Gasoline Prices, Carbon Emissions and Other Unpleasant Subjects

GASOLINE PRICES, CARBON EMISSIONS AND OTHER UNPLEASANT SUBJECTS

July 16, 2008. A day of infamy? Probably not, but that was the day the average price of a gallon of regular, unleaded gasoline maxed out at $3.99 per gallon here in Hampton Roads. In a few locations within our region, the price at the pump climbed as high as $4.20 per gallon. During that memorable summer, Louisville, Ky., led the "east of the Mississippi" crowd with a maximum average price per gallon of $4.27 (see Table 1).

The rapid spike in gasoline prices nationally elicited howls of pain and not a few assertions that the market for gasoline was monopolized. Of course, during the subsequent fall in prices to $1.80, those allegations were quickly forgotten. After all, if the oil companies really were monopolists, why did they allow the price of gasoline to fall by more than 50 percent in the space of only a few months?

The primary causes of the upheaval in gasoline prices lay elsewhere. They included:

- Rapid increases in the demand for gasoline in India, the People's Republic of China and various other countries;
- A concern that the world may have hit its peak in terms of oil production;
- Uncertainty as to levels of future oil production in unstable countries in the Middle East and Western Hemisphere countries such as Venezuela; and
- Fear of hurricanes disrupting the production and distribution of gasoline in the United States.

In other words, **the price spikes primarily reflected ordinary supply and demand influences rather than nefarious activities.**

Nevertheless, $4 per gallon gasoline (the highest "real," inflation-adjusted price for gasoline in the United States since 1918) was a shock and it caused many people and organizations to re-evaluate their lifestyles. Did we really need to drive that much and could we find ways to economize on our gasoline usage? Would such a price spike occur again in the near future? Could we look more to "green" alternatives as a response to the challenge of higher gasoline prices? Was now the time to figure out how to reduce carbon emissions, deal with global warming threats and reduce environmental pollution? These are the topics that we explore in this chapter.

What Determines Gasoline Prices?

Hampton Roads and Virginia are completely dependent on other states for the gasoline they consume. Virginia has no currently producing crude oil fields and Western Refining Yorktown is the only oil refinery in the state. Virginians get the largest share of their gasoline from oil port facilities located in Newport News and Norfolk. Further, Virginia does not have a crude oil pipeline running into the state. All of this doesn't sound good, but as we shall see, it's not as bad as it may seem.

By far the largest factor in the price of gasoline is the price of the crude oil from which gasoline is obtained. While the share of crude oil of the total price of gasoline has changed somewhat over time, since the turn of the century, crude oil prices have accounted for about one-half of the price of gasoline. Since 2007, this share has risen to almost 60 percent.

A second significant determinant of the price of gasoline is the cost of refining crude oil into gasoline and any profits earned by refiners. Since 2000, the percentage of the price of gasoline going to refiners has been relatively stable at about 17 percent.

TABLE 1

GASOLINE PRICE SPIKES IN SUMMER 2008

Location	Highest Price Date, Regular Unleaded	Highest Price, Regular Unleaded	March 27, 2009 Price, Regular Unleaded	VR Ratio 1	2009 Q1 Price	VR Ratio 2	Reformulated Gasoline
Norfolk/ Virginia Beach/ Newport News	7/16/08	3.989	1.932	2.0647	1.732	2.3031	Yes
Roanoke	9/15/08	4.138	1.904	2.1733	NA	NA	No
Richmond	7/16/08	4.000	1.941	2.0608	NA	NA	Yes
Charlottesville	7/15/08	4.015	1.950	2.0589	NA	NA	No
Washington, D.C.	7/16/08	4.188	2.076	2.01731	2.006	2.0877	Yes
Atlanta	9/16/08	4.114	1.934	2.1272	1.632	2.5208	No
Baltimore	6/19/08	4.029	2.003	2.0115	1.812	2.2235	Yes
Charlotte	9/15/08	4.181	1.999	2.0915	NA	NA	No
Louisville	6/30/08	4.268	2.048	2.0840	1.852	2.3045	Yes
Memphis	7/17/08	3.901	1.919	2.0328	1.792	2.1769	No
Philadelphia	6/20/08	4.155	2.041	2.0358	1.901	2.1857	Yes

Sources: American Automobile Association, Oil and Gas Journal and Energy Information Agency

A third large factor influencing the price of gasoline is the cost of distributing and marketing the product. The Energy Information Administration (an agency of the U.S. government) estimates this share to be about 10 percent to 12 percent of the price of gasoline.

The fourth major contributor to the price of gasoline is state and federal taxes. These taxes, which are denominated in cents per gallon (not a percentage tax rate), fall as a percentage of the price when the price of gasoline increases. The current federal tax rate on gasoline is 18.4 cents per gallon. The federal tax on diesel fuel is higher at 24.4 cents per gallon, while the federal tax on gasohol is lower at 13.3 cents per gallon. Table 2 provides data on state fuel taxes in Virginia and selected other states. The data reveal a wide variance between the taxes imposed by the states. Included in the table are the states

TABLE 2

STATE GASOLINE TAXES

State	Gasoline and Gasohol Tax, Cents per Gallon	Diesel Tax, Cents per Gallon
Virginia	17.50	16.00
North Carolina	29.70	29.70
Washington, D.C.	20.00	20.00
West Virginia	27.00	27.00
South Carolina	16.00	16.00
Maryland	23.50	24.25
Pennsylvania	31.20	38.10
Tennessee	21.00	18.00
Georgia	7.50	7.50
Washington	36.00	36.00
Average for All States	21.50	22.05

Source: Energy Information Administration, Petroleum Marketing Monthly

with the highest and lowest tax rates on fuel – Washington and Georgia, respectively.

Virginia maintains the lowest fuel taxes in the mid-Atlantic region. South Carolina is the closest state to have lower fuel taxes. Virginia is one of the few states that taxes diesel fuel less than gasoline and gasohol. Only nine of the 50 states tax diesel fuel at a rate less than gasoline.

Gasoline Price Spikes in Hampton Roads: 2008

Referring back to Table 1, we can see both the date and the amount of the highest recorded average price of a gallon of regular, unleaded gasoline in 2008 for cities in Virginia and selected other cities. In general, the highest per-gallon prices for gasoline occurred in July 2008. For comparison purposes, we also have provided the price of gasoline in the same cities during March 2009. The simple ratio of the July to March prices provides a rough measure of the size of gasoline price spikes, and we label this VR1 (our first "vulnerability ratio"). The larger the ratio, the larger the spike during summer 2008 and the more economically vulnerable the region.

Within Virginia, Roanoke experienced the largest gas price shock during summer 2008. The price spike in Hampton Roads was smaller and was similar to that experienced by Richmond and Charlottesville. One can see in Table 1 that the price spike in Hampton Roads was not unusually high or low. We experienced a relatively greater gasoline price shock than Baltimore, Washington, D.C., Memphis and Philadelphia, but a smaller shock than Atlanta, Charlotte and Louisville. With the exception of Memphis, the cities that experienced smaller price hikes all were located close to the East Coast. This reflects the obvious influence of transportation costs on the price of gasoline.

How did the high prices of summer 2008 compare to early 2009 prices? Using data from the Oil and Gas Journal, Table 1 also records the average price of unleaded gasoline for the first quarter of 2009, though the sample of cities differs somewhat. The ratio of peak price in summer 2008 to the average price in first quarter 2009 produces VR2, our second measure of the vulnerability of Hampton Roads to gasoline price spikes. Once again, Baltimore, Memphis, Philadelphia and Washington, D.C., all had lower vulnerability ratios than Norfolk.

The final column of Table 1 indicates whether or not gasoline in the market is "reformulated." Reformulated gasoline utilizes a recipe designed to make it burn cleaner and produce less pollution. The Clean Air Act of 1990 specifies triggers that allow the governor of a state to require reformulated gasoline. Currently, about 30 percent of the gasoline sold in the United States is reformulated. Most of the residents of Hampton Roads patronize gasoline stations that pump reformulated gasoline. Adjacent areas that do not use reformulated gasoline include Isle of Wight County, Gloucester, northeastern North Carolina and Virginia's Eastern Shore. Richmond also utilizes reformulated gasoline, as does the Washington, D.C., metropolitan area.

The Implications of Gasoline Price Spikes for Hampton Roads

When gasoline prices spike, as they did in summer 2008, drivers react in a fashion similar to any consumers who face a price increase – they attempt to cut back on their usage. **The demand for gasoline, however, is "price inelastic," a term economists use to reflect a situation where the quantity consumed of a good is not very responsive to price changes. In the very short run (a week or less), increases in the price of gasoline generate only very small decreases in gasoline purchases. A 10 percent increase in gasoline prices may stifle gasoline purchases by less than 1 percent.**

As time passes, however, gasoline consumers find ways to adjust. They drive less; they use public transportation; they carpool; they tune up their vehicles to obtain better gas mileage; and, ultimately, they purchase more fuel-efficient vehicles. In the long run (one to three years), a 10 percent increase in gasoline prices causes a 7 percent decline in gasoline purchases.

Thus, in summer 2008, when gasoline prices approximately doubled (let's round this off by making it a 100 percent increase), this reduced regional gasoline consumption hardly at all. However, by fall 2008, regional gasoline consumption had declined by almost 4 percent. At the close of 2008, however, the restoration of "cheap" gasoline brought most of this gradual adjustment to an end. The moral to this story? Drivers do react to changes in the price of gasoline. But it takes them a while to do so.

Estimates from the Bureau of Labor Statistics indicate that urban citizens designate about 8 percent of their total expenditures for energy, with 3.8 percent of those expenditures devoted to gasoline consumption. A report by the Natural Resource Defense Council (NRDC) during the height of the gasoline price increase in summer 2008 ranked Virginia 30th in the vulnerability of its households' budgets to gasoline price increases, as measured by the percentage of income allocated to gasoline consumption. **In 2007, drivers in Virginia on average spent 5.13 percent of their income (or $2,121 on average) on gasoline.**

In this regard, the state with the highest proportion of household budgets devoted to the purchase of gasoline was Mississippi, at 7.87 percent, while Connecticut was the lowest, at 3.17 percent. It is easy to see that the residents of poorer states spend more of their incomes on gasoline than those living in more wealthy states. Table 3 discloses these data.

TABLE 3

PROPORTION OF INCOMES SPENT ON GASOLINE, SELECTED STATES, 2007

State	Percent of Income Spent on Gasoline	State Ranking
Virginia	5.13	30
North Carolina	5.70	24
West Virginia	6.17	11
Mississippi	7.87	1
Maryland	4.52	41
Pennsylvania	4.41	43
Tennessee	5.82	17
Georgia	7.08	3
Connecticut	3.17	50

Source: "Ranking States' Oil Vulnerability and Solutions for Change," Natural Resources Defense Council

Environmental Issues

Because of its proximity to the ocean and the winds that result, air pollution levels in Hampton Roads are lower than in other similarly sized metropolitan areas. Nevertheless, we are vulnerable to air pollution because of traffic congestion, especially during our tourist-heavy summer months; when military traffic is particularly heavy; or virtually anytime our tunnels and bridges are congested. Further, Hampton Roads is not immune to natural events that increase pollution, such as the wildfires that burned in Hyde County, N.C., and Chesapeake during summer 2007.

TABLE 4

TRANSPORTATION CARBON EMISSIONS IN SELECTED METROPOLITAN STATISTICAL AREAS, 2005

MSA	Total Emissions and Rank Among 100 MSAs	Auto Emissions and Rank Among 100 MSAs	Truck Emissions and Rank Among 100 MSAs
Virginia Beach/ Norfolk/Newport News	1.145 (18)	1.004 (33)	0.141 (4)
Richmond	1.738 (79)	1.335 (92)	0.404 (56)
Charlottesville	1.724 (77)	1.256 (73)	0.068 (73)
Washington, D.C.	1.157 (20)	0.984 (30)	0.173 (10)
Atlanta	1.634 (66)	1.224 (73)	0.410 (58)
Baltimore	1.355 (40)	1.044 (44)	0.311 (40)
Charlotte	1.724 (77)	1.256 (79)	0.468 (73)
Louisville	1.700 (73)	1.129 (59)	0.571 (91)
Memphis	1.692 (72)	1.162 (65)	0.530 (85)
Philadelphia	1.023 (6)	0.789 (5)	0.234 (22)

Source: "Shrinking the Carbon Footprint in Metropolitan America," the Brookings Institution

A 2008 report by the Brookings Institution investigated the "carbon footprint" of U.S. metropolitan areas. A region's carbon footprint is its per capita emissions of carbon, measured in metric tons, from transportation activities and from residential use. We will focus on the carbon emissions from transportation here.

Table 4 presents Brookings Institution data on transportation carbon emissions for selected metropolitan areas in 2005. The better the ranking of the metropolitan statistical area (MSA), the smaller the carbon footprint for that area – that is, the lower its carbon emissions. **Hampton Roads emerges rather well from the Brookings analysis in terms of its carbon footprint. This is particularly true where trucks are concerned. This comes somewhat as a surprise, since our region's location and the presence of the port make it a trucking-intensive area. However, emissions that otherwise might produce a bad score are vitiated by the size of Hampton Roads and the reality that large portions of our region still are predominantly rural.**

The Hampton Roads MSA has a much smaller carbon footprint than Richmond, which ranks in the bottom one-quarter of the largest 100 MSAs in terms of its overall carbon emissions. The only MSA with a better transportation carbon footprint than Hampton Roads is Philadelphia. The Hampton Roads data are slightly worse for auto emissions, but better in terms of truck emissions, than the Washington, D.C., data.

What can be done to reduce carbon emissions? The Natural Resources Defense Council report mentioned earlier discussed four different categories of solutions: Clean Vehicles and Efficient Use, Research and Development, Clean Fuels, and Smart Growth and Transit. From these four categories, 10 different solutions were identified, most of which relate to transportation policies, such as developing an efficient state vehicle fleet. Virginia ranked only 31st in carbon emission reduction among the states, according to the NRDC. On the positive side, the Commonwealth has taken steps to develop an efficient fleet of state vehicles, has imposed idling restrictions on inspected cars, and is attempting to coordinate growth investments across state agencies (see Table 5).

On the negative side of the ledger, however, Virginia does not provide incentives for the purchase of plug-in hybrid cars, or require emission standards con-

TABLE 5

TRANSPORTATION-EFFICIENT PUBLIC POLICIES IN SELECTED STATES

State	Hybrid Incentives	Fleet Efficiency	R&D Grants	Clean Fuel Station Incentives	Coordinated Development or Growth Management	Percentage Spent on Mass Transit
Virginia	No	Yes	No	No	Yes	7.9
North Carolina	No	Yes	Yes	Yes	No	4.12
West Virginia	No	Yes	No	No	No	1.11
Mississippi	No	No	No	No	No	0.67
Maryland	Yes	Yes	No	No	Yes	38.08
Pennsylvania	Yes	Yes	Yes	Yes	Yes	14.82
Tennessee	No	Yes	No	Yes	Yes	3.22
Georgia	No	Yes	No	Yes	Yes	5.99
New York	Yes	Yes	Yes	Yes	Yes	50.31

Source: "Ranking States' Oil Vulnerability and Solutions for Change," Natural Resources Defense Council

sistent with California's clean cars program. Also, Virginia does not offer state grants for research and development for smart cars, and does not specify standards, or provide incentives, for low-carbon fuels. The NRDC study also computed an index of mass-transit spending by state, which it measures as the share of money spent on transit divided by total highway spending. The NRDC gave Virginia high marks for its high ratio (7.9 percent) of mass-transit spending to highway spending. This ranked the Commonwealth 14th among the 50 states. It is worth noting, however, that most of this spending has been on the Washington, D.C., Metro system extensions in Northern Virginia and does not include significant expenditures in Hampton Roads.

The upshot is that Hampton Roads is not excessively burdened with pollution generated by gasoline consumption (at least compared with other metropolitan areas). However, the state has not been as aggressive as many other states in taking steps to reduce carbon emissions. For example, Virginia is not a member of the Regional Greenhouse Gas Initiative. The RGGI consists of New England and mid-Atlantic states that have agreed to set limits on the greenhouse gases from power plants.

One of the policies favored by President Obama involves the use of carbon taxes, or "cap and trade," in order to reduce carbon emissions. The intent is to set specific limits on carbon that can be emitted by a region or a state. There are two major variations on this theme. In the most commonly proposed cap-and-trade scenario, those who wish to emit carbon will have to purchase permits in a competitive auction that would give them the "right to pollute." Thus, cap and trade would simultaneously limit carbon emissions and invoke price penalties on those who elect not to curtail emissions. Because the carbon emission permits would be distributed via a competitive auction, these permits presumably would be purchased by those who will earn the highest profits if they

own the permits. In turn, this means that the permits ultimately will be purchased by the individuals and firms that produce the goods and services that consumers regard as most essential.

In another commonly discussed version of cap and trade, current emitters of carbon (for example, manufacturing plants) would receive a free allocation of permits, but the number of those permits would be limited to a level that would reduce total carbon emissions. Then, those who desire more permits than they received initially will be forced to bid to acquire more if they want to emit additional carbon. In this cap-and-trade scenario, those who choose to discharge additional carbon will incur higher costs. Simultaneously, an incentive is created for some individuals not to emit carbon so that they are able to sell their permits.

Under either cap-and-trade scenario, however, consumers end up paying higher prices for the things they purchase because carbon-emitting businesses will do their very best to pass the costs of their carbon permits on to consumers. For obvious reasons, this aspect of cap-and-trade proposals often is glossed over by elected officials who propose cap-and-trade systems. Elected officials also tend to say little about the additional tax revenue a cap-and-trade system will generate for the federal government, though those in the know clearly have plans how to spend these incremental dollars.

By most accounts, Virginia would be less affected by a cap-and-trade system than many other states because it is not home to many manufacturing operations that emit carbon. In general, the same "we won't be affected as much as other regions" judgment applies to Hampton Roads because our region is characterized by relatively low carbon emissions per person. Geographically, the most vulnerable region in Virginia where cap and trade is concerned appears to be the Richmond metropolitan area, because of its elevated carbon emission levels.

At this point, however, we must insert a note of reality. Because a cap-and-trade system, properly understood, introduces a new, broad tax on economic activity, and new taxes always are unpopular, it is not preordained that such a system will be adopted. Even so, as this material is being written, it does appear that some type of cap-and-trade system seems likely to be legislated at the federal level.

Sustainability in Hampton Roads

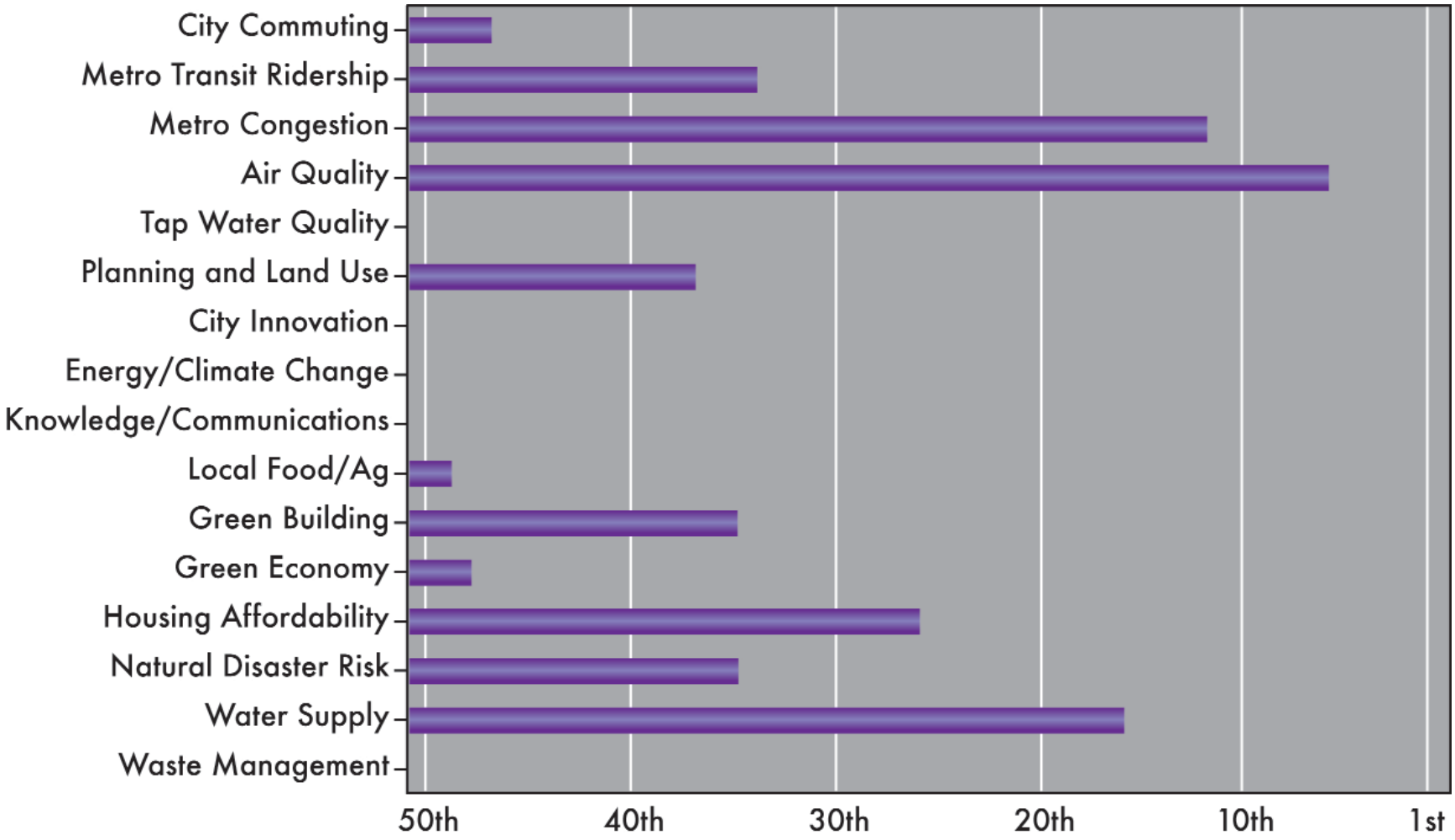
The notion of sustainable economic activity is one that has attracted considerable attention in recent years. At its most basic, it focuses on economic activity that can be perpetuated and sustained over very long periods of time. **The question is: Can humans develop patterns of economic activity that meet current needs, yet replenish resources and preserve the environment in ways that do not impoverish future generations?**

One can extend the notion of sustainability to cities and regions. Based upon a variety of indicators, www.sustainlane.com provides a ranking of the degree of sustainability of the 50 most populated cities in the country. Graph 1 presents information for the only Virginia city in the Top 50, Virginia Beach. The Beach receives high marks for some of its policies, for example, having 10 percent of its school buses that run on biodiesel and introducing LEED-certified (environmentally efficient) buildings. It also does well in terms of air quality, water supply and the relative absence of traffic congestion. However, Virginia Beach ultimately ranks only 45th overall among the 50 largest cities because of long commutes (often to Norfolk), low usage of mass public transportation, relative low usage of farmers' markets, and inadequate planning and land use. Even so, this represents an improvement over 2006, when it was ranked 48th.

Of course, not all observers would choose the same criteria, or assign the same weights on these criteria, as www.sustainlane.com. Further, there are many other significant economic enterprises in Hampton Roads (the military, Norfolk Southern, Northrop Grumman Shipbuilding, Smithfield Packing, K-12 public schools, universities) whose sustainability might usefully be measured.

GRAPH 1

VIRGINIA BEACH'S RANKINGS AS A SUSTAINABLE CITY, 2008



Source: www.sustainlane.com
Note: The sample consists of the largest 50 cities in the country. The highest (most favorable) ranking a city can receive is 1st; the lowest (least favorable) is 50th. Virginia Beach was not measured in five of the categories.

Final Thoughts

This chapter started by examining the vulnerability of Hampton Roads to price spikes in gasoline and ended by probing our region's long-term economic sustainability. How are these topics related? First, rising energy prices (and the extent to which these prices rise in Hampton Roads) could disadvantage the region in the future. However, **our region appears to be somewhat less vulnerable to energy price spikes (for example, in gasoline) than many other regions, primarily because of our coastal location. In this respect, our economic model may be more sustainable than that of many other metropolitan areas.**

Second, sustainable economic development worldwide appears to require limiting carbon emissions, and several cap-and-trade taxation schemes have been proposed to use prices and markets to achieve this goal. Because Hampton Roads is one of the lower carbon-emitting regions, we will not be affected as much as other areas (such as Richmond) that emit much larger amounts of carbon.

Third, however, **our region is not particularly "green" in terms of its daily existence. Virginia Beach is the only city in the region examined for its sustainability practices by www.sustainlane.com and it ranked only 45th among the largest cities in the country. In general, topics such as recycling, protecting our numerous waterways and even "turning off the lights" are not at the top of most individuals' agendas in our region.** Clearly, Hampton Roads is not to be confused with Portland, Ore., on environmental and sustainability issues.

Ultimately, we will reduce our vulnerability to gasoline price spikes, and increase our long-term viability, if we:

- Rely more heavily upon mass transportation;
- Pay higher prices for gasoline and other fuels so that people will drive fewer miles, purchase more fuel-efficient vehicles, increase carpooling, utilize mass transportation more often, and emit fewer carbons and other pollutants;
- Utilize increased amounts of reformulated gasoline;
- Build more LEED-certified, environmentally efficient buildings; and
- Increase recycling.