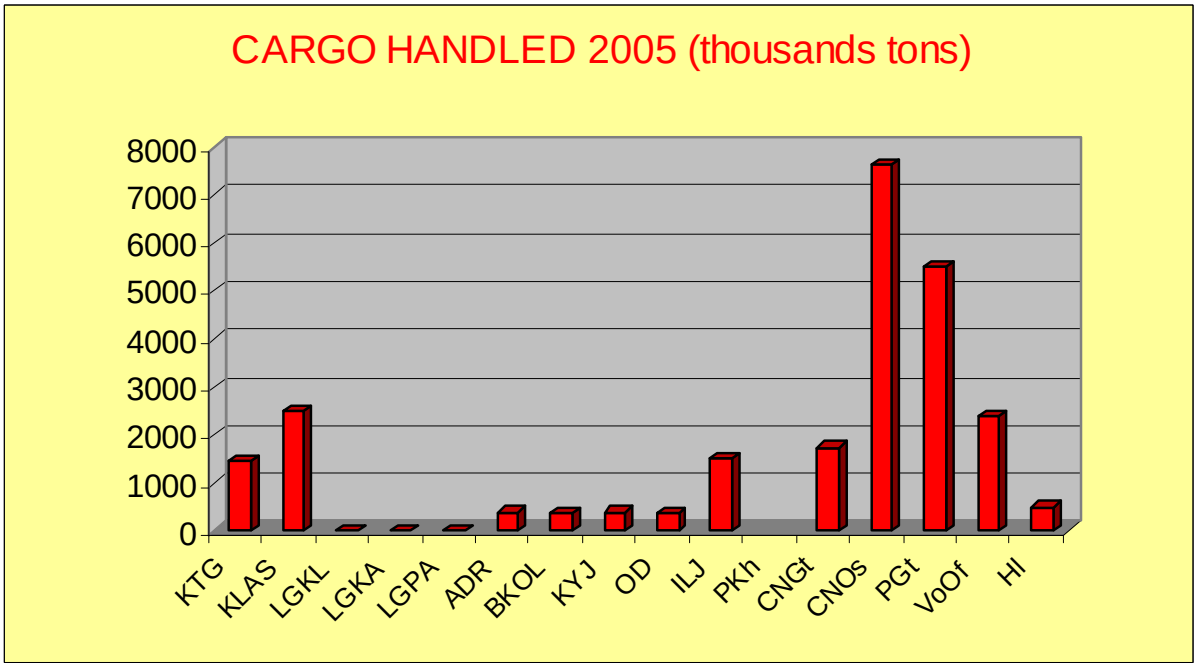


C.1.2.Railway related cargo structure

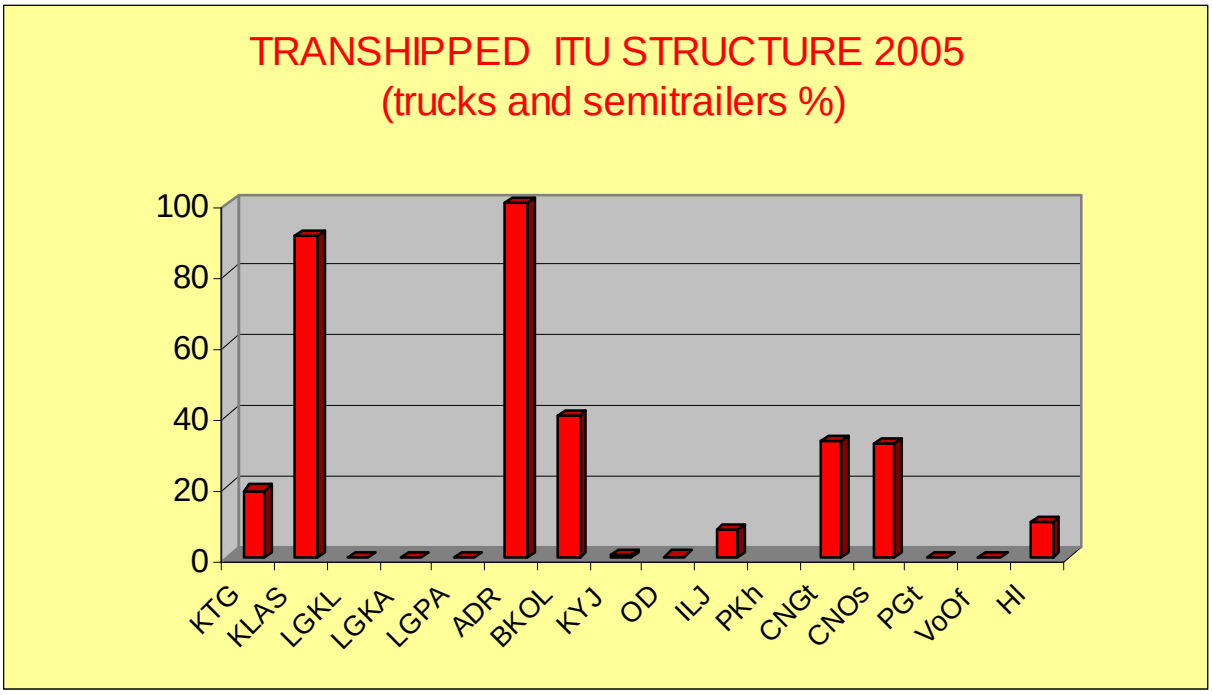


C.3 VOLUME OF TRANSHIPMENTS IN 2005

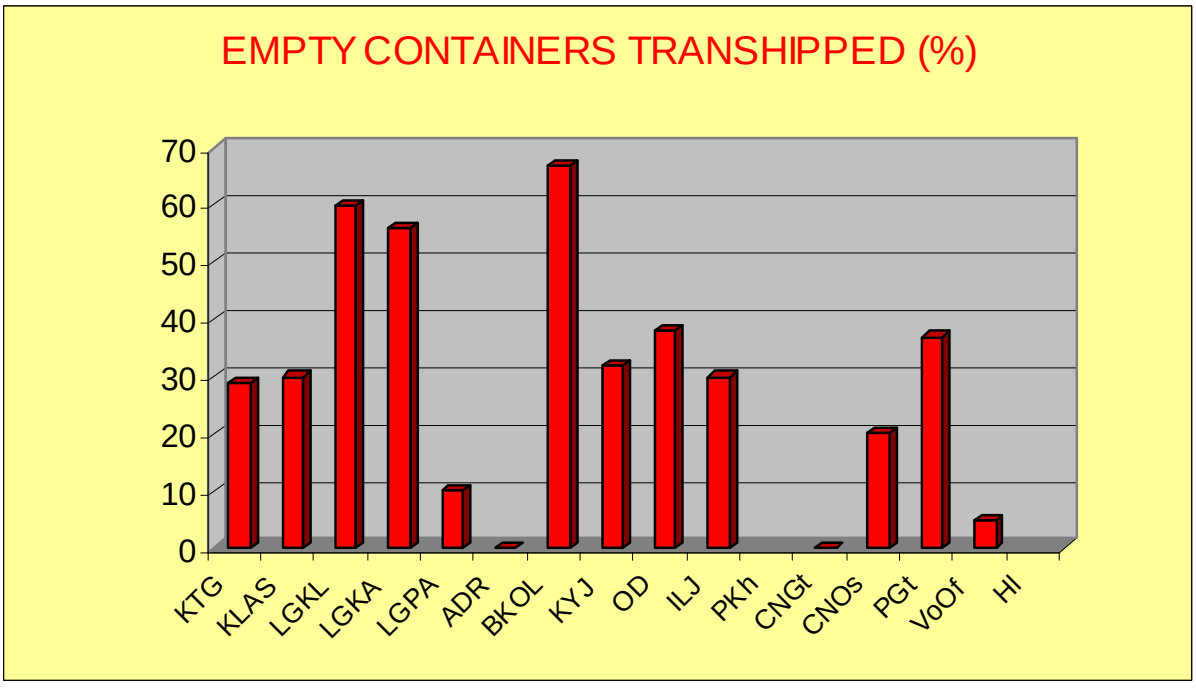
C.3.1. Cargo throughput in 2005 (thousands tonnes).



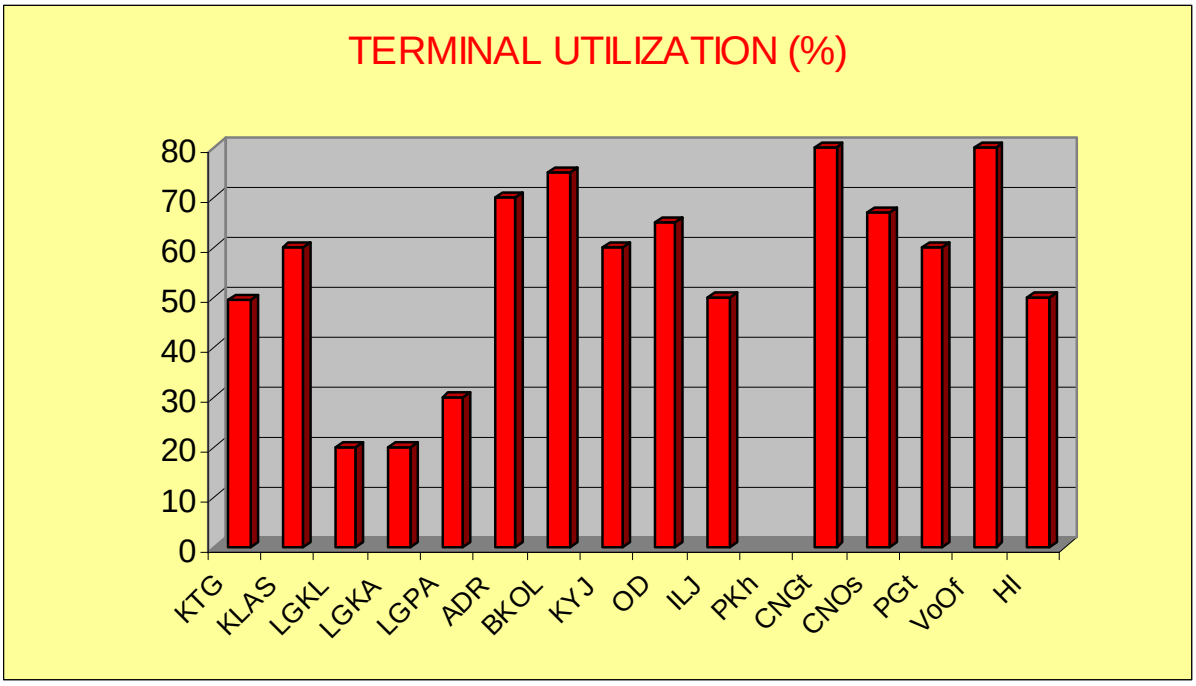
3.2. Structure of transhipped units.



C.3.3. Percentage of empty containers.

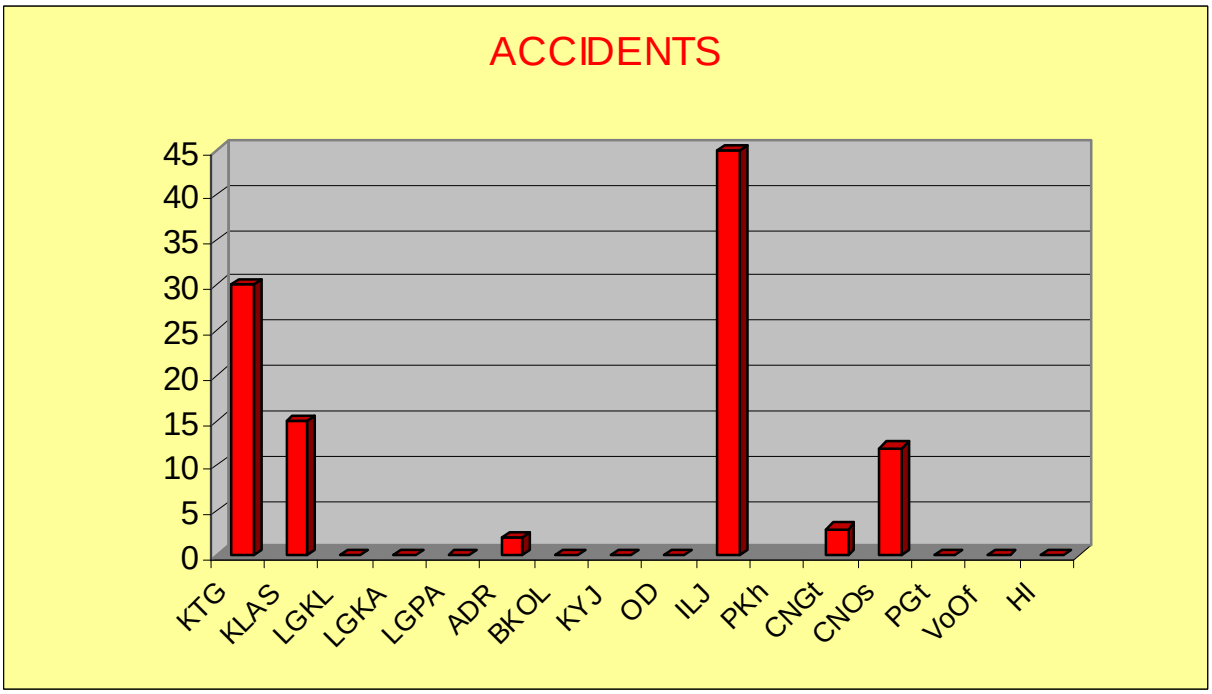


C.4 Utilisation of terminals

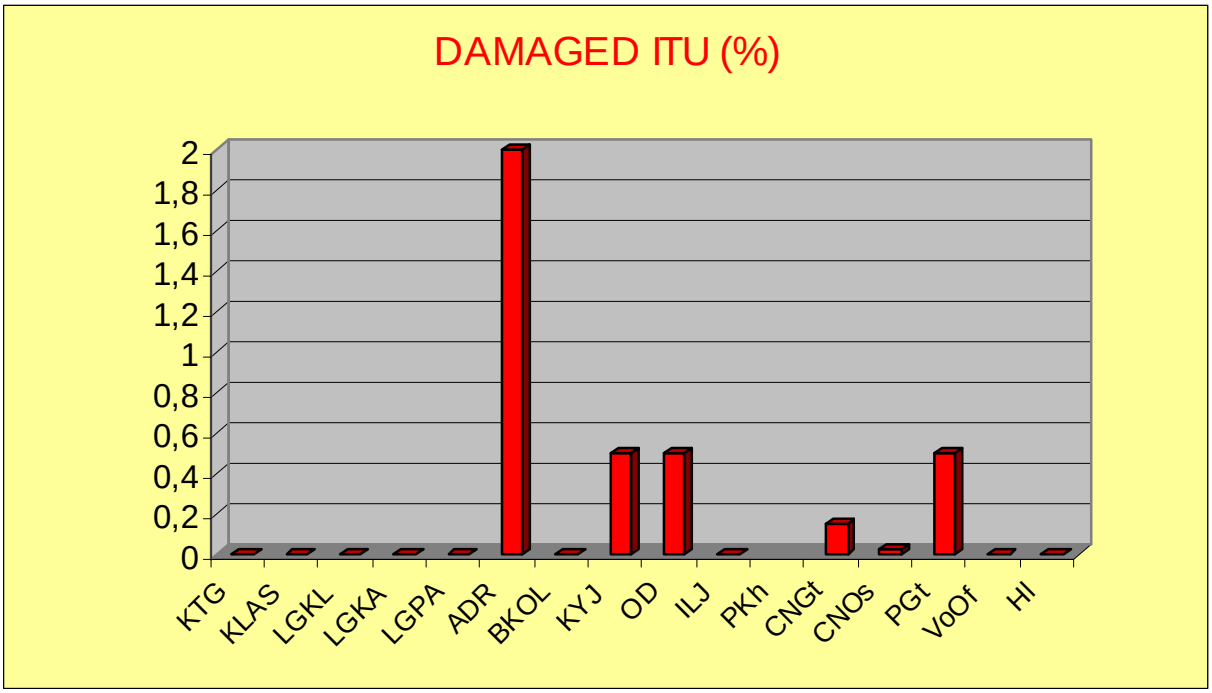


C.5 SAFETY & SECURITY

C.5.1. Accidents with ITU in terminals



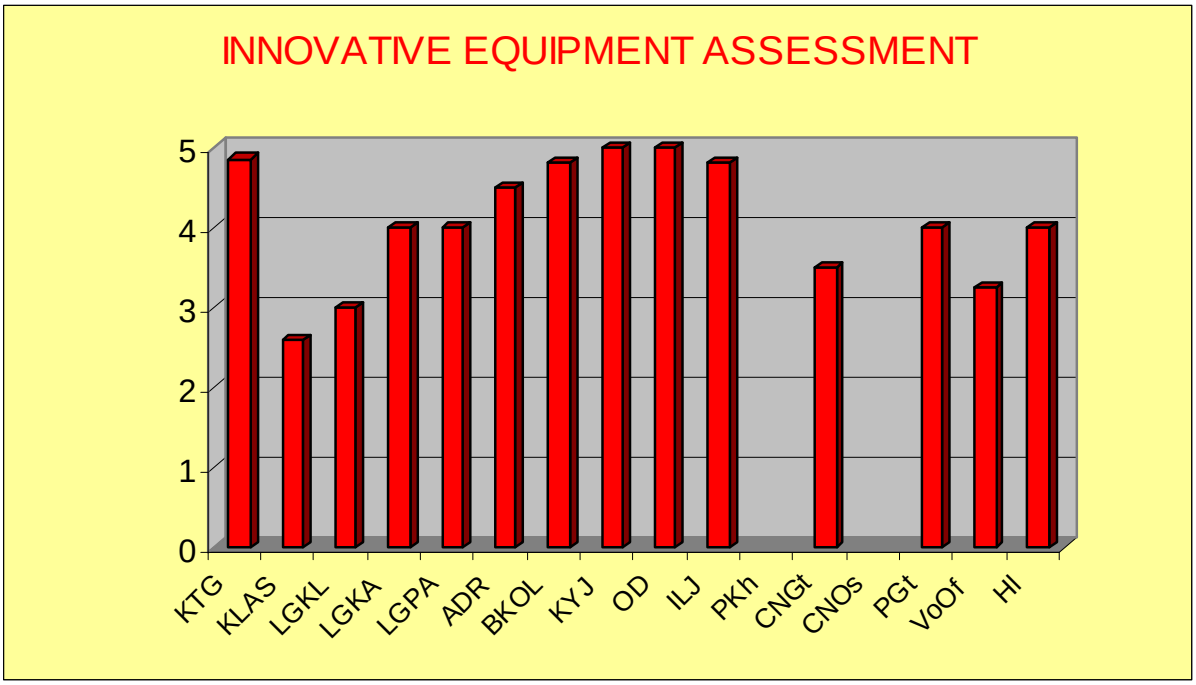
C.5.2. Percentage of damaged ITU



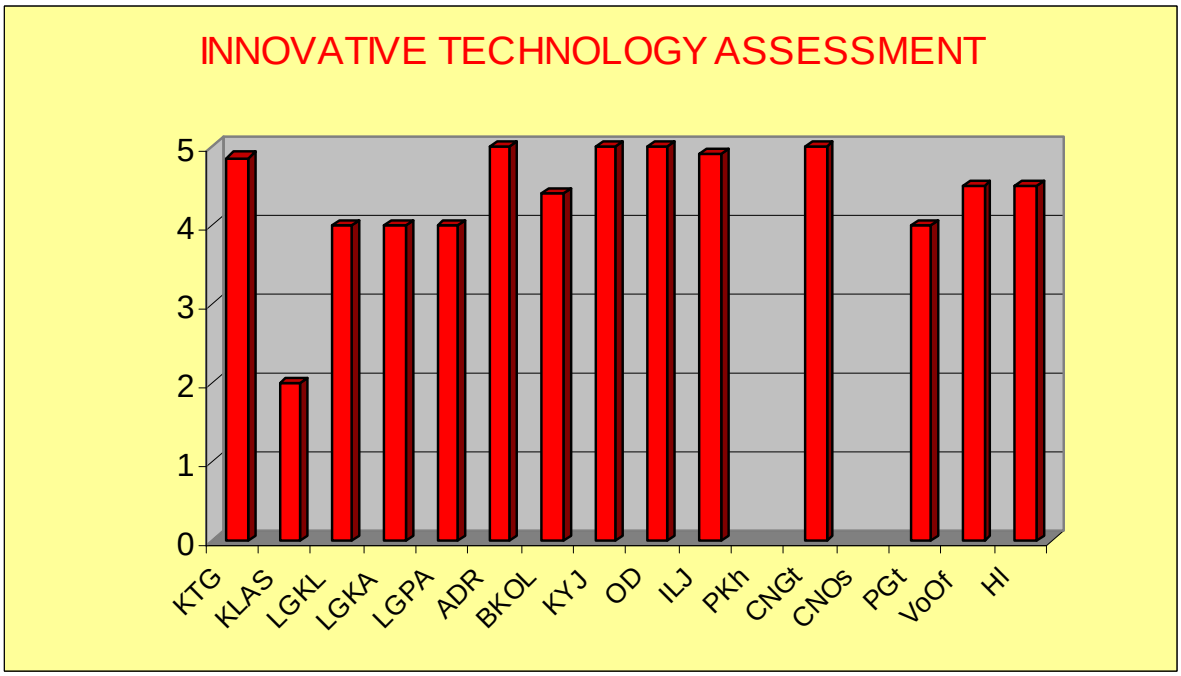
PART D: INNOVATION AND INVESTMENT

D.1. Innovative equipment used/ tested at the terminal

Terminal operators compared innovative equipment used/tested at the terminal with conventional equipment (handling speed, reliability, flexibility, costs etc.), indicating effectiveness from 1 to 5. Results were as follows:



D.2 Innovative technology used / tested at the terminal



Terminal operators compared innovative technologies, used/tested at the terminal with conventional technologies (handling speed, reliability, flexibility, costs etc.), indicating effectiveness from 1 to 5.
Results are shown in the above figure.

D.3 INVESTMENTS IN PROGRESS AND PLANNED

D.3.1 Investments into infrastructure (warehouses and other buildings, storage areas, rail and road infrastructure, etc.)

Cargonet Gothenburg - trucks that are being replaced.
Cargonet Oslo - 2,5 M NOK in loading lanes.
Port of Gothenburg - 100 M SEK new and longer tracks, shunting facilities. Land exploration.
Port of Karlshamn - extension of parking areas, new rail track to port, new rail terminal, extension of berth capacity, gate.

Port of Karlshamn development plan. Source – port of Karlshamn.

Olofstroem - expansion of terminal area at the South Plant to be able to handle increased volumes
Hoglandsterminalen - electricity for locomotives

D.3.2 Handling equipment

Cargonet Oslo - 4 new locomotives, 350 new wagons, 1 new truck + 2 reinvested, 1 reach stacker, 1 new port truck and 1 new container spreader.
Port of Gothenburg - straddle carriers, container chassis, new cranes.
Port of Karlshamn - new fork lifts, reach stacker, container crane, tug masters
Olofstroem - top lift equipment to handle 40”-containers

D.3.3 Handling technology

No significant investments.

D.3.4 IT system

Cargonet Gothenburg - computers in trucks within 2 years. Further development of Cargonet GTS IT-system.
Cargonet Oslo - WLAN covering the terminal, improving internal information handling.
Port of Karlshamn - system for terminal and warehouse, ICT-terminals in tug masters
Olofstroem - RFID for container identification for full implementation.

D.3.5 New types of services (transport services, logistics and other)

Cargonet Gothenburg - increased capacity Gothenburg-Umea. Improved traffic to and from the port of Gothenburg
Port of Gothenburg - 4 new train shuttles, Railport concept development.
Port of Karlshamn - intermodal rail shuttles

D.4 EXPECTED INCREASE IN TERMINAL CAPACITY

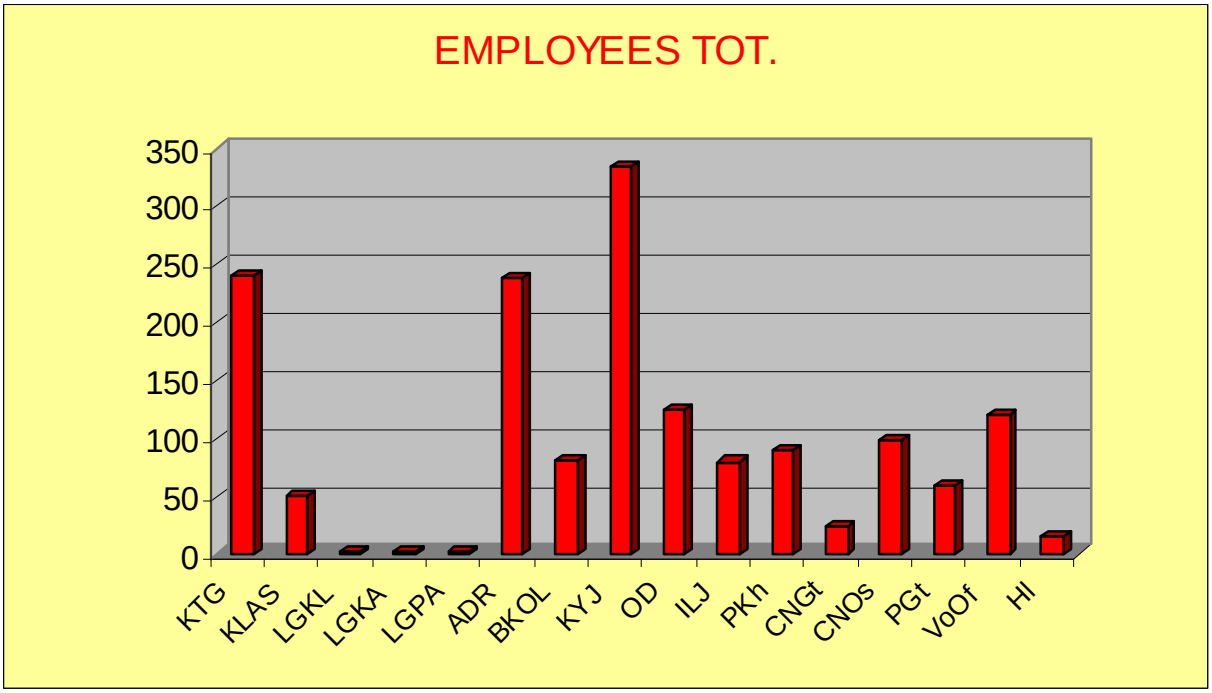
Cargonet Oslo - 750.000 TEU/year
Port of Gothenburg - according to plan the capacity will increase to 1,2 M TEU in 10 years (2017). This will need more investments than the ones mentioned above.
Hoglandsterminalen - 50 000 TEU but the terminal will be easier to use after the investments

D.5 ACCESSIBILITY

Port of Karlshamn - improved access to terminal, tracking & tracing of vehicles and goods
Hoglandsterminalen - increased accessibility for rail.

PART E: EMPLOYMENT POLICY

E.1. Number of employees in terminals



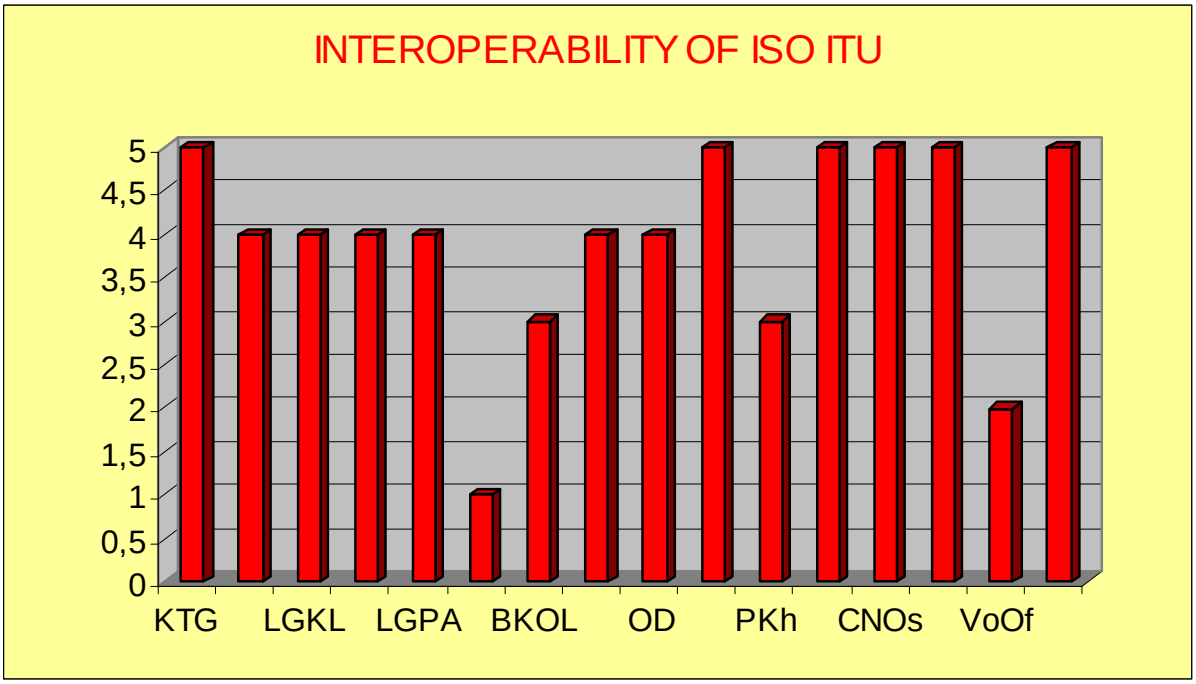
E.1. Impact of new / innovative technologies on the number of employees, level of staff training and education.

In all researched terminals there was indicated a positive influence of new / innovative technologies on the number of employees, level of staff training and education.

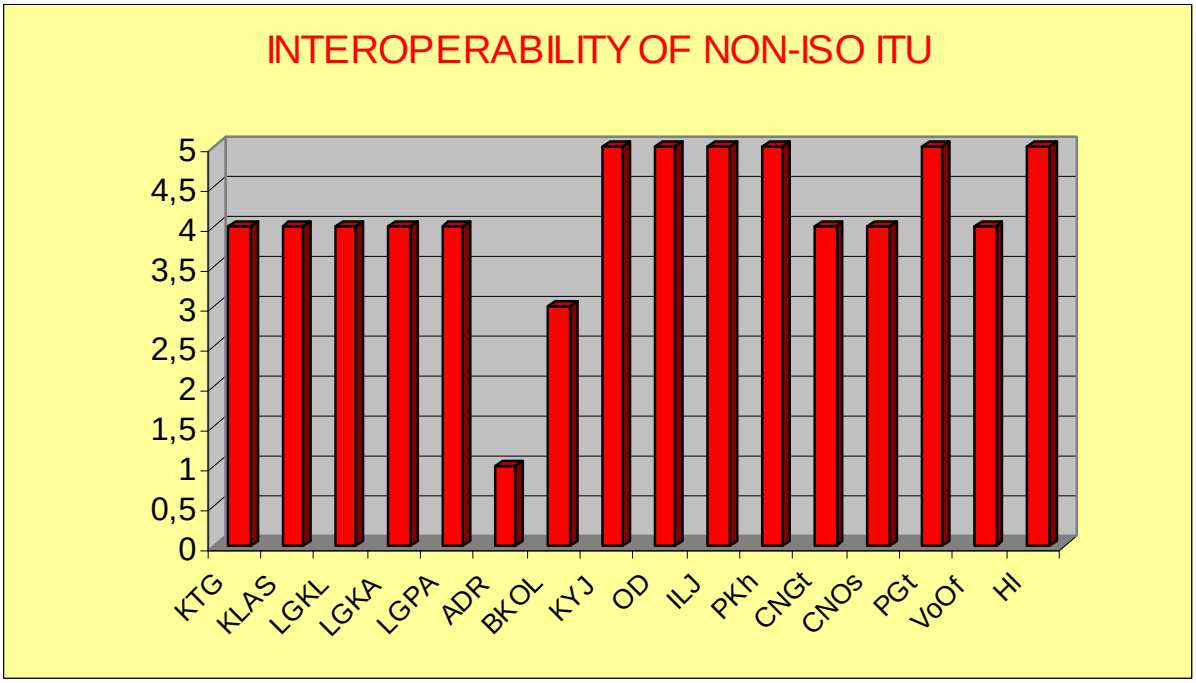
PART F: TECHNICAL INTEROPERABILITY ASSESSMENT

Current level of interoperability of technologies used at terminals were analysed and ranked from 1 (not interoperable) to 5 (fully interoperable) with respect to:

F.1 ITU – according to ISO standards

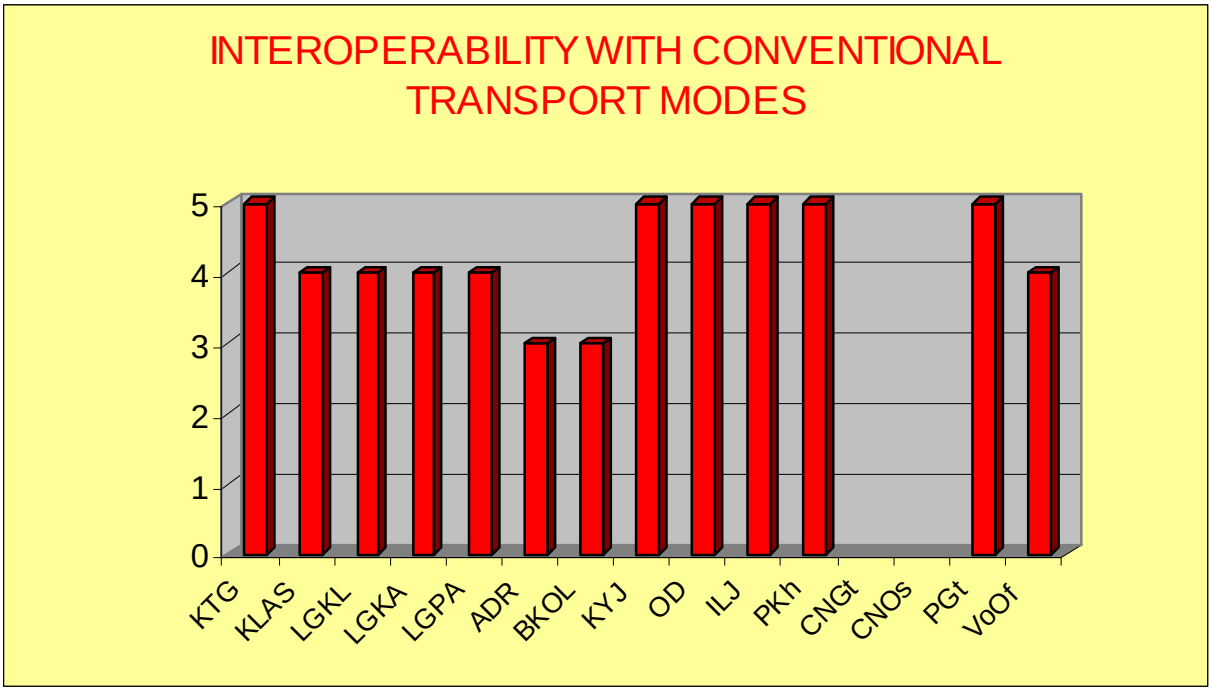


F.2 ITU – beyond ISO standards

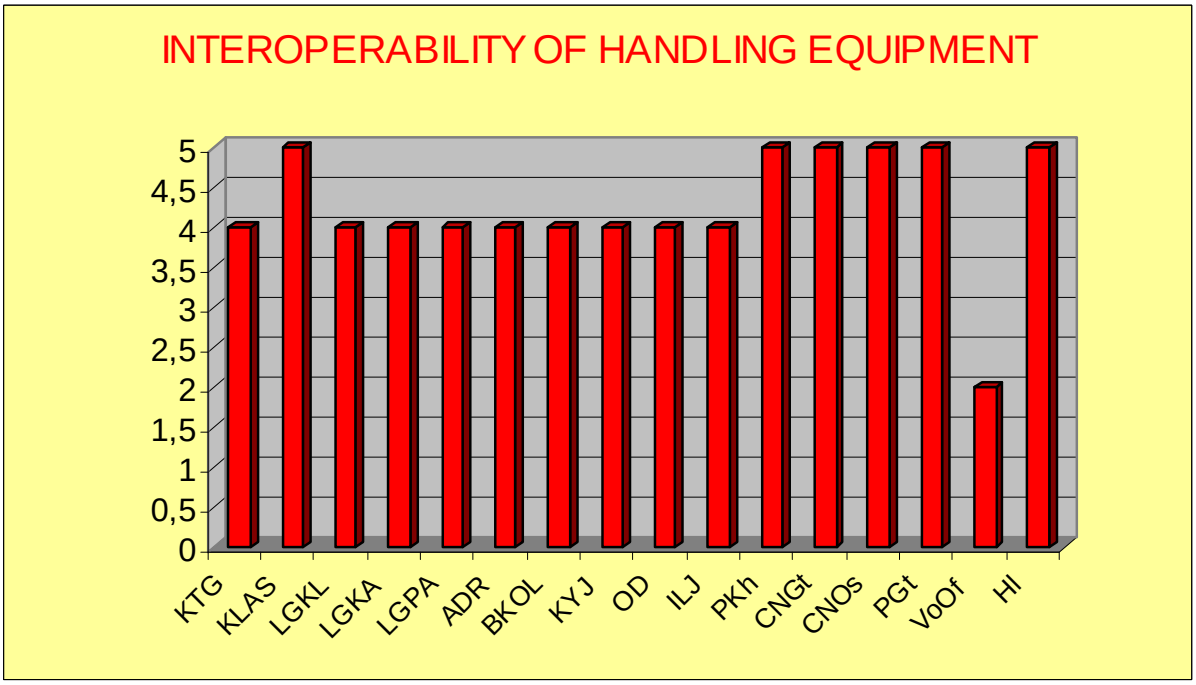


F.3 Conventional transport modes

Ability to interact with existing containerships, rail wagons and trucks (with respect to the type of terminal)

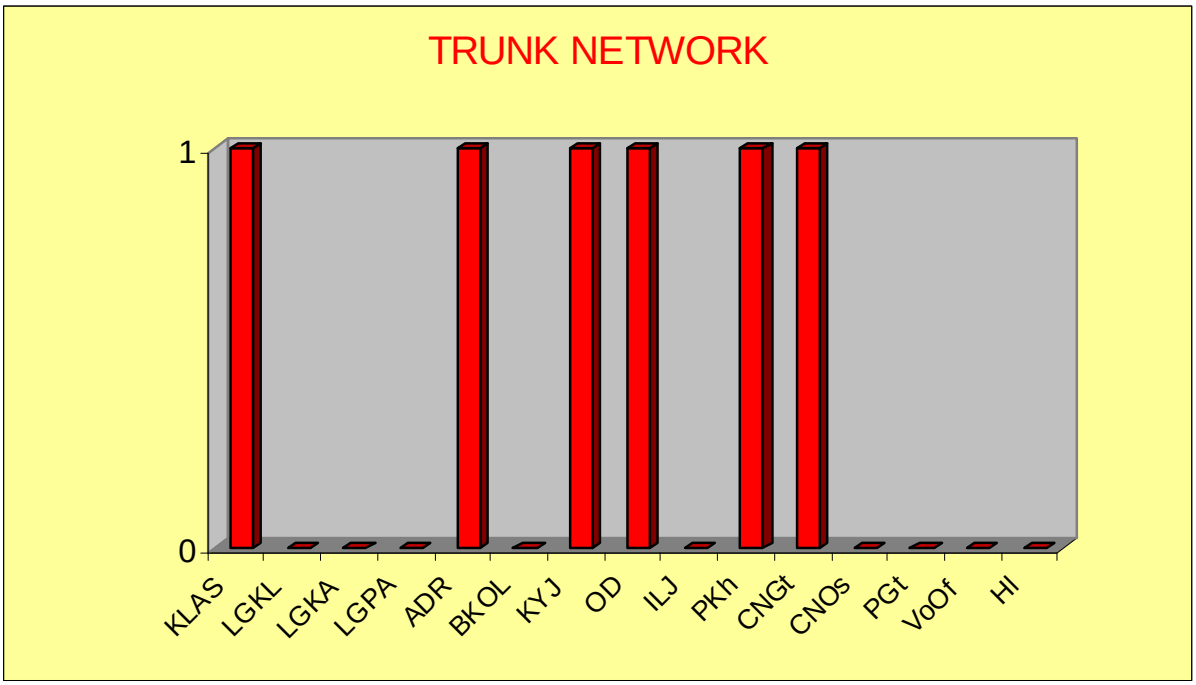


F.4 EXISTING HANDLING EQUIPMENT *(if a transport unit loaded with a system can be unloaded at the destination terminal using conventional equipment, the system is interoperable)*

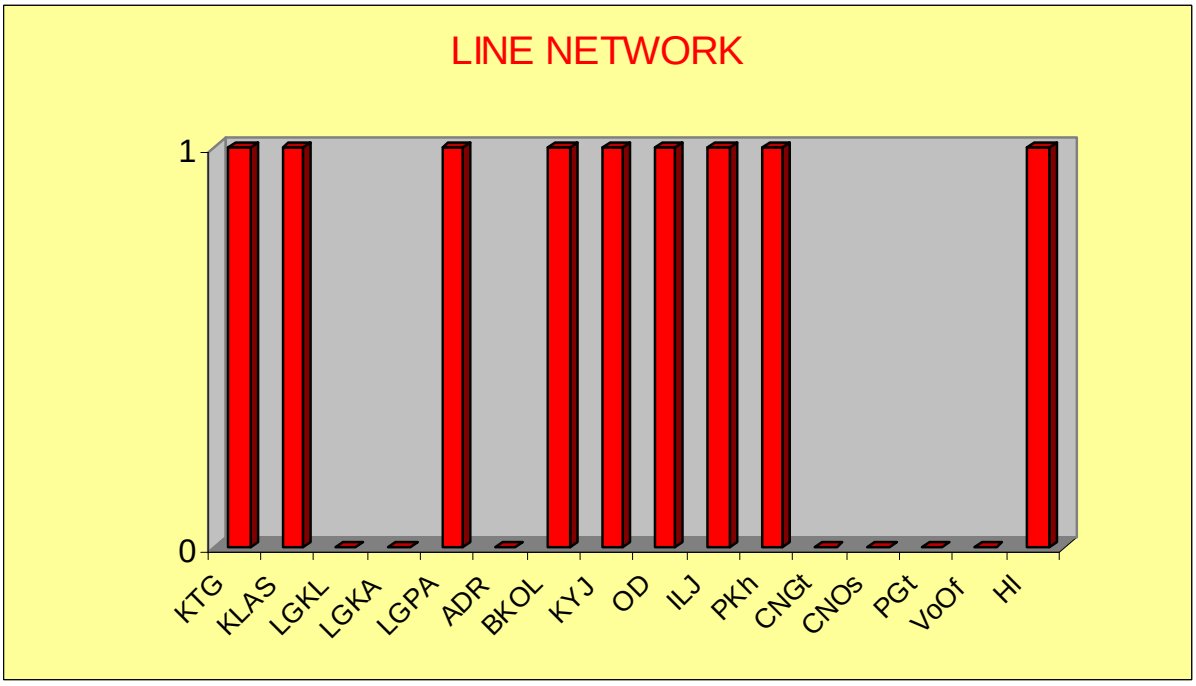


F.5 COMPATIBILITY WITH NETWORK OPERATING FORMS

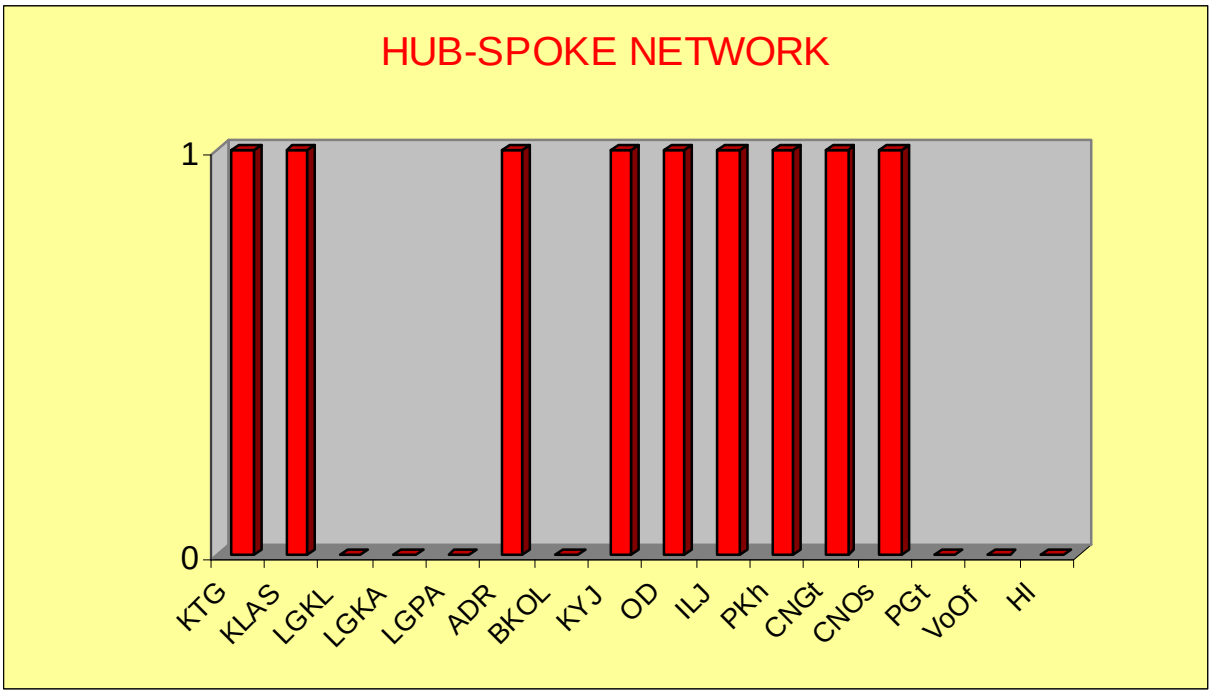
F.5.1. Compatibility with trunk network



F.5.2. Compatibility with line network



F.5.3. Compatibility with hub-spoke network



CHAPTER 5

CONCLUSIONS

6.1. The existing intermodal infrastructure along the East West Transport Corridor as a TRANSIT ROUTE, connecting the EU Baltic region with CIS and further (western and northern parts of China and the Black Sea region) is ready to function and satisfy current customer demand.

But, consistent development and modernisation are compulsory, especially in IT support and interoperability of handling equipment.

The infrastructure of terminals needs further modernisation, especially road transport related infrastructure.

The scope of offered services in the chain has to be revised and improved (especially those concerning transportation of food products – phitosanitary control, refrigeration services).

6.2. As a LOGISTICAL CHAIN for interaction between industries and trades of the Baltic region of the EU with the European part of CIS and the Black Sea regions, the East West Transport Corridor does not meet increasing market demand and is less competitive than the corridor via the Finnish Gulf.
The position of the East West Transport Corridor can be significanly strengthened by developing value added logistics services as well as relations with authorities and private operators of logistics chains in Europe, Russia and Asia.

The subject needs special study, and a resulting plan of investment and organisational measures.

It is essential to notice that in each of the countries, where interviews were performed, the establishment of logistic centres is actualised, and appropriate development plans are under preparation of national or local governments.

Logistic business is becoming more and more attractive for private capital and the market apparently is on the threshold of crucial changes. Constituting of appropriate territories is common key obstacle for this process.

6.3. The analysis identifies an evident scattering in programmes used for IT support of operations.

Only a specialized and targeted study, made by experts in this field could give conclusions, if and how intercommunications between these IT systems may be practically performed.

6.4. Systematic networking between institutions and responsible personalities along corridor is of high importance.

The co-operational experience during the arrangement of shuttle trains Viking and Merkury was a significant elaboration and may be inured with further networking.

ABBREVIATIONS TABLE

ITU: INTERMODAL TRANSPORT UNIT
Containers, swap bodies and semi-trailers suitable for intermodal transport.

ABBREVIATIONS OF TERMINALS

ADR- „Vilniaus Tranzitas" (AD REM group)
BKOL - Koliadichi (Minsk).
CNGt - Cargonet Gothenburg
CNOs - Cargonet Oslo
Hl - Hoglandets terminal AB
ILJ - Port of Illjichevsk (Ro-Ro terminal).
KLAS - JSC Klaipėda Stevedoring Company (KLASCO) - Ro-Ro terminal
KTG - Klaipėdos Terminalo Grupė
KUNC - Kuncevo 2, Moscow.
KYJ - LISKI Kyjev .
LGKA - Container terminal of the Station Station Kaunas), "Lithuanian Railways".
LGKL– Container terminal of the Station "Draugystė" (Klaipėda), "Lithuanian Railways".
LGPA - Container terminal of the Station Station „Paneriai"), "Lithuanian Railways".
OD - LISKI Odessa.
PGt - Port of Gothenburg
VoOf - Volvo Olofstroem

REFERENCES

1. WHITE PAPER "European transport policy for 2010 : Time to decide"

2. TERMINOLOGY ON COMBINED TRANSPORT
Prepared by the UN/ECE, the European Conference of Ministers of Transport (ECMT) and the European Commission (EC). UNITED NATIONS; New York and Geneva, 2001

3. BALTIC MARITIME OUTLOOK 2006. Goods flows and maritime infrastructure in the Baltic Sea Region

4. Transport connections between the EU and Russia. Current status and outlook for the future.Ministry of transport and communications. Finland 2005

5. http://ec.europa.eu/dgs/energy_transport/index_en.html - The Directorate-General for Energy and Transport of the European Commission

5. www.eia-ngo.com - European Intermodal Association

7. www.eurift.net/en/index.html - The European Reference Centre for Intermodal Freight Transport (EURIFT)

8. www.transp.lt - Ministry of Transport and Communications of Lithuania

9. www.litrail.lt – Lithuanian Railways

10. www.rw.by – Byelorussian Railways

11. www.uz.gov.ua – State administration of railway transport of Ukraine

12. www.rzd.ru – Russian Railways

13. www.finnports.com - The Finnish Port Association

14. www.portofklaipeda.lt – Klaipėda State seaport Authority

15. www.ilport.com - Sea Commercial Port of Illichivsk

16. www.portgot.se – Port of Gothenburg

17. www.cargonet.no – Cargonet

18. www.karlshamnshamn.se –port of Karlshamn

Partners of East West TC

AAK
Aerotech Telub
Baltic State Fishing Fleet Academy
Blekinge Institute of Technology
Coordinating Council on Transsiberian Transportation
County Administrative Board of Blekinge
DFDS Tor Line
DFDS Lisco
EC Gruppen
Esbjerg Business Center
IKEA Sweden
ITS Sweden
Kaliningrad Branch of North West Academy
Kaliningrad Oblast
Kaliningrad State University
Karlshamns Expressbyrå
Klaipeda County Coordination
Klaipeda County Governors Administration
Klaipeda State Seaport Authority
Klaipeda University
Klaipedos Smelte
Lithuanian Road Administration
Municipality of Baltijsk
Municipality of Karlshamn
Municipality of Karlskrona
Municipality of Klaipeda
Municipality of Sölvesborgs
Municipality of Ronneby
Port of Esbjerg
Port of Karlshamn
Railion
Railog
Region Blekinge
Region Skåne
Region Sealand
SC Lithuanian Rail Administration
South West Business Development
Swedish National Maritime Administration
Swedish National Rail Administration
Swedish Road Administration Skåne
Swedish Road Administration South East
University of Southern Denmark
Vilnius Gediminas Technical University
Vinnova