Measure: Transit-oriented Development Initiative (T6)

This measure concerns a Transit-oriented Development Initiative (hereafter Initiative) that will maximize the City of Tucson's promotion and support of compact transit-oriented developments and supporting mass transportation development through 2020. The Initiative includes City-based incentives and regulations as well as policy advocacy activities with the county, regional and state governments that influence land use and transportation patterns.

The Initiative's key components are the following:

- Pursuit of full development of the region's High Capacity Transit corridors' transit systems by 2020 and corresponding redevelopment of corridor station sites into sustainably-designed transit-oriented developments.

- Continual improvement of Tucson's land use planning system to facilitate maximum use of compact and transit-oriented development techniques in infill projects, including financial incentives where necessary.

Emission reduction potential by 2020:	11,947 tCO_2e / yr.
Percentage of goal (2012):	NA
Percentage of goal (2020):	0.53%
Total annual average implementation costs:	NA – accelerating existing plans/trends for compact development that saves City infrastructure costs and increases tax receipts per developed acre
Entity that bears the costs of implementation:	City of Tucson
Cost/Savings per tCO_2e:	Savings $1,575 / tCO2e
Net annual savings:	$18.8 million
Entity that realizes the financial return:	Citizens living in compact developments enjoy reduced transportation and building utility costs
Equitability (progressive/regressive, income/revenue neutral, etc):	Likely progressive
Potential unintended consequences:	HCT Corridor transit systems and compact developments could increase traffic congestion

Background information:

Compact and transit-oriented development strategies center around increasing the density of the population in central areas of a city and minimizing outward auto-oriented growth (i.e. growing up instead of out).

This is accomplished through a combination of government policies affecting real estate economics such that the following are promoted:

(1) Infill development - converting existing structures into desirable living spaces and development of vacant lots in existing urban areas;

(2) Greater density of development, often through mixed-use development; and

(3) Creating appropriate transportation infrastructure to serve denser development (typically meaning increased mass transit services that reduce auto dependence).

In addition to reducing the energy and carbon intensity of the activities of organizations and individuals, compact and transit-oriented development reduces natural habitat destruction, improves real estate values, improves city finances by increasing tax collections per developed area, protect regional agricultural economies (which are typically damaged by sprawl development patterns), and can make a city more attractive to the young adult labor force that is critical to ongoing economic competitiveness.

The ten basic principles what's known nationally as Smart Growth apply to this Initiative:[1]

Mix land uses.
Take advantage of compact building design.
Create a range of housing opportunities and choices.
Create walkable neighborhoods.
Foster distinctive, attractive communities with a strong sense of place.
Preserve open space, farmland, natural beauty, and critical environmental areas.
Strengthen and direct development towards existing communities.
Provide a variety of transportation choices.
Make development decisions predictable, fair, and cost effective.
Encourage community and stakeholder collaboration in development decisions.

The plans of various regions leading the way on compact and transit-oriented development reflect strong relationships between development patterns and GHGs:

- Transportation
  - It is estimated that if US biking and walking levels returned to those of 1969, 1.5 million tons of carbon dioxide emissions would be saved annually.[2]

  - Maximum deployment of compact ("Smart Growth") strategies nationwide between 2010 and 2050 was projected to save US consumers over $1 trillion dollars of vehicle ownership and operational costs and reduce carbon emissions by 1.45 billion tons by 2050.[3]

  - Compact development patterns reduce vehicle miles traveled (VMT) by an average of 35%. Each increment of compact development can be expected to reduce VMT 20-40%.[4] Regional growth plans emphasizing compact development are expected to reduce VMT an average of 8%, ranging as high as 32%. Analysis of a compact, mixed-use development in Atlanta compared to an urban edge site for same results projected a 35% VMT reduction.[5]

- Housing
  - A detached single-family home uses 54% more energy for heating and 26% more for cooling than a multi-family home.[6]

  - Homes in compact developments use, on average, 20% less energy than homes in sprawling development.[7]

- Infrastructure
  - The compact development plan scenario developed by Envision Utah for the Salt Lake City region was estimated to save $4.5 billion in infrastructure spending compared to continuing the existing sprawled development pattern.[8]

The State of Arizona's Climate Action Plan (2006)[9] includes both a "Smart Growth Bundle" policy in the Transportation / Land Use section, and two policies in the Residential, Commercial and Industrial section, all adopted unanimously, summarized below:

- Smart Growth Bundle (TLU-2)
  - Measure: Target achievement of 2-11% reduction in VMT growth from passenger vehicles through a combination of development fees / fee waivers, smart growth bid package requirements, infill incentive district and other measures focused on:
    - Infill and Brownfield Development
    - Transit-oriented development
    - Smart growth planning
    - Targeted open space protection

  - Estimated cumulative GHG savings 2007-2020 (assuming 2006 adoption): 26.7 million tons CO2e.

  - Estimated cost per ton CO2e reduced: zero because it results in net savings.

- Building Standards/Codes for Smart Growth (RCI-4)
    - Measure: State should establish mandatory energy code or "strongly encourage" localities to maintain state-of-the-art codes and regularly update them.

    - Estimated cumulative GHG savings 2007-2020 (assuming 2006 adoption): 14.0 million tons CO2e.

    - Estimated cost per ton CO2e reduced: Net savings of $18 per ton CO2e.

- "Beyond Code" Building Design Incentives and Programs for Smart Growth (RCI-5)
    - Measure: Implementation of LEED or other green building certifications in state and locally funded buildings and promotion of practices to other buildings through financial incentives, use of life-cycle costing and education.

    - Estimated cumulative GHG savings 2007-2020 (assuming 2006 adoption): 18 million tons CO2e.

    - Estimated cost per ton CO2e reduced: Net savings of $17 per ton CO2e.

Status Quo / Business as Usual:

Arizona was ranked 15th of the 50 US states in a recent appraisal of carbon emissions-related state infrastructure policies (scoring 47 out of 100 points; the high was 93 and low was 0). However, Arizona received zero of the 25 points possible for Smart Growth policies and Transit-oriented Development Incentives.

Arizona also was ranked 15th concerning transportation investment decision-making processes, scoring all the possible ranking points regarding state support for non-motorized transportation and use of CMAQ federal funds, but was rated only 8 of 20 concerning the balance of state transportation investments and scored zero points regarding prioritization of highway maintenance and state contributions to public transit.[10]

The City of Tucson's existing real estate development process includes subarea plans that encourage compact and transit-oriented development. The Downtown Area Infill Incentive District Zone is designed to encourage sustainable infill partly through addressing barriers to infill development such as incompatible development standards, and to provide incentives.[11]

The City's Livable Tucson Vision Program of 1997 was a shared vision of the future and a common framework for action at the policy level. It includes an Infill and Reinvestment Goal for which key measures of progress include the ratio of city building

permits to total regional permits, dollars reinvested in restoring and renovating inner-city buildings, ratio of protected natural desert to total developed land, and percentage of residences located within half a mile of a market.

Livable Tucson also adopted the following indicators of progress towards "Better Alternatives to Automobile Transportation": Use of alternative means of travel, miles of quality pedestrian and bike paths and bus routes to total lane miles of roads, and number of pedestrians in neighborhoods.[12]

In short, the Livable Tucson program is wholly supportive of this Initiative, but its lack of specific goals and regulations to achieve them means that the Climate Action plan could make an important difference towards performance. This analysis assumes that the Livable Tucson program will not, by itself, alter continuation of recent development patterns in Tucson.

The City adopted its Residential Green Building Rating System in 2009 in order to promote residential developers to build green developments.

A streetcar line four miles long, the Tucson Modern Streetcar, connecting downtown and the University of Arizona, will be opened in 2012. The line's expected 1.4 million annual ridership is projected to encourage transit-supportive development and redevelopment along the route.

Eight potential High Capacity Transit (HCT) corridors were identified in the 2040 Transportation Plan process as not having "fatal flaws." The two priority corridors are Broadway Blvd. and 6th Ave / Nogales Hwy. Transit-oriented development principles are already part of the planning for the corridors, including transit-encouraging densities and intensities, parking management to promote alternative mode use, and mixed uses.

Funding for the high capacity transit systems is the primary obstacle to HCT plan implementation that the City of Tucson must address for the HCT component of this measure to succeed.[13]

According to the City's Planning and Development Services Department, transit-oriented developments or compact developments are often prohibited or hindered by existing plans and zoning regulations, but the City's staff is working to free up processes through projects such as the Downtown Infill Incentive District and developers are beginning to show interest in compact developments as financing again becomes available.

Description of Measure and Implementation Scenario:

Building on traditional land-use planning practices of restricting development uses, densities and designs through zoning and/or incentives, the Initiative follows the practices of leading-edge urban areas in the US to set specific land-use redevelopment targets linked to transportation system development strategies.

More specifically, the initiative involves:

- Maximizing infill development and redevelopment in the City through 2020 such that:
  - 2000 units are under contract for redevelopment at compact development densities.

- Accelerating development of the High Capacity Transit corridors such that:

  - All six recognized non-freeway corridors have seen the transit system installed at the BRT Exclusive Lane (BRT XL) or street car level (Campbell Ave. north only) by 2020; and

  - Transit-oriented compact developments 3 acres in size built at an average of 20 residential units per acre are completed or under contract for development at 50% of identified stations or otherwise every one mile.

Maximizing Infill:

The Initiative is a flexible set of activities primarily conducted by the City of Tucson that will stimulate 100 acres of compact development or redevelopment in the City that would not have otherwise occurred by 2020. Expected actions are zoning/code changes and potentially financial incentives.

High Capacity Transit Corridor Development:

Of the eight high capacity transit corridors identified in the PAG High Capacity Transit System Plan, six are on roadways subject to compact developments at stations (transit-oriented developments). The other two are freeway routes that are not scheduled for transit service that would stimulate compact developments.

The Initiative's goal is funding and implementation of BRT exclusive lane transit systems by 2020, supported by City land-use planning processes, such that 50% of likely station sites are under redevelopment as compact developments averaging 3 acres at a density of 20 residences per acre.

Funding of the transit systems should include identified sources of revenues to cover the capital costs and at least five years of the operational subsidies required.

Note that the HCT study concluded that only 2 Broadway Bl. sites and zero sites on the 6th Ave. / Nogales line are presently suitable for "major transit-oriented development." Along the 6th Ave. / Nogales line, the study found that "smaller parcels could be combined to create mixed-use residential/commercial redevelopment opportunities that

would benefit from a BRT or streetcar line." One major ToD redevelopment opportunity was identified for Campbell Ave North – the UA Agricultural Farm.[14]

The table below shows the roadway corridors, their length, transit-oriented station developments and expected annual ridership.

Table 1: Transit-oriented compact development sites on HCT corridors

Corridor	Service	Length (miles)	Stations*	Annual Ridership Projected (000s)
Speedway	BRT XL**	10	10	1,121
Broadway	BRT XL	12.5	16	1,205
Oracle	BRT XL	16	16	1,099
Grant	BRT XL	7.5	8	435
Campbell S/Kino	BRT XL	8.5	8	435
6th Ave / Nogales Hwy	BRT XL	9	15	1,053
Campbell N	Street Car	5.3	5	224
Total Stations with Redevelopment Potential:			***78***	

*See Attachment A for a station list where applicable. Some corridor stations are assigned to another corridor to avoid double counting. Where station lists have not been provided by the HCT Plan, this analysis assumes one station with redevelopment potential every one mile.

** BRT XL means Bus Rapid-transit with an exclusive lane.

Has the Measure been implemented elsewhere and with what results:

Numerous metropolitan areas have adopted Smart Growth policies in the past ten years; only a few have specifically identified expected carbon emissions savings from implementation. Similar cities throughout the US have been implementing high-capacity transit corridors accompanied by transit-oriented developments.

Sacramento, CA

The Sacramento Council of Governments adopted a regional growth "preferred blueprint" based on Smart Growth principles in 2004 as part of its 2035 regional transportation plan. It won the Association of Metropolitan Planning Associations' National Achievement Award for 2004. Key goals are reduction of vehicle miles traveled and reduction of traffic congestion. A number of transportation-based tactics

are involved such as more inner-city HOV lanes, greater roadway maintenance, pursuit of state/federal regulatory reform for better support of Smart Growth, and non-auto infrastructure investments.

The plan predicted that by following the preferred Smart Growth-based blueprint, carbon emissions per capita would be reduced 14% by 2050 from the base case (continuation of the existing land-intensive suburban growth development pattern).

This result is partly from reducing the number of trips taken by car about 10% and tripling the number of trips using transit from one to three percent. Total transit and walk/bike trips using Smart Growth were projected to be 16% instead of the existing 8% rate and 6% in the base planning case. Daily vehicle minutes of travel per household is projected to be reduced nearly 20% from the base case of 81 minutes.

Most dramatically, the preferred blueprint would bring 41% of jobs and 38% of housing within walking distance of 15-minute or better transit service, compared to only 5% of jobs and 2% of housing in the base case scenario. This reflects a key blueprint component: The addition of housing near the region's three primary employment centers. Such housing proximities reduce vehicle miles travelled ~30%; the plan is expected to reduce vehicle miles traveled per household per day from 42 to 35, which is over 25% below the base case scenario.

The plan aimed to change the dominant housing pattern from 80% large lot single-family homes to 70% small single-family detached or multi-family development typically fours stories high. This process was described as well under way at a conference reviewing the plan's first five years in early 2010. Transit priority areas were established for 15-minute transit service by 2035, which determined the preferred housing development (including mixed-used development) areas for 175,000 new housing units.

Implementation is primarily by regional county and local governments, largely through Smart Growth policies such as form-based codes and incentives for infill and transit-oriented developments. The City of Lincoln's implementation includes a neighborhood electric vehicle transportation plan. The City of Sacramento adopting a community Climate Action Plan by July, 2011. Regional cities that are signatories to the US Mayors Conference Climate Agreement include Citrus Heights, Elk Grove, Galt, Sacramento, West Sacramento and Winters.

Stakeholders at a five-year review of the blueprint in April 2010 strongly supported the plan's objectives, and identified raising the funds for the required improvement of transit systems followed by developers finding a profitable balance between new housing costs and affordability as the top two implementation challenges. Revitalization of downtowns and neighborhoods in transit corridors was strongly chosen (4.7 of a possible 7 points) as the main benefit of the new housing location and design policies, followed by reduced traffic congestion through increased transit usage (2.7), and reduced conversion of agricultural land (2.3). Over two-thirds of stakeholders responded that

implementation of the blueprint was "very important" to the future quality of life in the region.[15]

Portland, OR

The City of Portland was an early adopter of Smart Growth policies. A climate plan was adopted in 1993 and has been continually updated; a three-year plan was adopted in 2009 comprising 100+ actions to achieve the goals of a 40% reduction by 2030 and an 80% reduction by 2050 from 2008 GHG emissions levels.[16] The City's planning department has been merged with sustainability promotion as the Bureau of Planning and Sustainability under a unified citizen's commission.

Partly due to Smart Growth-based planning, community-wide (county) GHGs have decreased 15% since 2000 and 2% below 1990; per capita emissions have decreased 20% since 1990.[17] Smart Growth efforts to date resulted in 44% of new dwellings designed into mixed-use developments by 2009. The City's Smart Growth efforts are partly a result of the regional urban growth boundary that encourages dense rather than sprawled development, as well as the City's landlocked boundaries and desire for continual economic development.

The City is in the process of adopting its 25-year (to 2035) strategic Portland Plan. Smart Growth related objectives include:

- Creating "complete twenty-minute neighborhoods" that facilitate 90% of citizens to "easily walk or bike to meet all basic, daily non-work needs."
- Increase the numbers of commuters who walk, bike, take transit or telecommute from 28% to 70%.
- Increase new dwellings built in mixed-use areas to 75%.
- Design and manage streets to accommodate non-auto modes of travel giving first priority to investments that support walking, biking and universal accessibility.
- Reducing household energy use 20%.
- Reducing impervious areas 15%.
- Creating "green corridors" along major streets.
- Increasing "access to nature" such that all citizens are within one-half mile of nature.

Stamford, CT

Stamford adopted a Sustainability Amendment[18] to its existing master plan in December, 2010 partially to address greenhouse gas emission reductions. The City had joined ICLEI's "Cities for Climate Protection Program" in 2003, and developed its "Local Action Plan: Greenhouse Gas Emission Reductions" in 2005 that provided a strategy for the City to reduce GHG emissions 20% by 2018 from a 1998 baseline. The Sustainability Amendment suggests sustainability metrics such as solid waste recycling rates.

The Sustainability Amendment addresses Land Use and Transportation, Energy and Climate, Open Space and Natural Resource Management, Infrastructure and City Services, New Construction and Existing Buildings, Adaptation and Mitigation, and Community Involvement and Education. Relevant strategies and objectives to Smart Growth include the following:

- Direct growth toward areas with strong transit access through nine strategies including:
  - Master plan and zoning regulations that support transit oriented developments;
  - Requirements that developers use (1) the LEED Neighborhood Development Project Scorecard for site plan review and (2) submit Parking and Transportation Demand Management plans;
  - City design of streets to support/enhance access between neighborhoods and neighborhood-level commercial developments and adopt "Complete Streets" design standards.

- Transportation plans will promote reductions in vehicle trips and encourage alternative modes through twelve strategies including:
  - Promoting remote working options;
  - Master planning expansion of the existing Transportation Center;
  - Enhancing and promoting transportation alternatives;
  - Reducing required parking; and
  - Promoting car sharing.

- Reduce the City's carbon footprint by:
  - Requiring all new developments to meet minimum green performance levels and report projected GHG emissions;
  - Encourage retro-commissioning of all major facilities;
  - Require sub-metering of multi-tenant buildings;
  - Provide incentives for use of green / "Cool" roofs
  - Create incentives for sustainable development such as excluding from property taxes incremental value resulting from adopting sustainable practices and expediting permitting processes for sustainable projects.

Other Estimates of the Compact Development / Carbon Emissions Relationship

Below are the relationships found by Monterey Bay CA and new RapidFire Modeling Tool developed by Calthorpe Associates regarding the effects of compact and transit-oriented development plans on carbon emissions:

- Monterey Bay CA: The Association of Monterey Bay Governments issued in November 2010 a "Blueprint for Sustainable Growth and Smart Infrastructure." If the "sustainable growth patterns" are followed, per capita greenhouse gas emissions are projected to be only 1.1% more than 2005 levels in 2035 instead of 13.7% via "current growth patterns."

The region's target for annual per capita carbon emissions in 2020 is 14.1 pounds, decreasing to 13.4 by 2035. The sustainable growth pattern estimate used the EMFAC 2007 model, but the Association notes that it, along with many other California planning agencies, are "continually updating modeling capacities in order to better estimate how Smart Growth policies can reduce GHGs."[19]

- The Rapid Fire Modeling Framework uses the following assumptions leading to an estimated reduction of 17% of GHG emissions from transportation and buildings in its Growing Smart scenario and 48% from its Green Future scenario compared to its Business As Usual scenario:[20]

    - Gasoline prices will increase 2.4% per year to 2020 in real dollars, reaching $4 per gallon in 2008 dollars.

    - Urban development characterized by high levels of regional and local transit service will help people use only 1500-4000 VMTs per capita per year, whereas "Compact" development results in VMTs per capita of 4000-7500 per year, and "Business As Usual" development results in 9500-18,000 VMTs per capita annually. The "Growing Smart" or "Green Future" development scenarios can be expected to reduce 2005 VMTs by 18% by 2035 whereas Business As Usual would increase 2005 levels (8100 miles per capita) by 8%.
        - Reduced VMTs are projected to lead to a reduction in driving costs per household from $14,600/yr in Business As Usual to $11,100 in Growing Smart and $9,900 in the Green Future scenario.

        - Annual GHGs per capita by 2035 are projected to decline 35% from 2005 levels in Business As Usual, 49% in the Growing Smart scenario and 72% (from 8500 to 2390) in the Green Future scenario.

    - Residential building GHG emissions are projected to be about 10% less via Growing Smart and 30% less via Green Future scenarios than Business As Usual.

    - Green development policies can be expected to reduce energy use of new buildings to 55% below 2005 levels by 2035, whereas "Trend" development policies will only reduce energy use 20%.

Energy/Emission analysis:

This analysis assumes the following:

- Infill: 100 acres of City infill developments outside HCT planning areas are done as "compact developments" (20 residential units per acre) *that would otherwise have been* "business as usual"[21] developments by 2020 (refinement of this rough estimate is recommended if this Initiative is developed.)

- HCT Corridors:
    - 50% of the 78 identified or estimated stations are redeveloped by 2020 at the average size of 3 acres at 20 dwelling units per acre.

The total acreage that becomes compact development by 2020 due to the Initiative is the following:

Infill: 100 acres
HCT areas: 117 acres
Total: 217 acres

Analyst Reid Ewing estimates the VMT-related carbon emissions reductions from compact development using the following ratios:[22]

- % VMT reduction from regular development patterns: 30%
- Ratio of carbon emissions reduction to VMT reduction: 90%

Using these carbon reduction ratios and the acreage figures above, this report estimates that this Initiative has the potential to reduce Tucson CO2 emissions in 2020 (counting projects under way but not yet completed by 2020) by the following amounts:

- Transportation
  - 217 acres at 20 units per acre = 4340 units
  - Baseline is 2005 annual transportation-related pounds of CO2e per capita of 8,500 lbs., and two people per 4340 units = 73.8 million lbs.
  - Compact development reduces emissions by 27% (90% of 30% VMT reduction) = 19,920,600 lbs = 9,034.
- Buildings
  - Annual Residential Emissions per Household: 3.36 tCO2e
  - 30% reduction from compact development's multi-unit buildings: 0.67 tCO2e per unit.
  - Total emissions reduction from the Initiative: 4,340 tCO2e

The estimated total reduction from Business As Usual development patterns of 4,340 units to compact development units because of the Initiative is: 13,374 tCO2e per year.

COT 1990 Citywide GHG emissions (baseline):	5,461,020 tCO_2e
MCPA 7% reduction target for COT:	5,078,749
2012 BAU GHG emissions projection:	7,000,000
2020 BAU GHG emissions projection:	7,343,141
GHG emissions reduction to meet 7% goal (2012):	1,921,251
GHG emissions reduction to meet 7% goal (2020):	2,264,392
Contribution of this Measure:	11,947 tCO_2e

Economic analysis:

The HCT Plan estimated the capital costs as follows (including park and ride lots):[23]

Broadway Bl. BRT: $29 million
6th Ave. / Nogales Hwy BRT: $17.5 million
Campbell Ave. North Streetcar: $198.5 million

Based on the average per mile BRT capital costs for Broadway and 6th Ave. / Nogales of $1.2 million, the following estimates have been made regarding development of the Speedway, Oracle, Grant and Campbell S/Kino corridors:

Speedway: $12 million
Oracle: $19.2 million
Grant: $9 million
Campbell S/Kino Parkway: $10.2 million

The total estimated capital costs for the HCT Plan are:

$96.9 million for the 62.3 miles of BRT exclusive lane routes
$198.5 million for the 5.3 miles of streetcar
$295.4 million combined

The net costs of these investments to the citizens of Tucson have not been estimated. Net cost calculations would require meaningful estimates of:

- The costs of maintenance of the roadways that would be replaced by the BRT lanes and maintenance savings throughout the City from the reduction of vehicle miles traveled by transit-oriented development residents;

- The capital costs covered by non-City sources, such as Federal transit development grants;

- The annual subsidies required by the transit routes, if any; and

- The increased City tax revenues from the compact redevelopments.

This analysis uses an estimate that 50% of the HCT transit capital costs (estimated at $295.4 million) are provided by non-Tucson sources (most likely Federal grants), and that transit system operating subsidies required are balanced by reduced roadway maintenance costs and increased property taxes from redevelopments such that transit operating costs are not a net cost to Tucson citizens.

Initial estimated Tucson Costs – HCT Transit component of Initiative: ~$147.7 million.

The HCT study lists eight feasible sources for the City's funding requirements for capital and operating costs. The equitability of this Initiative would depend on the choice of funding sources.[24]

These investment costs will be offset by savings accruing to the City and citizens from HCT development. It is too preliminary to estimate the savings, but sources of savings would be the following:

- Vehicle operation savings (a citizen who was able to meet mobility needs without a private vehicle could save $400+ per month).

- City infrastructure development and maintenance savings: It is estimated that compact or transit-oriented developments are 48.6% less costly to a citizenry because of reduced infrastructure requirements per square foot of residential or commercial development.[25]

Experience in other transit corridor developments has shown that completing transit investments earlier rather than later can reduce development costs. As the Pima Association of Governments has included the HCT corridors in its transportation plan, it is reasonable to assume that the investments will be made regardless of this Smart Growth Initiative, and that advancing the construction dates of the systems would result in cost savings to Tucson residents. However, the savings are impossible to predict.

Therefore, this analysis assumes no special costs regarding transit corridor development are generated by the Initiative, and the only economic impact are the projected savings on building energy and transportation costs accruing to the ~8,700 residents of the 4,340 units built to compact standards because of the Initiative.

The annual savings that residents of the units would begin to enjoy are calculated as follows:

- Transportation:
    - VMTs per capita are expected to be reduced 30% from 8500/yr. baseline of 2005.
    - Costs of each VMT that costs $.50 today projected to rise 60% by 2020 based on projected 60% fuel increase (Westmoreland Associates Tucson projection) = $.80/VMT.
    - Vehicle savings per person in compact development = $2,040
    - Two people in each of 4340 units = 8680 people X $2,040 savings = $17.7 million.

- Buildings:
    - Multi-tenant buildings typically reduce energy costs 20%.
    - Average single-family home energy costs in Tucson in 2010: $100/month
    - Expected utility cost increases to 2020 of 7%: $107/month
    - 4340 units expected to save 20%: $1.1 million

Total annual savings projected for 8680 residents of 4340 compact development units starting in 2020: $17.7 million + $1.1 million = $18.8 million savings accruing to the people living in the compact developments.

At the savings multiplier used in this analysis, the annual positive economic impact is projected at $28.2 million.

Co-benefits:

The Initiative's co-benefits include the following:

- Reduced health care costs, particularly for obesity and its related maladies. For example, if compact development land use policies were to eliminate the six extra pounds per person estimated to result from sprawled development patterns, the citizens of Oregon might annually save $206,000,000 in health costs. The following estimates of maximum annual health savings from greater walking due to compact development policies were made for the Portland OR region:[26]
    - Street connectivity: $23.2 million
    - Population density: $8.4 million
    - Retail employment density: $0.5 million
    - Employment density: $0.2 million

- Other environmental benefits
    - Reduction of outdoor water use. For example, higher residential density in Salt Lake City UT reduced residential water use 50%.[27]

Additional co-benefits of the proposed Initiative are likely to include:

- Reduced traffic congestion and related health impacts.

- Increased property taxes per developed acre, and a more positive ratio of City infrastructure revenues to costs.

Equitability:

The compact or transit-oriented development concept is often used to ensure adequate development of affordable housing, though this strategy is not required. For example, the new Yale Station transit-oriented development project in Denver adjacent to a light-rail station combines retail and covered parking with 50 affordable senior housing units.[28]

Equitability will largely depend on the sources of funds used to pay for the City of Tucson and other government's investment in this Initiative. The Initiative has potential to be very positive from an equitability perspective if the transit systems allow lower income people to avoid the costs of private vehicle ownership, presently $500+ per month.

Potential unintended consequences:

Compact developments or exclusive-lane transit aren't everyone's preference. By adopting this measure to promote 50% of new City of Tucson infill development to fit Compact or transit-oriented development patterns, it is possible the City would reduce its overall redevelopment potential if developers perceive that far less than 50% of development customers (residential and commercial) wish to participate in compact developments.

In addition, the use of exclusive lanes for transit on existing roadways that cannot be widened have the potential to increase traffic congestion.

Attachment A: HCT Station Sites

This analysis assumes that 75% of the stations listed below in the PAG's HCT plan are redeveloped as compact developments. Where the PAG plan did not list likely stations, the analysis assumes one potential station every 0.5 miles, of which 75% are redeveloped.

Broadway Boulevard corridor, System Alternative A
- Ronstadt Transit Center
- Broadway Bl. and Euclid Ave.
- 6th St. and Park Ave.
- 6th St. and Cherry Ave.
- Broadway Bl. and Campbell Ave.
- Broadway Bl. and Tucson Bl.
- Broadway Bl. and Country Club Rd.
- Broadway Bl. and El Con Mall
- Broadway Bl. and Swan Rd.
- Broadway Bl. and Craycroft Rd.
- Broadway Bl. and Wilmot Rd.
- Broadway Bl. and Kolb Rd.
- Broadway Bl. and Pantano Rd.
- Broadway Bl. and Camino Seco
- Broadway Bl. and Harrison Rd.
- Broadway Bl. and Houghton Rd.

6th Ave. / Nogales Hwy corridor, System Alternative A
- Ronstadt Transit Center (counted as Broadway corridor)
- Stone Ave. and 14th St.
- 6th Ave. and 14th St.
- 6th Ave. and 18th St.
- 6th Ave. and 22nd St.
- 6th Ave. and 26th St.
- 6th Ave. and 29th St.
- 6th Ave. and 34th St.
- 6th Ave. and I-10
- 6th Ave. and Veterans Bl.
- 6th Ave. and Ajo Way
- 6th Ave. and Illinois St.
- Laos Transit Center
- Nogales Hwy and Valencia Rd.
- Valencia Rd. and Campbell Ave.
- TIA

Campbell Avenue North (streetcar line)
- Campbell Ave. and Helen St.
- Campbell Ave. and Elm St.
- Campbell Ave. and Grant Rd.
- Campbell Ave. and Copper St.
- Campbell Ave. and Glenn St.
- Campbell Ave. and Blacklidge Dr.
- Campbell Ave. and Ft. Lowell Rd.

Campbell Ave. and Kleindale Rd.
Campbell Ave. and Prince Rd.
Campbell Ave. and Allen Rd.
Campbell Ave. and Limberlost Dr.
Limberlost Dr. and Mountain Ave.
Limberlost Dr. west of Fremont Ave.
Limberlost Dr. and 1st Ave.
Limberlost Dr. and west of 4th Ave.
Stone Ave. and south of Mills Dr.
West of Tohono Transit Center

Endnotes

[1] Smart Growth Network, www.smartgrowth.org/about/default.asp. See also Anna Read and Christine Shenot of the International City/County Management Association, "Getting Smart About Climate Change," 2010, at: http://icma.org/en/icma/knowledge_network/documents/kn/Document/105215/Getting_Smart_About_Climate_Change.

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