

What is low impact development

An innovative stormwater management approach modeled after nature: infiltrate, filter, store, evaporate, and detain runoff close to its source. The overarching idea is to treat water as a resource instead of a waste product, highlighting its importance in a desert environment. Spaces designed using LID should be multifunctional and utilize strategies that are simple, effective, economical, flexible, and balanced.¹ LID can be applied at various scales from single residences and businesses to entire watersheds.

“LID should strive to have a positive impact, not just a *low* impact.” - Catlow Shipek, Watershed Management Group

Arizona urban development patterns have created unintended consequences including urban heat island effects, air quality issues, pollution, and unsightly streetscapes and public areas. The growth of roadways and lack of trees and vegetation creates large volumes of stormwater runoff that pick up toxic and environmentally damaging pollutants that eventually flow into ecologically sensitive areas.

In 2008, the Environmental Protection Agency noted 136 incidents where Arizona waters were severely impaired by pollution; one of the leading causes was urban runoff or nonpoint source pollution.²

Low impact development benefits

- ✓ Improves water quality
- ✓ Reduces flooding
- ✓ Protects and restores aquatic habitats
- ✓ Increases ground water recharge
- ✓ Mitigates Urban Heat Island
- ✓ Saves energy
- ✓ Reduces air pollution
- ✓ Increases property values
- ✓ Conserves water
- ✓ Mitigates climate change
- ✓ Beautifies urban areas

The economic question

The benefits of LID have not been adequately researched and quantified for arid environments. LID can save on capital costs and represent responsible spending of public funds. When other benefits are taken into account, LID projects can improve community health, safety, and general welfare. Continued research and economic evidence is needed to assist decision makers and the engineering community to integrate LID into standard stormwater management designs.

“Implementing GI and LID are good for the community but do not necessarily benefit its creators.” - Evan Canfield, Pima County Chief Hydrologist

LID Principles¹

- ✓ Keep water close to the source
- ✓ Preserve landscape features
- ✓ Minimize imperviousness
- ✓ Create functional, appealing site drainage
- ✓ Treat stormwater as a resource rather than waste
- ✓ Reduce impact of built areas
- ✓ Promote natural movement of water
- ✓ Protect ecologic and hydrologic functionality
- ✓ Encourage sustainable stormwater practices



LID Techniques for Pima County³

- ✓ Water harvesting basins
- ✓ Vegetated and rock swales,
- ✓ Bio-retention basins
- ✓ Infiltration trenches
- ✓ Cisterns
- ✓ Pervious pavements
- ✓ Curb cuts
- ✓ Pretreatment filters
- ✓ Disconnected downspouts
- ✓ Berms and spillways



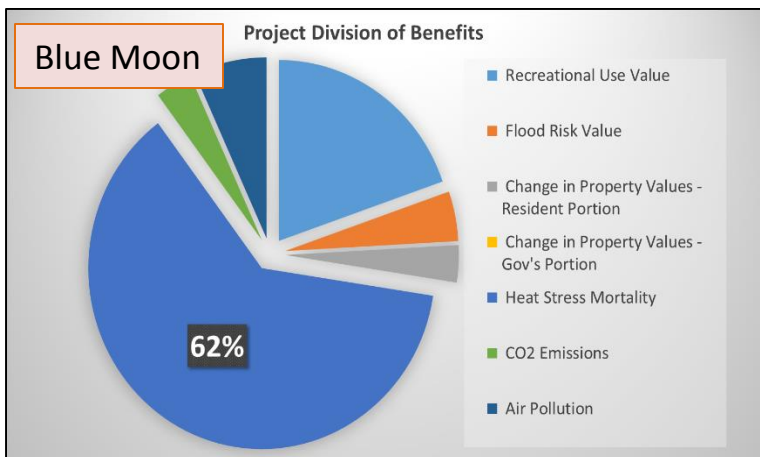
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 2. EPA. (2008). Arizona Water Quality Assessment Report. Retrieved from http://iaspub.epa.gov/tmdl_waters10/attains_state.control?p_state=AZ&p_cycle=2008
 3. City of Tucson & Pima County. (2014). Low Impact Development and Green Infrastructure Guidance Manual, November 2014 Draft.
 4. HDR. Retrieved from <https://www.hdrinc.com/sites/all/files/content/articles/article-files/3275-sustainable-return-on-investment-sroi-can-help-get>

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 1. LID Working Group
 2,4. Authors
 3 Wheat Scharf Assoc.

The business case evaluator (BCE)

The Pima County Regional Flood Control District and the Pima Association of Governments contracted with Impact Infrastructure LLC, the creators of the BCE, and Stantec to evaluate LID features specific to the desert Southwest.

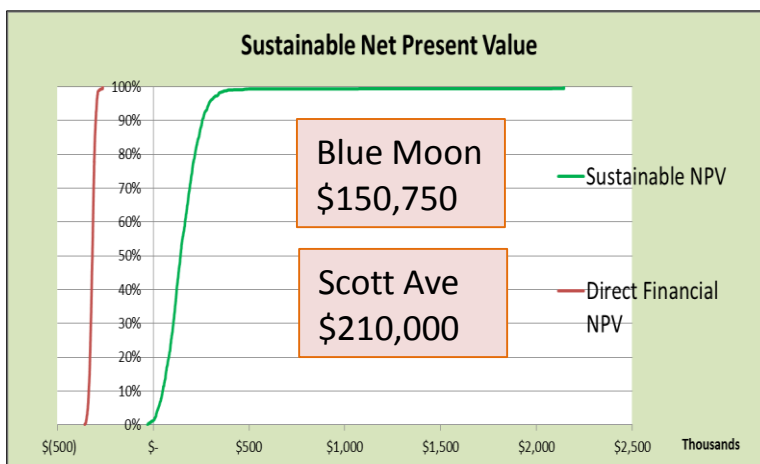
The BCE is an economic module of the Envision Rating System framework for evaluating the community, environmental, and economic benefits of infrastructure projects. BCE is a sophisticated Excel spreadsheet that incorporates economic modeling, in depth LID research, and Monte Carlo statistical simulations to produce potential values for a project. Based on sustainable net present value (S-NPV) and sustainable return on investment (S-ROI), the BCE quantifies time discounted benefits that have not been accounted for in traditional capital cost analyses. It can, for example, account for resource use and waste, recreational benefits, air and water quality, and flood risk.



Conclusions

Both projects showed a positive S-NPV utilizing available information. Removal of impervious asphalt, additional trees, and reduction of heat stress constitute the greatest benefits. Blue Moon would have had a large negative S-NPV without federal funding. Until all aspects like social well-being can be captured, grants and outside funding are critical. Property owners on Scott Ave are improving their properties but the contributions of LID to property valuation is not yet fully understood.

To better understand the value of LID, the true costs of conventional stormwater management need to be understood and made accessible and the multiple benefits of LID taken into account. Achieving these two objectives should help build the business case for LID becoming standard practice.



Sustainable Return on Investment (S-ROI)

Financial evaluation methodology that assigns monetary values to all costs and benefits of a project or investment including economic, social, and environmental. Helps communicate benefits and account for externalities that are not part of traditional economic assessments.⁴

Recommendations for Tucson

- Provide accessible and comprehensive central repository for financial information and project data.
- Combine a life-cycle costing framework with Impact Infrastructure's AutoCase tool to create a methodology to expedite LID adoption and acceptance.
- Make community health, safety, and welfare a part of all City of Tucson project assessments.