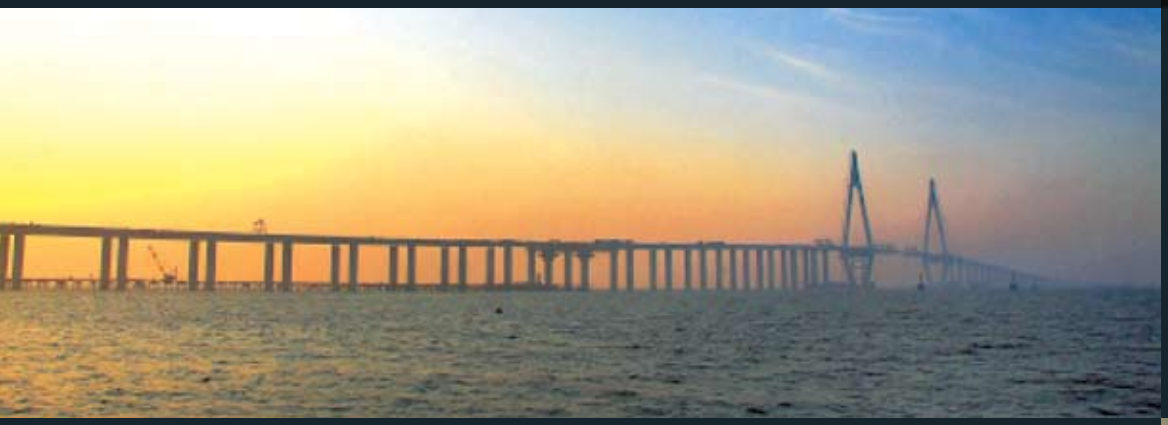
Freight Mobility and Intermodal Connectivity in China



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16. Abstract

Trade growth between the United States and China has increased U.S. interest in how the Chinese transportation system handles exports. The Federal Highway Administration, American Association of State Highway and Transportation Officials, and National Cooperative Highway Research Program sponsored a scanning study to identify how China provides intermodal access to its ports and uses investment strategies to foster freight mobility and intermodal connectivity.

The scan team learned that China's national, provincial, and metropolitan transportation policy is closely coordinated with the country's economic policy and social harmony goals. The transportation system is expanding rapidly to meet global intermodal freight demands and promote expansion into underdeveloped regions of the country.

Team recommendations for U.S. implementation include reviving a national transportation infrastructure focus to maintain U.S. competitiveness in the global market, conducting a study on how China uses performance measures to manage transportation policy, and synthesizing the results of this and earlier scans on intermodal freight and connectivity around the world.

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National Cooperative Highway Research Program

International Technology Scanning Program

The International Technology Scanning Program, sponsored by the Federal Highway Administration (FHWA), the American Association of State Highway and Transportation Officials (AASHTO), and the National Cooperative Highway Research Program (NCHRP), evaluates innovative foreign technologies and practices that could significantly benefit U.S. highway transportation systems. This approach allows for advanced technology to be adapted and put into practice much more efficiently without spending scarce research funds to re-create advances already developed by other countries.

FHWA and AASHTO, with recommendations from NCHRP, jointly determine priority topics for teams of U.S. experts to study. Teams in the specific areas being investigated are formed and sent to countries where significant advances and innovations have been made in technology, management practices, organizational structure, program delivery, and financing. Scan teams usually include representatives from FHWA, State departments of transportation, local governments, transportation trade and research groups, the private sector, and academia.

After a scan is completed, team members evaluate findings and develop comprehensive reports, including recommendations for further research and pilot projects to verify the value of adapting innovations for U.S. use. Scan reports, as well as the results of pilot programs and research, are circulated throughout the country to State and local transportation officials and the private sector. Since 1990, about 70 international scans have been organized on topics such as pavements, bridge construction and maintenance, contracting, intermodal transport, organizational management, winter road maintenance, safety, intelligent transportation systems, planning, and policy.

The International Technology Scanning Program has resulted in significant improvements and savings in road program technologies and practices throughout the United States. In some cases, scan studies have facilitated joint research and technology-sharing projects with international counterparts, further conserving resources and advancing the state of the art. Scan studies have also exposed transportation professionals to remarkable advancements and inspired implementation of hundreds of innovations. The result: large savings of research dollars and time, as well as significant improvements in the Nation's transportation system.

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Executive Summary

China's transportation system is rapidly expanding to support economic growth, meet projected global intermodal freight demands, and promote expansion into underdeveloped regions of the country. Given the current understanding of intermodal freight movement that was not available when the United States developed its port capacity, the purpose of this scan was to identify how China provides intermodal access to its new, greenfield maritime ports and the possible application of those methods in the United States. The scan also looked at the investment strategies adopted by Chinese officials to foster freight mobility and intermodal connectivity in support of their global competitiveness.

The scan team represented a diverse set of interests and concerns for national and State decisionmaking. In addition to Federal Highway Administration (FHWA) officials at the national and division levels, the team included representatives from the departments of transportation for California, Maine, and Pennsylvania; a representative of the I-95 Corridor Coalition; a representative of the American Association of State Highway and Transportation Officials (AASHTO); a representative of the American Trucking Associations; and a university professor who also acted as the report writer. These scan members reflected different modal interests and expertise in intermodal freight transportation, trucking, transportation policy and planning, and transportation system operations.

The scan team met with government officials at the national, provincial, and metropolitan levels; port authorities and terminal operators; U.S. shippers and retailers; logistics and warehousing companies; and research organizations. Although most of the team's visits were to specific organizations, meetings were also held under the auspices of the local American Chambers of Commerce in Shanghai and Hong Kong that provided an opportunity to meet with representatives of many shipper, carrier, and trade organizations.

General Observations

The scan team made numerous observations about the way China has provided transportation infrastructure in support of its impressive economic growth. These observations are presented below. However, several major takeaways from this scan provide important lessons to the United States:

- Given the global market and supply chain, what happens in China does affect the U.S., State, and local economies. Everyone is part of a global economy; flows of people and goods do not stop at jurisdictional boundaries. Although this scan focused on China, in reality the transportation system of each country is part of a global transportation network and should be viewed that way. It is surely the way the companies that move freight view it.
- Although the Chinese system of governance is very different from the United States, several characteristics of the system are noteworthy:
  - National, provincial, and metropolitan transportation policy is closely coordinated among the three levels and is linked to other policy goals, the most prominent ones being economic development and what the Chinese call "social harmony."
  - This strong linkage often results in a unified vision of what is necessary in the transport sector to achieve policy goals.
  - The Chinese government at all levels targets investment on those components of the transportation system that best advance national goals. As a result, the evolving Chinese transportation system is focused on excelling in markets dominated by international trade.
  - The expanding opportunities for investment in China have resulted in many public-private joint ventures for transportation projects.

However, in most cases, the government retains majority control in the joint venture. It always has the majority say.

- On intermodal access to the maritime ports, the scan team did not find new or different operational technology than is used in the United States or European Union. There were, however, significant differences in port operating rules because of different labor conditions and the focus on competing in a global market.

The following observations from the scan are organized in four categories: China's economic growth and driving forces; transportation infrastructure development; governmental structure, decisionmaking, and analysis; and global shipper and carrier perceptions.

China's Economic Growth and Driving Forces

1. China's economic growth over the past 10 years has been dramatic. Both government officials and private sector representatives expect this growth to continue in the foreseeable future at or near its current rate of about 10 percent per annum.

2. Although the national and local governments have invested heavily in infrastructure, much of the recent economic growth has been fueled by private investment. As different sectors of the economy have been opened to foreign investment, joint ventures and other financial partnerships have provided an institutional framework for expansion of the transportation infrastructure and the economy. Even with this foreign investment, the government is still in a dominant position on investing in the transport sector, especially in such areas as the national rail system.

3. The economic expansion of China started in the south (Pearl River Delta), moved north along the coastal area based on national economic policy, and is now pushing west in accordance with the "Go West" national government campaign. This campaign has significant implications to supply chain logistics costs and to the efficiency of the Chinese transportation system in moving exports to the coastal ports.

4. Much of China's economic expansion has occurred in urban areas where the population provides the labor force. The consequence of such large urban concentrations is that the central government pays particular attention to and provides the resources to make sure that the basic needs of these populations are met (social harmony). From a transportation perspective, the consequence of this policy focus is that passenger transportation often receives priority over freight movement (although in port cities freight movement often receives close attention from transportation officials), especially in peak holiday seasons.

5. Although it appears that economic development is still the primary goal of governmental policy, additional goals and performance measures relating to environmental quality and energy consumption have been added to the national agenda.

Transportation Infrastructure Development and Operations

1. Recognizing the vital role that transportation plays in meeting its goal of continued economic growth, China is investing heavily in transport infrastructure, an investment estimated at more than 9 percent of the country's gross domestic product (GDP). This investment comes from both public and private (joint venture) funds.

2. Substantial levels of private capital are being invested, in some cases with low expectations of rapid return on investment. In other words, investors are willing to accept lower immediate returns in exchange for longer term benefits. Over the past several years, this investment has occurred primarily in seaports, highways, airports, and logistics parks. Private investment in rail infrastructure and intermodal terminals has had limited success, although some recent agreements suggest that the rail sector will also see private investment.

3. Coastal and river shipping is a significant component of China's intermodal transportation system. In some port markets, as much as 35 percent of the containers arriving for export do so by barge.

4. The central government's "Go West" policy has shifted investment attention to inland transportation and the challenges facing such

transportation, especially the connections to the major international ports.

5. China's intermodal rail service faces significant challenges. The movement of containers receives low in priority on China's rail network, following military, passenger, energy (coal), and food movements. About 12,000 kilometers (7,456 miles) of passenger-only track are being built to separate passenger and freight movements. This will free up the existing combined-use track for freight movements. A goal of 10 million 20-foot equivalent units (TEUs) carried by rail (now less than 3 million) has been established for China's current 5-year planning period.

6. The Chinese central government has encouraged joint ventures to finance the national expressway system, the intent of which is to stretch government funds to support a variety of new modal investments. Consideration is also being given in some locales to how tolls can be used to influence truck routing.

7. Toll rates are comparable to those found in the United States and Europe, but the Chinese believe this does not reflect the economic reality of travelers in China, where per capita GDP is much lower. In some cases, the Chinese are trying to renegotiate concession agreements to allow lower toll rates, offsetting lower toll revenues with longer concession time periods (from 30 to 50 years).

8. The national expressway plan is centered primarily on three major economic and political centers: Beijing, Shanghai, and the Pearl River Delta. In essence, the national expressway system and the national rail network will be the major means of connection between the political and economic centers of the country, reinforcing their importance in the economic future of China. Intermodal connection has been an important consideration in network design.

9. Trucking is the predominant means of moving containers to and from the ports, especially in the river delta manufacturing regions. The trucking industry consists mainly of small businesses (one to three trucks), which makes its contribution to China's economic growth even more impressive. Enforcement of the standard vehicle configuration regulation is weak, and integration of technology into trucking operations appears to be limited.

10. Given the relatively large number of trucking businesses found in China and the intense competition for freight movements, it was not surprising to find that oversized and overweight trucks have become an emerging and important concern for transportation officials. It appears that Chinese transportation and enforcement organizations have just recently begun to implement national and provincial weight enforcement programs.

11. Chinese port productivity is the best in the world. Chinese ports operate 24 hours a day, 7 days a week, 365 days a year. Operational strategies are impressive—cranes that lift four TEUs, 20- to 30-minute truck turns, nine cranes working one ship, etc. New ports are being developed and the capacity of existing ports is being expanded rapidly.

12. Given the significant level of trade to the United States and current U.S. legislation, security was a growing concern to port terminal operators. The relatively new infrastructure at China's ports allows terminal operators to build security measures into terminal operations, especially using technologies to screen outbound containers.

13. China has not progressed to the point of systematically managing its transportation infrastructure; it is still in the "build" mode. The scan team saw little evidence that this infrastructure was being designed with system management challenges in mind, such as truck weight and size enforcement. Nevertheless, in a few of the more mature areas experiencing significant congestion, transportation officials indicated a need to begin paying serious attention to system management.

14. Intermodal connectivity and landside access to Chinese ports are not approached differently or in a more sophisticated way than in the United States or European Union. Many new port facilities are located in large urban areas, yet the access to and from these ports involves traversing mixed-use roadways that will, in the future, present the same challenges now faced in the United States and European Union.

15. Rail access to maritime port facilities is not being built consistently into new port design. With the exception of the Port of Qingdao, which has no river access and is being looked at as one terminus of a rail-land bridge from Asia to the European Union and Russia, no other port facility was being built with on-dock rail. This is partly due to a perception by shippers and ocean carriers that container movement receives low priority on the Chinese freight rail network, which results in little pressure to improve or provide rail access to the ports.

Governmental Structure, Decisionmaking, and Analysis

1. China's policymaking and implementation process identifies clearly specified national goals with corresponding performance metrics. However, local officials have leeway under this national policy to implement projects that also meet their local objectives. A national 5-year plan provides policy direction on what will be emphasized during the plan's timeframe (China is in its 11th 5-year plan).

2. National transportation agencies have different modal responsibilities (e.g., Ministry of Communications,* Ministry of Railways, Ministry of Construction, Central Administration of Civil Aviation). Because the performance of government officials is measured by results, attention is paid to measures of progress. National data on overall modal performance and the state of the economy are collected and analyzed. Data analysis is used to determine the extent to which goals are being met at different levels of government. Some officials referred to this as "results-oriented planning."

3. The performance of local officials and governments is measured against national goals. For example, many noted that the most important metric for local officials is the degree to which economic growth occurs during their tenure, defined primarily as job growth. China's tax policy also supports this goal because the tax revenue from the economic activity in a province stays, for the most part, in the province.

4. Although this scan did not conduct a systematic assessment of the capability of municipal government agencies to plan and provide for transportation infrastructure and services, every meeting with local officials included the staff members responsible for each mode. In other words, all of the modes were located in one agency, which encouraged the adoption of a multimodal systems perspective when looking at regional transportation investment.

5. In most cases, there was little evidence that carriers or shippers were asked for advice on national strategic transportation plans or investments. However, at the provincial or regional level, the inclusion of the private sector in tactical investment decisions was evident in the number of public-private partnerships.

6. Port development plans considered modal access strategies as part of the planning process, but multimodal port access did not always result (note comment 15 in the previous section about rail access to ports). The interesting aspect of this port planning was that the boundary of such studies encompassed a much larger area than that adjacent to the port itself. Access was a key concern.

7. Project development occurs much faster in China than in the United States. Transportation projects are viewed as a priority for economic development, so they move forward rapidly.

8. In keeping with the national policy of social harmony, government officials are concerned about the negative impacts of transportation facility operations and expansion on local communities. They provided examples of efforts to mitigate the impact when community displacement does occur.

9. Hong Kong's role in the competitive market of the Pearl River Delta is evolving. New ports

*In April 2008, the Chinese government created a Ministry of Transportation that incorporates the former Ministry of Communications. Aviation, maritime, and highways are among the functions in the Ministry of Transportation. The Ministry of Railways remains separate. The result is a transportation policy and development entity similar in structure to the U.S. Department of Transportation.

nearby (along with dredging in the river to allow access to these ports for bigger ships), as well as new manufacturing development on the west bank of the Pearl River, will likely cause a shift in container exports to other ports. It remains to be seen how the market will adjust to these changing conditions, but it appears that Hong Kong's relative position in global container flows could evolve in a different direction in the future.

Shipper and Carrier Perceptions

1. Many of the international ocean carriers and shippers the team met during this scan view the serious constraint in international trade and supply chain efficiency as being on the receiving end, in Europe and the United States. The prevalent perception is that terminal throughput in the United States and European Union is limited by terminal operational limitations, landside access capacity, growing road congestion, and protracted decisionmaking processes.

2. Shippers and carriers believe that the effect of a widened Panama Canal and increased transits through the Suez Canal will likely be more shipments heading to east coast U.S. ports, but that the west coast U.S. ports will still be the major destination for most transpacific containers.

3. Several shippers and carriers identified the "bunching" of vessel departures from Chinese ports (because of when merchandise arrives at the ports and when it is needed in the U.S. market) as the cause of a significant peaking problem. It was observed that a peaking in departures from China usually results in a peaking in arrivals at U.S. ports, especially Los Angeles-Long Beach in California. Several shippers and carriers believe that this peaking phenomenon could be remedied by working with retailers, shippers, and manufacturers.

Lessons for the United States

The lessons learned from this scan are organized in two major categories: consequences to the United States and its transportation system, and different approaches to planning and project development in support of a growing economy.

Consequences to the United States and the U.S. Transportation System

1. China competes as a nation. For the United States to remain competitive globally, it needs to invest in transportation infrastructure, apply new system management technologies, and consider institutional change in how it identifies, funds, operates, and makes key infrastructure improvements to key elements of the national transportation system.

> "Whereas the United States focuses on China…China focuses on the world."
>
> —SCAN TEAM MEMBER

2. Trade from China will put increasing pressure on east coast ports. With new service routes through the Suez and Panama Canals, States on the east coast will experience increasing demands on their transportation systems.

3. Given the navigable draft and terminal capacity of most U.S. ports, the largest container ships might not be providing service to the United States. This means most U.S. ports will be served by vessels carrying less than or equal to 10,000 TEUs.

4. Similar to what teams observed during intermodal freight scans in Europe and Latin America, the difference in port efficiency between China and the United States is dramatic. If U.S. ports are unable to expand because of community concerns or geographic limitations, maximizing the use of existing capacity and improving port throughput are imperative to handle increasing container flows.

5. The United States can learn a lot from China on using natural geography to the maximum extent, particularly in the use of barge and coastal shipping as access modes to major ports. In China, the Pearl and Yangtze River ports are being developed to act as transshipment ports, and new manufacturing capacity is being developed and located to take advantage of river transport.

6. Freight bottlenecks are viewed as a drain on transportation system and economic productivity. This is a perspective the United States should adopt as well. Solving these bottlenecks involves more than just expanding physical capacity. It also requires using technology and operational strategies.

7. Chinese officials have recognized that freight-oriented transportation investments, especially ports, are an important part of the nation's economic development. Accordingly, Chinese transportation agencies have invested heavily in improving port capacity.

8. The United States is fortunate to have a much more developed rail network, which in many cases provides on-dock service to port terminals. This is a significant advantage to U.S. trade flows, and one that needs to be nurtured.

9. Given China's experience with oversize and overweight vehicles and the corresponding infrastructure damage, it becomes even more apparent that the United States should ensure that its commercial motor vehicle size and weight program continues to advance and is provided adequate resources.

10. One challenge facing west coast ports is the bunching of vessel departures from China that results in vessels arriving at about the same time in the United States. If vessel bunching could be reduced, this could significantly benefit both U.S. and Chinese ports. In discussions with shippers and carriers in China, the scan team heard optimism that this could in fact occur.

How the Chinese Invest In and Operate Their Transportation System to Support a Growing Economy

1. China has a national transportation investment policy that is closely linked to its trade and economic policy. National transportation investment appears to focus on two major goals (besides military defense): strategies to foster social harmony among Chinese citizens and strategies to support economic growth, with the second goal supporting the first. The United States would benefit from adopting a national transportation investment policy that supports the nation's economic health.

2. The Chinese central planning function is not a model that would work in the United States. However, the concept of locally executing a strategic network focused on national interests with national financing support (along the lines of the initial effort to build the U.S. Interstate Highway System) is worth considering. Such a system should use performance measures to monitor progress in developing and operating key elements of the national transportation system.

3. Many of the assets that work in tandem with the Chinese transportation system (port terminal development, logistics parks, etc.) are partially funded through private investment. In some cases, the return on this investment is not likely to be realized in the short term. Instead, it will take years for the investment to start producing net gains. However, companies made it clear that because the Chinese can make infrastructure investment decisions quickly and show progress toward improvement, they are willing to invest. This suggests that if transportation agencies in the United States are interested in encouraging more private investment in transportation facilities, they need to give greater attention to timely public sector decisionmaking. Agencies simply need to get to the decision point earlier.

4. The primary instrument of privatization in China is the joint venture. In almost all cases, private investors do not get a majority share of the investment (the exception being port terminals). Government agencies or state-owned enterprises retain at least 51 percent control.

5. Chinese planning for intermodal centers, and indeed for regional transportation networks, adopts a systems perspective on performance and investment. In the United States, several multistate coalitions seek to coordinate multi-jurisdictional activity. To achieve systems-level coordination, more efforts along these lines will be necessary.

6. Air cargo is the fastest growing segment of freight movement in China. While it is still only a small percentage of total tonnage, the implication to the U.S. transportation system of this growth in both air cargo hubs and belly freight is new stress on the transportation network at already-overcrowded U.S. airports.

7. National data collection in China provides a springboard for national transportation planning, investment, and performance evaluation. U.S. freight data systems should not only be continued, but expanded to provide the information needed for optimal transportation investment decisionmaking, especially given the important role that freight plays in the economic health of the Nation.

8. Finally, it was noteworthy that the Chinese transportation officials who met with the scan team were very high quality professionals and most often quite young. They were expert in the use of data and data analysis and knowledgeable about how their respective transportation systems fit into a much larger transportation systems perspective.

Implementation Strategies, Dissemination, and Recommendations

The scan team developed recommendations for implementing the results of this scan. These related to dissemination, policy development, outreach, and research and data analysis activities. For example, the scan team recommends a wake-up call on the need for the United States to invest in transportation infrastructure with a more national perspective if it is to stay competitive in a global market. This first, and perhaps most important, recommendation is to develop a "Reveille for Refocus" on a fresh, strategic, national perspective for U.S. transportation and elected officials. This document would draw a sharp focus on the importance of the transportation-economic integration so evident in China. More discussion of the implementation plan is in the report.

CHAPTER 1

Introduction

China has been a major trading partner with the United States for many years. This relationship is likely to become even stronger in the future. The success of this trading relationship very much depends on the efficiency and productivity of freight movements between the two countries and the logistics system that supports such movements. With an increasing volume of imports coming into the United States from China, the ability of the Chinese transportation system to handle its exports is of great interest to U.S. transportation officials. The ability of the U.S. transportation system to handle these volumes on the receiving end is also important—and cause for concern. The Chinese government has invested heavily in transportation, with much of this investment coming from private investors. The United States can learn from this experience.

China's transportation system is rapidly expanding to support economic growth, meet projected global intermodal freight demands, and promote expansion into underdeveloped regions of the country. Given the current understanding of intermodal freight movement that was not available when the United States developed its port capacity, the purpose of this scan was to identify how China provides intermodal access to its new, greenfield maritime ports and the possible application of those methods in the United States. The scan also looked at the investment strategies adopted by Chinese officials to foster freight mobility and intermodal connectivity in support of their global competitiveness.

Scan Composition

The scan team represented a diverse set of interests and concerns for national and State decision-making (see appendix A for scan team member biographies). In addition to Federal Highway Administration (FHWA) officials at the national and division levels, the team included representatives from the departments of transportation for California, Maine, and Pennsylvania; a representative of the I-95 Corridor Coalition; a representative of the American Association of State Highway and Transportation Officials (AASHTO); a representative of the American Trucking Associations; and a university professor who also acted as the report writer. These scan members represented different modal interests and expertise in intermodal freight transportation, trucking, transportation policy and planning, and transportation system operations.

The scan team met with the following groups during its 15-day trip:

- Ministry of Communications (intercity highways, airports, and ports)*
- China Railway Container Corp. (organization under the Ministry of Railways)
- Provincial officials and representatives of the Hong Kong Special Administrative Region
- Port authorities
- Port terminal operators
- Ocean carriers
- Municipalities (Shanghai, Shenzhen, and Qingdao)
- U.S. shippers and retailers
- Logistics and warehousing firms
- China Development Institute

Although most of the team's visits were to specific organizations, meetings were also held under the auspices of the local American Chambers of Commerce in Shanghai and Hong Kong. The meetings provided an opportunity to meet with

*In April 2008, the Chinese government created a Ministry of Transportation that incorporates the former Ministry of Communications. Aviation, maritime, and highways are among the functions in the Ministry of Transportation. The Ministry of Railways remains separate. The result is a transportation policy and development entity similar in structure to the U.S. Department of Transportation.

individuals representing many different shipper, carrier, and trade organizations.

In preparation for the scan, the team sent a set of amplifying questions (see Appendix B) to the organizations it planned to visit to outline the type of information desired.

Report Organization

This report is organized in five chapters. Chapter 2 discusses the special circumstances that reflect the Chinese experience with infrastructure provision, the expansion of the Chinese economy over the past decades, and the implications to the transportation system. Chapter 3 describes China's investments in transportation and plans for the future, and presents observations from private company representatives who met with the scan team. Chapters 4 and 5 present general observations, lessons for the United States, and recommendations for implementing the scan results.

CHAPTER 2

Chinese Context

It is often difficult to compare the United States to other countries because of differing governmental structures, patterns of economic development, and positions in the global marketplace. This is especially true in any comparison between China and the United States. This section describes the key contextual differences between the two countries that should be considered when drawing conclusions or making observations on the characteristics of respective transportation system investment or productivity.

Stage of Development

China is in a very different stage of development than the United States. In essence, China is building a transportation network in 10 years comparable to what the United States did in 50 years, and it is doing so by learning lessons from more developed countries. Opening the Chinese market to foreign investment in the late 1980s and 1990s was a calculated step by the central Chinese government to speed up the process of modernizing and developing economic linkages to the rest of the world. Thus, the fact that China is investing almost 10 percent of its gross domestic product (GDP) in all of its infrastructure (compared to just under 4 percent in the United States) and that the Chinese economy is expanding at more than 10 percent a year (compared to 2 to 3 percent in the United States) should not be surprising.

China's rapid economic development has been reflected in the significant investment in the nation's transportation system. As this report shows, China has devoted considerable resources and has attracted much more private investment to its transportation system. China is directing almost all of the funding to new construction, while paying little apparent attention to incorporating aspects of systems management into facility design (such as weigh-in-motion technologies). In the United States and Europe, transportation agencies are now learning that thinking about systems operations and management in the early stages of network development saves time and resources later when such technologies must be retrofitted onto the network.

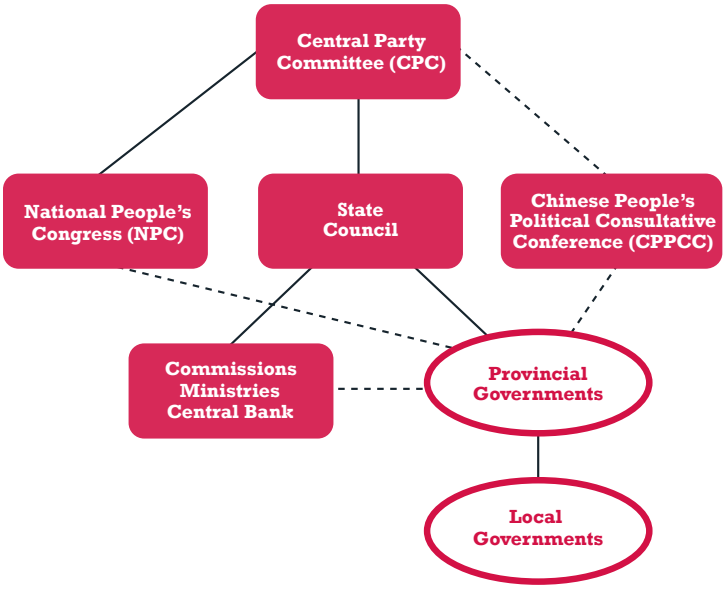
Governmental Structure for Decisionmaking

China has a very different form of government and decisionmaking process than the United States. With a strong centralized government and central planning authority, much of what happens in China is strongly influenced by central government policy. There are also significant differences in landownership and how land is transferred to private developers by lease instead of purchase.

Figure 1 (see next page) shows the organizational structure of different levels of government in China. The Central Party Committee (CPC) is the most important participant in the broad policymaking process in China, providing leadership to the National People's Congress, State Council, and Chinese People's Political Consultative Conference. The CPC establishes national policy and often plays a critical role in making sure adopted policies are carried out. This is done primarily by having party members serve as heads of agencies (at the national level) or by having at least a party member and an administrator serve jointly as agency head (at the local level). Ministries and commissions report to the State Council. All ministries must submit an infrastructure development plan to the National Development and Reform Commission (NDRC) for approval. Table 1 (see next page) shows the roles of the different groups involved in Chinese infrastructure policy, planning, and implementation.

The following are the most important transportation-related ministries:

- **Ministry of Communications**—Responsible for national roads and highways, inland waterways, ports, and ocean shipping



SOURCE: Liu, Z., "Planning and Policy Coordination in China's Infrastructure Development," Paper prepared for the ADB-JBIC-World Bank East Asia Pacific Infrastructure Flagship Study, undated.

Figure 1. *Chinese governmental structure.*

- **Ministry of Railways**—Responsible for the national railway system
- **Ministry of Construction**—Responsible for urban planning and urban transport
- **Central Administration of Central Aviation**—Responsible for planning and developing airports

At the provincial and municipal levels, each government has its own transportation agency, often with responsibility for all modes of transportation.

Transportation Planning

Infrastructure planning in China is really a combination of top-down and bottom-up processes. The national government provides its vision for national infrastructure through the development of 5-year plans. The current 5-year plan, the 11th in the series, covers 2006–2010. Policies and targets in the plan relating to transportation include the following:

- The target for economic growth was to be 7.5 percent a year.

Table 1. *Role and responsibilities of relevant national Chinese organizations in infrastructure provision.*

Organization	Role and Responsibilities Relevant to Infrastructure
Central Party Committee	Sets national development policy direction and general guidance on long-term and medium-term national socioeconomic development plans.
National People's Congress	The national legislative body. Three of its committees are relevant to infrastructure policies and laws: Legislative Affairs, Finance and Economy, and Environment and Resources. It reviews and approves national economic and social development plans, the national budget, and investment megaprojects such as the Three Gorges Dam.
Chinese People's Political Consultative Conference	A multiparty advisory board, with main functions in political consultation and supervision on major political, economic, and social policies. It is a major channel for constructive criticism of government policies.
State Council	The administrative body of the central government.
National Development and Reform Commission	Formulates and organizes the implementation of national socioeconomic development strategy, long-term plan, medium-term plan (i.e., 5-year plan), and annual plan. Provides policy recommendations for macroeconomic management and sectoral development of national significance. Coordinates policy implementation across sectors and levels of government. Sets and guides implementation of price policies. Determines the size of fixed-asset investment. Guides and approves major infrastructure investment projects.
Ministry of Finance	Formulates and supervises the implementation of medium-term and annual budget plans. Sets and supervises the implementation of fiscal policies. Supervises central government expenditures. Allocates funds to central government investment projects. Sets public debt policy and manages public debt. Formulates state debt issuance plans.

Organization	Role and Responsibilities Relevant to Infrastructure *(continued)*
People's Bank of China (Central Bank)	Analyzes, formulates, and implements macro financial credit policy based on national socioeconomic development policy and sectoral policy.
Ministry of Communications (now Ministry of Transportation)	Ministry responsible for roads and highways, inland waterway, ports, and ocean shipping.
Ministry of Railways	Ministry responsible for railways.
Ministry of Construction	Ministry responsible for urban planning, urban development and construction, urban utilities, and urban transport.
Ministry of Information Industry	Ministry responsible for information and telecommunications industry.
Ministry of Land and Resources	Ministry for planning, protecting, and managing the use of, land, mineral, and maritime resources.
Civil Aviation Administration of China	Central level bureau for civil aviation.
State Environmental Protection Administration	Sets guidelines for project environmental impact assessment.
State-Owned Asset Supervision and Administration Commission of the State Council	A special agency established in 2003 under the State Council to supervise and manage the state-owned enterprises (SOEs) (including the infrastructure sector SOEs such as China Power Grid Co.) and SOE reform and restructuring.
China Development Bank	A policy bank reporting to the State Council that is heavily involved in infrastructure financing.
State Commercial Banks	Responsible for infrastructure financing and SOE financing.
Development Research Center of the State Council	An in-house think tank for the Sate Council, focusing on the overall, comprehensive, strategic, and long-term issues in the national economic and social development, and providing policy recommendations and consulting advice. Among its research departments are three highly relevant to infrastructure: Development Strategy and Regional Economy, Sectoral Economy, and Technology Economy (survey and study on major construction projects and regional development projects).
China International Engineering Consulting Corporation	The primary agency designated for the due diligence of the feasibility studies of key investment projects that require NDRC approval. It provides its services mainly on commission from project sponsors, including governments at all levels and enterprises.
Institute of Geography, China Academy of Sciences	Heavily involved in regional planning, regional urban system planning, and detailed surveys of natural resources across the country and assessment of their economic potential.

SOURCE: Liu, Z., "Planning and Policy Coordination in China's Infrastructure Development," Paper prepared for the ADB-JBIC-World Bank East Asia Pacific Infrastructure Flagship Study, undated.

- National policy was aimed at supporting an economic expansion in the western provinces of China.
- Logistics was for the first time identified as a national issue, with reducing logistics cost defined as a governmental objective.
- Six new rail lines totaling 17,000 kilometers (km) (10,563 miles (mi)), six railway transportation hubs, 18 intermodal yards, 40 container handling stations, 150 intermodal substations, and 1 million km (621,371 mi) of rural roads were to be built.
- A 10 percent market share for rail intermodal traffic was established.
- All cities with more than 1 million people and 90 percent of cities with 200,000 to 1 million people were to be connected to the national road network.

The following ports were identified as being of national significance and thus needing improvements in port access and port infrastructure (see figure 7 for the locations of these port areas):

- **Yangtze River Delta**—Shanghai and Ningbo
- **Pearl River Delta**—Shenzhen and Guangzhou
- **Bohai Region**—Dalian, Tianjin, and Qingdao

Within the construct of the 5-year plan, local officials appeared to have some flexibility in investing in transportation infrastructure that meets national goals while satisfying their jurisdictional needs.

Scan team discussions with national transportation officials emphasized the cooperative nature of transportation investment, whereas local decisions were described as being much more targeted at increasing the jurisdiction's competitive advantage. Thus, local officials appeared to have a great deal of flexibility in targeting transportation investment in ways that best meet their needs.

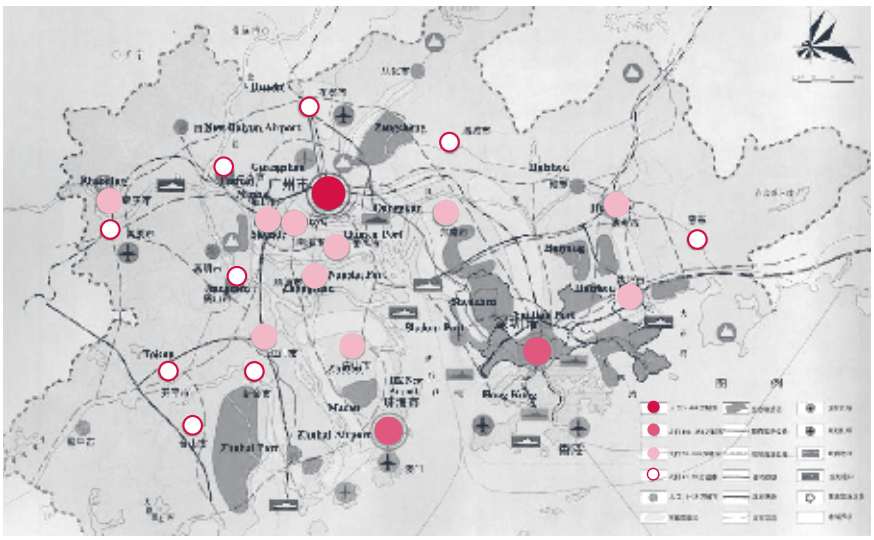
The scan team met with representatives from several provincial and metropolitan transportation organizations. It was difficult to determine exactly how these organizations were structured, but it was notable that almost all modal planning functions were found within the government agency. This appeared to foster a multimodal perspective on transportation planning. Figure 2 for example, was presented as an illustration of how the Pearl River Delta economic and transportation system worked.

The different symbols represent economic activities and transportation facilities. The map shows logistics corridors through which large freight volumes flow, connecting to the ports, airports, and river and barge terminals.

Transportation Investment and Finance

China has seen a profound change in its infrastructure financing strategy over the past 20 years, and not just in transportation. In 1981, for example, 57 percent of all infrastructure finance in China was funded directly by the national government through its general budget. By 1997, this had declined to 6 percent. By this date, most infrastructure was financed either through foreign direct investment, user fees, state debt, or loans from the China Development Bank.

China joined the World Trade Organization in 2001, with commitments to liberalize certain sectors of its market by set deadlines. In transportation, the government established a timetable for allowing foreign investment in different sectors. For example, in December 2002,



SOURCE: Charles Guowen Wang, China Development Institute

Figure 2. *Multimodal transportation system in the Pearl River Delta.*

the Ministry of Communications established a policy that foreign investment can reach 75 percent in road transport enterprise joint ventures (that is, joint ventures relating to trucking firms, warehousing, and trucking terminals). For investments that relate to roads, bridges, and other large-scale infrastructure development, foreign investment is limited to 49 percent, thus maintaining government control. This is referred to as asset equitization versus asset monetization (in which the public sector gets money from selling or leasing infrastructure). Some flexibility is allowed in increasing the private share of a joint venture under special circumstances. For example, private investment in facilities or services that serve the targeted western provinces of China can exceed the 75 percent maximum with permission of the Ministry of Communications.

Because of the many different means of investing in transportation infrastructure in China, the transportation financing picture in China can be confusing to the outsider. Data from the national ministries often do not represent the overall investment picture in logistics-related infrastructure. Rail and airport investment is mainly conducted by the national government; most seaports are invested in and owned by local government agencies or state-owned enterprises on behalf of government agencies. According to some local officials, investment incentives by local governments sometimes cause repetitive investment and overinvestment in logistics infrastructure (seaports, logistics parks).

In some cases, the Chinese government invests in infrastructure largely by itself (such as 18 freight intermodal yards) because it cannot interest private investors in the opportunity. In other cases, provincial or municipal governments invest in facilities in combination with private investors. In still others, joint ventures have been formed with several partners to develop and operate a facility. In many of these investment cases, the return on investment is small, but the expectation is that future demand (for example, volumes for toll roads) will provide bigger returns later on. Thus, it becomes impossible to generalize about transportation finance in China, except to say that the Chinese take advantage of any private investment dollars they are able to secure.

In summary, given the economic growth in China, the resources this places in the hands of the government, the governmental structure, the government's willingness to partner with private capital, private capital's interest in development opportunities, and the ability to use technological standards for roadway design and construction developed by the United States and European Union, it is not surprising to find that China has been able to expand its transportation infrastructure at such a rapid pace.

> "Chinese transportation officials are much more aware of the importance of logistics to their economy than American officials."
>
> –AMERICAN PRESIDENTS LINE REPRESENTATIVE

Chinese Economic Growth

During the 30 years after the founding of the People's Republic of China in 1949, the national economy was centrally planned and largely controlled on the basis of traditional socialist principles. Beginning in 1978, and starting in rural areas, the central government began to relax some of the stringent constraints on economic growth. The results have been dramatic. Over the past 25 years, China's GDP has grown an average of more than 8 percent per year, with a 10.4 percent annual growth rate from 2002 to 2006. As table 2 (see next page) shows, this growth is expected to continue at very high rates into the near future.

Growth in foreign trade has been the major factor spurring this economic growth. From 2002 to 2006, for example, the value of exports grew by 31.4 percent a year and the value of imports grew 29.5 percent annually. Much of this trade has been with the United States. Figure 3 (see next page) shows the Chinese export destinations and the U.S. import origins for sea-based trade in 2006 (U.S. imports from Canada and Mexico are excluded). Although China is a dominant source of sea-based trade with the United States, the country has a much more diverse set of export destinations. Many in China expected this to continue in the future, with intra-Asian trade becoming more prominent for China than it is today.

Table 2. *Forecasted economic factors for China, 2007 and 2011.*

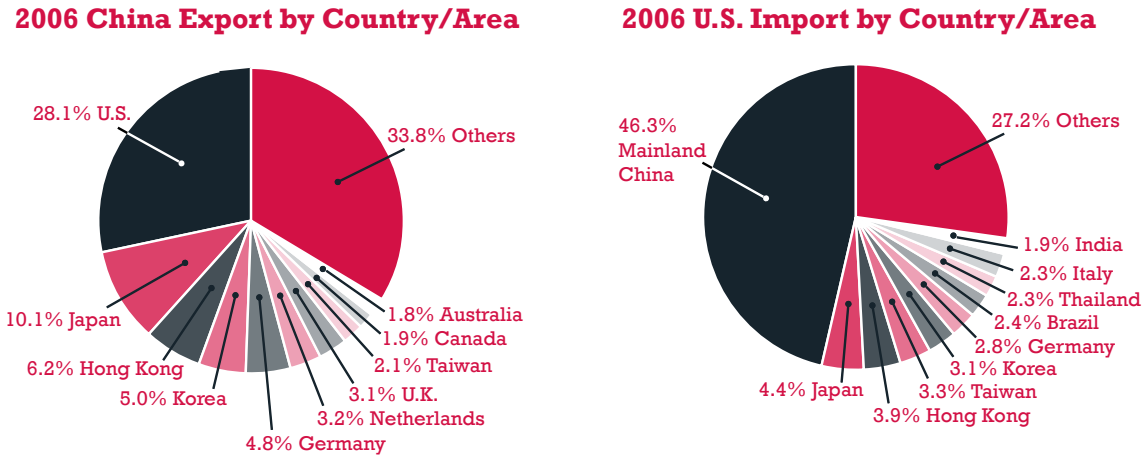
	2007	2011	CAGR
GDP (US$ bn at market exchange rates)	3,320.3	6,236.5	17.1%
GDP (RMB bn at 1995 price)	18,698.0	25,817.0	8.4%
GDP per head (US$)	2,510.0	4,620.0	16.5%
Goods: export fob (US$ bn)	1,200.4	2,422.0	19.2%
Goods: import fob (US$ bn)	(891.5)	(2,059.0)	23.3%
Foreign direct investment (pledged US$ bn)	83.4	92.9	2.7%
Exchange rate (RMB/US$) average	7.62	6.45	-4.1%
Greater China Area export volume (million 40-ft equiv)	19.62	32.68	13.6%
Greater China Area import (million 40-ft equiv)	7.96	13.43	14.0%
China's Share of the World in 2011			
Share of world GDP (% at market exchange rate)	6.32	9.36	
Share of world GDP (% at PPP)	16.05	18.82	
Share of world exports (%)	8.73	13.56	

Note: Export and import volume data is from GCAMKT
SOURCE: EIU country forecast report, August 2007

According to officials at A.P. Moller–Maersk, a major shipping line serving the Chinese market, the major factors that have contributed to this growth include the following:

- **Privatization**—Most small and medium state-owned enterprises (SOEs) have become privatized.
- **SOE reform**—Larger SOEs have become more efficient and profit oriented because of governmental reforms.
- **Banking system and capital market reform**—China's financial system has been overhauled with the public listing of the major banks and reform of nontradable shares.
- **Urbanization**—Rapid urbanization across the country has created both an accessible labor pool and a rapidly growing consumer market.
- **Industry upgrade**—Chinese enterprises have been improving the quantity and quality of their manufacturing in an attempt to move up the value chain and produce more valuable goods.

All of the analysts who participated in the scan meetings expected China's historical economic growth to continue in the foreseeable future. One assessment concluded that GDP growth would occur at a 17.1 percent annual rate (at market



SOURCE: A.P. Moller-Maersk

Figure 3. *China export destinations and U.S. import origins for sea-based trade.*

exchange rates), the value of exports would grow by 19.2 percent a year and imports by 23 percent a year, China's share of the world's GDP at market exchange rates would increase from 6.32 percent in 2007 to 9.36 percent in 2011, and China's share of world exports would increase from 8.73 percent in 2007 to 13.56 percent in 2011. With China's government focusing on economic growth and targeting its policies on investments to foster growth, it appears likely that these predictions will come true.

An example of the linkage between central planning and economic development that has important implications for the Chinese transportation system is the plan the State Council's Research and Development Center developed in early 2005 that divided China into four regions (see figure 4). These regions were divided into eight economic zones:

- The northeast economic zone would mainly develop heavy industry, machinery, raw materials, and manufacturing, as well as become the national agriculture base.
- The northern coastal zone would focus on high technology and manufacturing.
- The eastern coastal zone would be headed by Shanghai and would be developed into a comprehensive manufacturing center, becoming the most competitive region.
- The southern coastal zone would develop an outbound economy and a consumer commodity base.
- The mid-Yellow River zone would be developed into a coal, energy, iron, and steel production zone.
- The mid-Yangtze River zone would primarily develop planting and agriculture, with secondary emphasis on iron, steel, and automobile industries.
- The southwest zone would be built into a heavy industrial, textile, and tourist zone.
- The northwest zone would mainly develop energy, farm and raise livestock, and develop the tourist industry.

An important characteristic of this economic structure is that much of China's economic production and growth originates in the coastal provinces. For example, 93 percent of China's exports originate in these provinces. Almost 40 percent of the exports originate in the Pearl River Delta region alone (the region including Hong Kong, Shenzhen, and Guangzhou), the first region opened to foreign economic development. The Yangtze River region (Shanghai) was the second region to experience substantial economic growth. Over the past 10 years, the government has attempted to spur economic growth in the northeast and northern coastal zones, and most recently it has adopted a national investment and economic policy to support economic progress in the inland western provinces. This "Go West" policy has

> "China will have the infrastructure in place to handle increasing trade flows. The real problem is in Europe and the United States, where governments do not seem able or willing to invest in the transportation system. The Chinese clearly see the relationship between economic development and transportation system productivity. It is not clear if European and American officials understand this linkage."
>
> – MOLLER-MAERSK REPRESENTATIVE

Figure 4. *The four economic regions of China.*

important implications to trade and logistics because goods manufactured in the western provinces will have to make their way to the ports on the coast, possibly increasing logistics costs.

The growth in China's GDP and its place in the global market are even more impressive when one considers the costs of logistics on the Chinese mainland. Logistics costs represent more than 20 percent of the total cost of product manufacturing and delivery (compared to around 10 percent for the United States). Many of the shippers and retailers that participated in scan meetings pointed to reducing this level of logistics costs as being the greatest productivity improvement that could occur in the Chinese market.

Caution should be exercised in interpreting the 20 percent logistics cost. In many ways, this larger percentage (compared to the United States or Japan) can be explained by the different structure of the economy. Services, which generate little freight movement, are only 32 percent of China's GDP, compared to 81 percent in the United States and 68 percent in Japan. In addition, the average value of Chinese manufactures is well below the corresponding values in the United States and Japan. Thus, it might not be surprising that China's logistics costs are a larger part of the delivered price of manufactured goods. According to a long-time economist who has observed China's economic progress for many years, "As its wage levels rise, China will need to move up the value chain, gradually reducing the ratio of transport to final prices and hence its logistics-to-GDP ratio... It is wrong to use this ratio at this time to allege that logistics services are—across the board, anyway—high cost."

CHAPTER 3

China's Transportation System and Plans for the Future

Chinese officials at all levels of government and in the private sector agree that investing in the transportation system is one of the country's most important investment priorities. Not only does a reliable and efficient transportation system support economic development, but it also provides mobility for an increasingly mobile Chinese population.

Figure 5 shows the level of investment that has occurred since 2000 in different elements of the transportation system and the expected level of investment up to 2010, in U.S. dollars. Figure 6 (see next page) shows the extent of four transportation networks in terms of network expansion.

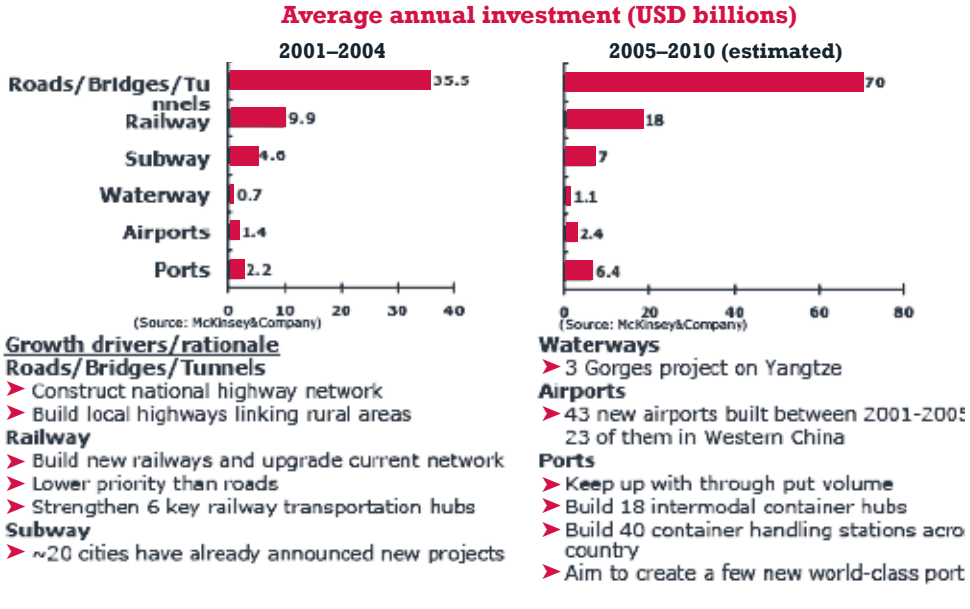
The investment strategy in each modal network is very different, including who is involved, what type of investment is being contemplated, and the expected role each modal network is to play in the overall transportation system. Each modal network will be discussed in the following sections.

Highways

Of all the transportation investments made in China over the past 5 years, the largest amount has been dedicated to the nation's road network. In fact, the pace of investment has been so fast over the past 5 years that any comparison with years before this does not provide a good picture of what is happening with road investment today. Table 3 (see next page) presents some of the most important characteristics of China's road network. As the table shows, the growth rate in both network expansion and network use has been substantial.

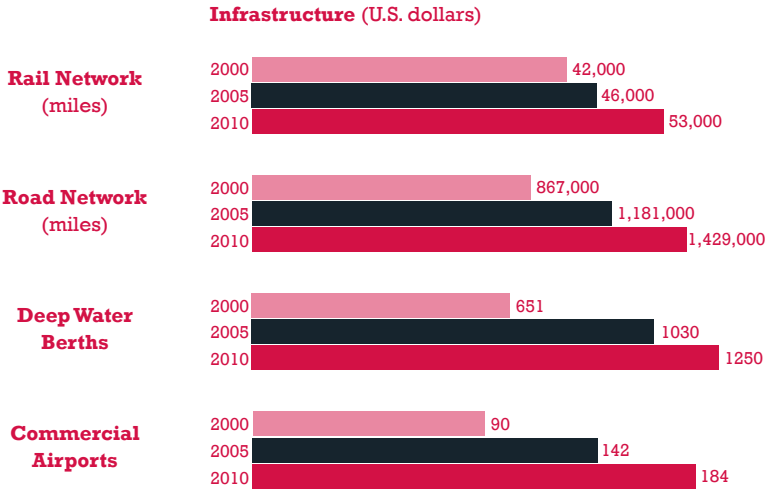
According to the Ministry of Communications, the total highway investment in 2006 was US$84.3 billion, a 13.6 percent increase over the 2005 investment level. Domestic loans (from the China Development Bank) and self-finance bonding accounted for the bulk of the revenue for this investment program, 40.7 percent and 32.8 percent, respectively, of the funding. Only 1.5 percent of the capital investment came from the national government budget.

The government has plans to expand the national expressway system, as shown in figure 7 (see page 21). By 2010, the expressway system is expected to be 65,000 km (40,389 mi)



SOURCE: A.P. Moller-Maersk

Figure 5. *Average annual total investment in Chinese transportation infrastructure (US$).*



SOURCE: APL, Inc.

Figure 6. *Growth and expected growth in Chinese transportation infrastructure.*

long; by 2025, the total expressway network is expected to be 85,000 km (52,800 mi). This expressway network is designed to have seven major expressways radiating out of Beijing, nine north-south expressways, and 18 east-west expressways (the so-called 7-9-18 plan). This network is intended to link most cities with a population of more than 500,000. In addition, expressway extensions into the western provinces are aimed at increasing economic opportunity in this part of the country.

To a large extent, this expressway network is modeled after the U.S. Interstate network, with similar geometric designs and operational characteristics. Also similar to U.S. expressways, the urban portions of this network are severely congested during peak periods.

Table 3. *Characteristics of China's road network, 2005–2006.*

Characteristic	2005	2006	% change
Total road mileage (miles)	2,078,603	2,148,080	3.3
Expressway (miles)	25,479	28,172	10.6
Freight tonnage by highway (100 million tons)	134.2	146.6	9.3
Freight ton-miles (100 million ton-miles)	5,401	6,061	12.2
TEUs carried by truck	24,649.224	35,178,263	42.7

SOURCE: Ministry of Communications, Transport Statistics Yearbook, 2006

Transportation officials and U.S. shippers pointed to overweight trucks as one of the most important challenges facing Chinese transportation agencies. Given that the trucking industry consists primarily of numerous one- to three-truck firms, many markets are highly competitive. In addition, Chinese manufacturers have the right to choose the carrier for the first move from the plant, which provides a strong incentive to load a truck as much as possible to maximize revenue. The national, provincial, and municipal governments have established enforcement programs, but the sense among transportation officials is that a large number of oversized and overweight trucks are still on the road.

Rail

Chinese officials realize that the rail network needs to be improved if it is to play an important role in international trade. Figure 8 shows the major rail lines in China. Similar to the national expressway network, China plans to add to this network to create an 84,973-km (52,800-mi) main rail network by 2010 and a 100,000-km (62,137-mi) network by 2025. The current 5-year plan targeted the following rail investments:

- Build an express passenger transport network with four north-south and four east-west lines, plus three intercity express routes.
- Enhance rail access to ports.
- Target rail investments in the western region.
- Optimize rail network by electrifying and building dual track.
- Construct 18 intermodal container rail terminals and develop a double-stack container transportation route.
- Construct five major hubs.

Container movements by rail face several challenges. Container movement on the rail network carries about 2.2 percent of the national rail freight tonnage and 1.5 percent of the total container volume moved in the country. Three types of rail intermodal services are available: scheduled, unscheduled, and block trains. Scheduled and unscheduled trains have the least priority on the rail network, with military, passenger, coal, and foodstuffs coming first (the rail network is shared by freight and passenger rail services). Freight movements

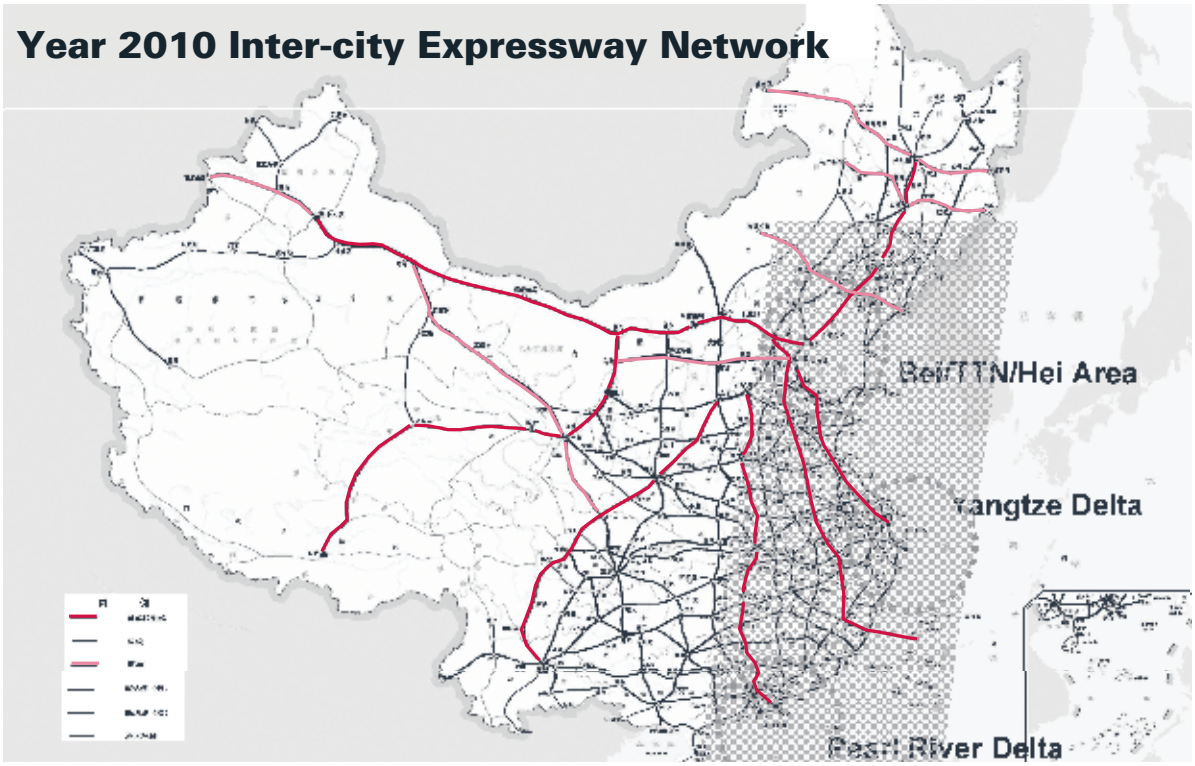


Figure 7. *China's major highway network.*

Figure 8. *China's rail network.*

by rail are often unreliable and, in many markets, face stiff competition from trucking firms. Few ports have dockside rail access, so some form of intermodal transfer must occur before containers reach the port that enables them to be loaded onto a ship.

China plans to invest in the freight rail network with expectations that more freight (especially containers) will be hauled by rail. A 10 million 20-foot equivalent unit (TEU) target via rail has been established as part of the 5-year planning process. Given that the level is now 3 million TEUs, this is an ambitious goal. Eighteen new intermodal yards are part of the strategy to attract more container traffic to rail. Several of these yards are open and others are under construction. New freight-only track is being constructed in major origin-destination corridors and investments are being made in rolling stock. However, unlike many of the major road projects, private investors have not actively

sought investment opportunities in the rail network. Government solicitations to participate in some of the intermodal rail yard projects, for example, did not attract much attention from the investment community.

Navigable Waterways

Throughout China's history, rivers and coastal shipping routes have been major thoroughfares for commerce. The Pearl and Yangtze Rivers, in particular, have served as the commercial arteries for much of China's economic development. As noted earlier, the Pearl River Delta was the first region to experience large-scale foreign investment, becoming a major manufacturing and transportation hub of China's international trade.

Table 4 shows statistics on the importance of China's navigable water network. These statistics are national and thus hide the more local nature of barge transportation. For example, about 30 percent of the transshipments that occur in Shanghai involve barges. In the Pearl River Delta, the percentage is slightly higher. The exact percentage in the Pearl River Delta is hard to estimate because many transshipments occur in midstream from one barge to another to avoid terminal fees. Also, some terminals have limited barge access because of capacity constraints, so barges must have a minimum of six containers to berth pier-side.

Those interviewed for the scanning study had different opinions about the Pearl and Yangtze River barge operations. The sense was that too much barge capacity exists in the Yangtze River market and, given the numerous small operators (similar to the trucking industry), it is a highly competitive market. In some cases, the freight forwarder is also the barge operator, which results in a mixing of interests on expediting the movement of the container. Few berths are available for barges along the river and at the mainland port itself (this is not true for the new port built off the coast). In addition, the recent opening of a new port in Shanghai (Yangshan) many miles from the old port and located in deep water raises questions about the seaworthiness of the existing barge fleet to serve the new port.

For the Pearl River, the sense was that barge capacity is sufficient to handle market demand, although competition is still quite high, in this case among larger barge companies. New river ports have been constructed in the Pearl River to cater to barge traffic, thus providing more convenient intermodal transfer (although a large percentage of the transshipments occur midstream).

Table 5 indicates why inland water transportation is so important for the supply chain in China. This table shows estimated costs and transit time to move a 20-foot container from Chongqing to Shanghai, a distance of 2,092 to 2,575 km (1,300 to 1,600 mi), depending on the modal network (see map in figure 8 for the location of Chongqing). Although

Table 4. *Characteristics of China's navigable water network.*

Characteristic	2005	2006	% change
Total navigable mileage (miles)	—	76,639	—
Inland river berths	—	30,942	—
Coastal port berths	4,298	4,511	5.0
Number of barges	41,000	37,000	-9.8
Fleet net dead weight (million tons)	11.0	12.0	9.0
Tonnage by waterway (billion tons) • River • Coastal • Oceangoing	2.2 1.05 0.65 0.49	2.5 1.2 0.8 0.5	13.2 9.8 19.5 12.1
Ton-miles (100 million ton-miles) • River • Coastal • Oceangoing	30,865 1,632 5,279 23,954	34,477 1,880 6,141 26,456	11.7 15.2 16.3 10.4
TEUs carried by water	19,400,000	23,300,000	20.21
SOURCE: Ministry of Communications, Transport Statistics Yearbook, 2006			

Table 5. *Comparative costs and time to transport a TEU to Shanghai from Chongqing.*

Chongqing to Shanghai	Distance (Miles)	Transit Time (Days)	Cost (US$, 20-ft container)
Road	1,300	3–4 (40 hours)	$1,500
Rail	1,600	7–10	$ 540
Barge	1,500	8 (11 upriver)	$ 315
SOURCE: APL, Inc.			

barge transport takes a longer transit time than truck, it costs almost 80 percent less. For commodities that are not time sensitive, barge transportation is clearly the preferred mode on the basis of cost.

Ports

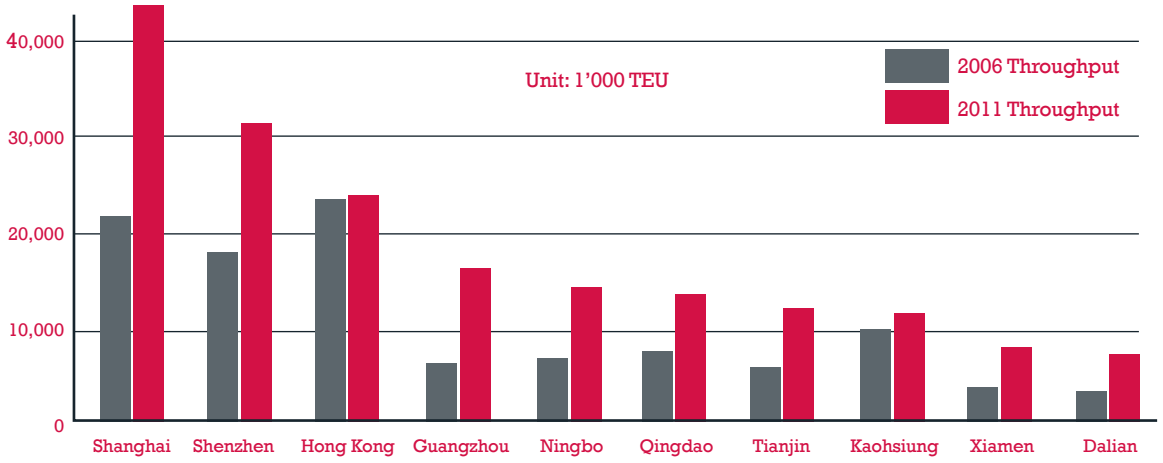
The economic growth that China has experienced over the past two decades has been driven primarily by international trade. This trade could not have occurred without port capacity to handle the ever-increasing flow of containers coming from mainland factories. Figure 9 shows TEU movement for selected Chinese ports in 2006 and that expected in 2011. Growth in these ports has averaged greater than 20 percent per annum over the past 5 years, so the forecasted volumes do not appear unreasonable. Figure 10 (see next page) shows a comparison between TEU throughput in Chinese and U.S. ports. Figure 11 (see next page) shows the expected growth in China container movements as a share of the global market, from a 31 percent share in 2006 to an expected 34 percent share by 2011. Ten of the top 30 container ports are located in China, as are three of the top four (Hong Kong, Shenzhen, and Shanghai). By 2010, eight of the top 15 container ports will be in China, with Shanghai expected to be the largest container port in the world.

The ports in Shanghai, in particular, play a significant role both in the Chinese economy and the global market. Tonnage through the ports in Shanghai will exceed 350 million in 2007, making it the largest port in the world from the perspective of tonnage moved. Shanghai has already overtaken Hong Kong as the largest container port in China (an expected 27 million TEUs in 2007), and expected future growth will only solidify this position.

The new Shanghai Port of Yangshan is an example of the type of investment the Chinese are making in port infrastructure (see figures 12 and 13 on page 25). The first two phases of the US$14.5 billion Yangshan deep-sea port are now open, with a 2020 target year for achieving the full capacity of the port (33 to 50 deep-sea berths) at 25 million TEUs per year. The port is located about 32 km (20 miles) offshore and is connected to the mainland by a highway bridge (there is no direct rail connection to the port, although there is a new intermodal rail yard on the mainland near the bridge gateway).

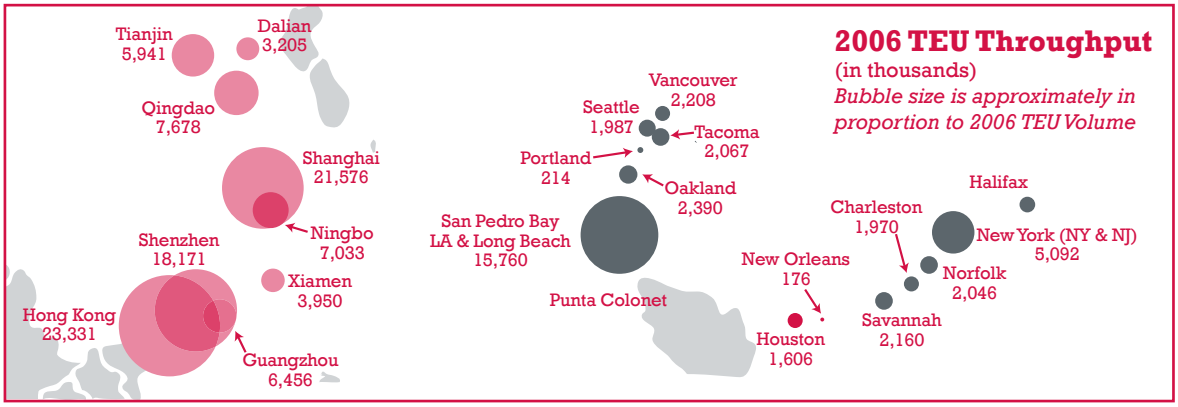
One of the most impressive aspects of the Yangshan Port, and indeed other Chinese ports, is its operational productivity. The terminal can handle 35 TEU operations per hour per crane, with a daily throughput record of 23,044 TEUs. The terminal is open 7 days a week, 365 days a year. The terminal operator commits to loading and unloading a barge within 5 hours and a vessel within 20 hours, and it has a posted truck turn time of a maximum 30 minutes. Some ports can use seven cranes per vessel in the loading and unloading process, greatly speeding up the vessel turnaround time.

The Yangshan Port has not only created a modern facility to export goods to the world, but it has also spurred local growth. For example, the mainland



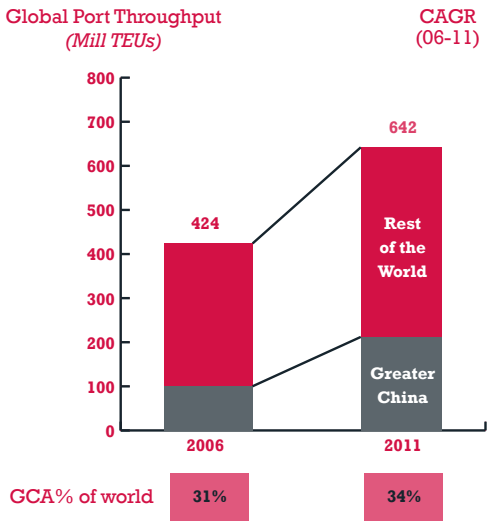
SOURCE: A.P. Moller-Maersk

Figure 9. *TEU throughput in selected Chinese ports, 2006 and 2011.*



SOURCE: A.P. Moller-Maersk

Figure 10. *TEU throughput in Chinese and U.S. ports, 2006.*



SOURCE: A.P. Moller-Maersk

Figure 11. *Expected Chinese share of global container market.*

entry to the port bridge has become a highly desirable location for logistics and warehousing centers. A new town has been created to house port employees, and what was once agricultural land is turning into manufacturing, freight consolidation, and warehousing sites.

Meetings With Shipping, Retail, Logistics, and Warehousing Firms

The scan team met with many representatives of U.S. retailers and shipping, warehousing, and consolidation firms. Many of these discussions focused on their perceptions of the performance of the U.S. transportation system as much as on the Chinese transport system. The major point the private sector participants in these meetings made is that they have every expectation that the Chinese government, along with private investors, will provide a transportation system that will meet the needs of the supply chain in China. Their concern is more with the ability of the United States and European Union to provide reliable transportation serving their own ports. Much of the discussion centered on the poor productivity of U.S. port operations compared to Chinese ports.

Several companies provided the scan team with estimates of future trade trends. Firms such as ProLogis, Moller-Maersk, and American Presidents Line made several observations that they believe characterize the current and expected market situation in China. The following is a compilation of their observations:

- World trade is expected to grow 6 to 12 percent a year over the next 5 years, and 80 percent of this trade will be carried by ships.
- Asian growth (especially in China) is key. More than 51 percent of worldwide container traffic passes through Asia. In 2001, international trade represented 79 percent of East Asian GDP, up from 50 percent in 1991.
- Although China still faces serious challenges ahead, its strong growth momentum will be maintained in the next 5 years.
- Key challenges facing China include deteriorating environmental conditions, undersupply of natural resources, asset inflation, an aging population, a social welfare system under pressure, employment demands because of

accelerated urbanization, uneven income distribution, and protectionism in international trade.

- Coastal infrastructure is first class, but inland infrastructure is inadequate. The sources of China's economic growth are concentrated in coastal China, but growth in coastal China is slowing as costs rise. Linking coastal China to untapped inland markets is a key to the future.
- Rail use in mainland China's hinterland still remains the key bottleneck for the future. Rail rates over long distances are still challenged by truck, which enjoys fuel price protection on diesel (to a degree). There is little enforcement of over-the-road weight limit, allowing one truck to carry what would normally require two to three. This makes some long-haul truck routes competitive with rail, especially because of speed.
- Mainland China is dominated by mom-and-pop truck operators. The average trucking company has one to two trucks.
- Current ship orders (3.15 million TEUs) represent more than 45 percent of worldwide capacity. Thirty-five ships are in service with a capacity in excess of 7,500 TEUs, with orders for 126 additional ships of this size or larger.
- In North America, there is a clear trend by shippers to diversify inbound shipments to multiple ports. The goal is to minimize the risk of disruption in the supply chain in the event a single port is impacted by labor unrest, terrorism, etc.
- North American and European transportation systems are a concern because of insufficient investment in infrastructure, limited terminal capacity, road congestion, and the inability of government to provide timely investments. Harbor depths, port terminal size and equipment, capacity of regional highway and intermodal rail infrastructure, land availability, and labor and environmental constraints will limit or enhance port growth in North America and Europe.
- Few U.S. ports will be able to accommodate post-Panamax ships, trade routes will become more concentrated between major ports, inland ports will grow in number, and interest in intermodal

Figure 12. *Many container transshipments in the Pearl River basin take place in midstream, primarily to avoid fees for land terminal use.*

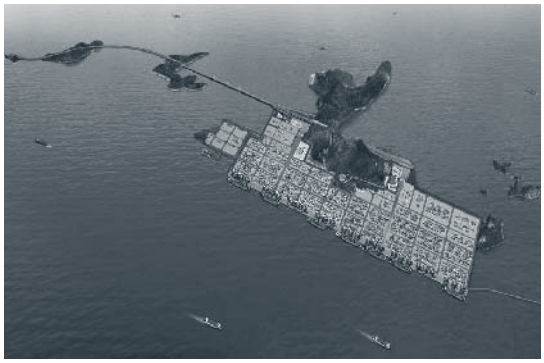


Figure 13. *The new Yangshan deep-sea port in Shanghai.*

Figure 14. *The new bridge connecting the Port of Yangshan to the mainland.*

Port of Qingdao

The city and Port of Qingdao, located in the province of Shandung on the Yellow River, has been one of the fastest growing economic centers in China. GDP growth in the province has averaged just over 16 percent a year for the past 3 years, with growth in foreign direct investment averaging just over 13 percent a year. The Port of Qingdao has been one of the fastest growing ports in China. Port officials expected about 9 million TEUs to move through the port in 2007. The United States has the highest number of container exports (19 percent), but Japan (18 percent) and South Korea (14 percent) are just behind. The European Union represents 17 percent of port exports.

Figure 15. *The Port of Qingdao is one of the most efficient ports in China.*

The port used to be located in center city, some 80 km (50 mi) away. However, because of community concerns about port expansion so close to neighborhoods, government officials decided that a new port should be constructed some distance away. A toll road was built to connect to the new port. Qingdao is one of six cities in China that has been given planning authority by the central government, so it has been able to develop an economic development strategy that emphasizes the competitive advantages of the surrounding region.

The port itself is one of most modern in China. It has on-dock rail facilities (one of the few in China that does), as well as barge transshipment terminals. The major terminal in the port, the QQCT terminal, is a joint venture of four shareholders—a government corporation (31 percent share), Dubai Ports (29 percent), Maersk (20 percent), and Cosco Pacific (20 percent). Just over US$880 million has been invested in the terminal to date. Terminal operations include the monitoring of key performance measures, such as gross crane rate (36.6 moves per hour), gross vessel rate (69 hours), net crane rate (40.8 moves per hour), and truck turnaround time (34 minutes).

rail links will increase in Europe and North America. Gateway ports with good intermodal rail links to inland ports (Seattle, Houston, Rotterdam, Hamburg) may experience less warehouse demand as many containers are transported directly inland.

- The number of transshipment hubs will grow. Twenty-eight percent of the worldwide volume of containers (85 million TEUs) are transshipped. In China, new direct shipment ports are emerging in areas that traditionally used transshipment hubs. As a result, the ports at Los Angeles-Long Beach and New York-New Jersey will likely lose market share to several emerging North American ports, yet the sheer volume of containers handled at the major North American ports will remain dominant.
- Larger, multimarket, global terminal operators continue to grow (Hutchinson, Eurogate, PSA Corp., HHLA, CSX World Terminals, International Container Terminal Services, Inc.). Major shipping lines (A.P. Moeller-Maersk, Evergreen, APL, COSCO, NYK, Mediterranean Shipping Co., P&O) continue to integrate vertically, offering more value-added services (consolidation and deconsolidation, rail shuttles, logistics, third-party logistics services (3PLs), etc.). Increasingly, 3PLs and ship lines will be customers for port-related properties.
- The need for deconsolidation warehouse facilities will increase in North America and Europe, especially at the emerging direct shipment ports. Logistics providers (shipping lines and 3PLs) are increasingly seeking deconsolidation warehouse facilities where inbound product can be unloaded, mixed, and repacked for direct distribution. Proximity to port terminals is essential and foreign trade zone designation is increasingly meaningful.
- In China, facilities for import- and export-oriented activities will increase: export consolidated forwarding services for consolidation (nonbonded), international logistics (bonded),

and inbound consolidated forwarding services for deconsolidation (bonded). The provision of such facilities should not be difficult, given the access to world finance markets that Chinese development projects enjoy.

Many other private company participants echoed the observations made by these three companies. Economic growth is expected to continue at high rates. The Chinese government is investing heavily in transportation infrastructure and is slowly opening the transport sector to foreign investment. There are areas of concern for the Chinese transportation system (e.g., the freight rail network), but generally most believed that transportation to and from the ports will not be a big issue in the future, although lowering the cost of logistics will be a major focus of both public and private organizations.

ProLogis Metrics for Evaluating Port Markets for Future China Investment

The most important criterion for investment is that a port is in the government's plan for expansion and improvement. Once this prerequisite is satisfied, the following criteria are important:

- Proximity to large local population base
- Physical port capacity for growth in TEUs handled
- Good road infrastructure
- Inland ports—intermodal rail-river connections
- For export markets, proximity to diverse manufacturing centers (e.g., Shanghai)
- Availability and cost of labor
- Frequency and availability of dedicated ocean carrier service

Development of Distribution Centers: Case of ProLogis

ProLogis is the world's largest owner, manager, and developer of distribution facilities, with 44.9 million square meters (483 million square feet) of industrial space in 105 markets across North America, Asia, and Europe. The company leases its industrial facilities to 4,700 customers, including manufacturers, retailers, transportation companies, third-party logistics providers, and other enterprises with large-scale distribution needs. Since going public in 1994, ProLogis has experienced extraordinary growth. It has gone from $400 million in assets under management in just nine U.S. States to a global portfolio of properties valued at more than $34 billion. ProLogis continues to follow its customers into new markets and to extend its position as the global leader in industrial real estate.

Figure 16. *The new Lingang industrial park has the road and sewer infrastructure built, waiting for development to occur.*

ProLogis identified China as a major market several years ago and now has facilities in 19 markets in the country. ProLogis has also been a major player in developing the Lingang industrial park near the new Yangshan Port. The Lingang industrial area is expected to be about 300 square km (116 square mi) in area (half the size of Singapore), with land uses targeted for manufacturing, heavy industry, high tech, logistics, and residential and commercial activities. The 2020 population is expected to reach 800,000.

The ProLogis facility in Lingang, a joint venture with a state-owned agency, has an area of about 2.8 square km (1.1 square mi) and currently has 15 acres of warehousing floorspace and just over 52 acres for a container yard. At build out, this facility is expected to have about 1.4 million square meters (15 million square feet) of usable space.

Investment in the ProLogis facility was based on expectations that the new Yangshan Port will generate large demands for both bonded and nonbonded warehousing and container-handling facilities. The local government invested in the local road infrastructure with the expectation that development would occur at some future point.

CHAPTER 4

General Observations and Lessons for the United States

The major observations from this scan are organized in four categories—China's economic growth and driving forces; transportation infrastructure development; governmental structure, decisionmaking, and analysis; and global shipper and carrier perceptions.

China's Economic Growth and Driving Forces

The following are observations on factors and driving forces that have contributed to China's impressive economic growth:

1. The economic growth of China over the past 10 years has been dramatic. Both **government officials and private sector representatives the team met with during the scan expected this growth to continue in the foreseeable future at or near its current rate.** The estimate for 2007 was that China's GDP would increase by about 10 percent. This follows a trend line that shows annual GDP growth of 10.4 percent per year for the past 10 years. The growth in the economy was mirrored by the office expansion of the global companies the team met with during the scan, such as the rapid expansion of subsidiary offices of APL, Maersk, and ProLogis throughout China.

2. Much of the economic growth has been fueled by private investment. **As different sectors of the economy have been opened to foreign investment, joint ventures and other financial partnerships have provided the institutional framework for the expansion of the economy.** This is especially true in the transport and logistics sectors, where foreign investments have occurred.

3. **The economic expansion of China started in the south (Pearl River Delta), moved north based on national economic policy, and is now pushing west based on government policy.** Ninety percent of China's exports are manufactured in the coastal provinces, which is causing large demographic shifts that are straining China's resources and social fabric. The "Go West" campaign, an attempt to mitigate these strains, was a continuing theme of the team's discussions with both government officials and private sector representatives during the scan. ("West" refers to the next set of provinces west of the coastal provinces). This national campaign has significant implications to supply chain logistics costs and to the efficiency of the Chinese transportation system in moving exports to the coastal ports. With logistics costs already high in China (about 20 percent of GDP), the movement of manufacturing westward will require efficient intermodal services leading to the coastal ports, 643 to 804 km (400 to 500 mi) away.

4. Although China has had large urban populations for centuries, urbanization has reached unprecedented levels over the past 10 years. Much of China's economic expansion has occurred in urban areas, where the large population provides a substantial labor force. However, many laborers move from one urban area to another looking for jobs, so large portions of the urban labor force are transient. **The consequence of such large urban concentrations is that the central government must pay particular attention to these populations and provide resources to make sure their basic needs are met.** The term "social harmony" was an often-heard theme to describe the intent of governmental programs. **From a transportation perspective, the consequence of this policy focus is that passenger transportation often receives priority over freight movement (although in port cities freight movement often receives close attention from transportation officials).**

5. Environmental degradation and energy consumption are consequences of China's

rapid economic growth and the equally rapid increase in its urban populations. Air quality in particular has received increased government attention. **Although it appears that economic development is still the primary goal of governmental policy, additional goals and performance measures relating to environmental quality and energy consumption have been added to the national agenda.**

Transportation Infrastructure Development and Operations

The following are observations on the characteristics of China's transportation infrastructure and how it has been provided:

1. **Recognizing the vital role that transportation plays in its goal of continued economic growth, China is investing heavily in transport infrastructure, over 9 percent of the country's GDP. This investment comes from both public and private (joint venture) sources.** The current 5-year plan has allocated billions of dollars for a national expressway system, new freight rail lines, port improvements, and 18 new rail intermodal yards. Much of the national investment in transportation is intended to attract private investment to specific facilities, such as toll roads.

2. **Substantial levels of private capital are being invested, in some cases with low expectations of rapid return on investment,** but investors anticipate long-term benefits from investing in China. This investment has occurred primarily over the past several years in highways, port facilities, and logistics parks. Private investment has been sought in rail infrastructure and intermodal terminals with limited success.

3. **China is leveraging its natural geography to facilitate movement of goods. River and coastal shipping continues to be a significant component of China's intermodal transportation system.** The Pearl and Yangtze Rivers traditionally have been China's highways to the world. To a large extent, this is true today. China relies on barges and coastal shipping to access its major ports served by rivers. For example, about 40 percent of the containers shipped to Shanghai's new Yangshan Port arrive by barge. New barge-only ports upstream of the Pearl River Delta provide a similar percentage of barge traffic to several container ports in the delta. The central government is also adopting barge design and energy standards along with subsidies for their adoption to improve consistency and efficiency in barge operations. For the development of the ports along the Bohai Bay, rail and truck access is used to bring cargo to the port facilities.

4. **The central government's "Go West" policy has shifted investment attention to inland transportation and the challenges facing such transportation, especially the connections to the major international ports.** In cases where barge transportation can be used cost-effectively, such as on the Pearl and Yangtze Rivers, inland economic development relies on barge transportation to move a large percentage of the intermodal freight. However, where barge transportation is not feasible or economical, government investment in highway and rail networks provides alternative means of accessing the coast. Both the trucking and barge industries, however, are highly fragmented and consist of many small owner-operators, offering few of the economies of scale that occur with larger companies. Although the market for moving containers is competitive, the limited capacity of individual barge and trucking firms forces shippers to deal with many different operators, increasing the transaction costs associated with moving substantial levels of intermodal freight to the coast.

5. **China's intermodal rail service faces significant challenges.** The movement of containers receives low priority on China's rail network, following military, passenger, energy (i.e., coal), and food movements. Accordingly, intermodal rail movement tends to be unreliable, often with no scheduled departures. It is estimated that rail handles about 2 percent of the intermodal moves in the country. However, the government is investing heavily in improving this service. Eighteen intermodal yards are in various stages of development, although those that are open are lightly used because of network reliability problems. About 12,000 km (7,456 mi) of freight-only track are being built to separate passenger and freight movements. A goal of 10 million TEUs carried by rail (now less than 3 million) has been established for the current 5-year plan period. However, even with a threefold increase

in TEUs handled (which will be a challenge), the market share for rail intermodal movements will still be only 3 percent.

6. **The Chinese central government has encouraged joint ventures to finance the national expressway system, stretching government funds to support a variety of new modal investments.** Historically, tolls on these expressways have not been used to influence travel behavior, but to raise revenue. **However, consideration is now being given in some locales to using tolls to influence truck movement.** In Shanghai, for example, a distance-based toll system on a ring road was converted to a considerably less expensive flat toll rate to encourage trucks accessing the port to use the ring road and reduce congestion on other inner-city expressways. This is exactly what happened, but this mechanism is not always possible. The three tunnels between Kowloon and Hong Kong are tolled. The ability to change toll rates is limited, so the older tunnel, priced lower than the other two, has considerably more traffic and is routinely congested. Governmental authorities face heavy resistance to toll increases for social reasons, so the other two toll tunnels, even though they provide what could be viewed as premium service for a higher price, are underused.

   Chinese toll rates are comparable to those in the United States and Europe, but the Chinese believe this does not reflect the economic reality of travelers in China, where the per capita GDP is much lower. Accordingly, the Chinese are trying in some cases to renegotiate concession agreements to allow lower toll rates, but offset lower toll revenues with longer concession time periods (from 30 to 50 years).

   There was some limited indication that, as in the United States, the tolling of highways can run into public opposition. In Hong Kong, for example, truckers and the public opposed tolls on a new highway, so the government had to use its own funds rather than private investment to build the road. The official in charge noted that this represented a perspective of a road as a social asset rather than an economic one.

7. **The national expressway plan is centered primarily on three major economic and political centers: Beijing, Shanghai, and the Pearl River Delta.** In essence, the national expressway system will be the major means of connection between the political and economic centers of the country, reinforcing their importance in the economic future of China. The scan team noted that all of the new intermodal rail terminals are next to a national expressway, as are ports and major airports. **Intermodal connection has been an important consideration in network design.**

8. **Trucking is the predominant means of moving containers to and from the ports, especially in the river delta manufacturing regions.** The trucking industry consists mainly of small businesses (one to three trucks), which makes its contribution to China's economic growth even more impressive. No standard vehicle configuration exists, and little integration of technology in trucking operations is apparent. Truck movements respond to changes in cost structure, as the Shanghai example above shows. The trucking industry is maturing, with a variety of strategies being used or considered to improve industry productivity. Different strategies are being considered for different purposes. American trucking companies are entering into partnerships with Chinese companies to provide financial capital and expertise.

   The makeup of the Chinese trucking industry also means that containers do not move considerably beyond the port facilities. Goods are brought into consolidation-deconsolidation facilities, where they are placed in containers for export or devanned for further movement inland. It will be interesting to see how these operations change as China's trucking industry matures and commercial motor vehicles more closely resemble those in the United States or European Union, as well as when China's intermodal rail network is complete and containers can be loaded directly onto double-stack rail for movement west.

9. **Given the relatively large number of trucking businesses in China and the intense competition for freight movements, the team was not surprised to find that oversized and overweight**

trucks have become an important concern to transportation officials. Chinese officials are developing a national strategy for enforcing size and weight regulations, especially on the country's new expressway system, and are considering fixed truck weigh stations. They apparently are not seriously considering weigh-in-motion technologies. A national campaign to enforce load limits has been in place for about a year.

10. **Chinese port productivity is the best in the world.** Chinese ports operate 24 hours a day, 7 days a week, 365 days per year. Operational strategies are impressive—cranes that lift four TEUs, 20- to 30-minute truck turns, nine cranes working one ship, etc. New ports are being developed and the capacity of existing ports is being expanded rapidly. Although the scan team did not examine any safety data, terminal operators noted that the safety record for Chinese terminals was as good as, if not better than, terminals elsewhere in the world.

11. **Given the significant level of trade to the United States and current U.S. legislation, security compliance was a growing concern for port terminal operators.** The relatively new infrastructure at China's ports allows terminal operators to build security measures into terminal operations, especially using technologies screening outbound containers. One terminal in Hong Kong has undertaken a 3-year demonstration to show how X-ray and other scanning technologies can be used to screen all containers entering the terminal with minimal disruption to terminal efficiency.

12. **China has not progressed to the point of systematically managing its infrastructure; it is still in the "build" mode.** Nevertheless, at a few of the more mature areas experiencing significant congestion transportation officials indicated a need to begin paying serious attention to system management.

13. **Intermodal connectivity and landside access to Chinese ports are not approached differently or in a more sophisticated way than in the United States or European Union.** With the exception of a truck-only access road that was retrofitted from the national network to the Port of Yantian, there was little evidence of the Chinese building into their large container port facilities a dedicated capacity to maintain free flow of cargo. The general consensus is that the congestion would be dealt with when it arrived.

14. **Rail access to maritime port facilities is not being consistently built into new port design.** With the exception of the Port of Qingdao, which has no river access and which is being looked at as the entry port for land bridge cargo from the rest of Asia to the European Union and Russia, no other port facility was being built with on-dock rail. This appears to reflect the lack of reliability that stems from the low priority intermodal cargo has on the rail network (fourth behind passengers, energy, and agricultural products) and that the majority of the goods made for export are manufactured in the coastal provinces, making the distance from manufacturing facility to export port less than 500 km (310 mi). How this will play out with the building of the 18 intermodal rail terminals and the "Go West" policy will be interesting to watch.

Governmental Structure, Decisionmaking, and Analysis

The following are observations on the institutional structure and process of making transportation investment decisions in China:

1. **China's policymaking and implementation process identifies national goals, some of which have performance metrics. However, local officials have leeway in implementing projects so that they also meet local objectives.** A national 5-year plan provides policy direction on what will be emphasized during the plan's timeframe (China is now in its 11th 5-year plan).

2. The transportation agencies in the national government have different responsibilities focusing on different modes (e.g., Ministry of Communications, Ministry of Railways, Ministry of Construction). **Because governmental officials' performance is measured by results, they pay attention to measures of progress. National data are collected and analyzed on overall modal performance and the state of the economy.** Some challenges the national transportation agencies face are responsible for the sometimes conflicting roles of planning, operating, and regulating a modal system. Some viewed this as a hindrance to achieving progress on

performance goals. This was the specific reason the CRCT was separated from the Ministry of Railroads and given the sole responsibility of operating the rail network.

3. **Data analysis is used to determine the extent to which goals are being met at different levels of government.** Some referred to this as "results-oriented planning." The port terminals are all private operations and the terminal operators routinely use metrics.

4. **The performance of local officials and local governments is measured against national goals.** Many noted, for example, that the most important metric for local officials is the degree to which economic growth occurs during their tenure, defined primarily as job growth for residents. China's tax policy also supports this goal, because the tax revenue from the economic activity in a province stays, for the most part, in the province. Local officials clearly understand the linkage between expanding transportation infrastructure and their ability to create new economic development. While economic development is still the primary metric and motivator, growing environmental concerns appear to be increasing attention on measuring governmental performance on environmental quality (for example, the number of days cities experience a certain level of air pollution).

5. Although the scan team did not conduct a systematic assessment of the capability of municipal government agencies to plan and provide for transportation infrastructure and services, every meeting with local officials included the staff members responsible for each mode. In other words, **all of the modes were located in one agency, which encouraged the adoption of a multimodal systems perspective when looking at regional transportation investment.** For example, in Shenzhen the relationship among sea cargo, barge transportation, highway travel, and air cargo was discussed with an understanding of how each affected the other. The same was true in the other municipalities visited.

6. **In most cases, there was little evidence that Chinese officials sought advice from carriers or shippers on national strategic transportation plans or investments. However, at the provincial and regional levels the inclusion of the private sector in tactical investment decisions was evident in the number of public-private partnerships.** Although not reflective of the common practice on the mainland, in Hong Kong, an advisory committee to the government consisting of carriers and shippers routinely provides advice on overall transportation policy. Also, the national government is seeking advice from the private sector as the 18 intermodal rail hubs are being developed.

7. **Port development plans considered modal access strategies as part of the planning process, but it did not always result in multimodal port access.** The officials responsible for ports, and especially newer ports, were very aware of and concerned about port access. Planning for ports included attention to highway and barge access and, in the case of Shenzhen, rail. This represented a much broader, multimodal perspective on planning than is usually found in the United States. Rail access to the ports is limited, primarily because of a perception that the rest of the intermodal rail network suffers from unreliable and slow service.

8. **Project development occurs much faster in China than in the United States.** Transportation projects are viewed as a priority for economic development, so they move forward rapidly. Chinese officials noted that project alignments and other project characteristics were sometimes modified by environmental considerations, but they could not identify any project that was stopped for environmental reasons. Given the rapid growth in China's economy and the need for expeditious provision of supporting infrastructure, it is not surprising that environmental considerations are not viewed as a controlling factor in project development (similar to the early years of the U.S. Interstate Highway System). However, it appears that environmental considerations are becoming more important to local officials and that future project development efforts will be influenced even more by such factors.

9. **In keeping with the national policy of social harmony, government officials are concerned about the negative impact of transportation facility operations and expansion on local communities.** For example, there was evidence

that at least two new ports that replaced central city ports were built some distance from the city center to reduce traffic and development pressures on the surrounding communities and the complications of inner-city congestion. When community displacement does occur, efforts are made to mitigate the impacts (e.g., a new logistics park that displaced farmers trained them to earn a living in the logistics park).

10. **Hong Kong's role in the competitive market of the Pearl River Delta is evolving.** Having the largest container port terminals in south China positioned Hong Kong as a major port of departure for mainland exports. However, new ports in nearby Shenzhen and along the Pearl River (along with dredging in the river to allow access to these ports for bigger ships), as well as new manufacturing development on the west bank of the river, will likely cause a shift in container exports to other ports. Second, certain cost advantages associated with exports through Hong Kong could soon disappear because of infrastructure improvements on the mainland. Third, containers can enter Hong Kong only on trucks driven by Hong Kong drivers. This labor cost is much higher than comparable movements to the Shenzhen ports. Once the special tariffs expire, the cost structure for goods moving though Hong Kong's terminals will not be very advantageous. It remains to be seen how the market will adjust to these changing conditions, but it appears that Hong Kong's relative position in global container flows could evolve in a different direction in the future.

Shipper and Carrier Perceptions

The following are observations made by shippers and carriers in the China market:

1. **Many of the international ocean carriers and shippers the team met with during this scan view the serious constraint in international trade and supply chain efficiency as being on the receiving end, in Europe and the United States.** The prevalent perception is that terminal throughput in the United States and European Union is limited by terminal operational limitations, landside access capacity, and growing road congestion. There was a strong perception that the United States lacks the political will to invest in infrastructure and could not deliver needed investments in infrastructure in a timely manner even if desired. China is viewed as proactive on infrastructure provision by building for the future and clearly stating in its strategic plans what will be built and when. The United States, on the other hand, is perceived as reactive. The biggest complaint was the length of time it took to reach decisions on transportation projects. Industry representatives expressed an understanding of governmental laws, regulations, and structures, but were frustrated with not knowing a project's fate for a long period of time, so long in some cases that other investment or logistics decisions could not be made.

2. **Shippers and carriers believed that the effect of a widened Panama Canal and increased transits through the Suez Canal will likely be more shipments heading to east coast ports, but that west coast ports will still be the major destination for most containers.** The shifting of sea routes is in response to transportation costs and the reliability of ground access modes at the west coast ports. With increased capacity at the Panama Canal, some carriers believed it would become a more appealing route than rail or truck services across the continental United States. In addition, carriers mentioned that one constraint in all movements is that the new generation of container ships (10,000 to 12,000 TEUs) cannot physically dock at most U.S. ports. The larger ships are used primarily to serve Europe because of market factors and the capacity of many European ports to handle larger vessels.

3. Several shippers and carriers said bunching of vessel departures from Chinese ports (because of when merchandise arrives at the ports and when it is needed in the U.S. market) causes a significant peaking problem. They observed that a peaking in departures from China usually results in a peaking in arrivals at U.S. ports, especially Los Angeles-Long Beach. **Several shippers and carriers believed that this peaking phenomenon could be remedied by working with retailers, shippers, and manufacturers.**

Lessons for the United States

The lessons learned from this scan are organized in two major categories—consequences to the United States and its transportation system, and different approaches to planning and project development in support of a growing economy.

Consequences to the United States and the U.S. Transportation System

1. Under current economic projections in the United States and China, trade flows from China to the United States will continue to grow. China is building the infrastructure to handle them, but there are questions about whether the U.S. transportation system is ready. With a limited number of ports of entry, the U.S. transportation system necessarily concentrates these imports at a few strategic locations. **For the United States to remain competitive globally, investment in transportation infrastructure is needed, new system management technologies should be applied, and institutional change in how the country identifies, funds, operates, and makes targeted infrastructure improvements to key elements of the national transportation system should be considered.** These improvements help not only to expedite the movement of imported goods, but also to reduce the logistics cost of U.S. companies to compete in the global market.

2. **Trade from China increasingly will become an east coast issue.** With new service routes through the Suez and Panama Canals, States on the east coast will experience increasing demands on their transportation systems. Shippers and carriers noted that these routes will become even more important if land access to west coast ports deteriorates.

3. Given the navigable draft and terminal capacity of most U.S. ports, **the largest container ships will not provide service to the United States.** This means that U.S. ports will be served by vessels carrying less than or equal to 10,000 TEUs. With increasing cargo volumes, that means more vessel calls.

4. **Similar to what scan teams observed during the intermodal freight scans in Europe and Latin America, the team noted a dramatic difference in port efficiency between China and the United States.** Hours of operation, the time to turn trucks, crane productivity, and good land access make Chinese ports very efficient. If U.S. ports are unable to physically expand because of community concerns or terrain limitations, maximizing the use of existing capacity and improving port throughput are imperative to the United States' ability to handle increasing container flows.

5. **The United States can learn much from China on using natural geography to the maximum extent, particularly in the use of barge and coastal shipping as access modes to major ports.** In China, the Pearl and Yangtze River ports are being developed as transshipment ports, and new manufacturing capacity is being developed and located to take advantage of river transport. Although the United States has few locations where manufacturing concentration is along navigable rivers that connect to major ports, the Chinese experience in barge operations might be informative in those locations where such operations make sense. Even if U.S. river systems and the ports they serve do not provide logical conduits for containerized freight movement, they provide key assets for bulk commodity movement. They need to be well maintained to ensure that goods move efficiently and do not shift to an already-burdened rail and highway network.

6. **Freight bottlenecks are viewed as a drain on transportation system and economic productivity.** This is a perspective the United States should adopt as well. Solving these bottlenecks involves more than just expanding physical capacity. It also involves using technology and operational strategies. The Port of Yantian is a good example. Ten years after the port was built, it became apparent to local officials that congestion on the roads serving the port was affecting not only freight movement, but also local traffic. They built a truck-separated access route to the port to eliminate the bottleneck.

7. **Chinese officials recognize that freight-oriented transportation investments, especially near ports, are an important part of the nation's economic development. Accordingly, Chinese transportation agencies have implemented system management strategies aimed at improving port access.** Efforts to encourage more efficient movement of trucks have included setting differential tolls, prohibiting trucks in congested areas, enhancing enforcement of pedestrian and passenger vehicle flows on streets near ports, separating trucks from passenger highway lanes, and encouraging the use of barges as an alternative access mode (although rail does not appear to be a major consideration at this point).

8. **The United States is fortunate to have a much more developed rail network, which in many cases provides on-dock service to port terminals. This is a significant advantage to U.S. trade flows and one that needs to be nurtured.** The efficiency of the feeder services into and out of U.S. ports will be a key factor in the ability of the U.S. transportation system to support increased container demands from China. The U.S. rail network, although facing congestion issues of its own, still provides an indispensable capacity for moving containers once they reach U.S. ports. Improving the productivity of such services will be an important element of the U.S. strategy to remain competitive in the global market. The team noted that the new Chinese freight-only rail track being built to connect the 18 new intermodal hubs will have no at-grade crossings.

9. **Given China's experience with oversize and overweight vehicles and the infrastructure damage it is grappling with, the United States should ensure that its commercial motor vehicle size and weight program continues to advance and receive adequate resources.** This is a critical part of the road management system. As the scan team learned in China, when such a program is not in place, roads wear out much faster than expected. Thus, Federal and State efforts to monitor and enforce appropriate size and weight standards on the Nation's road network need to be continued and supported.

10. **One challenge facing west coast ports is the bunching of vessel departures from China that result in vessels arriving at about the same time in the United States.** This is primarily due to operations in which ships depart Chinese ports over the weekend in response to manufacturing, supply chain, and market requirements. If vessel bunching could be reduced, this could significantly benefit both U.S. and Chinese ports. Shippers and carriers in China expressed some optimism that this could in fact occur.

How the Chinese Invest In and Operate Their Transportation System to Support a Growing Economy

1. **China has a national transportation investment policy that is closely linked to its trade and economic policy.** It was clear in discussions with Chinese officials at all levels of government that they were aware of the national transportation policy and what it is intended to accomplish and supported it. **China competes as a nation.** National transportation investment appeared to focus on two major goals (besides military defense): strategies to foster social harmony among Chinese citizens and strategies to support economic growth, with the second goal supporting the first. Given where China is in its development cycle, there is little question that **transportation infrastructure is considered a critical component of the nation's economic future** and that creating a transportation infrastructure network is critical to and in some cases leading the economic development pattern. The United States would benefit from adopting national transportation investment policy that supports the nation's economic health and global competitiveness. Transportation, trade, and economic policies that coordinate transportation investment, especially freight-related investment, are vital.

2. The Chinese central planning function is not a model that would work in the United States. However, **it is worth considering a strategic investment plan for the national expressway network that is financially supported at the national level and executed locally (similar to the initial effort to build the U.S. Interstate Highway System) and that uses performance measures to monitor progress in developing and operating key system elements.** A centrally planned and financially supported national expressway network provides the platform for China to compete as a nation—a united whole that works for the benefit of the entire nation. The three-tiered planning effort the Chinese employ—which covers central, provincial, and local needs—appears to work well in addressing national, intraregional, and local transportation needs. For example, performance measures and standards for the Interstate Highway System might be established nationally, with the means of achieving desired performance left to the States.

3. Many assets that work in tandem with the Chinese transportation system (port terminal development, logistics parks, etc.) are funded through private investment. In some cases, it may take years for the investment to start producing net gains. However, companies made

it clear they are willing to invest in China because the Chinese can make decisions and show progress toward infrastructure improvement. A similar confidence in the U.S. approach to decisionmaking and project development was lacking. For instance, a number of private sector representatives pointed to the length of time it takes to complete the environmental process on U.S. projects. They noted that it often exceeds the time companies can place a planned project or investment on hold. While they did not indicate that the United States should stop mitigating environmental impacts, they did point out that a more streamlined process for environmental (or other public) decisions could allow the private sector to look more favorably on business and capital investments. Companies know that in China they will get a timely decision on a proposed investment, but they have little confidence in the U.S. process for assuring that progress will be made. **This suggests that if the United States is interested in fostering economic development and encouraging more private investment in transportation facilities, it needs to place greater emphasis on timely public sector decisionmaking. Agencies simply need to get to the decision point earlier.**

4. The joint venture is the primary instrument of privatization in China. **In almost all cases, private investors do not get a majority share of the investment (the exception being port terminals); government agencies or state-owned enterprises retain control.** In some instances, such as the development of 18 intermodal rail yards, private investors have turned down participation in a joint venture because the government stipulations were too stringent. The major lesson, however, is that the model of private funding in China is that government participates in a significant way by steering where the investments can be made.

5. **Chinese planning for intermodal centers and indeed for regional transportation networks adopts a systems perspective on performance and investment.** The regional highway network, ports, airports, intermodal facilities, and warehousing and distribution centers appear to be planned with an understanding of how they interconnect and affect one another. While multistate coalitions seek to coordinate multijurisdictional activity in the United States, more effort along these lines will be necessary to achieve systems-level coordination.

6. The team learned that Hong Kong's international airport has been the busiest airport in the world since 1996 for international air cargo—not because of air cargo planes, but because of the freight shipped as belly cargo in passenger aircraft. The air cargo market in Hong Kong has grown rapidly but is not viewed as a new market, given the long-established air cargo business in Hong Kong (with the United States as the single largest destination for air cargo originating in Hong Kong). **Air cargo is the fastest growing segment of freight movement. While it still is only a small percentage of total tonnage, the implication to the U.S. transportation system of this growth in both air cargo hubs and belly freight is new stress to the transportation network on already-stressed and overcrowded U.S. airports.**

7. National data collection in China provides a springboard for national transportation planning, investment, and performance evaluation. This is especially true for investment in freight facilities and services. This is an important lesson for the United States. **U.S. freight data systems should not only be continued, but expanded to provide the information needed for optimal transportation investment decisionmaking, especially given the important role that freight plays in the Nation's economic health.**

CHAPTER 5

Implementation Strategies and Recommendations

The scan team developed the following preliminary recommendations for activities that should follow from the scan:

1. The results of this scan are a wake-up call on the need for the United States to invest in transportation infrastructure with a more national perspective if it is to stay competitive in a global market. This first, and perhaps most important, recommendation is to revive a national focus for U.S. transportation officials. This effort would focus on the importance of the transportation-economic integration so evident in China. Key messages in this effort include the following:
   - Federal, State, and local governments cannot dismiss the potential lessons to be learned from the Chinese experience because of preconceived notions that China's form of governance has no application in the United States. Major differences in governance exist between the two countries, but that should not preclude U.S. consideration of successful concepts being deployed in China, such as unified national goals and performance measures. Similar concepts were once a vital part of U.S. initiatives such as the building of the Interstate Highway System.
   - Transportation policy with a national perspective needs to be integrated with other key national and State-level policies. This integration could relate to economic development, trade, community development, environmental quality, etc.
   - Transportation investment should be targeted to those elements of the national system that meet the established policy goals. Performance measures should be established and monitored to gauge the level of success achieved.
   - A national transportation policy has room for both public and private sector roles and responsibilities. China is ahead of the United States in the use of private investment in the transportation sector. In an era when resources are limited, private investment opportunities should be provided throughout the transportation system.

2. A study of the Yantian Port truck highway facility should be commissioned. This case study would be conducted by the Chinese Academy of Transportation Systems. It would focus on the metrics the Chinese used to quantify the congestion they experienced, how they used those metrics to vet potential solutions, and how they determined that a dedicated truck lane was the most appropriate solution. The study would also cover how, if at all, the Chinese have documented the effect of the new access road on the congestion they sought to resolve.

3. The Chinese governance structure uses established performance measures and national data collection extensively to manage transportation policy. The scan team believes this approach has useful constructs, but it is unclear what specific measures China uses. The concept of establishing performance goals or levels for national systems (such as the U.S. Interstate Highway System) has a potentially useful application in the United States. A study should be undertaken to understand how the Chinese government develops and uses performance measures to manage its national transportation policy. In the long term, it would be interesting to compare and contrast the available performance measures of both countries.

4. A major observation of the scan was the need for a better understanding of the scheduling and operation of ship movements to the U.S. west coast. Because of long-standing traditions and market considerations, most ships leave China during the weekend and arrive on the U.S. west coast at about the same time, placing peak demands on port operations. It became clear during the scan visit that opportunities exist to work with retailers, manufacturers, logistics providers, shippers, carriers, and terminal

operators to flatten out this peak arrival distribution. FHWA will conduct a preliminary analysis of vessel bunching to develop a better understanding of the nature of vessel arrival times in key U.S. ports. If the data show that a problem does exist, FHWA will convene a forum to address the streamlining of vessel bunching at U.S. ports.

5. This report is the third of three that have documented international scans on intermodal freight and connectivity in different parts of the world. The scan team recommends that a synthesis be undertaken of all three scan findings to determine what has been learned, the implications to the United States of these lessons, and the research and training opportunities that should be developed on these topics to educate the U.S. transportation community.

6. China appears to have a wealth of data on freight, ports, etc., that is of interest to the U.S. transportation community. It would be beneficial to both countries to compare national data collection strategies and to share information of mutual benefit. The U.S. Department of Transportation should pursue a data exchange program between FHWA and the U.S. Research and Innovative Technology Administration and the Chinese Ministry of Communications. A memorandum of understanding (MOU) has been signed, so the scan team's recommendation is to implement this MOU as soon as possible.

7. Chinese officials expressed an interest in learning how the U.S. truck information management system works. A comparison should be made between U.S and Chinese truck information management systems to see if there are areas of joint benefit and possible applications in the United States.

8. The Chinese are in the early stages of truck size and weight enforcement strategies. They are starting to recognize the damage that overweight vehicles cause on the road network. FHWA should make information available to relevant Chinese agencies on size and weight enforcement methodologies, including weigh-in-motion technologies, and identify possible further technology exchange opportunities.

9. The scan team has identified numerous conferences and meetings at which the results of this scan could be presented. Scan team members will pursue as many of these opportunities as possible. Other outreach efforts will target specific audiences, such as congressional committees, national commissions, Federal and State agencies, and professional organizations.

10. Much of what was reported from this scan reflects the poor level of understanding that elected officials and the general public have of China and its emerging role as a trade superpower. Educational and public outreach efforts should be undertaken to inform key constituencies. This would include incorporating the results of this scan (and the other two freight scans) into professional training courses, especially those focused on freight movement.

11. Given the rapid pace in economic growth and the corresponding expansion of the transportation system, consideration should be given to visiting China again in a few years to see what has happened in several key areas. Among the questions that it would be useful to explore are the following:
    - How might the further development of rail in China affect passenger and freight movement?
    - What lessons can the United States learn as it invests in its rail system?
    - What has been the impact of private investment on transportation facilities?
    - How have new security technologies been incorporated into port terminal operations?
    - What has been the impact of the "Go West" campaign on logistics costs?
    - To what extent are barges still an important mode of access to coastal ports?
    - How has the massive investment in port and inland transportation infrastructure affected the relative competitive advantage of different Chinese ports?
    - How has the trucking industry evolved in vehicle technology and industry structure?

APPENDIX A

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Biographic Sketches

David Cole (AASHTO cochair) is the commissioner for the Maine Department of Transportation. He is responsible for planning, building, and maintaining Maine's transportation system, including highways, bridges, mass transit, railroads, ferries, ports, airports, and bicycle and pedestrian trails. Before his appointment as commissioner, Cole served as president and chief executive officer of the Eastern Maine Development Corp., focusing on entrepreneurial development and advocacy at the local, State, and national levels, including reverse foreign investments. Cole also became a member of the Maine Port Authority in 1997. Cole serves on the Board of Directors of the American Association of State Highway and Transportation Officials (AASHTO) and is vice chair of the AASHTO Subcommittee on Intermodal Transportation and Economic Development. Cole graduated from the University of Maine and with a master's degree in public administration.

Tony Furst (FHWA cochair) is a senior executive with the Federal Highway Administration (FHWA) in Washington, DC. Furst is director of the Office of Freight Management and Operations, which develops freight policy for FHWA, provides data analysis and decision-support tools for transportation professionals evaluating freight projects, develops and promulgates professional capacity-building programs and training for freight professionals, provides truck size and weight program guidance and interpretation, and evaluates and promotes freight technology development for national and international deployment. Before joining FHWA, Furst held a range of positions in the U.S. Department of Transportation, including program coordinator with the Maritime Administration, regional coordinator for intermodal projects in the Northeastern States and California in the Secretary of Transportation's Office of Intermodalism, and branch chief of the Maritime Infrastructure Security Branch in the Maritime and Land Security Directorate of the Transportation Security Administration. Furst is a retired U.S. Coast Guard officer. He has a bachelor's degree in marine biology from Florida State University and a master's degree in business administration from the University of Washington.

Sharon Daboin was the deputy secretary for aviation, rail freight, ports, and waterways for the Pennsylvania Department of Transportation (PennDOT) when this scan took place. She oversaw the administration of financial assistance grants and technical assistance to more than 135 public-use aviation facilities and 67 regional and shortline railroad operators. Daboin was PennDOT's lead on intermodalism, participating in multimodal, multistate transportation studies and initiatives. Daboin represented PennDOT on the Aviation and Rail Freight Advisory Committees, cochaired the Delaware Valley Regional Planning Commissions' Goods Movement Task Force and the Pennsylvania Air Service Committee, and was a member of the AASHTO Standing Committees on Aviation and Rail Transportation (cochairing the task force for State programs), the I-95 Corridor Coalition, and the South Central Pennsylvania Regional Goods Movement Steering Committee. Before joining PennDOT, Daboin held several positions in the Federal Aviation Administration, including manager of the Harrisburg Airports District Office. Daboin served 4 years in the U.S. Air Force and has a bachelor's degree in organizational management from Pennsylvania's Eastern University.

Warren E. Hoemann is a senior vice president with the American Trucking Associations (ATA). Hoemann oversees ATA councils and conferences and is the ATA liaison with key affiliate

organizations. Before joining ATA in 2006, Hoemann was deputy administrator of the Federal Motor Carrier Safety Administration at the U.S. Department of Transportation. Before his Federal government service began in 2003, Hoemann had a long career in the trucking industry. He was vice president of the California Trucking Association and vice president of government relations for Yellow Corporation (now YRC Worldwide), where he handled the company's political and legislative affairs in the 50 States and U.S. Congress. From 1978 to 1986, Hoemann was the general counsel for the Western Highway Institute, a nonprofit trucking industry research organization. He started his career as a private attorney in Denver, CO, representing motor carriers. Hoemann is a Phi Beta Kappa graduate of St. Olaf College in Minnesota with a law degree from the University of Colorado School of Law. He has studied international law at Cambridge University in England and has spoken at universities on trucking issues.

Dr. Michael D. Meyer (report facilitator) is a professor of civil engineering in the School of Civil and Environmental Engineering at the Georgia Institute of Technology. He is also director of the Georgia Transportation Institute. Meyer has conducted research on transportation investment planning and program development, systems engineering, and intermodal transportation. Before joining Georgia Tech, he was director of transportation planning and development for Massachusetts, and before that he was a professor of civil engineering at the Massachusetts Institute of Technology (MIT). Meyer has published more than 180 articles on topics related to transportation decisionmaking and has served on numerous national transportation committees. He is a graduate of the University of Wisconsin-Madison and holds a master's degree in civil engineering from Northwestern University and a Ph.D. in civil engineering from MIT. He is a licensed professional engineer in Georgia and served as chair of the Executive Committee of the Transportation Research Board in 2006.

Richard Nordahl is chief of the Office of Goods Movement at the California Department of Transportation. His office, part of the Division of Transportation Planning, is responsible for statewide goods movement planning, including the analysis of goods movement by truck and rail and movement through California's airports, seaports, and border crossings. His responsibilities include developing major portions of the Goods Movement Action Plan of the California Business, Transportation, and Housing Agency and the California Environmental Protection Agency. His foreign experience includes participation in the U.S.-China Modern Logistics Conference in Beijing in May 2004 and an October 2006 briefing of China Ministry of Communication officials. Other major assignments include serving as the department's acting chief of planning in San Diego, staff to Gov. Gray Davis' Commission on Building for the 21st Century, and project manager and assistant project manager for the 1993 California Transportation Plan. Nordahl holds a degree in environmental studies from California State University and a certificate in rail transportation from the University of California's Institute for Transportation Studies.

Marygrace M. Parker serves as program coordinator for freight mobility, safety, and security for the I-95 Corridor Coalition, an alliance of transportation and related agencies in the 16 States from Maine to Florida. Parker provides program oversight and coordination for the coalition's Intermodal Freight and Commercial Vehicle Operations program committees. She oversees a number of coalition studies, including assessment of rail operational bottlenecks in the Northeast, Mid-Atlantic, and Southeast I-95 Corridor regions and the potential for short sea shipping along the I-95 Corridor/Eastern Seaboard. Before joining the coalition staff, she served as director of the Office of Traffic Management for the New York State Thruway Authority, where she oversaw the various bureaus responsible for traffic operations, communications, emergency management, and intelligent transportation systems. Parker is a former New York State Police officer. She holds a bachelors' degree in criminal science from Russell Sage College. She has served on several technical committees for the Transportation Research Board and National Cooperative Highway Research Program panels.

R. Leo Penne is program director for intermodal and industry activities with the American Association of State Highway and Transportation Officials (AASHTO). He is responsible for issues involving freight transportation by all modes—

rail, truck, aviation, ports, and waterways—and for liaison with industries with significant interests in freight movement. He shares responsibility for developing and communicating the case for the economic benefits of transportation and for demonstrating the linkage between transportation and economic development. Penne has initiated and carried out programs for advocacy, policy development, and research in areas such as transportation, economic development, urban development, environmental protection, public finance, training, and tourism and has written and edited books, reports, and articles on these subjects. He has held positions dealing with issues of strategy and policy analysis for the State of Nevada, the U.S. Department of Commerce, and the National League of Cities. He holds degrees in political science from Seattle University and the University of Washington and has served as an adjunct faculty member at the University of Maryland.

Norman R. Stoner is the administrator for the FHWA Illinois Division. He leads the Illinois Division's professional staff in partnership with State and local highway agencies to deliver an effective Federal-aid highway program in Illinois. Stoner has been active in the Chicago Region Environmental and Transportation Efficiency Program (CREATE), an effort to relieve rail freight and highway congestion in the Chicago freight hub. Since joining FHWA in 1969, Stoner has served in a variety of positions and in other FHWA offices, including the Michigan Division, where he was involved in projects addressing growing freight demands at the border crossing with Canada. Stoner received his bachelor's degree in civil engineering from Ohio University and is a registered professional engineer in Ohio.

Dr. Tianjia Tang is a transportation specialist for FHWA in Washington, DC. He is responsible for the Freight Analysis Framework (FAF) and the Freight Modeling Improvement Program (FMIP). The FAF provides strategic analysis of commodity movements in the United States related to transportation infrastructure and investment needs. It supports policymaking and legislation development and enactment. The FMIP is developing a new generation of freight forecasting and modeling tools for State and local government agencies to use in transportation planning, programming, and project development processes. Before joining FHWA's headquarters staff in 2004, Tang served as highway engineer and environmental specialist in FHWA's Resource Center in Atlanta, GA, and Baltimore, MD. Before his Federal tenure, he served in a wide range of positions, including project engineer, project manager, and megaproject development and design manager with a State DOT and private consulting firms. Tang is a Ph.D. graduate of the University of Arkansas and a registered professional engineer in Georgia. He is a member of the American Society of Civil Engineers and serves on several freight-related technical committees of the Transportation Research Board.

APPENDIX B

Amplifying Questions

The following questions indicate the type of information that the U.S. delegation is interested in obtaining during our visit. We have organized the questions from the perspective of the professional responsibilities of the individuals we would like to talk to. In addition, we have listed primary questions, or questions we want to focus on during our visit, and secondary questions, or questions we would like to discuss if time permits or to obtain answers from other sources.

National Transportation Policy Officials

Primary Questions

1. Please briefly describe the relationship among the central government, provincial government, local government, and private freight operators as it relates to the movement of freight. Who owns and operates what part of the nation's freight transportation system? What does the national government regulate with respect to freight transportation (for example, vehicle requirements, pricing, etc.)? What is expected to be funded and operated by the government? By private companies?

2. Is there a national freight policy on transportation's role in economic development, mobility, and system investment? If so, what are the specific elements of this policy that relate to international trade and investment in the nation's transportation system? What does the policy say about the relative role and investment in harbors and seaports, railroads, highways, and inland water infrastructure? How are national decisions made on which mode or intermodal facilities will receive investment (for example, investing in highway versus rail, or one port versus another)? In what agency are these decisions made? Who is involved? How does the government provide for an integrated transport system in its decisionmaking process?

3. What are the most important economic and transportation factors influencing transportation system investment decisions? What performance measures are considered when making investment decisions (for example, reduce travel time, increase travel time reliability, reduce transportation cost, and create new jobs and economic opportunity in underserved parts of China)? Do you collect data on the performance of China's transportation system? If so, what data are collected?

4. How does China's transportation system accommodate freight and passenger traffic? Do they use the same infrastructure? Which takes priority in investment and operations? How is the decision made to invest in one type of transportation project (for example, for passenger movement) versus another that will provide greater benefit to freight movement?

5. How are trade and transportation policy coordinated? How is China's national transportation policy linked to a national energy policy, and what role does the freight sector play in this relationship?

6. To what extent are public-private partnerships and partnering agreements used to fund transportation infrastructure, particularly with financial equity arrangements? To what extent is private sector input included in determining what transportation investments are made?

7. What are the most challenging issues China faces on the movement of freight? What do you think will be the most challenging issues in the future (for example, 10 years from now)?

8. How are environmental considerations (for example, air quality and water quality) addressed when transportation investments are made? Similarly, how are community concerns (for example, urban development

and land use) addressed when such investments are made?

Secondary Questions

1. Is there a widespread understanding of the importance of freight transportation and support for major freight infrastructure projects at all levels of government?

2. From a pricing standpoint, how competitive is truck compared with rail and river transport? Does the government play a role in determining these prices or is the market deregulated?

3. When investments are made, do the calculations provide estimates of the cost to maintain in the future?

4. What other factors (such as the 2008 Summer Olympics in Beijing) are driving the nation's transportation policy and investment strategies?

5. So that you may best export goods to U.S. customers, what changes in U.S. infrastructure would you like to see occur? What level of Chinese investment in U.S. transportation infrastructure do you foresee?

6. Are certain revenue sources dedicated exclusively to transportation at the national, provincial, or local levels? If so, please describe. Does the national government have a dedicated capital budget for major transportation investments or are investments by the government treated as part of the general budget?

National Transportation Planning and Engineering Officials

Primary Questions

1. For China's highway network:
   - Please describe China's national highway investment plan. What steps are being taken to improve China's road network (for example, new highways serving major ports)?
   - Do you separate local and passenger traffic from freight traffic to and from your ports?
   - Have you or are you planning to develop lanes or highways dedicated exclusively to truck traffic? If so, are they for port connectors, bypasses to urban congestion, or longer segments of the highway system?
   - How do you determine truck size and weight limits to protect your road infrastructure investment? How do you enforce those limits?
   - What are the key challenges facing the movement of freight by highway?
   - When investments are made, do the calculations provide estimates of the cost to maintain in the future?

2. For China's rail network:
   - Please describe China's national rail investment plan. Is there a policy to attain a certain share of freight movement by rail?
   - What steps are being taken to improve China's rail network (for example, investing in rail lines to allow double stacking of containers or separating passenger and freight rail lines)?
   - What rail investments are being made to improve rail access to your export-import ports?
   - What percentage of your total rail freight traffic is intermodal (that is, uses containers)?
   - Will your new rail lines be completely grade separated?
   - When investments are made, do the calculations provide estimates of the cost to maintain in the future?
   - What are the key challenges facing the movement of freight by rail?

3. For China's inland water system:
   - Please describe China's national inland water system investment plan. Is there a policy to attain a certain share of freight movement by water? What steps are being taken to improve the nation's inland water network (for example, investing in inland intermodal ports or improving river navigation)? How important is your inland water system for both container and bulk freight movement in the future?
   - What inland water investments are being made to improve water transport access to your export and import ports?
   - Do you see coastal shipping (that is, from one Chinese port to another) as an important element of your future freight transportation system?
   - When investments are made, do the calculations provide estimates of the cost to maintain in the future?

- What are the key challenges facing the movement of freight by river and canal?
- Who is responsible for maintaining navigation channels and how it is being funded?

4. How long does it take to move a major freight infrastructure investment from the original proposal to completion? What are the major planning and project development steps followed in this process?
   - How do you balance investment in access corridor versus intermodal terminal needs? Line-haul versus distribution systems? Urban versus rural regional needs?

Secondary Questions

1. Do you have a national database that describes the flow of freight on the different modes of transportation? What kind of national freight data does this database include? At what level of geographic detail do you collect data—national, provincial, local? Are data required from private operators of port terminals and other freight carriers?

2. How do you link information on port traffic to decisions on investment in landside transportation?

3. Are there opportunities for sharing data on freight traffic between the United States and China that would benefit both?

4. What types of new technologies are being considered for the movement of freight (for example, magnetically levitating (maglev) trains, innovative port handling systems, etc.)?

5. Do you use a national freight transport model to predict future freight flows? If so, what kind of modeling tool do you use?

6. To what extent are vehicles standardized in the country? For example, are all heavy trucks designed to the same standard and weight limitations? Rail cars? Barges? Do you have hours-of-service regulations for truck drivers? Do truck size and weight standards affect distribution center activity?

7. Can you provide examples in which investment has been made in the nation's freight system to minimize or eliminate the need to transfer freight from one mode of transportation to another?

8. What projections of future growth are you using for freight volumes and passenger traffic? To what degree are you separating domestic and international movements? For international trade, how are export-versus-import considerations taken into account? To what extent are your projections broken out geographically, international (global versus regional) versus domestic perspectives? How are these projections used in transportation investment decisions?

Provincial, Municipal, and Port Government Officials

Primary Questions

1. What are the most important economic and transportation factors influencing transportation system investment decisions in your jurisdiction? What performance measures are considered when making investment decisions (for example, reduce travel time, increase travel time reliability, reduce transportation cost, and create new jobs and economic opportunity in underserved parts of your jurisdiction)?

2. Do you have a policy or plan that relates to transportation's role in economic development, mobility, and transportation system investment? If so, how is freight movement included in this policy? What does the policy or plan say about the relative role and investment in harbors and seaports, railroads, highways, and inland water infrastructure? How are decisions made on which freight facilities will receive investment? How does your agency provide for an integrated transport system perspective in its decisionmaking process?

3. Is your transportation system designed to accommodate both freight and passenger traffic? Do they use the same infrastructure? Which takes priority in investment and operations? How is the decision made to invest in one type of transportation project (for example, for passenger movement) versus another that will provide greater benefit to freight movement?

4. How are environmental considerations (for example, air quality and water quality) considered when transportation investments are made?

Similarly, how are community concerns (for example, urban development and land use) considered when such investments are made? To what extent is port development integrated into the community's development plan?

5. How are provincial, municipal, and port freight transportation projects funded? To what extent are public-private partnerships and partnering agreements being used to fund transportation infrastructure, particularly with financial equity arrangements? To what extent is private sector input included in determining what transportation investments are made?

6. What are the most challenging issues your jurisdiction or government faces on the movement of freight? What do you think will be the most challenging issues in the future (for example, 10 years from now)?

Secondary Questions

1. What types of projects are you considering to improve land access to your port? For example, are you building new port access roads? New barge facilities?

2. Is there a widespread understanding of the importance of freight transportation and support for major freight infrastructure projects among officials in your jurisdiction?

3. For port officials, how do you link information on port traffic and expected movements to decisions on investment in landside transportation?

4. How long does it take to move a major freight infrastructure investment from the original proposal to completion? What are the major planning and project development steps followed in this process?

Freight Carriers, Terminal Operators, and Shippers

Primary Questions

1. Generally, what is the role of foreign investment in intermodal freight facilities? Ownership? Construction? Operations? For a new intermodal freight terminal or facility or a major expansion of an existing one, who has general responsibility for and pays for the following:
   - Planning?
   - Design and construction?
   - Operations?

   If government funds are used to support these activities, are the funds dedicated solely to that purpose?

2. What are the underlying ownership arrangements for the transportation modes that serve intermodal facilities (rail, trucking, barges, etc.)? The intermodal facility itself? The surrounding land? The individual equipment components (chassis, etc.)?

3. In the siting of freight intermodal terminals or other freight-related facilities, to what degree are national, provincial, or municipal land use planning objectives taken into account? How are projects linked to the plans and activities of surrounding communities? Similarly, how are environmental concerns addressed in building and expanding facilities? What is the process for identifying and remediating any adverse environmental and community impacts that would be produced by the facility?

4. What are the key factors that drive intermodal facility capacity design? How is freight "surge" accommodated? Has there been any consideration of using departure control strategies to minimize congestion at the port? To what extent do security concerns affect facility productivity?

5. To what extent are you included in the decision-making process on changes to landside access, both rail and highway, for the terminals you operate?

6. What expectations are you under to operate your facilities 24 hours a day, 7 days a week to maximize use of the existing infrastructure?

Secondary Questions

1. What is the transport mode split in freight moving to this facility (that is, what percentage arrives by inland water, rail, or highway)? In your opinion, what are the key factors in the decision to access your facility by each access mode? In other

words, why does some freight come by train and other by truck?

2. To what extent is freight demand being directed or modified though the application of user charges (fees or tolls)? Are such charges limited to those applied to transport carriers (for example, tolls for trucks), or are they also being imposed on users of the intermodal facility (for example, a per container fee)?

3. How would differences in labor rules and expectations, safety, and security procedures account for differences in productivity at different intermodal facilities?

4. What kind of a benefit-cost analysis is done to determine whether the facility is justified?

5. What are the major benefits associated with investment in this intermodal facility? Access to labor? Better access and handling capacity to final markets? Improved financial performance? Minimized shipper costs? Enhanced freight handling productivity?

6. What performance measures are used to monitor the performance of the intermodal facility (for example, productivity measures, delay, etc.)? How are data collected in support of these performance measures? How are reliability, travel time, throughput, cost, or environmental impacts measured and considered?

7. To what extent has automated data collection been designed into terminal operations? What freight movement or vehicle tracking capabilities are available? If there are such systems, how widely are they used?

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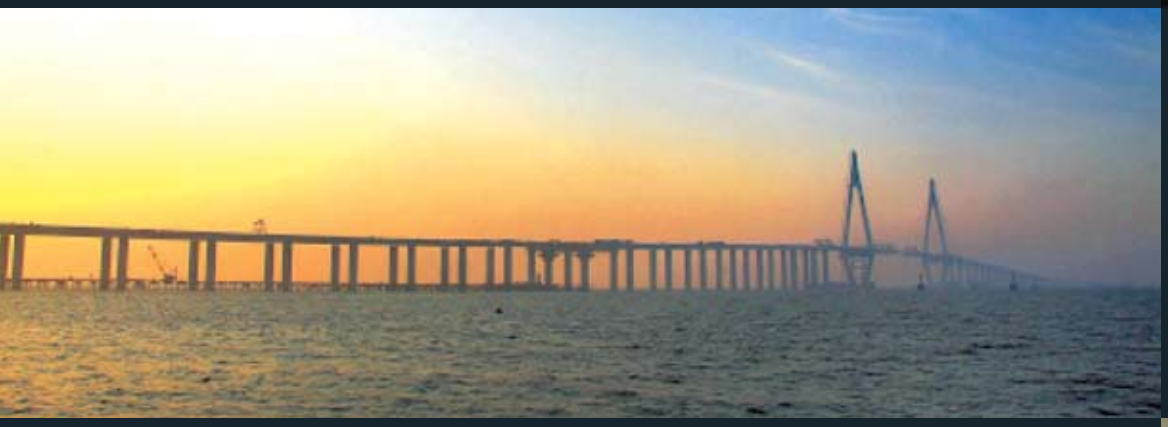

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