



Colorado Housing Affordability Project Issue Brief No. 3: Land Use Restrictions' Impacts on Environmental Sustainability

This paper is one in a series of Colorado Housing Affordability Project issue briefs summarizing the latest research on housing concerns statewide, from the origins of the affordability crisis to the best practices for addressing it. For every topic, CHAP's subject-matter-expert authors identify a component of that crisis, deliver the information essential to understanding the issue, and provide links or citations to further explore the supporting research. The entire CHAP issue brief series is available at <https://cohousingaffordabilityproject.org/the-research/> and continues to grow, so check back often.

The Issue: In much of Colorado, land use restrictions create a preference for single-family development—often on large lots, causing sprawl. This issue brief examines those controls' harmful impacts on the environment.

The Takeaway: It is well-established that moderate- and high-density forms of development are better for the environment than those that are low-density. Denser development uses water and land resources more efficiently and reduces greenhouse gas emissions stemming from car dependency. However, as a 2019 U.N. report stated, “[i]n some locations, spatial planning prevents the construction of multifamily residences and locks in the suburban form at high social and environmental costs.”¹ Common land use restrictions hinder denser housing development, make cities unaffordable and force many people to live in automobile-dependent, sprawling suburbs. Land use reform to support more moderate- and high-density housing therefore allows Colorado to reduce development's environmental impact while improving housing affordability and social equity.

The Research: Land use restrictions such as single-family zoning and minimum lot size requirements have hindered compact urban development. These constraints—and the high costs of urban living they create—have pushed many families out of denser, transit-oriented areas and into sprawling, suburban, greenfield developments.

The academic literature on the harmful environmental impacts of housing supply constraints identify three primary points: (1) suburban sprawl results in more vehicle miles traveled (“VMT”) and greenhouse gas emissions than denser, compact development; (2) zoning that promotes the development of single-family homes on large lots increases land consumption, reducing wildlife habitat and forest cover; and (3) land use restrictions against denser development increase the consumption of water resources.

Higher average VMT—widely considered a reliable measure of the environmental impact of land use patterns—have consistently been linked with suburbanization² and single-family zoning.³

¹ United Nations Environment Programme (2019). *Emissions Gap Report 2019*. UNEP, Nairobi.

² Robert L. Liberty, *Abolishing Exclusionary Zoning: A Natural Policy Alliance for Environmentalists and Affordable Housing Advocates*, 30 B.C. Env'tl. Aff. L. Rev. 581, 588 (2003), <http://lawdigitalcommons.bc.edu/ealr/vol30/iss3/8>.

³ Reid Ewing et al. (2007). *Growing Cooler: The Evidence on Urban Development and Climate Change*, available from https://www.nrdc.org/sites/default/files/cit_07092401a.pdf.



Numerous studies suggest that denser development, as an element of compact development that includes access to transit and a diversity of amenities, can reduce VMT.⁴ Over time, as more compact development is concentrated in an area, the reduction in both the length and number of vehicle trips decreases, in turn reducing greenhouse gas emissions.⁵ Studies vary on the exact amount by which VMT and greenhouse gas emissions can be reduced. However, several have found that denser, transit-oriented development can reduce average VMT by up to 25-60% over time, in turn reducing greenhouse gas emissions from transportation by up to 12-60%.⁶

Sprawl not only increases greenhouse gas emissions, it also increases development's impact on land resources. Simply by restricting the number of units allowed per acre and requiring larger lot sizes, lower-density development results in more land consumption than moderate- and high-density development. This increased land consumption presents several consequences.

First, because it can involve deforestation, sprawl often reduces the amount of forested land available to absorb carbon dioxide emissions.⁷ Second, greater demands for land can lead to development in sensitive habitat and wildlife corridors; sprawl has long been cited as a threat to biodiversity and the survival of threatened and endangered species.⁸ Third, sprawl and increased land consumption can alter the environment such that it creates risks for the human population. By increasing impervious surfaces, sprawl increases flood risk,⁹ and, by pushing development further into the wildland urban interface, it increases risk of forest fire impact.¹⁰

Relatedly, the preservation of land through denser development also increases the preservation of water quality, as it ensures more space is retained for watershed services.¹¹ Higher density development creates less impervious surface and demands less water usage than lower density development. A 2006 EPA study specifically found that, compared to lower-density development, per residence, higher density development (1) generates less stormwater runoff; (2) generates less

⁴ Urban Land Use Institute. *Land Use and Driving: The Role Compact Development Can Play in Reducing Greenhouse Gas Emissions*. Washington, D.C.: Urban Land Institute, 2010, p. 2.

⁵ Urban Land Use Institute. *Land Use and Driving: The Role Compact Development Can Play in Reducing Greenhouse Gas Emissions*. Washington, D.C.: Urban Land Institute, 2010, p. 7.

⁶ Growing Cooler, Moving Cooler, and Driving and the Built Environment all have different figures. *Land Use and Driving: The Role Compact Development Can Play in Reducing Greenhouse Gas Emissions*. Washington, D.C.: Urban Land Institute, 2010, p. 7. (discussing three different studies: Growing Cooler, Moving Cooler, and Driving and the Built Environment).

⁷ Ewing et. al. (2007).

⁸ Reid Ewing et al., *Endangered by Sprawl: How Runaway Development Threatens America's Wildlife*. National Wildlife Federation, Smart Growth America, and Nature Serve. Washington, D.C., January 2005, available from <https://www.nwf.org/~media/PDFs/Wildlife/EndangeredbySprawl.pdf>.

⁹ OECD. *Rethinking Urban Sprawl: Moving Towards Sustainable Cities (Policy Highlights)*. 2018, available from <https://www.oecd.org/environment/tools-evaluation/Policy-Highlights-Rethinking-Urban-Sprawl.pdf>.

¹⁰ See Volker Radeloff et al., *Rapid growth of the US wildland-urban interface raises wildfire risk*. Proceedings of the National Academy of Sciences. March 2018, available from <https://www.pnas.org/content/115/13/3314>; Patrick Sisson, *As cities confront climate change, is density the answer?*, Curbed (Dec. 11, 2018), <https://archive.curbed.com/2018/12/11/18136188/city-density-climate-change-zoning>,

¹¹ EPA Office of Sustainable Communities and Smart Growth Program. *Protecting Water Resources with Higher-Density Development*. 2005, available from <https://www.epa.gov/smartgrowth/protecting-water-resources-higher-density-development>.



impervious cover; and (3) affects less of the watershed.¹² Additionally, the study noted that density limits in certain municipalities may quickly drive growth to other parts of a region, resulting in severe and disproportionate effects on water quality.¹³ Denser development also reduces the amount of water used in lawn irrigation: a 2018 study on the effect of infill development on outdoor water consumption in Denver's Berkley neighborhood showed that the average irrigation rate for single-family parcels is 46% higher than that for multi-family parcels.¹⁴

Learn More. Interested in learning more about this topic? The following links provide additional research on the connection between land use regulations, housing affordability, and environmental sustainability:

- As Cities Confront Climate Change, is Density the Answer?
- EPA: Smart Growth and Climate Change
- EPA: Protecting Water Resources with Higher-Density Development
- Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions

¹² EPA Office of Sustainable Communities and Smart Growth Program. *Protecting Water Resources with Higher-Density Development*. 2005, available from <https://www.epa.gov/smartgrowth/protecting-water-resources-higher-density-development>.

¹³ EPA Office of Sustainable Communities and Smart Growth Program. *Protecting Water Resources with Higher-Density Development*. 2005, available from <https://www.epa.gov/smartgrowth/protecting-water-resources-higher-density-development>.

¹⁴ Kyle Blount, et al., *Building to conserve: Quantifying the outdoor water savings of residential development in Denver, Colorado*. *Landscaping and Urban Planning* 214 (2021) 104178, p. 11, available from <https://reader.elsevier.com/reader/sd/pii/S0169204621001419?token=3929771B80FF73DF5D3E341022338FA92ADB55914769D8AC5DB3A54C0915FB592C66F78583B01FCE5864CFE3365B4FC2&originRegion=us-east-1&originCreation=20210906201407>.