



The State of Low Impact Development in Connecticut Policies, Drivers and Barriers

Synopsis

This paper presents a “state of the state” for low impact development (LID) policy implementation in Connecticut. In 2015, the plans and regulations of 85 of Connecticut’s 169 municipalities were reviewed for LID-related language, based on a framework developed by the University of Connecticut’s Nonpoint Education for Municipal Officials (NEMO) program. Follow-up telephone interviews were then conducted with 78 individuals involved in the land use planning process in those towns.

It is clear that LID has established a presence in the state. Almost every interviewee (76) noted that there was at least some support for LID in their communities. All towns have integrated some form of LID as broadly defined (see About this Study) into their plans and regulations, although in many cases the practices found were conservation practices (tree conservation, open space preservation) that are not specifically focused on stormwater management. However, that general support has not consistently translated into more specific LID requirements.

By far the most common driver cited for the adoption of LID policies was the work of either staff or land use commission “champions.” This was followed by general concern for protecting the environment and addressing stormwater issues. The most common obstacles to implementing LID were perceived higher costs of LID practices and lack of educational opportunities. Recommendations for furthering LID in Connecticut included more learning opportunities, economic incentives, stronger state regulations, and improved local interdepartmental communication within towns. These results suggest that expanded education would be an effective and cost-effective way to accelerate the adoption of more specific LID requirements into local regulations.

About this Study

Connecticut, along with the rest of the country, is at least 25 years into an era of water resource protection that increasingly recognizes the importance of dealing with land use-derived stormwater runoff to protect water quality. Low impact development (LID), also called green stormwater infrastructure (see box, next page), is a major strategy to address these issues. CLEAR (Center for Land Use Education and Research) has a long history of assisting towns with land use planning and stormwater management, dating back to the advent of the national award-winning Nonpoint Education for Municipal officials (NEMO) program in 1991. With NEMO’s 25th anniversary looming, and a major revision of DEEP’s “MS-4” general stormwater permit going into effect in 2017 the time was ripe for a status report on LID adoption in towns across the state.

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Low Impact Development,

or LID, is a site design and stormwater management strategy intended to maintain or replicate predevelopment hydrology through the use of small-scale controls integrated throughout the site to manage runoff as close to its source as possible. In recent years this concept has also been referred to as “Green Infrastructure,” or “Green Stormwater Infrastructure,” and there is some latitude as to the definition of each term. In this publication we use the term LID as defined above, both to avoid confusion and because this is the term almost universally the one used in Connecticut municipal plans and regulations.

The purpose of this study was to “take the temperature” of LID policy implementation in municipalities across the state. The results provide insight into the motives and barriers towns face when integrating LID into their plans and regulations, and relate recommendations and thoughts for the future from staff, commission members, and others who have dealt directly with LID in the field. The intent of the authors is that the information will benefit Connecticut municipalities endeavoring to adopt LID policies and approaches, as well as organizations that wish to assist them like UConn CLEAR’s NEMO program and the CT Department of Energy and Environmental Protection (DEEP).

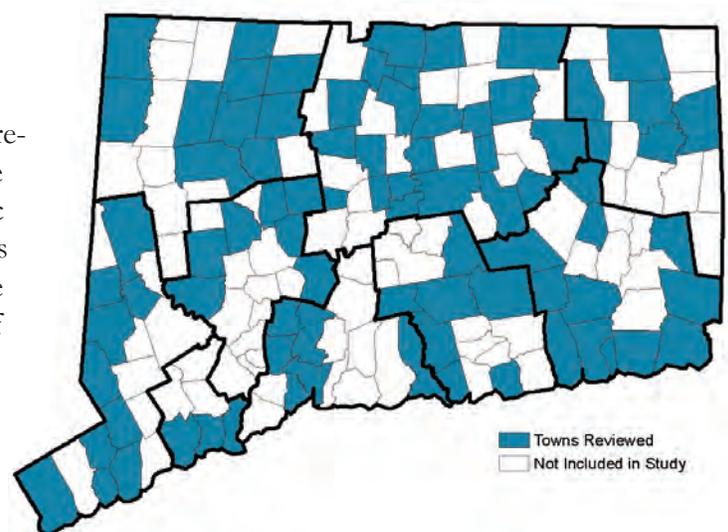
This study was done in two phases. The first phase focused on a review of the plans and regulations of 85 Connecticut towns for references to LID, or LID policies. The second phase involved collecting on-the-ground experiences with LID policy adoption via phone interviews involving 74 towns, in an attempt to capture real-world problems and successes with LID implementation.

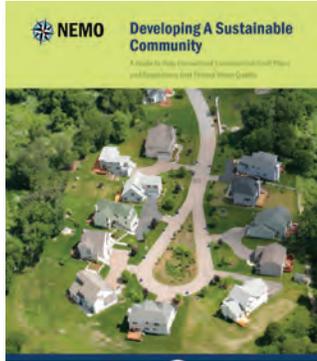
Status of LID in Municipal Plans & Regulations

Methods

We reviewed the plans and regulations of 85 Connecticut towns (see Figure 1) through internet research. The number of towns included was restricted by available CLEAR resources and the towns were not randomly chosen. We started with towns that were known to the CLEAR/NEMO team as working on LID. The list was then expanded to ensure that the overall pool represented all nine regional councils of government (COGs) in the state, as well as a wide range of population sizes and economic status. Because of the way the towns were chosen, the statistics generated by the study should not be extrapolated to the entire state. Notwithstanding this shortcoming, with just over half of Connecticut’s 169 municipalities surveyed, the results can be considered to be robust and informative.

Figure 1: Towns reviewed shown in blue (85 in total). Regional COGs outlined in black.





See Appendix Table 1, page 8, for descriptions of each of the 14 GSI strategies mentioned in “Developing a Sustainable Community.”

To examine town plans and regulations, we compiled Plans of Conservation and Development, Zoning and Subdivision regulations, Stormwater and Low Impact Development guides, and Inland Wetlands and Watercourse regulations from municipal websites. First, each town’s documents were reviewed for any general references to “reducing impervious surfaces” or “LID.” Second, we looked for specific policies related to LID. There is no one overarching LID policy that towns can easily adopt. Rather, LID must be integrated into various regulations and plans addressing a wide range of land use planning issues. “Developing a Sustainable Community,” a guide prepared by the NEMO program in 2009, outlines many of these strategies. The guide is organized around 14 LID policies that are divided into three general land use planning topics: (1) residential streets and parking; (2) lot development practices, and; (3) conservation of natural areas (for a list of these strategies see Appendix 1).

Results

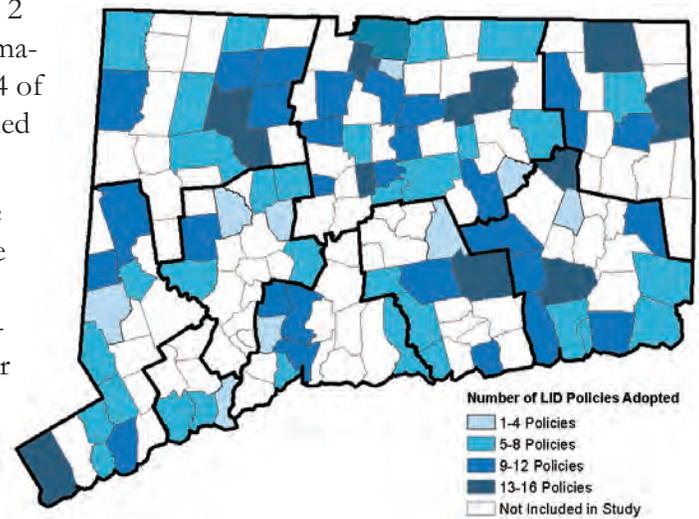
The majority of towns reviewed demonstrate an awareness of LID approaches and an interest in reducing impervious surfaces. Of the 85 towns reviewed, 65 (76%) mentioned reducing impervious surfaces and 54 (64%) specifically mentioned low impact development somewhere in their plans or regulations. However, that general interest does not consistently translate into specific LID requirements or policies. See box, lower left, for a full breakdown of the number of towns adopting each of the recommended LID approaches. A summary of those results follows.

- Of the 14 specific LID policies, the three most common were conservation or open space subdivisions, tree conservation, and the requirement of stormwater management plans for developments of a certain size. More than 85% of towns included in the review implemented one or more of these conservation strategies. While these three share the broader goals of reducing imperviousness and addressing stormwater, they are not specifically focused on LID practices.

LID Practices by Number of Towns Adopted	
1. Conservation/Open Space Subdivision	(76 out of 85 towns)
2. Tree Conservation	(71 out of 85 towns)
3. Stormwater Management Plan	(65 out of 85 towns)
4. Riparian Buffers	(59 out of 85 towns)
5. Parking Area	(44 out of 85 towns)
6. Sidewalks	(44 out of 85 towns)
7. Clearing and Grading	(43 out of 85 towns)
8. Parking Runoff	(41 out of 85 towns)
9. Road Drainage	(34 out of 85 towns)
10. Driveways	(28 out of 85 towns)
11. Street Width	(25 out of 85 towns)
12. Cul-De-Sacs	(21 out of 85 towns)
13. Roof Runoff	(21 out of 85 towns)
14. Setbacks	(21 out of 85 towns)

- Approximately 52% of municipalities integrated reduced sidewalk and parking requirements into their regulations. Other LID practices specifically addressing impervious surfaces (minimizing parking runoff, promoting shared driveways, narrowing street widths, and altering cul-de-sac design) were implemented in less than half of the towns. The two least common LID applications were practices to reduce roof runoff and relax setback and frontage requirements. These appeared in approximately one out of every four towns in the study.
- There was a wide range among towns in the number of LID practices that have been adopted. Nearly half of the towns (41) have adopted 9 or more of the LID policies tracked (14 specific practices and 2 general policies). Of those 41, 12 towns have adopted the vast majority of the identified LID policies (13 or more). Conversely, 44 of the reviewed towns have adopted 8 or fewer of the recommended policies, with 11 adopting 4 or fewer. (See Figure 2.)
- Note: The number of high adopter and low adopter towns were also evaluated based on each town's size and median home price to gauge whether those factors had an effect on willingness to adopt LID policies. However there was no clear relationship between those demographic and economic factors and the number of policies adopted. More research is needed on this topic before making any conclusions.

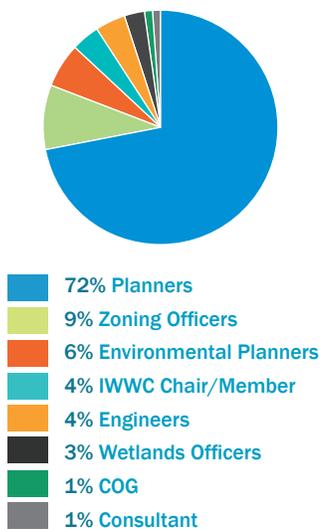
Figure 2: Number of LID Policies Adopted



To explore these results further, visit our interactive storymap at s.uconn.edu/stateoflid.

The View from Practitioners

Figure 3: Breakdown of Respondents



Methods

To gain a better understanding of the on-the-ground realities behind the inclusion of LID in town plans and regulations, we conducted 78 confidential interviews involving 74 of the 85 reviewed towns (Figure 1). As with the internet research, the number of towns was determined by our interest in including representatives from all nine CT planning regions and communities of diverse size and economic status, as well as by time and resource limitations.

The pool of interviewees included town planners, zoning officers, wetlands officers, inlands wetlands and watercourse commission members, environmental planners, engineers, council of government (COG) staff members, and consultant planners. While the study included a wide array of community perspectives, town planners were our chief target and contributed a majority (72%) of the responses (see Figure 3). It should be stressed that information collected in the interviews was limited to opinions of the individuals, and do not necessarily reflect the perception of all the town's staff and/or officials.

Each phone interview ranged from approximately 10 to 30 minutes in length. During these conversations, we used a “semi-structured” interview approach. Interviews were loosely structured conversations focused on three main questions (see box, right), along with impromptu follow-up questions based on individuals’ responses and findings from the Phase 1 research. Verbal responses were categorized by question and the results were recorded.

Main Interview Questions
1) Does your community encourage/require the use of low impact development or green infrastructure to deal with stormwater? And if so, in what ways?
2) What would you say are the factors driving your community to encourage (or not encourage) LID?
3) What are the biggest obstacles to implementing LID regulations or practices in your town?

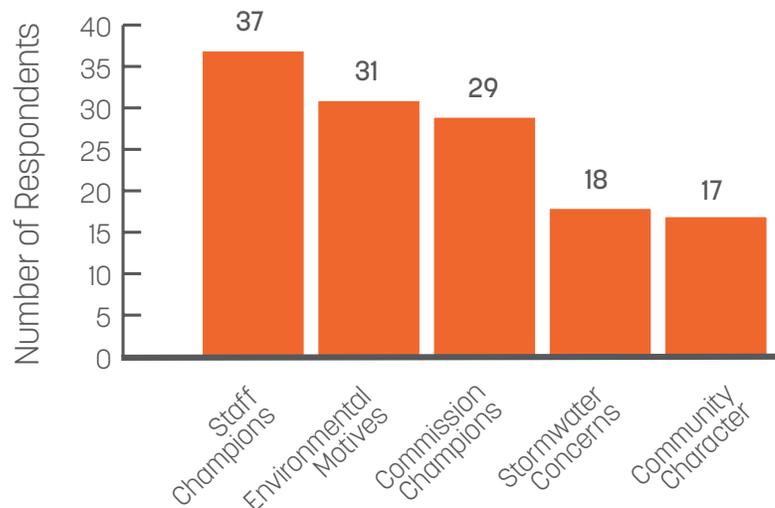
Results

Drivers

Interviewees were asked, “*what would you say are the factors driving your community to encourage (or not encourage) LID?*”

- Staff and/or commission “champions” were repeatedly named as the motive force behind LID implementation (see Figure 4). An impressive 49 of the 74 towns said that these individuals played a particularly strong role in pushing LID forward, whether through pressing the topic in planning meetings with developers or advocating for its integration into town regulations.
- Environmental motives and stormwater concerns were also named as major reasons for acceptance of LID. Environmental rationale for LID included stewardship of local water resources and an overall desire to protect the environment. In contrast, stormwater concerns centered more on specific issues such as flooding, erosion, and sedimentation control.
- The other top drivers were overall community values, and concern for maintaining community character. See Appendix 2 for a full breakdown of drivers.

Figure 4: Top 5 Motives for Implementing LID

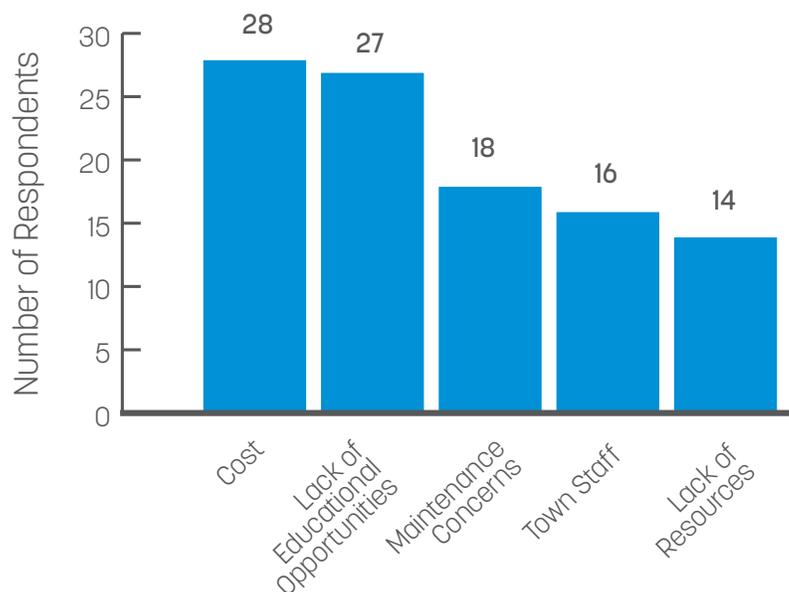


Barriers

After the discussion on motives, interviewees were asked, “what are the biggest obstacles to implementing LID regulations or practices in your town?” Two barriers dominated the responses: cost (or perceived cost), and the lack of educational opportunities for various actors in the land use planning process. (Figure 5).

- Interviewees listed the higher cost of LID as a major barrier. “Higher cost” in this context has several interpretations. Some individuals cited higher cost as a fact, while most mentioned the perception of higher cost among developers and commission members.
- The other most frequently cited barrier was the lack of educational opportunities. 38% of respondents mentioned a need for more learning opportunities for a variety of audiences in order for LID adoption to continue. Several interviewees indicated that many engineers and public works employees are wary of LID because they are unsure of how to install and maintain the practices, and/or feel it is still unproven. Town planners also indicated a need for more education on LID for themselves, leading to discomfort in whole-heartedly recommending or championing LID. The need for education for the general public was also mentioned.
- Maintenance concerns were also a recurrent theme. Interviewees explained that often times it is unclear where the responsibility lies for the long-term care of LID sites, especially in residential settings when properties change hands. Furthermore, respondents mentioned a disparity between a town’s experience maintaining conventional stormwater methods in comparison with newer, more dispersed low-impact methods.

Figure 5: Top 5 Barriers to Implementing LID



- Other obstacles included town staff resistance, lack of resources, the lack of economic incentives, the need for clearer/stronger state guidance, and the difficulty of collaboration, whether between departments within one town, or across town lines. See Appendix 3 for a full breakdown of barriers.

Recommendations from Practitioners

While interviewees were not specifically asked for recommendations, the open nature of the interviews led many to offer suggestions for increasing the use of LID at the local level. Some common themes included:

- Increased education and outreach. Examples included workshops on LID maintenance for public works departments, flyers highlighting successful approaches in other CT towns, and free programs from UConn and DEEP introducing LID concepts.
- Enhanced economic incentives.
- Strengthened or expanded statewide regulations.
- Technical assistance to towns on how to integrate LID into land use regulations. This last suggestion is even more relevant considering the requirements of the new MS4 General Permit (see box on the left).

A New “MS4” Stormwater Permit

The CT Department of Energy and Environmental Protection (DEEP) issued a new Municipal Separate Storm Sewer System (MS4) General Permit on January 20, 2016 that will be effective on July 1, 2017. The new permit applies to 121 of Connecticut’s 169 towns and brings many new requirements including increased use of LID to address stormwater issues. More specifically:

- All MS4 towns must include LID in their land use regulations.
- Town land use regulations must address long term maintenance of stormwater management measures.
- Towns must reduce directly connected impervious area by 1% per year.

These changes are expected to have a significant impact on the state of LID in Connecticut. While the new MS4 rules will likely become a primary driver of LID, the barriers to LID identified in this study remain and will need to be addressed even more urgently than before.

Discussion

The state of LID in Connecticut is at an interesting point. Nearly 25 years have gone by since these concepts were first introduced in the state, but only perhaps half that time since “early adopter” towns experimented in on-the-ground implementation. As our plans/regulations research shows, LID practices as codified through town documents are often still restricted to methods that have their genesis in broader conservation efforts. This is not a bad thing by any means. However, there is a slower adoption rate for the more stormwater-specific practices that most have come to equate with the term LID (or the more recent “green stormwater infrastructure”).

Our interview results indicate that for the most part, the LID concept is familiar at the local level, and the interest is there. Where adoption has occurred, it has most often been the work of local staff or commissioners (or others) that



champion the LID cause and keep up the pressure and/or momentum for change. The critical role of local champions confirms the convictions of the NEMO team based on their 20+ years of working with communities on land use issues. Where adoption is slow or nonexistent, the prime barriers are cost and education. In some cases the higher cost may be quite real, but in many others it is a perception that can be dealt with by addressing the other barrier, lack of education. Many other barriers, like maintenance concerns and “push-back” by town staff, developers or the public, are also issues that can be addressed through education and technical assistance.

An important observation is that there appears to be a disconnect between what is “on the books” in plans and regulations and what is practiced “on the ground.” In other words, the level of commitment to LID in plans and regulations did not indicate the level of LID adoption occurring in the real world. Interviews revealed that some towns that rated high in the Phase One research did not appear to have many actual installations of LID, while other towns with a low rating had quite a few. These results illustrate the critical importance of the “champion factor” noted above, but also highlight the danger of relying on champions. Once these individuals are gone, if the practices aren’t solidified in town plans and regulations, will they be continued?

Conclusion

Overall, study results seem to indicate that expanded education would be an effective and cost-effective way to further accelerate the adoption of LID practices in Connecticut municipalities. This education should address the real and perceived barriers that were identified, and encourage the development of informed local champions of LID while assisting towns to codify their commitment in plans and regulations.

Appendix 1: Recommended LID Practices*

*From *Developing a Sustainable Community from UConn NEMO program, 2009.*

LID Practice	
1. Street Width	Design residential streets for the minimum required pavement width needed to support travel lanes, on-street parking, emergency services and maintenance access. (25 out of 85 towns)
2. Cul-De-Sacs	Minimize the number of residential cul-de-sacs and, where they do exist, incorporate landscaped areas to reduce impervious cover and encourage infiltration of stormwater runoff. (21 out of 85 towns)
3. Road Drainage	Where density, topography, soil and slopes permit, vegetated swales should be used in the street right-of-way to convey and treat stormwater runoff, replacing curb and gutter drainage systems (34 out of 85 towns)
4. Parking Size	Required parking ratios governing a particular land use or activity should be enforced as both a maximum and a minimum in order to curb excess parking construction. Further, reduce the overall imperviousness associated with parking lots by minimizing stall dimensions and incorporating efficient parking lanes. (44 out of 85 towns)
5. Parking Runoff	Wherever possible, provide stormwater treatment for parking lot runoff using bioretention areas, filter strips and/or other practices that can be integrated into required landscaping areas and traffic islands. (41 out of 85 towns)
6. Conservation/Open Space Subdivision	Encourage development designs that minimize total impervious area, reduce total construction costs, conserve natural areas, and provide community recreational space and promote watershed protection. (76 out of 85 towns)
7. Setbacks and Frontages	Relax side yard setbacks and allow narrower frontages to reduce total road length in the community and overall site imperviousness. Relax front yard setback requirements to minimize driveway lengths and reduce lot imperviousness. (20 out of 85 towns)
8. Sidewalks	Promote more flexible design standards for residential sidewalks on only one side of the street and provide common walkways linking pedestrian areas, use permeable pavement. (44 out of 85 towns)
9. Driveways	Reduce overall lot imperviousness by promoting alternative driveway surfaces and shared driveways that connect two or more homes together. (28 out of 85 towns)
10. Roof Runoff	Direct roof runoff to pervious areas such as yards, open channels, or vegetated areas and avoid routing rooftop runoff to the roadway and the stormwater conveyance system. (20 out of 85 towns)
11. Stormwater Management Plan	As a minimum, a stormwater management plan should be required for sites that have disturbance equal to or greater than one acre, as proposed by the CT Stormwater Quality Manual. The purpose of the plan is to identify potential water quality and quantity impacts of the proposed development, and to propose selected source controls and treatment practices to mitigate against those impacts. (65 out of 85 towns)
12. Riparian Buffers	Riparian Buffers: Create a naturally vegetated buffer along all water resources that also encompasses critical environmental features such as the 100-year floodplain, steep slopes, and wetlands, which should be preserved or restored with native vegetation. (59 out of 85 towns)
13. Clearing and Grading	Clearing and grading of forests and native vegetation at a site should be limited to the minimum amount needed to build lots, allow access, and provide fire protection. (43 out of 85 towns)
14. Tree Conservation	Conserve trees and other vegetation at each development by protecting trees and other vegetation during construction and by planting additional vegetation, clustering tree areas, minimizing native vegetation disturbance, and promoting the use of native plants. (71 out of 85 towns)

Appendix 2: LID Drivers

Drivers	Number of Respondents	Category Composition
Staff Champions	37	<ul style="list-style-type: none"> • Environmental Planner • Mayor/First Selectman • Planner • Land Use Administrator • Staff • Town Engineer • Water Pollution Control Authority • Zoning Officer
Environmental Motives	31	<ul style="list-style-type: none"> • Accumulation of Open Space • Environmental Motivation • Water Resources (Protection) • Water Quality Concerns
Commission Champions	29	<ul style="list-style-type: none"> • Boards • Conservation Commissions • Commissions • Flood and Erosion Control Board • Inland Wetlands and Water Course Commission • Planning and Zoning Commission
Stormwater Concerns	18	<ul style="list-style-type: none"> • Flooding • Runoff • Erosion/Sedimentation Control • Stormwater Control Concerns
Community Character	17	<ul style="list-style-type: none"> • Progressive Community Culture • Rural Community • Small Town • Surrounding Towns • Aesthetics
Private Sector	13	<ul style="list-style-type: none"> • Engineers (Local) • Private Developers/Landscape Architects • Strong Consultant
Education/Outside Organizations	13	<ul style="list-style-type: none"> • Education/Workshops • Conservation/Open Space Groups • Outside Organizations • Watershed Groups
Reduced Cost	9	n/a
Other	12	<ul style="list-style-type: none"> • MS4 • Observed LID Models in the Field • Funding/Grants • Easier to Monitor • POCD Updating Process

Appendix 3: LID Barriers

Barriers	Number of Respondents	Category Composition
Perceived Higher Cost	28	<ul style="list-style-type: none"> • Costs in General • Cost to Developers and Applicants • Cost to Town • Cost to Residents
Lack of Educational Opportunities	27	<ul style="list-style-type: none"> • Commission/Board Education • Community/Homeowners • Contractors • Developers • Nurseries • Planners • Private Engineers • Town Engineers • Staff
Maintenance Concerns	18	<ul style="list-style-type: none"> • Difficult to Keep Track of LID • Maintenance Concerns
Staff Pushback	16	<ul style="list-style-type: none"> • Lack of Coordination Between Planning and Public Works • Planner • Public Safety (Fire Department, etc.) • Public Works • Town Engineer
Lack of Resources	14	<ul style="list-style-type: none"> • Lack of Funding/Resources • No In-House Engineer • Time Constraints for Staff and Volunteers
Site Constraints	12	<ul style="list-style-type: none"> • Limited Land/Community is Built Out • Problems with Redevelopment and LID • Poor Site for LID Due to Soil Composition
Poorly Written Regulations	12	<ul style="list-style-type: none"> • Not in Regulations • Weak Regulation • Regulations Overcomplicated or Confusing
Low-Priority Issue	11	<ul style="list-style-type: none"> • Climate-change Doubters • Public Pushback
Developer Pushback	11	n/a
Public Pushback	9	n/a
Engineering Community	9	n/a
Other	18	<ul style="list-style-type: none"> • Town Does Not Want to Thwart/Hinder Development • Installation Concerns • Town Commission Pushback • Materials Inaccessible • LID Perceived as Unproven • No Incentive for Community Members • Past LID Failures • Regulators Compliant with Resistance • Town Wants to Hinder Development/Remain Rural



For more information on this study and an interactive story map, visit <http://s.uconn.edu/stateoflid>.



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CLEAR



This research project was funded by the Connecticut Department of Energy and Environmental Protection (DEEP) and the Department of Extension in the UConn College of Agriculture Health and Natural Resources through its internship program. Research brief design by Kara Bonsack. Maps by Manon Lefèvre and Cary Chadwick.