Commission Briefing Paper 4M-05
Long-Term Transit Expansion Prospects

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Introduction

This paper is part of a series of briefing papers to be prepared for the National Surface Transportation Policy and Revenue Study Commission authorized in Section 1909 of SAFETEA-LU. The papers are intended to synthesize the state-of-the-practice consensus on the issues that are relevant to the Commission's charge outlined in Section 1909, and will serve as background material in developing the analyses to be presented in the final report of the Commission.

This paper presents summary information on the history of U.S. transit contraction and expansion and on the most important work over the last decade on transit expansion projections and the economics of transit expansion. Because there is relatively little solid analytical material in this field, the author, encouraged to do so by USDOT staff, devotes much of the paper building a long-range transit expansion scenario and develops recommendations for pursuing such a scenario.

Key Findings

The long-term trend in transit[1] ridership is well summarized in Exhibit 1 on the following page, which notes many of the important national events that have affected the transit industry and its users. Interestingly, the most recent period is aptly characterized as "Intergovernmental Partnership." This section will elaborate on why this is a good title for the period we are now in, and will suggest that the Section 1909 Commission now has an opportunity to outline a new direction for intergovernmental partnership that may have promise for a major upward trend in long-term transit expansion prospects as well as substantial benefits in the quality of life in urban America.

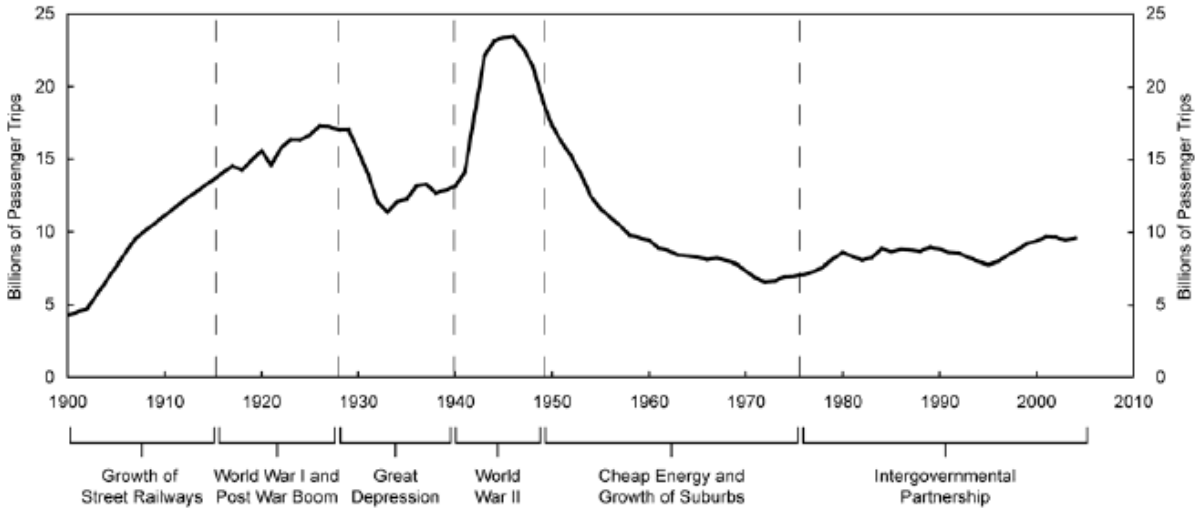
Research Questions to Be Answered To assist in guiding the recommended program, initial research should focus on questions relating to TOD and transit, including ridership effects, transportation modeling, the balance and mix of uses in TOD, parking, and the built environment. Research should also focus on the relationships between transit and other critical benefits and impacts, including energy, environment, safety, and quality of life.

Development of a Feasible Long-Range Transit Expansion Program In the last 2 sections of this paper a long-range transit development scenario is developed based on current actual achievements of higher levels of transit ridership per capita in Canadian urban areas. Applying the increased trip rates per capita to the distribution of transit service by urbanized area size

[1] In this paper the term "transit" is used in place of the commonly used term "public transportation," since the latter term is often used to encompass other forms of transportation such as intercity rail service. In this paper "transit" includes commuter rail service, but not intercity rail service.

currently being experienced results in an increase of vehicles in service to over 320,000 nationwide, and an increase in transit trips to over 27 billion annually before considering growth in population and changing demographics between our base year (2000) and our long range horizon for achieving our transit market targets.

Exhibit 1: Major Trends of Public Transportation Ridership



Source: Public Transportation Fact Book, 57th Edition; April 2006, American Public Transportation Association, Page 12

If these target rates of ridership per capita are applied to the urban area population using a projected middle-growth Census 2050 population, nationwide transit vehicles in service would grow to about 500,000 and transit trips would grow to about 46 billion annually -- more than a quadrupling of current national transit ridership.

Preliminary Recommendations for Organizing the Program If the Section 1909 Commission decides to pursue a transit expansion program similar to what is recommended in this paper, it might begin by recommending legislation that would establish a long-term standing Quality of Life Urban Transit and Urban Development Commission. Such a commission might include the following types of representatives:

- The transit industry (e.g., APTA and individual operators)
- Developers (e.g., the Urban Land Institute and individual firms)
- Metropolitan transportation organizations and metropolitan planning organizations
- State and local governments
- The Federal government
- Universities
- Firms involved with other aspects of the recommended program, such as in the technology, energy, and environmental fields

Such a commission might be charged with the following responsibilities:

- Defining the goals of the program and the initial strategies

- Calling together one or more conferences of stakeholders to work on developing a more specific program
- Periodically meeting to review progress
- Developing recommendations for how the long-term process should be modified and continued after completion of the initial report of the commission.

Summary of Modern History of the Transit Market Growth

Since the early 1970s public transportation ridership has been growing at the modest but steady pace of about 1.3% per year compound growth rate. Several factors have contributed to this moderate steady pace of growth, including increasing congestion, fuel price increases, a maturing public transportation industry that has improved in management, marketing, and ability to sustain long-term improvement programs; continuing growth in support from state and Federal programs, and other factors.

Other factors point toward an increasingly favorable outlook for transit. Planning programs in many urban areas have been increasingly successful in integrating transit growth with smarter land use policies. Developers have become aware that transit-oriented mixed–use, higher density development, although much more complicated to plan and implement, can yield substantial benefits by serving different but related markets that reinforce each other and provide greater transportation and economic flexibility as market forces change.

These recent trends are being recognized by others interested in policies to deal more effectively with growing national concerns over urban sprawl, congestion, global warming, energy cost increases, and the desire to avoid international risks and reduce trade deficits by achieving energy independence.

The U.S. may now have the opportunity to bring all these and other policy concerns together in a mutually re-enforcing manner. However, achieving such complex policy coordination will not be easy. As a nation, we have not had a great track record in managing such complex multi-dimensional coordinated programs – generally less well than some other societies of the developed world. However, we are becoming increasingly aware that we can learn a significant amount from their successes in these fields.

The work that the Section 1909 Commission is undertaking is fortuitous in terms of timing as relates to all of these recent trends and growing national policy concerns. Because of the complexity involved in pulling together all these diverse concerns, it appears wise at this time to attempt to set up a process that can evolve as the many leaders in these fields begin to focus on the potentially enormous long-term benefits that may become of a much broader approach to the future of urban transportation and urban development policies and programs.

Toward the conclusion of this paper we perform analysis showing that it may be feasible to expand the U.S. transit market several-fold over a 40 or 50 year period.

Consideration of the Range of Likely Transit Futures

For many years after World War II, transit declined rapidly. Between 1946 and the late 1950s many privately owned systems failed and national transit ridership was reduced to less than half

of what it had been. If not for public policy intervention, primarily at the local level, the transit industry might have disappeared almost completely.

By the 1960s, several states and eventually the Federal government began to get involved in attempts to slow this rapid decline. As a result the rate of decline slowed greatly, but it continued until the petroleum crisis of 1973-1974. Over the last decade, transit ridership, for the first time since the 1940s, has grown as a share of urban surface transportation – growing faster than motor vehicle miles of travel on urban streets and highways.

Since that time many more states and the Federal government have greatly increased their involvement and levels of support, and have continued to do so on a quite consistent basis. It seems highly unlikely that these commitments will be substantially reduced within the foreseeable future, particularly in light of the increasing awareness of the wide range of benefits that most officials have come to recognize over the last decade or two.

One step up from that unlikely negative prospect, the question needs to be raised as to the likelihood of a status quo set of policies across the country at all levels of government. Is it likely that we may see little or no change in policy and investment in transit over the next decade or so?

This is unlikely. There is a rather dramatic change going on in the inner suburban jurisdictions across the country, which have been rapidly transforming themselves from rural, single-family detached bedroom communities, to mixed-use compacted areas, to smarter growth areas, while educating themselves about such evolving concepts. They are rapidly becoming a major national constituency for an expansion, advocating a substantial increase in transit investment. This trend is likely to continue as older, inner suburbs become more urbanized.

Moving beyond a status quo scenario, we have three serious economic analyses of what could and maybe should happen to expand national transit systems.

In 1999, Cambridge Systematics prepared a report for members of the American Public Transportation Association on the economic benefits of transit. It updated earlier analyses of the job creation and business revenue impacts of investment in public transit at the national level using state-of-the-art analytical techniques; examined and expanded estimates of transit's economic impacts in other dimensions; and assessed the value to the economy of each dollar invested in transit. The paper reaffirms the significant positive economic impact of transit investment on jobs and business revenues, and affirms a variety of broader indirect benefits.

Cambridge Systematics later (2006) prepared a Transit Cooperative Research Program report on state and national transit investment needs, which was intended to become an input to the reauthorization of the surface transportation program. The investment scenario was based on the objective of maintaining then-existing conditions and performance, and was driven by alternative annual ridership growth projections ranging from 1.57% to 3.5%.[2]

[2] Cambridge Systematics, Inc., TCRP Project H-33(A): State and National Transportation Investment Analysis; Transportation Research Board; 2006; pages ES-2 – ES-3.

The 2006 CSI report estimated that the cost to maintain conditions and performance would be 27 percent higher than that estimated in the 2006 Conditions and Performance Report to Congress, and that the cost to improve them would be 38 percent higher.

Then, in January of this year, U.S. DOT staff with assistance from AECOM Consult prepared a Briefing Paper for the Section 1909 Commission which included an assessment of future transit needs over 25, 30, and 50 year time horizons. The analysis was based on a continuation of the then-current trend of 1.57% per year growth in transit ridership.[3] On a cumulative basis in constant 2005 dollars, the paper estimated needs to be $1.1 trillion through 2020, $2.4 trillion through 2035, and $4.6 trillion through 2055. The paper does a careful job of distinguishing and estimating different types of needs (replacement and rehabilitation, asset expansion, and performance improvements).

Is it possible that the U.S. might go far beyond these scenarios and recommendations described above to return to the maximum transit scenario that we experienced at the end of World War II?

Such a rosy scenario seems unlikely within the next decade or two because conditions have changed so greatly since World War II. At that time wartime conditions had resulted in gas rationing and many other restraints on motor vehicle ownership and use. New autos were not being manufactured and replacements for tires and other products were limited. Automobile ownership was a small fraction of what it now is. Americans were being strongly influenced to support the war effort and make voluntary efforts to conserve scarce resources needed for the war. Under these conditions, the transit industry was able to rapidly expand operations to serve demand with universal support from the public and all levels of government.

In summary, those wartime levels of transit ridership cannot be achieved on a per capita basis, at least within a decade or two, without dramatic changes that cannot be foreseen at this time. Such changes will require sustained effort to build widespread support under a long-term strategy of 40 to 50 years. This must be understood in the broader context that transit functions best under high-density, mixed-use conditions where many daily and incidental trip destinations are in relatively close proximity (less than half an hour of travel time).

So, what are the prospects for long-term future transit expansion? What is reasonably likely to happen over the next several years? And what can and should be done to reinforce the best of these prospects over the long-term to maximize net benefits, broadly considered?

Several current factors, conditions, and recent trends should first be listed:

- Demographic trends: aging population, fewer children, greater percentage of the population living in dense, congested urban areas – i.e., an increasing return to cities and suburban mixed-use higher density "town centers"

- Energy availability and prices: likelihood of future interruptions in petroleum supply, exhaustion of Alaskan and off-shore sources, lack of supply of alternative sources,

[3] "Baseline Transit Needs Assessment," paper 3H-01 prepared for the National Surface Transportation Policy and Revenue Study Commission; January 5, 2007.

technology development of alternative sources, increasing demand from China, India, and other rapidly developing countries, increasing prices from other sources due to overall market conditions

- Energy conservation: private sector responses to above conditions in order to develop new technologies and cut cost of production and distribution, as well as regulatory programs to increase motor vehicle fuel efficiency; Federal government programs to develop fuel cell technology and support private sector programs

- Increasing urban density: demographics including immigration; pressures to reduce sprawl in order to prevent the continuing decrease of the supply of high quality agricultural land; state and local agricultural land protection policies; use of higher and higher urban development impact fees at state and local levels; increasing costs of agricultural production and distribution

- The beginnings of understanding of how recent and current policies have furthered exurban sprawl and the resulting interest in trying to understand how public policies can possibly reduce sprawl

- Increasing understanding of fundamental land use-transportation interrelationships in general and in quantitative terms, leading to rapidly increasing interest and understanding of how transit-oriented development around rapid transit stations, light rail stops, and bus rapid transit stations can improve transit use and walking, and reduce motor vehicle use

- Continuing increase in interest of state governments in transit-oriented development (TOD) and policies to control exurban sprawl

- The beginning of interest among national leaders in what we might learn from experience in Western Europe, Canada, and East Asia

- An emerging national consensus on how all of the above relate to each other, particularly as relates to urban transportation and urban development policies, and transit in particular.

An Achievable Long-Term Quality of Life Urban Transit and Urban Development Scenario

In this scenario, we make an attempt to define an achievable long-term high quality of life scenario focusing on revitalizing the country's urbanized areas through transit-oriented development and coordinated policies involving all programs that can contribute to this goal.

We see this goal as having several important characteristics:

Achievability Targets for transit expansion should be based on what recent experience has shown can be accomplished within political and cultural conditions similar to ours.

Target for Transit Market Specific long-range targets for the size of the potential transit markets should be established, and revised as progress is made and as the market is better understood.

Transit-Oriented Development Focus Experience over recent years has increasingly demonstrated that the maximum benefits of transit can best be achieved when transit-oriented development (TOD) around transit systems is well-planned and implemented, particularly around high capacity transit systems such as rail rapid transit systems, but also around light rail and bus rapid transit stations. All levels of government should continue to be involved, building upon the forms of partnership that have been developed over recent decades, and these partnerships should continue to be tailored to the varying forms of political organization and socio-economic culture we have across the country.

Varying Forms of Transit As we have clearly learned over the last few decades, different forms of both transit technology and transit service are better suited to different forms of urban development, density, and geography.

Long-Term Nature of the Recommended Approach The scenario being defined must inherently be long-term because high capacity transit systems are very expensive and are often built over many years, sometimes stretching to decades, and because the success of this scenario depends on restructuring of much of our urban form through TOD, which requires adapting to and following the development market.

Importance of Private Sector Despite the fact that transit is overwhelmingly a public sector program across the country, this scenario inherently requires greater involvement of the private sector, particularly in implementing TOD, but also in shaping the direction of the scenario to better make use of private sector expertise in financial management, emerging forms of public-private partnerships, operation of parts of transit systems, and in technological development.

Collaborative Leadership In order to make maximum use of private sector expertise, as well as to foster complementary roles of different levels of government, the organizational structure of the recommended approach should be collaborative in nature. Other characteristics of the approach being defined also call for collaborative leadership (flexible approach, research-driven, TOD focus, monitoring of progress, open-ended scope, etc.). Collaboration among programs in different urbanized areas is often needed because of close geographic proximity and interconnectivity, as well as in sharing experience as progress is made in achieving targets for the transit market. Current multi-state regional compacts provide a valuable model for this.

Getting Started in the Development of the Scenario

Defining Achievable Long-Term Targets The accomplishments of societies of Western Europe, East Asia, and Canada were cited above as models we can learn much from. These are all highly developed societies, many of which are comparable to the U.S. in per capita income, technological development, socioeconomic characteristics, and political structure.
Using achievements of Western European urban transit systems may be unrealistic, however. Most of them have fuel tax rates several times as high as ours. Research has demonstrated that the price of fuel is closely related to the choice of mode of transportation. And it is extremely

unlikely that fuel tax rates of $4 or more per gallon would be politically acceptable in the U.S. within the foreseeable future. Moreover, Western European cultures are very different in terms of the long histories of high-density urban living and the willingness of these societies to accept governmental controls on land use and urban structure.

East Asian societies have many of the same characteristics as Western Europe in these regards. Most of them have much shorter histories of democratic government and open market economies. Some of them have been so successful in transit development that their transit systems are still profitable despite high levels of per capita income.

Canada, however, is much more comparable in most of these characteristics and is therefore a better source for defining achievability. Canadian urban areas have had relatively similar histories and relatively comparable urban densities. They also have preceded us in recent decades in investment in modern transit systems, and particularly in their achievements in transit-oriented development (TOD).

For these reasons, we have used recent Canadian data to define potentially achievable goals as initial targets for expansion of U.S. transit markets. Exhibit 2 on the following page provides suggested initial targets for our urbanized areas in three size ranges:

- Greater than 1,000,000
- Populations between 500,000 and 1,000,000
- Populations between 50,000 and 500,000

This exhibit shows data on (a) transit ridership and population for U.S. large urbanized areas in each of the above size classes, (b) overall annual riders per capita in each size class, and (c) a target for long-range transit ridership market based on actual experience in large Canadian urban areas in each of the larger 2 size classes. Data for those 2 large Canadian urban area size classes are shown at the bottom of the exhibit.

Exhibit 2: U.S. and Canadian Riders Per Capita and Population Density

	Annual Riders 2000 FY (000s)	Population 2000 FY (000s)	2000 Riders Per Capita	2050 Target Riders Per Capita	Population Density	Target Rider Growth
U.S. Urbanized Areas[1]						
All > 3 mill.	5,723,149	74,531,761	77	176	3,841	229%
All 1 to 3 mill.	1,295,237	41,658,284	29	176	2,924	606%
All 0.5 mill. to 1 mill.	393,808	22,852,273	17	130	2,257	752%
All 50 K to 500 K	676,828	52,190,935	13	100	1,860	771%
All U.S. Urbanized Areas	8,089,022	194,140,302	42	150	2,657	360%
Canadian Urban Areas[1]						
Total > 1 mill.	1,764,214.9	10,022,987	176		5,717	
Total 0.5 mill. To 1 mill.	351,386	2,711,551	130		3,406	

[1]Census definitions are essential the same for U.S. Urbanized Areas and Canadian Urban Areas. Canadian data are all for 2006, the year of the last Canadian Census.

It is interesting to consider how the density of the larger Canadian urban areas compares with the density of large U.S. urbanized areas. The densest Canadian urban area (Toronto) is almost exactly the same as the densest U.S. urbanized area (Los Angeles) – about 7,070 persons per square mile. The aggregate density of the largest three Canadian urban areas (5,717 persons per

square mile) is comparable to the average for the next three or four densest U.S. urbanized areas (San Francisco, San Jose, New York, and pre-Katrina New Orleans).

Also of interest is how dense most California urbanized areas have become in recent decades. The 54 California urbanized areas (their average population size is only slightly over 0.5 million) have an overall density of 4,565 persons per square mile, which is greater than the density of all except the ten most dense U.S. urbanized areas, which have an overall average population size of over 3.7 million people.

Four comments are of interest in relation to this observation: (a) California's land use policies over the last several decades have greatly reduced exurban sprawl compared to most other large U.S. growing urbanized areas, (b) California's very high agricultural land values, and policies to protect these areas from development, have further restrained exurban sprawl, (c) California's rapid growth has created a very large housing market that has responded to those two conditions in innovative ways to achieve increasingly higher densities in both urban and suburban areas, and (d) of most relevance to this paper, all of these three factors have created conditions very favorable to long-term transit expansion, as is borne out by high per capita ridership growth rates in most of these areas over the decade of the 1990s

Note that the two largest Canadian urban areas (Toronto and Montreal), which both have rail rapid transit systems, each have higher transit ridership per capita than any U.S. urbanized area, including New York, as does the aggregate ridership per capita for the three largest Canadian urban areas.

If we set a target for the set of all large U.S. urbanized areas (greater than one million population) to achieve the same average as currently exists for Canadian large urban areas (176 annual riders per capita), the larger U.S. areas (greater than three million population in 2000) would have to more than triple (expand by 229% their markets on a per capita basis). The areas in the next class (1.0 to 3.0 million population) would have to expand their markets almost 3 times that amount (expand by 606%).

Perhaps a more realistic target would be to set an overall target of 176 riders per capita for the aggregate of all the U.S. largest areas (greater than one million), and set more realistic targets for each area, recognizing differences among them in circumstances (e.g., growth rates, current densities, and transit infrastructure, etc.).

Three smaller Canadian urban areas: Calgary, Ottawa, and Edmonton, which are in the 0.5 to 1.0 million population range, have transit ridership per capita in the aggregate that is higher than any U.S. urbanized area except New York. None of them has a rail rapid transit system. However, the two Alberta urban areas have large modern light rail networks and Ottawa has an extensive bus rapid transit system and a new light rail line.

Since transit ridership data for Canadian urban areas in the smallest size class were not available for this paper, a somewhat smaller target for them (100 annual rides per capita) was used for this size class, based on the ratio of the current level of ridership per capita (13), compared with next larger size class (17 annual rides per capita).

Applying the increased trip rates per capita to the distribution of transit service by urbanized area size currently being experienced results in an increase of vehicles in service to over 320,000 nationwide, and an increase in transit trips to over 27 billion annually before considering growth in population and changing demographics between our base year (2000) and our long range horizon for achieving our transit market targets. If these target rates of ridership per capita are applied to the urban area population using a projected middle-growth Census 2050 population, nationwide transit vehicles in service would grow to about 500,000 and transit trips would grow to about 46 billion annually. Note that the overall target for the long-term expansion of the transit market for all U.S. urbanized areas as a whole would be to more than quadruple ridership per capita (expand by 360%), or put another way, the goal would be to meet AASHTO's and APTA's goal for this generation and then to double the market again in the next generation.

This 2050 projection of target ridership is about 80 percent above the historical high for U.S. national transit ridership set in 1946 (see Exhibit 1 on page 3). However, on a per capita basis the 1946 historical peak national ridership of about 183 is about 22 percent higher than our projection for the target transit ridership of 150 per capita. So, we might still want to set a new target of a further national transit ridership growth of 22 percent in about 2050 percent even it we are successful in matching current Canadian transit achievements by 2050.

Transit-Oriented Development policy must be an essential element of this scenario, without which the transit market targets are not achievable. A good working definition of TOD development is offered in the box below based on a recently adopted definition by a large urbanizing inner suburban county as part of a project in which this author participated.[4]

TRANSIT-ORIENTED DEVELOPMENT (TOD): Transit-oriented development (TOD) is defined as compact, pedestrian- and biking-friendly, mixed-use development containing medium to high density residential, office, and retail uses within walking distance of rail transit stations identified in the area plans. Well-planned TOD should incorporate good design principles and a balanced mix of uses around transit stations to promote transit usage and create vibrant neighborhood centers at these locations.

A recent review of the impacts of TOD on mobility choices and benefits found the following:[5]

- A study of Portland, Oregon found that TOD *improves the effectiveness of transit* investments by increasing the use of transit by 20%-40%. Residents of older TOD-like neighborhoods throughout the San Francisco Bay Area used transit for 17% of trips, as compared to 3% in suburban areas. In Arlington, Virginia, 41% of those surveyed use transit to get to their jobs; in the more transit-accessible TOD Rosslyn-Ballston Corridor, transit use is likely to be higher.

- A study in Seattle, Washington found that in mixed-use TOD, the total contribution of transit, walking/biking, and internalized trips *reduce automobile trips* by up to one-third.

[4] Adapted from an Amendment to the Policy Plan (2003 Edition), adopted by the Fairfax County, Virginia, Board of Supervisors, March 12, 2007.

[5] These bullets are selected parts of "How California May Benefit From Transit-Oriented Development;" a four page paper found on the web as an html file with this title; from a California Senate TOD fact sheet that is no longer accessible on the web. The bullets have been edited slightly and highlights added for the purpose of this paper.

- Residents of TOD-like neighborhoods in the San Francisco Bay Area had almost *half the vehicle miles traveled* per year of new suburban developments. A California statewide study by Caltrans reported that of 27 neighborhoods in Northern and Southern California doubling residential density reduced automobile ownership and resulted in 20% to 30% fewer annual VMT.

- Various studies have found that TOD can *lower annual household rates of driving* by 20% to 40% for those living, working and shopping near transit stations, it can reduce *rates of greenhouse gas emissions* by 2.5 to 3.7 tons per year for each household, and the California Energy Commission reported that California *could reduce statewide transportation energy consumption* by 3% to 10% with the implementation of smart growth policies across the state

- By *reducing driving costs*, TOD saves $3,000 to $4,000 per year for each household, enabling this money to be diverted to meet housing needs. The working poor who were able to take public transportation, bicycle, or walk to work *spent far less on transportation* than in more compact, transit- or pedestrian-oriented areas.