

Appendix B

Density Definitions



Densification Definition and Concepts

Density, at its most basic, is a measure of the number of units in a given area (Forsyth 2003, 3). Typically, density measures take into account three things: what **unit** is to be measured (housing, jobs, population, built floor areas, etc.); over what **area** the units are measured (parcel, neighborhood, city, metropolitan area); and what land will be **included or excluded** in that area (residential uses, streets and public infrastructure, local neighborhood uses, all land). Gross measures put a simple boundary around an area and measure all the land inside it; **net** measures exclude certain kinds of land. These considerations create an almost endless variety in density measures.

Traditional Mexican towns and cities may have relatively high densities without tall buildings. Pictured here is downtown Guanajuato, Mexico.
Photo: Collection of Ann Forsyth

While it is perhaps one of the most widely used measures in the fields of urban planning and design, it does not do a very good job of measuring the physical or social quality and design of a building, neighborhood, or city (Boyko and Cooper 2011, 2). Furthermore, density can be measured in a variety of ways, meaning the same area can have a number of different densities (Forsyth 2003, 2). For example a parcel of 10 units per hectare may be adjacent to a park in the same block giving a block density of perhaps 5 units per hectare if the

park takes up half the block. Such variation means it is necessary for policy makers, planners and designers to be specific about what they mean when they discuss density. This is especially important when discussing densification and compact city policies. Since there are no exact definitions for what constitutes low, medium, and high densities, governments, again, need to be specific about the types and forms of density they are promoting.

To complicate matters, it might be desirable to use different measures of density for different purposes. For example, planners and designers might be interested in measuring the density of dwelling (or housing) units in a given neighborhood, as this measure gives some sense of the physical character of the area. On the other hand, an engineer or policy maker might be interested in measuring the density of population in that same area, as this number reflects the intensity of usage or demand for certain municipal infrastructure and services (Boyko and Cooper 2011, 5-8).

Types of Density Measures

The following are some of the most commonly used measures for residential density:

- **Site/parcel density:** A measure, usually of dwelling units or residential population per site/parcel area (Forsyth 2003, 5). Parcel density is commonly used in zoning and land use codes as a way to regulate the form and intensity of development that can occur on a lot. Measuring site density is relatively straightforward, as there is no need to distinguish between gross or net measures. However, it can be difficult to perceive from physical observations, as parcel boundaries are not always evident (Forsyth 2003, 5).
- **Block density:** Block density measures the dwelling units or residential population per area of a city or neighborhood block (Forsyth 2003, 5). This is also relatively easy to measure, as many national census agencies use a block as the minimum unit of measurement (such as *manzanas* in Mexico). However, the boundaries of a block are not always evident, and decisions about what land to include or exclude may still be necessary (Forsyth 2003, 5). For example a “block” may include the area within parcels, or may be measured out to the street centerline—the latter would include much more land for the same number of dwellings or people making the density lower.

- **Net neighborhood density:** Net neighborhood density measures the number of dwelling units or residents divided by the area of the neighborhood, excluding city-wide uses such as parks or large commercial areas (Forsyth 2003, 6). There is no standard way of measuring a neighborhood, but the area included should conform to larger census geography or to a city-identified area (Forsyth 2003, 5). Uses that do serve the neighborhood are included; however, land uses that serve the city or region are excluded. The line between neighborhood and other uses can be difficult to determine.
- **Net neighborhood residential density:** Net neighborhood residential density measures the number of people or residential dwelling units divided by the total residential land area (Forsyth 2003, 5). For this measure of density, it is necessary to calculate both the area of the neighborhood and the amount of residential land it contains (Forsyth 2003, 5). There are no standards for deciding what to include as residential land and what to exclude, although excluded land typically includes: “commercial and industrial areas, shops, commercial garages, public parks/playgrounds, undeveloped vacant land, vacant unsuitable land, schools, churches, public streets, public parking spaces” (Forsyth 2003, 5).
- **Net neighborhood residential building type density:** This measure is similar to the previous one, however it counts only residential buildings of a certain type and associated land area (such as single family home density or townhouse density) (Forsyth 2003, 5). This measure is useful to better understand the composition of neighborhoods, and the amount of space associated with each.
- **Gross neighborhood density:** This measures the number of dwelling units or residents divided by the total area of the neighborhood. No exclusions are made (Forsyth 2003, 6).
- **City or municipal density:** This measures the number of dwelling units or residents divided by the total area of the city or municipality (Forsyth 2003, 6). This can be a useful measure when the entire area of the city is built-out. However in cases where substantial portions of the land area is undeveloped, the results will be skewed. For this reason, it is common to include only developed land in the calculation (Forsyth 2003, 6).

- **Metropolitan density:** Similarly, metropolitan density measures the number of dwelling units or residents divided by the area of the metropolitan area (Forsyth 2003, 6). Unlike city density, it is not common to exclude undeveloped land in this measurement (Forsyth 2003, 6).

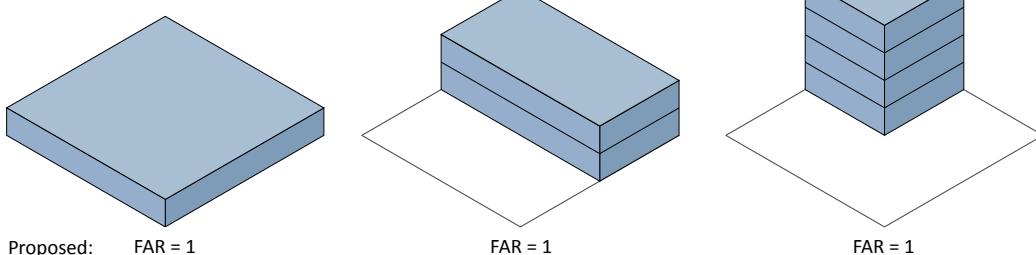
While these examples are all for residential density, it is possible to use these same methods to measure other types of density, such as employment density.

Additional Related Concepts and Metrics Related to Densities/Metrics

Other methods for measuring the built environment are also common in urban planning and design. Metrics that gauge the intensity of land uses or the mass of buildings are most common. While not strictly measures of density, they are often used in conjunction or in place of density, especially in zoning codes and development regulations. They include:

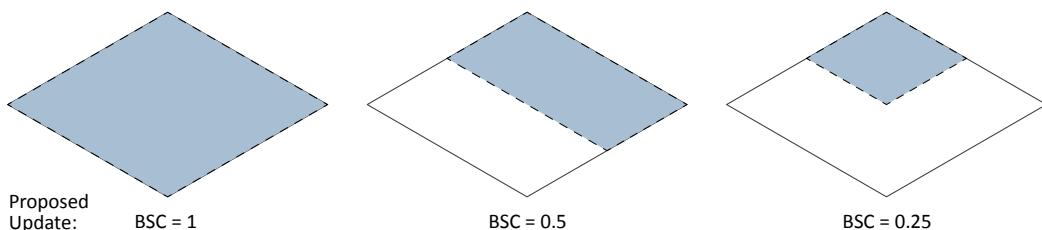
Floor area ratio (FAR): Floor area ratio divides the built floor area of a building or structure by the area of the parcel on which it is built (Forsyth 2003, 6).

$$\text{FAR} = \frac{\text{Built Floor Area}}{\text{Area of the Parcel}}$$



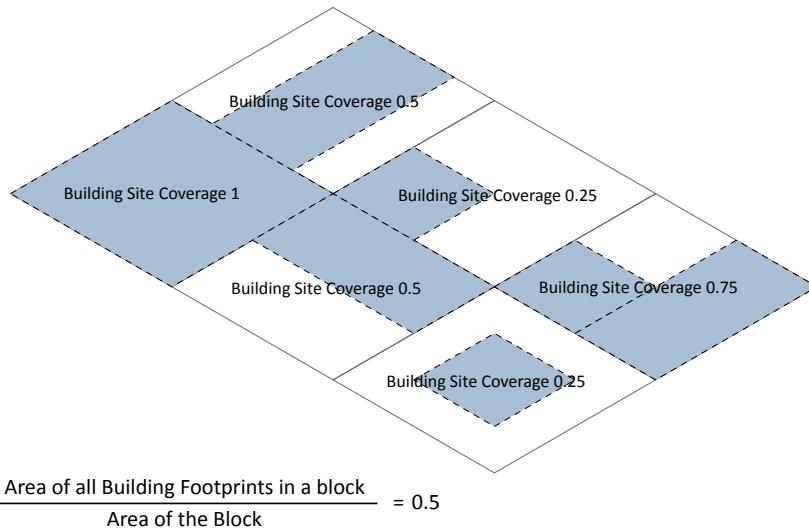
Building site coverage: Often used to measure open space on a site, building site coverage divides the area of the building's footprint by the area of the parcel or site (Forsyth 2003, 6).

$$\text{Building Site Coverage (BSC)} = \frac{\text{Area of Building Footprints}}{\text{Area of the Parcel}}$$



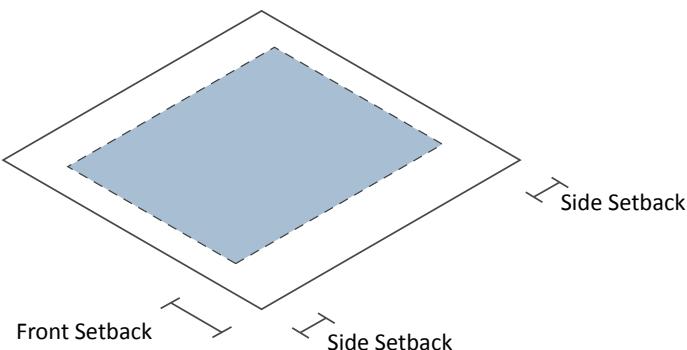
Building block coverage: Building block coverage is calculated in the same manner as building site coverage, except it covers an entire block. It divides the footprints of all the buildings found on a block by the area of the block (Forsyth 2003, 6). This measure, more so than building site coverage, reflects a person's actual experience of the built environment (Forsyth 2003, 7).

$$\text{Building Block Coverage} = \frac{\text{Area of all Building Footprints in a block}}{\text{Area of the Block}}$$



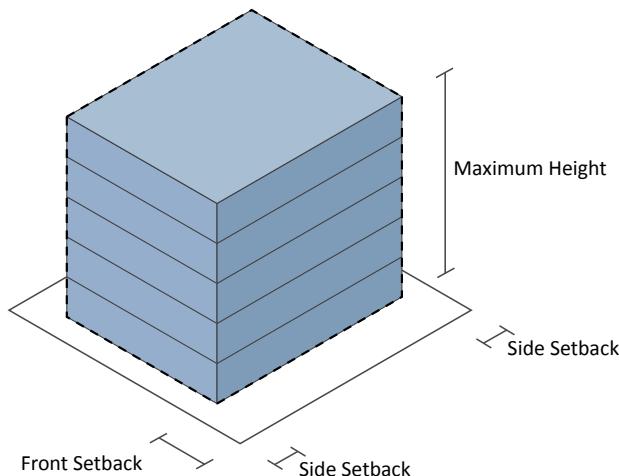
Front or side setbacks: This measures how far from a property line a building must be.

Front and Side Setbacks



Building envelope and height: The maximum building area allowed given regulations concerning 1) building height and 2) setbacks that measure minimum distance from a property line to a building.

Building Envelope



However, both density measures and building/land use intensity measures do a poor job of describing or measuring a particular physical layout or design of a building or neighborhood. This is mainly due to the fact that each of these measures allows a variety of configurations that will all result in the same outcome. For example, a high-rise apartment building seems as though it should be high-density, however, if the parcel on which it is sited is large, then its density will be low. It might even be the same as a single-family home placed on a small lot (Forsyth 2003, 4).

Humans perceive density and land use intensity differently from the way they are measured. Aversion to high density has more to do with perceptions and associations than with the numerical measurement of density. This makes residents wary of any plan or policy that will increase density. In residents' minds, the result will be similar to any bad example of high-density development they have experienced. On the other hand, a good design can lead people to perceive the project to be much lower density than it really is. Perceptions and the design of density and high-density areas must be an essential aspect of any efforts to support densification.