

**Technical Report Documentation Page**

1. Report No. SWUTC/04/167241-1		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Identifying Gaps and Limitations in Data Sources by Mapping the Transportation Chain of International Trade Shipments at U.S. Ports				5. Report Date September 2004	
				6. Performing Organization Code	
7. Author(s) Dr. Leigh Boske, Abhay Kantak and Stephen Spruiell				8. Performing Organization Report No. Report 167241	
9. Performing Organization Name and Address Center for Transportation Research University of Texas at Austin 3208 Red River, Suite 200 Austin, Texas 78705-2650				10. Work Unit No. (TRAIS)	
				11. Contract or Grant No. 10727	
12. Sponsoring Agency Name and Address Southwest Region University Transportation Center Texas Transportation Institute Texas A&M University System College Station, Texas 77843-3135				13. Type of Report and Period Covered	
				14. Sponsoring Agency Code	
15. Supplementary Notes Supported by general revenues from the State of Texas.					
16. Abstract According to the Transportation Research Board, from 1990 to 2001, the value of U.S. international merchandise trade more than doubled (in inflation-adjusted dollars), from \$891 billion to over \$2 trillion. Also, during this period, the value of U.S. merchandise trade grew at an average annual rate of 8 percent, while growth in U.S. real gross domestic product (GDP) averaged 3 percent per year. Further, more than 10 percent of the 16 billion tons of freight moved on the nation's transportation system is international freight, either entering the country as imports or intended for export. The increasing pace of globalization and the differential in manufacturing costs between the U.S and developing countries like China will mean that trade, and more particularly imports, will continue to grow in the foreseeable future. Despite the growing importance of international trade in the U.S. economy, existing data sources do not provide any transportation data on the domestic portion of import shipments. This report, while profiling existing data sources, makes an attempt to map the transportation chain of international trade shipments using profiled data sources and thus identifies data gaps and limitations in mapping that chain.					
17. Key Words Gaps and Limitations in Data Sources, Mapping the Transportation Chain, International Trade Shipments			18. Distribution Statement No restrictions. This document is available to the public through NTIS: National Technical Information Service 5285 Port Royal Road Springfield, Virginia 22161		
19. Security Classif.(of this report) Unclassified		20. Security Classif.(of this page) Unclassified		21. No. of Pages 57	22. Price



# **Identifying Gaps and Limitations in Data Sources by Mapping the Transportation Chain of International Trade Shipments at U.S. Ports**

by

Dr. Leigh Boske

Associate Dean

Lyndon B. Johnson School of Public Affairs

The University of Texas at Austin

Abhay Kantak

Graduate Research Assistant

Lyndon B. Johnson School of Public Affairs

The University of Texas at Austin

and

Stephen Spruiell

Graduate Research Assistant

Lyndon B. Johnson School of Public Affairs

The University of Texas at Austin

SWUTC/04/167241-1

September 2004

Sponsored by:

Southwest Region University Transportation Center

Texas Transportation Institute

Texas A&M University System

College Station, Texas 77843-3135



## **ABSTRACT**

According to the Transportation Research Board, from 1990 to 2001, the value of U.S. international merchandise trade more than doubled (in inflation-adjusted dollars), from \$891 billion to over \$2 trillion. Also, during this period, the value of U.S. merchandise trade grew at an average annual rate of 8 percent, while growth in U.S. real gross domestic product (GDP) averaged 3 percent per year. Further, more than 10 percent of the 16 billion tons of freight moved on the nation's transportation system is international freight, either entering the country as imports or intended for export. The increasing pace of globalization and the differential in manufacturing costs between the U.S and developing countries like China will mean that trade, and more particularly imports, will continue to grow in the foreseeable future. Despite the growing importance of international trade in the U.S. economy, existing data sources do not provide any transportation data on the domestic portion of import shipments. This report, while profiling existing data sources, makes an attempt to map the transportation chain of international trade shipments using profiled data sources and thus identifies data gaps and limitations in mapping that chain.



## EXECUTIVE SUMMARY

According to a Transportation Research Board (TRB) report titled “*International Trade and Freight Transportation Trends, 2003*”, the United States is the world’s largest merchandise-trading nation, accounting for 12 percent of world merchandise exports and about 19 percent of world merchandise imports in 2000. From 1990 to 2001, the value of U.S. international merchandise trade more than doubled (in inflation-adjusted dollars), from \$891 billion to over \$2 trillion. During this period, the value of U.S. merchandise trade grew at an average annual rate of 8 percent, while growth in U.S. real gross domestic product (GDP) averaged 3 percent per year. The TRB reports that more than 10 percent of the 16 billion tons of freight moved on the nation's transportation system is international freight, either entering the country as imports or intended for export. The increasing pace of globalization and the differential in manufacturing costs between the U.S and developing countries like China will mean that trade, and more particularly imports, will continue to grow in the foreseeable future. “Landside access to U.S. ports, congestion on highways around major gateways, delays at border crossings, and environmental and community concerns may continue to affect the efficient movement of merchandise from, to and within the United States. While the nation derives enormous benefits from international merchandise trade, increased freight traffic resulting from growth in trade could generate negative effects including air quality, noise, traffic, and safety issues, particularly for communities adjacent to major freight gateways and corridors. Also, as international trade continues its expected growth, the demand for improved intermodal access to U.S. ports will rise, particularly at containerized ports in urban areas.”<sup>1</sup>

To properly address issues confronting the freight movement at and around the ports, one first needs to examine sources of data which yield information on the international maritime trade. It is becoming increasingly important for policymakers and planners to have access to the best trade and transportation data available. These data, however, are collected by a variety of actors for a variety of purposes, and there is no centralized clearinghouse for trade and transportation data to which policymakers can turn. Data must be collected from a number of different sources

---

<sup>1</sup>[http://www.bts.gov/publications/us\\_international\\_trade\\_and\\_freight\\_transportation\\_trends/2003/html/conclusion.html](http://www.bts.gov/publications/us_international_trade_and_freight_transportation_trends/2003/html/conclusion.html)

– sources of varying coverage and reliability. For this reason, data collection suffers from a lack of integration, making it difficult to analyze trends across a transportation chain. In some areas of trade and transportation like congestion, data are collected sporadically and are of limited utility. This report highlights the fact that despite the growing importance of international trade in the U.S. economy there are no data sources which provide transportation data on import shipments moving on U.S. highways and railroads. An attempt has been made in this report to identify the gaps in mapping the domestic portion of international trade shipments and more particularly the import shipments. The methodology employed traces a cargo shipment across a generic transportation chain from a foreign port to a U.S. port to identify import data collection, and then from a U.S. port to a foreign port to identify export data collection.

The U.S. Bureau of Customs and Border Protection is identified as the primary data source on import shipments. However, in the absence of reconciliation of different Customs database systems, a proper sense of the direction of the cargo movement cannot be made with reasonable certainty. The reconciliation of Customs data from the Automated Manifest System (AMS) and the Automated Broker Interface (ABI) would provide information on origins/destinations of import shipments. The dissemination of the reconciled data on an aggregate basis without compromising private-sector concerns of confidentiality would prove to be a good starting point in bridging the existing data gap in monitoring the movements of import shipments on the domestic transportation network. The reconciliation efforts are made difficult as multiple agencies need to be involved. The transition of the Customs' database systems, from the archaic Automated Commercial System to the Automated Commercial Environment in the next couple of years, would make the existing requirement of reconciliation redundant. The new system will allow the user to capture information residing in the ABI and the AMS in a single window.

Chapter 1 of this report identifies the types of data being collected and by which public agencies and private-sector entities. Chapter 2 looks at each data source individually to find what data are being collected and for what purposes. Each data source is evaluated for its scope of coverage, specificity, reliability and limitations, and other key considerations. After a thorough analysis of each data source, chapter 3 attempts to map a generic transportation chain for purposes of locating where various data sources provide useful information along that chain. In this manner,

the report attempts to locate weaknesses and gaps in the data coverage. Chapter 4 offers recommendations for addressing those weaknesses in the absence of data on import shipments.



# TABLE OF CONTENTS

<b>ABSTRACT</b> .....	<b>v</b>
<b>EXECUTIVE SUMMARY</b> .....	<b>vii</b>
<b>TABLE OF CONTENTS</b> .....	<b>xi</b>
<b>DISCLAIMER</b> .....	<b>xv</b>
<b>ACKNOWLEDGMENTS</b> .....	<b>xvii</b>
<b>CHAPTER 1. TYPES OF DATA</b> .....	<b>1</b>
<b>Trade Data</b> .....	<b>1</b>
<i>Import Data</i> .....	1
<i>Export Data</i> .....	2
<i>Commodity Data</i> .....	2
<i>Value/Unit Data</i> .....	2
<b>Transportation Data</b> .....	<b>3</b>
<i>Vessel Movement Data</i> .....	3
<i>Vessel Identification Data</i> .....	3
<i>Facility Data</i> .....	3
<b>CHAPTER 2. DATA SOURCES</b> .....	<b>5</b>
<b>INDEPENDENT DATA SOURCES</b> .....	<b>5</b>
<b>Port Import and Export Reporting Service</b> .....	<b>5</b>
<i>AMS Database Search and Reports</i> .....	5
<i>Export Bulletin</i> .....	6
<i>U.S. &amp; Foreign Company Profiles</i> .....	6
<i>U.S. Global Container Report</i> .....	6
<i>On Board Review</i> .....	6
<i>Port Rankings</i> .....	6
<i>PIERS International Databases</i> .....	7
<i>Maritime Research</i> .....	7
Limitations and Reliability .....	8
<b>Clarkson</b> .....	<b>8</b>
<i>Shipping Review &amp; Outlook</i> .....	8
<i>Shipping Intelligence Weekly</i> .....	9
<i>Container Intelligence Monthly</i> .....	9

Limitations and Reliability .....	9
<b>Lloyds Register-Fairplay .....</b>	<b>9</b>
<i>Internet Ships Register</i> .....	10
<i>World Shipbuilding Statistics</i> .....	10
<i>World Fleet Statistics</i> .....	10
<i>Port Security Handbook</i> .....	10
<i>Ports &amp; Terminals Guide</i> .....	10
Limitations and Reliability .....	11
<b>LMIU Seasearcher and PurpleFinder .....</b>	<b>11</b>
<i>LMIU Seasearcher</i> .....	11
<i>PurpleFinder</i> .....	11
Limitations and Reliability .....	11
<b>Containerisation International.....</b>	<b>12</b>
<i>Liner Alert</i> .....	12
<i>Liner Intelligence</i> .....	12
Limitations and Reliability .....	14
<b>Reebee Associates' TRANSEARCH.....</b>	<b>14</b>
<i>Traffic Lane Flow Report</i> .....	14
<i>Market Commodity Report</i> .....	14
Limitations and Reliability .....	15
<b>Drewry Shipping Consultants .....</b>	<b>15</b>
<i>Drewry Quarterlies</i> .....	15
<i>Drewry Monthly</i> .....	15
Limitations and Reliability .....	15
<b>Marine Information Service of North America .....</b>	<b>16</b>
Limitations and Reliability .....	16
<b>GOVERNMENT SOURCES.....</b>	<b>17</b>
<b>U.S. Bureau of Customs and Border Protection.....</b>	<b>17</b>
<i>Automated Commercial System</i> .....	17
Automated Manifest System .....	17
Automated Broker Interface .....	18
<i>Automated Export System</i> .....	18
Limitations and Reliability .....	19
<b>U.S. Coast Guard .....</b>	<b>19</b>
<i>Ship Arrival Notification System</i> .....	19
<i>Marine Information for Safety and Law Enforcement</i> .....	20
Limitations and Reliability .....	20
<b>U.S. Army Corps of Engineers .....</b>	<b>21</b>

<i>Vessel and Clearances</i> .....	21
<i>Foreign Cargo Imports and Exports</i> .....	21
<i>State Summary Tonnage Data</i> .....	21
<i>State-to-State and Region-to-Region Commodity Tonnages</i> .....	21
<i>U.S. Coast Guard Vessel Identification Table</i> .....	22
<i>Vessel Characteristics</i> .....	22
<i>Waterborne Commerce of the United States</i> .....	22
<i>Infrastructure Facilities Along the Waterway</i> .....	24
<i>Limitations and Reliability</i> .....	24
<b>Maritime Administration</b> .....	<b>24</b>
<i>Fleet Statistics</i> .....	25
<i>Jones Act Fleet</i> .....	25
<i>Global Fleet</i> .....	26
<i>World Order Book</i> .....	26
<i>Age Profiles</i> .....	26
<i>Port Statistics</i> .....	26
<i>Top U.S. Trading Partners</i> .....	27
<i>U. S. Foreign Waterborne Container Trade by Coastal District</i> .....	27
<i>Limitation and Reliability</i> .....	27
<b>Bureau of Transportation Statistics</b> .....	<b>28</b>
<i>Limitations and Reliability</i> .....	28
<b>PROPRIETARY SOURCES</b> .....	<b>28</b>
<b>CHAPTER 3. MAPPING THE TRANSPORTATION CHAIN: IDENTIFYING GAPS AND LIMITATIONS</b> .....	<b>31</b>
<b>Imports</b> .....	<b>32</b>
Stage 1: Cargo Loaded at Foreign Port .....	32
Stage 2: Vessel in Transit .....	33
Stage 3: Vessel Nears U.S. Port of Destination.....	33
Stage 4: Vessel Enters Port and Unloads Cargo.....	34
<b>Exports</b> .....	<b>35</b>
<b>Tracking Cargo Beyond the Ports</b> .....	<b>36</b>
<b>CHAPTER 4. CONCLUSION</b> .....	<b>37</b>



## **DISCLAIMER**

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the information presented herein. This document is disseminated under the sponsorship of the Department of Transportation, University Transportation Centers Program, in the interest of information exchange. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.



## **ACKNOWLEDGMENTS**

The authors recognize that support for this research was provided by a grant from the U.S. Department of Transportation, University Transportation Centers Program to the Southwest Region University Transportation Center which is funded 50% with general revenue funds from the State of Texas.



## **CHAPTER 1. TYPES OF DATA**

Data relating to waterborne freight (excluding freight movement on domestic waters) can be grouped into two major categories: trade data and transportation data. Trade data provide information about freight, while transportation data provide information about vessels. Integrating these two types of data has always posed a challenge to government agencies tasked with collecting, analyzing and disseminating useful information about cargo and vessels entering and leaving the United States. This chapter will discuss the components of each broad category of data and will conclude with a brief section on how governmental and private entities cooperate to manage and merge these data sources.

### **Trade Data**

Trade data capture a wide variety of information and statistics about cargo moving into and out of the United States. One of the purposes of this report is to determine aspects of trade for which data are currently unavailable, inaccessible or unusable. This report finds it helpful to categorize trade data in four ways for further examination: import data, export data, commodity data and value/unit data. These categories are not mutually exclusive, as sources of import and export data contain information about commodities, dollar values and quantities. This section gives an overview of what is meant by import, export, commodity and value/unit data.

### *Import Data*

The point at which cargo enters or is loaded for entry into the United States is the point at which most trade data are collected. Import data provide information about the value, quantity and type of each commodity entering the United States. Import data are most reliable in denoting origin/destination information. In this case, however, the origin simply refers to the foreign port-of-origin, while the destination refers to a port or hinterland location in the United States that may not actually be the final destination of the cargo. Nevertheless, these data are the most reliable indicators of cargo origins/destinations currently available to the public.

### *Export Data*

Export data are recorded as cargo that is shipped out of the United States. All the data variables are the same as for import data, but the data are collected by different agencies for different purposes. Whereas the U.S. Bureau of Customs and Border Protection (Customs) collects import data, export data are recorded by the U.S. Census Bureau (Census).

### *Commodity Data*

Commodity data are captured upon import and export. They are usually captured by a field on a Customs or Census form marked "Description of Cargo." On manifests, this description can be very vague, but once the cargo is entering the United States, Customs requires that it be registered using a very specific set of commodity codes. Similarly, Census requires that commodities be specifically identified as they are leaving the United States. Many private and public entities use these data to identify new trade opportunities, such as highly-used trade corridors or the prevalence of a commodity being traded in a new market. There are many uses for commodity data, and commodity data sources are valuable and widely sought by analysts, researchers, consultants and private-sector firms.

### *Value/Unit Data*

This is a component of commodity data specific to the dollar values and amounts of commodities entering the United States. This data variable is most prone to error, and often must be scrutinized for accuracy. Some data sources use highly inaccurate estimation methods to ascertain the value of certain cargo because it is not listed in manifests. Also, some data sources have problems with weight and measure conversions.

Trade data are commercially sensitive information. Hence, with the exception of the Port Import Export Reporting Service (PIERS), almost all trade data are collected and disseminated by government agencies. The primary agencies responsible for collection are Customs and Census. The main agencies tasked with integrating trade and transportation data and disseminating them are the Maritime Administration of the U.S. Department of Transportation and the U.S. Army Corps of Engineers. The difficulty of integration becomes clearer upon further examination of the way transportation data are collected and used.

## **Transportation Data**

Transportation data capture a wide variety of information and statistics about the vessels that move cargo in and out of the United States, and about the particular movements of vessels. One of the purposes of this report is to determine aspects of transportation for which data are currently unavailable, inaccessible or unusable. However, most transportation data are readily available. Unlike trade data, transportation data are less sensitive to the private sector; although they are still valuable, transportation data do not have as many proprietary hurdles to clear. This report classifies transportation data in three different ways: vessel movement data; vessel identification data; and facility data.

### *Vessel Movement Data*

Vessel movement data refer to information collected to identify all ports at which vessels docked while moving from their origins to their final destinations. These data capture voyage-specific information, such as port of arrival/departure and crew lists for particular voyages. Because vessel movement data are specific to voyages, they are often collected at the same time as import/export trade data, and often by the same agencies. The U.S. Coast Guard (USCG) maintains the most up-to-date and accurate vessel movement information as part of its safety and security responsibilities.

### *Vessel Identification Data*

This category of data provides information about the characteristics of specific vessels that are generally made available by commercial entities such as Lloyd's Register-Fairplay and Clarkson. It includes items such as ship owner and ship operator, and ship details such as engine type and the ship's International Maritime Organization (IMO) number – the number by which all oceangoing vessels can be identified and tracked. These data have little policy relevance, but are very useful to commercial shippers, importers and other interests.

### *Facility Data*

This category includes data about channels, docks, ports and other facilities that vessels use in the course of trade. These data are made available through trade associations like the Association

of American Port Authorities, government agencies like the U.S. Army Corps of Engineers, and private companies like Lloyd's Register-Fairplay.

The three types of data mentioned above, when properly integrated, allow investigators to analyze the mechanics of trade – the movement of vessels, the specific characteristics of each vessel and fleet, and the port facilities used for trade. One additional category is real-time transportation data. The example in this field is the 'PurpleFinder' system developed by Pole Star Space Applications (see chapter 2). This system tracks the vessels of participating ocean shipping lines in real-time using Global Positioning Satellite (GPS) technology. PurpleFinder tracks rail carriers, trucks, and containers as well – it is designed to track any kind of transport equipment using GPS. PurpleFinder is an example of how technology is creating new categories of transportation data.

The following chapter will profile the most significant sources of available trade and transportation data. Chapter 3 then seeks to map a transportation chain using these data sources. In doing so, the report aims to identify areas in the transportation chain that are not covered by any existing data source. Finally, chapter 4 will articulate practical solutions for filling those gaps.

## **CHAPTER 2. DATA SOURCES**

In this chapter, we shall look at each data source individually to find what data are being collected and what purposes they serve. Each data source is evaluated for its area of coverage, time span of collection, specificity, reliability, limitations and other key parameters. We have evaluated data sources that have been widely used in both the private and public sectors. And we have classified the data sources into three categories: independent; government; and proprietary.

### **INDEPENDENT DATA SOURCES**

We term all commercially available and non-government data sources as independent data sources. Government agencies like the Maritime Administration (MARAD) and the U.S. Army Corps of Engineers (USACE) rely on independent data sources such as the Port Import and Export Reporting Service (PIERS), Containerisation International and Clarkson for part of their data requirements.

#### **Port Import and Export Reporting Service**

PIERS, in turn, relies on Customs for its data requirements. The core of the PIERS database is detailed transaction information gathered from the bills of lading and manifests documenting the import/export trade that begins or ends at U.S. ports. PIERS verifies and enhances these data to create reliable intelligence about exporters, importers, shippers, cargoes, seagoing traffic, and regional markets. Based on manifest data, PIERS compiles the following reports:<sup>2</sup>

##### *AMS Database Search and Reports*

The PIERS U.S. Customs Automated Manifest System (AMS) database offers 25 standard reports, available as downloads or on computer disk (CD), on U.S. imports, including importers, suppliers, market share and commodities. It also allows the user to browse through its archives or query the database for specific information such as commodity detail, marks and numbers for identification, shipper and consignee.

---

<sup>2</sup> <http://www.piers.com/piersproducts/>

### *Export Bulletin*

This complete reference includes details such as the exporter's name, city and state; the export cargo's port of departure and destination; the export commodity, weight, quantity, unit of measurement and PIERS product code; and shipping line and vessel name. These reports are compiled on a monthly basis and are made available on a CD. It also allows the user to access the online search engine to track activity in particular cargoes, lines or ports.

### *U.S. & Foreign Company Profiles*

These profiles allow the user to analyze an individual company's trading activity. They provide details such as its top carriers, commodities, U.S. ports and export markets.

### *U.S. Global Container Report*

This report ranks containership lines based on container volumes in 12 different global trade routes. It includes market shares by U.S. coastal region and trade lane. This report is published quarterly. The supplemental historical data covering the most recent 10 years are also available on CD.

### *On Board Review*

This quarterly analysis of container capacity covers utilization rates by carrier in trade lanes linking the United States with 12 regions around the world. An overview of current U.S. supply and demand for containerized transport is a useful tool for negotiating freight rates or securing vessel space.

### *Port Rankings*

This monthly report summarizes the container volumes in twenty-foot equivalent units (TEUs) and direction of cargo moving through the top U.S. ports.

### *PIERS International Databases*

PIERS also provides international trade data for certain geographical regions. Trade data are compiled for three different regions /countries: <sup>3</sup>

- Latin American Database

PIERS agents collect and verify transaction details from the import/export documents filed in Latin America's leading ports in Brazil, Chile, Colombia, Ecuador, Peru, and Venezuela.

- Guatemalan Database

PIERS offers complete coverage of waterborne import/export trade between Guatemala and its trading partners, including the United States (its largest trading partner) and Latin America.

PIERS Guatemalan data are updated monthly and available from November 2001.

- Asia-Pacific Database

The PIERS Korean database provides manifest details of intra-Asian and Asian-European import/export trade. And, through a business partner in China, PIERS offers access to detailed information on over nine million import/export transactions – by air, overland and sea – documented by China's Customs authority. It does not include Hong Kong.

### *Maritime Research*

PIERS also uses its extensive experience in dealing with trade data to conduct in-house maritime research. PIERS research is available in three different products:

- Trade Horizons

This quarterly report offers a two-year forecast and analysis of container trade between more than 60 major trading-partner countries and the United States.

- Port Horizons

This report provides a two-year history and forecast of import and export values, measured in TEUs, covering 30 U.S. regions.

- Ten-Year Horizons

This bi-annual report offers 10-year forecasts, supplemented by the last 5-years' record of U.S. containerized trade with over 60 partners in 14 regions.

---

<sup>3</sup> <http://www.piers.com/piersproducts/>

## **Limitations and Reliability**

PIERS relies on Customs' Automated Manifest System for its data needs. The main limitation of the manifest-based system is that the dollar value of the cargo is not available. The value field in the system is an estimated number provided by PIERS. Its strength lies in recording container volumes. In case of PIERS, every cargo is recorded with the vessel information. The value fields in the Automated Broker Interface (ABI) system of Customs are the most reliable. These data can be accessed by the Census. PIERS data are also incomplete. "It has historically not included the Great Lakes area, but in past few years has included it as part of coverage. It still does not include Virgin Islands or Louisiana Off-shore Oil Port (LOOP). PIERS has commodity numbers that are less specific than Census commodity numbers. The Census commodity numbers are relatively free of discrepancies."<sup>4</sup> PIERS database includes origin/destination (O/D) data taken from vessel manifests listing addresses of the shipper and consignee, although it does not include information on shipment routing or landside modes used in transporting shipments to and from inland origins and destinations. Historically, the biggest problem with the PIERS O/D data has been confusion between the location of the owner or bill-to party and the physical origin or destination of the shipment."<sup>5</sup>

## **Clarkson**

Clarkson provides data on the shipping industry but also supplements data with in-depth analyses. It offers customers three products:<sup>6</sup>

### *Shipping Review & Outlook*

The Shipping Review & Outlook report consists of three parts:

- The market fundamentals section examines trends in the world economy, and the balance of supply and demand for bulk and container shipping.
- The second section focuses on 16 segments of the shipping market, ranging from VLCCs to container ships.

---

<sup>4</sup> Powerpoint presentation "Foreign Waterborne Transportation Statistics Program (FWTSP), U.S. Army Corps of Engineers.

<sup>5</sup> Transportation Research Board. *Special Report 276: A Concept for A National Freight Data Program* (August 2003). Available: <http://trb.org/publications/sr/sr276.pdf> (page 38).

<sup>6</sup> <http://www.clarksonresearch.com/acatalog>

- Finally, a statistical appendix provides a comprehensive historical time-series database of freight rates, prices and fleet and trade statistics.

### *Shipping Intelligence Weekly*

Shipping Intelligence Weekly provides access to market information. Shipping Intelligence Weekly serves a second vital function as a portable data source, containing over 200 data series and graphs:

- It provides immediate access to the data needed by shipping executives, bankers, ship builders, or shipping lawyers.
- It provides information on freight rates, earnings, prices, and activity in all these markets; fleet statistics, trade, financial and economic indicators.

### *Container Intelligence Monthly*

Container Intelligence Monthly tracks developments in the container shipping market, providing easy access to the data required by executives in the container industry. Each month, the Clarkson Market Research Group gathers information from many sources, including the Clarkson broking team and the Clarkson Research Fleet Statistics database. It includes analysis of the charter, secondhand, new building and demolition markets alongside latest industry news, and financial, economic and port data. It also provides analysis of supply/demand in the form of detailed monthly coverage of the entire liner fleet and order book, and global containerized trade. Forecasts of the fleet, deliveries and demolition and trade are provided. Container Intelligence Monthly is available in hard copy and digital format.

### **Limitations and Reliability**

The Clarkson publications provide in-depth analysis of the shipping industry. Its utility goes well beyond being just a data source. This source is particularly useful to those who wish to be kept informed of the developments in the shipping industry on a regular basis.

### **Lloyds Register-Fairplay**

Lloyd's Register-Fairplay provides information on the world's fleet of over 91,000 vessels and also maintains the largest database of maritime companies – a total of over 140,000 – with

details of over 6,500 ports and terminals, casualty data, fixtures, vessel detentions, photographs and an electronic news archive going back over 7 years. The database is indexed as follows:<sup>7</sup>

#### *Internet Ships Register*

The register is designed for those who require access to the latest information on commercial ships of 500 gross tons (GTs) and above, and their owners, operators, managers and builders.

#### *World Shipbuilding Statistics*

This publication provides a quarterly summary of the shipbuilding activity for all self-propelled, seagoing merchant ships of 100 GTs or above and details of all ships that are on order or under construction, together with their intended registration.

#### *World Fleet Statistics*

This annual publication shows the composition of the current self-propelled, seagoing merchant fleet of 100 GT or above. It contains tables and notes about vessels completing construction within the year, together with losses and disposals. In addition, the World Fleet Statistics summarizes the previous five years' merchant fleet and completions by country of build, registration, nationality and ship type, together with ships that are no longer in operation.

#### *Port Security Handbook*

The annual International Ship and Port Facility Security (ISPS) Code – Port Security Handbook, written by Lloyd's Register in its role as a Recognized Security Organization, explains the intricacies of this new and important piece of international maritime legislation. The handbook describes the role and responsibilities of the Port Facility Security Officer and describes the practical steps needed to ensure the most rapid and efficient compliance with Code requirements.

#### *Ports & Terminals Guide*

This annual guide contains all of the information one needs to plan next port calls. Comprehensive details are provided on over 8,100 ports and terminals, including a complete description of ports and all of the relevant facilities, plans and mooring diagrams (over 4,000 in

---

<sup>7</sup> <http://www.lrfairplay.com/archway/Services/default.htm>

total), contact details of port service providers and agents, maritime atlas, port photographs and a worldwide distance table. This is available online and also on a CD.

### **Limitations and Reliability**

LR-Fairplay is very important source of the latest developments in the maritime industry. It is also a very valuable data source on the global shipping industry.

### **LMIU Seasearcher and PurpleFinder**

The LMIU Seasearcher and PurpleFinder allow tracking of vessels on a real-time basis.

#### *LMIU Seasearcher*

LMIU Seasearcher is a product of Lloyds Marine Intelligence Unit (LMIU). It is the most effective way to keep track of ships and ports online. It provides shipping movements on a real-time basis and it also provides detailed information on over 60,000 vessels such as contact details for each ship owner, tonnages, dimensions, capacities, service speed and casualty history for each vessel.<sup>8</sup>

#### *PurpleFinder*

PurpleFinder uses Global Positioning Satellites (GPS) with land-based communication services to provide global, two-way, real-time, web access to standard and exception-based asset position reporting, messaging and monitored data. All that is required is a transceiver unit for each asset, an internet/email-enabled computer, and the appropriate free web browser. By logging on to PurpleFinder, no special hardware or software is required beyond a standard office personal computer. PurpleFinder is a way to track oceangoing vessels, trains, trucks and aircraft from participating carrier lines (participation is voluntary) in real-time from your computer.

### **Limitations and Reliability**

The facility of tracking the ships online can be used for both commercial and security considerations. The location of the ship will allow importers the estimate the time for getting possession of the cargo. Also, this will allow tracking the movement of ships which have been

---

<sup>8</sup> [www.seasearcher.com](http://www.seasearcher.com)

involved in the violation of the law in the past. It is also useful for determining the traffic density on various shipping routes on a daily basis and thus identifying global shipping patterns. Since the participation is voluntary, not all the carriers would be covered by these two sources.

## **Containerisation International**

Containerisation International online (CI-online) provides both maritime data and news on the latest developments in the shipping industry. Two kinds of services are offered to customers:<sup>9</sup>

### *Liner Alert*

This service offers shipping industry news on a real-time basis and allows access to CI monthly magazines' library (as far back as 1994), liner shipping schedules, company directory and a 'what's on' listing. The daily news service has been established by CI-online with a team of correspondents located world-wide covering all the major regional container shipping locations in Asia, the United States, Europe and on the north-south and cross trades, as well as major east-west routes.

### *Liner Intelligence*

This service offers access to port and fleet statistics, fleet deployment information, conference and alliance details, freight rate indicators, services, shipping-line profiles and a transit analyzer.

- Ports

The CI-online database provides information on the world's top-350 container ports and terminals. It provides terminal data, direct call services plus individual contacts. There is also archived throughput information dating back to 1970.

- Fleet Statistics

This section supplies a daily update of world-fleet ranking (based on TEU carrying capacity), vessels in operation and vessels on order, presently covering over 500 shipping lines. Users are able to refine their search through headings such as vessel type, size or age. Additionally, there is an archive history dating back to July 1999.

---

<sup>9</sup> <http://www.ci-online.co.uk/demo/>

- Ship Fleet

The CI-online ship fleet section presently has over 7,000 vessels in operation. It is fully searchable and provides all technical details together with deployment information and ownership data such as operator, beneficial owner, and registered owner. Other details include IMO number, service speed and flag. Additionally, this section is further enhanced by the ‘new-build search’, enabling users to research ‘who is currently building what’.

- Fleet Deployment

Fleet deployment is able to search on a country-by-country or region-by-region basis the total number of vessels and TEUs deployed. There is also the ability to perform searches on all carriers or by individual carriers.

- Transit Analyzer

This is a tool to match ocean carriers’ services against each other. From a pre-determined origin and destination, the database will draw together all available carriers and supply the user with transit times and day of calling. This is an invaluable tool when researching how competitive individual carriers or alliances really are.

- Conferences and Alliances

CI-online provides the service and vessel listings of all the major liner alliances. There is also some information on lesser-known alliances; over 123 conferences, alliances, and rate agreements are detailed.

- Freight Rates

A comprehensive report that contains information on price trends in the major east-west trades, including Transpacific, Transatlantic and Europe-Asia dating back to 1993.

- Shipping Lines

The corporate profile of over 500 shipping lines supplies key facts and figures by individual ocean carrier. For example, there are five years of financial data, a full directory of agency networks and a complete listing of global services. All of these data are dynamically searchable. Ultimately developed to simplify the search on container fleets, ocean carriers or liner services, this advanced software will produce instant results in a user-friendly manner.

- Deployment Statistics

CI-online has identified 178 specific trade routes within the deployment statistics section, which will aggregate the number of vessels, deployed on a given route with TEU capacity. This

information is also archived on a monthly basis. This facility provides invaluable information for a business development unit researching market trend analysis.

- Container Traffic

CI-online provides global container traffic statistics by country from 1970 to the present.

### **Limitations and Reliability**

CI-online is a very important source of the latest developments in the container-shipping industry. It is also valuable source of data on almost all aspects of the container-shipping industry.

### **Reebie Associates' TRANSEARCH**

Reebie Associates' TRANSEARCH database is a major source of U.S. freight traffic data. According to Reebie Associates, its database includes tonnage and equipment volumes by commodity, transportation mode, and lane. The scope of the data includes truck shipments of manufactured goods and select non-manufactured goods; rail shipments, including carload and intermodal; waterborne and air shipments; U.S./Mexico and U.S./Canada shipments for select transport modes. TRANSEARCH is constructed from 100-plus proprietary, commercial and public sources of data, representing domestic and NAFTA trade flows. Economic modeling is used where data are lacking or confidential, to check elements such as spatial patterns, and to construct forecasts.<sup>10</sup> The TRANSEARCH data are published in two reports:

#### *Traffic Lane Flow Report*

This database displays commodity movements between an origin market area and a destination market area. Total tons are shown for each commodity with a breakdown by seven modes of transportation. Each report contains a summary at the 2-digit Standard Transportation Commodity Code (STCC) level, as well as more detailed commodity listings.

#### *Market Commodity Report*

This report is a by-product of the Reebie Associates' TRANSEARCH database and shows all movements of a specific commodity moving inbound or outbound of a single market area. Total

---

<sup>10</sup>. <http://www.reebie.com/images/transearch.asp#Product%20Scope>

annual tons are shown for each traffic lane. Commodities may be defined at any level of detail, from very narrow definitions to highly aggregated groupings.

### **Limitations and Reliability**

The Reebie Associates' TRANSEARCH database finds widespread use both in the private and public sector. The proprietary nature of the database does not allow the user to verify the underlying assumptions and data used in the modeling process.

### **Drewry Shipping Consultants**

Drewry, an independent consulting company in the shipping industry, makes available data in two products:<sup>11</sup>

#### *Drewry Quarterlies*

The Drewry Quarterlies reports cover the oil, LPG, chemicals and dry-bulk industry. It contains 18-month forecasts of key market variables, covering vessel supply, vessel demand, freight rates, costs and profitability. In addition, each report provides a comprehensive analysis and interpretation of recent market developments.

#### *Drewry Monthly*

Drewry Monthly provides information for organizations involved in the international shipping industry. It contains detailed fixture and sales listings for the dry-cargo, oil and gas sectors. Tools for analyzing freight-market-related data are also available.

### **Limitations and Reliability**

This source is especially useful for those who rely on the information on a regular basis. These products will allow the user to obtain a better understanding of the maritime market and more particularly the oil and gas transportation markets.

---

<sup>11</sup> <http://www.drewry.co.uk/frame2.phtml>

## **Marine Information Service of North America**

Marine Information Service of North America (MISNA) is a coalition of non-profit maritime information service organizations, in the United States and Canada, dedicated to improve the quality of information available to existing clients and to market information beyond traditional clientele.<sup>12</sup> The membership includes a broad cross section of maritime interests in their respective regions – vessel owners and agents, ports, pilots, towboat companies, stevedore and terminal operators, customs brokers and freight forwarders, ship repair firms, employer associations, insurance agencies, marine surveyors, maritime unions and oil spill response organizations. According to MISNA over 8,000 private and public maritime businesses, agencies and associations are represented. Each member monitors and records all vessel activity in their respective port areas. MISNA establishes a common protocol for each exchange to provide its information to the other exchanges so that all west coast standard information is available electronically from any one of the participating MISNA members.

Some of the products and services that MISNA provides to its members, governmental entities and the interested public are: vessel monitoring; estimated time of vessel arrivals and departures; actual time of arrivals and departures; vessel traffic analysis; historical vessel movement inquiries; and port and terminal utilization studies.

### **Limitations and Reliability**

It is a good source for both estimated and actual vessel arrival/departure information. The main limitation of MISNA is that the information exchange takes place on a voluntary basis. The reliability of using MISNA as a data source would depend upon the frequency and regularity with which information exchange takes place amongst its members.

---

<sup>12</sup> <http://www.misnadata.org/content/history.php?m=15>

## **GOVERNMENT SOURCES**

The U.S. government remains the primary source of information for trade and transportation data. PIERS depends on Customs for its data requirements. In this section of the chapter, we review data collected by government agencies.

### **U.S. Bureau of Customs and Border Protection**

The data collected by the U.S. Bureau of Customs and Border Protection (Customs) serve to meet the following needs:

1. To assess duties on imported goods;
2. To determine whether the imports are lawful and not in contravention of U.S. laws or any bilateral or multilateral trading agreement involving the United States; and
3. To safeguard the borders.

We shall review two Customs databases: the Automated Commercial System and the Automated Export System.

#### *Automated Commercial System*

The Automated Commercial System (ACS) is the backbone of the Customs data-collection mechanism. It serves to track, control and process all imports into the United States. It has two main components:

#### *Automated Manifest System*

Customs requires all vessels prior to their entry into U.S. ports to transmit electronically the manifest data using a unique bill-of-lading number. The Automated Manifest System (AMS) allows the Customs to review the submitted documentation and determine, in advance, whether the merchandise merits examination or whether to release it immediately upon arrival. The carrier, upon receiving a provisional release from Customs, is able to make decisions on staging cargo and the importer can arrange for the examination, release, and further distribution of the merchandise. All of this can be accomplished before the merchandise actually arrives. All the vessels entering into the United States need to fill the Customs cargo declaration form (CF-1302) before its arrival at U.S. ports. This gives information on details such as name of the vessel, brief description of the cargo, etc. These data are made available in electronic form to the Customs 24-

hours before the cargo is laden at the foreign port. The other forms made available to the Customs on arrival at the U.S. ports are the Vessel Entrance and Clearance Statement (CF-1300), ship's stores declaration (CF-1303) and the crew effects' declaration (CF-1304). The ship's stores declaration gives information on the non-cargo-related goods on the ship and the crew effects' declaration gives details on the personal belongings of the crew members.

The basic purpose of this system is for assessing the security risk associated with the entering vessel. An important aspect of AMS is that it links into a Vessel History Index, which acts as an enforcement tool. AMS can key into vessel history and/or crew violations that may be connected to the trafficking of contraband goods and other important enforcement concerns.<sup>13</sup> The data collected from the Automated Manifest System is measured against the Sea Carrier Operating Performance Analysis (SCOPA) standard. This standard measures the level of compliance of the entering vessel with existing procedures and information disclosure. The compliance level is gauged by ascribing a score to the risk associated with the entering vessel.

#### Automated Broker Interface

The Automated Broker Interface (ABI) permits qualified participants to electronically file required import data with Customs. ABI is a voluntary program available to brokers, importers, carriers, port authorities, and independent service centers. These data are collected via the two forms – CF-3461 and CF-7501 – submitted electronically (mostly in this mode) to Customs. The CF-3461 and CF-7501 forms are filed by customs brokers. The data collected by these two forms reside in the ABI. This provides the description of the cargo, estimated value of the cargo, and the address of the importer to whom the cargo belonged. CF-7501 also denotes of the ultimate destination of cargo. CF-3461 provides only the name of the ultimate consignee and not the address.

#### *Automated Export System*

The Automated Export System (AES) is the primary means of collection of export data. AES is the paperless mode for shippers and forwarders to file the Shippers' Export Declaration (SED) and manifest information. The primary export shipment data required by multiple agencies is

---

<sup>13</sup> [http://www.cbp.gov/xp/CustomsToday/2001/June/custoday\\_vessel.xml](http://www.cbp.gov/xp/CustomsToday/2001/June/custoday_vessel.xml)

filed electronically with Customs. Once the exporter files the SED information through AES, the system validates the data against editing tables and U.S. government agency requirement files and generates a confirmation message or error messages back to the filer. The process is much quicker than the processing of paper SEDs. AES is a joint venture between the U.S. Bureau of Customs and Border Protection (Homeland Security), the Foreign Trade Division of the U.S. Census Bureau (Commerce), the Bureau of Industry and Security (Commerce), the Directorate of Defense Trade Controls (State), other federal agencies, and the export trade community. While the information contained in the individual SEDs is restricted, Census provides constant updates on export trade in the aggregate.

### **Limitations and Reliability**

Customs data are a restricted source. PIERS is the only mechanism through which the manifest data are made available on a commercial basis. However, the manifest data without the ABI data are incomplete. Origin/destination information is more reliable in the case of ABI. The manifest data are provided by the carrier, while ABI data are provided by the intermediary (e.g. customs broker) between the shipper and consignee. The lack of integration between the Customs data system and other agencies means that Customs data are not optimally utilized. For transportation planning in urban areas and more particularly in port towns, origin information regarding export cargo and destination data in the case of import cargo are particularly useful. For informed transportation planning, one needs to know the quantities shipped, transit times, the route taken and the mode used. The Customs data are deficient in this regard. In the case of the AES, no data are available on the weight of the cargo being exported.

### **U.S. Coast Guard**

The U.S. Coast Guard (USCG) collects data on vessels entering the United States to assess their security risks. The Ship Arrival Notification System (SANS) and the Marine Information for Safety and Law Enforcement (MISLE) are two databases used by the USCG to conduct security-risk assessments.

#### *Ship Arrival Notification System*

The Ship Arrival Notification System is a database maintained by the National Vessel Movement Center (NVMC) and used primarily by the USCG. The USCG requires all vessels entering U.S. ports to submit a Notice of Arrival form ('Form 33' CFR 160) to the NVMC 96 hours prior to their arrivals. The NVMC uses the data from the Notice of Arrival forms to create the SANS database. The USCG at each port uses the SANS database to determine which vessels entering its port pose security risks.

### *Marine Information for Safety and Law Enforcement*

The Marine Information for Safety and Law Enforcement database is the second major database used by the USCG to track oceangoing vessels entering United States ports. After performing this analysis of security risks on every vessel at each port, the SANS data are updated to include the results of each analysis and then are entered into the MISLE database. The samples included in this profile are sample risk analysis grading sheets used by the USCG to act on SANS data. The grade from these sheets and information on action taken toward each vessel are captured by the MISLE database. MISLE also serves the purpose of making the SANS data more reliable and accurate. SANS data are acquired from a Notice of Arrival form that is filled out by a shipping agent and sent to the National Vessel Movement Center (NVMC), where information is entered by data clerks. The information contained in SANS is often incomplete or erroneous. One of the purposes of the MISLE database is to correct for these shortcomings so that the USCG has a complete and accurate record of each vessel as it enters and leaves U.S. ports.

### **Limitations and Reliability**

SANS database's major limitation is that the data come from shipping agents and are entered directly into the system by data-entry clerks at NVMC. They are often incomplete and unreliable. USCG uses SANS as a starting point from which to perform analysis to assess risk. If the USCG finds the data lacking, then they contact the shipping agent for more details, contact the vessel itself or simply board the vessel before it comes into the U.S. port of call. Once the USCG fills in the data gaps through these processes, the data are re-entered into the MISLE system. The SANS data, however, are more immediate than the MISLE data: they provide information about a vessel before it actually arrives. But if time is not a factor, the MISLE database is a more complete and accurate source of information.

## **U.S. Army Corps of Engineers**

U.S. Army Corps of Engineers (USACE) periodically publishes data on waterborne transportation and waterway infrastructure facilities. The USACE publishes a series of reports which provide statistics on foreign and domestic waterborne commerce. These reports present data on the movement of commodities at the ports and harbors and on the waterways and canals of the United States and its territories.

### *Vessel and Clearances*

This database maintains the record of the date a vessel made entry into (entrance record) or cleared (clearance record) the U.S. Customs port. It provides information on ship movements from foreign (or domestic) ports to U.S. ports and waterway facilities. The database makes a distinction between a port and a waterway facility. It contains a code assigned by the USACE to ports and waterway facilities. It provides information on the vessel name, type of vessel, and 3-digit International Classification of Ships by Type (ICST) code. This code reveals the construction characteristics of the vessel and not the type of ship or cargo it is carrying at that time. The database also includes the nationality or country of registry of the vessel, net and gross registered tonnage, draft of the vessel, whether it is carrying containers and IMO number which is a unique identification number for the vessel. Customs provides these data to USACE.

### *Foreign Cargo Imports and Exports*

This database covers cargo flows between the United States and foreign ports. It contains data on tonnage and description of the cargo and distinguishes between regular and in-transit cargo. It does not include cargo imports or exports by facilities which are outside the port system.

### *State Summary Tonnage Data*

This database describes cargo flows on waterways within states, to states and to foreign locations. It also gives the origin and destination of cargo in tons by state.

### *State-to-State and Region-to-Region Commodity Tonnages*

This database contains state-to-state and region-to-region tonnages for 14 major commodity groups by origin and destination on U.S. waterways. It also describes the transported cargo by commodity code, tonnage, and year of transport. The database is published annually.

#### *U.S. Coast Guard Vessel Identification Table*

The U.S. Coast Guard Vessel Identification Table data are entered directly by USCG personnel who conduct the vessel boardings. This database includes details of ships boarded by the USCG for security checks.

#### *Vessel Characteristics*

This database lists U.S. carriers with vessels available for operation or in commercial operation on U.S. waterways, harbors and channels. It contains the name and address of vessel operator, the type of vessel and region of operation. The operating regions are categorized by geography:<sup>14</sup>

1. Great Lakes System
2. Mississippi River System and the Gulf Intra-coastal Waterway
3. Atlantic, Gulf and Pacific Coasts

Additional information includes the specific points within the operating region between which the operator operates and the principal commodities carried. The sources of these data are the domestic companies operating in the U.S. waterway system.

#### *Waterborne Commerce of the United States*

Waterborne Commerce of the United States (WCUS) provides statistics on the foreign and domestic waterborne commerce moved on U.S. waterways. It presents data on the movements of commodities at the ports and harbors and on the waterways and canals of the United States and its territories. The database is subdivided into four parts according to geography:<sup>15</sup>

1. Atlantic Coast
2. Gulf Coast, Mississippi River System, Puerto Rico, and Virgin Islands
3. Great Lakes

---

<sup>14</sup> <http://www.iwr.usace.army.mil/ndc/data/datawcus.htm>

<sup>15</sup> <http://www.iwr.usace.army.mil/ndc/data/datawcus.htm>

#### 4. Pacific Coast, Alaska

The import and export data include cargo from overseas, but exclude Canada and cargo from Canada. There is also a provision for recording in-transits. In-transits are defined as in-bound cargo from a foreign country that is destined to another foreign country. The WCUS gives details on coastal traffic. The cargo movement between the Great Lakes ports and the sea coasts are also termed as coastal movement. Data on cargo movement between the Great Lakes ports is also available. Moreover, this data source also provides the cargo description and distance carried in short-ton miles.

“The data on foreign commerce are supplied by the U.S. Census Bureau and that on domestic commerce are collected by the USACE from the commercial vessel operators. The waterborne traffic movements are reported to the USACE by all vessel operators of record on ENG Forms 3925 and 3925b. The reports are generally submitted on the basis of individual vessel movements completed. For movements with cargo, the point of loading and the point of unloading of each individual commodity must be delineated. Cargo moved for the military agencies in commercial vessels is reported as ordinary commercial cargo; military cargo movements in Department of Defense vessels are not collected. In summarizing the domestic commerce certain movements are excluded: cargo carried on general ferries; coal and petroleum products loaded from shore facilities directly into bunkers of vessels for fuel; and insignificant amounts of government materials (less than 100 tons) moved on government owned equipment in support of Corps projects. Beginning with the calendar year 2000 publication, foreign waterborne import, export and in-transit cargo statistics are derived primarily from data purchased from the Port Import Export Reporting Service, and supplemented by data furnished to the Corps of Engineers by the U.S. Census Bureau and the U.S. Bureau of Customs and Border Protection. Foreign cargo is matched to vessel moves to improve geographic specificity. Prior to CY2000 the foreign commerce were supplied by the Bureau of the Census only. Import and export shipments for use of the United States Armed Forces abroad are not reported to Waterborne Commerce and Statistics Center (WCSC). Beginning with CY1989 shipments under the military assistance program of the Department of Defense is included in the statistics”.<sup>16</sup>

---

<sup>16</sup> <http://www.iwr.usace.army.mil/ndc/data/datawcus.htm>

### *Infrastructure Facilities Along the Waterway*

This source lists the inventory of infrastructure facilities along the U.S. waterway system. It contains physical information on commercial facilities at the principal U.S. coastal, Great Lakes and inland ports. The data consist of listings of a port area's waterfront facilities, including information on berthing, cranes, transit sheds, grain elevators, marine repair plants, and docking and storage facilities.

### **Limitations and Reliability**

USACE data sources are limited to cargo movements on U.S. waterways. The positive aspect about the data source is that it reconciles the data available from the U.S. Census and PIERS. Hence, the data residing in both the AMS (through PIERS) and ABI (through U.S. Census) are captured.

### **Maritime Administration**

The Maritime Administration (MARAD) is responsible for annually collecting data on the tonnage of U.S. commerce shipped aboard U.S.-flag and foreign vessels. MARAD collects data by type of waterway, foreign/domestic commerce, and type of vessel. It also provides data on the tonnage of commerce shipped aboard U.S.-flag vessels and foreign vessels and that which is shipped through the Great Lakes, inland waterways, and coastal waters.

The Maritime Administration maintains the Foreign Traffic Vessel Entrances and Clearances database which contains statistics on U.S. foreign maritime trade. The database contains information on the type of vessel, commodities, weight, customs districts and ports, and origins and destinations of goods. These data reflect the physical movement of waterborne foreign-trade shipments into and out of U.S. Foreign Trade Zones, the Virgin Islands, and the Customs districts (including the 50 states, the District of Columbia, and Puerto Rico).

The data-collection efforts result in the following reports with which one can conduct further analysis and investigation:<sup>17</sup>

---

<sup>17</sup> [http://www.marad.dot.gov/Marad\\_Statistics/index.html#Fleet%20Statistics](http://www.marad.dot.gov/Marad_Statistics/index.html#Fleet%20Statistics)

### *Fleet Statistics*

Fleet statistics are available for the U.S. Flag Fleet and for the global maritime industry. In the case of the U.S. Flag Fleet, data are available on all the cargo-carrying U.S. Flag Fleet vessels by area of operation and fleet of passenger vessels, tugs/towboats and other workboats. The database is composed of two categories based on vessel size:

1. Vessels of 1,000 gross tons or more; and
2. Vessels less than 1,000 gross tons

For each of the two categories, the data are further subdivided into two other categories:

1. Self-propelled
2. Non-self-propelled

For each classification based on size and type of engine, vessels are further distinguished according to geography of operation:

- Foreign Trade

Foreign Trade data are delineated according to vessels which operate oceanborne and those which operate on the Great Lakes

- Domestic Trade

Domestic trade is classified according to vessels operating on the inland waterways, Great Lakes or coastal waters.

The U.S. Army Corps of Engineers, Lloyds Maritime Information Service, U.S. Coast Guard and U.S. Customs data are included in the database.

### *Jones Act Fleet*

This database is a compilation of the private merchant vessels with tonnages of at least 1,000 tons. The database lists vessels by type such as tanker, full container, dry bulk, roll-on/roll-off, freighter and cruise/passenger. The gross tonnage and the deadweight tonnage are also provided.

### *Global Fleet*

This database lists the top-20 world merchant fleets by country of owner and flag of registry. The data are compiled by MARAD using inputs from Lloyds Register-Fairplay. The vessels are classified by types into tanker, container, dry bulk and others. Others include roll-on/roll-off, passenger, break-bulk ships, partial containerships, refrigerated cargo, barge carriers, and specialized cargo ships.

### *World Order Book*

The World Order Book gives the number of ships under construction worldwide by major vessel type and as a percentage of the existing world fleet. The vessels are classified by types into tankers, bulk carriers and full containerships. The size of the order book and existing world merchant fleet is measured in terms of the number of ships and deadweight tons (DWT). For the containerships, the measure is TEU capacity.

### *Age Profiles*

This database presents the age profile of the major segments of the world fleet. The fleet is subdivided into four categories by type – containerships, other general cargo, dry bulk, and tanker. Also, they are categorized by size as less than 70,000 DWT and greater than or equal to 70,000 DWT. The age of the vessels are classified into four categories - Vessels built:

1. Before 1972;
2. Between 1972 and 1982;
3. Between 1982 and 1991; and
4. After 1991

### *Port Statistics*

MARAD is able to provide different kinds of cargo-traffic statistics at U.S. ports by sourcing data from different commercial entities such as Port Import Export Reporting Service (PIERS) and Lloyds Maritime Intelligence Unit (LMIU):<sup>18</sup>

---

<sup>18</sup> [http://www.marad.dot.gov/Marad\\_Statistics/index.html#Fleet%20Statistics](http://www.marad.dot.gov/Marad_Statistics/index.html#Fleet%20Statistics)

- Top-25 U.S. Ports

MARAD, using data supplied by PIERS, lists the top-25 container ports in terms of handling volumes in TEUs – export, import and total. It also provides total container traffic handled in a calendar year at all U.S. ports. PIERS also provides loaded container weight in tons.

- Top-25 World Port Calls by Vessel Type

MARAD, relying upon data supplied by Lloyds Marine Intelligence Unit (LMIU), lists the top-25 ports globally in terms port calls by vessel types. The vessel types include tanker, break bulk, containership and others. It excludes calls by vessels whose DWT is less than 10,000. This database is compiled on an annual basis.

- Top-25 U.S. Port Calls by Vessel Type 2000

MARAD annually lists the types of vessels – tanker, break bulk, containership and others – calling on U.S. ports. It also presents the total capacity of the ships calling at the ports. These data are sourced from LMIU.

#### *Top U.S. Trading Partners*

MARAD compiles a list of the top-25 U.S. trading partners in terms of containerized cargo. The list also delineates containers handled in terms of annual imports and exports. Moreover, MARAD compiles a list of top-20 trading partners of U.S. in terms of annual tonnage. These data are available since 1997.

#### *U. S. Foreign Waterborne Container Trade by Coastal District*

MARAD compiles TEU volumes handled annually by the each coastal district.<sup>19</sup> The data sourced from PIERS are available since 1999. The TEU volume mix in terms of exports and imports is also provided. The coastal districts are: California; North Atlantic; South Atlantic; Pacific Northwest; Gulf; Puerto Rico/Virgin Islands; Hawaii; Alaska and the Great Lakes.

### **Limitation and Reliability**

The USACE and MARAD have assumed complete responsibility for the ongoing production of official monthly and annual U.S. foreign waterborne transportation statistics and are fully

---

<sup>19</sup> [http://www.marad.dot.gov/Marad\\_Statistics/index.html#Fleet%20Statistics](http://www.marad.dot.gov/Marad_Statistics/index.html#Fleet%20Statistics)

committed to meeting the data needs of other government agencies and private-sector customers, without imposing any new reporting burden on the public. Under the new arrangement, monthly and annual vessel movement reports and "Data Bank" cargo reports previously produced by the Census are now be produced by MARAD. These reports contain movement data on all vessels engaged in U.S. foreign trade and cargo data by type of service, U.S. and foreign port, country of origin/destination, commodity, value, weight, and containerized cargo. Though it does not collect any data, MARAD does perform an important function of compiling and reconciling data from various sources.

## **Bureau of Transportation Statistics**

The Bureau of Transportation Statistics (BTS) of the U.S. Department of Transportation publishes the Commodity Flow Survey (CFS) which contains data on the flow of goods and materials by mode of transport, including shipments by domestic establishments in manufacturing, wholesale, mining, and other selected industries. The Census, in partnership with the BTS, conducts the Commodity Flow Survey as part of the Economic Census. Started in 1963, data have been collected every five years. The 1993 survey reported all modes used for shipment (for-hire truck, private truck, rail, inland water, deep-sea water, pipeline, air, parcel delivery, or U.S. Postal Service, other mode, and unknown)

## **Limitations and Reliability**

The CFS provides information on state-to-state commodity flows, but is not intended to provide detailed coverage of local freight movements. The 1993 and 1997 surveys have a greatly expanded coverage of intermodalism, whereas earlier surveys only reported the principal mode. These surveys cover all modes of transport. CFS data are not about actual commodity flows. Rather, it is an origin shipper survey. It does not have detailed origin/destination data for commodity by mode. The CFS does not cover import traffic in its surveys.

## **PROPRIETARY SOURCES**

The confidentiality associated with proprietary sources of data greatly restricts their accessibility. The access is typically available to the owner of the proprietary database and its customers. However, there are instances in which the proprietary data have been shared with government

agencies like the Customs. For instance, Customs has restricted access to the on-line tracking system of the Burlington Northern Santa Fe Railway. This access allows Customs to track the imports moving out of ports by rail. But these data are being recorded in the ACS system of Customs. This data-sharing capability does fulfill the operational need of Customs, but usually does not meet the data requirements of transportation planners and policymakers for analyzing freight transportation issues.



## **CHAPTER 3. MAPPING THE TRANSPORTATION CHAIN: IDENTIFYING GAPS AND LIMITATIONS**

The sources of trade and transportation data available to researchers are decentralized in nature. Data are collected at a variety of points across transportation chains for a variety of different reasons. This creates a “stovepiping” effect on the data: there is very little integration among different data sources, because data are collected on *transactions* rather than *transportation chains*. As a result, it proves difficult for researchers to fit data together in order to form a complete picture of cargo or vessels moving across transportation chains. This chapter attempts to solve that problem by connecting the dots between the data sources profiled in the previous chapter. The study goes further to identify gaps in the transportation chain that no current data source covers, points in the transportation chain that are inadequately covered, and limitations of certain data sources.

The methodology employed traces a cargo shipment across a generic transportation chain from a foreign port to a U.S. port to identify import data collection, and then from a U.S. port to a foreign port to identify export data collection. This methodology locates the data sources cataloged in the previous chapter at corresponding points along the transportation chain. The purpose of this exercise is two-fold: first, to connect the dots between points in a transportation chain so that researchers know how to find information about any transaction along that transportation chain; and, second, to identify gaps in the transportation chain where data are not currently being collected. The methodology employs a format that uses **bold letters** to identify data collectors and underlining to identify the data collected. Limitations are highlighted in *italics*.

This methodology only discusses data collected as cargo moves through that part of the transportation chain between ports. The chapter will conclude with a section on the difficulties of tracking cargo once it leaves ports and moves into the hinterland.

## Imports

### Stage 1: Cargo Loaded at Foreign Port

Preloading stage: This stage refers to the point in time 24 hours before the cargo is loaded at the foreign port. At this point, **Customs** collects manifest information.<sup>20</sup> If the manifest information is not properly submitted, then Customs sends a “do not load” message to the carrier in reference to the cargo. If cargo comes to the U.S. port without complying with this 24-hour manifest notification requirement, the carrier of the cargo incurs a financial penalty.<sup>21</sup> This manifest information is stored as part of the Automated Manifest System described in chapter 2.

Loading stage: At this point, data are collected differently depending on whether the foreign port is a participant in the **Customs’** Container Security Initiative (CSI). If the port is a participant in the CSI, Customs agents located at the foreign port are authorized to pre-screen cargo before it leaves the port using information gathered under the 24-hour manifest collection. Rather than collecting new data, this process just verifies the manifest data by targeting suspicious cargo for further search. *The major limitation at this point is that not all countries with which the United States trades have become participants in the CSI.* This means that other than boarding, there is no way for Customs to verify the manifest information of suspicious cargos or vessels until they are nearing or docked at U.S. ports. However, at this point in the transportation chain, the USCG provides a second level of scrutiny, data collection and risk analysis, as discussed later in this chapter.

---

<sup>20</sup> Manifest information refers to a set of standardized data that Customs collects about a ship’s cargo and where it is going. The information variables include port of arrival/departure; data and time of arrival/departure; nationality, name and type of vessel; name and country of vessel owner; name and country of vessel operator; particulars of the voyage (such as stops along the way); description of the cargo; purpose of the cargo (this variable describes whether or not the cargo is actually going to enter the United States).

<sup>21</sup> U.S. Customs and Border Protection. “Frequently Asked Questions on the 24-Hour Rule (Revised 04/16/04).”

Online. Available:

[http://www.customs.gov/ImageCache/cgov/content/import/carriers/24hour\\_5frule/24hour\\_5ffaq\\_2edoc/v5/24hour\\_5ffaq.doc](http://www.customs.gov/ImageCache/cgov/content/import/carriers/24hour_5frule/24hour_5ffaq_2edoc/v5/24hour_5ffaq.doc)

## **Stage 2: Vessel in Transit**

Each vessel has an International Maritime Organization (IMO) number, which is captured by the manifest information described above. If a researcher can obtain this number from manifest information, then this number will allow him or her to exactly locate the position of the vessel as it is in transit. This only pertains to vessels belonging to carriers that participate in one or both of two vessel information programs: **PurpleFinder** and **Lloyd's Marine Intelligence Unit (LMIU) Seasearcher**. Both agencies are profiled in the previous chapter, and both use GPS tracking technology to provide the real-time whereabouts of vessels belonging to participating carriers. This is particularly useful in determining the position of an in-transit vessel, with the major drawback that *not all carriers participate in either of these services, and therefore these carriers' vessels are not tracked by either*. The result is that comprehensive real-time vessel movement data are not possible to obtain. PurpleFinder and LMIU Seasearcher are nevertheless valuable tools.

## **Stage 3: Vessel Nears U.S. Port of Destination**

As the vessel nears the U.S. port, it is required to submit detailed vessel information to the **USCG** 96 hours prior to arrival. The data are submitted through the Ship Arrival Notification System (SANS). The SANS database provides information specific to this point in the transportation chain, such as the previous five ports of call, the crew list and the non-crew and passenger list. The ship information is used by the USCG to assess safety and security risks. Coast Guard officials run checks on the vessel's previous security and safety records and determine whether a ship should be boarded. The SANS database is the best source from which to obtain data collected at this point in the transportation chain. *A limitation of SANS is that it is entirely based on information which is voluntarily submitted by shipping agents to data-entry clerks at the National Vessel Movement Center*. SANS data should be considered incomplete and/or inaccurate until reviewed by the Coast Guard, vetted for accuracy and entered into the Marine Information for Safety and Law Enforcement (MISLE) database, described below. SANS data are difficult to obtain from the USCG, but vessel data that are less specific to transportation-chain transactions can be obtained from the USCG's Vessel Identification Table.

If the USCG determines from the SANS data that the ship is a threat, it has several options. Each Coast Guard office has a method of assessing risks by using points or grades. Depending on a vessel's score, it can either be granted clearance, boarded and searched, or allowed to dock in port on the condition that it meet certain safety or security requirements before it is allowed to leave. Whatever course of action is taken, the **USCG** inputs the new security and safety evaluation information for each vessel into the MISLE database. This information is updated for each vessel each time that vessel approaches a U.S. port.

Customs uses the AMS and ACS system to inform itself about the status of an in-coming vessel. It reconciles the information in the AMS and ABI and looks for discrepancies. The discrepancies, if any are noted, result in further scrutiny of the incoming vessel. Customs works with Coast Guard at this stage to act on data received and analyzed for security risks, so as to avoid redundant boardings and share information on vessels and cargos to maximize threat awareness. Customs and Coast Guard offices at each port share this information on a daily basis, and some offices have Customs personnel working at Coast Guard offices and vice versa, to aid in intelligence-sharing.

#### **Stage 4: Vessel Enters Port and Unloads Cargo**

Once the vessel arrives in the port, data about the vessel and its cargo are collected and used by **marine exchanges**, which act as representatives of the private sector at the port. The amount and type of data each marine exchange collects depends on the specific port, but there are some common elements. Most marine exchanges act as clearinghouses of information for all arrivals, departures and vessel movements in their areas. The various marine exchanges around the United States are making an attempt to centralize their data as part of the Marine Information Service of North America (MISNA). This broader coalition of marine exchanges could someday provide comprehensive real-time vessel movement data at every port in the United States, *but for now a major limitation is that not all marine exchanges are part of MISNA and not all marine exchanges collect data with the same level of comprehensiveness.*

The cargo data collected at the port by **Customs** are similar to the manifest information it collects 24-hours prior to the cargo being loaded at the foreign port—the major difference is that

the broker information Customs collects at this point in the transportation chain is much more specific. This information is collected through the Automated Broker Interface (ABI). The ABI contains a more specific degree of information about the commodities being shipped as well as other data that allow Customs to ascertain and collect duties on the cargo. This only applies if the cargo's final destination is the United States. Information on in-transit cargo is collected differently. In-transit cargo does not go through a broker, and therefore data about this cargo are not entered into ABI. *A limitation of ABI data are that the "final destination" of the cargo listed in this database is not always the true final destination, but might actually be an intermediate destination. But this information is more reliable than what is residing in the AMS.*

Understanding the way Customs collects both manifest and broker data is key to understanding how the **Port Import Export Reporting Service (PIERS)** collects its data. Because Customs databases are very difficult to access, even for other government agencies, most major data users get their comprehensive commodity data through PIERS. PIERS is most accurately placed at this point on the transportation chain, because a majority of its data come from Customs, shippers and consignees at this point in the transportation chain. Although PIERS is considered the best source of trade data available, it has several major limitations:

1. *The true value of containerized cargo is not given by PIERS.*

Rather, the value of the containerized cargo given by PIERS is an estimate derived from the type and quantity of the commodity and the market price.

2. *PIERS does not capture imports from the Louisiana Offshore Oil Port or the Virgin Islands.*
3. *PIERS uses outdated coding schemes that do not conform with current commodity codes.*

The final expression of this data is realized in the data sets produced jointly by the **Maritime Administration (MARAD)** and the **U.S. Army Corps of Engineers (USACE)**. These data sets attempt to integrate vessel and commodity data to give a comprehensive picture of U.S. foreign waterborne commerce. These data sets are described in more detail in chapters 1 and 2.

## **Exports**

This section addresses the differences in how data are collected on exports from the way they are collected on imports. Export data are collected by **Customs** on behalf of the **Census**. The data

collected reside in the in a database called the Automated Export System (AES). The Automated Manifest System (AMS) also captures export data just as it captures import data, and **PIERS** receives its export commodity data from the AMS at this point in the transportation chain. The ABI data are not collected at this point, which is where the AES fills in the gaps. Finally, the **MARAD/USACE** U.S. Foreign Waterborne Commerce data sets capture these export data.

## **Tracking Cargo Beyond the Ports**

Most of the agencies discussed heretofore are not concerned about cargo once it leaves the port. For Customs, data serves to assist in the collection of duties and securing the borders. The USCG is similarly concerned with preventing catastrophic accidents or attacks. These agencies take an approach of attempting to detect everything they can at the borders; after that, it's too difficult to track cargo.

Even though Customs collects information on the “final destination” of cargos within the United States, this “final destination” data should not be interpreted as the actual final destination of the cargo. Many times, these destinations are clearinghouses where cargo is resold and shipped to other destinations in the United States or simply the address of the headquarters of the importing parties.

Further complicating the task of those wishing to follow the transportation chain further inland is the fact that most of these data are proprietary. Once it leaves the port, it is in the hands of private actors who have a commercial interest in keeping cargo data private. At this point, government agencies become interested in congestion and security issues related to the cargo. But information is still difficult to obtain.

These limitations and others resulting from gaps in data collection along the transportation chain outlined in this chapter will be discussed in more detail in the next chapter.

## CHAPTER 4. CONCLUSION

The growing importance of international trade has made it increasingly important to have information on the domestic portion of its movements. Traditionally, data on international trade has focused more on economic transactions rather than on physical commodity flows and often provide only limited information on the transportation aspects of the transaction.

In our attempt to map the transportation chain, the available sources are successful in mapping to the point when the cargo enters the port. From the available data sources profiled in chapter 2, we find PIERS is the only publicly available data sources which provides information on the destination of the cargo unloaded at the port. However, PIERS data (being based on manifests) may be unreliable. “The destination information contained in the manifest system is intended to provide evidence of liability and is not developed as a source of transportation data. For example, a bill of lading functions as a receipt, as evidence of a contract of carriage, and as a document of title to the goods being shipped. Because the ocean carrier may be responsible for transporting the goods only from port A to port B, the bill of lading may not show the true origin/destination (O/D) of the shipment, and the PIERS database will be similarly deficient. A transportation analyst seeking to establish a complete picture of the freight movement will, therefore, need to find other data describing the initial movements from the true origin to port A and the final movements to the true destination from port B.”<sup>22</sup> A more reliable source of information on the ultimate destination of the cargo imported is the ABI. This information is provided by the broker to Customs in the ABI filing. However, these data are not publicly available. The O/D data availability or accessibility is one of there are many problems that a transportation planner or policymaker faces. The knowledge of the O/D is not sufficient. The routing and time of day, mode(s) used, cargo characteristics and value and cost of transportation are essential for making informed choices in planning and policy-making.

Currently, “only the Commodity Flow Survey (CFS) and the TRANSEARCH database from the Reebie Associates recognize the need a complete description of freight flows in the United

---

<sup>22</sup> Transportation Research Board. *Special Report 276: A Concept for A National Freight Data Program*” (August 2003). Available: <http://trb.org/publications/sr/sr276.pdf> (page 47).

States”.<sup>23</sup> However, the best available data sources suffer from several deficiencies. The CFS is not comprehensive. For instance, it does not cover import shipments. The proprietary nature of the TRANSEARCH database does not allow the user to make a fair assessment of data reliability. The important thing to note is that currently there is no reliable source in the public domain that provides information on import shipments. PIERS O/D data has inherent limitations on reliability as stated earlier. The integration of the data residing in the AMS and ABI can prove to be a more reliable source of import shipments including O/D data. Such an effort to integrate and reconcile data from two important sources is missing in case of cargo movements on U.S. highways and railroads. The only consolation is that there are data available on import shipments moving on domestic U.S. waterways. This has been made possible by the joint efforts of USACE and MARAD which integrate data from various sources including the ABI and AMS data from Customs. A similar effort is urgently needed to fill the gaps on import shipment data.

The on-going modernization efforts will make possible the task of integrating the AMS and ABI data. The AMS and ABI which are part of the Automated Commercial System (ACS) was developed in 1984. ACS is in the process of being revamped to meet the current requirements of commerce and security. The Automated Commercial Environment (ACE) represents the Customs’ attempt to replace or enhance its existing databases and combine them into a single system. ACE is an attempt to shift from a transaction-based system of trade data to an account-based system. This system will aggregate all transaction data for one account like a credit card account, so that Customs can establish the identity of the U.S. trading partners. By knowing the history of the transactions by account, the ACE system acts as a better risk-management system than the existing transaction-based system, in which data on individual transactions were not properly integrated. Also, the shift from the transaction processing to account processing will allow the user to get a better sense of the direction of cargo flows. This technological development, will also allow users to interact with Customs through a web-based system rather than the cumbersome mainframe-based ACS environment. The web-based model will enable all users to interact on a single interface called the International Trade Data System (ITDS). The new system will allow the user to capture information residing in the ABI and AMS in a single

---

<sup>23</sup> Transportation Research Board. *Special Report 276: A Concept for A National Freight Data Program*” (August 2003). Available: <http://trb.org/publications/sr/sr276.pdf> (page 10).

window. The ITDS will be administered by a board made up of representatives from a number of government agencies, all of which will participate in the administration of ACE. This inter-agency cooperation is meant to foster greater data integration between government agencies and bring in more capacity for risk analysis. The lack of inter-agency cooperation has been one of major shortcomings of the existing systems. ACE will overcome the operational difficulties of the existing ACS system and bring significant benefits in terms of faster and more reliable information on a timely basis. The transition to the ACE system will allow faster retrieval of trade and transportation data and efforts to integrate and reconcile ABI and AMS data would be no longer required. However, it still does not address the issue of routing once it leaves the port.

The dissemination of trade and transportation data on an aggregate basis, without compromising private-sector concerns of confidentiality, would prove to be a good starting point in bridging the existing data gap in monitoring the movements of import shipments on the domestic transportation network.