

Research Results Digest 327

TRANSPORTATION IMPLICATIONS OF EMERGING ECONOMIC DEVELOPMENT TRENDS

This digest contains excerpts from a study conducted for NCHRP Project 20-05, "Synthesis of Information Related to Highway Problems." The study was conducted by Anne Strauss-Wieder, Westfield, New Jersey. Jon M. Williams is the Director of the NCHRP Synthesis Studies Program.

INTRODUCTION

This report focuses on economic development trends and how transportation relates to these trends. It provides practical information that could be used to relate transportation investment with economic development.

This project grew from a TRB conference on Transportation and Economic Development and was designed to "provide transportation, economic development, and planning professionals with a broader understanding of the most timely and important issues in the linkage between transportation and economic development" (1, p. 1).

The literature reviewed and the experts interviewed for this report are from the fields of site selection, labor analysis, logistics, and economic, rural, and real-estate development. Transportation planners and agencies, in general, were not interviewed. The approach was designed to provide an objective "non-transportation" view of the topic, covering bodies of knowledge less commonly used by transportation planners.

The literature and interviews focused on the following five subject areas:

- Business production, inventory, and logistics and distribution trends and practices;

- Site selection research and practices;
- Labor market considerations;
- Urban and rural development practices; and
- International trade and global market trends and implications.

The methodology used for this project was designed to tap practical knowledge and experience, drawing in particular from the development and site selection communities most responsible for making or facilitating economic development decisions. These organizations and individuals weigh a variety of factors, of which transportation is just one consideration, in formulating economic development deals. These organizations are therefore in a unique position to identify what really matters in transportation access and investment from the broader economic development perspective. A list of these organizations can be found in Appendix A.

The methodology of this project included two elements: literature reviews and interviews with economic development, labor, site selection, logistics, and real-estate experts. Much has been written on the five subject areas included in this report. Even more has been written on the linkages between transportation investment and economic development. The literature review

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was targeted, current, and limited. By following one of the guiding principles for this research project, the literature review focused on nontraditional sources, meaning that transportation planners or organizations generally did not prepare the material included in the report.

The literature review included material generated by economic development and real-estate researchers at universities, industry associations, and Federal Reserve Banks, as well as from trade publications. Many trade publications and research groups post their articles as web content. Theoretical research and articles were not included.

This project included 22 in-depth telephone interviews with experts from throughout the United States. The interviewees were individuals on the front-line of making business and economic development decisions or experts in their respective fields of site selection, development, land use, labor analysis, logistics, and trade.

The interviewees were identified through Internet searches of articles and relevant research centers, economic development organizations, the synthesis topic panel, and other interviewees. They provided the practical insights and current knowledge that makes this report of immediate use to transportation agencies.

EMERGING TRENDS IN ECONOMIC DEVELOPMENT

This section summarizes developments in each of the five subject areas identified by the Synthesis Topic Panel:

- Business production, inventory, and logistics, and distribution trends and practices;
- Site selection research and practices;
- Labor market considerations;
- Urban and rural development practices; and
- International trade and global market trends and implications.

Recent key trends and developments in each area were identified through the literature review and interviews with experts. Table 1 summarizes the key trends and developments. Some of these trends involve more than one of the subject areas.

The discussion of each subject area is structured in the following manner:

- The trend is identified and defined.
- The implications for economic development are articulated, and examples are used throughout the discussions to illustrate key points.

Business Production, Inventory, and Logistics and Distribution Trends and Practices

Recent trends in business production, inventory management, and logistics and distribution have had profound ramifications for economic development and transportation investment. In some respects, the changes have been as dramatic as the Industrial Revolution.

“Just-in-Time” and “Pull” Logistics

Traditional manufacturing involved large production runs to achieve economies of scale, with goods then stored until they were sold. As global competition increased in the 1980s, American businesses needed to regain their competitiveness. Companies achieved this goal by modernizing their production facilities, downsizing their operations, and implementing new business and logistics management strategies.

The Council of Logistics Management defines logistics management as:

That part of supply chain management that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers’ requirements (2).

Key cost areas targeted by businesses included the amount of inventory stored to support production lines, the size of the production runs, and the finished product inventory maintained before purchase by customers. The size and flexibility of production runs were modified through the use of new technologies, better tracking, and anticipation of customer-demand levels.

Two crucial new logistics practices emerged beginning in the 1980s in support of companies’ cost-efficiency drives: just-in-time (JIT) logistics management and pull logistics practices.

JIT logistics management was developed in response to the high interest rates of the 1970s and the associated high costs of carrying inventory. JIT originated in Japan in the auto production industry and

Table 1 Recent trends and developments affecting economic development

Trend	Subject Area				
	Business Production and Logistics Practices	Site Selection	Labor Market Considerations	Urban and Rural Development Practices	International Trade and Global Market Trends
“Just-in-time” and “pull” logistics	X	X			X
“Supplier parks”	X	X	X	X	X
New roles for warehouses: final assembly/customization/product readiness at the warehouse	X	X	X	X	X
Increased interest in and size of warehouses and distribution centers	X	X	X	X	X
Global Freight Villages/Integrated Logistics Centers/DistriParks	X	X		X	X
Access to/expansion into specific global markets	X	X			X
Impact of new telecommunications needs	X	X	X	X	X
Global site selection	X	X	X	X	X
Increased importance of community infrastructure and quality of life factors		X	X	X	
Growing importance of passenger aviation service for corporate executives and business visitors		X	X	X	X
Need for transit and commuter options for workers		X	X	X	
Setting up training programs for the local labor force		X	X	X	
Brownfield/property redevelopment		X	X	X	
New business attraction strategies in rural areas (including shifting focus away from industrial and commodity production)		X	X	X	X

originally involved substituting transportation for inventory costs. Materials were delivered just in time from suppliers for use on the assembly line, and the auto manufacturer maintained minimal inventory.

However, in the two decades since JIT was introduced, companies have learned that maintaining minimal inventory carries risks, disruptions in trans-

portation systems, or problems in a particular run of a supply that can shut down assembly lines. Accordingly, although the goal of goods arriving just in time for use remains the same, a greater inventory is now maintained. That said, by using their purchasing power to keep costs low, many large companies require their suppliers to maintain the inventory and

deliver the materials when needed. As noted in an article on the new Toyota truck plant in Texas:

Auto assembly plants built in the past 15 years are designed for the just-in-time (JIT) production system, which requires suppliers to deliver components within hours, or even minutes, of when they are needed in the assembly process. The JIT system enables auto manufacturers to store a minimum inventory; suppliers instead bear the storage cost (3).

Economic development officials are particularly interested in one potential end result of this practice—the possible creation of supplier parks in the vicinity of many auto assembly plants. Supplier parks are discussed later in this digest.

Pull logistics practices arose as a result of the move to leaner manufacturing and inventory, combined with the introduction of new information and telecommunication technologies. Bar codes were added to products, and store clerks could complete sales by scanning the codes. This new information technology not only increased the efficiency of inventory management but also provided new data to track customer demands for specific products. As the “mining” of the new customer demand data became more sophisticated, retail stores and manufacturers could better predict the size of their production runs. Instead of the traditional approach of producing goods and “pushing” them through the system to customers, the new data created a “pull” system. The real-time demand of customers more often now dictates the goods that are ordered and delivered to the stores. Goods are pulled through the system rather than stored until needed.

These systems allow firms to more carefully track individual store trends and match specific customer demands. One of the outcomes is the need to be able to customize products to respond quickly to customer demand levels. With global production, this need has translated into a joining of the production and distribution processes. The rise of value-added warehouses is discussed later in this digest. Value-added warehouses are of growing interest to economic development officials.

Supplier Parks

The clustering of suppliers to serve an industry concentration is not a new concept; it is referred to as *agglomeration*. However, suppliers who specifically locate their facilities near a single large plant to provide it with JIT logistics management is a new

twist and a significant consideration for economic development officials.

According to the Urban Land Institute publication *Just-in-Time Real Estate*, supplier parks, also known as co-location sites, are populated by a number of suppliers and are situated close to the main manufacturing operations that they support (4). The publication further notes:

First popularized in Europe by automotive manufacturers, the supplier park concept is just now taking hold in the United States. General Motors is building a massive complex outside Chicago that features such a park. Inside, complementary suppliers manufacture components, sending them to the next supplier along the carefully designed route to add another piece to the assembled component, which is then transported by a light-rail system to the plant floor at exactly the point where assembly takes place (4, p. 18).

Supplier parks are of particular interest to economic development officials. They represent a second potentially larger wave of development, job opportunities, and tax revenues that can follow after a site and region are selected for a major production facility. For example, Hyundai is in the process of opening its first automobile assembly plant in the United States, which will employ 2,000 workers in Alabama when it is at full operation (5). As of May 2004, 29 suppliers to the plant, mostly Korean firms, are also locating facilities in Alabama, bringing an additional \$500 million in investment and 4,000 jobs to the state (6).

In accordance, the economic development and real-estate communities have investigated the supplier park concept. Research conducted in connection with possibly attracting suppliers to San Antonio, Texas, in connection with the new Toyota plant, which is discussed in more detail further in this digest, found that:

- Although many suppliers will locate where the sum of production and transportation costs are the lowest, a core of suppliers will locate within minutes of the assembly plant. These suppliers locate near the plant because they must share critical technical expertise, along with the components (3).
- When it is inefficient to set up a separate production facility, suppliers will need locations for warehouses and distribution centers where they can receive products, assemble components, and provide deliveries to the plant. The

rise of warehouses and use of the macro-level freight transportation system as an alternative for locating supplier production plants nearby is illustrated in the case of the New United Motor Manufacturing, Inc. (NUMMI) auto-assembly facility developed jointly by Toyota and General Motors in Fremont, California. The NUMMI facility is located far from the existing domestic suppliers. Rather than construct new supplier plants near NUMMI, “the bulk of suppliers ship parts from their existing facilities in the Northeast to warehouse–distribution centers in El Paso, Memphis, Chicago, and Detroit. Various components are consolidated at these points and transported to NUMMI by rail” (3). NUMMI’s California location also enables the plant to receive supplies from overseas through the local ports.

- Suppliers look for affordable land in industrial parks with modern space that is already constructed. If such space is not available, then suppliers look for industrial property where the necessary infrastructure is in place (3).

The Toyota plant in San Antonio is described further in the profile later in the report.

Suppliers are cost-conscious. Affordable land is a key consideration and can affect an area’s ability to attract suppliers. One interviewee noted that in Canton, Mississippi, the property next to the announced new auto assembly plant rose in a single day from \$5,000 per acre to \$30,000 per acre, which negatively affected efforts to attract suppliers. The executive director of the Georgetown–Scott County Kentucky Chamber of Commerce noted in an article, “We missed capturing some of Toyota’s suppliers when the assembly plant opened because our industrial land just wasn’t competitively priced” (3).

New Role for Warehouses: Final Assembly, Customization, and Product Readiness at the Warehouse

The changed role of warehouses and distribution centers is one of the newest trends to affect economic development. Some economic development agencies are still trying to understand the value of this type of facility. As one interviewee stated, “It’s hard to figure out the incentives for these [warehouses].”

Warehouses traditionally were buildings where materials were stored or staged (1) prior to use in production facilities, (2) post-production prior to con-

sumer use, and (3) for long-term storage. As such, these buildings were cost centers, adding little value to the goods moving through them and representing inventory costs on corporate balance sheets.

The introduction of JIT logistics management and lean manufacturing directly targeted warehousing and inventory costs. Indeed, when JIT was introduced, some experts anticipated that the amount of warehousing space in the United States would significantly decrease. Instead, the opposite situation has occurred. Significant new construction of warehouses and distribution centers continues to take place, with the buildings growing in size. Some North American distribution centers exceed 1 million square feet in size, and many are more than 500,000 square feet.

Warehouses and distribution centers have taken on new functions. Although storage and staging functions still exist to some degree, the key objectives of today’s warehouses and distribution centers are:

- Velocity—expediting the movement of goods in line with JIT logistics management,
- Customer service—ensuring that the products are shelf-ready to customer requirements and potentially handling returns (referred to as “reverse logistics”), and
- Adding value—assembling and customizing products moving through the facility. “Value-added” services are considered by some experts to be the new form of manufacturing jobs in the United States.

Velocity means keeping the inventory in motion, using tracking capabilities to manage the inventory, and maintaining flexibility to allow for shifts in delivery instructions. Velocity functions can include transloading products from overseas containers to domestic trailers and “cross-docking” products (e.g., having truckloads of a product come in and shifting it to trucks bound to one or more locations).

Customer service has become a new role for warehouses. Today, most retailers and manufacturers require specific product packaging, labeling, ticketing, and delivery. To meet these new requirements, warehouses and distribution centers are now becoming the final stage of the production line for many goods. In addition, warehouses and distribution centers have become fulfillment centers, handling the Internet and mail-order operations of many companies. For example, the Barnes and Noble (B&N) distribution center in Jamesburg, New Jersey, which

has the capacity to hold 16 million books, provides replenishment services to all of B&N's stores throughout the United States and supports the company's Internet operation. Books on the best-seller list may move from the warehouse to stores in full-pallet loads. Other fast-moving books may be transported to the stores in full cartons. Slower-moving books that have been automatically identified by each store's computers for replenishment, along with special orders and Internet orders, are picked by the individual book, consolidated into cartons, and shipped out (7, p. 42).

Adding value at warehouses includes undertaking final assembly and customization of products, packaging items to meet customer specifications (e.g., blister packing, assembling sets of goods, adding price tags, adding air to soccer balls, stuffing quilts and pillows), and undertaking repairs. This value-added function represents warehouses' new role in the manufacturing process: Warehouses and distribution centers often now take on the final elements of the production process.

These final elements are the major source of jobs at newer distribution centers. In function, they resemble light manufacturing jobs, hence the use of the term "new manufacturing." The job generation associated can be significant, particularly for regions that have lost traditional manufacturing jobs and are therefore attractive to economic development officials. Although the older storage form of warehouses employed a minimum number of workers, job generation at some of the new facilities can approach that of manufacturing operations. For example, the B&N distribution center in New Jersey is 345,000 square feet and employs 850 workers (7, p. 42).

This change in the production process stems from certain trends:

- A shift in warehouse location. As noted by the Urban Land Institute, "Traditionally, the distribution of foods has been dependent upon the place of production. . . . As a result, warehouses and other types of industrial space were concentrated near manufacturing centers. Today, deciding where to locate distribution centers depends largely on access to suppliers and consumers" (4, p. 58).
- Quick response to real-time customer demands. Although production now takes place at the least-cost location globally, companies must still be able to nimbly respond to changing customer needs. Therefore, the ability to perform

the final customization happens as close to the market as possible. This trend is also reflected in the use of warehouses to serve NUMMI.

When production occurs overseas, the final assembly warehouse function tends to occur near major gateways and border crossings in the United States. These are logical stopping points in the global supply chain and thus serve as a place to add value to products. In accordance, significant warehouse and distribution center concentrations can now be found in New Jersey (Port of New York and New Jersey), southern California (Ports of Los Angeles and Long Beach), and at major border crossings (El Paso and Laredo, Texas). Interviewees noted that although Laredo has a population of approximately 200,000, the city contains 65 million square feet of space serving the United States and Mexico. New Jersey had 778 million square feet of industrial space, with more than 2.5 million square feet of additional space under construction at the end of the fourth quarter of 2003 (8). An example of value-added warehousing located near a major port, Lifetime HOAN, is presented later in this digest.

The growing economic value of such warehouses in connection with global transportation is also becoming noticed. In the 2000 *Economic Impact Assessment of the New York/New Jersey Port Industry*, 55,000 or 68% of the direct port industry jobs were in wholesaling and warehousing. More than 110,000 or 48% of the total job impacts of the port industry in the region were in wholesaling and warehousing (9). Instead of maritime cargo just passing through a region to its final destination, these warehouses represent a new economic value gained for the region hosting the port or gateway.

For this reason, some transportation and economic development agencies are pursuing value-added warehousing in connection with their macro-level freight transportation system. Many U.S. locations, such as Laredo, Texas, and Savannah, Georgia, are actively pursuing the attainment of these warehouses. The development of global freight villages or integrated logistics centers (ILCs), an offshoot of this concept, is discussed later in this report.

Increased Interest in and Size of Warehouses and Distribution Centers

Industrial real-estate development increasingly relies on warehouse and distribution center demand.

For example, one author in *Site Selection* magazine states that “in the Lehigh Valley area of Pennsylvania, about half of the area’s 41 new plants and expansions in 2003 were distribution related, a trend that echoed across North America” (10). Combined with the trends indicated previously, the facilities are of increasing interest to the economic development community.

Facility size is a growing consideration: Instead of shrinking with the introduction of JIT, modern warehouses and distribution centers are growing in size. With their new roles, warehouses and distribution centers can also serve different geographical areas. The largest of the newer distribution centers may serve all of North America from a single location, and smaller or regional warehouses may support customers in a more concentrated area.

At the large end of the scale, new distribution centers exceed 1 million and sometimes 2 million square feet. They also can employ hundreds of workers. Examples include:

- A \$200-million, 2.2-million-square-foot headquarters and distribution center in San Bernardino, California, for Stater Brothers (a regional grocery chain; 10);
- A \$55 million, 907,000-square-foot distribution center for Family Dollar in rural Jackson County, Florida (10);
- A 1.4-million-square-foot distribution center for General Mills in Harrisburg, Pennsylvania (11);
- A 1.35-million-square-foot distribution center for Target Stores in Columbus, Ohio, which will employ 900 workers (11);
- A 1.3-million-square-foot distribution center for Target Stores in Chambersburg, Pennsylvania (11);
- A 1-million-square-foot distribution center for Victoria Classics in Edison, New Jersey (11);
- A \$54-million, 1.2-million-square-foot distribution center for Wal-Mart in Mount Crawford, Virginia, which will employ 1,000 workers (12; the site has access to I-81, a major north–south corridor);
- A \$45-million, 1.35-million-square-foot distribution center for Target in Cedar Falls, Iowa, which will employ 900 workers (13); and
- A 1.7-million-square-foot distribution center for IKEA in Perryville, Maryland (near Baltimore), which will employ 300 to 400 workers (14).

Economic development agencies are beginning to pursue these distribution centers to fill a void left by a departed manufacturing operation or to reuse a “brownfield” site. For example, because of its location in an area that had suffered a series of plant closings and in anticipation of 1,000 employees, Wal-Mart obtained the types of economic development incentives more commonly found for production facilities as follows:

- Rockingham County, Virginia, provided \$1.5 million in incentives to extend utilities to the site and waived \$200,000 in fees.
- The Virginia Governor’s Opportunity Fund provided a \$1.5-million grant.
- The Virginia Department of Business Administration will provide workforce training for Wal-Mart’s new employees (12).

In a press release regarding the Wal-Mart distribution center, Virginia Governor Mark Warner noted that the project was the “largest single economic development announcement, in terms of new jobs created” to date for his administration (15), and that, “Today’s announcement is further evidence of Virginia’s world-class transportation network.” Wal-Mart was attracted by both the macro-level transportation system of the area and the micro-level improvements made for the site.

Global Freight Villages, Integrated Logistics Centers, and DistriParks

Economic development and freight organizations have begun pursuing the concept of ILCs. These specialized industrial and cargo-handling complexes are also known, particularly overseas, as Global Freight Villages and DistriParks. The concept brings together at least two forms of freight transportation (most often road and rail), may also be related to a specific airport or seaport, and contains value-added distribution centers and other logistics functions. All of these operations are located in a single integrated setting, and for a region the ILC concept provides an opportunity to leverage a local existing strength in macro-level freight infrastructure to secure the economic value associated with distribution centers.

More than a decade ago, the Port of Rotterdam realized that the key strength of being a major maritime complex serving Europe was its capacity to add value locally, rather than just seamlessly moving cargo. As a consequence, Rotterdam embarked

on a program of creating a system of DistriParks— inland depots designed to add value to its trade flows. Each DistriPark consists of a cargo transfer center, warehouses, product manipulation facilities, offices, and a variety of commercial services.

Similarly, the German Guterverkehrszentren (GVZs), or Global Freight Villages, are designed to expedite and add value to the cargo moving through them. The characteristics of GVZs include the following:

- Dedication to transportation and logistics operators, along with manufacturers and distribution centers;
- Service by a multiplicity of modes (road, rail, maritime, and air), including transshipment facilities;
- Location generally away from areas with conflict potential (e.g., residential areas), thereby allowing 24/7 operations;
- Provision of access to the macro-level transportation network and delivery points in urban areas;
- Offering of cost savings for the provision of certain services (e.g., electricity and telecommunications);
- Provision of public transit connections; and
- Establishment as public and private ventures. (16)

ILCs may also be part of foreign-trade zones, which are legally designated areas where products can enter before sale or distribution within the United States (customs fees are applied). In foreign-trade zones, imported products may be combined (e.g., radios in cars) or mixed with domestic products. The resultant goods can then enter the United States by paying the fees associated with the final product, or they can be shipped overseas without paying U.S. fees.

In the United States, some regions and developers are pursuing ILCs, either on undeveloped property or on previously used property. Railroad companies are pursuing ILCs because they provide an opportunity to create a density of receivers and therefore a critical mass for rail freight operations. Two ILC examples are the CenterPoint Intermodal Center (a brownfield reuse property) in Elwood, Illinois (near Chicago), and Alliance in Fort Worth, Texas.

CenterPoint Intermodal Center is located on the former Joliet Arsenal, a military facility that employed 8,000 people until it was decommissioned in 1976 (4, p. 110). The site is approximately 40 mi

from Chicago and is accessible by an Interstate highway. As a real-estate investment trust, CenterPoint acquired 1,850 acres of the site (also a SuperFund site) from the Joliet Arsenal Development Authority, along with an adjacent 350-acre farm that provided a direct link to the Union Pacific Railroad and another major local highway (17). A second railway company, Burlington Northern Santa Fe (BNSF), also was accessible from the 2,200-acre complex, and they decided to build a 621-acre intermodal (truck and rail) yard at the site.

The warehouse, distribution, and light manufacturing businesses on the property are drawn to the macro-level access by rail and truck and to the micro-level transportation access to the Chicago area market. At full build-out, CenterPoint is anticipated to have 12 million square feet of warehousing, 2 million square feet of distribution space, and 1 million square feet of light manufacturing (4, p. 111). The development will then employ 8,000 to 12,000 workers and generate annual tax revenues of \$27 million (4, p. 112).

The private sector investment in CenterPoint is estimated to be \$650 million over the 12-year build-out period, including \$125 million from a tax-increment financing plan provided by the city of Elwood (17). BNSF is investing \$140 million for its rail yard, and the state is contributing \$75 million for the construction of road, water, and sewer facilities.

The Alliance property was privately owned when the FAA considered acquiring part of the site in 1987 for a new airport to relieve congestion at Dallas–Fort Worth International Airport in Texas (4, p. 98). The ensuing negotiations and discussions led to the development of Alliance as an ILC.

The property has macro-level transportation access by an Interstate highway, two rail lines, and the first industrial airport constructed in the United States. The site is proximate to the Dallas–Fort Worth urban area and is centrally located so that it may take advantage of new trade generated by the North American Free Trade Agreement.

Alliance is divided into a series of developments, largely anchored by specific freight operations. For example, similar to CenterPoint, BNSF developed a 700-acre cargo and rail complex, along with a 25-acre auto unloading facility for Honda in an area known as Westport at Alliance. Distribution, warehousing, and auto users are located near the site.

Alliance is anchored by the industrial airport and primarily serves aviation tenants. Examples

include a Federal Express sorting facility and American Airlines' maintenance and engineering center. Two additional developments, Alliance Gateway and Alliance Commerce Center, focus on warehousing and distribution activities.

Access to and Expansion into Specific Global Markets

Access to markets has long been a consideration in site selection. What makes the current trend different is that access to market is also now a business practice designed to build customer awareness and local support for a product line. This trend can be industry or product-line specific. For example, on the basis of interviews, Toyota selected the San Antonio, Texas, location to have a physical presence in the large truck market in the area, and the new Toyota plant will produce their Tundra truck. The San Antonio location, according to the interviews, also helps position Toyota to enter the Central and South American markets.

The selection of Alabama for Hyundai's first U.S. plant also has been cited as an example. This South Korean corporation is seeking to become one of the five top auto companies in the world by 2010 (5). Interviewees noted that the company viewed the southeast United States as being a preferred market for their products. Hyundai Motors Chief Executive Kim Dongjin also noted in a news article that the site's proximity to the Port of Mobile was a significant factor (5). As in the case with Toyota, the port can be used to access the Central and South American markets.

The influence on area consumers of having a plant in the local community was demonstrated in a follow-up article that was written about the Hyundai plant. A local chamber of commerce director was quoted as saying, "You can see the impact [of the plant] in other ways. Local sales of Hyundai vehicles have doubled since the company announced it was coming here" (6).

One interviewee noted that this practice is world-wide. The example provided was an automobile plant in China: it was not only the labor market that attracted the plant to the area, but also the new access gained to the customer market in that part of the world.

Site Selection Research and Practices

Site selection is the process by which companies decide where to locate their facilities. The criteria and processes for site selection vary considerably, depending on the industry and facility type. Facili-

ties can also have variations that can affect the site selection process. For example, different criteria are applied for headquarters site selection than for support office site selection.

Although transportation is among the top considerations, other considerations can be of equal or greater significance. As discussed further later in this digest, labor considerations, such as availability and skill levels, are often of great importance in surveys of site selection criteria. In addition, matters such as proximity to market, telecommunications, community lifestyles, and utilities also can be top considerations.

This section discusses current methods of site selection (including changes to the process), variations among industry and facility types, and where transportation considerations fit into site selection.

Some trends that affect site selection have already been addressed in this digest, including the following:

- JIT and pull logistics;
- Supplier parks;
- Final assembly, customization, or product readiness performed at the warehouse;
- Increased interest in and size of warehouses and distribution centers;
- Global Freight Villages/ILCs/DistriParks; and
- Access to and expansion into specific global markets.

Two additional trends addressed in this section include the impact of new telecommunications needs and global site selection. Labor considerations, which have had a considerable impact on site selection, will be discussed in the next section.

Site Selection Process

The site selection process is closely tied with business objectives and strategies and consists of a series of analyses and decisions. The literature and interviewees revealed two recent developments. First, significantly more demographic, socioeconomic, and community and regional information can be easily accessed by means of the Internet for use in site selection analyses. Local areas, government agencies, and private sources post information on their websites, and Internet search tools are more fully developed. In the past, the collection of such data could be time-consuming.

Second, more consultants and tools are used. Instead of looking for information to make a decision, companies are hiring site selection consultants and

using analytical tools to mine the vast amount of information available. This is generally a private-sector process rooted in corporate requirements and objectives. On the basis of the literature and interviews, the site selection process involves several steps, which include:

- Defining the company's business strategy and the role of the facility in that strategy (what is driving the project?),
- Developing site selection criteria, beginning with a macro-level selection and followed by a micro-level or local-level assessment,
- Undertaking location-specific assessment, and
- Identifying three to four sites and beginning detailed discussions, including incentive packages.

The business strategies stage can include the following:

- Defining the corporate business plan and strategies.
- Reviewing facility alternatives, such as modernizing and expanding the existing location, expanding locally, expanding out of the region, expanding overseas, consolidating facilities or operations, and relocating the company.
- Specifying the purpose(s) of the new facility. Examples include introducing a new product, reducing costs, expanding the market area, building local market awareness of the product lines (as discussed previously), replacing an obsolete facility, and reviewing employee considerations (18).

The business strategy process can define the geographic search area and scope of the project (19). Macro-level transportation access and infrastructure are considered at this stage in the process. Geographically defining issues, according to one article, include items such as the following:

- Proximity to an airport, rail, port, or Interstate;
- Proximity to suppliers (although some interviewees believed that this could be mandated by some companies rather than a consideration);
- Time zone preference;
- Relationship to other company facilities;
- Relationship to competitor facilities; and
- Market access and center of sales activity (19).

Once the broad geographical area has been defined, then in-depth micro- or community-level site-

selection analysis takes place. The factors reviewed can be considerable; for example, the Conway Data site selection checklist is almost 90 pages in length.

Variations Among Industries and Facilities

As indicated by one interviewee, the site selection process depends on the company and product; specifically, is the product resource-based or dependent on certain types of labor and suppliers?

A resource-based product needs to be near the source of the raw materials. Transportation is a key consideration. One interviewee reported chemical plants were developed in Louisiana because of the proximity of raw material and water, in addition to low local tax rates. This was also illustrated by McCallum and Goldsmith (20) in an article about the plastics industry: "The plastic resins industry is concentrated primarily in the Gulf Coast region, due to the abundant supply of raw materials and intense petrochemical infrastructure. The basic building blocks, called hydrocarbons, are derived from petroleum or natural gas, and are in abundance in this region" (20).

The need for specific labor skills can be a significant determinant in site selection today. The literature and interviews indicated that lower unemployment rates, coupled with the need to retain employees, require the review of additional location-specific criteria during the site selection process. This is discussed in the next section on labor market trends. The variation in site selection considerations is illustrated through the following examples.

Medical Device Industry. "Five essential factors for all OEMs' [original equipment manufacturers] site selection checklists are: availability of labor force, cost of doing business, regulator environment, transportation network, and community attitude and assistance" (21). A highly skilled, well-educated workforce was considered to be an essential consideration by Dray (21). Transportation considerations cited in the Dray article are addressed here:

As the medical device industry becomes more global, it is increasingly important for firms to be part of a transportation system that can move people and materials both locally and throughout the world. Companies should investigate the accessibility of the region's Interstate Highway System, railroad networks, and airport. A convenient and continually developing transportation infrastructure in proximity to major trade corridors, and offering access to major markets, as well

as to product suppliers, is critical to companies attempting to streamline their supply chain. . . . In the medical device industry, proximity to a major international airport is often the most important transportation consideration, allowing next-day delivery of products around the globe (21).

Plastics Industry. Plastics processors showed a marked sensitivity to transportation time and cost, the quality and cost of the workforce, the reliability and cost of energy, and the business climate (20). With regard to transportation considerations, McCallum and Goldsmith state,

Excellent transportation infrastructure, then, is a prerequisite to the successful operation of a plastics manufacturer (and a key site location factor). Whether raw materials to the processors are delivered via rail or truck, the infrastructure must be able to support the most reliable, consistent and flexible means of delivery needs unimpeded by potential delays. Factors to look for include direct access from either mainline rail routes or Interstate highway corridors with interconnects that allow raw material to be delivered expeditiously with the minimum amount of handling or rerouting and consequently cost (20).

Electronics, Software, and Biotech Industries. Angelou (22) highlighted how the changing business climate and global nature of the market have affected site selection:

Few industries are so globally-driven as the technology industry. . . . Prior to 2000, technology relocations or expansions were closely tied to a search for a quality, competitive labor supply in a tight environment. Now, site selection has been expanded to achieve higher, more strategic purposes over the long-term. Site selection for the technology industry has now become the lifeline to new capital, new markets, and new research (22).

Angelo (22) cited key site selection considerations as follows:

- Access to a pool of highly educated, talented, and technically skilled workers (considered vital);
- Access to research universities with enrollment and degrees conferred in engineering, life sciences, business, and computer science;
- Competitive business climate, including the tax environment, the entrepreneurial and net-

working environment, and the proximity of venture capital firms;

- Utility costs for manufacturers and large consumers of electricity; and
- Air travel among locations.

Pharmaceutical Industry. Brandwein (23) noted six site selection considerations:

1. Labor: “For pharmaceutical companies, a skilled workforce with experience in the life sciences or healthcare field is clearly the overriding factor when choosing a site.”
2. Facility considerations, including expansion potential and exit strategies.
3. Community considerations.
4. Governmental gratuities, including incentive packages, the ability to fast track projects, regulatory approval time, tax structures, and regulations.
5. Availability, cost, and reliability of utilities.
6. Transportation, including “getting products to the market with convenient access and great ease.” Other considerations noted were access to Interstate highway systems, availability of suitable port and waterway facilities, access to railroad services, and supplier accessibility.

Aerospace Industry. Boeing Corporation, after announcing that the United States would be the location for the final assembly of their new 7E7 Dreamliner aircraft, released their general set of site selection criteria (Appendix B). Ultimately, the company selected Everett, Washington, a suburb of Seattle, for the facility. Washington State will provide a \$3.2 billion incentive package (24).

Impact of New Telecommunications Needs

The experts interviewed highlighted the growing importance of telecommunications in site selection. Telecommunications is generally measured in terms of availability and bandwidth. Given its role in the movement of information, several of the interviewees and some of the literature concluded that telecommunications should be considered as a form of transportation, placed on par with transportation investment considerations or, in some cases, considered more important than transportation investment. The article by Drabenstott (25) stated the following:

- “In our infrastructure initiative its ‘road, rail and information.’”

- “Highways are widely viewed by public officials as an infrastructure tonic. Transportation is always an important consideration. Yet, other types of infrastructure may even be more important in the future . . . Telecommunications is the most obvious.”

Telecommunications availability and bandwidth have become an essential element for businesses and people. For businesses, telecommunications, combined with advances in information technology, is the backbone for nearly every operation. Telecommunications enables JIT logistics management and connects facilities and staff.

Telecommunications infrastructure has become a critical element in attracting businesses to an area. The interviews and literature point to the importance of telecommunications, for example, in attracting back or support office operations, logistics and warehousing operations, call centers, and key service industry sectors (such as banking).

Telecommunications also allows business operations to be located throughout the world and work in synergy, a practice referred to in the press as “outsourcing or offshoring.” For example, from *The Wall Street Journal*, “Electrolux AB joined the list of Western companies outsourcing back-office services to India, announcing plans to route calls from U.S.-based customers to its call center in New Delhi” (26, A1).

Global Site Selection

Business decisions are driven by cost considerations. Overseas locations may represent cost savings and new market opportunities for U.S. companies. In addition, some countries are aggressively pursuing business opportunities or moving to more actively participate in the global marketplace. For example, one interviewee noted that India intends to be the second largest economy in the world by 2020. The interviewee noted that China is also making huge investments and sending large numbers of students to the United States to be educated.

Accordingly, site selection has gone global. The negative affects include increased competition for facilities and job reductions in certain businesses and areas. The positive implications include overseas companies seeking U.S. locations to expand their presence in the North American market, and increased opportunities resulting from joining of the production and distribution processes.

Numerous articles have documented the affect of offshoring. For example, an article in *The Wall*

Street Journal noted that “‘There’s a clear impact on the real estate sector from the offshoring trend.’ says Dale Anne Reiss, global director of real estate at Ernst & Young LLP in New York. ‘We’ve already seen office demand equivalent to the central business district of Tampa move overseas,’ she says, ‘and at a faster rate than previously anticipated’ (27, B4).

Offshoring most affects secondary or tertiary markets, or those that serve certain business segments such as back office operations or call centers (27, B4).

The rise of the global economy, combined with improved telecommunications and logistics, can translate into various business functions being located in different countries. For example, “a computer manufacturer may have its headquarters and engineering in San Jose, manufacturing in Austin and Taiwan and back office in Phoenix or Bangalore, India” (22).

One positive outcome of global site selection is that overseas companies are also seeking U.S. locations. Hyundai’s \$1 billion investment in an auto assembly facility in Alabama, for example, was described previously. As another example, in 2004, European mobile communications company Nokia selected Westchester County, New York (a suburb of New York City) for a 300-worker office, which will serve as a unit headquarters, as well as the office of the company’s chief financial officer (28). The location is designed to give Nokia’s chief financial officer ready access to New York’s capital markets. Some U.S. cities and regions are actively pursuing foreign investment as part of their economic development strategy.

Transportation in Site Selection: How Does Transportation Fit In?

Although site selection considerations vary, several factors always appear to gravitate to the top of the list. Transportation, particularly macro-level access for passengers and freight, generally appears in the top four or five.

As demonstrated in Table 2, in the final decision regarding particular sites, the leading factors can include incentives, labor cost, and the availability of skilled labor. The information in the table is from an annual survey of corporate site selection executives and includes 114 responses.

Although only six of the interviewees responded to the question regarding how they ranked the various site selection criteria, the results are somewhat similar. The top considerations in site selection were: (a) availability of labor, (b) labor skills, (c) highway

Table 2 Site selection and quality of life factor rankings for 2002 and 2003

Ranking	Factor	2002 Rating (%)	2003 Rating (%)
<i>Site Selection</i>			
1	State and local incentives	88.0	92.7
2	Labor costs	89.9	89.7
3	Availability of skilled labor	90.9	89.0
4	Highway accessibility	86.6	88.9
5	Occupancy or construction costs	82.4	86.3
6	Tax exemptions	88.2	86.2
7	Corporate tax rate	84.6	85.1
8	Energy availability and costs	80.9	80.8
9	Proximity to major markets	83.7	80.0
10	Availability of land	75.2	78.1
11	Availability of telecommunications services	76.1	77.9
12	Cost of land	74.0	77.3
13	Environmental regulations	76.7	72.9
14	Low union profile	69.4	71.6
15	Availability of broadband telecom services	66.7	67.4
16	Right-to-work state	58.0	60.8
17	Proximity to suppliers	61.8	58.5
18	Availability of long-term financing	60.0	57.5
19T	Raw materials availability	56.0	55.8
19T	Availability of unskilled labor	55.1	55.8
21	Accessibility to major airport	54.0	53.1
22	Training programs	44.7	47.3
23	Proximity to technical university	33.4	34.0
24	Railroad service	22.6	27.9
25	Waterway or oceanport accessibility	19.3	18.5
<i>Quality of Life</i>			
1	Low crime rate	75.9	69.8
2	Health facilities	67.2	64.2
3	Housing availability	64.2	59.0
4	Ratings of public schools	65.7	57.3
5	Housing costs	63.0	56.3
6	Climate	43.5	49.5
7	Colleges and universities in area	48.1	49.0
8	Recreational opportunities	45.9	47.9
9	Cultural opportunities	46.3	46.3

Note: All figures are percentages and are the total of “very important” and “important” ratings of the *Area Development* corporate survey. Figures are rounded to the nearest 10th of a percent.

Source: Gambale, G., “2003 Corporate Survey: A Look at the New Mindset,” 18th Annual Corporate Survey, *Area Development Site and Facility Planning*, Dec. 2003 [Online]. Available: www.area-development.com/FrameCorpSurvey.html.

access, (d) proximity to markets, (e) labor costs, and (f) land costs. The interviewee rankings are shown in Appendix C.

Labor Market Considerations

Labor was often cited as the top consideration in site selection. As one interviewee stated, “Work-

ers can be the most important thing you select in a location.”

The reasons for the rise of labor considerations include the use of more skilled or specialized workers in businesses today, the low unemployment rate in many areas, and a new emphasis on employee retention. One interviewee noted that “[t]here is a cost in turning a company’s labor force. A failed em-

ployee [one that leaves] costs three times the amount of keeping an employee.”

This section looks at labor market considerations, key trends, and the role of transportation. Some of the trends affecting labor market considerations, such as supplier parks and global site selection, have already been discussed. Three additional trends will be discussed in this section.

- Increased importance of community infrastructure and quality of life factors,
- Growing importance of passenger aviation service for corporate executives and business visitors, and
- Need for transit and commuter options for workers.

Labor considerations vary by type of worker. Executive staff has certain requirements and transportation considerations. Skilled staff has certain requirements, and the general workforce also have considerations. Based on the interviews and literature, these considerations can be diagrammed (Figure 1). The shape is based on an interviewee’s comments.

The discussions and literature indicate that local lifestyles, school systems, university access, and general community feel can significantly affect whether key executives and skilled labor will work in a particular area. This is also true of the general workforce, because communities with certain characteristics are more likely to attract certain types of workers.

As depicted in the figure, access to transit and commute times is a key concern for the overall workforce (the base of the pyramid). Commute times of approximately 20 min and access to transit options are among the key considerations.

Skilled labor, according to the interviews and literature, also seek locations that offer high quality of

life and education systems. Executive staff and visitors to the executive offices, at the top of the labor pyramid, additionally seek access to scheduled air passenger service (preferably direct service) and corporate airfields to facilitate business travel. This is particularly important for international travel. Each of these trends is detailed here.

Increased Importance of Community Infrastructure and Quality of Life Factors

Transportation considerations, such as journey-to-work commute times and access to public transit, are not the only considerations in labor force decisions. Certain community characteristics are essential for attracting certain types of workers, as noted in the literature and interviews. “The intended site needs to have an economy that is rich and diverse enough to provide long-term careers for both spouses. The community must have an equilibrium between income and housing costs, access to the most selective colleges for the knowledge workers’ children, low commute times, and a welcome-ness to diversity” (29).

The importance of community characteristics was also illustrated in the criteria that Boeing applied to select its new corporate headquarters:

Among [the factors] were Chicago’s air transportation infrastructure (O’Hare and Midway); advanced telecommunications; big city quality of life; diversified human capital that emerges from a diversified economy; affordable housing; access to engineering graduates and MBA’s from nearby colleges and universities; and an urban core that does not shut down at 6 o’clock every evening (30).

The resulting concentration of knowledge and skilled workers is an important consideration for site selection.

- Virgin USA Chief Executive Fred Reid on the company’s dual selection of New York, New York, and San Francisco, California, for headquarters: “Culturally, both New York City and San Francisco reflect the Virgin brand’s fun, dynamic style, making it an ideal place for us to recruit creative, skilled employees who can deliver on our vision of outstanding customer services” (31).
- From an article on where to find knowledge workers: “Scandinavia has always done well because its cities have developed clusters that

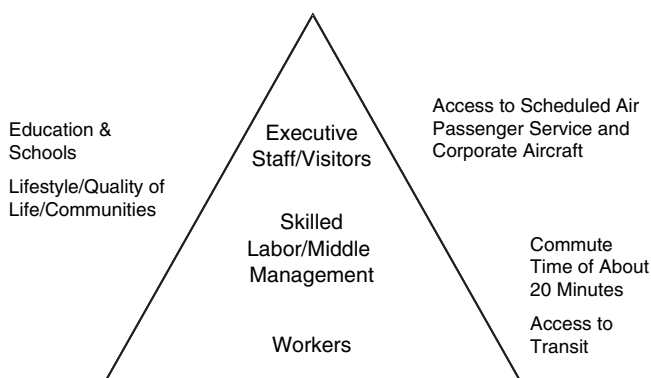


Figure 1 Labor market considerations.

offer a high quality of life, great educational institutions, and cultural amenities” (32).

- From an article on Novartis AG (a Swiss pharmaceutical company) selecting Cambridge, Massachusetts, for its worldwide research headquarters: “San Diego and San Francisco were the other two finalists for Novartis’ research headquarters, Novartis Chairman and CEO Daniel Vasella said. Cambridge won out because of its scientific talent pool, high-quality academic base and comparative proximity to Europe” (33).

Growing Importance of Passenger Aviation Service for Corporate Executives and Business Visitors

As noted in the site selection section, macro-level passenger aviation service is a crucial consideration for locating facilities with executive staff or with international business connections. With the advance of the global economy, this requirement will most likely become more crucial in the future.

The following are examples of corporate decisions where aviation services for executive staff significantly influenced the location decision:

- On Boeing’s selection of Chicago: “The third and, perhaps, deciding factor, is Chicago’s central location—closest to New York of the three finalists and yet only a half-day’s travel time by air to Seattle . . . When your company CEO spends 80 days of the year traveling in the air, as Condit did last year, it pays to move him closer to the places where deals get done” (30).
- On Newell Rubbermaid’s selection of Atlanta, Georgia, for its new headquarters location: Newell Rubbermaid CEO Joe Gallie commented in an article, “Why did we select Atlanta? Atlanta offered us great proximity to our key customers, particularly Home Depot. Atlanta offered us the ability to easily travel nationally and internationally, particularly to Europe, Asia, and Latin America” (34).

Need for Transit and Commuter Options for Workers

The increased focus on worker retention has led to greater consideration of the amount of time and the options available for employee commuting. Several interviewees noted that the desired commuting time was less than 30 min and, preferably, less than

20 min. Some described companies that selected sites based on the availability of public transit or that established their own bus or van pool systems to assist employees with their commutes.

One example was Best Buy’s institution of commuter options for its workers at its new Richfield, Minnesota, headquarters outside Minneapolis. The new development was designed to bring together employees who were scattered among several facilities in the area. “A key issue was retaining our existing employee base. We did a scattergram and found out where the centroid was” (35). The company also hired a full-time transportation coordinator.

There is also an interesting context to the Best Buy location decision. A Minnesota Public Radio discussion on congestion in the Twin Cities area focused on Best Buy’s headquarters and its location on the busy I-494 corridor (36). While noting that the location was chosen based on its central location to existing employee residences, the discussion also highlighted the community’s concern regarding the potential impact of the new headquarters on the I-494 corridor. Minnesota Public Radio noted that Best Buy pledged to make its new campus accessible to buses, and that the company had agreed to encourage employees to consider alternative ways to get to work. Interestingly, from a site selection perspective, the discussion also noted that “[t]here have been several companies that have reconsidered the 494 corridor as a location and have moved to areas that are either more easily accessible or have highway infrastructure that is more modern” (36).

From another perspective, where transportation has been improved, the effective labor shed increases. This helps employers access a larger pool of prospective applicants. The improved transportation also helps job seekers, many of whom believe they are underemployed, to access a larger pool of prospective employers. These two factors tend to result in better matches between employers and employees and, at the margin, reduce other business costs such as absentee days and training.

Urban and Rural Development Practices

This section looks at some urban and rural development practices. Many have already been discussed.

- Supplier parks—Supplier parks increase the economic benefits of attracting a major assembly operation to a rural area.

- Final assembly, customization, or product readiness at the warehouse—This trend offers increased opportunities for urban areas around gateway ports and key border crossings.
- Increased interest in and size of warehouses and distribution centers—Warehouses and distribution centers can be new opportunities for rural areas, as well as for potential users of brownfield sites in urban areas.
- Integrated logistics centers—ILCs may develop near urban areas where there is a convergence of freight transportation options and large parcels of available industrial property.
- Impact of new telecommunications needs—Telecommunications infrastructure is considered a key initiative for rural areas and is discussed further in this section.
- Global site selection—Similarly, global site selection has potentially created a more difficult competitive environment for rural areas. The additional implications of global site selection for rural areas are discussed later.
- Growing importance of passenger aviation service for corporate executives and business visitors—Regions with concentrations of direct domestic and international air passenger service, as well as corporate aviation facilities, will benefit from this trend. Areas, particularly rural areas, without such service are affected.
- Need for transit and commuter options for workers—Commuter options and travel times are important in any setting, according to the interviews. Commute times of less than 20 to 30 min are most desired in both rural and urban settings.

This section will also discuss the following trends and developments:

- For rural areas: New business attraction strategies in rural areas, including shifting focus away from industrial and commodity production.
- For urban areas: Brownfield and property redevelopment.

Impact of Global Site Selection and Telecommunications on Rural Areas

The general conclusion from the literature and interviews is that rural economic development has been most affected by the globalization of the site selection process. As one article noted, “Put simply,

rural America’s claim to low-cost land and labor is being challenged by foreign locations that are even *less expensive*” (37). This article noted two amplifications on the global challenges facing rural areas. First, the impact of plant closings has been greater in rural areas than in urban areas. The article noted that factory closings, in part owing to globalization, represented 45% of total mass layoffs at factories in rural areas, compared with 25% at factories in metropolitan areas.

Second, research indicated that rural factories focused on such commodity products as food, textiles, lumber, furniture, and paper. In contrast, factories in metropolitan areas tended to be more technologically intensive (e.g., involved in the production of chemicals, equipment, and instruments). The article’s conclusion was that U.S. technology could better compete in world markets, whereas the commodity focuses of rural factories were more susceptible to global competition.

Competing on the basis of 21st-century technology has become a critical tool for rural areas. Just as telecommunications opened up global opportunities, telecommunications infrastructure such as broadband is seen as key to increasing the competitiveness of rural areas. Telecommunications is seen as being as crucial to rural economic development today as transportation access was in the past.

Indeed, the federal government has created programs to assist rural areas in obtaining telecommunications capacities. The U.S. Department of Agriculture, which also focuses on rural development, inaugurated the Rural Broadband Loan and Loan Guarantee Program in January 2003 (38). For FY 2003, \$1.4 billion in loans and loan guarantees was made available to provide broadband services in rural communities. The program as described on the U.S. Department of Agriculture website was designed to facilitate deployment of new and innovative technologies to provide two-way data transmission of 200 kbps or more in communities with populations up to 20,000.

The broadband investment has been successful in attracting certain back-office operations, such as call centers. Call centers have been the frequent topic of global offshoring articles, as previously noted. However, improved technologies, available labor pools, and buildings in rural areas, combined with quality concerns, some cost issues, and political backlashes of offshoring, have combined to make U.S. sites attractive again. As an article in *The Wall Street Journal* commented:

India doesn't offer many bargains when it comes to real-estate development costs. Often the cost of upgrading infrastructure overseas is comparable to, if not more costly than, such costs in the U.S. Small towns often have vacant warehouses and supermarkets that are suited to call centers' wide-open layouts. And rural communities in the U.S. have been wired with high-bandwidth fiber-optic cable over the past decade, allowing for more traffic and cheaper calls. That isn't the case in India. 'When you go to India, usually your telecom cost is higher than your labor cost' (39, B1).

The selection of small towns for domestic call centers also appears to consider other site criteria:

- Quality of life and quality of labor—"In Coeur d'Alene, a lakeside resort town, mining and logging jobs are disappearing, but the population is growing. 'Unemployment keeps creeping up, but people keep moving there because of the quality of life,' says U.S. Bank's Scott Hanson. Residents have a good service ethic, he adds. 'Talk with them on the phone and you can hear the smile in their voices.' "
- Available labor force—Many small towns have lost manufacturing plants but are still home to eager work forces. One rural town had a program with the local community college to train workers for call centers.
- Better worker retention—The article notes that call center turnover can be as high as 100% annually. However, researchers at Purdue University found turnover and worker performance to be much higher in small rural areas than in metropolitan areas (39).

New Business Attraction and Economic Development Strategies in Rural Areas

In the more challenging global competition for economic development opportunities several new strategies have been suggested for rural areas. The new strategies include:

- Determining which links in the value chain of cluster strategies rural economies are best positioned to enter or compete for. One article pointed out that clusters and networks of businesses and people were the same factors that sparked the dynamic and successful urban technology corridors (40).
- Creating multi-jurisdictional arrangements to create a greater-sized entity for marketing

and for facilitating projects. Working together, clusters of areas may be able to more aggressively market their region. As an example, "The Quad Cities straddling Iowa and Illinois represent a region that spills across the two states and the boundaries of more than eight cities. Yet, the region is now discovering that its future depends importantly on its ability to serve as a distribution center for a variety of products. Being a world-class logistical center is all about passing through jurisdictions as quickly and efficiently as possible. In much the same way, achieving that goal may mean transcending the many city limits that have defined the history of the Quad Cities" (37).

- Developing niche markets or specialty branding for an area. Examples from the literature include the historic branding of certain wine areas of France (e.g., Champagne) and Napa Valley, California (37); a relationship formed between Yakima Valley hop farmers in Washington State, a regional processor, and the multi-national brewing industry (40); and developing new industries from existing resources and strengths, such as "wildlife recreation" (which was defined as including hunting, fishing, and wildlife viewing) (41).

Brownfield and Property Redevelopment

Urban areas are densely developed and increasingly facing a scarcity of new land, or "greenfields," for development. However, urban areas also are likely to contain fallow properties that were formerly used for primarily industrial purposes. These sites may be underutilized or may be environmentally contaminated from their previous uses.

Although these brownfield sites may have been considered eyesores in the past, they now represent new opportunities as sites for economic development, particularly for areas reaching full build-out. "I can't tell you how many times I've picked up the phone and heard someone say, 'We've run out of clean land, can you find us a brownfield to build on?' " (42).

An assessment of brownfields redevelopment by the Council for Urban Economic Development (now known as the International Economic Development Council) reached the following conclusions (43):

- Industrial development, primarily light industry, remains the most common form of brown-

field reuse. Manufacturing and processing areas are also popular reuse options.

- Residential development is a small but fast-growing segment of the market. However, contaminated property must meet stringent cleanup requirements that may be cost-prohibitive for this type of redevelopment.
- Recreational and cultural redevelopment has a strong track record for reuse. However, the study noted that these projects tend to be primarily funded by the public sector because they serve public-sector purposes.
- Brownfield redevelopment occurs in economically disadvantaged areas.
- Infrastructure costs represent a small percentage of total project costs if land use does not change. In other words, brownfields can be of use to the existing infrastructure, a savings for urban areas.

In addition, a report on the potential reuse of brownfields for warehouses and distribution centers for the North Jersey Transportation Planning Authority, a metropolitan planning organization whose jurisdiction includes some of the oldest urban areas in New Jersey, found that brownfields must meet the same site selection criteria as greenfield sites—appropriate site size and conditions, cost, time frame for site approvals and preparation, and transportation access:

- The size of the brownfield property must be sufficient to build the warehouse or distribution center.
- The cost of the site, including property acquisition, mitigation, approvals, and preparation, must be reasonable enough to allow the charging of the market lease rate or purchase price for warehousing space in the area.
- Speed is of the essence in warehouse development. Warehouse operators demand an aggressive timeline for the completion of new buildings, often requiring that new facilities be constructed and operational in less than a year. Unless a specific time frame for mitigation and site approval can be guaranteed, brownfield sites will not be as attractive as greenfield sites for warehouse development.
- Good transportation access between the brownfield and the region's freight network is crucial to the viability of the site. Transportation access can include proximity to highway entrances,

local road conditions, and access to rail yards and intermodal terminals. (7, pp. i–ii)

The North Jersey Transportation Planning Authority report also noted that because brownfield sites tend to be located closer to the urban core, Port Newark–Elizabeth, and Newark International Airport, these sites could be of increasing importance to those warehousing operations that require close proximity to the regional market and these major transportation hubs. The locational advantage of brownfield sites may also provide greater access to labor and reduce trucking time and cost. The sites' greater access to labor stemmed from their location in existing communities and, in some cases, their access to existing public transit connections.

Indeed, brownfields are moving into redevelopment. Examples include a proposal to develop 5 million square feet of new warehousing and distribution center space on a 300-acre brownfield site near Port Newark–Elizabeth, the largest container port on the East Coast (44, p. 31), and numerous retail store developments by major companies including Wal-Mart, Home Depot, and IKEA.

International Market Trends and Implications

Global trade is growing. According to FHWA, international trade is forecasted to grow faster than domestic goods movement and to nearly double by 2020 (45). All of the international trade and global market trends have been discussed:

- JIT and pull logistics—JIT has increased the need for predictable and efficient transportation connections regardless of whether the move is domestic or international.
- Supplier parks—Overseas suppliers are more likely to locate facilities near assembly plants of the same nationality. This is also an example of foreign investment in U.S. economic development.
- Final assembly, customization, or product readiness at the warehouse—With production taking place in the least-cost location and the need to do final customization near the customer, there is increased international trade and growing demand for distribution centers in the vicinity of ports and key border crossings. These new warehouses and distribution centers represent new economic development opportunities for these regions.

- Increased interest in and size of warehouses and distribution centers—Distribution centers are getting larger as the facilities handle increasing amounts of overseas goods, combine them with domestic products, and send them to larger market areas. With the optimal size of distribution centers growing and the goal still that facilities handling international goods are as close to ports and border crossings as possible, areas face the problem of finding appropriately sized and priced properties and ensuring good connectivity with the port or border crossing. In New Jersey, efforts are being made to develop warehouses on former brownfields within close proximity of the port, as well as identify transportation improvements to improve access to these “first place of rest” locations. An example from New Jersey is profiled in the next section. Other ports and key border crossings are also marketing larger-sized distribution center space.
- Integrated logistics centers—The ILC concept started overseas and is being introduced throughout the United States. The concept combines international trade, logistics, and economic development in a single location. ILCs can be designated as foreign trade zones to attract international trade activity. A foreign trade zone is “a restricted-access site in or near a port designed by the government of a country for duty-free entry of non-prohibited goods; merchandise may be stored, displayed, used for manufacturing, etc., within the zone and re-exported without duties being paid” (46).
- Access to or expansion into specific global markets—Access to specific markets is no longer just a transportation consideration. It is also a corporate strategy to build local product recognition and increase global market share.
- Impact of new telecommunications needs—The rise of telecommunications, along with advances in information technologies, has facilitated growth in international trade. New technologies link facilities in different countries and have aided in making site selection occur at a global level.
- Global site selection—With the rise of new technologies, companies can now seek the best locations worldwide for their operations. As

previously discussed, companies may locate their headquarters, research, back office, and production facilities separately in countries that best meet their site selection requirements.

- Growing importance of passenger aviation service for corporate executives and business visitors—As previously noted, regions with concentrations of direct domestic and international air passenger service, as well as corporate aviation facilities, will benefit from this trend. Areas, particularly rural areas, without such service are affected. International connectivity (a macro-level transportation system characteristic) is particularly important for firms with facilities in multiple countries.

PROFILES OF FOUR ECONOMIC DEVELOPMENT SITUATIONS

This section profiles four examples of economic development trends and situations, along with the role of transportation in each. The four profiles are:

- The new Toyota Tundra assembly plant in San Antonio, Texas.
- Laredo, Texas, and its continuing development as an international trade center (including the construction of the World Trade Bridge).
- Value-added warehousing and the Portway Project in New Jersey.
- New Wal-Mart distribution centers in Wisconsin.

The first profile is of a single, large economic development project where transportation investments are being made as part of the incentive package. The second looks at a city where the economic development is clearly driven by macro-level transportation connections and investments. The third profile reviews an economic development opportunity in a state that is also densely developed and wants to reuse its brownfields. The transportation investments would be proactive in this third example. The fourth profile highlights the micro-level transportation system discussions and improvements associated with locating three distribution centers in Wisconsin.

Each profile contains a list of the economic development trends represented, an overview of the development, and a review of the roles played by transportation access, infrastructure, and investment in each situation.

Toyota Motor Manufacturing, Texas, Inc.

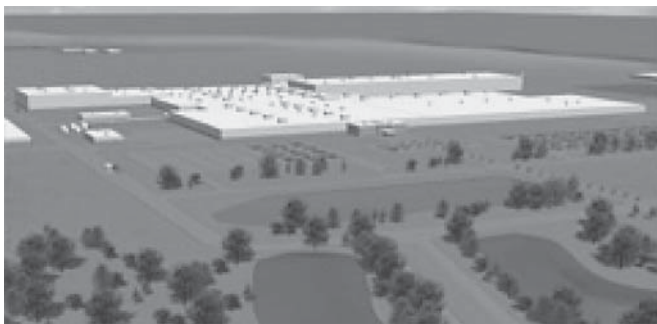
The economic development trends represented in the Toyota Motor Manufacturing, Texas, Inc. (TMMTX) profile include JIT and pull logistics, supplier parks, access to and expansion into specific global markets, and setting up training programs for the local labor force. The profile also illustrates site selection and international trade considerations.

Description of TMMTX Project

The project, announced in February 2003 and completed in November 2006, produces Tundra full-size pickup trucks. According to Toyota, the new plant:

- Is situated on a 2,000-acre site;
- Required a corporate investment of approximately \$800 million;
- Employs approximately 2,000 workers;
- Is expected to have an annual payroll of \$37.4 million;
- Produces 150,000 Tundra pickup trucks annually; and
- Includes operations such as stamping, body welding, plastics, and assembly (see Figure 2) (47).

As is the practice at other Toyota assembly plants, TMMTX is a JIT operation. The literature notes that the San Antonio site, similar to the Toyota NUMMI site in California, is somewhat distant from Toyota's suppliers. However, based on published reports, it appears that the plant will be supported through a combination of approaches, including the development of an adjacent supplier park, imports through the Port of Houston, and deliveries from supplier



SOURCE: <http://www.toyota.com/about/operations/manufacturing/texas/photogallery.html>.

Figure 2 Rendering of the TMMTX Plant, San Antonio, Texas.

plants and facilities in the United States and Mexico. The San Antonio location is within a day's drive of Mexican suppliers and the distribution facilities in Laredo. As previously discussed, suppliers can be within a 400-mi radius of the plant. One interviewee did note that Laredo would likely benefit from the TMMTX development.

In March 2004, Toyota announced that several of its automotive suppliers would set up operations on their TMMTX site (48). Illustrating the additional economic development value of supplier parks, the announcement indicated that the supplier companies would generate an additional 1,000 jobs at the site and invest at least \$100 million for buildings and equipment.

In the press release, TMMTX president Hidehiko Tajima noted, "We appreciate these suppliers' willingness to locate operations in San Antonio" (48). From a site selection standpoint, the development of the supplier park also illustrates two points. First, as some of the interviewees noted, "access to suppliers," a common site selection criterion, can be mandated or encouraged by major companies. Second, use of the TMMTX property addresses the concern raised by interviewees that opportunities were lost because land prices rose too quickly in their areas to secure supplier parks. Mr. Tajima noted in the press release that "this will be the first time Toyota or any other automaker has had so many automotive suppliers actually on plant property" (48).

It is clear from the literature and interviews that access to the market and building local brand recognition were perhaps the most important criteria in selecting San Antonio for the Tundra production facility. Toyota Motor Manufacturing North America Senior Vice President Dennis Cuneo noted that Texas is the largest U.S. market for full-size pickup trucks: "We don't have a very large share of the Texas full-sized pickup truck market. It's only about 4 percent. We expect that when we start building them here, Texans will start buying them" (49).

The interviewees also noted that the San Antonio location provided Toyota with potential access to the Central and South American markets, which could become important for building global market share.

In terms of site selection, dual-rail freight service (service by at least two Class I or North American railroads) to the location was considered a critical factor (49). By having two Class I railroads competing for the plant's business, costs can be lowered. Provision of that service became part of the incen-

tive package—state funds are being used to build a second rail spur to the site. The Toyota plant is anticipated to generate 150 rail cars of new business daily for the Class I railroads (50).

The TMMTX project received a \$133 million incentive package that included the following provisions:

- \$27 million to train the plant’s workforce,
- \$47 million in phased-in taxes and waived fees,
- \$15 million for site utility infrastructure,
- \$15 million for rail tracks,
- \$14 million for land acquisition,
- \$10 million for site preparation, and
- \$3 million for a city-provided job-training center (49).

The TMMTX development has been the subject of several economic-impact studies. As noted by the Federal Reserve Bank of Dallas, the estimates of the total economic impacts accruing from the plant ranged from 7,300 jobs for Bexar County to 16,000 jobs for the state (51). Federal Reserve Bank analysts suggested caution in the assessment, specifically focusing on the anticipated employment derived from suppliers to the plant and a concern that multipliers could be overstated. Their comments included the following:

- Industries new to an area tend to initially have low multiplier effects. Most suppliers will wait to see if other manufacturers relocate, which would make it more cost-efficient to build a new plant rather than ship products from an existing one.
- Possible Toyota suppliers have or are building plants within the 400-mi delivery radius, including several large plants in Arkansas, Alabama, and Mexico. There is also a supplier plant being built in Georgetown, Texas, outside of the San Antonio metropolitan area. The analysts speculate that many suppliers will therefore locate or expand outside the local area or possibly Texas.
- The announcement of 10 suppliers and 1,000 additional jobs next to the TMMTX plant was viewed as representing the bulk of the new permanent indirect jobs resulting from the project.

The Federal Reserve analysis did note that the plant would have the latest technology and could expand production in the future.

The economic impact studies focused on job generation and tax revenues. In one article, Texas

Governor Rick Perry noted that the TMMTX plant would generate \$300 million in state sales and franchise tax revenues during the next 25 years and that the incentives given to the plant would yield an 18.3% return over 10 years (49). Another article noted that the plant site would be annexed to the city of San Antonio so that residents could immediately benefit from school and other taxes (52).

Transportation’s Relationship to the Project

Transportation’s specific roles in attracting this economic development project were two-fold. First, macro-level transportation access connected Texas with suppliers in the United States, Mexico, and overseas. Although the existing macro-level system attracted Toyota, improvements were necessary as illustrated by the need for rail service and use of the Port of Houston. Second, TMMTX was an economic development opportunity requiring a response by public agencies in Texas. In this example, the transportation investments were made reactively to the project. Micro-level transportation access investments became part of the incentive package, along with other investments by the state. This is an example of “seal the deal.”

Texas allocated \$15 million to build a new 6- to 7-mi rail spur to the plant. The construction of the line is being done through the Bexar County Rail District, established in November 2002. The total cost is estimated at between \$20 and \$25 million (50). The Real Estate Center at Texas A&M University noted that the rail line could also become the centerpiece for an industrial district and additional job growth (53).

The Real Estate Center also noted that the Texas Transportation Commission approved \$17.6 million to upgrade roads in Bexar County that will serve TMMTX in March 2003.

Laredo, Texas: Continuing Development as International Trade and Distribution Hub

Located on the north side of the Rio Grande, Laredo is an example of an area that historically has been a key border crossing between the United States and Mexico. Macro-level transportation links and international trade, combined with available inexpensive land and labor, has enabled Laredo to develop as a center for warehousing and distribution activity.

The economic development trends represented in this profile include international trade and global commerce; final assembly, customization, or product readiness at the warehouse; and access to and expansion into specific global markets.

History of Laredo: Always on the Trade Route

For centuries, Laredo has been a key location for crossing the Rio Grande, starting with the Paso de los Indios and a shallow area to cross the river (54). From the early 1800s, the area had a trading economy, with cattle hides and wool traded south and food and household items traded north. The role of trade increased with the opening of the Port of Corpus Christi in 1836. Goods moved overland from the port to Laredo and then down to Mexico. The first warehouses were developed primarily for the cotton trade.

Railroads transformed Laredo into a major north–south gateway city beginning in 1881. Jay Gould’s International and Great Northern railroad connected Laredo with Chicago, Illinois; Dallas and San Antonio, Texas; and then Mexico. Beginning in the late 19th century, bridges began to connect Laredo to Mexico. Eventually, as truck traffic became the predominant method for moving cargo, more modern bridges with additional capacity were constructed.

Currently, the Laredo International Bridge System has four crossings (55):

1. Bridge I—Gateway to the Americas—non-commercial traffic and pedestrians.
2. Bridge II—Juarez–Lincoln International Bridge—noncommercial traffic.
3. Bridge III—Colombia Solidarity Bridge—noncommercial and commercial traffic.
4. Bridge IV—World Trade Bridge—opened in 2000, commercial with automatic vehicle identification or electronic toll tag only (see Figure 3) (56).

In addition to the four bridges, Laredo is currently served by two railroads—the Union Pacific and Texas–Mexican Railroad—and six highways, including I-35.

Portrait of Modern Day Laredo— A Distribution Hub

According to the U.S. Census, Laredo had a population of approximately 177,000 in 2000. This population size notwithstanding, Laredo has 65 million



SOURCE: Federal Highway Administration.

Figure 3 World Trade Bridge in Laredo, Texas.

square feet of warehousing and distribution space in 20 industrial parks and is adding approximately 500,000 square feet of new space each month, according to the interviews. The warehousing space exists because of the trade route.

An article by the Federal Reserve Bank of Dallas provides the statistics to show that Laredo is a city supported by international goods movement (57):

- In 1999, \$30 billion in U.S. exports and \$35 billion in U.S. imports flowed through Laredo. At this time, the city accounted for about 39% of the volume and 50% of the value of all land-transported trade between the United States and Mexico. The volume was twice that of the second largest land port, El Paso, Texas.
- Location quotients measure how much of a certain product or service is supplied by the local market. A location quotient of “1” means that all of a product or service is supplied locally; under “1” means that supplies have to come from outside the area; over “1” means that the area provides a surplus of the product or service, which can support other areas as well. The Federal Reserve article noted that all of the border counties in Texas have location quotients greater than “1” in transportation services. However, Laredo had a location quotient of 26 in 1997, meaning that Laredo’s employment share in transportation services was 26 times the U.S. average.
- Warehousing and distribution center space in the Laredo area grew as a result of Mexican customs paperwork and inspections, which caused delays. In addition, Mexican customs

brokers who need to preclear truck cargo before it goes into their country also located their warehouses and truck terminals in Laredo because of a lack of space on the Mexican side of the border. The combination of situations resulted in the practice of both U.S. and Mexican truck drivers picking up and dropping off loads at Laredo warehouses.

As was discussed previously, where there is a logical break in cargo movement, the current business practice is to add value to the goods moving through the warehouse. Thus, Laredo has emerged as a logistical hub.

According to the interviews, the Laredo warehouses are following the national trend; they are becoming logistical centers where some light assembly and JIT cross docking of cargo now occur. The buildings are also getting progressively larger, also in line with the overall trends.

The warehouses also serve both U.S. and Mexican businesses. Laredo, for example, is anticipated to benefit from the development of the TMMTX plant in San Antonio. The Laredo crossings and warehouses will enable Toyota's Mexican suppliers to support the new Tundra plant.

In addition, the interviewees noted that Laredo warehouses serve Mexican customers, primarily through the provision of temperature-controlled space. There is little cold storage space available in Mexico. For example, all of the frozen products for Sam's Warehouse locations in Mexico are stored and shipped from Laredo. In addition, boxed beef from Colorado is distributed to Mexican stores through Laredo. Mexican locations of McDonald's restaurants receive their refrigerated and frozen merchandise from Laredo facilities.

Transportation's Relationship to the Project

Laredo is an example of where the macro-level transportation linkages are responsible for creating an ongoing economic development opportunity in distribution and warehousing activities.

The role of transportation in Laredo is clear: Macro-level transportation linkages are its lifeblood. As such, efficient connections must be maintained. The most recent connection, the World Trade Bridge, opened in April 2000 and cost \$100 million. The bridge serves only trucks and has 12 lanes, weigh-in-motion, and electronic toll collection. The bridge connects with I-35 and is designed for efficient

freight commerce. The economic development value associated with the cargo movement comes directly from the warehouses and distribution activity located in the city. Continual improvements to macro-level access, such as the World Trade Bridge, are crucial to continuing economic development in Laredo.

Although Laredo's economic development is closely tied with macro-level transportation linkages and investment, other factors are still important. Laredo's growth is also supported by the availability of inexpensive land and labor. Potential problems were also noted in terms of available utilities and water, both considerations in site selection. According to the interviews, there are no water-intensive businesses in Laredo.

Further, the distribution activity is currently concentrated on U.S.–Mexican trade and movements. The amount of import activity from Mexico could be affected as other countries aggressively advance their international activity (offering even lower-cost locations in a situation similarly faced by U.S. rural areas). In addition, Laredo's warehouses originally developed because of delays at the border crossings. As North American Free Trade Agreement and more efficient customs clearance are implemented, this need may decrease. However, because Laredo is already positioned as a distribution hub and is located at a strategic point, its role as a distribution center is likely assured.

Value-Added Warehousing in New Jersey and the Portway Project

Similar to Laredo, New Jersey has a substantial amount of warehousing and distribution center activity that serves the New York–New Jersey region and North America. The state also has the largest port on the East Coast, Port Newark–Elizabeth. Unlike Laredo, New Jersey has a population of 8 million, is located at the center of one of the largest consumer areas in the world, and is densely developed.

This profile looks at efforts to extract maximum economic development value from the port by more closely and efficiently tying it to the value-added warehouses and distribution centers in New Jersey. A business-specific portrait of a value-added warehouse and its recent site selection are also provided within the context of the general trends.

The economic development trends covered in this profile include JIT and pull logistics; final assembly, customization, or product readiness at the

warehouse; increased interest in and size of warehouses and distribution centers; ILCs; and brown-field property redevelopment.

A History in Transportation and Distribution, but Changing

From the earliest days of the colonies, New Jersey has been the crossroads between the growing cities of New York and Philadelphia (58). An increasing network of roads and then rail lines developed in the state to serve commerce, supporting New Jersey's growth as a manufacturing center. In 1950, 50% of the state's workforce was employed in manufacturing.

Following the trend in the New England and Middle Atlantic states, manufacturing in New Jersey began declining in the 1970s. At the same time, handling technologies changed in the port industry, leading to the shifting of maritime facilities from the piers of New York to the Port Newark–Elizabeth area. Use of cargo containers grew in popularity.

Warehousing developed early in New Jersey and was generally found around factories, and New Jersey had a large manufacturing base. In addition, New Jersey warehousing could serve customers in neighboring New York.

Similar to manufacturing, warehouses changed technologically and moved from multi-story buildings to single-story facilities. Needing more land, the facilities shifted to locations further from the urban core along the New Jersey Turnpike. Even before the growth in international trade, the warehouses and distribution centers served the high density of consumers in and around the state.

The New Jersey economy grew, but changed. In 2000, only 10% of the workers were employed by manufacturing firms, although the actual number of employees was higher than in 1950. Nearly 75% of the state's workforce was employed in service sectors. The state's rich manufacturing history did leave it with a legacy—hundreds of acres of brownfields and underutilized properties.

New Jersey's warehouses and distribution centers continued to grow in size and quantity. Because the state no longer produced all that it needed to consume, products needed to be brought in to support its population and businesses. In addition, New Jersey's central location allowed its warehouses and distribution centers to support the surrounding states, which, together, represent the most concentrated and affluent consumer market in the world (59).

As JIT logistics and value-added services were added to warehouse functions, New Jersey facilities remained in the forefront. These abilities, combined with the large portion of the North American consumer base within a day's drive, helped set the stage for warehouses and distribution centers in New Jersey to take on the final assembly and customization requirements associated with today's international goods movement.

Situation in 2004

The port has grown substantially, moving 86.5 million tons of freight in 2003 (see Figure 4) (60). In terms of maritime containers, the port handled 4.1 million twenty-foot-equivalent units (TEUs), up from 1.9 TEUs in 1991. International trade has grown substantially, even through the 2001 economic recession.

With 778 million square feet of industrial space, New Jersey is considered one of the leading locations for distribution in North America (see Figure 4). The distribution centers are generally concentrated at interchanges along the New Jersey Turnpike (I-95) heading south from the port. These buildings have grown in size, with many new structures exceeding 500,000 or even 1 million square feet. The new larger warehouses have tended to locate further from the port and urban core in both New Jersey and Pennsylvania (along Interstate highways), where large, less expensive land parcels are available.

Because New Jersey is the most densely developed state in the United States, different uses often



SOURCE: A. Strauss-Wieder, Inc.

Figure 4 Cargo movement at Port Newark/Elizabeth.

compete for available property, raising land prices. For example, the top grossing IKEA in the United States and one of the largest malls in New Jersey are now adjacent to Port Newark–Elizabeth.

At the same time, public agencies are actively pursuing the use of brownfields and underutilized property in the state and attempting to limit development on New Jersey’s remaining greenfields. Some of the brownfield initiatives have focused on reuse of the property for freight-related purposes, such as warehouses and distribution centers closer to the port and urban core.

Value-Added Distribution Center and Local Site Selection

Lifetime HOAN Corporation designs, markets, and distributes a broad range of household cutlery, kitchenware, cutting boards, and bakeware products to major retail customers throughout the United States (7, pp. 35–36). Items are sold under owned and licensed trade names, such as Hoffritz, Prestige, HOAN, and Farberware. Lifetime HOAN is also a licensed supplier of KitchenAid, Revere, and Pillsbury. All of North America is served from the company’s New Jersey distribution center.

The facility receives product in bulk, such as different sizes of kitchen knives. The items are made “shelf-ready” at the facility; per customer specifications, individual products are packaged or bundled and packaged. Packaging may include blister packing, assembly of knife sets in boxed sets, and ticketing. Virtually all of the products arrive through the Port of New York and New Jersey from overseas. The facility receives approximately 1,600 forty- and twenty-ft containers annually and employs between 500 and 550 workers.

In 2000, when the contractor toured the building, Lifetime HOAN was located by Interchange 8A on the New Jersey Turnpike in a 300,000 square foot main building and two 150,000 square foot satellite buildings. Interchange 8A has the greatest concentration of warehouses and distribution centers in New Jersey, with more than 30 million square feet of space. (In contrast, there are 65 million square feet in total in Laredo.) The interchange is approximately 25 min from Port Newark–Elizabeth.

Despite this existing space, in 2000, Lifetime HOAN was in the process of building a new distribution center with all the technologies expected in a JIT operation. These include the following:

- An advanced, computerized warehouse management system;
- Very narrow aisle racking with swing-reach turret trucks;
- Radio-frequency-directed piece-picking carts; and
- Picking directly onto conveyors.

The new building, which became operational in 2001, is 560,000 square feet and can be expanded to 710,000 square feet.

Although nearly all of the inbound products for the distribution center are from the port, Lifetime HOAN selected a more distant location for its new building. The location, by Interchange 7A on the New Jersey Turnpike, is approximately 45 min from the port, but still within the desired 1-day’s drive radius.

The key criterion in the company’s selection process was to have the new facility completed and operational before the start of their next selling season. At the macro-level, the company had decided to remain in New Jersey and continue to import their products through the port. Matrix, an industrial developer, was the only company that offered the property and timeline that met this requirement. Therefore, the company moved to Interchange 7A. There were no public incentives involved.

Lifetime HOAN is not alone at Interchange 7A. Matrix has developed more than 4 million square feet of distribution centers there and has approval to construct an additional 4.5 million square feet (61).

The literature and interviewees noted that the time involved in completing a project and the availability of existing facilities can be key criteria in site selection for some industries. Warehouse and distribution center development generally require a tight time frame and must match product sales or cycle requirements, as evidenced in the Lifetime HOAN example. In this case, the timeline for completion of the project outweighed the additional transportation drayage expenses between the facility and the port.

Portway Project

Portway, a New Jersey Department of Transportation (DOT) initiative, is a series of freight improvement projects designed to improve and strengthen access to and connections between key maritime, air cargo, railroad, regional surface transportation systems (highways and streets), and warehouse or distribution center concentrations in northern and central New Jersey (62, p. C-34). Portway’s objectives include the following:

- Relieve current high levels of congestion in this intermodal freight service corridor and meet growing future demand for access generated by increased activity at port facilities, rail yard, and distribution centers;
- Add system redundancy to ensure the timely delivery of goods and services;
- Make improvements that increase safety and support seamless connections; and
- Promote economic development, job creation, and environmental improvements along the Portway corridor.

Phase I of Portway focused on better linking the port with key rail yards. The associated series of transportation improvements is now underway. This was a transportation project that was geared toward efficient movement rather than economic development goals.

The objective of the second phase was to recommend extensions that facilitate goods and container movements from northern New Jersey's ports to their next destination, that is, first place of rest, as well as prioritized implementation (63). The Extensions Study, as Phase II of Portway is known, found that the first place of rest for many containers was New Jersey's warehouses and distribution centers. Through an analysis of traffic data, container origin and destination information, and other regional data, the study articulated that containers mean jobs and revenues in freight handling and value-added processing (64). The study goal evolved to include maximizing the economic benefits and minimizing the transportation impacts of the increase in cargo activity at the port—a program of transportation investments to support economic development for the state.

The recommended improvements focused on congestion mitigation, as well as on brownfield redevelopment. The study found that millions of square feet of warehousing and distribution center space could potentially be developed on brownfields and underutilized properties closer to the port, as well as in existing distribution center locations where additional property was available. Further, micro-level road improvements and remediation, underway or under study at some locations, were prerequisites for increasing their attractiveness. The improvements were thus designed to do the following:

- Encourage businesses that ship or receive containers to locate where they can be served by rail or water along with or instead of trucks;
- Return underutilized properties to productive use, generating jobs and tax revenues; and

- Support major investments by railroads and land developers to create ILCs.

The recommended improvements included operational strategies; elimination of height, weight, and capacity restrictions on the rail freight system; creation of a short-haul rail shuttle linking the port with key warehouse and distribution center concentrations; targeted highway and interchange improvements; and “last mile” road improvements.

Transportation's Relationship to the Portway Project

Macro-level transportation access and investments and expanded international trade created the opportunity for economic development in New Jersey, particularly through the joining of the production and distribution processes. Micro-level access and improvements were needed both to maintain container movements and to capture the potential economic development from the port traffic. The latter could also be used to direct new development to brown-field and underutilized properties.

An economic impact assessment was undertaken for the Extensions Study (63). The economic benefits were assessed in terms of the one-time, nonrecurring impacts accruing from the construction and capital investment stage in the transportation investments and the permanent impacts associated with new, ongoing economic activity. Based on the anticipated growth in cargo through the port, the truck and rail trips generated within the state, and known and projected origin and destination pairs, the economic impact assessment determined that an estimated 98.7 million square feet of warehousing space could potentially be located in New Jersey, or an increase of 48.5 million square feet.

The 48.5 million square feet represents the amount of new warehousing activity that New Jersey could potentially capture associated with international trade activity. These facilities could be located on brown-field properties or accommodated on other sites in New Jersey. Additional calculations, based on information developed by the study team, determined that the capture of the 48.5 million square feet of activity could generate a total of 55,000 new permanent jobs in New Jersey.

This information helped turn the Portway project from a transportation efficiency project into an economic development-related initiative in New Jersey. Further discussions with warehouse operators

and developers confirmed the need to better link the port with distribution center clusters to grow the value-added distribution business in the state.

New Wal-Mart Distribution Centers in Wisconsin

The economic development trends covered in this profile include JIT and pull logistics, final assembly, customization, or product readiness at the warehouse, and increased interest in and size of warehouses and distribution centers.

Wal-Mart has constructed two major distribution centers in Wisconsin and is working on the development of a third facility. Each of the distribution centers occupies 200 to 300 acres, with the buildings ranging in size from 800,000 to 1.2 million square feet. Between 600 and 900 workers are hired for each distribution center. Typical truck movements into and out of each distribution center average 800 to 1,200 trucks per day.

Wal-Mart is one of the leading retail companies in the United States and was among the first to begin mining sales information to ascertain and respond to real-time demand. Quick response and ensuring that customers' demands are met define the pull philosophy in supply chain management.

To meet real-time demand, Wal-Mart must have distribution centers capable of quickly supplying their existing stores, as well as positioned to support new stores. The distribution centers in Wisconsin support stores in the state, as well as in neighboring Illinois and Minnesota.

Transportation's Relationship to the Distribution Center Development

Many economic development factors were considered in Wal-Mart's search for distribution center locations. From a transportation perspective, the company was drawn to Wisconsin by the state's macro-level Interstate and four-lane highway connections. The macro-level system allows Wal-Mart to support stores within a 150-mi radius.

The Wisconsin DOT became involved in this economic development effort in two ways: during the information gathering phase, when Wal-Mart was seeking information on the transportation system and potential financial incentives needed to improve the micro-level transportation infrastructure, and in "seal the deal" incentive packages to enable local communities to secure the distribution center developments.

Early in the selection and development processes, Wal-Mart and the Wisconsin DOT discussed:

- Highway access points, such as interchanges and intersections;
- Regulatory approvals, such as driveway permits, weight restrictions, and truck registration;
- Scheduled maintenance and plans for future highway improvements;
- Specific transportation infrastructure needed to facilitate each distribution center; and
- Available financial incentives for needed transportation infrastructure.

The Wisconsin DOT provided financial assistance to local communities for incentive packages to support their bid for the Wal-Mart distribution centers. The financial assistance was for a variety of micro-level transportation improvements, including interchange ramp extensions and lane widening; intersection widening and turn lanes for trucks; passing lanes for through traffic; a new highway interchange; construction of new access roads; and widening of local streets, along with construction of new curbs, gutters, and storm sewers.

Approximately \$5.5 million was provided in state DOT funds for the distribution centers. The projects were evaluated on the number of jobs to be created and the amount of private capital investment involved in the project. Wage and tax revenues to the state are also calculated. Local property taxes generated from these facilities are estimated to be \$1 million to \$1.5 million per year. The local communities also provided tax incremental financing for the land and utility services.

Note that Wal-Mart was also required to pay for certain improvements on the sites. For example, at the newest site in Beaver Dam, Wisconsin, Wal-Mart will pay for the construction of an earthen berm that will separate the distribution center from the surrounding residential neighborhood and reduce noise and light spillage from the facility.

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APPENDIX A

Organizations That Assisted in this Report and Experts Interviewed

RESEARCH AND INDUSTRY ASSOCIATIONS THAT PROVIDED ASSISTANCE TO THE SYNTHESIS

- American Planning Association
- Center for Economic Development Research, University of South Florida
- Center for the Study of Rural America, Federal Reserve Bank of Kansas City
- Center for Urban Policy Research, Rutgers University
- Council of Logistics Management
- Industrial Asset Management Council
- International Economic Development Council
- National Association of Industrial and Office Properties, New Jersey Chapter
- Real Estate Center, Texas A&M University
- Regional Science Association International

EXPERTS INTERVIEWED FOR THIS SYNTHESIS

- John A. Adams, Jr., Executive Director, Laredo Development Foundation
- Dave Brandon, Senior Vice President and Principal, The Pathfinders (labor market and site selection specialists)
- Adam Bruns, Managing Editor, *Site Selection* magazine
- Ronnie L. Bryant, President and Chief Operating Officer, Pittsburgh Regional Alliance
- Robert Burchell, Co-Director, Center for Urban Policy Research, Rutgers University
- Dennis Colie, Director, Center for Economic Development Research, University of South Florida
- Martha Cooper, Professor of Marketing and Logistics, Ohio State University
- Richard (“Buzz”) David, Director, Pinellas County Economic Development (Florida)
- Mark Drabenstott, Vice President and Director, Center for the Study of Rural America, Federal Reserve Bank of Kansas City
- Andrew Flores, President and Chief Operating Officer, Global Marketing Advisors
- Ed Gilliland, Vice President, Senior Director, Advisory Services, International Economic Development Council
- Andrew F. Haughwout, Research Officer, Federal Reserve Bank of New York
- Harold Hunt, Associate Research Scientist, Real Estate Center, Texas A&M University
- Bill LaFayette, Vice President, Economic Analysis, Greater Columbus Chamber of Commerce
- Peter Linneman, Albert Sussman Professor of Real Estate, Finance, and Public Policy, Wharton School of Business, University of Pennsylvania
- Michael G. McGuinness, Executive Director, New Jersey Chapter, National Association of Industrial and Office Properties
- Charles McSwain, Director of Real Estate, CSX
- Marya Morris, American Planning Association
- Alan Pisarski, Transportation Consultant
- James R. Schimmer, Administrator, Economic Development, City of Columbus, Ohio
- Ron Starner, Director of Publications, Conway Data, and Executive Director, Industrial Asset Management Council
- Haidee Stith, Executive Director, South Carolina Women’s Business Center, South Carolina Manufacturing Extension Partnership

APPENDIX B

Boeing 7E7 Site Selection Criteria Summary

- Transportation
 - Suitable runway provisions
 - Proximity to a port capable of around-the-clock operations
 - Continuous availability of heavy traffic ways between plant site and port
 - Proximity to railways and Interstate highways.
- Facilities
 - Available land, buildings, and related infrastructure to accommodate 7E7 final assembly and the collocation of suppliers.
- Total cost of doing business
 - Cost of land and buildings
 - Construction cost
 - Site preparation cost
 - Support services (fire, police, emergency, and medical services)
 - Taxes, utilities, insurance, and other recurring and nonrecurring costs.
- Workforce
 - Training infrastructure and partnering opportunities with local agencies or governments
 - Absenteeism and turnover rates for other local companies
 - Available labor pool
 - Quality of local public schools.
- Environmental considerations
 - Local flying weather
 - Possible extreme temperature impact to manufacturing
 - Susceptibility to natural disasters (earthquakes, tornados, hurricanes, and flooding).
- Community support
 - Local community and governmental support for manufacturing businesses
 - Support of local, county, and state governments for Boeing and its suppliers
 - Environmental regulations and permitting process
 - Likelihood of long-term community support
 - Ability to expand or modify facilities and infrastructure
 - Quality of life that supports employee recruitment.
- Additional infrastructure issues
 - Including relative cargo and freight costs
 - Availability of utilities including water, sewer, power, waste, and telecommunications
 - Transportation enhancements that support schedule and requirements.

Source: Boeing Corporation website [Online]. Available: www.boeing.com/commercial/7e7/site/html.

APPENDIX C

Interviewee Responses to Site Selection List

Of the 21 experts interviewed, 6 completed their rankings of the site selection list. The responses are shown here.

Site Selection Considerations	Low Ranking				Very Important
	1	2	3	4	5
Highway access				2	4
Airport access			2	2	2
Port and marine access		1	3	2	1
Rail freight access		3	1	2	
Availability of labor				1	5
Labor costs			1	3	2
Labor skills			1		5
Availability of land			2	1	3
Land costs			1	4	1
Occupancy or construction costs			2	3	1
Energy availability and costs			2	3	1
State and local incentives		1	1	4	
Taxes and fees			2	4	
Availability of telecommunication services		1	2	2	1
Proximity to markets			1	1	4
Proximity to suppliers			3	2	1
Low union profile			2	1	3
Reliability and availability of trucking services		1	1	2	2
Reliability and availability of rail freight services		1	4	1	
Reliability and availability of air cargo and express services		2	2	1	1
Reliability and availability of marine and port services		2	3	1	
Cost of trucking services			4	2	
Cost of rail freight services		1	4	1	
Cost of air cargo and express services	1		4	1	
Cost of marine and port services			5	1	
Availability of parking	1		3	2	
Environmental regulations		2	2	2	
Availability of financing		2	2	2	
Time line for completing and making operation				4	2

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