

## Workers per Job Equilibrium Index

This EnviroAtlas Smart Location map portrays an index that measures the balance of resident working population and jobs present within each U.S. Census block group. An index value near one indicates a balance between resident workers and jobs in a census block group.

### Why is worker to job balance important?

The workers per job equilibrium index is one of many measures or variables used by city planners to examine the proportions of residents, jobs, and services in urban areas and to guide development planning. These measures are used by local governments to promote compact, mixed-use development and to justify investment in transit networks.

From a city planning perspective, it is most efficient to have concentrations of jobs near a large working age population. In addition to reducing fuel consumption and congestion, the local economy and standard of living benefit by having a large working age population with easy access to available jobs.<sup>1</sup> A measure of worker to job balance in neighborhoods helps to support other community design strategies that make alternatives to driving more viable. Public transit becomes more efficient and cost-effective as population density levels in transit corridors rise. Research has shown that the proportion of people working within their home neighborhood is higher when jobs and housing are in balance.<sup>2</sup>

Compact neighborhoods, with a mix of residences, employment opportunities, and services, can offer a number of environmental benefits when compared to lower density neighborhoods. In more compact areas, people can travel shorter distances for everyday activities, and they may find it easier to walk or bike to those destinations. While multiple built-environment characteristics affect travel behavior, research studies indicate that people who live in compact neighborhoods walk more, use transit more, and drive less than people living in lower density neighborhoods.<sup>3,4</sup>

Many communities across the U.S. have experienced a decline in traditional downtown employment centers in favor of office parks and retail in outer suburbs. Such dispersion of employment to the suburbs can result in reduced accessibility by workers due to longer average trip distances, increased traffic, and lack of public transit. The movement of jobs to the suburbs has been most pronounced in industries that offer low- and middle-skill jobs. The National Research



Photo: Castro District, San Francisco, C. Beland

Council reported that while half of people on welfare live in the core city, 70% of jobs available to them are located in the suburbs.<sup>5</sup> Changing demographic patterns in suburbia suggest that creating more compact neighborhoods with available affordable housing would improve worker to job equilibrium within suburban communities.

A balance of jobs and housing in diverse neighborhoods can reduce vehicle miles traveled by making walking, biking, and transit more appealing. Planning strategies for compact neighborhoods promote housing in job-rich areas and new employment centers in dense residential zones.<sup>2</sup> A recent study found that doubling residential density in a metropolitan area with compact neighborhood design could lower vehicle miles traveled by 5 to 12%.<sup>5</sup> Other studies suggest that consistently reducing private auto usage through urban development design guidelines nationwide would help to improve air quality and public health through lower [greenhouse gas emissions](#).<sup>3</sup> A worker to job balance is just one attribute that is characteristic of compact, mixed-use neighborhoods. A good worker to job balance does not guarantee that people living in these neighborhoods will work close to home, but it does indicate the potential for residents with an occupational match to find local jobs.<sup>2</sup>

### How can I use this information?

Identifying neighborhoods with or without a worker to job balance can be useful in a number of different urban planning contexts. Planners can promote increased housing in neighborhoods with high employment density and a low working population. Transit planners may wish to identify

neighborhoods and corridors that can support new or enhanced transit service. Localities may also consider the worker to job balance when prioritizing neighborhood improvements such as sidewalks, street lighting, or bike lanes. Focusing improvements in compact neighborhoods can ensure that the greatest number of people benefit.

This data layer may be used with other EnviroAtlas demographic and Smart Location data layers to compare the proportions of residents, jobs, and services among community block groups. The aerial-image base map (seen by increasing the transparency of the map layers) can be used to show the spatial distribution of the built environment within the census block groups. For select communities, users can overlay EnviroAtlas community land cover maps that show impervious surfaces, street trees, and other common land cover at 1-meter resolution.

### How were the data for this map created?

The [2010 Census](#) provided a count of the number of workers per census block group. The 2010 [Census LEHD](#) (Longitudinal Employer-Household Dynamics) gave total employment at the census block group level for all states except Massachusetts. Total employment (TotEmp) was summarized for each block group from the LEHD WAC tables, using the C000 field (total number of jobs). Massachusetts employment data came from InfoUSA. The equation for EPA's diversity metric, Household Workers per Job Equilibrium Index (D2c\_WrEmIx) is:

$$D2c\_WrEmIx = \exp(-|(\text{Workers} / \text{TotEmp}) - 1|),$$

where  $\exp$  = the exponential function (e [approximately 2.718281828] raised to the power of the number in parenthesis). For more information on this metrics, please see page 20 in the [Smart Location Database User Guide](#).

### What are the limitations of these data?

Census block groups typically include a mixture of developed, undeveloped, residential, and business areas. A

### Selected Publications

1. Melo, P.C., D.J. Graham, D. Levinson, and S. Aarabi. 2012. [Agglomeration, accessibility, and productivity: Evidence for urbanized areas in the U.S.](#) Paper submitted to the Transportation Research Board 92<sup>nd</sup> Annual Meeting, January 13–17, 2013, Washington, D.C. 20 p.
2. Cervero, R., and M. Duncan. 2006. [Which reduces vehicle travel more: Jobs-housing balance or retail-housing mixing?](#) *Journal of the American Planning Association* 72(4):475-490.
3. Kramer, M. 2013. [Our built and natural environments: A technical review of the interactions among land use, transportation, and environmental quality, Second edition.](#) Environmental Protection Agency, Washington, D.C.
4. Ewing, R., M. Greenwald, M. Zhang, J. Walters, M. Feldman, R. Cervero, L. Frank, and J. Thomas. 2011. [Traffic generated by mixed-use developments: Six-region study using consistent built environmental measures.](#) *Journal of Urban Planning and Development* (September): 248–261.
5. National Research Council. 2009. [Driving and the built environment: The effects of compact development on motorized travel, energy use, and CO<sub>2</sub> emissions.](#) Special Report 298, The National Academies Press, Washington, D.C. 240 p.

balance of workers and jobs across block groups does not necessarily indicate that the majority of residents avoids commuting and works locally. The metric highlights regional patterns or specific neighborhoods with a lack of worker to job balance that would benefit from further study.

### How can I access these data?

EnviroAtlas data can be viewed in the interactive map, accessed through web services, or downloaded. This data layer is incorporated into a larger EPA data product called the [Smart Location Database](#). The Smart Location Database is a nationwide geographic data resource for measuring location efficiency. Most attributes are available for every census block group in the United States.

### Where can I get more information?

A selection of resources on the relationships among city planning, worker to job balance, and environmental quality is listed below. More details about this metric are available in the [Smart Location Database User Guide](#). In addition, EPA's [Smart Growth Program](#) provides tools, resources, and technical assistance to communities seeking to pursue vibrant compact, mixed-use, walkable, and transit-oriented development strategies to protect public health and the environment. For additional information on the data creation process, access the metadata for the data layer from the drop down menu on the interactive map table of contents and click again on metadata at the bottom of the metadata summary page for more details. To ask specific questions about this data layer, please contact the [EnviroAtlas Team](#).

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