WATER ♥ INFILL

INFILL DEVELOPMENT: A KEY STRATEGY FOR WATER IN SAN DIEGO

Acknowledgements

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Introduction

San Diego faces a continuing challenge for adequate water supply and water quality. Infill development provides a useful tool for the region to safeguard water supplies and ensure continuing water quality.

Infill development,[1] consistent with General Plans for both the City and County of San Diego, can provide relief from the combination of drought susceptibility,[2] deteriorating water infrastructure,[3] and population growth.[4]

Numerous pieces of California legislation such as SB 375, SB 743, and Executive Order S-3-05 address the well-documented benefits of infill development on public health, air quality, housing affordability, and transportation infrastructure.[5] Less appreciated are the considerable benefits surrounding the reduced costs and efficiencies of developing compactly within close proximity to locations with existing water infrastructure.[6] In arid, drought prone regions, it is crucial to implement existing policies to support compact infill development, which have been found to shrink water demand, lower costs, and improve water quality.

Background

San Diego's dry, arid climate and drought susceptibility stress the region's water systems.[7] In addition to drought conditions, land use decisions that expanded an already overburdened water system with low density growth on the urban fringe have strained water resources. Future population growth predictions for the region indicate even more tension for the fragile water system.[8]

"San Diego's dry, arid climate and drought susceptibility stress the region's water systems."

Population growth projections and the risk of future drought require utilizing water resources as efficiently as possible. One of the most cost effective methods to addressing concerns over water efficiency is to take advantage of the low hanging benefits that infill development provides to water systems.

"[I]nfill development could accommodate 66% of the estimated growth directed for the urban periphery"

An approach to land development that satisfies growth and water demand is vital. A 2010 study conducted by the GreenInfo Network estimated that infill development could accommodate 66% of the estimated growth directed for the urban periphery in San Diego.[9] This research, along with the current policies at the state and local level pushing for infill growth, provide a chance to reduce water demand and cost while absorbing population growth.

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[1] Infill development as defined by the California Office of Planning and Research is "building within unused and underutilized lands within existing development patterns, typically but not exclusively in urban areas," California Office of Planning and Research, http://www.opr.ca.gov/s_infilldevelopment.php.

[2] National Aeronautics and Space Administration, *California Drought*, NASA Science News, (February 7, 2014), http://science.nasa.gov/science-news/science-at-nasa/2014/07feb_drought.

[3] Liam Dillon, *The City's Infrastructure Woes, in 3 Charts*, Voice of San Diego, (January 26, 2015), http://www.voiceofsandiego.org/topics/government/the-citys-infrastructure-woes-in-3-charts.

[4] San Diego Association of Governments, *2050 Regional Growth Forecast*, http://www.sandag.org/index.asp?projectid=355&fuseaction=projects.detail.

[5] Benjamin Winig, Heather Wooten, Allison Allbee, *Building In Healthy Infill,* ChangeLabSolutions, (June 2014), page 21, http://changelabsolutions.org/sites/default/files/Building_In_Healthy_Infill-FINAL-20140731.pdf.

[6] Paula Van Lare, *Growing Toward More Efficient Water Use: Linking Development, Infrastructure, and Drinking Water Policies*, United States Environmental Protection Agency, (January 2006), http://www.epa.gov/smartgrowth/pdf/growing_water_use_efficiency.pdf; Lynn Richards, *Protecting Water Resources with Smart Growth,* United States Environmental Protection Agency, (May 2004), http://www.epa.gov/smartgrowth/pdf/waterresources_with_sg.pdf.

[7] National Aeronautics and Space Administration, supra note 2.

[8] San Diego Association of Governments, supra note 4.

[9] Larry Orman, *An Alternative Development Scenario for San Diego County*, GreenInfo Network, (July 2, 2010), https://d3n8a8pro7vhmx.cloudfront.net/transitsandiego/pages/14/attachments/original/1416421703/Infill_Study.pdf?1416421703.

Smaller infill lots create less water demand:
Infill development's ability to reduce water demand is directly related to lot size. Large lots with big lawns consume considerably more water than the compact lots used for infill development. Landscaping and other outdoor purposes contribute between 50% and 70% of household water use.[10] This high percentage represents a water saving opportunity.

Smaller lots and more compact development lead to water savings. The connection between water use and lot size is evident in research done in Utah which showed that daily water demand per capita drops to 110 gallons per acre from 220 gallons when an acre is split between five lots instead of two.[11]

"Landscaping and other outdoor purposes contribute between 50% and 70% of household water use."

Smaller infill lots create less water waste:
A closer look at the water demand of smaller infill lots reveals less water lost through pipe leakage than larger lots on the urban periphery.[12] All pipes leak, but some pipes leak more than others depending on their age, size, and the pressure required.

"A 2002 study found that pipes leak between 6% and 25% of the water pumped through them."

A 2002 study found that pipes leak between 6% and 25% of the water pumped through them.[13] There are two types of pipes: larger transmission mains that run along streets, and smaller distribution pipes that connect properties to transmission mains. Long systems that require high amounts of pressure to push water over long distances leak more than pipes in compact areas.

Old pipes leak more than new ones and all pipes need to be replaced eventually. Demand for new water infrastructure in developing areas may lead communities to lay new pipes rather than fix old interior pipes. This approach is common on the urban fringe and exacerbates pipe leakage by putting more pressure on older pipes. Alternatively, compact infill development encourages replacement and puts less pressure on the pipes, which results in less leakage and lower water demand. Compact infill development provides a reduction in demand for an overburdened water system serving a growing population in a region with limited water supplies.

Infill development creates lower water infrastructure costs:
The water infrastructure costs associated with compact infill development are less expensive, more efficient, and have a greater return on investment than traditional sparse development on the urban fringe. The amount of pipe used in a water system not only plays an important role in reducing demand for water but also in lowering water infrastructure costs.

"The water infrastructure costs associated with compact infill development are less expensive, more efficient, and have a greater return on investment than traditional sparse development on the urban fringe."

As indicated above, infill development requires less pipe, which can come at a considerable cost. Compact infill efficiently capitalizes on existing transmission mains using many short distribution pipes to serve a higher number of smaller lots and people. When the distance that pipes need to cover is reduced, the cost is lowered, the pipes leak less, and the pipes require less pressure.

Many communities around the country face maintenance backlogs due to deferring improvements while expanding new systems. This approach leads to a fragile and inefficient system. Water main breaks and leakages increase the cost of operation.

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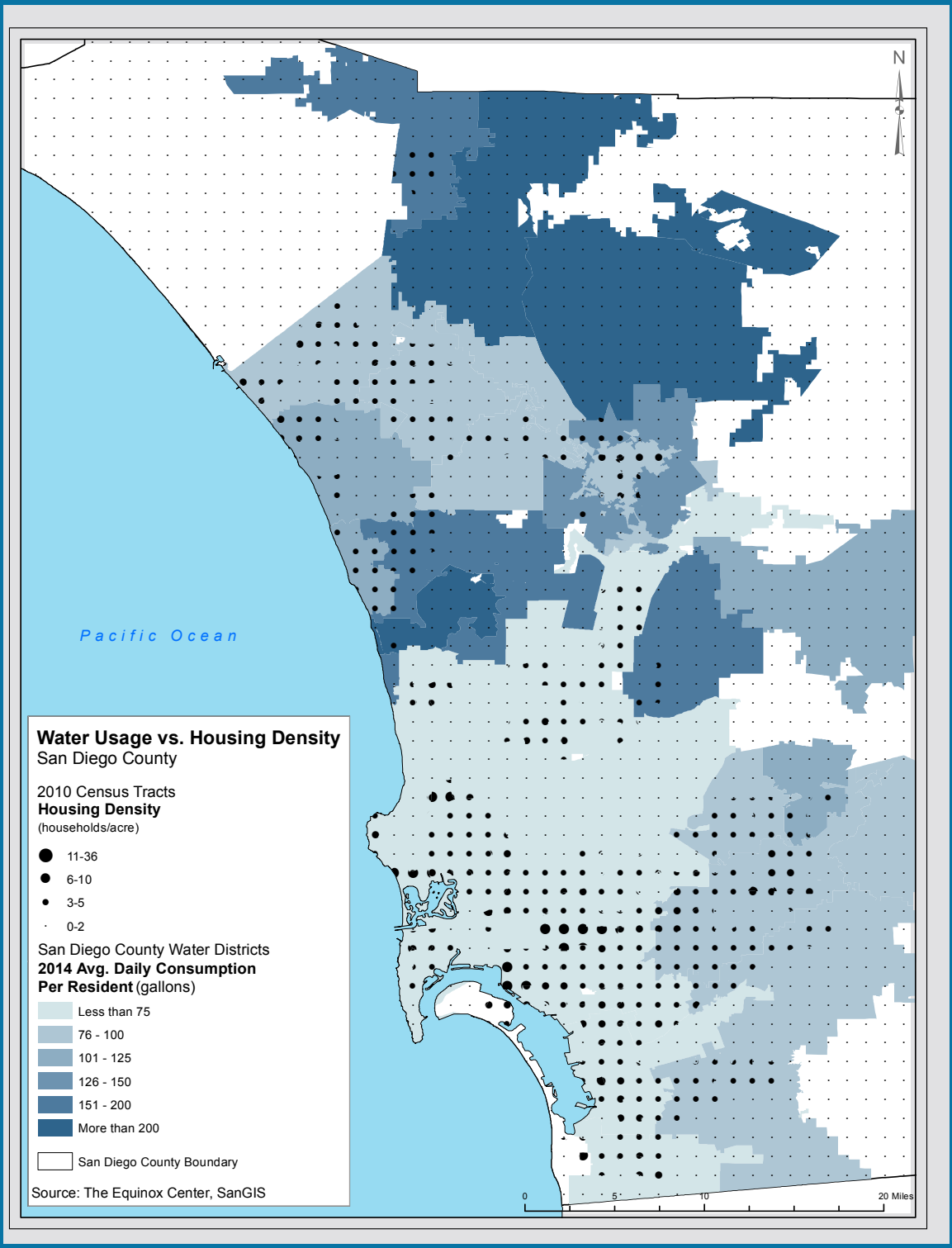
[10] Van Lare, supra note 6.

[11] *Id.*

[12] *Id.*

[13] Ronnie B. Levin, Paul R. Epstein, Tim E. Ford, Winston Harrington, Erik Olson, and Eric G. Reichard, *U.S. Drinking Water Challenges in the Twenty-First Century, Environmental Health Perspectives*, (2002), http://dash.harvard.edu/bitstream/handle/1/8097013/1241146.pdf.



The Equinox Center, *San Diego County Residential Water use Trends*, (February 2015), http://www.equinoxcenter.org/research-topics/water/overview.html.

This set of problems is indicative of an over-expanded system that does not have the customer base to pay for expansions. A remedy for this is a compact infill approach to new development that is integrated into the existing system. Infill can help spread "the capital costs over a larger customer base, lowering the cost of water service per customer."[14]

Promoting compact infill growth offers a way for San Diego to increase its return on investment through serving more people with less infrastructure. Given budgetary, water resource, infrastructure conditions, and land constraints in the San Diego region, a compact infill development approach is necessary for future growth.

"Infill development is able to preserve the supply of water and the quality of water through conservation of natural land and by reducing the development of new impervious surfaces."

Infill and Water Quality

Infill development limits the creation of impervious surfaces:
An infill development approach not only addresses the demand and costs of water in the San Diego region by reducing the amount of water and infrastructure needed, but it also helps to maintain water quality. Infill development is able to preserve the quality of water through conservation of natural land and by reducing the development of new impervious surfaces.

Impervious surfaces are surfaces created as a result of development through which water cannot infiltrate or flow easily. Impervious surfaces include paved roads, driveways, parking lots, sidewalks, buildings, and compacted soils and lawns that allow water to runoff into drainage systems. The amount of impervious surface has a strong relationship to a community's water quality.[15] Impervious surfaces collect a wide variety of pollutants deposited by automobiles

and other uses. Urban drainage systems are designed to efficiently remove rain water from impervious surfaces in the surrounding area. During rain events, these pollutants, along with large amounts of storm water, are quickly carried through drainage systems to regional water bodies. This pollution is detrimental to local water bodies and drinking water, and is expensive to treat.[16] The large amount of storm water running off of impervious surfaces picks up pollutants and increases the volume and speed of streams. This escalates erosion and flooding, damages infrastructure, curbs biodiversity, and releases large amounts of sediment.[17]

In a region facing drought and water shortages, it is imperative to recognize that impervious surfaces reduce water supply. Impervious surfaces prevent water from draining into the ground, which removes a vital source for replenishing potential groundwater reserves and underground aquifers. A recent report done in partnership between the Pacific Institute and the National Resource Defense Council about storm water runoff pointed to the potential for groundwater: "Altogether, hundreds of billions of gallons of potential water supply are thrown away each year in a manner that endangers public health and ecosystems, and weakens coastal and other economies that depend on clean water for tourism revenue."[18]

Infill development preserves open space that naturally filters runoff:
San Diego needs a land development pattern that reduces the need for new impervious surfaces and maximizes the preservation of open space. Open natural space conserves water quality and quantity by slowly absorbing and filtering runoff through vegetation and natural soils to recharge underlying groundwater. Tree and shrub root systems create a slower flow which is beneficial for water quality since reduced turbidity and erosion in streams gives less sediment more time to settle.

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[14] Van Lare, supra note 6.

[15] Lynn Richards, supra note 6.

16 Natural Resources Defense Council, *After the Storm: How Green Infrastructure Can Effectively Manage Stormwater Runoff from Roads and Highways*, (September 2011), http://www.nrdc.org/water/files/afterthestorm.pdf.

[17] *Id.*

[18] Noah Garrison, *Stormwater Capture Potential in Urban and Suburban California, Natural Resources Defense Council*, Pacific Institute, (June 2014), http://pacinst.org/wp-content/uploads/sites/21/2014/06/ca-water-stormwater.pdf.

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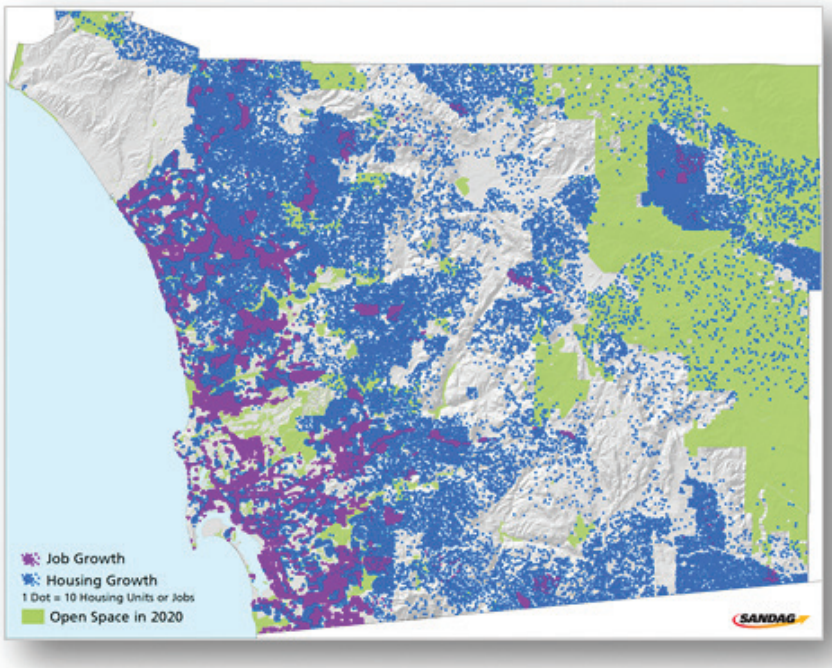

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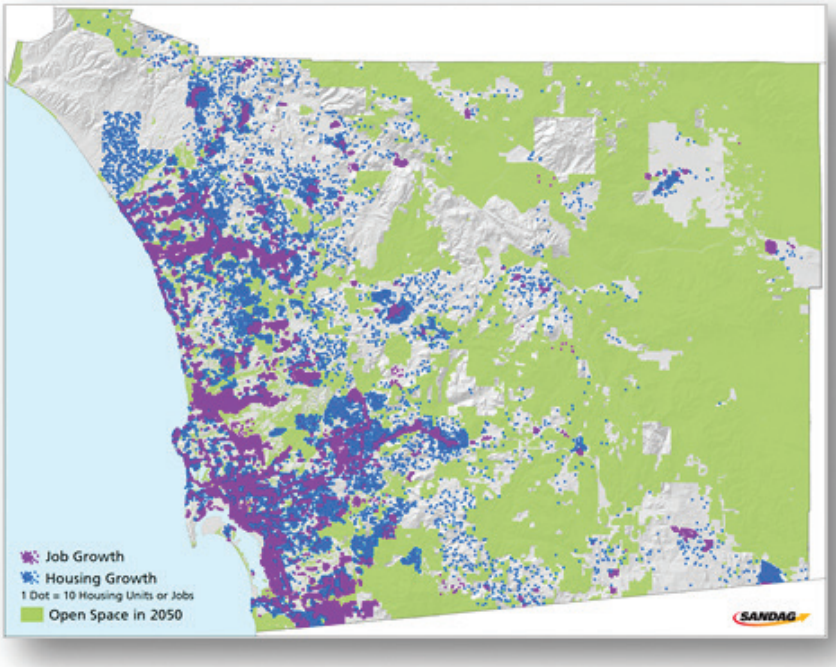


Image provided by the San Diego Association of Governments.

Between 1999 and 2013, local jurisdictions updated land use plans to concentrate growth within the urbanized areas of the region. This change reflects a growing preference in local policy for infill development, which will lead to water efficiencies. San Diego Area Association of Governments, *San Diego Forward: The Regional Plan: Alternative Land Use Scenarios*, (December 6, 2013), http://www.sdforward.com/sites/sandag/files/meetingid_3479_17075.pdf

Research indicates that open space in the form of wetlands are especially proficient at slowing runoff and increasing ground water recharge, which directly reduces the potential for flooding.[19] Infill development allows for more efficient use of developed land, lowering pressure to expand development into areas of existing open space.

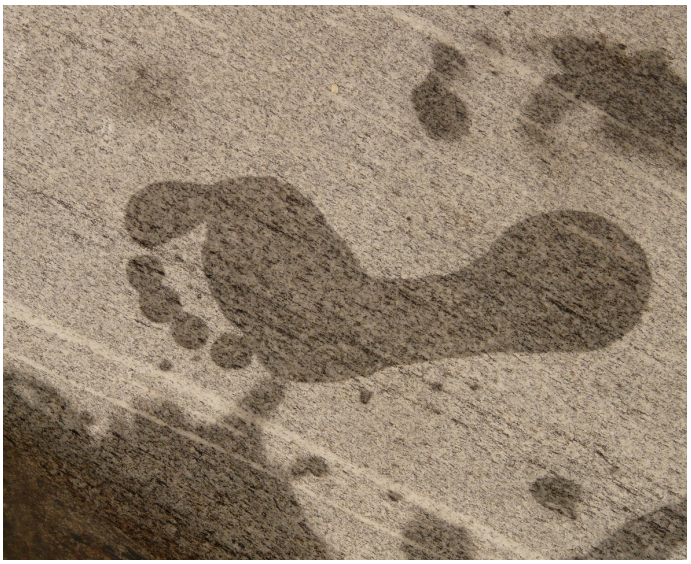
Besides the clear environmental benefits, infill development allows regional water providers to contain water treatment costs,[20] preserve supply, and avoid additional costs due to increased damage to infrastructure caused by floods and high volumes of storm water runoff.[21]

Conclusion and Infill Development Policy Recommendations

Local governments can improve water system efficiency by incorporating statewide environmental goals and facilitating local existing policy on where to focus development. Infill development can help meet mandates included in SB 375 and Executive Order S-3-05 to cut greenhouse gas emissions, while simultaneously providing the parallel benefit of protecting water quality and supply.

Local leaders have already made numerous policy decisions that push for infill development. The next step for the region is for local leaders to implement these policies. The Comprehensive Policy for a Sustainable Water Supply in the City of San Diego strives to efficiently balance land use with water demand.[22] Other policies include the City of San Diego's City of Villages strategy, and the County of San Diego's General Plan, both of which have identified opportunities and incentives for smart growth infill development.[23] SANDAG created a variety of regional policies related to Smart Growth Opportunity Areas to encourage infill development throughout the region.[24]

Abstract policies purporting to support infill development are not alone sufficient. For the water benefits of infill development to be achieved, local leaders must provide leadership and actually approve the infill projects contemplated by the region's various planning documents. While land use entitlement decisions are often politically difficult for elected decisionmakers, approval of infill development will be key to the future of the region's water supply and water quality.



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[20] Van Lare, supra note 6.

[21] Federal Emergency Management Agency, *Reducing Damage from Localized Flooding,* (June 2005), http://www.fema.gov/pdf/fima/FEMA511-complete.pdf.

[22] City of San Diego, *Comprehensive Policy for a Sustainable Water Supply*, (October 25, 2011), http://docs.sandiego.gov/councilpolicies/cpd_400-15.pdf.

[23] City of San Diego, *City of San Diego General Plan*, (March 10, 2008), http://www.sandiego.gov/planning/genplan/pdf/generalplan/adoptedtoc.pdf;

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