

Maritime Freight Transportation, National Economic Recovery, and Global Sustainability

Coordinating a Strategic Plan

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n planning a journey, the first focus is the destination, and the second is the route. National economic recovery and economic security are a primary destination for the United States in 2010. If the route were straight and clear, the second part of the plan would be "Drive on!"—that is, continue to let market forces dictate economic outcomes. But in a world of rapidly advancing globalism, climate change, and energy volatility, a road map is needed.

Since the 1950s, exports have increased as a portion of the U.S. gross domestic product (GDP)—the sum of all goods and services produced—from 5 percent to nearly 13 percent in 2008. In February 2010, President Barack Obama launched the National Export Initiative (NEI) to double exports in the next 5 years. In addition to service-sector products, exports will include agricultural goods, manufactured goods, and natural resources, which will require transport.

The President has noted that exports will boost the GDP, reduce the trade deficit, and stimulate job creation. The NEI aims to improve conditions that directly affect the ability of the private sector—especially of small businesses—to export and to overcome the hurdles to entering new markets. As the United States emerges from the recent global economic constriction, implementation of the NEI will aid in national economic recovery.

Shifts in the trade and transport environment—at the local, national, and international levels—pose a dynamic challenge and point to the need for a strategic freight plan. In addition, significant impacts on the system can come from two sources: first, from the lack of adequate intermodal transport capability; second, from emerging challenges to energy use and sustainability. Policies are needed to ensure that the nation's marine transportation system (MTS) will be ready to operate in the rapidly changing environment of domestic and international goods movement.



U.S. Secretary of State Hillary Rodham Clinton reviews the new National Export Initiative at Boeing Shanghai Aviation Services in Shanghai, China, this year.



Aerial view of the Kwai **Tsing Container Terminals** at Hong Kong Port. The trade imbalance between the United States and China—far more goods are imported from China than are exported from the States—has grown since the 1970s.

New Realities

The United States has taken bold steps to address the economic recession, but the steps have led to significant debt. Other factors must be considered in charting the road map:

- ◆ Global economic dominance eventually will shift from the United States and Western Europe to the Far East. Nevertheless, even after this shift, the United States will continue as the world's dominant military power.
- Middle-class incomes in the United States and Western Europe will stagnate or decline as a result of globalization and the growth in the global labor force, which has increased by 1 billion or more workers since the collapse of communism. Discretionary income and consumption also will decline, and savings will increase, from 1 percent to approximately 8 percent, as populations in the West age.
- Economies of scale and scope will increase in importance as strategies for competitive advantage and marketplace performance. These will affect infrastructure and resource systems.
- ◆ Fossil fuel dependency and the volatility of energy prices will continue to heighten concerns about transportation costs and energy security.
- ♦ Environment-related concerns such as climate change, congestion, biohazards, and the availability of nonrenewable resources could limit economic growth and competitiveness. Moreover, public con-

cerns about livability issues may hinder transportation system initiatives in some regions.

International Trade

Economic security depends on the success of nations and their megaregions in the global marketplace. In early 2007, international trade contributed approximately 28.5 percent of the U.S. GDP; in 2009, the share declined to approximately 25 percent (1). The U.S. economy and the global economy both contracted between 2007 and 2009; international trade declined by 20 to 30 percent for many nations, the worst recession since the 1930s. In the next 15 years, however, international trade will contribute as much as 50 percent of the U.S. GDP.

Almost 70 percent of the U.S. GDP depends on products for personal consumption. The approximately 30 percent that remains comprises business investments (approximately 13 percent) and government spending (approximately 17 percent). In the mid-2000s, this level of personal consumption caused the U.S. foreign trade deficit to balloon. The trade deficit grew rapidly as a percentage of GDP in the mid-1990s, with the globalization of production, the expansion of international trade, and rising energy prices.

For years, the United States has had a trade imbalance (Figure 1, page 16) that has expanded because imports from China greatly exceed U.S. exports to China and to other international trading partners. This imbalance between imports and exports has



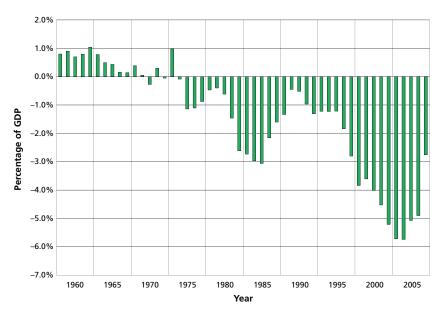
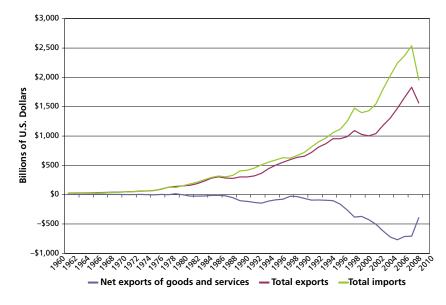


FIGURE 1 U.S. trade balance as a percentage of GDP.

continued since the mid-1970s (Figure 2, below) and has weakened the financial attractiveness of the United States to investors considering the purchase of public debt.

Between the third quarter of 2008 and the third quarter of 2009, the U.S. GDP dropped approximately \$310 billion, a decline of a little more than 2 percent (1), as U.S. consumers significantly cut back their purchases of imports—import volume dropped more than 25 percent. Exports from the United States fell by 2 to 4 percent or more, as the rest of the world experienced the economic shocks of 2008. Exports rebounded in 2009 as foreign demand for U.S. products expanded—the economies of several trading partners grew, and the U.S. dollar weakened. Most of these exports depend on international shipping and distribution networks for delivery to overseas customers.

FIGURE 2 U.S. imports, exports, and net exports by year.



Consumer Demand

During the past 15 years, much of the global goods transport system has focused on Asian exports to U.S. and European consumer markets. The extraordinary growth in Asian production to satisfy consumer demand nearly overwhelmed the U.S. goods movement system. When the excess Pacific Coast transportation capacity was absorbed, routing economics shifted to favor all-water services to East Coast ports for East Coast customers. The primary end-consumer of manufactured goods, however, is shifting to the Far East.

In the next several decades, the emerging middle classes in China and India will be the primary consumers of global goods and services. China has a middle class of 300 million—approximately the same size as the population of the United States. According to one estimate, the GDP of emerging markets will grow from 35 percent in 2008 to 50 percent of world GDP by 2018 (2).

The spending power of China, India, and Russia is expected to triple. The higher growth rates of emerging markets will attract foreign direct investments from the West. The anticipated creation of wealth and consumption by China and India will change global transportation patterns of supply and demand. The two nations will generate unique import and export trade flows, fostering a demand for the most efficient transportation assets. China and India may create new demands for U.S. agricultural and finished goods.

With population growth and economic convergence, developing nations will increase their demand for goods. The world population is expected to reach 7 billion in late 2010 and 8 billion within 20 years. The U.S. Census Bureau estimates that the world population will exceed 9 billion before 2050. Meanwhile, Western populations will age and will increase their rates of savings to provide for retirement. In short, demand will be on the other side of the planet, where more growth opportunities will arise, including new infrastructure and other opportunities for capital investment. These regions will compete to have the most efficient transportation and distribution services.

To maintain its economic security, the United States must increase its exports of goods and services to the global marketplace. Transportation policy makers can ensure that the products of U.S. companies are globally competitive by providing adequate infrastructure capacity for the efficient movement of goods. In particular, maritime commerce is indispensable in supporting overseas transactions and therefore is a fundamental building block of national economic prosperity.

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Marine Transportation System

More than 90 percent of international trade travels by sea (3). Ocean-borne maritime trade more than tripled between 1968 and 2008 (4). Because most of the world's trade travels by ship, the port is a key component of infrastructure, linking water and land transportation. National ports serve as international gateways to world trade.

The MTS, including ports, always has been evaluated by the cost of services but now must offer flexibility and reliability to satisfy the demands of shippers in the global supply network. Ports are evaluated not only for their costs but for their connectivity. Ports that do not function seamlessly with international production networks are likely to have an adverse effect on the economic development of the hinterland or market area.

The MTS is a demand-derived service, and when demand is low, the system is vulnerable to economic and operational disruptions. The demand for international shipping has declined with the recent decrease in trade. The MTS is threatened not only by sluggish trade economics but by other types of system shocks—for example, a major natural disaster or human-caused incident could cripple the operation of the supply chain, with national economic consequences.

Although considerable work has enhanced the security of ports and of the segments of the transportation system serving freight, the resiliency of the system needs to be built up to protect its critical interdependence with other industrial sectors (5). U.S. economic security increasingly will depend on the transportation infrastructure and global connections.

Economies of Scale and Scope

The dominant players in the recovering global trade markets will achieve economies of scale and scope. The bulk carriers started the trend with larger ships, and the container carriers in the late 20th century achieved new economies of scale (6). Because profit margins are slim, only ports and logistics systems with sufficient capacity to handle the volume of cargo on megaships will compete successfully in the global marketplace.

Economies of scope also have become important to competitiveness. So-called port poles are forming as collaborative freight networks in Asia, India, and Europe to achieve economies of scope (7). The port poles offer the size and reliability to attract cargo and can serve as regional platforms for freight logistics. The networks combine the infrastructure and business services of more than one port into an expansive platform of distribution and delivery services,



gaining agility, cost-effectiveness, and resilience when shocks occur. Shippers see the networks as reliable because of the redundancy of services. Future investments in transportation infrastructure will have to consider economies of scope and scale, as well as shippers' needs for connectivity and reliability.

Infrastructure Requirements

Costs and reliability are the watchwords for global business. As goods flow across the world's oceans and through ports and connect to domestic corridors, they may face delays en route and uncertainty about delivery schedules because of infrastructure capacity constraints. Today's freight must flow seamlessly or face a time, cost, or reliability penalty.

The United States has been living on its past infrastructure construction accomplishments. If the consumption patterns of earlier in the decade had been sustained, the MTS would have been overwhelmed by traffic and would not be adequate for anticipated

The American Society of Civil Engineers (ASCE) estimates that more than \$1 trillion is needed to meet the shortfall in funding for road and bridge infrastructure investments (8). Some transportation funding was allocated under the 2009 stimulus package, which is distributing \$787 billion—although less than \$52 billion is scheduled to support transportation infrastructure improvements, with \$27.5 billion for highway and bridge construction projects. According to ASCE, more than \$50 billion is needed to rebuild the U.S. inland waterway system.

Navigation and terminal infrastructure requirements have expanded as new megaships with larger containers are calling on the U.S. ports along the Instructors at the U.S. Customs and Border Protection's Canine **Enforcement Training** Center stand by as a handler and a dog search a seaport container for contraband. Since the growth of maritime trade in the past 40 years, port security has become crucial to the system's health.



A cruise ship passes Paraiso Hill in the Panama Canal. The first dry excavation contract of the Canal Expansion Program—the new locks are scheduled to open in 2014—took place in June 2008. Pacific and Atlantic. The vessels require channel depths of 50 feet or more. To stay competitive, the nation must enlarge its navigation channels—and in some cases, raise bridges and increase rail tunnel clearances—to accommodate the enormous oceangoing vessels in an environmentally friendly manner. The U.S. transportation infrastructure system needs significant financial investments to ensure that businesses can maintain global competitiveness.

Panama Canal Expansion

The Panama Canal Authority is investing \$5.3 billion to accommodate container ships with capacities of 8,000 20-foot-equivalent units and more (9). When the new locks open in 2014, a new era will begin that could change global trading patterns as the original canal did in 1914.

According to some estimates, as much as 25 percent of the West Coast cargo base could transfer to East and Gulf Coast ports as global trade picks up again. Ports are likely to have only one chance to win over the initial surge; the deepest East Coast ports with the necessary intermodal connections and warehousing capacity will capture the shift in market share.

Sustainability

The National Environmental Policy Act, signed into law in 1970, raised tensions between the need for economic development and the need for environmental protection. Sustainable development addresses both needs simultaneously. The United Nations' Brundtland Commission coined the term in 1983 and defined it as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs."

Sustainable development—or sustainability—must allow for economic viability while protecting the health of individuals, communities, and the environment and embracing social responsibility and community livability. The challenge is to achieve these central tenets while the world's population increases rapidly—and as the most affluent populations consume the greatest volume of resources at an increasingly disproportionate pace. While these changes are occurring on the demand side, on the supply side many natural resources are becoming more scarce and expensive.

A scarcity of oil is the most significant economic concern. Many of the world's oil reserves are coming under the control of national governments and corporations indifferent or hostile to the United States. Other dwindling natural resources include fresh water in some regions; rare earths, used in many high-tech manufacturing processes; and potassium, essential for agriculture.

Without modifying the global consumption patterns of the most affluent nations, reducing the demands of people in developing countries becomes difficult, risking future scarcities that threaten the quality of life for this and future generations. Long-term solutions to environmental issues for global trade and transportation and for sustainability will require



A container ship crosses under the Arthur Ravenel, Jr., Bridge at the Port of Charleston, South Carolina. U.S. marine transportation infrastructure must continue to accommodate ever-larger oceangoing vessels.

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efforts at the community, national, and global levels.

Ports and their associated freight transportation are heavy industrial activities that must address air, water, and land impacts and community livability under the applicable laws and regulations. From 2002 to 2007, many ports established proactive environmental policies to gain community approval to operate and expand. Most major ports experienced double-digit increases in their volume, causing problems with surrounding communities over road congestion, noxious air emissions, and safety concerns. In the San Pedro Bay area of California, for example, neighborhood groups voiced their anger to local politicians, and port projects were placed on hold.

The chief local issue is emissions, including nitrogen oxides and particulate matter from traffic congestion and the diesel combustion of port vehicles (10, 11). West Coast and East Coast ports are instituting emissions reduction programs for trucks, marine vessels, and railroad locomotives. Port authorities are working with the Environmental Protection Agency, local air boards, and tenants to curb emissions beyond the regulatory requirements, to achieve the objective of sustainable development. Despite the progress in improving air quality, port leaders must acknowledge that solving these problems will lead to other demands to address livability issues that have not received adequate attention. Examples of unresolved issues include noise, light, siting decisions, and environmental justice concerns.

Environmental compliance often is viewed as an essential but expensive maritime requirement. Poor environmental performance on the waterside or the landside, however, can have a devastating impact on the success of maritime business—as occurred, for example, with the Exxon oil spill in Alaska's Prince William Sound and with public concerns about portassociated air emissions in the Los Angeles-Long Beach Basin. Environmental concerns not only can stall port and logistics infrastructure development but also can cost millions of dollars to mitigate.

Efforts to eliminate noxious air pollutants are important. But equally important and maybe more difficult to mitigate are the air pollutants that contribute to climate change—greenhouse gases (GHGs).

Climate Change

Global agreements addressing the emerging issue of climate change may affect the international maritime industry. Will a carbon tax or cap-and-trade policy be established worldwide? What will be the cost penalty for oceanborne cargo here or worldwide? How fast will engine room and terminal equipment technology adapt?



The United States contributes 20 percent of the world's emissions from burning fossil fuels; India contributes 4 percent. Other nations demand that the United States implement stringent emissions reduction standards before they act accordingly. The United States could apply such measures as a carbon tax, a carbon cap-and-trade program, or other mechanism. A national GHG emissions reduction protocol, however, will have to consider the business perspective and the cost implications for the United States in the global marketplace.

Yet the transportation sector generates approximately one-third of global GHG emissions. The International Maritime Organization and regulators worldwide are increasing their scrutiny of emissions from ships and cargo movement. These concerns and anticipated costs will affect the market practices of carriers and shippers. Ports and vessel owners prepared to address the issue proactively and to increase their competitiveness can reduce their liabilities and look for opportunities to profit as the new carbon markets open.

Finally, one other consequence of global climate change is the melting of ice, particularly in the polar regions, which will raise global sea levels. As sea levels rise, the infrastructure of ports in low-lying areas may be inundated during tidal fluctuations or storm surges. Sea level changes also are likely to affect roadway and rail infrastructure connecting ports to markets. Landside connectivity may be limited or severed during intense storm events. The potential for significant impacts to low-lying regions could outstrip the ability of state and local governments to pay for infrastructure mitigation or for full replacement.

As climate change concerns increase, along with international political moves to address those concerns, the pressures to reduce GHGs aggressively A clam shell dredge digs virgin material as part of a \$700 million, multiphase Port of Anchorage, Alaska, expansion project. Environmental compliance is vital to the success of port operations and projects.

Located at the northern end of the Antarctic Peninsula, James Ross Island has experienced atmospheric warming of approximately 2°C since 1950, causing a vast retreat of its floating ice shelves, among other effects. Ice melt, a consequence of climate change, will raise global sea levels, affecting freight infrastructure.



will be enormous. New laws and regulations could affect U.S. port performance and operating costs from three perspectives: U.S. emissions requirements; emissions controls for international ocean carriers; and measures to protect transportation infrastructure from sea level rise and storm surges. If dealt with reactively, these issues will have a severe effect on the cost of port and transport services.

Systemwide Initiatives

The future of U.S. economic recovery depends on more than building on past domestic economic practices. Recovery will demand a strong export policy for U.S. goods. For the NEI to succeed, exports must enter the international marketplace at competitive prices, moving from the point of manufacture to a port along intermodal corridors that operate efficiently and effectively. The nation's rural transportation infrastructure, which brings agricultural products to ports, will require ongoing maintenance and enhancement.

For these transport capabilities to be available, however, the freight transportation sector—including the maritime sector—will have to develop a systemwide plan for transport capacity and will have to address emerging domestic and international energy and sustainability demands proactively.

National and state decision makers will need to address the inability of public funding mechanisms for transportation infrastructure to meet the needs of today's global marketplace. If these issues are resolved, the U.S. freight transportation sector will contribute positively to national economic recovery and global sustainability.

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