SUSTAINABLE TRANSPORT IN THE DEVELOPING WORLD: A CASE STUDY OF BOGOTA’S MOBILITY STRATEGY

Submitted By: William F. Lyons Jr., PE, Esq.
Dear NEITE Members:

The 2017 year kicked off to a great start with the first New England Section Board Meeting held on January 26 at the Killington Grand Hotel in Vermont as part of a joint meeting with the ITE Vermont Chapter. The meeting was well attended, with a dozen people skiing before the Board meeting and 30 attendees at the technical sessions. Rick Bryant of Stantec led a discussion of criteria utilized to evaluate left-turn lane warrants throughout the country and described the methodology adopted by VTrans. Chris Clow of VTrans and Jon Slason of RSG followed with a discussion of Act 145 and impact fees being implemented throughout Vermont. Nearly all attendees stuck around for a wonderful networking reception hosted by the Vermont Chapter. I’d like to thank Jennifer Conley and the Vermont Chapter for hosting this great event.

During the Board Meeting, we approved the 2017 budget, which included dedicating funds for New England Section members to participate in ITE leadership and partnerships with other organizations to host events. We also briefly discussed some of our upcoming events for the year, including the Northeastern District Student Symposium and Traffic Bowl on March 23 in Brooklyn, NY; the NE/CT ITE Annual Joint Meeting in April; the UMass Student ITE Chapter Tech Day on April 5 in Amherst, MA; and the NE/MA ITE Annual Meeting on September 28 in Waltham, MA.

Fortunately, this year all of our committee chairs have decided to return and I would like to welcome them all back and thank them for their continued service. I would also like to welcome Jennifer Conley and Thomas Errico back to the Board of Directors as Junior Directors. Jennifer and Thomas both served previously on the Board and have chosen to join us again. I would also like to thank Past President Alan Cloutier for his leadership services throughout the 2016 year. As the immediate past president, Alan will continue to sit on the Board to provide guidance throughout the year. A special thank you also to Jason DeGray for serving on the Board for the last three years as Director and Treasurer, as well as the Continuing Education Chair. Jason brought great new ideas to the Section, including the Strong Towns workshop at the 2015 Annual Meeting, which was a great success.

I am looking forward to another exciting year with the Section and have several goals that I am hoping to implement this year in an effort to meet some of the items outlined in our Strategic Plan. These include hosting networking events for the entire membership, visiting schools to build interest in ITE with younger engineers and planners, and partnering with other organizations to host events in order to expand ITE’s membership to a variety of professionals.

If you have any questions or suggestions, please contact me at rebeccabrown@gpinet.com or (978) 570-2946.

Sincerely,

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New England Section President
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On the Cover: Tweed River Bridge in Haverhill, Massachusetts
Photo Source: VHB

On the Back Cover: Merrimack River Bridge in Haverhill, Massachusetts
Photo Source: VHB
Hello New England Section!

I just returned inside from shoveling after the third major storm this week. My husband is laid out on the couch next to me with the flu. It seems the worst of winter is upon us. I hope everyone is staying safe and warm as we hunker down and try to make it through the rest of February.

Articles
We were able to successfully release four issues of the New England Chronicle in 2016 and we plan to do the same this year. As is typical of the winter issue, we have included a recap of the awards that were presented at the NEITE Annual Meeting in December. Congratulations to all of the winners and a special thank you to the Awards Committee for their time in the selection process.

The feature article in this issue was written by William Lyons, Jr. of Fort Hill Companies LLC. This article offers an interesting insight into how developing countries address the challenges posed by developing sustainable transportation infrastructure. Specifically, the city of Bogota, Columbia is studied. The article discusses how economic and social sustainability, as well as environmental sustainability, should be considered.

Events
During this past quarter, the NEITE Annual Meeting was held at the Crowne Plaza in Warwick, Rhode Island. The Vermont chapter held their joint meeting with the New England Section in January at the Killington Grand Hotel. While I was not able to personally attend, I heard that there was a great turn out and the event ran smoothly.

Looking ahead, it is already time to start planning for the 2017 Northeastern District Annual Meeting. The meeting will be held at the Crystal Springs Resort Minerals Hotel in Vernon, New Jersey from May 10th through May 12th. Be sure to keep an eye out for when registration becomes available. Please see the Section Calendar for all upcoming events.

Final Thank You
I would like to thank all of our sponsors for their continued support of the New England Chronicle. Many sponsorships have expired so please contact Lisa Rutherford of Ocean State Sign (lrutherford@oceanstatesignal.com) if your sponsorship needs renewal. If you are interested in becoming a sponsor of the award-winning New England Chronicle please contact Lisa or myself. I would also like to thank all of the contributors to this issue. I hope you enjoy the first issue of 2017!

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Please remember to visit the New England Section website at http://www.neite.org and our updated Section Directory for information on the New England Section.

NEITE Nametag Order

It has been several years since the last order of section nametags and our membership has seen many changes since then. The Executive Board recently approved an order for all interested ITE members of the NEITE section to receive a new nametag. A sample is provided to the right. If you are interested, please fill out the form on our website: http://neite.org/nametag-order-form by Friday, March 17, 2017. Nametags will be distributed at each NEITE joint state chapter meeting beginning with the April Connecticut Meeting.

Rebecca
Rebecca Brown, P.E., PTOE
Massachusetts
SUSTAINABLE TRANSPORT IN THE DEVELOPING WORLD: A CASE STUDY OF BOGOTA’S MOBILITY STRATEGY

WILLIAM F. LYONS JR., PE, ESQ.
PRESIDENT AND CEO, FORT HILL COMPANIES LLC

INTRODUCTION

Sustainability and Transportation Infrastructure

Typically, infrastructure development is thought of as improving sustainability. This is typically the case in water resources development, for example, which generally improves access to clean drinking water, improves waste water sanitation, and provides water for irrigation. Each of these activities improves environmental, social, and economic conditions in developing countries (Penalosa 2005, 1).

Sustainability in the field of transportation is perhaps the most challenging of all infrastructure development because increased mobility has historically decreased sustainability from an environmental protection context. For most of the developing world, transportation infrastructure includes constructing highways. Constructing highways leads to vehicular congestion, reduced air quality, decreased social conditions, and unsustainable economic practices. Moreover, automobile centric development results in sprawl, inefficient land use, and social disparities.

On the other hand, mobility is essential to economic and social development. When mobility is delivered sustainably, it improves quality of life, improves economic competitiveness, and provides access to employment and other economic opportunities. Reduced congestion and air pollution, and improved road safety, result in economic savings potentially equal to several percentage points of GDP and can result in long term benefits to society (United Nations Conference on Sustainable Development 2012, 1-2).

The challenge to developing countries is to avoid the pitfalls of unsustainable transportation infrastructure development. To avoid the pitfalls of unsustainable infrastructure development, developing countries must envision new paradigms for urban development and mobility. Such a paradigm must be based on a societal de-emphasis on the automobile in favor of other modes of transportation. In addition, developing countries should strive to integrate their policies for land use and transportation planning to promote sustainable practices (United Nations Conference on Sustainable Development 2012, 1-2).

This paper examines how developing countries address the challenges posed by developing sustainable transportation infrastructure through a case study of the city of Bogota, Colombia. Bogota has implemented a successful program to address sustainability in its development of various transportation infrastructure components. While Bogota’s experience is not perfect, it does serve as an early model for cities in developing nations to follow on their path to sustainability.

The framework of sustainable development was first advanced by the United Nations World Commission on Environment and Development (also known as the Brundtland Commission). The Brundtland Commission released its report, Our Common Future (also known as the Brundtland Report), in 1987. The Brundtland Report defined sustainable development as being “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” (United Nations World Commission on Environment and Development 1987, part 1, section 3, paragraph 27) This definition has been widely adopted in the field of sustainability.

Building on the Brundtland Report, the United Nations 2005 World Summit Outcome Document refers to three pillars of international development: economic development, social development, and environmental protection (United Nations, Resolution Adopted by the General Assembly, A/RES/60/1 (New York, NY: October 24, 2005), 11-12. These three pillars still form the basis of much discussion of sustainability and form the basis of this paper’s analysis. Each pillar is further described below.

Economic Development

Economic development is widely understood to include those activities and outcomes that advance economic progress, increase productivity, and generally improve living standards. Sustainable economic development represents those activities that result in progressive economic stability and improvement for people in all economic strata without compromising social or environmental sustainability.

For instance, economic development is unsustainable if it increases vulnerability to crises. In contrast, a development path that combines growth with reduced vulnerability is more sustainable (United Nations World Commission on Environment and Development 1987, part III, § 2).

In the context of transportation infrastructure, there are four general categories of economic development: (1) increased economic activity resulting from construction and maintenance activity; (2) reduced travel times; (3) increased productivity; and (4) agglomeration. Each of these four general categories is mutually interdependent and related to one another (Chatman 2012, 6). A brief explanation of each category of economic development resulting from transportation infrastructure is provided below.

It is a well-known fact that highway and transit construction generates jobs, and thereby directly contributes to economic development (Chatman 2012, 6). Properly executed, the construction of transportation infrastructure results in technology transfer, resulting in more skilled labor, which is itself a sustainable practice. In addition, the construction of transportation infrastructure results in a long-term maintenance obligation, which further generates skilled labor jobs that have an enduring (and thus sustainable) impact (Chatman 2012, 6).

As a result of the increased efficiency generated by reduced travel times, cities, cities, and whole countries can become more economically competitive. Increased competitiveness can result in new economic investment, improved economic opportunity, and steady economic progress with improved standards of living for entire populations (Chatman 2012, 6). This is the essence of economic sustainability.

Finally, economic competitiveness can be further enhanced by the creation of clusters of complimentary economic activity – an economic theory called agglomeration. Theoretically, agglomeration can result in the whole of the economy exceeding the sum of its parts. While difficult to measure, such conditions do exist in places such as Kendall Square in Cambridge, Massachusetts. When such clusters can be achieved in part by constructing exceptional transportation systems, sustainable economics are realized through sustainable transportation systems (Chatman 2012, 10). Agglomeration is the penultimate economic objective of a sustainable transportation system.

One indicator of sustainable economic activity is rising real estate values benefiting the entire population (Chatman 2012, 1). This is particularly true of areas where agglomeration has been achieved. While rising real estate prices can be unsustainable when they rise too fast, steady growth in real estate values is a very good indicator of sustainable economic development. It is a well documented fact that properly planned and designed public transportation
systems contribute significantly to increased property values, increased efficiency, and — in some cases — agglomeration (Chatman 2012, 6).

Social Development

Social development is generally described as social progress that benefits people — all people, especially the poor and disadvantaged. Social development considers the human condition. It occurs when the human condition improves, such as when working conditions become safer or when the mortality rate of a population declines. Social development also takes into consideration such important factors as culture, religion, history, politics and gender when measuring progress (United Nations World Commission on Environment and Development 1987, part III, § 2-3). For instance, women and children benefit substantially from public transportation due to increased economic and social opportunities (Duarte, Fabio and Fernando Rojas 2012, 2).

Sustainable social development occurs when social progress occurs in a steady way, without excessive fluctuation in social conditions and with an eye towards fairness and equality across all social strata. Another key aspect of sustainable social development is that progress in one area does not cause regression in another area. Sustainable social development occurs when society ensures that no one is unduly impacted by progress made in the name of another consideration (United Nations World Commission on Environment and Development 1987, part II, § 2, paragraph 2). Stable progress across the board of social considerations represents the most sustainable social development conditions.

Social development plays a key role in the development of transportation infrastructure. Such key social considerations as traffic safety, urban mobility, public health, access to jobs, and access to open space are all important considerations in the development, planning, design, operation, and maintenance of transportation systems. The most sustainable transportation systems have the greatest positive impact on these various social development considerations.

One of the key social considerations in the sustainable development of transportation systems is traffic safety. According to the World Bank, crash rates in developing nations disproportionately affect vulnerable populations, especially the poor. In addition, crash rates in developing countries continue to rise, causing a crisis in the overall safety of motorized transportation that must be addressed (World Bank 2013).

Another key social consideration in developing countries is public health. Overdependence on automobiles causes a number of public health issues, from air quality to obesity, as well as traffic safety (American Public Health Association 2010, 1). Disadvantaged populations are much more affected by these issues than other populations (Centers for Disease Control 2013).

Environmental Protection

Environmental protection is the most frequently considered pillar of sustainability. Environmental protection is the preservation of our natural resources for the benefit of current and future generations, striking the balance between these two competing interests. Environmental protection has broad implications, taking into consideration such wide-ranging issues as climate change, global warming, green house gas emissions, air quality, sea level rising, water resources pollution and depletion, desertification, deforestation, consumption of natural resources, habitat destruction, and species extinction, to name a few of the many environmental considerations (U.S. Environmental Protection Agency 2013).

As previously described, transportation is one of the few areas of infrastructure development where environmental protection has historically been degraded, rather than improved, as a result of development activities. Traditionally, transportation development has included the construction of new highways. Such construction activities generally result in significant changes to land forms, destruction of mature vegetation and deforestation, destruction of natural habitats, and consumption of large amounts of raw materials (asphalt, concrete, stone, etc.). Further, the operation and maintenance of highways typically results in air quality degradation, green house gas emissions, climate change, water resources pollution, and further consumption of natural resources (oil).

 Destruction of land forms, deforestation, habitat destruction, and consumption of raw materials are not sustainable transportation practices. Even when a city elects to develop more sustainable transportation modes (e.g., transit), some impacts will occur. Without sustainable development strategies, transportation infrastructure development will deplete the world’s natural resources. To mitigate the impacts of transportation infrastructure development, sustainable efforts such as minimizing changes to land forms, replanting affected vegetation in impacted areas, replicating destroyed habitat, and using recyclable materials must be considered. Each of these practices makes a transportation system more sustainable and less environmentally threatening in the long term.

It is widely acknowledged that air quality degradation is a significant problem in an automobile dependent society (United Nations Conference on Sustainable Development 2012, 1-2). Emissions from automobiles cause poor air quality, cause greenhouse gas emissions, and are widely blamed for climate change and such related issues as sea level rise. Transportation sustainability in an environmental context has heightened awareness in recent years due to the growing carbon footprint of automobiles in developing countries (United Nations Conference on Sustainable Development 2012, 1-2). It is presently estimated that 90 percent of the growth in green house gases is occurring in developing countries due to automobile use (United Nations Conference on Sustainable Development 2012, 1-2). Continued construction of transportation infrastructure tailored to automobile travel in the developing world will unquestionably exacerbate air quality issues in these vulnerable urban centers.

Perhaps one of the most environmentally (and socially) destructive outcomes of an automobile dependent infrastructure is sprawl. Sprawl consumes excessive amounts of land and promotes long journey to work times, while perpetuating poor air quality due to traffic congestion (Penalosa

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Access to jobs and public space are also very serious social considerations. Due to higher land values closer to employment centers, populations afflicted with poverty and disability are often pushed further away from the employment they depend on for a livelihood. The longer distances to employment centers from housing opportunities results in higher transportation costs. For those who manage to stay closer to the employment centers, these vulnerable populations are pushed into informal housing and slums, devoid of meaningful open space and recreational opportunities – further compromising public health due to inactive lifestyles, poor sanitation, and poor air quality (Bocarejo, Juan Pablo, Ingrid Portilla, and Maria Angelica Perez 2013, 84-85).

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Section Calendar

March 2017
Northeastern District Student Symposium and Student Traffic Bowl
March 23rd, 2017
Brooklyn, New York

April 2017
UMass Student ITE Chapter Tech Day
April 5th, 2017
University of Massachusetts Amherst
Amherst, Massachusetts

May 2017
2017 Northeastern District Annual Meeting
May 10th-12th, 2017
Crystal Springs Resort—Minerals Hotel
Vernon, New Jersey

August 2017
2017 ITE Annual Meeting and Exhibit
July 30th—August 2nd, 2017
Sheraton Centre Toronto Hotel
Toronto, Ontario, Canada

Please send all calendar announcements, including the name of event, the contact person, event location, and date to New England Section webmaster Colin T. White, PE and Chronicle Editor Rachel A. Dooley, PE at cwhite@gpinet.com and rdooley@vhb.com.

Continuing Education Opportunities

As always, the Continuing Education Committee needs your feedback and fresh ideas for technical sessions and training opportunities that are innovative and that would draw significant interest to the Section membership. Most importantly, training opportunities that would serve you, the New England Section membership in the upcoming meetings and gatherings.

If you have ideas for training sessions that would benefit the membership the most and have a high interest level, whether a half-day or full-day or training, please contact:

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2005, 5-6). In addition, it perpetuates the unsustainable cycle of consumption of natural resources indicated by highway based development.

In contrast, sustainable transportation practices seek to reverse the trends of highway construction that have resulted in such negative environmental consequences. While not all negative impacts of transportation infrastructure development can be eliminated, conscious efforts can be made to minimize and mitigate such negative consequences. While developed nations – such as the United States – have pursued a path of largely unsustainable transportation development practices for more than a century, developing nations have the opportunity to pursue more sustainable systems as their new infrastructure is conceived, planned, designed, and constructed.

To achieve sustainability in their transportation infrastructure, developing countries have the ability to envision entirely new approaches to urban design and development. Instead of designing low density development supported by diffuse highway transportation, developing societies can design their cities to include greater density served by a high-density public transportation system with sidewalks and bicycle paths leading from residential areas to public transportation stations. Such a system is inherently more egalitarian, more environmentally sensitive, healthier, and more economically sound (Penalosa 2005, 2).

Based on the lessons learned throughout the world, the goals of developing countries in the implementation of public transportation systems should include: incorporation of corridor land use development as part of the fundamental building blocks of the system; social equity considerations embedded in the public transportation plan; and curtailment in the growth of car ownership (Chisolm-Smith 2011, 17-18). Adherence to these lessons will result in a more sustainable development environment. These are largely the lessons learned in Bogota.

SUSTAINABLE TRANSPORTATION IN BOGOTA, COLOMBIA

When Enrique Penalosa was elected Mayor of Bogota, he came to his office with a new philosophy. His philosophy went beyond just transport. Penalosa intended to redefine the relationship between the urban environment and its residents. His vision was to create an egalitarian society where the economic, social, and environmental well-being of the citizens of the city of Bogota is at the foundation of all urban development policy. Penalosa’s goal was nothing less than social justice, environmental sustainability, and economic growth (Penalosa 2005, 1).

In support of his urban development strategy, Penalosa’s mobility strategy proposed lower expenditures for road construction and maintenance (and transportation in general) allowing for more money available for other social programs (Penalosa 2005, 1-2). In order to satisfy the city’s mobility needs, he developed a mobility strategy with three major components: curtailing automobile use; promoting bicycle and pedestrian use; and constructing a world class transit network, anchored by a bus rapid system (Penalosa 2005, 1-12). Further, he integrated transportation planning with social planning, designing and implementing housing and open space plans that are complimentary to the transportation plan. Each of these components has played a critical role in the success of Bogota’s mobility strategy.

Upon taking office, Mayor Penalosa worked quickly to implement the mobility strategy he envisioned. First, Penalosa took immediate steps to curtail automobile use in Bogota. Instead of restricting vehicle use outright, Bogota implemented a program where 40% of all cars have to be off the road during each peak period. This is affected by restricting vehicles during certain times based on the last number of the license plate, a policy called “pico y placa” or “peak and plate.” These restrictions are combined with higher fuel taxes to limit automobile use (Cain 2006, 5). These progressive transportation policies were at least partially responsible for the modal shifts realized by Bogota from private automobile use to transit use.

In addition, the city has adopted stringent rules on the parking of automobiles so as not to impede or obstruct bicycle and pedestrian travel. While initially unpopular, the parking restrictions significantly enhance the non-motorized experience. Together policies support a reduction on dependence of automobiles throughout Bogota (Cain 2006, 5).

Second, he constructed the first phase of TransMilenio, the city’s BRT system. In addition, and integral to the success of TransMilenio, is a supportive network of feeder bus systems. Third, the city constructed a vast network of bicycle and pedestrian paths. Each of these physical components plays a vital role in the success of Bogota’s transportation system (Cain 2006, 6).

In addition to the physical components of the transportation system, Bogota implemented several complementary policy initiatives which significantly impact the city and the effectiveness of the mobility strategy. The first is a policy of severely restricting automobile use in the city, especially during peak periods (Cain 2006, 6). The second is a policy of encouraging density along the TransMilenio line and throughout the city, especially for vulnerable populations (Bocajero 2013, 80). These two policies are entirely consistent with Penalosa’s vision of economic, social, and environmental sustainability. Bogota also implemented policies to improve access to public spaces for lower income groups as well as coordinated public housing program (called Metrovienda) along the TransMilenio trunk lines. The open space and public housing policies are also quite consistent with Penalosa’s vision of sustainability. Combined with the physical components of the city’s transportation infrastructure, these policies encourage economic, social, and environmental sustainability on a level not previously experienced in the Americas.

Sustainable Outcomes in Bogota

The city of Bogota has realized substantial economic, social, and environmental benefits as a result of the implementation of Penalosa’s vision. By focusing on more than just environmental sustainability, Bogota has reaped the benefits of economic and social development as well. Bogota serves as an example of sustainability in each of the three pillars.

Economic Sustainability

A summary of the sustainable economic achievements of Bogota is contained in Table 1. The economic benefits of Bogota’s mobility strategy are clear. As a public works project, TransMilenio is estimated to cost US $3.04 billion upon completion, including costs for rolling stock and fare collection technology (Cain 2006, xii). These governmental expenditures have created – and continue to create – substantial economic activity in Bogota for skilled workers in the building trades. Because the imple-
mentation of TransMilenio has resulted in work for skilled laborers, with substantial technology transfer, the construction jobs indicated sustainable economic development.

Savings due to reduced congestion and travel times have also resulted in substantial economic benefits. Phase I of TransMilenio has resulted in a 32% decline in travel times for transit users due in part to a 9% modal shift from automobile to transit (Cain 2006, 4-9). The reduced travel times are achieved by an increase in public transit speeds of 15 kph to 26.7 kph, which results in 16 minutes of saved time per BRT trip and 13 minutes of saved time per trip for the city as a whole (Cain 2006, 14). Travel time savings have been the greatest for the lower income populations, which are at the periphery of the city. Travel times were reduced for the lowest income group by an average of 18 minutes, whereas travel times for those in the highest income group were reduced by 10 minutes (Cain 2006, 14). These are substantial economic savings to the economy of Bogota, and contributed directly to economic and social sustainability.

In addition to the increased productivity due to reduced travel times, there are other measures of sustainable economic progress as well. As described above, increased productivity leads to increased competitiveness – locally, nationally, and internationally. Increased competitiveness results in economic investment. Increased investment results in increased employment opportunities, rising wages, and improved living conditions. One way that economic competitiveness and increased economic opportunity can be measured is by determining the increase in real estate values in a particular area.

Numerous studies have been conducted of the changes in land values resulting from the construction of TransMilenio. Experience in Curitiba suggests a strong relationship between BRT service and land values. One study suggested a 15-20% premium in land value for areas served by TransMilenio (Rodriguez 2008, 7). Other studies have indicated as much as a 17% premium for residential properties located along the TransMilenio BRT line and as much as a 367% increase in value for commercial properties having access to TransMilenio. Another study suggests a 15-20% premium in land values in the BRT corridors as compared to areas not served by BRT (Bocajero 2013, 84). These are substantial economic benefits indicative of increased competitiveness and productivity.

The increase in property values that resulted from TransMilenio is a strong indicator of sustainable economic development. Combined with Bogota’s Metrovivienda program, stable increases in real estate prices benefit the entire population of Bogota, including the socioeconomically disadvantaged. This sustainable economic development increases economic opportunity across all social strata and reduces the likelihood of long term economic regression.

### Social Sustainability

The social benefits of TransMilenio are equally as striking as the economic benefits. A summary of the sustainable social outcomes is included in Table 2. One study indicated a 93% reduction in fatalities due to traffic accidents (Levinson 2011, Appendix B: Bogota, Colombia, 3). Another study indicates a reduction of crashes by 79% in the service corridors (Cain 2006, ix). Such an improvement is an extraordinary benefit for the social fabric of Bogota. A traffic accident rate reduction of that scale is the envy of the entire developing world, where crash rates take on epidemic proportions.

In addition to the traffic safety benefits, the reduced travel times discussed previously are indicative of improved access to employment opportunities, improved economic opportunity, improved standards of living, improved mobility, and improved public health. These social progress indicators point to a sustainable social development trend for the areas influenced by TransMilenio. Social development on the scale promoted by TransMilenio is worth emulating throughout the developing world.

Another important indicator of the social benefits of TransMilenio is the resulting development patterns of the city. Consistent with Penalosa’s vision, the city has continued on a path of densification, especially in residential development. Seventy-five percent of new development has been for residential use (Bocajero 2013, 81). Bogota increased overall density by 8% from 2001 to 2008 (Bocajero 2013, 80). Areas along the TransMilenio route increased density by 9.6%, while areas not served by BRT have increased density by 1.6%, a testament to the power of BRT to promote dense urban development and prevent sprawl, which indicates a more socially sustainable development pattern (Bocajero 2013, 80).

Just as importantly, data suggest that the populations that have benefited the most from TransMilenio are disadvantaged populations. For instance, lower income households have benefited the most from TransMilenio from a mobility perspective (Bocajero 2013, 84). Likewise, the poorest residents have benefited from increased mobility due to improved pedestrian and bicycle connectivity. However, while improvements have been made in access for the disabled, there is still much work to be done in that category (Duarte 2012, 14).

From a public health perspective, non-motorized trips have increased by approximately 7% due in part to improved pedestrian and bicycle mobility in the city. During this same period of time, vehicle trips in the city decreased by 7% (Cain 2006, ix). This suggests a modal shift to bicycle and walking, which apart from the obvious environmental benefits has a significant potential benefit for public health and represents a more socially sustainable mobility plan for the city.

### Environmental Sustainability

As expected, the environmental benefits of TransMilenio are also very noteworthy. A summary of the sustainable environmental outcomes is contained in Table 3. One of the key environmental improvements is a reduction in air pollutants, which also has public health and social benefits. One study indicated that TransMilenio has resulted in a 40% reduction in some air pollutants (Levinson 2011, Appendix B: Bogota, Colombia, 3). Bogota has reported a 43% reduction in sulfur dioxide, an 18% reduction in nitrous oxide, and a 12% reduction in particulate matter along a key BRT corridor (Turner 2012, 14). This is indeed a significant environmental benefit.

### CONCLUSION

The city of Bogota has achieved a high degree of sustainability through implementation of its mobility strategy. Following a vision laid out by former Mayor Enrique Penalosa, Bogota has achieved quantifiable results measuring improved sustainability. These results span the three pillars of sustainability: economic, social, and environmental sustainability. The sustainable development results of Bogota are also able to be replicated in other developing countries, with transferrable policies and technical solutions available to other cities throughout the developing world.

Economically, Bogota has used its mobility strategy to achieve sustainable economic benefits. Bogota has improved access to employment, increased land values for the benefit all socioeconomic strata, and increased employment and improved economic competitiveness. This economic progress represents the type of sustainability envisioned by United Nations interna-

### Table 1—Sustainable Economic Outcomes

<table>
<thead>
<tr>
<th>Sustainable Economic Indicator</th>
<th>Measurable Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access to Skilled Labor Employ-ment</td>
<td>$3.04 billion of construction and system implementation.</td>
</tr>
<tr>
<td>Increased Productivity for all Social Strata</td>
<td>32% decline in travel times for transit, 9% modal shift from automobile to transit, Travel times reduced by 18 minutes for low income residents v. 10 minutes for others.</td>
</tr>
<tr>
<td>Increased Land Values due to TransMilenio</td>
<td>15%-20% premium in land value for areas served by TransMilenio, 17% premium for residential properties located along the TransMilenio BRT line, 367% increase in value for commercial properties having access to TransMilenio</td>
</tr>
</tbody>
</table>

Continued on Page 12
The 2016 New England Section Awards

Committee Members
The 2016 New England Section of the Institute of Transportation Engineers (NEITE) Awards Committee was comprised of:

- Joseph C. Balskus, Connecticut
- Thomas A. Er rico, Maine
- Kevin W. Johnson, Rhode Island
- Samuel W. Gregorio, Massachusetts
- Kim Eric Hazar vartian, New Hampshire and Chairman
- Joseph F. Segale, Vermont

Process
The guidelines speak to the Chairman reporting directly to the President. Otherwise the process is open. The Chairman keeps a database of past nominees that may be reused for future nominations. Telephone and email has facilitated the exchange of information among the Committee, including coordination and selection.

Awards and Selections
The awards and selections were:

- Transportation Leadership Award, Thomas J. Tinlin, PE, Highway Administrator, Massachusetts Department of Transportation
- Transportation Engineer of the Year Award, Michael W. Wasielewski, PE, PTOE
- William P. McNamara Distinguished Service Award, Kevin R. Dandrade, PE, PTOE and Kenneth J. Petraglia, PE, PTOE
- Emerging Professionals Group Award, Christina Dube, EIT

Previously, Tom served as Chief of Operations and Maintenance at MassDOT, where he was responsible for overseeing day-to-day operations, a big part of which included quarter backing snow and ice operations during the record breaking winter of 2014/2015. As Chief of Operations, he was also responsible for overseeing the Highway Assistance Program, a roving vehicle patrol that assists over 30,000 distressed motorists annually. Also notable was Tom’s role in overseeing the Highway Operations Center in South Boston, MassDOT’s statewide traffic management center responsible for coordinating incident response and security management on over 3,000 miles of roadway including one of the most complex tunnel systems in the world.

Before coming to MassDOT, Tom served as Commissioner of the Boston Transportation Department (BTD). He was appointed Commissioner by Boston Mayor Thomas M. Menino in September of 2006. As Commissioner, he implemented innovative technology solutions to streamline BTD operations and improve the user-friendliness of the transportation system. Under his leadership, the City’s parking meter operability rate increased from 78 percent to 98 percent as a result of improvements made to BTD’s in-house maintenance and payment collection systems. Tom also implemented the Boston Meter Card, a debit card used exclusively for payment at the City’s single space meters. These cards first became available in November of 2011, and in less than a year more than 10,000 were sold.

OUTGOING PRESIDENT 2016
Cabinet Alan T Cloutier, PTOE

TRANSPORTATION ENGINEER
OF THE YEAR AWARD
is presented to
Michael W. Wasielewski, PE, PTOE
This year’s recipient of the Transportation Engineer of the year has 16 years of experience as transportation professional. During that time he has distinguished himself as a leading voice in the application of Adaptive Traffic Signals. He was the lead traffic signal designer for the Concord Street (Route 126) Roadway Improvement Project in Framingham, which included roadway improvements, traffic signal installations, and streetscape improvements—all to revitalize the Downtown area. Due to the ever-changing demand in this corridor, one of the first adaptive signal applications in Massachusetts was included in this design. Off-the-shelf adaptive systems did not meet the needs of the Town, so this professional developed a hybrid adaptive system that satisfied the client’s specifications. The design of this system included the ability to alternate between adaptive and responsive operation. This person is currently taking the lead on an additional adaptive design on Main Street in Worcester.

He has also shared his experiences: presenting the Framingham adaptive signal design at the 2016 Northeast District Institute of Traffic Engineers Meeting in Portsmouth, New Hampshire; participating in a panel discussion of adaptive technology at the most recent joint NEITE Section/ Massachusetts Chapter meeting in Waltham, Massachusetts; and, co-teaching a six-hour course on the same subject.

Congratulations to this year’s recipient of the New England Section Transportation Engineer of the year, Mike Wasielewski of BETA Group, Inc. in Norwood, Massachusetts.
The 2016 New England Section Awards

WILLIAM P. McNAMARA DISTINGUISHED SERVICE AWARD

is presented to

Kevin R. Dandrade, PE, PTOE

This recipient of the William P. McNamara Distinguished Service Award obtained his Bachelor of Science in Civil Engineering in 1996 from the University of New Hampshire (UNH). His history in civil engineering stretches back to here, starting in the profession as an young engineer with VHB in Watertown, Massachusetts, moving up the chain fast to be a Project Manager. After to few years, he returned to New Hampshire as a Project Manager with CityNET in Concord, NH, and then the Traffic Team Leader for CLD in Manchester, NH. In 2004, he found his current home at TEC, helping to guide and lead the TEC team. His wife Tracey and daughter Ella has supported him greatly along the way. Kevin is a Principal at TEC, Inc. in Lawrence, Massachusetts and Hampton, New Hampshire.

Within the Institute of Transportation Engineers (ITE), Kevin has given countless hours to help promote and participate in the Institute since 1997. He does his best work promoting professional development, and the many other opportunities that ITE provides, to the TEC team. He has served as President (2004-2005) of the New Hampshire Chapter of ITE. Kevin also served on the New England Section Board culminating as the President of the Section in 2010. Since his time after sitting on the Board, he has continued to assist, serving on the Local Arrangements Committee for the 2013 ITE Northeastern District Annual Meeting in Northampton, Massachusetts and more recently co-chairing the highly successful 2016 ITE Northeastern District Annual Meeting in Portsmouth, New Hampshire.

WILLIAM P. McNAMARA DISTINGUISHED SERVICE AWARD

is presented to

Kenneth J. Patraglia, PE, PTOE

This recipient of the William P. McNamara Distinguished Service Award has more than 40 years of experience in the field of traffic/transportation engineering. He earned a Bachelor of Science in Civil Engineering from Northeastern University in 1973 and a Master of Science in Transportation from Northeastern University in 1977. His experience includes TAMS, Vollmer, Sverdrup, HTSD and HDR and he is now a Vice President at BETA Group, Inc. in Norwood, Massachusetts. He also taught the graduate Traffic Engineering course at Northeastern University.

This recipient’s service includes:

- ITE International Director for the Northeastern District for 2014 through 2016
- Local Arrangement Chair for the 2013 Annual International Meeting in Boston
- Technical Chair for the 2007 Northeast Technical Committee in Providence, Rhode Island
- ITE Traffic Engineering Council Executive Committee
- Northeastern District Chairman
- NEITE President
- Tom Desjardins Memorial Golf Tournament Committee
- Volunteer PTOE Refresher Course Instructor
- Member of all six New England State ITE Chapters
- Northeastern District Student Chapter Coordinator
- Chair of the NEITE Technical Committee for more than ten years

EMERGING PROFESSIONALS GROUP AWARD

is presented to

Christiana Dube, EIT

This recipient of the Emerging Professionals Group Award completed in 2013 her Bachelor of Science in Civil and Environmental Engineering and in 2014 her Master of Science in Transportation and Highway Engineering in 2014 at the University of Massachusetts (UMass) Amherst.

Her service and accomplishments include:

- David J. Beaubien Scholarship (2012)
- UMass ITE Undergraduate Liaison (2011-2013)
- UMass ITE Vice President (2013-2014)
- UMass WTS Secretary (2013-2014)
- Sinha Scholarship (2010 and 2011)
- UMass ITE Student Service Award (2014)
- Research on distracted driving
- Work on the 2016 Northeastern District Annual Meeting
- Chair of the Emerging Professionals Group
- Continued growth as a professional while participating in and supporting ITE

Her experience includes Fuss & O’Neill, in Manchester, Connecticut, United States Department of Transportation Volpe Center, in Cambridge, Massachusetts, MassDOT District 4 Office in Arlington, Massachusetts and Innovative Data, LLC in Belchertown, Massachusetts. She is now a Traffic Engineer with VHB in Boston.
From a social perspective, Mayor Penalosa’s vision of a more egalitarian society has clearly been advanced through sustainable social development. Reduced traffic accidents and fatalities, increased walking and bicycle riding, increased access to economic opportunity, reduced exposure to air pollution, and increased exposure to green open spaces all speak directly to the intent of social sustainability. While social sustainability can be a challenge to achieve for a transportation policy, Bogota has certainly demonstrated that a socially sustainable transportation system is achievable.

Finally, environmental sustainability has been demonstrated by Bogota. While environmental sustainability is typically difficult to achieve for a transportation policy, Bogota has identified specific strategies to achieve environmental sustainability. At the center of this strategy is a robust BRT system, with very high carrying capacities and substantial environmental benefits, such as improved air quality, increased urban density, and limitations of sprawl. The BRT system is supported by a progressive plan that includes limits on private automobile use, improved access to bicycle paths and walking paths, and improved access to open space. Bogota’s mobility strategy offers hope to other developing cities in search of environmentally sustainable transportation plans.

Overall, Bogota’s transportation plan has demonstrated that a sustainable transportation plan is achievable for cities in the developing world. Other cities in Latin America, Asia, and Africa should look to Bogota’s example as they craft their transportation policies and plans. Certainly, Bogota has demonstrated that BRT is a viable and realistic centerpiece for an urban transportation plan. Bogota has also demonstrated that increased access to bicycle and walking paths are a viable strategy to promote non-automobile transportation. Bogota has demonstrated that sustainable transportation plans are possible, issuing a challenge to the rest of the world to follow their example.

### Bibliography

SAVE THE DATE!
MAY 10-12, 2017

ITE 2017 NORTHEASTERN DISTRICT ANNUAL MEETING, VERNON, NJ

Crystal Springs Resort Minerals Hotel
1 Stonehill Drive, Vernon, NJ
Message from the Northeastern District

MICHAEL J. SALATTI, PE, PTOE
Senior Vice President
GPI

Dear Transportation Professionals,

So in my quest to provide routine communications between the International Board’s activities and the membership, I will be including regular articles in the newsletter. In this issue, I will share the latest action items that emanated from the IBOD meeting in early January.

BUDGET AND FINANCE

Our Executive Director, Jeff Paniati, estimated that ITE would finish 2016 in the black (after a nearly $1M projected loss) and projects that we will end 2017 at more than $150,000 in the black. This is attributed to a significant reduction in operating expenses as well as an increase in revenue with contracts and ITE products and services. It has been noted that a risk area for the 2017 budget include the Annual Meeting and Publication Sales. The budget could be significantly impacted should we not have a strong attendance in Toronto and if the Trip Generation publication does not hit the marketplace when expected.

LEADERSHIP

ITE The LITE program has been very successful with another 30 candidates in this year’s program. It is expected we will transition to a fully-run program by alumni by the end of the year and that two organizations (Kimley-Horn and FHWA) had committed to having candidates for the program each year. A number of action items are up for consideration by the Board, but I think two key items are:

1. Direction on future curriculum. It is expected the current program facilitator (who has garnered rave reviews) will at some point cease his involvement. How do we proceed at that juncture with regard to the intellectual property of the material used with our program? Can it be purchased by ITE, licensed or do we start fresh?

2. Consider a signature sponsor for the program (naming rights) for increased funding source.

This has been a highly rated program by its attendees. I have reached out at recent meetings with both the Met and New England Sections to ensure they have line items in their budgets and consider increasing funding support of their section candidates. The current program tuition is $4K of which ITE HQ covers $1K and the Northeastern District generously offers support of $1.5K for each candidate. So there is a $1.5K balance plus travel and meal costs which I am told can be another $2-3K. Our individual sections offer varying support of up to $1K. This can be particularly burdensome to candidates who received none or very limited support by their employer.

VISION ZERO INITIATIVE

The Steering Committee wants to work on a series of webinars. A portal will be created on the ITE web site and link with the toolbox. More than 700 resources were received for the toolbox and the working group is now going through the process to match the resources to the framework that has been developed. This is expected to be completed by the end of February. A launch event is being considered during the Texas District meeting in April.

SMART CITIES/COMMUNITIES

During 2016, ITE investigated the topic of smart communities through the Transportation Systems Management and Operations (TSMO) Council. This investigation culminated in a white paper published in the ITE Community. The whitepaper led to robust conversations in Anaheim and the IBOD in November has now led to the formation of the Smart Communities Task Force. As part of the

Continued on Page 15
formation activities, the TSMO Council agreed to conduct outreach via presentations in all of the Districts on Smart Communities. I have put the Task Force leader in touch with Gordon Meth, the Northeastern District Annual Meeting technical chair, to include such a robust roundtable in the upcoming program.

ANNUAL MEETING (TORONTO)
Key elements:
1. The Opening Plenary will have a Smart Communities Theme
2. The Power Lunch will focus on the Vision Zero Theme
3. The Closing Plenary will have a Transportation and Health focus
4. There will be a Smart Communities Pavilion in the tradeshow anchored by the US DOT
5. The full educational program should be developed by April/early May
6. There will be a hockey-themed promotional element for the Meeting
7. The TRB Traffic Signal Committee has asked to meet in conjunction with our Annual Meeting

MEMBERSHIP
We have added over 1,000 new members in 2016 and ended with a retention rate of 85%, a 5% increase over 2015. The goal for 2017 is attain a 90% renewal rate. A new member drive will begin in early March and the next District/Section/Chapter call will be in February.

Committee, Chapter, and Student Chapter Updates

TRIP GENERATION
Trip Generation is still on schedule and at least 1,000 new locations were added to the database. Person-based urban data was also included. Core land uses will be available in hard copy, and other land uses will be available electronically. The Trip Generation Handbook is in the final stages of updating and it is anticipated that it will be available in March of 2017.

Welcome to the Newest
ITE New England Section Members
(as of January 30, 2017)
Daniel S. Loureiro (University of Rhode Island)
Alexander Mendoza (University of Rhode Island)
Rachel Chambers (University of Rhode Island)
Kate Lundy (University of Pittsburgh)
Tom Stasiuk (University of Rhode Island)
Tess Schwartz, P.E. (Tessera Engineering)
Parker Sorenson (University of Connecticut)
Michael Crimmins (University of Connecticut)
Teresa Sandell (TranSystems)
Karim Naji (Federal Highway Administration)
Tom Bertulis
Francisco Lovera (McMahon Associates)
Kush H. Bhagat (MassDOT)
Thomas L. Morneau (Fuss & O'Neill)
Emily Buck (McMahon Associates)
Corey J. O'Connor (MassDOT)

Total NEITE Membership: 599 persons

RHODE ISLAND STATE CHAPTER
Chapter President: Peter J. Pavao, PE, PTOE

The Rhode Island ITE Chapter had their first board meeting of the year in early January. They have been planning their first event with the University of Rhode Island’s student chapter which will take place on February 23rd at 4 PM at the URI Kingston Campus. The event will be a Resume Review and Networking event with the Civil Engineering students. Pictured to the right are the 2017 Board Members of RIITE.

Left to right: Joseph Frawley, PE, Secretary; Phil Viveiros, PE, PTOE, Vice President; Peter Pavao, PE, PTOE, President, and Kayla Cabral, Treasurer.

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The New England Chronicle is interested in short articles on innovative projects and cutting-edge solutions.

Please send articles, listings (ITE and other relevant), graphics and photographs to the Editor: Rachel A. Dooley, PE at rdooley@vhb.com

The New England Section Chronicle staff thanks you and we hope you enjoy the issue.

REMINDERS

Those members of the New England Section that have not updated your personal and/or business contact information recently should visit the ITE website and do so. An updated contact directory allows the Section to properly send information emails, election information, and other details such as the NEITE calendar.

http://www.ite.org

For those members of the New England Section that would like to be included on the Section email list for Google Groups, please contact Samuel W. Gregorio, PE, PTOE at TEC, Inc.

sgregorio@theengineeringcorp.com