Sustainable Transportation Options
for
Smith College

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ABSTRACT

Sustainable transportation has increased in importance as ever-increasing scientific evidence suggests human activity is negatively impacting the planet. Global warming and air pollution, scientifically linked to automobile use, have become common topics in environmental circles as well in general public discourse. As a fragment of society and a leader among the private liberal arts colleges in the United States, Smith College has a unique responsibility and opportunity to examine its transportation practices and continue to lead, as they have in so many other fields, as environmental stewards. In order to assess the current status of sustainable transportation at Smith College and potential changes in practice, data regarding current commuting patterns, faculty and staff interests, costs of maintaining parking areas, and the number of student vehicles were gathered from various College offices and departments. The results demonstrate a significant need to alter current practice in order to promote sustainable transportation. Faculty and staff parking decals are below the real cost of maintaining parking areas, little incentive is provided for faculty and staff to utilize alternative transportation, and student vehicles vastly outnumber parking spaces available on campus, creating tensions between city residents and the College. While the College may not currently operate under a sustainable transportation model, economic alternatives are available to alter the system and provide viable alternatives to faculty, staff, and students. In the short-term, actions to promote sustainable transportation will require some capital, but in the long-term fuel, labor, and emissions savings will offset these costs. Smith College is at a unique juncture in its transportation policy and has the option to make economical alternative transportation choices to promote sustainable transportation both within the College community and in a broader social context as a leader in the academic realm.

INTRODUCTION

Transportation to, from, and around campus is part of a daily routine for many faculty, staff, and students at Smith College. Numerous automobiles are parked along city streets, in College owned lots, and in the newly constructed Smith College Parking Garage. The question, therefore, is how these automobiles are affecting the local environment and how they contribute to broader environmental problems.

Global warming as the result of elevated greenhouse gas emissions is a serious concern for modern society. The scientific evidence has been questioned time and time again, but the issue remains that global temperatures have risen more rapidly over the last century than ever before over geologic time (U.S. D.O.E. 1999, Worldwatch 2002). The temperature rise corresponds to a similar unparalleled increase in carbon dioxide (CO₂) concentrations in the atmosphere (U.S. D.O.E. 1999). Increased CO₂ concentrations have been attributed to anthropogenic sources following the industrial revolution and the age of fossil fuels. Carbon dioxide is a natural by-product of burning fossil fuels to generate energy,
therefore as we drive our cars and consume more fossil fuel, we emit more harmful greenhouse gases into the atmosphere and worsen the already alarming problem.

Air pollution and acid rain have also been a problem in certain areas of the globe. As we drive our cars and burn coal in power plants, we are forming sulfur oxides (SO\textsubscript{x}) and nitrogen oxides (NO\textsubscript{x}), both of which contribute to air quality problems (Baird 1999). Sulfur oxides, emitted primarily from coal-fired power plants, are a major contributor to acid rain (Baird 1999). More important to this study, nitrogen oxides are formed from elements in the natural atmosphere (nitrogen and oxygen gases) with elevated temperatures such as those in coal-fired power plants and internal combustion engines (Baird, 1999). Nitrogen oxides can then react in the atmosphere to generate photochemical smog, a public health concern in many urban and some low-lying areas. The Environmental Protection Agency (EPA) has enacted numerous emission controls over the past 30 years, but air pollution and NO\textsubscript{x} emissions persist as public health concerns in areas with high concentrations of automobiles.

Two main groups exist at Smith- the faculty and staff and the student body- that present very different problems to transportation alternatives. Faculty and staff live in the surrounding areas and must commute to and from campus each day. Some may live within a very small radius of Smith and others farther away. Similarly, some may have homes near bus and bike routes, while others may not. Examining the distribution of faculty and staff and their realistic alternatives is key to finding a workable system of sustainable transportation.

Students primarily live on campus and walk to and from classes, appointments, and other daily activities. However, by surveying the neighborhood streets in surrounding residential areas, an overwhelming number of cars are observed that accompany the residents of campus. License plates from all over the country can be found, meaning that at some point those automobiles were driven to Smith and may be driven back and forth repeatedly. City-College relations are often strained surrounding the issue of parking, creating a social and political issue as well. The problem of how to decrease the number of student cars on campus is quite complex and requires innovative solutions.
Automobiles are linked to both NO\textsubscript{x} and CO\textsubscript{2} emissions that contribute to global warming and air pollution (EIA, 2001). Transportation issues are therefore directly linked to Smith College, the global community, and the overall environmental stability of the planet. This study will investigate the current status of transportation to and from campus, how automobile transportation around the Smith College campus can be minimized, and how the needs of the campus can be met in a more sustainable and environmentally harmonious manner.

**METHODOLOGY**

**Current Status of Commuting and Interest in Alternatives**

The current status of transportation to and from campus by faculty and staff was gathered from existing data kept by the Office for Institutional Research. The Environmental Protection Agency requires, on an inconsistent annual basis, that Smith College survey all faculty, staff, and commuting students on the number of trips they make to the campus in a five day work week and what transportation methods they use for each trip. The survey also asks which alternative transportation methods the faculty, staff, or commuting student would be interested in using to commute to and from Smith College. The survey included data regarding what communities faculty and staff were commuting from, but the results were not disclosed with the remainder of the survey. While the Office for Institutional Research was unable to provide historical results for the survey and did not supply the survey methods, the response data for the 2002 survey served as a basis for analyzing how well Smith College faculty and staff were utilizing alternative transportation as well as what alternatives may be viable for this group.

**Current Parking Facilities and Quantity of Vehicles**

The number of faculty, staff, and student parking spaces on campus was collected from Smith College Public Safety. Public Safety was unaware of the total number of faculty and staff parking decals distributed, but they did provide the total number of spaces available to them as well as the number of student green line spaces available and their locations. The number of student cars was estimated to be
approximately 2-3 times the number of student parking decals distributed each year. Public safety also confirmed that the parking garage contained four levels of parking.

**Calculation of Parking Area**

The total parking surface area was approximated using GIS data provided by the Smith College Spatial Analysis Lab (SAL). The SAL had converted the AutoCAD data maintained by Physical Plant into GIS format and it was this converted data that was used in conjunction with an orthophotograph of campus from April 2001 to calculate the parking area on campus. The orthophotograph, Physical Plant’s demarcation of parking areas, and the analysts own knowledge of campus were used to generate polygons on an ArcMap representing the parking areas on campus. A judgment was made for each parking area whether the inlet road would exist without the existence of the parking lot and the inlet was included or excluded from the total parking area accordingly. A total area for all parking surfaces except the parking garage was calculated by ArcMap software. The area of the parking garage was estimated by multiplying the footprint of the building (as calculated by ArcMap software) by a factor of 4 for the total levels of parking.

The average area of one parking space was estimated by field survey of parking spaces behind McConnell and Sabin-Reed.

**Calculation of Annual Parking Area Maintenance Costs**

The annual maintenance cost per parking space was calculated by the following process:

1. \( \text{total area of parking surfaces excluding parking garage} \times \text{cost per gallon of IceB’Gone} \times \text{(gallons of IceB’Gone per square meter)} \times \text{(number of applications)} + \text{(annual cost of restriping lots)} + \text{(operating budget of the parking garage)} + \text{(other non-quantifiable labor and fuel inputs)} = \text{annual total maintenance cost of all parking surfaces} \)

2. \( \frac{\text{annual total maintenance cost of all parking surfaces}}{\text{total parking area}} = \text{annual maintenance cost per square meter} \)

3. \( \text{annual maintenance cost per square meter} \times \text{(average area of one parking space)} = \text{annual maintenance cost of one parking space on Smith College campus} \)

Bob Pattee, Director of Physical Plant, provided data on the annual cost of restriping the parking lots, the annual operating budget of the parking garage, and labor and fuel costs. Bob Dombkowski, Head
of the Grounds Department, provided the cost per gallon of the de-icer used on campus, IceB’Gone, and the application rate of the de-icer. The number of applications was assumed to be 2 applications per storm at an average of 15 storms per year. Labor and fuel costs could not be quantified due to the diversity of vehicles used and the varied nature of the labor force. Contract details for Physical Plant workers were also provided to assess whether transportation alternatives could apply to all faculty and staff.

**Cost of New Construction of Parking Areas**

The cost per space of new parking lot construction was estimated using the following method:

1. \[(\text{cost per space for new construction}) \times (\text{number of proposed new spaces}) = \text{total cost of new construction}\]

2. \[(\text{annual maintenance cost per space}) \times (\text{number of proposed new spaces}) - (\text{annual maintenance cost per space}) \times (\text{number of spaces lost to new construction}) = \text{net increase in annual maintenance costs for all parking areas on campus}\]

3. \[(\text{total cost of new construction}) / (\text{total parking area on campus}) + (\new parking area on campus) = \text{cost per square meter of parking surface for new construction}\]

4. \[(\text{cost per square meter of parking surface for new construction}) \times (\text{average area of parking space}) = \text{cost of new construction per parking space on campus}\]

The average cost per space for new construction and the number of proposed new spaces on campus were provided by Bob Pattee.

**Location and Quantity of Bicycle Racks**

Bicycle racks were located in all areas of campus by a sight survey on April 28 and 29, 2003. Locations were indicated on a copy of the orthophotograph utilized in demarcating campus parking areas and later added by eye as points on the ArcMap. Each bicycle rack in a given location was indicated by a single point on the map.

**Cost of Establishing and Maintaining a ZipCar System**

ZipCar, a company specializing in pay-per-use vehicles, provided costs of establishing a pay-per-use student vehicle system. Initial set up charges are time consuming to calculate and without upper-level administrative interest in the company, ZipCar was unable to provide concrete costs. Though a direct
quote was no received, ZipCar asserted that their charge would be lower than Smith College establishing a similar system. Per month charges would apply as well, though they are specific to the particular vehicles from which Smith could choose. ZipCar also provided additional details, such as what would happen to the cars over the summer months.

**Alternative Transportation Routes**

In an effort to provide alternative transportation routes to interested members of the Smith College community without having access to their specific addresses, GIS maps of the PVTA bus routes were obtained from the Pioneer Valley Planning Commission and the walking and biking paths and trails as maintained by the SAL were mapped within and directly around the Northampton city bound.

**RESULTS**

**Current Status of Commuting and Interest in Alternatives**

The 2002 annual commuter survey administered by the Office for Institutional Research indicated that nearly 75% of the trips to campus per work week were accomplished by lone drivers (Table 1).

Walking commuters ranked second, comprising 13.8% of the trip to campus each work week (Table 1).

| Table 1: Commuting Patterns for Faculty, Staff, and Commuting Students in 2002 |
|----------------------------------|------------------|------------------|
| Number of Trips per Work Week    | Percent of Total Trips per Work Week |
| Drive Alone                      | 3,176            | 74.5             |
| Carpool                          | 225              | 5.3              |
| Vanpool                          | 0                | 0                |
| Public Transportation            | 25               | 0.6              |
| Bicycle                          | 180              | 4.2              |
| Walk                             | 588              | 13.8             |
| Combined                         | 30               | 0.7              |
| Other                            | 37               | 0.9              |
| Total                            | 4,261            | 100              |

Smith College Office for Institutional Research

The same survey also indicated that 14% of commuters were interested in cycling to work as were 13% of commuters interested in walking and 10% interested in carpooling (Table 2).
Table 2: Commuter Interest in Alternative Transportation in 2002

<table>
<thead>
<tr>
<th>Alternative Transportation</th>
<th>Percentage of Faculty and Staff Interested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carpool</td>
<td>10</td>
</tr>
<tr>
<td>Vanpool</td>
<td>3</td>
</tr>
<tr>
<td>Public Transportation</td>
<td>9</td>
</tr>
<tr>
<td>Bicycle</td>
<td>14</td>
</tr>
<tr>
<td>Walk</td>
<td>13</td>
</tr>
</tbody>
</table>

Smith College Office for Institutional Research

Current Parking Facilities and Quantity of Vehicles

The number of parking spaces available for faculty, staff, and students obtained from Public Safety and Bob Pattee indicate that 81.8% of white line spaces (designated for faculty and staff) and 70.9% of green line spaces (designated for students) are exposed (Table 3). Faculty and staff parking decals currently cost $5 per year with no limit on the number of decals per person. Given the estimated 2,700 faculty and staff there would be at least a 1,185 parking space shortage if all faculty and staff members drove individually to campus on a given day. The number of student parking decals is equal to the number of green line spaces and it has been estimated that for every student decal there are 2 vehicles without decals. In real terms, that means 282 student vehicles have decals and 564 student vehicles are parked along the neighborhood streets for a total of approximately 846 student vehicles. Student parking decals currently cost $150 per year with priority given to upperclasspeople. Only out-of-state students are required to register their vehicles with Public Safety (though the rule seems only lightly enforced). The parking surfaces included in the calculation of the total parking area on campus can be seen on Parking Areas on the Smith College Campus, Northampton, MA (Map 1).

Table 3: Summary of Faculty, Staff, and Student Parking Availability

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
<th>Percentage of Total Spaces in Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total White Line Spaces</td>
<td>1,515</td>
<td>100</td>
</tr>
<tr>
<td>Total Green Line Spaces</td>
<td>282</td>
<td>100</td>
</tr>
<tr>
<td>Total Spaces in Parking Garage</td>
<td>358</td>
<td>N/A</td>
</tr>
<tr>
<td>White Line Spaces in Parking Garage</td>
<td>276</td>
<td>18.2</td>
</tr>
<tr>
<td>Green Line Spaces in Parking Garage</td>
<td>82</td>
<td>29.1</td>
</tr>
<tr>
<td>Exposed White Line Spaces</td>
<td>1,239</td>
<td>81.8</td>
</tr>
<tr>
<td>Exposed Green Line Spaces</td>
<td>200</td>
<td>70.9</td>
</tr>
</tbody>
</table>

Smith College Public Safety, Smith College Physical Plant
Calculation of Parking Area and Annual Parking Area Maintenance Costs

Using ArcMap software, the total area of exposed parking surfaces was estimated as 29,665.7 m$^2$ and the parking area of the parking garage to be 9,991.6 m$^2$ (Table 4). The cost per gallon and application rate of IceB’Gone, the only substance used to treat parking areas on campus, were calculated based on figures cited by Bob Dombkowski, namely the cost per gallon of $0.80 and application rate of 8 gallons per lane mile, which equals 0.0007 gallons per square meter (Table 4). According to Bob Pattee, the annual budgets for restriping parking lots (performed on an as-needed basis) and operating the parking garage are $1,000 and $35,000, respectively (Table 4). Given the costs and areas calculated, the total annual maintenance cost per parking space was $12.79 or $36,498.38 for all parking areas on campus (Table 4). The annual maintenance costs do not include labor and fuel costs, which will invariably increase the annual maintenance costs.

<table>
<thead>
<tr>
<th>Table 4: Summary of Annual Parking Area Maintenance Costs and Individual Factors</th>
</tr>
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<tbody>
<tr>
<td>Total Area of Exposed Parking (m$^2$)</td>
</tr>
<tr>
<td>Total Area of Parking Garage (m$^2$)</td>
</tr>
<tr>
<td>Average Area of Parking Space (m$^2$)</td>
</tr>
<tr>
<td>Cost per Gallon of IceB’Gone</td>
</tr>
<tr>
<td>Application Rate of IceB’Gone (gallons/m$^2$)</td>
</tr>
<tr>
<td>Assumed Annual Number of Applications of IceB’Gone</td>
</tr>
<tr>
<td>Cost of Annual Restriping of Parking Lots</td>
</tr>
<tr>
<td>Annual Operating Budget of Parking Garage</td>
</tr>
<tr>
<td>Total Annual Parking Area Maintenance Cost</td>
</tr>
<tr>
<td>Total Annual Maintenance Cost per Square Meter</td>
</tr>
<tr>
<td>Total Annual Maintenance Cost per Parking Space</td>
</tr>
</tbody>
</table>

Smith College Physical Plant, Smith College Grounds Department

Cost of New Construction of Parking Areas

New parking areas have been proposed for both faculty and staff and students. An additional 70 faculty and staff parking spaces have been proposed across from Ainsworth gym, expanding into the dike. An additional 80 student parking spaces have been proposed by expanding Mandell Road (the road between Comstock/Wilder and Cushing and Morrow). The construction of 80 new “nose-in” green line spaces would eliminate the current 22 parallel spaces currently available for a net increase of 58 green
line spaces. Based on the estimate that each new parking space costs $800 to construct, the construction cost of both projects would total $120,000 and would yield a net increase of 1,779.2 m² in parking area (Table 5). When distributed across all parking areas, the expense of construction would cost the user of each parking space on campus $39.89 (Table 5). Bob Pattee noted that while these are proposed projects they are unlikely to proceed in the immediate future due to the current budget situation.

<table>
<thead>
<tr>
<th>Table 5: New Parking Area Construction Costs and Factors</th>
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<tbody>
<tr>
<td>Total Construction Cost per parking Space</td>
</tr>
<tr>
<td>Number of Proposed New Parking Spaces</td>
</tr>
<tr>
<td>Number of parking Spaces Lost to New Construction</td>
</tr>
<tr>
<td>Net Increase in the Number of Parking Spaces</td>
</tr>
<tr>
<td>Net Additional Parking Area Resulting from New Construction (m²)</td>
</tr>
<tr>
<td>Construction Cost per Parking Space Campus-wide</td>
</tr>
<tr>
<td>Smith College Physical Plant</td>
</tr>
</tbody>
</table>

**Location and Quantity of Bicycle Racks**

Based on a sight survey of bicycle racks across campus, there are 66 racks on campus. The locations of bicycle racks can be seen on both Parking Areas on the Smith College Campus, Northampton, MA and Alternative Transportation Routes, Northampton, MA (Maps 1 and 2). Notable areas lacking bike racks included Stoddard Hall, Physical Plant, the Engineering Building, Sabin-Reed, the Admissions Office, the Office for Public Relations, Dewey Hall, the Nielson Lawn side of the Brown Fine Arts Center, Clark Hall, the Riding Stables, Athletic Fields, and Field House, the Plant House, and the Boat House. Some houses in the Quad, such as Emerson, Wilson, and Cushing, do not have bicycle racks for their house and have bikes locked to handicapped railings and benches.

**Cost of Establishing and Maintaining a ZipCar System**

ZipCar, the company specializing in pay-per-use vehicles, did not concretely define the cost of establishing a pay-per-use student vehicle system. While a concrete figure was not provided, ZipCar asserted that establishing a system through their company would be less costly than Smith College setting up their own similar system. After paying a initial start-up fee, Smith College would pay a set monthly fee to ZipCar per vehicle that would depend on the particular vehicle chosen. Available vehicles included the Honda Civic, Element and Civic Hybrid, Toyota Prius Hybrid, Matrix, and Rav-4 electric, Mini
Cooper, Volkswagen Jetta, Golf, Passat, and Beetle, and Ford Focus. Smith College would then charge students on an hourly basis for use of the cars which they could reserve online at www.zipcar.com. Each user would have a unique access code and would enter the code to both reserve the car and to enter the vehicle (which is wirelessly programmed to open for a given access code at the reserved hour). Fuel is included in the cost of use and is charged by the driver to the ZipCar credit card within each vehicle. Assuming Smith College has enough use of the cars to cover the monthly fee per vehicle, the College would not actually pay for the service and is allowed to keep as profit any use fees collected above the amount owed to ZipCar. ZipCar estimated that institutions may begin to generate profit about 2 to 6 months after establishing a ZipCar system and that each ZipCar on campus eliminated 7-10 vehicles. Insurance for drivers over 21 is provided by ZipCar and drivers under 21 would need to be insured by Smith College.

DISCUSSION

The annual commuter survey draws out important issues facing faculty and staff transportation issues in that the majority of commuters drive alone and have limited interest in utilizing alternative transportation. Based on the apparent parking shortage one would expect a greater interest in alternative transportation, but only mediocre enthusiasm was displayed. Some interest in cycling, walking, and carpooling were expressed, however, and those transportation methods were incorporated into a solution to enhance transportation sustainability.

The annual cost of maintaining a parking space is conservatively $7.79 more than the current cost of a faculty or staff parking decal. When considering the fuel and labor costs not included in the maintenance estimate, the gap between the real cost and the price paid will invariably increase. Given the low usage of alternative transportation and the negative environmental impacts generated by high vehicle miles traveled (VMT), the parking subsidy seems out of place. In order to reflect the real cost of parking privileges, the cost of a faculty staff parking decal should be increased to at least $13, if not more to compensate for the fuel and labor costs not included.
Smith College faculty and staff have shown some interest in carpooling and in order to reduce overall VMT, a preferential parking system should be established. A combination of factors may make preferential parking successful in reducing VMT. Increased decal cost, especially if the cost were greatly increased, would change faculty and staff desire to park on campus since it would be more costly. Some interest has been shown in carpooling without changes in the system and creating greater incentive to change habits can only increase faculty and staff interest. Preferential spaces could be established at little cost to the College since signs designating the particular spaces would be the only capital expense. Vehicles with standard faculty and staff parking decals could park in the preferential spaces based on an honor system. Faculty and staff would be expected to follow a honor code similar to the students at Smith College and park in regular parking areas when not carpooling. Potential areas for preferential parking include the parking garage, the lot adjacent to Green Street, the Ainsworth lot, the lot near Sage Hall at the terminus of Green Street, behind McConnell, and in the Quad.

The greatest incentive for faculty and staff to use alternative transportation would be the implementation of a parking cash-out system. Instead of the faculty or staff member paying the College for parking privileges, the College could subsidize alternative transportation. A typical parking cash-out system pays the commuter an amount equal to what it would have cost to maintain a parking space for the individual. In the case of Smith College, this subsidy would be fairly small, probably somewhere between $13 and $20, but since the College has subsidized campus parking for so long it could change focus and provide funds for alternative transportation instead. Money saved by faculty and staff on fuel and vehicle maintenance could be reallocated to alternative transportation, be it bus fare, bicycle maintenance, or walking shoes. Alternative transportation routes within and immediately surrounding Northampton have been provided (Map 2). A geographical analysis of the most viable alternative transportation routes was not completed since faculty and staff addresses are not publicly disclosed, but this could be an area of future study within the Smith College community. 

The combination of increased decal cost and a parking cash-out system would deal a double-blow to those still choosing to drive alone
to campus and perhaps create enough of an incentive for them to utilize more sustainable modes of transportation.

Additional bicycle racks should be placed in the areas lacking adequate facilities such as Stoddard Hall, Physical Plant, the Engineering Building, Sabin-Reed, the Admissions Office, the Office for Public Relations, Dewey Hall, the Nielson Lawn side of the Brown Fine Arts Center, Clark Hall, the Riding Stables, Athletic Fields, and Field House, the Plant House, the Quad, and the Boat House. A covered bicycle rack could also be established, perhaps on the ground level of the parking garage or in the basement of Seelye. Bicycle routes within Northampton and the current location of bicycle racks on campus are provided (Maps 1 and 2). Convenient racks and the expressed faculty and staff interest could promote bicycling as a common mode of transportation.

Potential barriers to implementation of faculty and staff commuting recommendations exist including weather, contractual agreements, and acclimation to the status quo. New England weather can be highly variable, making the decision to forgo parking on campus altogether a difficult decision. To entice faculty and staff to abstain from purchasing an annual parking decal (since having a decal makes it easier to drive to campus more often), daily parking passes could be made available at the Public Safety office. Such a decal would be purchased on the day needed and clearly displayed to indicate parking privileges for that particular day. Having the option to pay only on the days necessary allows faculty and staff some flexibility for weather and other personal obligations in choosing more sustainable transportation.

Contracts are common among Physical Plant workers, especially those requiring staff members to use their personal vehicles for work on campus. According to Bob Pattee, approximately 50% of all Physical Plant workers are required by contract to use their own vehicles, meaning they have no choice but to drive to campus each day. Contracts are generally signed for 1 to 3 years and the contracts revolve on a five-year cycle, so over time the vehicle requirement clause could be phased out to allow the same transportation options for all workers. As an alternative, Smith College could provide electric vehicles for work on campus, such as those currently being tested at Physical Plant, equipped with essential racks.
and tools. Leasing 12 such electric vehicles would cost Smith College approximately $18,000 per year, but fuel and emissions savings counterbalance the cost. Contractual changes providing staff members with electric vehicles rather than using their own personal vehicles has the support of Bob Pattee and would be a significant move toward sustainable transportation at Smith College.

The final potential barrier to increased decal cost and a parking cash-out system is resistance from faculty and staff that have become accustomed to the parking subsidy Smith College has long-provided. While the recommendations proposed may generate some initial negative feedback, over time a new status quo will be established and resistance would be expected to fade.

The benefits of bringing ZipCar to Smith College would be expected to outweigh the costs. Initially, the College would have to pay to establish an account with ZipCar and bring the selected vehicles to campus. The fees charged would be based on the vehicles chosen, so given the appropriate advertisement of the new service, the College should be able to generate enough revenue to pay the monthly fees, if not actually generate profit. If ZipCar estimates are accurate, for each ZipCar on campus, 7 to 10 student vehicles would be left at home each year. As the program flourished, more vehicles could be added to the fleet, further reducing the number of student vehicles on campus. Insurance for those under 21 could be provided via the same infrastructure currently in place to drive College-owned vehicles. The proximity of Smith College to the Boston headquarters of ZipCar provide another advantage in that ZipCar has expressed a willingness to take the vehicles selected by the College back for the summer months when use would be too low to cover the monthly costs. The benefits of the ZipCar system are multiple: the College can generate revenue from the program after monthly fees are paid, student vehicles will be left at home thereby reducing parking congestion along neighborhood streets and improving City-College relations, and vehicle emissions are reduced by both students not driving their cars to campus and by promoting the use of the hybrid vehicles available from ZipCar. While some students currently without vehicles may be enticed to drive more often with easy access to a vehicle, the emissions savings from other vehicles not being driven to campus and the use of hybrids are expected to more than compensate for the potential increase from this group.
An analysis of sustainable transportation on campus would be lacking if the importance of regional solutions were not stressed. Transportation issues are not limited to Smith College, but apply to the region and the nation. The trends exhibited by Smith College commuters are typical of the population as a whole, necessitating larger scale solutions to address the problem directly. Regional transportation planning has been accomplished by the Pioneer Valley Planning Commission (PVPC), the regional planning agency, and is summarized in both the *Regional Transportation Plan for the Pioneer Valley-2000 Update* (2000) and in the *Pioneer Valley Regional Bicycle and Pedestrian Transportation Plan* (2000). The plans suggest areas of the regional transportation systems that may be improved to reduce VMT and to promote alternative transportation. A multitude of short- and long-term initiatives are presented focusing on the topics of land-use planning and zoning, education, engineering and infrastructure, and policy. Specific initiatives of interest include increasing bike lanes to encourage safe cycling, improving PVTA bus service throughout the Valley, and promoting pedestrian-friendly development. City-wide or regional implementation of the ZipCar system, though not proposed by PVPC, would complement a Smith College program and extend the benefits beyond the campus community. Sustainable transportation is a regional and national issue that may be approached from the top-down as well as the bottom-up, allowing for large-scale changes agreeable to society as a whole.

Sustainable transportation is becoming increasingly important on a local, regional, and national scale as scientific evidence suggests increasing environmental damage due to vehicle emissions. Some ways that Smith College can reduce emissions and promote sustainable transportation include:

- increasing the parking decal cost for faculty and staff to reflect the real cost of parking privileges
- creating preferential parking spaces in convenient locations to encourage faculty and staff carpooling
- establishment of a parking cash-out system with a possible additional alternative transportation subsidy to encourage alternative transportation use
- installing bicycle racks in areas currently lacking storage and creating a covered bicycle rack to encourage cycling
- altering staff contracts so personal vehicles are no longer required for work on campus and providing low emissions electric vehicles as an alternative
• establishing a campus ZipCar system to reduce the number of student vehicles on campus and encourage the use of hybrid technology

A number of barriers to implementation may be met by each action, but in the long-term sustainable transportation will be a necessity more than an option. As a leader in academic circles and among private liberal arts colleges across the United States, Smith College should seize the opportunity to embrace environmental stewardship in surprisingly economical ways.

REFERENCES


Smith College Spatial Analysis Lab. 2003. GIS data of paved areas on campus and walking and bike trails within Northampton city bounds, and an orthophotograph of campus.

