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**For more information, contact**  
MIT Global SCALE Network

**Postal Address:**

Massachusetts Institute of Technology 77  
Massachusetts Avenue, Cambridge, MA 02139 (USA)

**Location:**

Building E40, Room 267  
1 Amherst St.

**Access:**

Tel: +1 617-253-5320  
Fax: +1 617-253-4560

Email: [scale@mit.edu](mailto:scale@mit.edu)  
Website: [scale.mit.edu](http://scale.mit.edu)

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**Investigation of dry port opportunities via intermodal operations mapping:**

**An application to the East Asia-Europe trade route**

**Panagiotis S. Tsilingiris**

**For Full Thesis Version Please Contact:**

**Marta Romero**

**ZLOG Director**

Zaragoza Logistics Center (ZLC) Edificio

Náyade 5, C/Bari 55 – PLAZA 50197

Zaragoza, SPAIN

Email: [mromero@zlc.edu.es](mailto:mromero@zlc.edu.es)

Telephone: +34 976 077 605

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## **Investigation of dry port opportunities via intermodal operations mapping: An application to the East Asia-Europe trade route**

Panagiotis S. Tsilingiris

### **EXECUTIVE SUMMARY**

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The continuous increase in international transportation network flows, and especially the “avalanche-scale” rise incurred by East Asia-generated containerized cargo, appears to have created significant imbalances and problems. These are both coastal and inland problems and can be epitomized as follows:

- **Coastal Problems:** The executive committee of the International Chamber of Commerce in May 2005 warned that “freight transport infrastructure is incapable of adequately handling current container volumes.”
- **Inland Problems:** The general director of the European Association of Freight Forwarders stated in 2005 that “everybody thinks that there is too much traffic in the roads”, a rather rational opinion if we factor in that 44% of the goods in the EU are dispatched via trucking (the percentage in the US is 28%).

The negative implications of these problems are exacerbated by the fact that leading nations or unions fail to reach a *modus vivendi* apropos a synergetic plan for the confronting of these problems and their principal side effects, *viz.*, increased congestion levels and environmental pollution. Moreover, inland –and, especially, dry ports’ role- in large transportation initiatives is seriously undermined. At that point we conjectured that containerization and intermodalism enable opportunities for dry transshipment hubs.

In order to investigate the value of dry ports, we perform intermodal transportation operations mapping with a dry port alternative taking into account the latest trends in transportation practices and equipment. The mapping entails assigning cost and time coefficients, and in

some cases their inherent uncertainty, to the principal operations. The flow of containers can be seen in the following figure:

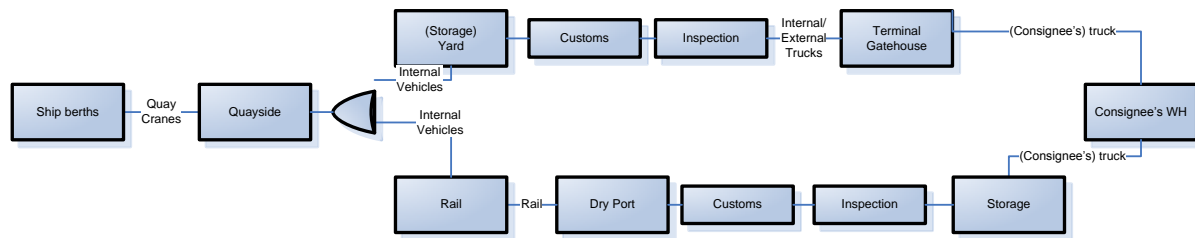


Figure 1. The flow of containers from the harbor of arrival to consignee's warehouse with or without the dry port alternative.

We leveraged the operations mapping to diagnose the *raison d'être* of the problems at intermodal terminals. Major factors include:

- **Terminal congestion:** The capacity of the fleet of containerships increased 727% during the period 1980-2003. The upgrading of maritime terminal infrastructure significantly lags behind the rapid growth of the containerships mentioned above. Moreover, it is estimated that a water port needs to know with 90% reliability exact time windows of ship visits in order to provide services on time. This results in unexpected waiting times before berthing or before starting loading/discharging.
- **Excessive container storage time at the yard:** Bad coordination between ocean, rail and truck carriers results in excessive and expensive container storage time at a yard.
- **Poor intermodal emphasis in terminal design:** This is reflected in the increased costs for port-rail and port-truck operations and the above excessive storage time.

We leverage the mapping of operations to investigate certain dry port vis-à-vis sea port advantages and disadvantages in costs and times. Our observations are the following:

- Container handling costs and storage costs can be less in a dry port. The reasons are that dry ports are less congested, the storage space around them is less expensive and the labor inland is often cheaper and less unionized.
- The same holds true on certain operations' times with an emphasis on storage time and inspection. Regarding the latter, we opine that dry ports can assist in increasing rates of inspection of import containers.

We can further exploit intermodal operations mapping along with the causes and symptoms diagnosed above to investigate how to improve transportation networks via dry port

utilization and/or other transportation solutions. To evaluate these options, we propose the following criteria which all improve the state of a transportation network:

- A decrease in average transportation cost subject to an upper-bounded allowable increase in average transportation time.
- A decrease in average transportation time subject to an upper-bounded allowable increase in average transportation cost.
- A decrease in generalized cost, which includes both the actual transportation cost and the value of time.

In the special case that we aspire to improve transportation service offerings via the utilization of a dry port, we additionally suggest the following:

- a) Evaluate air/road/rail transportation connections;
- b) Investigate port and sub-network dynamics in the certain area;
- c) Compare with other dry and sea ports;
- d) Perform a SWOT analysis (Strengths/Weaknesses/Opportunities/Threats).

To be pragmatic, we applied our methodology to one of the largest (from the point of volume) trade routes in the world, *viz.*, the Far East to Europe trade route. The confidentiality of some data, among other difficulties, makes precise analysis very difficult. However, we succeeded in collecting cost, time, and in some cases uncertainty data, in order to accomplish our analysis.

We evaluated two prime scenarios:

- **Scenario 1:** In scenario 1 we showed that, under certain assumptions, adding a dry port stop at the route Barcelona-Madrid and perform there certain intermodal operations is more profitable rather than perform the operations in the sea port of Barcelona and dispatch the containers via truck to Madrid. Rail connection between the sea port of Madrid and the dry port of Zaragoza is very important for the dry port alternative to be better off.
- **Scenario 2:** In scenario 2 we evaluated the combinations of the three largest sea ports of Spain, *viz.*, Algeciras, Valencia, and Barcelona, and two dry ports, namely, the dry ports of Madrid and Zaragoza. Under certain assumptions, we observed that the combination that minimizes total costs for the dispatching of 10,000 TEUs to the 47 provinces of Spain proportionally to the GDP is that of Barcelona-Zaragoza. We also judge that it

would be profitable for the dry port of Zaragoza to collaborate with both sea ports of Barcelona and Valencia.