

# HOW GREEN ARE WE?

## A QUICK LOOK AT MEASURING GREEN DEVELOPMENT OUTCOMES

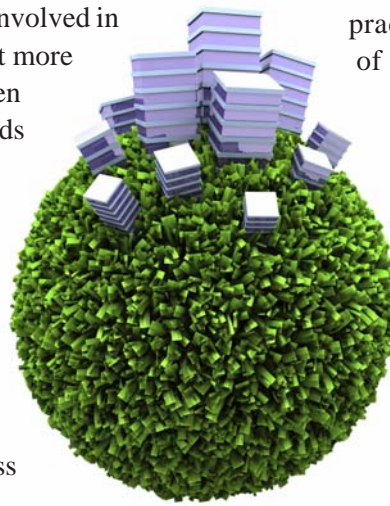
The latter part of this decade has been characterized by a renewed focus on the environment and sustainability. That last word – sustainability – is the “plastics” of the current time, falling off the lips of nearly everyone even remotely involved in public policy. As a society we want more green buildings, green jobs, and even green food. Unfortunately, the words “sustainability” and “green” seem to have as many definitions as there are proponents.

Many cities and regions now claim to be the greenest or most sustainable. There are indexes, ratings and rankings that consider a wide range of variables to express some aspect of sustainability. For example, even places that have an inordinate risk of natural disaster; poor water supply and quality; high levels of traffic congestion; few green buildings and little access to local food systems have been rated highly sustainable by some measurement systems. Differing measurement approaches yield differing results from the same sample communities.

Some measurement systems are complex, taking into consideration a very wide range of concepts, including environmental, economic, and policy variables. Some mix policy and performance indicators. Some consider cause and effect, while others aim to measure outcomes alone.

The goal of this analysis is to create an index of green development outcomes for localities in the Washington, D.C. region. Prior to determining the components for the Green Development

Index for Washington, D.C., a review of city sustainability ranking systems and city and state sustainability benchmarks was conducted. The section below on current measurement practices provides a review of the state of the art as it exists today.



### *Sustainability Measurement*

Later in this study, we construct an index using a set of variables indicating the level of green development of Washington D.C. metropolitan area cities and counties based on existing measurable and comparable output data. To inform our research, we reviewed the

methodology and data collection process of existing studies with similar goals.

The *SustainLane US Cities Sustainability Ranking* is a well-known system that has annually ranked U.S. city sustainability since 2005. This study ranks the 50 most-populous cities, as defined by the U.S. Census. Its stated goal is to explain “How people’s quality of life and city economic and management preparedness are likely to fare in the face of an uncertain future.” Categories for data included in the *SustainLane’s US City Rankings* were first developed through consultation with a number of urban sustainability experts prior to the launch of the first rankings in 2005. SustainLane annually engages sustainability practitioners in the review of its ranking categories and metrics. For the *2008 SustainLane US Cities*

*Sustainability Rankings*, data were collected in 16 categories: air quality; city commuting; city innovation; energy and climate change; green building; green economy; housing affordability; knowledge and communications; local food and agriculture; metro street congestion; metro transit ridership; natural disaster risk; planning and land use; tap water quality; waste management; and water supply. A city's overall sustainability ranking was then calculated by averaging and weighting the 16 categories of data (multiplied by a weighting of 0.5, 1, or 1.5, depending on the category). The data used was collected from standardized data sets from reliable sources, such as the U.S. Census, U.S. EPA and respected NGO or academic institutions, as well as primary data collected by SustainLane via e-mail and phone surveys and other primary research. While the measures purport to measure "city" performance, the data is actually a mix of city, county, and metro regional data that makes it difficult to determine precisely the geography being measured.<sup>1</sup>

The *ICLEI STAR Community Index* is currently under development; it will be released in its pilot phase in 2010. The *STAR Community Index* is a "national, consensus-based framework for gauging the sustainability and livability of U.S. communities." It is currently being developed through a partnership between ICLEI-Local Governments for Sustainability (ICLEI), the U.S. Green Building Council (USGBC), and the Center for American Progress (CAP). The *STAR Community Index*



*With 86 miles of interconnected jogging and bicycle trails and nearly 200 public parks and playgrounds, Arlington is one of the greenest urban areas in the region.*

is a rating, not a ranking system. Modeled after the USGBC's Leadership in Energy Efficient Design (LEED) rating system, the *STAR Community Index* will provide local governments with a framework of indicators to systematically evaluate their progress towards sustainability. While rating indicators are currently under development, several categories of indicators have been identified, including: environment (natural systems, planning and design), economy (economic development, employment and workforce training), and society (education, arts and community, children, health and safety, affordability and social equity). Jurisdictions will have the opportunity to submit their rating indicators to pursue a STAR designation, similar to the LEED designations. The *STAR Community Index* will provide for the standardization of local government sustainability indicators. With so many communities working on sustainability issues, it may be difficult to obtain a single consensus measure as evidenced by the problems associated with LEED ND. It is likely that sustainability ratings and rankings will evolve over time.

Many state and local green economic development and community sustainability plans for states and local governments were reviewed, but only a few offered tangible benchmarks for measuring progress towards achieving a sustainable society. The *2009 California Green Innovation Index* published by the independent, non-partisan public policy organization, NEXT 10, isn't an actual index

<sup>1</sup> Also, eastern cities are often relatively small, representing a relatively small part of their region, e.g. Washington, DC comprises about 10 percent of its metro area; while western cities are often very large and comprise the majority of their regions.

but rather a set of indicators that is intended to track the state's progress towards a greener economy and society. Due to the presence of Silicon Valley in California, green technology development, venture capital investment and patents are the primary green economic indicators used. The *2009 California Green Innovation Index* took a focused approach in creating a set of "dashboard indicators" which will be used to statistically track the state's progress toward a green innovation economy and society over time. These indicators were grouped into three broad categories: the carbon economy, energy efficiency and green technology innovation.

The state of **Oregon benchmarks** an extensive set of economic, social and environmental indicators. Most relevant to issues of sustainability are those relating to the built environment (growth management, infrastructure, housing) and the natural environment (air, water, land, plants and wildlife, outdoor recreation). In addition, the state tracks indicators in the areas of economy, education, civic engagement, social support and public safety.

Besides comprehensive indexes, we also looked into relevant research relating to particular variables in the index. For instance, Washington State's recent study of green jobs, the *Washington State Green Economy Jobs Report*, provides important insights into the definition of green jobs. The Washington State report provided a breakdown of the NAICS sectors used to the six-digit level, and was based on a "rigorous survey design and sampling methodology." (For details, please refer to the methodology section)

The projects described above are broadly focused on sustainability and measure a wide array of variables that can affect environmental

performance. This study by Arlington Economic Development (AED) looks more closely at those variables that reflect the "green-ness" of the built environment based on planning and development outcomes. Green should be reflected in great planning. Great planning results in great communities and is reflected in the development performance of those communities. For our purposes, it is the outcomes that are important; an investigation of the policies that create those outcomes is the topic of another study.

AED has collected data on eight (8) variables that reflect development outcomes. Each of these variables is measured at the city or county level, using readily available and replicable secondary data sources, creating a simple and handy way to compare communities. Although we have collected data only for the larger Washington, D.C. metropolitan area jurisdictions, the same methodology and data sources should allow comparable measurements anywhere in the U.S.<sup>2</sup> The variables, the rationale for their selection, and their use in an index, are described below.



*Vehicles which are rented on an hourly basis have significantly reduced the need to own a car in many cities.*

<sup>2</sup> While much of the transportation data is derived from a regional survey, identical or similar surveys are undertaken by many regional planning agencies. If we had been able to use a much larger set of area data, our location quotient base would of course be based on the broader pool, whereas ours is based on regional averages for each variable.

## Green Development Variables

From our review of sustainability measurement systems we selected a set of common categories for measuring sustainability for which reliable jurisdiction-level data is available:

- Transportation
- Green Buildings
- Green Economy
- Environmental Quality<sup>3</sup>

In these categories we were able to locate data to construct the following components for the Green Development Index:

1. Vehicle Miles Traveled per Capita
2. Alternative Mode of Transportation Use
3. Households with Zero Vehicles
4. Average Travel Time to Work
5. Average Commute Time
6. Development Intensity
7. Green Buildings
8. Green Jobs

With the exception of the rating system the *ICLEI-Local Governments for Sustainability (ICLEI) STAR Community Index*, which will be launched in 2010, all of the sustainability ranking and rating systems reviewed used data at the state or Metropolitan Statistical Area (MSA) level. A challenge for this project was to identify readily available, reliable data for measuring green development at the local government (city and county) level. Where possible this project used data from Federal sources (Census, Bureau of Labor Statistics), but data was also collected from state agencies and the Metropolitan Washington Council of Governments, the region's Metropolitan Planning Organization. Unless otherwise noted, all data used for the index components is 2007 annual data.



*Metro is an essential alternative to driving for many commuters.*

### Vehicle Miles Traveled per Capita (VMT)

Vehicle Miles Traveled per Capita was selected because it reflects traveler behavior within an urban environment. The smart growth paradigm suggests that intensively developed mixed use communities are efficient and reduce the number and length of trips. This measure was obtained by dividing VMT by population for 2007. It should be noted that this measures VMT within a community; not travel generated by that community and includes trips that neither originate nor terminate within the jurisdiction.

#### *Population data source:*

- U.S. Department of Commerce, U.S. Census Bureau, Census Population Estimates, July 1, 2007. Available online at <http://www.census.gov/poest/counties/CO-EST2008-01.html> as of June 2009.

#### *VMT data was obtained from the following sources:*

- District of Columbia: U.S. Department of Transportation, Federal Highway Administration, Highway Statistics 2008, Table VM-2. Available online at <http://www.fhwa.dot.gov/ohim/ohimstat.htm>, as of June 2009.

<sup>3</sup> Unfortunately, we have not found consistent localized measures of environmental quality and these are yet to be developed.

- Maryland: Maryland Department of Transportation, State Highway Administration, Highway Use and Characteristics, Annual Vehicle Miles Traveled. Available online at <http://www.sha.state.md.us/SHAServices/SHAServices.asp?id=WO63> as of June 2009.
- Virginia: Virginia Department of Transportation, 2007 Traffic Data Daily Vehicle Miles Traveled, Table 1200 - DVMT by Physical Jurisdiction. Available online at <http://www.virginiadot.org/info/ct-TrafficCounts-VMT2007.asp> as of June 2009.

**Alternative Mode of Transportation Use (AMT), Households with Zero Vehicles (HH0V), Average Commute Length (ACL), Average Travel Time to Work (ATT)**

These four transportation variables measure transportation behavior. Again, the smart growth paradigm suggests that the use of alternative transportation modes such as public transit, walking or biking are key elements of sustainability resulting in a reduction in carbon emissions. Households without vehicles reflect a necessary reliance on alternative transportation modes. Intensively developed mixed use communities are hypothesized to be efficient and therefore encourage the reduction of commute length. Average travel time to work is slightly confounding in that the use of alternative travel modes could increase commute time.

Data was obtained by a special tabulation of the 2007 Metropolitan Washington Council of Governments (MWCOG) State of the Commute Survey provided by MWCOG. This periodic survey samples only Washington, D.C. area commuters. The data does not reflect the transportation use of resident's non-commute travel.

**Development Intensity (DI)**

Development intensity reflects the composite use of land for both residential and commercial use that



*Urban districts such as Ballston have a Development Intensity of 100 employees and residents per acre.*

density measures alone cannot account for.<sup>4</sup> It considers not only land use, but the land used for urban purposes, by excluding land used for parks, agriculture, forests and public conservation uses. Development intensity was calculated by adding jobs and population, and dividing that figure by the urbanized area in square miles. Data was obtained from the following sources:

- County Total Land Area Square Miles, 2000: Census 2000. Available online at <http://www.census.gov/> as of June 2009.
- County Total Rural Land Area Square Miles, 2000: Computed from Census 2000 data through the Missouri Census Data Center. Available online at <http://mcdc2.missouri.edu/websas/geocorr2k.html> as of June 2009.
- County Population, 2007: Census Statistical Abstract, July 1, 2007. Available online at <http://www.census.gov/> as of June 2007.
- County Jobs, 2007: Bureau of Labor Statistics, Quarterly Census of Employment and Wages, available online at <http://www.bls.gov/> as of June 2009.

<sup>4</sup> For a more detailed discussion of development intensity, see *Urban Development Intensities in the Washington, D.C. Metropolitan Area, A Comparative Analysis*. <http://www.arlingtonvirginiausa.com/docs/UrbanDevelopmentIntensities.pdf>

### Green Office Buildings (GO)

Commercially developed properties have been under pressure to be more environmentally responsible and to reduce carbon emissions and other environmental externalities. Two programs have come into general acceptance as measures of the “green-ness” of commercial buildings: Leadership in Energy & Environmental Design (LEED) and Energy Star. LEED is a product of the U.S. Green Building Council (USGBC), which is a nonprofit membership organization. LEED was created as a way to define high performance green buildings in the following aspects: sustainable sites; water



*This LEED Gold building is leased to the U.S. Environmental Protection Agency*

efficiency; energy and atmosphere; materials and resources; indoor environmental quality; innovation and design process; and the use of a LEED-accredited designer. The four levels of LEED certified buildings: certified, silver, gold and platinum, are all included in our calculation as green buildings. Energy Star is a government program administered by the U.S. EPA and the U.S. Department of Energy (DOE). The main focus of

Energy Star rating is energy conservation and operating efficiency.

Our measure for green buildings is the percentage of office space, of the total in a community, which is either LEED certified or Energy Star rated. Office building data was obtained from CoStar, which identifies LEED certified or Energy Star rated buildings.

The Green Office Buildings data were extracted in June 2009.

### Green Jobs (GJ)

With multiple definitions of green jobs and no single accepted data source or methodology for calculating green jobs currently available, multiple approaches for establishing employment figures for green occupations and industries have resulted.

For the purpose of this study, a methodology was needed that could easily count green jobs at the county level using reliable, readily available data. To do this, the 2008 Green Economy Jobs in Washington State report was chosen as a model green jobs measurement methodology. This report aimed to establish a reliable baseline of green jobs in Washington State that could be used to track the job growth in the state’s green economy. The report defined the green economy as “rooted in the development and use of products and services that promote environmental protection and energy security.” It defined the “core” green economy as industries and businesses engaged in energy efficiency, preventing and reducing pollution, renewable energy and mitigating or cleaning up pollution.<sup>5</sup>

<sup>5</sup> The Washington State report used a “rigorous survey design and sampling methodology” to produce a reliable number for the state’s green economy employment. A survey was mailed to 17,000 randomly selected businesses in sectors where green jobs were thought to be present; over 9,500 businesses (60 percent) participated in the survey. The surveyed sectors were selected based on their three-digit 2007 North American Industrial Classification System (NAICS) industry classification. NAICS industry codes were first selected in those sectors which were thought to contain green jobs based on the operational definition. A random sample of 7,500 firms not included in the initial selected NAICS classifications were surveyed to determine if they had any green products or services, and if they did then their NAICS was added to the original list.



*Groups like the Nature Conservancy represent green jobs*

The Washington State report provided a breakdown of the NAICS sectors used to the six-digit level. The six-digit level NAICS sectors used by Washington State were initially examined for their fit with the Washington, D.C. regional economy. Agricultural and natural resource based sectors were excluded given the scarcity of these sectors in the region's urban economy. Several sectors were also excluded due to our inability to discern green from non-green jobs within the sector. For example, unlike the Washington State survey we were unable to include any data from the construction sector, because we were unable to determine the number of green construction jobs versus non-green ones. This was also true for many of the manufacturing and financial services sectors. This is unfortunate, as there are firms in this region in these sectors that provide a variety of green services. Therefore, the definition of green jobs in this study is narrow, and only includes the jobs with direct impact on environmental protection and energy conservation. The NAICS sectors that we've used fall into a five core green categories, including both private companies and public agencies:

- Alternative Energy
- Transit and Alternative Transportation
- Green Waste Management
- Environmental Consulting, Architecture and Landscape Architecture Services
- Environmental Quality Management and Advocacy

Given the important presence of the Federal government in the Washington, D.C. region, both private sector and government employment are included in our analysis. Based on these criteria a set of 26 six-digit level NAICS sectors were selected for inclusion in this analysis:

While this methodology to calculate green jobs is admittedly imperfect, given the resource constraints of this project and the data currently available, this is a solid attempt at beginning to

### Green Jobs NAICS

423860	Transportation Equipment and Supplies (except Motor Vehicle) Merchant Wholesalers
423930	Recyclable Material Merchant Wholesalers
485111	Mixed Mode Transit Systems US
485999	All Other Transit and Ground Passenger Transportation US
541310	Architectural Services
541320	Landscape Architectural Services
541620	Environmental Consulting Services
541711	Research and Development in Biotechnology
541712	Research and Development in the Physical, Engineering, and Life Sciences (except Biotechnology)
562211	Hazardous Waste Treatment and Disposal
562910	Remediation Services
712190	Nature Parks and Other Similar Institutions
813312	Environment, Conservation and Wildlife Organizations
924110	Administration of Air and Water Resource and Solid Waste Management Programs
924120	Administration of Conservation Programs US
925120	Administration of Urban Planning and Community and Rural Development US

quantify this region's green-collar employment. It likely undercounts green jobs in the region as a whole and in individual communities.<sup>6</sup>

## Green Development Index

AED created an index using the above green development variables to score localities on their relative "green-ness". Of course, any attempt to do scoring or ranking presents questions of bias in the

**Table 1**

Correlation of Green Development Variables  
Washington Metropolitan Area

Jurisdiction	VMT	AMT	HHØV	ATT	ACL	DI	GO	GJ
VMT	1.0000							
AMT	-0.7120	1.0000						
HHØV	-0.6286	0.8951	1.0000					
ATT	0.6668	-0.8093	-0.6887	1.0000				
ACL	0.7863	-0.9165	-0.7437	0.9156	1.0000			
DI	-0.8082	0.8741	0.8258	-0.8170	-0.8229	1.0000		
GO	0.3345	0.2611	0.1618	-0.1986	-0.0906	0.1686	1.0000	
GJ	-0.0500	0.6455	0.5512	-0.4724	-0.4661	0.3975	0.7963	1.0000

Source: see text for source details

selection and use of the variables. A correlation matrix of the variables is illustrated below.

Some of the variables do have an element of autocorrelation. For instance, use of alternative transportation is highly correlated with households without vehicles and development intensity as expected. It may be that the development intensity and the availability of transit allow households to live without owning a vehicle, but this analysis does not attempt to validate that hypothesis: we are not looking at causality. Because our indicators, while sometimes highly correlated, are sufficiently different in what they measure, we have not eliminated any variables due to autocorrelation. We have done some tests

on weighting and how different emphases on importance may affect index scoring; these are discussed below.

AED has used simple location quotients (LQ) in deriving a score for each jurisdiction on each variable. Thus, the score represents the variability above or below the regional average for each item. For instance, the District of Columbia's score of 1.63 on AMT Commute Use means that D.C. is 63 percent better than the regional average for this variable. Some relationships are reversed, where a low absolute number is better than a high one, VMT per capita for instance, the inverse is used to compute the LQ score.

The scores on each variable by community are illustrated in Table 2. It is readily apparent that these variables and the resulting index have an urban bias. The city center and innermost suburbs score the highest overall and on most variables. Their performance on these green building variables is

better than the suburbs. It also suggests that sprawl and exurban development is generally less green than more urban development.

Alexandria and the District have the fewest VMT per capita in the region. At first glance, this seems to make sense, but other Metro served communities such as Arlington and Montgomery Counties are clustered around the mean for the region. Some additional research is needed to determine more precisely why; other than the fact that many commuters travel through these jurisdictions to work in other communities.

The District, Arlington and Alexandria are the only communities that are above average in the

<sup>6</sup> Also see *Economic Development and the Green Economy*, AED's analysis of the subject. <http://www.arlingtonvirginiausa.com/docs/GreenEconomy033109.pdf>

**Table 2**  
Green Development Measures  
Transportation Variables

Jurisdiction	VMT		AMT		HHØV		ATT		ACL	
	Raw No.	LQ	Raw No.	LQ	Raw No.	LQ	Raw No.	LQ	Raw No.	LQ
District of Columbia	6,139	1.48	55.2	1.63	19.3	4.09	28.8	1.22	9.0	1.77
Arlington County, VA	8,445	1.08	48.0	1.42	7.2	1.53	30.6	1.14	9.5	1.67
City of Alexandria, VA	5,446	1.67	40.6	1.20	6.1	1.29	28.8	1.22	10.9	1.46
Fairfax County, VA	9,995	0.91	31.6	0.94	2.2	0.47	33.5	1.04	14.3	1.11
Frederick County, MD	14,144	0.64	21.2	0.63	0.4	0.08	38.8	0.90	24.4	0.65
Montgomery County, MD	8,148	1.12	32.3	0.96	2.2	0.47	34.6	1.01	15.6	1.02
Prince George's County, MD	10,563	0.86	30.1	0.89	3.6	0.76	36.6	0.96	16.4	0.97
Prince William County, VA	9,830	0.93	26.0	0.77	1.0	0.21	44.9	0.78	22.6	0.70
Loudoun County, VA	9,334	0.98	18.9	0.56	0.5	0.11	38.4	0.91	20.8	0.76
<b>Average</b>	<b>9,116</b>		<b>33.77</b>		<b>4.72</b>		<b>35.0</b>		<b>15.9</b>	

Source: see text for source details

percentage use of alternative transportation (AMT). The density of transportation options does seem to be related to actual modal choice. The more distant suburbs, with fewer transportation choices, consequently score lower.

Average travel time (ATT) to work is much more highly clustered in terms of actual trip times. There is an urban advantage that shows up in the data, however alternative transportation often adds to commute time but not to commute length. Metro does not necessarily save commuters a lot of time.

Average commute length is more variable, ranging from 9.0 miles in the District to 24.4 miles in Frederick County, Maryland. This of course also relates to the relationship between job and residential locations. Washington, D.C. has retained a larger job core in the central city than many American cities (23.1 percent), although not to the same extent as New York or Chicago.

The District scores well above all others on the measure of households without vehicles. At 19.3 percent overall and a score of 4.09; this represents the greatest disparity of any community on any variable. This is mostly reflective of the high levels of available public transit, reducing the need for a vehicle. It may, however, also be a function of income, with the very low incomes in the eastern portion of the District financially precluding auto ownership. Arlington and Alexandria also have a relatively high percentage of households without vehicles, although both jurisdictions have a median income higher than the regional median income.

**Table 3**  
Green Development Measures  
Economic Variables and Total Score

Jurisdiction	DI		GO		GJ		Total Average Score
	Raw No.	LQ	Raw No.	LQ	Raw No.	LQ	
District of Columbia	18,566	2.16	4.61	1.16	3.89	1.78	1.91
Arlington County, VA	13,821	1.61	10.92	2.76	4.38	2.00	1.65
City of Alexandria, VA	17,727	2.06	1.37	0.35	0.98	0.45	1.21
Fairfax County, VA	4,964	0.58	2.79	0.70	2.44	1.11	0.86
Frederick County, MD	3,374	0.39	9.52	2.41	2.91	1.33	0.88
Montgomery County, MD	5,278	0.61	2.05	0.52	2.42	1.11	0.85
Prince George's County, MD	4,117	0.48	1.19	0.30	0.88	0.40	0.70
Prince William County, VA	4,168	0.48	1.52	0.38	1.23	0.56	0.60
Loudoun County, VA	5,388	0.63	1.68	0.42	0.60	0.27	0.58
<b>Average</b>	<b>8,600</b>		<b>3.96</b>		<b>2.19</b>		

Source: see text for source details

The next variable, development intensity, derives directly from planning and growth management policy. Development intensities are clearly greater in the District, Arlington, and Alexandria. Future intensities are projected to continue to increase and not be approached by the outer suburbs in the next 20 years. Tysons Corner may finally eclipse Georgetown and Old Town Alexandria in development intensity, but will remain less than half of that of the other Metro-served major regional activity centers by 2030.<sup>7</sup>

Development intensity enables many other planning related positives. It is highly correlated, negatively, with travel time to work and commuting distance and highly positively correlated with reduced auto ownership. While this paper does not analyze this further, the precise relationship between development intensity and the transportation variables is a good subject for further detailed study.

Green office buildings and the programs that certify them as such are a more recent phenomenon. LEED certification and Energy Star ratings have now become common. Most new buildings are designed for some level of green-ness and older buildings can still achieve it through progressive renovations and tenant improvements. Arlington has the highest rating, with approximately 11 percent of the leasable floor area covered by one or the other certification. This variable does not have an urban bias – Frederick

County, Maryland scores nearly as high as Arlington on this measure. Further, a large older office base presents less opportunity for large changes in this measure since any new construction will represent a larger proportion of all development in growing areas. This variable has the potential to increase significantly over a relatively short time. Of course if all communities increase positive outcomes, any single jurisdiction's score may not necessarily change since the score is relative to the average.



*Cycling represents an alternative mode of transportation for commuters in the region.*

Green jobs are highly correlated with green buildings, although the nature of the relationship beyond the locations of architectural and engineering firms is not readily apparent. Arlington may score relatively high for that reason and for the research activities on energy and climate change that take place in that community. This

is another variable that may change significantly over a short period of time; both because the definitions of green jobs are in flux and because the economy is transitioning towards sustainability in all aspects of the production of goods and services.

Based on the transportation variables alone, the District scored the highest on every measure, followed closely by Arlington and Alexandria. The density of transportation options seems to truly matter. Arlington is the high scorer on the green buildings and green jobs variables. If all variables are weighted equally, the District, Arlington and

<sup>7</sup> Again, for a more detailed discussion of development intensity, see *Urban Development Intensities in the Washington, D.C. Metropolitan Area, A Comparative Analysis*. <http://www.arlingtonvirginiausa.com/docs/UrbanDevelopmentIntensities.pdf>

<sup>8</sup> The LQ scores are associated with the Washington, D.C. metropolitan region averages; it could be the case that many jurisdictions would score above 1.0 on a national scale.

Alexandria are the top three in scores and the only communities with an overall LQ above 1.0.<sup>8</sup>

A short test regarding the weights placed on the variables showed that double weighting the transportation related variables did not change the relative rankings but did increase the disparity between communities. Double weighting the development variables also had no significant change on either the rankings or scoring.

## *Conclusion*

There is a growing variety of sustainability measures competing for widespread acceptability. They measure different variables and they cover a variety of geographies. AED has undertaken this effort to create an index of green development in order to provide a model for measuring sustainable development outcomes at the local jurisdictional level. Most development policy is locally determined and nearly all development regulations are codified by local governing bodies. The measures themselves, however, are generally broadly accepted

as desirable outcomes of smart growth and sustainable development.

This study falls short of investigating the specific relations between variables and any causal relationships that may exist. For instance, AED suspects that there is a strong linkage between development intensity and the type and density of transportation options available and the transportation related outcomes, but have not fully quantified this.<sup>9</sup> More analysis is required and should be the subject of another study.

A simple index to describe the relative value of transportation and development variables on green outcomes associated with development appears to reflect what most planners implicitly believe – that planning associated with smart growth and intensively developed communities, with a balance of people and jobs that favors jobs, green jobs especially, coupled with the creation of environmentally responsible buildings, results in higher scores on green development measures. Ultimately this study will be input into a broader sustainability framework as was the recent AED study on the Green Economy.

*This study was prepared by Terry Holzheimer Ph.D. and Isabelle Xu of Arlington Economic Development and Shana Johnson, a planning consultant to AED.*

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<sup>9</sup> Arlington transportation planners have analyzed the transportation infrastructure needed to support planned development, given some of the factors reported here such as VMT, AMT and DI.