Water Facts

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Water Saving Solutions:
Stopping Pollution at its Source with Low Impact Development

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America's urban landscape is affecting our cities' water supply and water quality. Runoff from urban areas is a leading cause of water pollution in the United States, and in many areas people are using water faster than it can be replenished. More than 100 million acres of land have been developed in the United States, and with development and sprawl increasing faster than population growth, the risks to water supply and quality are growing. Low impact development, or LID, is a simple and cost-effective green development strategy that can help cities, states, and even individuals meet the water supply challenge, clean up our existing water resources, and, in many places in the West, curb global warming pollution by reducing the amount of electricity used to supply water.

How Does LID Work?

When it rains, the traditional urban landscape of roadways, sidewalks, and buildings directs rainfall from paved surfaces into storm drains, picking up animal waste, trash, and chemicals along the way—and ultimately dumps this pollution into our waterways. This causes water quality problems that can make people sick, impair ecosystems, and weaken coastal economies that depend on clean water for tourism revenue.

LID uses smarter city design such as permeable pavement to infiltrate rainwater into the earth and recharge groundwater supplies, rain barrels to capture rainwater for use where it falls, and green roofs to filter pollutants and evaporate runoff. This reduces the runoff that contaminates waterways, while often collecting clean water that can be used to meet our water supply needs. With population growth and global warming putting ever-increasing strains on water availability, particularly in parched Western states, LID provides clean water resources we cannot afford to squander.

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In addition to reducing stormwater pollution and increasing water supply reliability in a region prone to natural disasters, LID can reduce flooding and erosion associated with urban runoff, reduce the "heat island" effect from solar radiation in urban settings, and provide green space and open land, enhancing property values. The use of LID can also reduce the costs of municipal stormwater infrastructure and decrease the frequency and severity of combined sewer overflow events.

Implementing Water Saving Technology in California

LID techniques can deliver water, energy, and greenhouse gas emissions savings for Californians. A recent joint analysis by NRDC and the University of California, Santa Barbara's Donald Bren School of Environmental Science and Management shows that LID can play a significant role in addressing issues of water supply and climate change throughout California and the Southwest United States. The study found that implementing LID practices that emphasize capture and infiltration at new and redeveloped residential and commercial properties in the urbanized areas of Southern California and portions of the San Francisco Bay area has the potential to increase local water supplies by up to 405,000 acre-feet of water per year by 2030—roughly two-thirds of the amount of water used by the entire City of Los Angeles each year.[2] See NRDC's Technical Report on LID, available at: http://www.nrdc.org/water/lid/

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Drainage swale, shown here in Seattle, captures rainwater and reduces pollution

LID Increases Local Water Supplies

Traditional stormwater management conveys runoff from rain, snow, or over-watered lawns away from its source as quickly as possible, dumping it into streams, lakes, or the ocean with little or no treatment, which is both polluting and wasteful. In contrast, by collecting water on site, or infiltrating water into soil to recharge groundwater supplies, LID helps capture and retain rainwater to increase local water supplies.

NRDC, in cooperation with leading stormwater experts, has calculated that 100 percent of the runoff from paved surfaces generated by the typical annual rainfall that occurs on many, if not most, commercial and residential developments in California can be retained onsite to recharge groundwater, or captured for onsite use. Even in densely populated and developed urban centers, significant quantities of water can be captured for use in landscape irrigation, for flushing toilets, or for other non-drinking water applications. LID is a holistic water resources solution because, in most cases, the water saved and repurposed through LID designs is water that would otherwise have been discharged from sites, creating the polluted runoff problem affecting local streams, rivers, and coastal waters.

LID Strategies Can Reduce Global Warming Emissions

In many places, particularly in the West, water is pumped hundreds of miles and over mountain ranges to reach cities, where it is used in homes and businesses. The energy used to transport the water over long distances results in the release of greenhouse gases that contribute to climate change. Overall, the collection, distribution, treatment, end use, and safe disposal of drinking water and wastewater consume tremendous amounts of energy nationwide and release approximately 116 billion pounds of carbon dioxide (CO_2) per year—as much global warming pollution each year as 10 million cars.[1] But for every gallon of water saved through the use of LID practices, one less gallon of water needs to be supplied from sources that are energy intensive, since LID provides a local supply of water that reduces the need to carry water over

California could save more than 1.2 million megawatt hours of electricity each year through LID practices—enough energy to power more than 102,000 single-family homes for one full year.

long distances from the source to the tap. The energy-water connection is particularly strong in the driest regions of the United States, such as the Southwest, where significant amounts of energy are used to import water. Implementing LID practices is an important tool for governments and communities to reduce and respond to climate change.

A recent analysis by NRDC and the University of California at Santa Barbara highlights the significant energy and climate benefits that would result from widespread implementation of LID in California. In California, the water sector is the largest energy user in the state, estimated to account for 19 percent of the total electricity consumed. A significant portion of this electricity is used to convey water across the state. The NRDC-UCSB report, *A Clear Blue Future*, estimates that by 2030, 1,225,500 megawatt hours of electricity savings can be achieved each year through use of LID practices in California, representing enough energy to power more than 102,000 single-family homes for one full year. Reducing imported water from distant sources in Northern California or from other energy-intensive sources such as ocean desalination could prevent as much as 535,500 metric tons of CO_2 from entering the atmosphere annually, the equivalent of taking nearly 100,000 cars off the road each year.

The rapid rate at which buildings in the United States are replaced or redeveloped magnifies the potential to achieve water resources, energy and climate benefits. By the year 2030 some 50 percent of the residential and commercial buildings in the United States will have been built after 2000, and each of these buildings presents an opportunity to integrate LID practices that can harness water supplies.

LID offers a number of opportunities to reduce the energy required to supply water:

- Capturing water or infiltrating it onsite can offset the energy-intensive pumping needed to convey water to arid regions, such as Southern California.
- Capturing water or infiltrating it onsite also can reduce the need to desalinate or otherwise purify ocean water, an energy-hungry practice.
- Allowing water to permeate the earth can recharge groundwater aquifers so that their levels rise, allowing pumping to occur from shallower, less energy-intensive depths.

LID Is Cost Effective

The U.S. Environmental Protection Agency states that "LID practices can reduce project costs and improve environmental performance."[3] As a result, LID practices can provide a targeted, cost effective means of addressing issues of water pollution, water supply, and climate change all at once.

Greening Cities in California Can Help Solve Water and Energy Challenges

Rain Garden / Photo Courtesy of USDA NRCS

Nationwide, about 4 percent of power generation is used for water supply and treatment, but in certain parts of the United States the number is far higher. California is particularly vulnerable: conveying water in the state requires electricity at a rate far above the national average. As in many western states, the sources of water used for urban or agricultural supply in California are often far removed from the cities and fields they must reach. As a result, water travels long distances from its source, resulting in huge expenditures of energy to pump the water through deserts or over mountain ranges. The California State Water Project, which transports water from the San Joaquin-Sacramento Bay Delta over hundreds of miles and thousands of feet of elevation to supply Southern California's more than 20 million residents, is the state's single largest user of electricity. The massive amount of energy needed to transport water emits greenhouse gases such as CO_2, which contributes to global warming. As a result, the safe and sufficient supply of water in California is both a casualty of global warming, and a contributor to it.

LID, however, can provide other sources of water, primarily produced from local sources that require significantly less energy to supply. It takes up to *twenty times more energy* to supply water to Southern California through the State Water Project as it does to supply groundwater locally. Where rooftop runoff is captured in tanks for use in gravity fed irrigation systems, no electricity use may be required at all. LID strategies implemented widely can significantly increase the amount of water available to recharge groundwater or for capture and onsite use, and help offset the need to supply water through the much more energy-intensive State Water Project.

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Putting LID to Work in Your Community

- **Individuals** can plant landscaping native to their region's climate to reduce the need for extra watering, and install rain barrels or cisterns to gather rain for the garden instead of using water from the tap. Homeowners can redirect downspouts so they empty water onto vegetation, and plant rain gardens at the bottom of inclines to absorb rainfall so it replenishes aquifers instead of carrying runoff pollution into our waterways.
- **Businesses** can install green roofs and integrate cisterns to harvest rainwater for non-potable uses such as landscape irrigation or to flush toilets.
- **Developers** can use permeable pavement and other porous materials in new development and redevelopment, and preserve open space in construction.
- **Governments and municipalities** can use LID on a larger scale to cut back on city-wide runoff and the sewage overflows that occur when too much rainwater causes sewer systems to dump waste into our waterways. Governments can also offer tax credits to business and individuals who invest in green infrastructure improvements. Several cities across the country are also initiating programs to "green" their streets through utilizing permeable pavement. Governments and municipalities can also require the use of LID practices in retrofits, redevelopment, and new properties to achieve water quality and water supply goals.

Rain barrels, such as this one in Santa Monica, California, capture rainwater for the garden

Green roof in Vista Hermosa Park, Santa Monica Mountains Conservancy, Los Angeles

[1] EPA, *National Water Program Strategy: Response to Climate Change* (2008), at 24-25, at http://www.epa.gov/water/climatechange/strategy.html.

[2] One acre-foot contains 325,851 gallons or enough to flood a football field to the 91 yard line with water a foot deep, or enough to supply roughly two families in California for a full year.

[3] U.S. Environmental Protection Agency, December 2007, *Reducing Stormwater Costs through Low Impact Development (LID) Strategies and Practices*, http://www.epa.gov/owow/nps/lid/costs07/.