Examining container vessel turnaround times across the world

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There is a wide range of studies on port efficiency but curiously enough, these studies have never focused on turnaround times in ports, despite this being considered as a key indicator of efficiency. More often we see studies in operations research about queuing models of vessels in relation to port entrance channels and berth allocation and productivity, but there is a drastic lack of systematic reporting and analyses of ship turnaround times. This paper wants to fill this gap, by presenting an overview of time efficiency in world container ports in 1996, 2006, and 2011.

The calculation of average turnaround time (ATT) is straightforward; it corresponds to the average difference between date of departure and date of arrival among all container vessels calling at a port (or country) within one month of navigation. The unit is the number of days per call. Other measures such as standard deviation could have been used, but the average value better matches the practical reality of port operations. Data obtained from Lloyd's List Intelligence (LLI) is the base upon which such a large-scale analysis can be conducted, as it embraces about 98 percent of the world's container fleet. The time range of one month was judged to be sufficient to provide a global snapshot of the situation at different years, in the month of May. We conducted this analysis at the level of countries and ports.

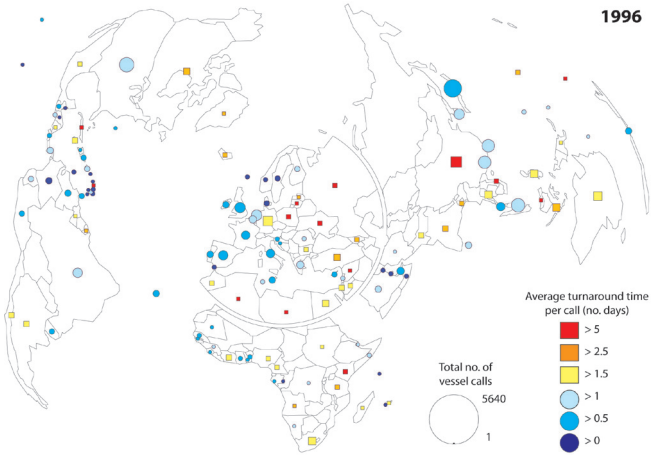
Global snapshot at country level

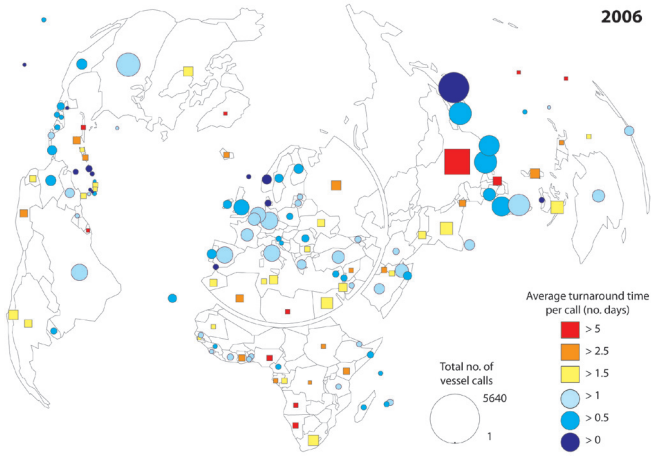
Mapping the scores of countries reveals interesting trends in the geographic distribution and evolution of average turnaround times. In 1996, many former socialist countries, as well as China have the worst performance (eg. Cuba, Ukraine, Baltic States, Poland, Russia, India, Vietnam, North Africa), compared with other Asian, European, and American countries. Germany still bore more resemblance with East European countries and Russia than with West Europe where most countries exhibit high efficiency. Interestingly, Canada and Australia rank rather low in 1996, while Japan has the highest efficiency among countries handling large traffic volumes. The east-west divide faded away by 2006 as most former socialist countries had improved their score, except Vietnam and Cuba. On the contrary, the time efficiency of African countries worsened over the period. Gradual improvements are also visible for Russia, Brazil, Canada, and Turkey.

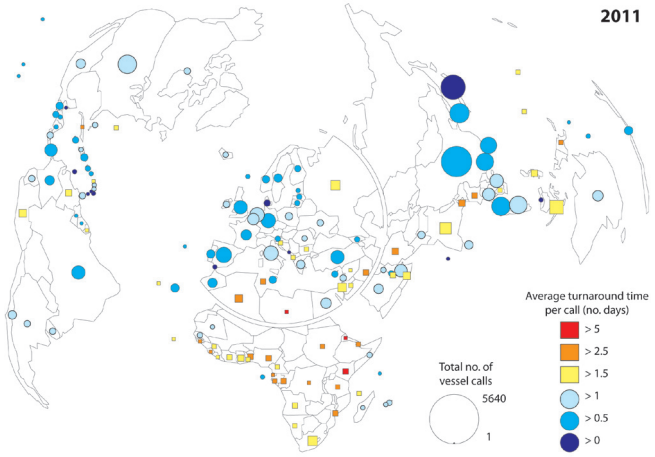
Although China remains the major exception in 2006 with the lowest efficiency and the second highest number of vessel calls, its profile in 2011 has totally changed as it reached the first rank for the number of calls and an average turnaround time of 0.96 days, compared with 5.8 days in both 2006 and 1996. This evolution is unique in its scope and pace compared with the more gradual improvements of some large countries and the stagnation of others (eg. India, Indonesia, South Africa). China remains slightly below Hong Kong (0.72 days), Taiwan (0.71 days), and South Korea (0.68 days), but it has outpaced Singapore (1.16 days) and the United States (1.02 days). In comparison, Africa as a whole lags behind the world average: most of its countries exhibit very long average turn around times also in 2011, with the exception of Morocco and Egypt. Perhaps, on-going improvements of port facilities in Africa by a number of global terminal operators in recent years through public-private partnerships were still to materialise in 2011.

Time efficiency across world ports

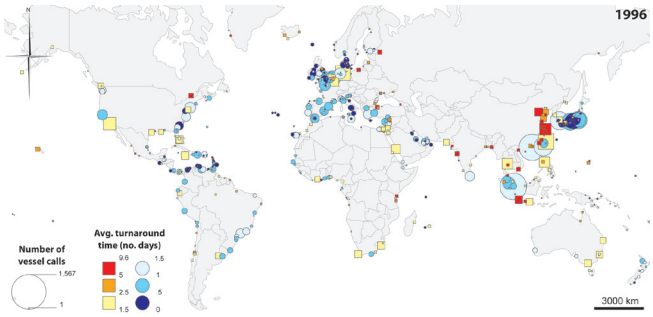
The same analysis at port level confirms the concentration of highest efficiency is in the North Atlantic region and in Japan in 1996, as opposed to the worst efficiency at Shanghai, Tianjin, Jakarta, St. Petersburg, Gdansk, and – surprisingly - Montreal. Strong national and continental effects explain the limited differences among ports of the same country or range: this is a clear evidence of the importance of national trans-port policies on local performance. Europe as a whole has gone through a process of integration and harmonisation, with the Scandinavian ports consistently having the highest efficiency. Within China, Ningbo has become the most efficient of the largest ports (0.49 days) before Shanghai (0.79 days), Chiwan (0.59 days), Yantian (0.65 days), and Shekou (0.95 days), while Tianjin (2.94 days) and Zhoushan (5.46 days) remain far less efficient. Latin America in general is characterised by good efficiency over the period, with Caribbean ports having highest scores (eg. Puerto Rico, Colombia). Peru and Northern Brazil lags behind, and Kingston (Jamaica) as well as several Chilean ports have improved gradually. The picture is much contrasted in North America where west coast ports tend to have lower efficiency than the rest, notably compared with the high (and growing) efficiency of Halifax and other east coast and US Gulf ports: this reflects the different legacies and challenges faced at those port ranges. In the rest of the world, the worst efficiency scores at large ports are seen at Kolkata (India), Mombasa (Kenya), and Algiers, whereas African ports consistently have the worst scores on port efficiency over

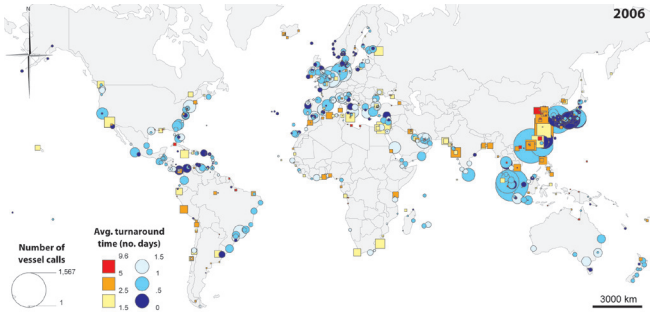


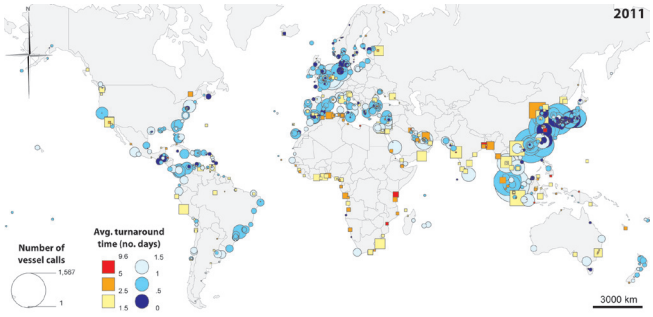




Figures 1a, 1b, 1c: Average turnaround time per country, 1996-2011







Figures 2a, 2b, 2c: Average turnaround time per port, 1996-2011

the whole period. Yet, there are diverse trajectories within a single country, as seen with Mumbai gradually improving its time efficiency, while other Indian ports stagnate or even increase their ATT. Within a given port range like North Europe, only Hamburg exhibits regular improvement, but this being from the worst score in 1996. Le Havre has experienced the biggest increase in ATT until 2006 but has gone back to good efficiency in 2011, performing on average better than other ports, with a comparable performance with Felixstowe and Bremerhaven.

Although there are certainly ways to refine the measurement of ATT, such as on a weekly basis, by standard deviation rather than average, by relating it to containers handled, or only for large vessels, it appears as a useful benchmark for evaluating countries and ports' ability to efficiently operate container flows within their terminals. A fruitful approach would also be to test the closeness between ATT and other measures at country level (using the World Economic Forum Port Infrastructure Quality, DHL Global Connectedness Index, Liner Shipping Connectivity Index, World Bank Logistics Performance Index) and at port level. This could help to better describe how certain countries, such as China, have drastically improved their port efficiency, whereas other countries, indeed whole continents (such as Africa) have continued to score badly on ship turnaround time. A closer look at port functions also seems necessary because ATT may greatly vary according to the importance of transhipment activities in certain ports.

Improving time efficiency

The ways by which container ports may improve their time efficiency are very diverse and can be summarised in three main approaches, aimed at improving ship-to-shore operations, other terminal operations and port functions as a whole. Ship-to-shore operations can be improved by vessel queuing systems, modernisation of equipment that will allow for quicker operations (double cycling, tandem and multiple lift cranes) and qualified personnel able to achieve high crane productivity rates. Ship-to-shore operations are largely dependent on other terminal operations, including yard equipment, terminal surface, storage capacity and terminal planning; these can be bottlenecks that affect the average turn around time of a ship.

This turn around time will also be quicker if the conditions in the whole port area are more favourable, including good intermodal connections with the hinterland within an integrated transport system, truck appointment systems at the terminal gate, and increased competition between different terminals and global terminal operators. Such solutions are often implemented at new port-sites outside traditional port cities where lack of space and congestion in high-density urban areas remain a challenge. One of the contributions of this study is the complementary perspective it provides on time efficiency where continental and national factors play a vital role alongside individual port trajectories: port authorities can improve the efficiency of their ports, but their choices are to some extent determined and constrained by national conditions.

About the authors

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About the organisation

PortEconomics is a web-based initiative aimed at generating and disseminating knowledge about seaports. It is developed and empowered by the members of the PortEconomics group, who are actively involved in academic and contract research in port economics, management, and policy. Since October 2012, Port Technology International and PortEconomics have been engaged in a partnership. Website: www.porteconomics.eu

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