



DEMOGRAPHIA RESIDENTIAL LAND & REGULATION COST INDEX: 2010

Annex II: Methodology

Summary: The *Demographia Residential Land & Regulation Cost Index* estimates the extent to which more restrictive land use regulation has increased the price of new housing in 11 metropolitan markets, based upon the historic norm that the non-construction costs of new housing (land and regulation) does not exceed 20% of the house and land price.

Period Covered: The period covered is January through June 2010.

Houses Included: New detached homes, attached homes (townhouses and duplexes) and low-rise condominium (non-elevator) buildings are included. Houses in gated, golf course and age restricted communities are excluded. The detached survey includes housing from 1,500 to 2,999 square feet. The attached survey includes houses from 1,000 square feet to 2,499 square feet.

New House Database: A new house database was developed of new house offerings by national, regional and local builders, using internet sites and published metropolitan home guides.

Metropolitan Markets: The houses in the new house database are the respective metropolitan statistical areas [as defined by](#) the Office of Management and Budget (OMB) as of January 1, 2010, with two exceptions. Washington-Baltimore and Raleigh-Durham are combined because they are more representative of their respective housing markets than the individual metropolitan areas. Because of these differing definitions, the term "metropolitan market" is used.

Land & Regulation Cost Ratio: A land and regulation cost ratio of 20% is assumed under less restrictive land use regulation. This means that the house construction is estimated to be 80% or less of the advertised house price (which includes land).¹

There is no comprehensive source for the land and regulation ratio. *Demographia* based this estimate for less restrictively regulated metropolitan markets on data from multiple years and metropolitan markets from privileged industry sources and on interviews with industry experts. This data used in this examination indicated that the actual land and regulation ratio in such markets has tended to be approximately 17.5%, with a standard deviation of 2.2%, while interviewees generally cited the 20% ratio. The *Demographia Residential Land & Regulation Cost Index* assumes a 20% land and regulation ratio, which produces smaller (more conservative) *Index* values.

Finished Land: Land to which on-site infrastructure (local streets, curbs, sewer and water lines and connections) has been added and is ready for house building. Typically finished land is purchased by a land developer, who arranges for the on-site infrastructure and sells the land to a home builder.

¹ The sale of house and land in a single package is typical in the United States, but not, for example, in Australia and some European nations.

On Site Infrastructure (Finishing) Cost: On site infrastructure costs were estimated at 50% of the expected finished land cost.² There is no standardized database for such information.

Expected Finished Land and Regulation Cost: The cost of finished land that would be expected in a less restrictively regulated market. The *Demographia Residential Land & Regulation Cost Index* assumes this figure to equal 25% of the expected construction cost.³

Expected Raw Land and Regulation Cost: The expected finished land and regulation cost minus the cost of on-site infrastructure. The expected raw land and regulation cost is the base from which the *Demographia Residential Land & Regulation Cost Index* is calculated for each metropolitan market.

Expected House Construction Cost: House construction costs are estimated using a model based upon cost factors⁴ for house characteristic⁵ from R. S. Means *Square Foot Costs* and *Residential Square Foot Costs: 2010*.⁶ These cost estimates include all home builder costs, such as labor, materials, transportation financing and overheads. The cost estimates were then adjusted to account for these factors.

1. The cost estimates were adjusted to account for the lower square footage costs reported in the Bureau of the Census data (2008).

2. The maximum construction cost was assumed to be 80% of the advertised house price, consistent with the 20% land and regulation cost ratio. This maximum is necessary because in metropolitan markets with the lowest house prices, use of the *R.S. Means* factors can produce house cost estimates that exceed the price of the house and land combined. In markets where the land and regulation cost ratio exceeded the 20% norm, square footage cost estimates were placed at the highest house construction cost (locational adjusted) observed in metropolitan markets with the 20% land and regulation cost ratio to replicate the more competitive conditions that would be expected with less restrictive land use regulation.

The differential metropolitan market construction costs were adjusted based upon the midpoint of the R. S. Means and Craftsman geographical location factors.⁷ Construction finance costs were added.

House Size Standardization: The resulting data was standardized at 2,150 square feet for detached housing and 1,500 square feet for attached housing. These figures represent the approximate average house sizes in the new house database.⁸

² Based upon discussions with home builders and developers and <http://www.michaelcarliner.com/files/HE0303-MS-Cost.pdf> Housing Economics (NAHB) March 2003.

³ Calculation: Land and regulation cost divided by house construction cost (20% divided by 80% equals 25%).

⁴ Estimated from data in *Means Contractors Pricing Guide Residential Square Foot Costs: 2010*, R. S. Means (http://www.contractor-books.com/RS/Means_Contr_Pricing_Resi_SqFt.htm). The mid-points between economy houses and average houses was used in the calculations.

⁵ Such as square footage, number of bathrooms, size of garage as indicated in the new house offerings as identified for use in the *Demographia Residential Land & Regulation Index*.

⁶ A review of Craftsman cost estimates indicated general consistency with the R. S. Means cost estimates. See: "Building-Cost.net," Craftsman Book Company (<http://www.building-cost.net>).

⁷ There are substantial differences between the R. S. Means and Craftsman geographical factors (both of which provide locational factors at the "zip code" level. The average of the two sources is used. Calculated from data in *Means Contractors Pricing Guide Residential Square Foot Costs: 2010*, R. S. Means (http://www.contractor-books.com/RS/Means_Contr_Pricing_Resi_SqFt.htm) and "Building-Cost.net," Craftsman Book Company (<http://www.building-cost.net>).

⁸ These figures compare to Bureau of the Census data for new housing as follows (2008). Detached houses averaged 2,564 square feet, with a median of 2,317. Attached houses averaged 1,932 square feet, with a median of 1,794.

Lot size: Lot sizes vary and lot size information is typically not provided by the sources used in developing the new house database. As a result, lot size is not considered in the *Demographia Residential Land & Regulation Cost Index*. However a review of satellite photographs shows that new detached tract houses are being built on a variety of lot sizes (regardless of land regulation category), as indicated in Table II-1.

Calculation of the Index: The calculation methodology for the *Demographia Residential Land & Regulation Cost Index* is summarized in Table II-2 and Figure 1.

Sensitivity Analysis

As is noted above, there is variation in the actual land and regulation ratios in less restrictively regulated metropolitan markets, however there is no comprehensive database containing with this information. The *Demographia Residential Land & Regulation Cost Index* values were analyzed to estimate the effect of differing land and regulation ratio assumptions. A range of potential land development ratios were estimated from data obtained from less restrictively regulated metropolitan markets over a period of more than one decade. If a 17.4% land and development ratio is assumed (the average calculated from the review of available data), the *Demographia Residential Land & Regulation Cost Index* for more restrictive markets would rise from 5.9 to 6.8. At a higher 22.5% land and development ratio, the *Demographia Residential Land & Regulation Cost Index* for more restrictive markets would fall from 5.9 to 4.8. There would be no change in the *Index* values for the less restrictively regulated markets.

Thus, assuming a higher land and regulation cost ratio (22.5%), the *Demographia Residential Land & Regulation Cost Index* for more restrictive markets would be approximately 20% lower, and at the lower assumption (17.4%), the *Index* would be approximately 15% higher (both for detached and attached new houses), as is indicated in Table II-3.

	Minimum	Maximum	Average
Atlanta	4	14	7
Dallas-Fort Worth	5	9	7
Houston	6	10	8
Indianapolis	3	8	5
Minneapolis-St. Paul	4	10	5
Portland	5	11	8
Raleigh-Durham	4	9	6
St. Louis	4	14	6
Seattle	5	10	8
Washington-Baltimore	3	7	5
Average	4	10	7
Less Restrictive Regulation			7
More Restrictive Regulation			7

Notes:
 (1) As observed and measured on satellite photographs. In many cases, the satellite photography was not recent enough to determine lot sizes.
 (2) Net acre (rather than "gross acre") is the actual lot size sold to the buyer. It does not include land that is dedicated to public use, such as streets or open space.

Table II-2 Demographia Residential Land & Regulation Cost Index Summary of Calculation Methodology	
1	Start with advertised house sales price
2	Estimate the <i>expected house construction cost</i> from a model based upon RS Means data (adjusted for metropolitan market construction cost differences, using a composite of RS Means and Craftsman location factors)
2A	If the estimated house construction cost is greater than 80% of the house price, the expected house construction cost is set at 80% of the house price.
2B	If the estimated house construction cost is less than 80% of the house price, the <i>expected house construction cost</i> from #2 is used, with a competitive discount to the location adjusted rate found for the most expensive construction market in which the house construction cost in #2A is 80% of the house price.
3	Estimate the expected finished land and regulation cost.
3A	If the expected house construction cost (#2) is 80% of the advertised sales price (#1), then the expected finished land and regulation cost is 20% of sales price (a land and regulation cost ratio of 20%).
3B	If the expected house construction cost (#2) is less than 80% of the advertised sales price (#1), then the expected finished land and regulation cost is 25% of the house construction cost (which equals a land and regulation cost ratio of 20%).
4	Estimate the excess land and regulation cost (<i>Column 1, Tables 1 & 2</i>). This is the advertised sale price (#1) minus the expected house construction cost (#2) minus the expected land and regulation cost (#3).
5	Estimate the expected raw land and regulation cost (<i>Column 1, Tables 1 & 2</i>). The expected finished land and regulation cost (#3) is reduced by 50% for on-site infrastructure installation expenses.
6	Exclude houses on more costly land.
7	Calculate averages from the remaining houses
8	Calculate the total land and regulation cost (<i>Column 3, Tables 1 & 2</i>). This is the expected raw land and regulation cost (#5) plus the excess cost of land and regulation (#4)
9	Calculate the <i>Demographia Residential Land & Regulation Cost Index</i> . This is the total land and regulation cost (#8) divided by the expected land and regulation cost (#5).

Residential Land & Regulation Index CALCULATION EXAMPLES

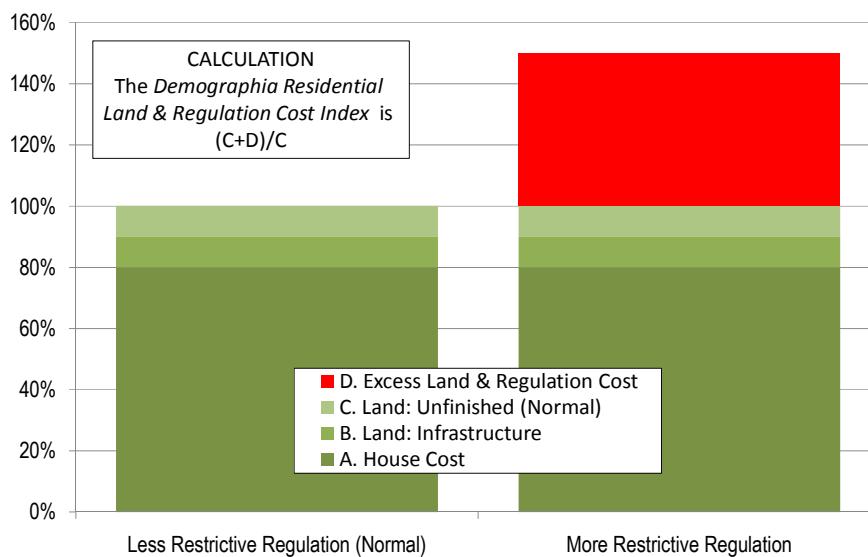


Figure 1

Land & Regulation as a % of Advertised House (& Land) Price		DETACHED HOUSING			ATTACHED HOUSING		
		All Markets	Less Restrictive	More Restrictive	All Markets	Less Restrictive	More Restrictive
Scenario	Description						
15.2%	Average Minus 1 Standard Deviation	4.4	1.0	7.8	4.8	1.0	7.1
17.4%	Average	3.9	1.0	6.8	4.3	1.0	6.3
20.0%	Used in Index (Historic Norm)	3.4	1.0	5.9	3.8	1.0	5.5
22.5%	High Sensitivity Analysis	2.9	1.0	4.8	3.1	1.0	4.4

Base Data

Tables II-4 and II-5 contain base data used in the *Demographia Residential Land & Regulation Cost Index*.

Metropolitan Market	Advertised House (& Land) Price	Expected House Construction Cost	Expected Finished Land & Regulation Cost	Exhibit: Expected Raw Land & Regulation Cost	Advertised Local Price per Square Foot of House
Atlanta	\$161,000	\$128,800	\$32,200	\$16,100	\$75
Dallas-Fort Worth	\$145,100	\$116,100	\$29,000	\$14,500	\$67
Houston	\$131,600	\$105,200	\$26,400	\$13,200	\$61
Indianapolis	\$138,700	\$110,900	\$27,800	\$13,900	\$65
Minneapolis-St. Paul	\$228,800	\$160,100	\$40,000	\$20,000	\$106
Portland	\$228,300	\$135,200	\$33,800	\$16,900	\$106
Raleigh-Durham	\$160,200	\$128,200	\$32,000	\$16,000	\$75
St. Louis	\$168,800	\$135,000	\$33,800	\$16,900	\$79
San Diego	\$402,300	\$145,100	\$36,200	\$18,100	\$187
Seattle	\$231,100	\$143,700	\$36,000	\$18,000	\$107
Washington-Baltimore	\$234,900	\$128,200	\$32,000	\$16,000	\$109
Average	\$202,800	\$130,600	\$32,700	\$16,300	\$94

Note: Advertised price per square foot is the total price of the house (including land). All house sizes are normalized to 2,150 square feet..

Metropolitan Market	Advertised House (& Land) Price	Expected House Construction Cost	Expected Finished Land & Regulation Cost	Exhibit: Expected Raw Land & Regulation Cost	Advertised Local Price per Square Foot of House
Houston	\$118,500	\$94,700	\$23,800	\$11,900	\$79
Minneapolis-St. Paul	\$160,200	\$112,900	\$28,200	\$14,100	\$107
St. Louis	\$156,200	\$125,000	\$31,200	\$15,600	\$104
San Diego	\$314,700	\$151,000	\$37,800	\$18,900	\$210
Washington-Baltimore	\$173,100	\$94,600	\$23,600	\$11,800	\$81
Average	\$184,540	\$115,640	\$28,920	\$14,460	\$116

Note: Advertised price per square foot is the total price of the house (including land). All house sizes are normalized to 1,500 square feet..