Economic and Transportation Impact of Warehousing on Rural Pennsylvania
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# TABLE OF CONTENTS

Executive Summary ............................................................ 5  
Introduction ......................................................................... 6  
Research Goals and Objectives ......................................... 7  
Methods and Definitions ..................................................... 7  
  Geographic Information System ........................................ 8  
Results ................................................................................ 8  
  National Comparison ...................................................... 8  
  Pennsylvania Comparison .............................................. 10  
  Examination of Economic Changes ............................... 11  
  Examination of Economic Impacts ............................... 12  
  Locational Analyses ......................................................... 14  
  Siting Considerations ...................................................... 15  
Summary and Conclusions ............................................... 17  
  Economic Impacts ............................................................. 17  
  Locational Impacts ............................................................ 18  
  Long-Term Influences ....................................................... 19  
Policy and Planning Considerations ................................ 19  
  State Level Considerations ............................................. 20  
  Local Government Considerations ................................. 20  
  Industry Best Practices .................................................. 21  
  Other Considerations ..................................................... 21  
References........................................................................ 21
EXECUTIVE SUMMARY

Nationally, Pennsylvania ranks second in employment in warehousing, sixth in employment in trucking, and fifth in employment in logistics services. In terms of employment concentration, Pennsylvania ranks first for warehousing, 20th for trucking, and ninth for logistics services.

Since little was known about the warehousing and trucking industries in Pennsylvania, in 2007, the researchers initiated a comprehensive analysis, which included geographic and economic assessments, of these industries.

The research findings show that Pennsylvania gained 21,194 net warehousing jobs between 2001 and 2006: rural counties gained 7,066 while urban counties gained 14,128 jobs. Employment grew and concentrated in Pennsylvania at rates substantially faster than the national averages. Employment in warehousing is concentrated along the Interstate-81 corridor, particularly near the major interchanges. In terms of facilities, warehousing occurs primarily in urban counties (74 percent), with Allegheny, Philadelphia, Bucks, and Luzerne having the largest numbers of facilities. From 2000 to 2004, warehousing jobs increased and the geographic center of the industry shifted from the suburban counties of Philadelphia, such as Lancaster, Berks, Lehigh and Northampton, to rural counties. Yet even in rural counties, warehousing tended to concentrate in the urban portions of those counties, typically in newer planned developments.

The research also revealed that, in 2004, warehousing activities in Pennsylvania produced $2.9 billion in direct output and nearly $7.3 billion of additional activity. Yet warehousing is strongly tied to household spending and consumption and any change that affects that portion of the national economy, such as rising fuel or food prices, will likely affect this industry. Also, warehousing has some of the lowest income and job multipliers of any sector in the Pennsylvania economy.

Although Pennsylvania gained warehousing jobs, warehousing’s relatively weak backward (purchases) links stimulated few additional jobs and spurred little wage and income growth in other sectors of the economy. Warehousing growth by itself produces little in the way of broad ripple effects that positively influence other economic sectors. An opportunity exists to develop additional activities that support warehousing, which can then be used to capture a larger share of indirect and induced economic effects that now are leaking out of state. Paper products, rubber and plastics, textiles, and transport equipment seem like natural compliments to warehousing and storage. If municipalities could develop these industries, then together they might stimulate greater indirect and induced impacts on wages, income, and employment.

According to the research, trucking facilities tended to be located in urban counties (64 percent), specifically Allegheny, Cumberland, and Bucks. Schuylkill, Butler and Franklin counties, which are rural, ranked within the top 20 percent relative to warehousing and trucking facilities. Truck traffic is a more visible presence on rural highways and interstates since overall traffic volumes tend to be lower. Montour, Franklin, Clarion, and Monroe counties all ranked high in the number of truck miles traveled there relative to the total length of highways in these counties.

In 2004, trucking services accounted for more than $10.4 billion in direct output and more than $8.2 billion in direct wages and proprietary income. This direct output produced nearly $24.7 billion in additional output and $18.9 billion in additional wages. Rural Pennsylvania generated 33 percent of all direct trucking output, but received only 27 percent of all indirect and induced effects. Trucking was better linked to other local activities than warehousing, and industry spending did not leak as much to regions outside Pennsylvania. Trucking in rural counties has a larger income multiplier than in urban counties; but when spillovers are considered, urban Pennsylvania seems to capture most of the new opportunities trucking creates, as well as much of what rural Pennsylvania creates.

From a statewide planning perspective, the research results suggest that if there is additional demand for warehousing or trucking in Pennsylvania, meeting that demand in rural Pennsylvania would generate greater impacts on total income, statewide, than meeting that demand in urban Pennsylvania alone. From a rural development perspective, these results reinforce an important policy issue – economic growth in rural Pennsylvania generates benefits not only for rural counties, but also for urban counties.
INTRODUCTION

Warehousing and related activities, such as trucking, have recently come to the forefront of a general discussion in Pennsylvania concerning economic development, land use and transportation. Many areas in Pennsylvania provide suitable environments for warehousing and distribution activities because they offer: good access to several important east-west and north-south transportation routes; reasonable land costs; and, coupled with the commonwealth’s position between Washington and Boston and gateways to the east and the industrial heartland to the west, proximity to a large proportion of the U.S. population (Eggert, 2006; Fuellhart and Marr, 2006). Based on 2005 U.S. Census population estimates, approximately 35 percent of the nation’s population lives within a comfortable one-day drive of State College, PA, which is near the geographic center of the commonwealth (Figure 1). In short, Pennsylvania has many locational characteristics that firms in the warehousing and related industries find attractive.

It is not surprising that both anecdotal evidence (typically in the form of newspaper articles) and academic research (Fuellhart and Marr, 2006; Marr, 2003) have noted recent increases in warehousing and trucking activities in Pennsylvania. Growth in warehousing and trucking is most visibly demonstrated by increasing truck traffic on the nation’s interstate highways. During the last four decades, truck traffic in terms of vehicle-miles traveled (VMT) in the United States increased by 216 percent, while the total population increased by just 33 percent during the same period. Meanwhile, the capacity of the interstate highway system (measured in lane-miles) has increased by only 18 percent since 1980 (NCHRP, 2003a). Given the nation’s increasing international trade deficit in goods and services (U.S. Census Bureau, 2008), and Pennsylvania’s relative location with respect to eastern gateway cities and the densest portion of the interstate system that carries so many imported goods, it might seem inevitable that the commonwealth would see growth in both warehousing and trucking activities.

Economically, growth in warehousing and trucking can provide jobs for people and new tax bases for municipalities (unless tax deferments or tax incentives are used to lure such activities). With respect to infrastructure and the environment, however, these activities place additional burdens on an already overburdened highway system and generate air quality, water quality, and land use impacts that can reach far beyond their surveyed footprints. Ideally, municipalities should be able to take advantage of the positive economic impacts these industries provide while mitigating or minimizing the negative environmental impacts. To be able to accomplish the above in a sustainable manner, however, requires a baseline level of knowledge concerning these industries and their impacts.

Yet, to-date, there have been no comprehensive analyses of warehousing or trucking in Pennsylvania. Municipalities currently have no resource to draw upon that provides them with both an overview of the positive and negative impacts of warehousing and trucking, and the means for planning for these impacts.

This research addressed these needs by providing local, regional, and state governments with a comprehensive analysis of warehousing and trucking in Pennsylvania.

Figure 1. 450-mile radius denoting Pennsylvania’s one-day service population.

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1 A comfortable one-day drive is defined as driving for 8 hours at an average speed of 55 miles per hour, and equates to approximately 450 miles. Given that the current Federal Motor Carrier Safety Administration’s (FMSCA) 2003 revision to the Hours of Service (HOS) regulations is that operators can drive up to 11 hours daily (Heaton, 2005), the above would seem to be a reasonable estimate of service area.
**RESEARCH GOALS AND OBJECTIVES**

This research focused on the following five goals:
- Provide a comprehensive analysis of warehousing and trucking by examining industry trends, labor issues, technology requirements, community issues, policy and tax issues, and land use concerns in Pennsylvania and conducting a locational analysis of warehousing and trucking at the national and state levels to understand the larger patterns of industry location trends.
- Present a geographic inventory of warehousing and trucking facilities throughout Pennsylvania counties in relation to transport infrastructure, inter-modal facilities, and other socio-economic and land use characteristics.
- Develop an economic/sectoral assessment of warehousing and trucking throughout rural Pennsylvania at the county-level to determine the economic contribution of warehousing and trucking and determine which other economic sectors are most affected economically by the presence of warehousing and trucking. Also, establish economic multipliers to provide policymakers with a sense of how future changes in employment within warehousing and trucking will influence local economies.
- Assess labor, location, and infrastructure impacts/needs of warehousing and trucking.
- Develop policy considerations.

**METHODS AND DEFINITIONS**

For this research, *warehouses* are facilities designed for the reception, delivery, consolidation, distribution, and storage of retail goods. Trucking facilities are businesses that transport retail goods to and from warehouses, manufacturers, and retailers. The average size of existing and new facilities has been increasing steadily in response to: a) increasing demand for capacity; and b) a period of mergers and acquisitions that began during the 1980s resulting in fewer total facilities nationwide (Brockmann, 1999). New facilities are often called ‘big-box’ warehouses because of their large sizes (usually exceeding 500,000 ft²) and simple shapes.

This research focused on big-box, retail warehousing and distribution facilities because as demand for additional capacity and physical size increases, so does the demand for larger lots, which results in a systematic preference for constructing new warehouses where relatively cheap, accessible, and undeveloped land is available. The scales of new construction and subsequent increases in truck traffic volumes have created serious challenges and opportunities for municipalities. The combination of large lot consumption, green space development, increasing truck volumes, and unprepared municipalities mark retail big-box warehousing as the most pressing warehousing issue in Pennsylvania.

Agglomerations of warehouses, usually referred to as warehousing clusters, are difficult to define precisely. Also, there is no widely accepted definition for the number of warehouses that must be present to be considered a cluster. The same is true for clusters of trucking facilities. For this research, agglomerations of warehousing and trucking facilities were considered to be clusters if they had one of two characteristics: warehouses and/or trucking facilities occurring in sufficient numbers to attract associated businesses; or they occurred in planned developments whose focus was attracting these industries.

*Organic warehouse clusters* are those that cluster within a confined area due solely to the perceived advantages or amenities of that area. Organic clusters are seen most often on the urban fringe in areas that have good interstate access, or in older areas that once were on the urban fringe but now are surrounded by more recent urban development.

*Planned warehouse clusters* are the results of development efforts that include a substantial amount of site alteration prior to warehouses locating there. These are developments that specifically target warehousing and similar industries.

This research describes the pattern of big-box warehouse and distribution-related activities in the U.S. and Pennsylvania, as well as the transport activity most visibly associated with them – trucking (Moore et al., 2005). In related work focused on south-central Pennsylvania, Fuellhart and Marr (2006) analyzed proprietary employment data (IMPLAN 2002 data) and found employment in these sectors was not distributed evenly throughout the commonwealth. The authors noted that agglomerations of employment have different implications for development plans in rural and urban areas. This study revisits their analysis, employs newer and more comprehensive datasets (IMPLAN 2004 and BLS 2006 data), and, subsequently, offers new interpretations of national, state, and county-level trends in these industries, as well as comparisons between the rural and urban regions of Pennsylvania.

Employment counts can be used as proxies for economic activity, for greater employment numbers suggests greater activity. The U.S. Bureau of Labor Statistics
publishes employment data collected during each Quarterly Census of Employment and Wages, which are organized with respect to the North American Industry Classification System (NAICS) (U.S. Census Bureau, 2007b). NAICS uses a six-digit hierarchical coding system to classify all economic activity into 20 industry sectors; five are goods-producing and the others are services-producing. Using NAICS as the definitional basis for this research has the advantage of dovetailing with the typical mode of data collection by federal, state, and local governments, thus increasing the amount and quality of available secondary data. Warehousing and trucking are service-producing industries.

National and state-level employment data associated with big-box warehousing and storage, long-distance general freight trucking, and logistics activities were selected from flat files disseminated by the U.S. Bureau of Labor Statistics (2006a). Data associated with local freight trucking, specialized trucking, farm product warehousing and storage, and other warehousing and storage activities were excluded from the analysis.

The researchers used the Center for Rural Pennsylvania’s definition of a rural county, which is based on population density: rural counties have a population density of less than 274 persons per square land mile (Center for Rural Pennsylvania, 2007).

Although the terms “interstate” and “highway” are often used interchangeably, in this report interstate refers to limited access, federally funded roadways that are part of the Interstate Highway System, including auxiliary routes (such as I-676 in Philadelphia). Highway in this report refers to those routes that are part of the National Highway System (NHS) developed by the Department of Transportation and approved by Congress in 1995 (Slater, 1996), excluding interstates.

The Center for Rural Pennsylvania

RESULTS

National Comparison

Location of Warehousing and Storage

Employment in the United States

California, the nation’s most populous state, employs the most people in general and refrigerated warehousing (62,962). Pennsylvania employs the second largest number of people (48,722) in this industry and leads the nation in employment concentration of warehousing, which is measured by comparing regional employment to national employment in the industry. The commonwealth is, therefore, an important region in terms of both absolute and relative employment in general and refrigerated warehousing and storage.

Figure 2 shows employment concentration in general and refrigerated warehousing and storage by state. Pennsylvania and Kentucky have the highest concentrations. Overall, high concentrations tend to occur in the eastern half of the country – particularly along the east coast and in the lower Midwest. These regions contain large populations and, historically, have been associated with major manufacturing centers. The lowest concentrations occur in Great Plains states.

Location of Long-distance Trucking

Employment in the United States

Texas employs the most people in long-distance trucking (65,054), but Arkansas has the highest employment concentration. Pennsylvania is the sixth largest employer (35,888) but exhibits only slight employment concentration. Pennsylvania is important in terms of absolute employment, but Arkansas, Nebraska, Tennessee, Iowa and Indiana have higher concentrations.

The Center for Rural Pennsylvania
Figure 2. Concentration of employment in general and refrigerated warehousing and storage. Alaska and Hawaii are not shown as no data were available (U.S. Bureau of Labor Statistics, 2006a and the authors’ calculations).

Figure 3 shows the distribution of employment concentration by state for long-distance trucking. The pattern is interesting because the highest concentrations occur conspicuously in the nation’s interior. Both Arkansas and Nebraska have employment concentrations greater than four times the national average. The lowest concentrations generally occur along the nation’s periphery, save Colorado. Interestingly, Pennsylvania is the only state that overlaps the nation’s largest agglomeration of urban centers, which is situated along the I-95 corridor between Boston and Washington, DC, and has a greater-than-average concentration in long-distance trucking.

Location of Logistics-services Employment in the United States

California, Texas, and Florida are some of the nation’s most populous states and so, not surprisingly, they employ many people in logistics-services. Virginia, however, has both the highest absolute employment (12,431) and highest employment concentration, which is nearly six times the national average. Pennsylvania is the fifth largest employer in logistics-services (4,131) but exhibits only modest employment concentration.

Figure 4 on Page 10 shows the geographic concentration of physical distribution and logistics services-related employment by state. The pattern is interesting because 34 states have employment concentrations less than the national average. An apparent cluster exists along the east coast between Pennsylvania and South Carolina; Virginia and Delaware have the highest concentrations of employment in this class and are situated in the middle of this group. Of all the states with a greater-than-average concentration, only Alabama, Kansas and Michigan are not located in the apparent agglomeration on the east coast.

In summary, Pennsylvania employs a higher proportion of its total workforce than the expected national average in three transportation-related service industries. As the nation’s sixth most populous state, Pennsylvania ranks second for employment in general warehousing and storage, sixth for long-distance trucking, and fifth for logistics services. In terms of employment concentration, Pennsylvania ranks first for general warehousing and storage, 20th for long-distance trucking, and ninth for logistics services. Arkansas has
the highest concentration of long-distance truckers and Virginia has the highest employment concentration in the logistics-services industry.

**Pennsylvania Comparison**

**Location of Warehousing and Storage Employment in Pennsylvania**

Cumberland County employs the most people (5,987) and ranks second in employment concentration in warehousing and storage. Its relatively large employment concentration, with respect to the national average, suggests that Cumberland County employs six times the number of people expected for this industry given the size of its workforce. Clearfield County has a smaller workforce in this class (1,538) than Cumberland County, but a higher level of employment concentration. This result suggests warehousing jobs are very important to the economy of this rural county. The most striking feature of Figure 5 is the number of counties that have no employment concentration. Pennsylvania counties have either a relative abundance or lack of employment in this class.

With the notable exception of Clearfield County, the majority of counties that exhibit a high employment concentration are along the Interstate-81 corridor. These results are markedly different than those reported by Fuellhart and Marr (2006), for they indicated Clearfield County had a lesser concentration and the majority of warehousing employment was situated east of the I-81 corridor. These differences suggest that, between 2002 and 2004, many warehousing jobs were created in Clearfield County and along the I-81 corridor. This shifted the apparent center of agglomeration from the suburban counties around Philadelphia (Lancaster, Berks, Lehigh and Northampton) to rural counties. When the national and state results are considered together, they reveal Pennsylvania holds a relatively large share of people employed in the warehousing and storage industry, and that the share is highly concentrated within a cluster of 18 counties – most of which straddle the I-81 corridor.

**Location of Trucking Employment in Pennsylvania**

Cumberland County employs the most people in trucking (6,978) and ranks second in employment concentration. The large employment concentration, with respect to the national average, suggests that Cumberland County employs almost four times...
the number of people expected for this industry given the size of its workforce. Cumberland County is, therefore, an important region in terms of both absolute and relative employment in trucking. Juniata County employs less than one-tenth (508) the number employed in Cumberland County, but exhibits the highest employment concentration. This result suggests trucking jobs are very important to the economy of this rural county.

These results suggest that, overall, employment in trucking is agglomerated. In terms of absolute employment, urban counties hold the 13 highest counts (Cumberland is the highest). Yet, in terms of relative employment concentration, urban counties hold seven of the 10 lowest values. Only Cumberland and Lebanon counties rank among the 13 highest concentrations. These results clearly highlight Cumberland County’s apparent primacy in this sector, yet, at the same time, they suggest rural counties tend to employ greater shares of long-distance truckers.

Figure 6 shows the pattern of employment concentration for this industry. Only 17 of 67 counties have less-than-average concentrations, so it is easier to describe where trucking isn’t than is. Fuellhart and Marr (2006) found trucking comprises a relatively low share of employment in portions of the Erie, Pittsburgh and Philadelphia metro areas; these results support that finding.

Location of Logistics-Services Employment in Pennsylvania

When compared to warehousing and trucking, a relatively small number of people in Pennsylvania are employed in the logistics-services industry (4,131). Location and employment concentration analyses were not performed at the county level for this industry because the IMPLAN data do not allow employment associated with logistics-services to be disaggregated from other kinds of management services.

Examination of Economic Changes

Warehousing and Storage

Total employment in the U.S. fell 1.4 percent during the national economic downturn from 2001 to 2003. Since 2003, however, the U.S. has exhibited steady national growth and total employment rose approximately 5.1 percent by the end of the first quarter of 2007.

Changes in the warehousing and storage industry did not mirror changes in the national economy, however. Instead, the industry appears to have grown during the national economic downturn and it grew relatively rapidly thereafter.

Pennsylvania’s regional competitiveness component was positive every year, thus indicating that regional employment in warehousing and storage was concentrating and growing at rates substantially greater than the national average. The upward growth trend in urban counties indicates urban counties gained comparative advantage at a rapid rate. Rural counties also exhibited positive regional competitiveness over the entire period.

Overall, Pennsylvania gained 21,194 net warehousing and storage jobs between 2001 and 2006 (BLS, 2001-2006); rural counties gained 7,066 net jobs and urban counties gained 14,128 net jobs. Positive net job growth in warehousing and storage in Pennsylvania can be attributed to national trends in the overall economy, faster-than-average trends in the warehousing and storage industry, and relatively strong regional competitiveness.

According to the Bureau of Labor Statistics, some employment growth in this sector will result from “manufacturers’ willingness to concentrate on their core competencies – producing goods – while outsourcing their distribution functions to trucking and warehousing companies which [sic] can perform these tasks for less money” (BLS, 2006b). Given the relative abundance and concentration of manufacturing activities that remain in North America’s aging manufacturing belt, and given Pennsylvania’s central location within the belt, it seems reasonable that Pennsylvania would experience faster-than-average job growth in this sector.

Truck Transportation

Employment data indicate changes in the trucking industry followed changes in the national economy and, subsequently, analysis of the industry mix reveals the effects of the economic downturn that started in 2001, and subsequent growth thereafter. Job losses early in the
period, however, outnumber later job gains. Independent owner-operators are particularly vulnerable to economic slowdowns (BLS, 2006) and increasing fuel costs, which might explain why more trucking jobs were lost relative to the national share between 2001 and 2003, and why fewer jobs relative to the national share have been created since 2003. The industry mix component accounts for 465 fewer trucking jobs in Pennsylvania (336 fewer jobs in urban counties and 129 fewer in rural counties) because job growth in the trucking industry lagged behind national job growth.

Pennsylvania’s regional competitiveness component decreased over time and it was negative for the last four years, indicating regional employment in truck transportation was growing at rates substantially below the national industry average. The downward trend in urban counties is both conspicuous and striking, and it suggests urban counties lost comparative advantage at a rapid rate. Rural counties exhibited year-to-year volatility and no apparent trend. Pennsylvania effectively lost 4,383 trucking jobs (3,323 jobs lost from urban counties and 1,060 from rural counties) because of factors that cannot be attributed to national trends in the overall economy or national trends in the truck transportation industry. Even if the substantial effect of Consolidated Freightways, which closed in September 2002 and caused 1,351 layoffs statewide (Pennsylvania Department of Labor and Industry, 2002), is removed from this analysis, Pennsylvania still exhibited negative regional competitiveness during this period.

Overall, Pennsylvania lost 4,780 net trucking jobs between 2001 and 2006. Rural counties lost 458 net trucking jobs and urban counties lost 4,322 net trucking jobs. Positive net job growth in truck transportation during the last year (579 jobs) can be attributed to national trends in the overall economy and in the truck transportation industry. It seems that net regional job growth in truck transportation was limited largely by factors unique to Pennsylvania.

### Examination of Economic Impacts

#### Economic Impacts of Warehousing and Truck Transportation on Output

To examine the economic impacts of warehousing and trucking, the researchers used a modeling technique that divides the economy into two components – consumption and production – and accounts for the direct and indirect links among different sectors of the economy. The results reveal how the warehousing and trucking industries may affect aggregate economic activity, such as sales and purchases. The researchers used both Type I and Type II models: Type I models exclude households from the modeled economy and Type II models include households in the modeled economy. The difference between the two reveals the consumption effect of regional household spending. For this research, a change in final demand is an additional purchase of goods or services produced in either rural or urban Pennsylvania by a firm, industry or consumer outside of Pennsylvania. Output multipliers estimate the total change in sales (U.S. 2004 dollars) within the commonwealth resulting from the additional purchase; income multipliers account for the impact this new economic activity has on local wages and proprietor income (dollars); and employment multipliers quantify job creation effects (jobs).

The results indicate that the warehousing industry displays relatively weak purchasing links to other sectors of Pennsylvania’s economy. For example, every dollar of additional output demanded from the warehousing sector of urban Pennsylvania (direct effect) results in just $0.39 of additional inter-industry purchases (indirect effect) statewide ($0.26 is stimulated within urban Pennsylvania whereas $0.12 occurs in urban Pennsylvania). Every dollar of additional output requested from the warehousing sector of urban Pennsylvania (direct effect) results in $0.33 worth of additional inter-industry purchasing (indirect effect) statewide ($0.32 is stimulated within urban Pennsylvania, but only $0.01 spills into rural Pennsylvania). The Type II model results, however, indicate that the warehousing sector of rural Pennsylvania has the highest output multiplier ($3.71) among all sectors, which, by comparison with its Type I multiplier ($1.39), suggests the importance of labor to the warehousing sector and the role of household consumption in linking warehousing activities to the larger Pennsylvania economy. The Type II output multiplier for warehousing in urban Pennsylvania is not as large ($3.44), but, again, in comparison with the Type I multiplier ($1.33), it suggests the overall economic impacts of the warehousing sector are strongly related to household spending. The relatively low Type I output multipliers associated with warehousing services suggest an opportunity exists to develop ancillary activities in Pennsylvania that support warehousing, which can then be used to capture a larger share of indirect and induced effects that, now, are leaking out of state. The truck transportation sector has larger Type I output multipliers and smaller Type II multipliers than warehousing. This suggests that truck transportation is better linked to other local activities and sectoral spending does not leak as much to regions outside Pennsylvania.

Every dollar of additional output demanded from the truck transportation sector of rural Pennsylvania (direct effect) results in an additional $0.70 of additional inter-industry purchasing statewide (indirect effect); $0.53 is stimulated within rural Pennsylvania and $0.17 occurs in urban Pennsylvania. Every dollar of additional output demanded from the warehousing sector of urban Pennsylvania (direct effect) results in $0.59 worth of additional inter-industry purchasing statewide (indirect effect); $0.58 is stimulated within urban Pennsylvania and only $0.01 spills into rural Pennsylvania. As expected, Type II
Multipliers are larger than Type I multipliers. Relative to warehousing, Type II multipliers suggest household spending plays an important role in linking the trucking sector to the larger Pennsylvania economy, but not nearly as important as it does for warehousing.

In terms of the overall impact of the warehousing and truck transportation sectors in rural Pennsylvania on the state’s economy, the research estimates that warehousing accounted for more than $2.9 billion in direct output in 2004 (Figure 7). In turn, this direct output produced nearly $7.3 billion in additional activity as it rippled through the state’s economy. Rural Pennsylvania generated 25 percent of direct output associated with warehousing activities, and it received 21 percent of all indirect and induced effects generated statewide.

Truck transportation accounted for more than $10.4 billion in direct output in 2004 (Figure 8). In turn, this direct output produced nearly $24.7 billion in additional economic activity throughout the commonwealth. Rural Pennsylvania generated 33 percent of all direct output associated with trucking, but it received only 27 percent of all indirect and induced effects generated statewide.

Clearly, an apparent imbalance exists between the indirect spillover effects generated by rural and urban Pennsylvania. Without exception, among all sectors, the indirect spillover effects from rural to urban counties is many times larger than the indirect spillover effects from urban to rural counties. In the case of truck transportation, for example, indirect and induced effects are nearly 23 times larger. This imbalance suggests that, all other things being equal, the overall structure of the Pennsylvania economy tends to direct a disproportionate amount of stimulated output toward urban counties.

The sizeable impacts, which reach the tens of billions of dollars, should be used with caution, for they do not provide a clear picture of the actual returns Pennsylvania receives on its investments in warehousing and trucking. Every dollar of wages and proprietor income created by warehousing in rural Pennsylvania produces just $1.52 in additional earnings statewide; nearly 74 percent of the overall (direct, indirect and induced) multiplier effects remained in rural Pennsylvania ($1.12) while the other 26 percent ($0.41) spill into urban counties. Each dollar of direct income in urban Pennsylvania produces $1.42 in additional earnings statewide; 98.6 percent of these indirect and induced (multiplier) effects remain in urban Pennsylvania ($2.40), while only 1.4 percent ($0.02) spill into rural counties.

Based on these results, it is possible to estimate the overall impact of warehousing on wages and proprietary income (Figure 9 on Page 14). Overall, warehousing in Pennsylvania generated nearly $1.8 billion in direct wages and proprietary income. In turn, this direct income
produced $2.6 billion in additional wages and earnings as it rippled through the state’s economy.

Rural Pennsylvania generated 25 percent of all direct wages and income associated with warehousing activities, and it received 20 percent of all indirect and induced effects. Again, these results confirm the structure of the Pennsylvania economy directs the flow of income generated by warehousing toward urban counties.

Income multipliers associated with trucking are larger than those associated with warehousing. Every dollar of wages and proprietor income earned by truck transportation in rural Pennsylvania generated $2.48 worth of additional income statewide; nearly 72 percent of these direct, indirect and induced (multiplier) effects remained in rural Pennsylvania while the other 28 percent leaked into urban areas. Every dollar of wages and proprietor income in truck transportation in urban Pennsylvania generated $2.20 worth of additional income throughout Pennsylvania; nearly 99 percent of these indirect and induced effects remained in urban Pennsylvania while the other 1 percent leaked into rural counties. Based on these results, it is possible to estimate the overall impact of truck transportation on wages and proprietary income in the commonwealth. All truck transportation in Pennsylvania generated more than $8.2 billion in direct wages and proprietary income in 2004 (Figure 10). In turn, this direct income produced nearly $18.9 billion in additional wages and earnings as it rippled through the state’s economy. Rural Pennsylvania generated 14.9 percent of all direct wages and income and received 12.6 percent of all indirect and induced effects. These results suggest again that, all other things being equal, the overall structure of the Pennsylvania economy tends to funnel the flow of total income generated by trucking away from rural counties and toward urban counties.

From a statewide planning perspective, these results suggest that if more is to be demanded from either warehousing or truck transportation, then demand satisfied in rural Pennsylvania would generate greater impacts on total income than demand satisfied in urban Pennsylvania (assuming supply is perfectly elastic). And, from a rural development perspective, these results reinforce an important policy issue – economic growth in rural areas of Pennsylvania generates benefits not only for rural counties, but also for urban counties.

**Economic Impacts of Warehousing and Truck Transportation on Jobs**

Each additional warehousing job created in rural Pennsylvania results in 1.82 additional jobs and in urban Pennsylvania results in 1.52 jobs statewide. Each additional trucking job created in rural Pennsylvania and urban Pennsylvania generates 3.00 and 2.50 new job opportunities, respectively, statewide. When spillovers are considered, however, urban Pennsylvania captures most of the new opportunities it creates as well as a sizeable portion of what rural Pennsylvania creates.

Employment multipliers must be used with caution, however, since assumptions are made that all existing employees are fully occupied and performing at peak efficiency; thus any additional demand will necessarily require new workers. If existing employees in these sectors are underemployed, then job creation effects can go unrealized. Also, the warehousing industry continues to undergo revolution as the Internet is being used to receive and track orders, and manage inventories in real-time with greater efficiencies. Also, new warehouse automation technologies are being adopted with increasing frequency (Baker and Halim, 2007) for moving and storing loads “without the need for operators and drivers” (Rowley, 2000). Such capital investments build capacity and can also cause job creation effects associated with growth to go unrealized.

**Locational Analyses**

**County Rural/Urban Designation**

When the warehousing and trucking facility data were mapped, it became clear that the majority were found in urban counties. The largest clusters of warehouses and trucking operations, in terms of the number of facilities in a given area, were located near the state’s major population centers (Figure 11). Few, if any, numerically large warehousing or trucking clusters were seen in rural counties: some exceptions were those in Franklin and Schuylkill.
counties. Nearly all of the urban counties rank high in the number of warehousing and trucking facilities, with the urban counties of Allegheny and Philadelphia highest in warehousing, and Allegheny and Bucks highest in trucking. Butler, Schuylkill, Washington, and Franklin counties ranked highest among rural counties in warehousing and trucking facilities.

When aggregated to the county level, the number of rural warehouses per county only exceeded 2 percent of the total number of warehouses in three cases: Schuylkill (2.45 percent), Franklin (2.10 percent) and Butler (2.10 percent) counties. The only rural county to exceed 2 percent of the total number of trucking facilities was Butler County (4.12 percent).

Municipal Rural/Urban Designation

At the county level, approximately 26 percent of the warehousing and 36 percent of the trucking facilities were located in rural counties. However, when the municipal rural/urban designation was used, more facilities were categorized as being urban, especially warehouses. This suggests that both warehousing and trucking tend to locate more often near urban areas, and that even when located in rural counties, these facilities tend to locate in the more populated portions of those counties. It is not surprising that both facility types tend to be found in urban settings, since both often rely on municipal services, such as water, sewer, and electricity.

When using the rural/urban county definition, 290 facilities were classified as rural. However, about 29 percent were reclassified as urban when using the municipal definition. Conversely, 840 facilities were classified as urban using the county definition, with 18 percent being reclassified as rural when using the municipal definition. The larger percentage of reclassifications was from rural to urban, again suggesting a trend toward locating in an urban setting.

Siting Considerations

Land Use/Cover

Land use/cover is another important siting consideration with regard to the siting of large facilities such as warehouses. Older warehousing and trucking facilities were often sited within urban areas where there was easy access to manufacturers, customers, and transportation (principally rail lines). Due in part to the costs of urban land, these older warehouses tended to be smaller, in many cases less than 200,000 square feet. As trucking became the dominant method of moving goods, and retailers began outsourcing stock storage to distribution facilities, warehouses became larger and needed larger, less expensive lots, with easy access to interstates. Warehouses are often located in high-intensity developed areas (22 percent), but more commonly in the medium-intensity developed areas (31 percent), as well as the lower-intensity developed areas (16 and 17 percent). The location of trucking facilities by land use/cover is somewhat more common in the lower use intensity categories. This may be a function of the large number of small trucking operations found scattered throughout the state. Fully one-third of the trucking operations contained in the database were found in rural areas, at both the county and municipal levels.

Trucking and warehousing facilities found in rural counties display slightly different land use/cover characteristics. The location of trucking facilities is found less often in medium- and high-intensity developed areas and more often in forested and pastured lands. Again, this is likely a function of the abundance of smaller rural trucking operators and the relatively small amount of intensely developed land in rural counties. Rural warehousing follows much the same pattern of locating in somewhat less intensely developed areas, with the notable exception that there is not the same increase in facilities locating in forested and pasture lands. While rural warehouses generally tend to locate on less developed land, these lands are still within the urban setting.

Within the urban environment both trucking and warehousing are found most commonly in medium-intensity developed areas, followed by low-intensity developed areas for trucking and high-intensity developed areas for warehouses. The pattern appears to be warehousing tending toward higher intensity developed areas and trucking toward lower intensity developed areas.
While it seems that both warehousing and trucking tend to be located most often within urban settings, it should be noted that both of these industries (especially warehousing) also tend to influence the landscape around them. Just as with other industries, when one or more warehouses is built in an area, it can attract a cadre of associated businesses and industries. Even if warehouses are not agglomerated, per se, warehouse associated businesses often are, resulting in a change in the landscape. Therefore, although a warehouse or trucking facility may have initially chosen a less developed site, ultimately the agglomeration of associated businesses nearby will change the area to one of higher intensity of development. Without knowing when the facility was constructed and the land use/cover of the area prior to its construction, it is very difficult to tell where the causal mechanism lies.

**Distance from Interstates and Highways**

The majority of warehouses in Pennsylvania rely primarily on tractor-trailers as a means of transferring products, and therefore a key siting consideration is distance from interstates and highways\(^2\). On average, rural facilities are farther from interstates, and more so when the municipal designation is used. There is a 43 percent difference between rural and urban warehouses in terms of average distance to interstates, and a 69 percent difference in trucking when using the county designation. When using the rural municipal designation, the average distances to interstates increase for both warehousing and trucking. Yet, it should be noted that, in all cases, these average distances are quite small, and never more than about 2.5 miles. Regardless of facility type or rural/urban designation, distance to the nearest interstate or highway drops sharply after approximately 1.5 miles. Almost 60 percent of the warehousing facilities occur within 1 mile of an interstate or highway, regardless of rural/urban designation.

In rural settings, trucking appears to be more diffuse than warehousing relative to interstates and highways, but not markedly so. These results are not surprising, in that both industries are inextricably tied to roadways. Yet these results make it clear that the physical impacts of the siting decisions made by both industries are generally limited to those areas closest to interstates and highways.

**Truck Traffic**

For truck traffic, the east-west traffic movement is dominant. I-80, I-76, and I-78 all have long stretches where the daily truck traffic is greater than 30 percent—over twice the design capacity for these interstates (Figure 12). North/south truck traffic is also quite heavy, particularly on I-79, I-81, and I-83, which have over 20 percent truck traffic per day. That interstates have heavy volumes of truck traffic is not particularly surprising; however, the volume of truck traffic on U.S. highways was unexpected. Sections of U.S. 22, 11 and 15, and 219 have well over 20 percent truck traffic. U.S. 22, 11 and 15 form bridge-routes between I-76, I-78, and I-80, which may explain their truck traffic volumes. And while a significant number of the trucks on Pennsylvania’s roads are generated within the state, dominant east-west flow of truck traffic points to a substantial portion of this truck traffic being generated outside the state.

While the percent of truck traffic per interstate or highway is a good measure of flow relative to capacity, it fails to account for the overall volume of truck traffic experienced by a particular county. Total truck vehicle miles traveled (TVMT) aggregated to the county revealed a disproportionate burden of truck traffic experienced by some rural counties. In particular, Bedford, Monroe, Mercer, Butler, Clearfield, and Washington counties all have over 400,000 total truck vehicle miles traveled. When the total truck vehicle miles traveled per county is normalized by the total miles of highways per county, the pattern is even more telling (Figure 13). Six rural counties have over 3,000 total vehicle miles traveled per mile of interstate or highway. Of the six, only Franklin ranked moderately high in the number of warehouses (12) and trucking facilities (10). Monroe and Bedford both had a total of seven warehousing and trucking facilities combined, while Jefferson and Clarion had only five facilities. Montour, which has no warehousing or trucking facilities, ranked fourth in

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\(^2\) Interstate and highway location data were derived from maps produced by the Federal Highway Administration. See also [http://www.fhwa.dot.gov/hep10/nhs/](http://www.fhwa.dot.gov/hep10/nhs/).
terms of TVMT per mile. With the exception of Franklin, these counties are experiencing a level of through-traffic out of proportion to the amount generated by warehousing and trucking within their borders. Certainly a portion of this truck traffic is generated by manufacturing or other industries, but through-traffic along I-80 and I-76 likely account for the majority of the truck vehicle miles traveled.

Figure 13. Total truck vehicle miles traveled (TVMT), aggregated over a year, per mile of highway. Percent truck traffic per roadway is also shown for comparison. (PennDOT 2006)

SUMMARY AND CONCLUSIONS

Economic Impacts
Warehousing & Storage

Pennsylvania gained 21,194 net warehousing jobs between 2001 and 2006: rural counties gained 7,066 net jobs while urban counties gained 14,128 net jobs. Employment grew and concentrated in Pennsylvania at rates substantially faster than the national averages. Positive net job growth in warehousing and storage in Pennsylvania can be attributed to growth in the national economy, faster-than-average growth in the general warehousing and storage industry, and conspicuous regional advantages. Pennsylvania has many site and situation characteristics that firms in the warehousing industry find attractive.

In 2004, the majority of counties that exhibited high employment concentrations in warehousing were situated along the I-81 corridor, particularly where I-81 intersects the major east-west routes I-80 and I-76. Clearfield County, which is located near the center of the state and along I-80, was the only notable exception. When national and state results are considered together, they reveal that Pennsylvania holds a relatively large share of national employment in the warehousing and storage industry, and that share is now highly concentrated within a cluster of 18 counties, most of which straddle the I-81 corridor.

In 2004, warehousing activities in Pennsylvania accounted for more than $2.9 billion in direct output. This direct output was linked, in turn, to nearly $7.3 billion of additional activity as it rippled through the state’s economy. Yet the warehousing sectors of both rural and urban Pennsylvania had some of the lowest Type I output multipliers among all sectors, which indicate that the warehousing industry displayed relatively weak purchasing links to other sectors of Pennsylvania’s economy. Therefore, a planning opportunity exists to develop ancillary activities (i.e. backward linkages) in Pennsylvania that support warehousing, which can then be used to capture a larger share of indirect and induced effects that now are leaking out of state. Shields (2004) suggested several opportunities for industrial growth in rural Pennsylvania, including paper and allied products, rubber and miscellaneous plastics products, textile mill products, and transportation equipment, which seem like natural compliments to warehousing and storage.

The research also indicated that the overall economic impacts of the warehousing sector were strongly related to household spending and consumption. Therefore, any change that negatively affects household spending and consumption, such as rising fuel or food prices, rising health care costs, and declining housing values, will likely affect this industry.

It would be ideal if municipalities could take advantage of the positive economic impacts that warehousing activities can provide. Unfortunately, at least in 2004, warehousing and storage activities had some of the lowest income multipliers and below-average job multipliers among all sectors of the Pennsylvania economy. Obviously, as noted above, Pennsylvania gained 21,194 net warehousing jobs between 2001 and 2006, and with these new jobs came new income. However, given the warehousing sector’s relatively weak backward linkages, additional external demand for warehousing in Pennsylvania will stimulate relatively few additional jobs and spur very little wage and income growth in other sectors of Pennsylvania’s economy. Warehousing growth by itself produces little in the way of broad ripple effects that positively influence other economic sectors. If municipalities could develop ancillary industries in Pennsylvania to support these low-impact warehousing activities, thereby strengthening their own inter-industry links in the process, then to-
The Center for Rural Pennsylvania

gether warehousing and its ancillary activities might stimulate greater indirect and induced impacts on wages, income, and employment.

**Trucking**

Total employment in the U.S. fell 1.4 percent during the national economic downturn between 2001 and 2003. Since 2003, however, the U.S. exhibited steady national growth, and total employment rose approximately 5.1 percent by the end of the first quarter of 2007. If national growth and sectoral growth were the only influences on regional growth in long-distance, general freight trucking, then they would have accounted for 627 new trucking jobs in Pennsylvania over the observed period. However, Pennsylvania lost 4,780 long-distance, general freight trucking jobs between 2001 and 2006, with rural counties losing 458 jobs and urban counties losing 4,322 jobs. Overall, net job losses in this sector were limited largely by factors attributable to Pennsylvania; they cannot be attributed solely to national trends in the overall economy or national trends in the truck transportation industry during the same period.

In 2004, truck transportation services accounted for more than $10.4 billion in direct output and more than $8.2 billion in direct wages and proprietary income. This direct output produced nearly $24.7 billion in additional output and $18.9 billion in additional wages and proprietary income throughout the commonwealth. Such impacts, however, do not reflect the effects of any income transfers that were associated with rural persons working in urban counties, or vice versa. It is also worth noting that direct wages and their ripple effects would have likely decreased by 2006, as Pennsylvania was continuing to lose jobs in this sector. In 2004, rural Pennsylvania generated 33 percent of all direct output associated with general freight trucking, but received only 27 percent of all indirect and induced effects generated statewide by additional external demand. Rural Pennsylvania generated 14.9 percent of all direct wages and income, but received only 12.6 percent of all indirect and induced effects.

In 2004, truck transportation was better linked to other local activities than warehousing, and industry spending did not leak as much to regions outside Pennsylvania. Also, household spending played an important role in linking the trucking sector to the larger Pennsylvania economy, but not nearly as important as it did for warehousing. As was expected, the trucking sector is strongly linked to the manufacturing, health and human services, and retail trade sectors.

An apparent imbalance exists in the rural-urban structure of the Pennsylvania economy. Without exception, among all industry sectors, the indirect effects that leak from rural to urban counties are many times larger than the indirect effects that spill from urban into rural counties. For example, truck transportation in rural counties has a larger income multiplier than truck transportation in urban counties; but when spillovers are considered, urban Pennsylvania seems to capture most of the new opportunities it creates as well as a sizeable portion of what rural Pennsylvania creates. This imbalance suggests, all other things being equal, that additional demand for goods and services from Pennsylvania will generate ripple effects that send a disproportionate share of new output, income, and jobs to urban counties. From a statewide planning perspective, these results suggest that, if there is more demand from either Pennsylvania’s warehousing or truck transportation sectors, then the additional demand satisfied by rural Pennsylvania would generate greater impacts on total income, statewide, than additional demand satisfied by urban Pennsylvania alone (assuming supply is perfectly elastic). From a rural development perspective, these results reinforce an important policy issue – economic growth in rural Pennsylvania generates benefits not only for rural counties, but also for urban counties.

**Locational Impacts**

**Clusters and Agglomeration**

Warehousing in Pennsylvania occurs primarily in urban counties (74 percent), with Allegheny, Philadelphia, Bucks, and Luzerne having the largest numbers of facilities. Within the urban setting, warehousing clusters appeared to have developed organically at older sites located closer to the urban cores or as either organic or planned developments near the urban fringe. Most of the newest urban warehouse and trucking clusters were in planned developments. Trucking facilities followed much the same pattern, with the largest number occurring in urban settings (64 percent), specifically Allegheny, Cumberland, and Bucks counties. Three rural counties ranked within the top 20 percent relative to warehousing and trucking facilities: Schuylkill, Butler, and Franklin. Rural facilities, particularly warehousing, occurred most often in newer planned developments, such as those in Franklin and Schuylkill counties.

Regardless of the county designation (rural or urban), both warehousing and trucking facilities tended to locate near the urbanized portions of those counties. In urban counties, warehousing and trucking tended to locate in more intensely developed areas, while in rural counties they tended to locate in somewhat less intensely developed areas. In rural Pennsylvania, warehouses do not tend to locate in truly rural locations, although there are exceptions. In all cases (rural or urban), both industries tend to locate close to highways and interstates, on average less than 2.5 miles; therefore counties without major highways or interstates are unlikely to be impacted directly (negatively or positively) by warehousing and trucking. Of the two industries, trucking is more diffuse, and tends to cluster in those areas where warehousing already exists.
Traffic

The flow of truck traffic through Pennsylvania is predominantly east-west. I-80 and I-76 form the major east-west corridors through the commonwealth, while I-81 forms the single most important north-south corridor. Urban counties are most impacted by total truck traffic when measured by both percentage of total traffic and total vehicle miles traveled. However, truck traffic is more visibly present on rural highways and interstates since overall traffic volumes tend to be lower. Rural truck traffic impacts became apparent when total truck traffic, measured in vehicle miles traveled, was normalized based on the total length of highways per county. Montour, Franklin, Clarion, and Monroe counties all ranked high in the number of truck miles traveled there relative to the total length of highways found in these counties. While Franklin County has a large warehousing and trucking cluster that is in part responsible for the elevated truck traffic found there, Montour, Clarion, and Monroe counties have few trucking and warehousing facilities, and therefore the predominant cause of elevated truck traffic is due to through-flow. Truck traffic into, out of, and within the commonwealth, and especially through-flow, is expected to continue to increase for the foreseeable future (U.S. DOT, 2002). The truck trip generation results of this study, as well as other trip generation studies, indicate that larger warehouses (in terms of footprint) tend to generate more truck trips, and that trucking companies with more employees tend to generate more truck trips. Given that progressively larger warehouses are being built within the commonwealth and more of the demand for trucking is being outsourced to independent trucking companies, these industries will continue to generate more truck trips. As newer, larger warehouses are built, the source of these truck trips will become increasingly more concentrated while the burden becomes increasingly more widespread.

Counties, both urban and rural, that are located along I-76, I-80, and I-81, are expected to see the greatest benefits and largest impacts of warehousing, and to a lesser extent trucking. This is especially true for those counties with major interstate interchanges, such as the I-81 and I-80 interchange.

Warehousing agglomerations are not organic in most cases. There are few large warehousing agglomerations in rural counties; most are in urban counties. Those that exist were planned developments and were created to attract warehousing based on good site and situational characteristics. Since rural warehouse agglomerations tend to be planned rather than organic, warehousing and trucking companies are often simply choosing between competing business parks, which may diminish the importance of location in favor of tax breaks or other incentives.

Long-Term Influences

The long-term trend of net outmigration from the Northeast and Midwest regions of the United States to the Southern and Western flanks continues to change the composition of Pennsylvania’s workforce. It also reduces the relative value of Pennsylvania’s location and increases the relative values of other locations with respect to both growing labor pools and consumer markets. Although Pennsylvania’s total population continues to grow, it does so slowly and it is expected to grow at the sixth slowest rate among all 50 states until 2030 (U.S. Census Bureau, 2004). Pennsylvania is second only to Florida in size (1.9 million +) and percent (15.6) of population aged 65 years or older (U.S. Census Bureau, 2005). The U.S. Census Bureau expects a large wave of retirements starting in 2011 when the first Baby Boomers turn 65 (U.S. Census Bureau, 2005). The American Trucking Association points to trends like these as worsening workforce problems because, according to their research, “one in six drivers was 55 years or older at the time of the 2000 Census” and the industry desperately needs “to find and attract young male workers” (Global Insight, Inc., 2005). Obviously, given the large number of people employed in trucking in Pennsylvania, these worsening workforce problems are particularly acute for both rural and urban Pennsylvania. There is no extant research that describes the population structure of persons working in the warehousing and storage industry in Pennsylvania, but it is likely that this industry faces similar workforce issues.

[Policy and Planning Considerations]

Managing for freight/goods movement presents two, sometimes contradictory, challenges. First, there is the challenge to accommodate trucking and warehousing to foster economic development and to maintain the quality of life associated with rapid goods movement. Second, there is the challenge of mitigating the impacts of freight movement on the region and on local communities.

The first challenge addresses the efficient movement of goods, creation of jobs, and local as well as regional development (or even redevelopment). By extension, it may even include fiscal benefits to local communities through an increased tax base. The geographic scale of these benefits varies, and may be national, statewide, regional, and local, depending on the element involved. For example, fiscal benefits are generally local, job growth is regional in impact, and efficient goods movement benefits consumers and producers nationwide.

The second challenge of mitigating impacts, however,
is limited in scale to Pennsylvania. The state bears much (though not all) of the costs in the construction and maintenance of transportation infrastructure. Other impacts to environmental quality, quality of life, property values, and safety are limited to Pennsylvania boroughs, townships, and counties. Simply put, Pennsylvanians statewide and in certain municipalities “pay the fees” (the negative local land use impacts) for “dividends” (lower-cost consumer goods through efficient goods movement) that in large part are distributed nationally. This is in part offset, both directly and indirectly, by the jobs created and tax bases fortified.

This is especially remarkable to Pennsylvania, as a tremendous share of the goods movement is through the region. Therefore, the polarity of benefits accruing nationwide against the costs being borne to the state, its regions, and local municipalities is especially evident. This does not diminish the economic contributions that the freight and warehouse industry makes to the economic health of the state. The contributions are significant and critical. However, it does provide a rationale for planning and policy-making to best assure that the social, economic, and environmental costs of these activities are best addressed.

State Level Considerations

There are several planning and policy options that can be accomplished within or across several state agencies, with PennDOT being the most obvious player.

Spot Improvements to State Transportation Infrastructure

Targeted improvement to roadways and intersections is one strategy for addressing particular trouble spots. Improving roadway conditions, such as inadequate turning radii, few turning lanes and ramp configurations, can increase both truck and overall traffic flow conditions (NCHRP, 2003b p20).

Building Truck Rest Areas/Parking

As goods movement becomes increasingly time sensitive, the demand for off-site truck stop and rest areas also increases, as trucks need intermediate locations to park prior to appointment times. Options include new facilities, upgrade and expansion of existing facilities, and improving access, with signage, to better identify existing parking areas (NCHRP, 2003b). The inadequacy of rest areas and truck parking is one of the more common and obvious issues in goods movement.

Anti-Idling Legislation

Air quality concerns, along with compliance with the Clean Air Act, have brought greater attention to truck idling, including current and proposed anti-idling legislation. The prevalence of both state and local idling regulations is increasing. The trucking industry, to achieve better compliance, prefers state-wide regulation. This is because a multitude of variable local regulations makes compliance more challenging.

Increased investments in technology and a rising level of regulation both serve to reduce idling and to reduce air quality impacts. Trucking firms benefit as fuel consumption demands drop with decreased idling. As fuel costs increase, this benefit proportionally increases.

In the interest of reducing environmental impacts and increasing fuel efficiency, the U.S. EPA is collaborating with the industry to create the “SmartWay” Transport Partnership. A clearinghouse of information, which includes model regulations, may be found at the partnership web site (http://www.epa.gov/smartway/index.htm).

New state regulations poised to take effect in 2009 will limit idling to five minutes within a 60-minute period, with exceptions for given circumstances (25 Pa. Code Chs. 121 and 126.). These regulations are similar to existing regulations in Maryland, New Jersey, New York, and Virginia, as well as other states beyond the Mid-Atlantic region.

Intelligent Transportation Systems

Regional transportation planners across the U.S. are working to implement intelligent transportation system (ITS) technologies (NCHRP, 2003b). Such systems depend on “intelligent vehicles” and “intelligent infrastructure” (RITA, 2008). Intelligent transportation systems have been around in various forms since the early 1990s and are evolving as the programming and computing technology improves.

Incident Management Programs

An incident management system or program is useful in enhancing both safety and traffic flow. A database for such a program may assist in identifying more common truck safety problems and to track offending drivers and firms (NCHRP, 2003b p20). These programs may be set up and administered with cooperation of local, state, and regional trucking associations.

Public Education

Traffic safety can be improved with programs to educate the public about freight operations, including programs to educate motorists on defensive driving techniques and tips. Examples include the “NoZone” program that makes drivers better aware of the blind spots around trucks and other skills needed to drive safety in mixed traffic situations (NCHRP, 2003b).

Local Government Considerations

Local governments withstand the worst of land use, fiscal, and other community impacts of trucking and warehousing activities. Given this local context, citizen concerns are voiced most urgently and pressingly at the local level. Therefore, recommendations for action at the municipal level are of the greatest relevance.

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Fortunately, local municipal governments have a number of tools at their disposal in mitigating the impacts of trucking and warehousing. These tools include:

1) Comprehensive plans.
2) Zoning ordinances.
3) Subdivision and land development ordinances.
4) Other ordinances (potentially including noise and idling ordinances).
5) Other programs, including community education, working with advisory committees to establish “best management practices,” signage programs, and an access management program.

Industry Best Practices

Members of the goods movement industry may take proactive steps to not only better integrate freight facilities with community goals, but also establish a positive setting for broadly engaging all community stakeholders. Potential actions are:

1. Scheduling truck appointments and hours of operation.
2. Requiring staging areas for trucks at warehouses.
3. Reduction of empty truck movements.
4. Hiring locally.
5. Creating a neighborhood investment fund.
6. Developing driver education programs.
7. Voluntary idling reduction programs.
8. Good neighbor policy and community outreach programs.

Other Considerations

Ideally, it should be recognized that trucking and warehousing are not just industries, but systems that are designed and implemented in ways that intentionally cross municipal/regional boundaries. Although their immediate impacts can be fairly localized, their cumulative impacts almost always extend well beyond municipal boundaries. Therefore, in terms of planning, municipalities in Pennsylvania start with an immediate disadvantage because their scope of authority is usually geographically limited by historic boundary decisions. Planning for warehousing and trucking would be most effective when implemented on the same regional scale at which they operate.

Already discussed by local political leaders in South Central Pennsylvania is the idea of highway “corridor coalitions.” Such corridor coalitions allow stakeholders at various scales to collaborate so as to improve transportation and mitigate the negative impacts of transportation along a particular corridor. The best known and closest of these coalitions is the I-95 Corridor Coalition (2007). While the I-95 Corridor Coalition is multi-state and crosses through many urban (instead of rural) areas, it does offer a model for building consensus. Established in the early 1990s, the Coalition deals with a wide array of transportation issues, with freight and goods movement issues being among the more prominent.

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Economic and Transportation Impact of Warehousing on Rural Pennsylvania (continued on next page)


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