

## Port planning in Latin America and the evolution of container traffic with Asia-Pacific

This edition of the FAL Bulletin addresses port planning in Latin America and delivers an initial forecast on container traffic between Latin America and Asia-Pacific through 2015. This bulletin also summarizes the principal conclusions of the Expert Workshop organized by the Unit of Infrastructure Services, in conjunction with ESCAP and the Korea Maritime Institute (KMI) in October 2009, in Panama. The author of this bulletin is Octavio Doerr. For further information, please contact [trans@eclac.org](mailto:trans@eclac.org)

### I. Introduction

A **Workshop on Container Port Planning Techniques**, was held on 20 and 21 October 2009, in Panama City, organized by the Unit of Infrastructure Services of the Economic Commission for Latin America and the Caribbean (ECLAC), the Transport Division of the Economic Commission for Asia-Pacific (ESCAP) and the Korea Maritime Institute (KMI).

The workshop was attended by port directors, from both the public and private sectors, from 10 Latin American countries: Argentina, Chile, Colombia, Costa Rica, El Salvador, Mexico, Nicaragua, Panama, Peru and Uruguay, as well as representatives from the United States and the Republic of Korea, and academics from Latin America and Europe.

The workshop covered the following topics:

- Analysis of regional and world maritime markets;
- Situation of regional ports, port activity, projects and plans;
- Review of container trade and the associated shipping service patterns between Latin America and the Asia-Pacific region, including the past situation up until the present, as well as future growth potential;
- Discussion of the tools used in the region to plan port terminals;
- Presentation of ESCAP methodology (MPPM/ITPM)
- KMI application of MPPM for container trade between Asia-Pacific and Latin America and the Caribbean.

In their discussion, the panel of port representatives and experts focused on the importance of interregional trade projections, developments in the main container shipping routes and the shipping service patterns among ports in both regions. One of the main conclusions reached was the need to assist the team of experts from ESCAP/KMI by providing complete, up-to-date, standardized statistical information regarding container movement in the main ports and in the subregions. To this end, ECLAC and the participants agreed to adopt standards and request that they be applied in the ports of Latin America and the Caribbean (LAC).

At the end of this session, the participants commended the guest countries for the technical quality of their presentations, the main focus of which was the progress made thus far in researching the potential future evolution of trade between the Asia-Pacific region and Latin America and the Caribbean, the container service patterns between both regions and other topics of interest.

Based on the comments made by participants, it is clear that port activity is becoming increasingly more important for the transport chain and the distribution of production and trade in all the region's countries, and special attention should be given to rapid technological advances and growing interport competition, which make strengthening the capacity for regional port planning a necessity. Adequately forecasting national and

regional maritime traffic is the key to planning the most efficient and realistic port capacity possible.

This bulletin presents the main conclusions gathered from the event, as well as an analysis of the principal changes that have occurred in maritime container transport over the past decade and the impact that both regions have suffered as a result of the recent global economic crisis. It also addresses the evolution of traffic and the state of container operations in the principal LAC ports and their connection to Asia-Pacific, reviewing the methodology developed by KMI/ESCAP for analysing container traffic projections and maritime and port planning. The final section discusses container traffic forecasts through 2015 between Latin America and Asia-Pacific based on the model developed by KMI/ESCAP. It is important to point out that the values presented here are only preliminary and do not constitute official ECLAC or United Nations forecasts. Once the regional statistical information has been compiled and validated, these forecasts will be revised and published in a timely manner.

## **II. Effect of the global crisis on port planning**

The developments of this year have dealt a major blow to the seaport sector. In addition to the hardship caused by the oil crisis at the end of 2008, the economic crisis took its toll, with its well-known effects in the sector: lower freight charges, excess fleet capacity and the postponement of many infrastructure concessions due to a lack of investors and adequate financing.

After a decade of strong growth for most of the container ports in the region, at the beginning of the world economic crisis (2008) there was significant stock in the region (also an excess supply) of projects in varying phases of development aimed at expanding ports and even building infrastructure in new locations. All of these plans were supported by port authorities, who reasoned that they would need to accommodate the additional volumes indicated in the available traffic forecasts, which were created based on the assumption that the growth rates observed in previous years would hold steady.

However, in the wake of the economic crisis, its negative effects on foreign trade and the resulting reduction in cargo volumes at regional ports, there is a pressing need to revise expansion plans, verifying the validity of the assumptions made when formulating the forecasts and the magnitude and timeliness of the proposed investments. After more than a year of crisis and its negative impact on most of the world's economies and on port activity in the region, the same high levels of growth may not be expected in regional ports, at least not in the short term.

In these circumstances, port authorities from Latin America present at the event stated the need for updated port plans that take into account the current situation and that allow for adequate, sustainable investment in order to efficiently meet the new demands of maritime trade, especially with regards to container transport.

This diagnosis poses new challenges for the region's port authorities, but also reflects the need to conduct a systemic regional and subregional sector analysis, including demand and traffic assignment in ports that compete in the same sphere of influence, and shipping service trends on both South American coasts, in the Caribbean and in Central America, taking into account the future expansion of the Panama Canal. This would facilitate the analysis of common policies, such as those pertaining to shipping services that cover several ports, the best strategy for developing the port supply in a subregion, or the expected evolution of trade in a hinterland shared by two or more ports.

### **III. Analysis of the evolution of container flows between Latin America and the Caribbean and the Asia-Pacific region**

Over the last two decades, global trade, including trade in the Asia-Pacific and LAC regions, has grown steadily. The evolution of seaborne container transport during that period forced ports to adapt available infrastructure and incorporate specialized equipment in order to accommodate a growing number of container vessels, which were also growing in size. So, for over two decades, international container trade continued to rise at an average rate that far exceeded the growth rate of maritime trade,

and the ports of the main economies were adapting to the new requirements of container shipping services.

### **East Coast of South America (ECSA) and Asia-Pacific containerized traffic**

Total ECSA container trade in 2008 consisted of approximately 5.9 million TEU, with 3.6 million TEU of exports and 2.2 million TEU of imports. The Asia-Pacific region represents 16% of exports and 34% of imports. Over the last eight years, exports rose at an average annual rate of 7.5% and imports at an average rate of 7.8%. Exports to Asia rose at a much faster rate of about 11.8% per year and imports at an annual rate of over 14%, as seen in table 1.

**Table 1. Container traffic – East Coast of South America (Thousands of TEU)**

Movements	To or from	2000	2002	2004	2006	2008	2000 to 2008 Annual average rate (%)
Exports	To all countries	2,028	2,461	3,141	3,502	3,629	7.5%
	To Asia-Pacific	241	331	429	500	587	11.8%
Imports	From all countries	1,245	876	1,288	1,689	2,263	7.8%
	From Asia-Pacific	274	173	333	557	779	14.0%

Source: ECLAC/Global Insight 2009

The growth of container imports has not been constant and has been affected by economic crises. During the Argentine crisis, in 2001 and 2002, imports fell in Argentina, Brazil, Uruguay and Paraguay, while during the rest of the period both exports and imports rose in those countries, registering a 70% increase in 2004. The initial reports from 2009 show an increase compared to 2008 for container exports as well imports. Table 2 shows the evolution of container exports and imports in ECSA countries during 2000-2008.

**Table 2. Cargo containers by country – East Coast of South America (Thousands of TEU)**

Movements	Country	2000	2002	2004	2006	2008	Average rate 00-08
Exports	Argentina	416	496	534	631	708	6.9%
	Brazil	1,522	1,878	2,486	2,716	2,757	7.7%
	Uruguay/Paraguay	90	87	122	155	165	7.8%
	Total ECSA	2,028	2,461	3,141	3,502	3,629	7.5%
Imports	Argentina	367	148	317	422	549	5.2%
	Brazil	752	617	838	1,105	1,511	9.1%
	Uruguay/Paraguay	125	111	133	162	204	6.3%
	Total ECSA	1,245	876	1,289	1,689	2,263	7.8%

Source: ECLAC/Global Insight

Table 2 shows that ECSA annual growth rates for imports transported in containers have experienced sustained growth throughout the period. Brazil shows the highest average annual growth rate at 9.1%. In 2008, Brazil accounted for 67% of the imports of ECSA and Argentina accounted for 24% of that market. Despite the international crisis, all the ECSA countries showed strong positive growth for imports in 2008, with Brazil achieving a 13.8% growth rate. Table 2 shows that Brazil accounted for approximately 76% of ECSA exports in 2008, Argentina 19% and Uruguay and Paraguay about 5% apiece.

As shown in table 3, in 2006, imports from Asia-Pacific to ECSA exceeded exports to that region. Imports from Asia-Pacific have increased in terms of their share every year since 2004, reaching 57% of the total in 2008. In 2008, Brazil accounted for 68% of imports and 78% of exports on the Asia-Pacific route.

**Table 3 Cargo containers – East Coast of South America – Asia-Pacific Route (Thousands of TEU)**

Movements	Country	2000	2002	2004	2006	2008	Average rate 00-08
Exports	Argentina	45	62	64	86	96	10.1%
	Brazil	187	258	349	387	462	12.0%
	Uruguay/Paraguay	10	11	17	27	29	15.0%
	Total ECSA	242	331	429	500	587	11.8%
Imports	Argentina	83	22	76	132	197	11.4%
	Brazil	160	133	229	384	530	16.2%
	Uruguay/Paraguay	31	18	28	41	52	6.7%
	Total ECSA	274	173	333	557	779	14.0%

Source: ECLAC /Global Insight

As of December 2008, 47 shipping services are estimated to operate in ECSA, with a total of 271 assigned vessels and a nominal annual capacity of approximately 5.7 million TEU. In December 2008, only eight shipping services were operating between ECSA and Asia-Pacific with 79 vessels assigned to those services, with a nominal annual capacity of approximately 1.2 million TEU, equalling 22% of the total capacity of container vessel services on all ECSA routes.

### **West Coast of South America (WCSA) and Asia-Pacific containerized traffic**

WCSA container trade in 2008 was 3.4 million TEU (loaded). Exports totalled 1.7 million TEU, and imports totalled 1.7 million TEU. The Asia-Pacific region accounted for 16% of WCSA exports and 38% of WCSA imports.

During the 2000-2008 period, total WCSA exports rose at an annual rate of approximately 8.3% and imports at a rate of 10.6%. Exports to Asia rose at a faster rate than total exports, approximately 8.6% per year, and imports at a higher annual rate of 14.7% (see table 6).

**Table 6 WCSA – Cargo containers (Thousands of TEU)**

Movements	To or from	2000	2002	2004	2006	2008	Average 00-08
Exports	All countries	889	994	1,265	1,546	1,685	8.3%
	Asia-Pacific	142	135	204	235	274	8.6%
Imports	All countries	771	839	1,025	1,354	1,728	10.6%
	Asia-Pacific	217	260	325	498	651	14.7%

Source: ECLAC/Global Insight 2009; SPRBUN

Table 6 shows that growth in container imports remained consistently high throughout the decade. Table 7 shows that Colombia (Buenaventura) registered a high average annual growth rate of 14.4%, Chile and Ecuador a rate of 10.2% and Peru, 9.5%. Chile accounted for 36% of WCSA imports, Peru 27%, Ecuador and Bolivia 21% and Colombia (Buenaventura) 14%.

**Table 7 WCSA – Cargo containers by country (Thousands of TEU)**

Movements	Country	2000	2002	2004	2006	2008	Average 00-08
Exports	Colombia Pacific	69	84	104	109	110	6.1%
	Chile	475	514	733	895	988	9.6%
	Ecuador/Bolivia (Plur. State of)	239	257	265	303	330	4.1%
	Peru	106	138	163	238	257	11.7%
	Total WCSA	889	994	1,264	1,546	1,685	8.3%
Imports	Colombia Pacific	98	117	166	241	288	14.4%
	Chile	282	297	344	471	614	10.2%
	Ecuador/Bolivia (Plur. State of)	163	181	216	286	355	10.2%
	Peru	228	244	300	356	471	9.5%
	Total WCSA	771	838	1,025	1,354	1,728	10.6%

Source: ECLAC/SPRBUN

WCSA container trade showed slightly higher exports until 2007, when imports took the lead. A breakdown of ports shows Buenaventura and Callao register much higher import trade; Guayaquil shows a trade imbalance; Valparaíso and San Antonio have



equal import and export amounts, but the Chilean ports of San Vicente and Lirquén deal almost exclusively with exports. In WCSA, Asia-Pacific imports tend to exceed exports and this trend has been becoming more marked throughout the period: in 2000, imports represented 60% of total exports; in 2008, imports increased to 70% of exports. This imbalance is particularly noticeable in the case of Colombia (Buenaventura), Ecuador and Peru. Cargo container trade between Chile and the Asia-Pacific region is relatively balanced.

In 2008, all of the WCSA countries showed negative growth for exports to the Asia-Pacific region. Imports continued to increase, although to a lesser degree than in previous years. Table 8 shows container exports and imports on this route.

**Table 8 WCSA - Asia Pacific – Cargo containers by country (Thousands of TEU)**

Movements	Country	2000	2002	2004	2006	2008	Average 00-08
Exports	Colombia Pacific	8	7	7	7	8	0.6%
	Chile	111	105	164	186	219	8.9%
	Ecuador/Bolivia (Plur. State of)	11	8	8	9	10	-1.8%
	Peru	12	16	25	33	37	15.4%
	Total WCSA	142	135	204	235	274	8.6%
Imports	Colombia Pacific	37	49	66	109	152	19.3%
	Chile	85	111	112	181	224	12.8%
	Ecuador/Bolivia (Plur. State of)	44	44	53	96	119	13.3%
	Peru	51	57	94	112	156	15.0%
	Total WCSA	217	260	325	498	651	14.7%

Source: ECLAC/GI; SPRBun

As of August 2009, 37 different services are estimated to operate in WCSA, where 183 ships offer a nominal annual capacity of approximately 3.4 million TEU. There are six services between WCSA and Asia-Pacific with 62 ships providing a nominal annual capacity of approximately 968 thousand TEU. WCSA has more direct services operating to Asia-Pacific than on any other shipping route.

#### **IV. KMI/ESCAP methodology for maritime and port planning and for analysing container traffic projections**

Among the other tasks it performs, the Transport Division of ESCAP is known for its work on designing a planning model for maritime and port development (MPPM), which is a means of optimizing public and private strategies for investment in maritime transport and container ports. MPPM can be applied in the evaluation of future shipping service requirements, national port plans and the analysis of options. Recently, ESCAP has broadened the scope of the MPPM model by developing an integrated transport planning model (ITPM), which includes intermodal aspects of container transport. In the framework of collaboration between ESCAP and ECLAC, the model is expected to be expanded and used to analyse Latin American and Caribbean port issues in the near future.

##### **(a) Maritime transport policy planning model (MPPM)**

This model was developed using a port-to-port approach to analyse and validate the existing relationships among maritime trade flows, shipping flows, infrastructure and port productivity. MPPM includes three modules: the trade module, the port strategic planning module, and the liner shipping network module. The trade module is used to forecast maritime trade on a country-to-country basis. Separate forecasts are delivered for 53 commodities and for four types of transported cargo: container, break bulk, dry bulk and liquid bulk. The three principal activities are trade generation, trade distribution and the modal assignment phase. The trade module is used to produce forecasts of container cargo in the study regions and to assign trade flows of container cargo into port-to-port movements.

The port strategic planning module links the trade module to the liner shipping network model. In this module, the country-to-country trade flows obtained from the trade module are transformed into port-to-port flows. The information on port operations is obtained from port statistics compiled by ESCAP, collected from different institutions in the countries of the Asia-Pacific region and from other specialized sources. The data on

the volume of cargo flows and vessel call information is as necessary as the port infrastructure information for estimating the capacity required to cater to the projected shipping services.

The liner shipping network model (LSNM) assigns the port-to-port container cargo flows obtained from the port strategic planning module to shipping routes and estimates the shipping services (fleet) required to transport the forecast trade and the number of vessel calls at each port in the study region. The liner shipping network module generates the shipping network capable of managing trade flows and assigns the cargo to the services network, estimating the total costs of different shipping system configurations. The rules governing cargo assignment are based on certain common sense axioms and assumptions and, all else being equal:

- A service becomes more attractive as its frequency increases;
- Direct services are preferred to those requiring the trans-shipment of cargo;
- Services with fast transit time are generally preferred to slower services;
- Lower-priced services will be preferred to higher-priced services.

### **(b) Integrated Transport Planning Model (ITPM)**

Intermodal transport systems and their connections to inland markets play a crucial role in the economic development of the regions. An efficient system of inland logistics also facilitates international and bilateral trade. Asia-Pacific trade operates in a way that is increasingly more integrated with the global logistics network, and intermodal merchandise transport is also increasing. For this reason, ESCAP saw a need for an expanded MPPM model that incorporates services along the entire distribution chain, broadening its scope in order to include transport systems to inland markets in all the Asian regions.

To this end, KMI conducted a study for ESCAP for the purpose of developing ITPM, which, in addition to modelling maritime transport services, would incorporate services associated with inland transport in the Asia-Pacific region. ITPM therefore covers intermodal transport, provides analysis of the inland transport system with a special

focus on landlocked countries and thereby determines transcontinental intermodal movements in Central Asia. ITPM outcomes can support the analysis of the overall transport system in the Asia-Pacific region, including rail and road transport.

## **V. Preliminary forecasts of container traffic between Latin America and Asia-Pacific through 2015**

The study being developed by KMI/ESCAP is based on the use of MPPM/ITPM planning models, and its purpose was to provide adequate context for planning and making informed decisions in governments and port authorities in the Asia-Pacific region and LAC. Although the models take into account the decreased activity in 2008 and 2009, as well as a partial recovery in 2010, the following forecasts are preliminary and subject to revision in the near future.

In order to offer a more solid forecast, it is essential to have information on historic movements for the region's ports for a series of at least 20 years. For this reason, we request your assistance and the assistance of the respective national authorities in order to complete these series, through our Maritime Profile.

### **(a) Preliminary forecasts for the Asia-Pacific region**

KMI study estimates for the Asia-Pacific region (trade in full containers) show an average annual increase of 8.1% up to 2015, when the total is estimated to reach 328.07 million TEU, 135.95 million TEU more than the amount recorded in 2007, or a 71% increase in eight years. In 2007, the market reached a total of 192.12 million full TEU. For the four main subregions in which the KMI study is divided, estimates show an average annual increase until 2015 of 3.2% in South-East Asia, 8.4% in North-East Asia, 7% in South Asia, and 3.8% in Australia and the Pacific. The East Asia subregion, which in 2007 captured 28% of trade, should see its share reduced to 21%. The North-East Asia subregion is expected to see its market share increase from 63% to 71%. The South Asia and Australia and Pacific subregions will maintain their current market shares of 6% and 3%, respectively.

In terms of the study's estimates on full and empty container trade, by the year 2015 the region will also have shown an average annual increase of 8.1%, reaching a total of 437.56 million TEU that year, 187.08 million TEU more than the amount recorded in 2007, which represents a 75% increase in eight years. In 2007, the market reached a total of 250.48 million full TEU. For the four main subregions of the KMI study, estimates show an average annual increase until 2015 of 4.2% in South-East Asia, 8.5% in North-East Asia, 7.2% in South Asia and 3.6% in Australia and the Pacific. According to the study, the East Asia subregion, which in 2007 captured 26% of trade, will see its share reduced to 21%. The North-East Asia subregion is expected to see its market share increase from 65% to 71%. South Asia will maintain its current market share of 5%, while Australia and the Pacific can expect to see its market share drop from 4% to 3%.

In terms of exports and imports, KMI estimates for the Asia-Pacific region (full container trade) show an increase in exports from 107.12 million TEU in 2007 to 180.39 million TEU in 2015 and an increase in imports from 84.99 million TEU in 2007 to 147.68 million TEU in 2015. This increase in exports is 73.27 million TEU more than the amount recorded in 2007, which represents a 68% increase in eight years. The increase in imports is 62.69 million TEU more than the amount recorded in 2007, which represents a 74% increase in eight years. The balance of imports and exports is expected to shift. In 2007, exports were dominated by North-East Asia, which accounted for 67% of the market. This figure should increase to 75% in 2015, with a reduction in the South-East Asia subregion from 26% in 2007 to 18% in 2015. Imports show a similar tendency, with North-East Asia increasing its market share from 59% in 2007 to 65% in 2015. South-East Asia's imports drop from 30% in 2007 to 24% in 2015. The South Asia subregion will maintain its current market share of 5% in exports and 7% in imports. The Australia and the Pacific subregion can expect to see its share of exports fall from 3% to 2%, but imports will hold steady at 4%.

For the subregions mentioned above, estimates of the average annual increase until 2015 are as follows: in imports, 4.3% in South-East Asia, 8.6% in North-East Asia, 7.5% in South Asia and 4.3% in Australia and the Pacific; and in exports, 2.1% in South-East

Asia, 8.3% in North-East Asia, 6.5% in South Asia and 3.2% in Australia and the Pacific.

**(b) Preliminary forecasts for the Latin American and Caribbean region**

KMI study estimates on full container trade for the Latin America and Caribbean region show an average annual increase of 6.2% until 2015, when the total is estimated to reach 41.31 million TEU, 15.8 million TEU more than the amount recorded in 2007, which represents a 62% increase in eight years. In 2007, the market reached a total of 25.51 million full TEU. For the three main subregions in which the KMI study is divided, estimates show an average annual increase until 2015 of 5.4% for Central America and the Caribbean, 8.3% for the East Coast of South America and 5.9% for the West Coast of South America. According to the same document, the Central America and Caribbean subregion, which in 2007 captured 66% of trade, should see its share reduced to 62%. The East Coast of South America subregion can expect to see its market share increase from 24% to 28%. The West Coast of South America subregion will maintain its current share of approximately 10%.

Study estimates on full and empty container trade indicate that the region will also have shown an average annual increase of 5.4% by 2015, when the total will reach 56.93 million TEU, 19.64 million TEU more than the amount recorded in 2007, which represents a 53% increase in eight years. In 2007, the market reached a total of 37.29 million full and empty TEU. For the study's three subregions, estimates show an average annual increase until 2015 of 5% for Central America and the Caribbean, 6.9% for the East Coast of South America and 5% for the West Coast of South America. The Central America and Caribbean subregion, which in 2007 accounted for 66% of trade, should see its share reduced to 64%. Market share for the East Coast of South America is expected to increase from 23% to 26%. In total full and empty containers, the West Coast of South America subregion will also maintain its current share at around 10%.

KMI estimates on imports and exports for LAC (full container trade) show an increase in exports from 11.1 million TEU in 2007 to 17.66 million TEU in 2015 and an increase in imports from 14.42 million TEU in 2007 to 23.65 million TEU in 2015. This increase in exports is 6.56 million TEU more than the amount recorded in 2007, which represents a 59% increase in eight years, and the increase in imports is 9.23 million TEU more than the amount recorded in 2007, which represents a 64% increase in eight years. Nevertheless, no shift in the balance of imports and exports is expected for the LAC region. In 2007, exports were dominated by Central America and the Caribbean, which captured 59% of the market. Exports in that subregion are expected to fall to 55% in 2015, while the East Coast of South America had 12% in 2007 and will have 10% in 2015. Imports show a similar trend, with a slight reduction in Central America and the Caribbean from its market share of 71% in 2007 to 67% in 2015. The East Coast of South America will experience a slight increase from 20% in 2007 to 23% in 2015. The West Coast of South America should see its current market share of 9% in 2007 increase to 11% in 2015.

Estimates of the average annual rate of increase for the subregions until 2015 are as follows: in imports, 5.6% for Central America and the Caribbean, 5.4% for the East Coast of South America and 7.8% for the West Coast of South America; and in exports, 5.2% for Central America and the Caribbean, 8.2% for the East Coast of South America and 3.7% for the West Coast of South America.