Forging the Link:

Linking the Economic Incentives of Low Impact Development with Community Decisions

A Delivery Guide

This presentation is intended to be introductory in content, providing a foundation for integrating LID and CC into local planning efforts. This presentation is intended to accompany the Resource Manual that provides additional background information for local implementation.

FTL focuses on the economic incentives of LID to address the local decisional realities of community watershed protection to protect clean water. The presentation also articulates the connections between LID and climate change adaptation planning, demonstrating the benefits of capturing runoff at the source as a means to protect valuable infrastructure from changes in hydrology as a result of changes in climate.

This presentation is an ideal follow-up to many introductory presentations on low impact development strategies as it details, through case studies, several examples of local government's approaches to implementing the techniques. The presentation can be scheduled as a standalone presentation, or ideally, as an hour long session that includes time for discussion.

The Intended Audience:

This presentation contains concepts that are introductory in nature but details the economic incentives to LID. It is best suited for audiences seeking to understand the effects of land use changes on water resources, the economic incentives of LID, changes in climate and strategies to address them. The intended recipient of the presentation are local officials (elected, appointed and volunteer) and local staff. The accompanying resource manual is best suited for the audience to obtain detailed information regarding the material in the presentation.

The Presentation:

FTL consists of about 100 slides in a PowerPoint file. While the number may seem intimidating, many are visual in nature with limited text. Typically, the presentation will take approximately 25-30 minutes to deliver.

The presentation is organized and ordered around the following themes:

1. Communities are facing the challenges and opportunities of growth
2. Unplanned growth can lead to a loss of natural resources that support a community's health and quality of life
3. Local government is responsible for the health, safety and general welfare of their residents
4. Communities are facing economic challenges that dictate their actions
5. New economic examples of how communities have addressed these challenges

6. Communities are facing changes in climate that affect their infrastructure and long range planning efforts
7. Referencing new information about the connections between LID as an adaptation measure
8. This type of planning is achievable, realistic and economical

Delivering the Presentation

This presentation is a mixture of images and slides with limited text. A script accompanies each slide in the notes section with information regarding the image or data presented. While the presenter may choose to improvise, the text is intended to permit the presenter to have a baseline of information to reference.

Adapting for Local Relevance

Many of the images contained in the *FTL* presentation are site specific with geographic reference. Other photos are random images representing the concept being communicated.

The presentation is designed to be modified by the presenter to tailor to a community's specific needs or issues. Inserting local images of landscapes, projects, people, etc helps build the understanding and acceptance of the issues.

Discussion Questions and Process

A typical outreach or educational program will present technical information followed by a question and answer session that relies upon the presenter to provide responses to directed requests for additional information. While this approach is successful for improving the comprehension of the material presented, it limits the audience's opportunity to understand various perspectives from their neighbors. A collaborative educational approach allows participants to develop their own solutions based upon the concepts introduced in the presentation. To maintain the process and dialogue, ground rules and outlined expectations are identified.

At the end of the presentation, a brief questioning session permits the audience to ask a few questions of clarification of the information heard and seen. A series of questions to the audience begins the dialogue *between* the participants. The process may require the organizer of the session to either obtain the assistance of an objectively removed facilitator or the organizer may accept the additional role to facilitate the process and dialogue.

There are many means to leading stakeholder based processes to reach an outcome. The following *Focused Conversation* framework directs participants through a series of questions that lead the participants through objective, reflective, interpretive and decisional phases of questions directed to the participants.

The objective phase draws out facts and external realities.

- "What words, objects or phrases stood out to you?"

The reflective phase brings forth an immediate personal reaction or response to the information presented.

- "What information did you hear surprised you?"

The interpretive phase draws out meanings, values, implications of the information presented or to be discussed.

- "What does the data mean for us?"
- "Where did you find yourself saying. 'A-Ha!'?"

The fourth and final phase of the process is the decisional phase. The objective of the decisional phase is to elicit resolution, make new directions or determine a route to implementation.

- "What actions can we take?"
- "Who will lead the next steps?"

Contact:
Robert M. Roseen, Ph.D. P.E., D.WRE • Director, T he UNH Stormwater Center
Environmental Research Group, Department of Civil Engineering, 35 Colovos Road, UNH, Durham, NH 03824 ph 603-862-4024 fx 603-862-3957 robert.roseen@unh.edu

Todd V. Janeski • Environmental Scientist, Virginia Commonwealth University
1000 W Cary St., PO Box 843050, Richmond, VA ph 804-371.8984 fx: 804-786-1798 tvjaneski@vcu.edu

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Presentation Script

1. Cover slide

2. Guiding Principles—Summary of Three Points

3. Communities throughout the country

4. are confronting the opportunities

5. and challenges of growth. In these tough economic times, many communities are doing all they can to attract new growth.

6. At the same time, many want to maintain the unique character of their community. But these communities are also confronted with new challenges such as changes in climate.

7. That will put strain on the local resources which were not anticipated. The Forging the Link presentation is working toward

8. new tools for local assistance providers to help those localities face their issues

9. Over 50% of the Nation's population lives in 17% of the US land area (NOAA, 2010)…

10. …and that 17% is the coastal portion of the Nation. This region saw a population…

11. …increase of 46% from 1970 to 2010…

12. And is expected to increase another 7.1M by 2015 (or 5%)

13. In the Chesapeake Bay region, home of our Nation's Capitol, population growth increased by 8% in the 1990s,

14. the amount of farm and forest land lost to development increased by 25%.
    For example, about 100 acres of forest is developed every day. In short, we're using more land per person than we used to – largely as we move to less dense communities.

15. New development creates new hard surfaces – pavement, driveways, rooftops, etc.
    And these surfaces are increasing at a rate of 41% over the same period.

16. Let's take a look at what natural resources form the foundation of our communities.
    This community – like any other – depends on a natural water system, only parts of which are visible and obvious.

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17. The water system falls as rain or snow, is collected as surface water, flows into streams, then rivers and then to a lake…

18. …or a bay…
19. …or the ocean…

20. As the landscape changes and we add buildings, roads and other hardened surfaces in our rural, suburban and urban communities next to the forests, wetland, and active farmlands to affect how the water runs off the landscape…

21. …and leads us to this familiar image demonstrating the decline in stream health dramatically as the total hardened surface increases.

22. For community residents – that means a loss of some of the natural resources that form a community's quality of life –

23. …freshwater streams for recreation,

24. …wooded areas that cool the town,

25. …wetlands that support wildlife,

26. …local farmland that provides fresh produce

27. …and ultimately clean, safe and abundant water.

28. Informed community decisions are the foundation of the future of our communities and are linked to…

29. …thinking out where we develop and how we develop.

30. First, let's look at WHERE we develop. In the broadest sense this occurs when communities make decisions about two things: (1) the types of resources that are important to preserve and where they are located, and (2) the footprint of our communities – compact and vibrant or spread-out and disconnected.

31. A community might start thinking about the "where" by identifying what resources it values – perhaps wetlands, stream buffers, forests, active farmlands, cultural and historic resources,

32. They also provide a starting point for the second "where" question: where to grow. But there is a bit more to this, as a community might factor in choices to create compact vibrant town centers instead of more spread-out growth.

33. These decisions about where natural resources should be preserved and where development should be planned occurs at a community-wide level in the comprehensive planning process.

34. Important natural areas can be identified and located

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35. …while still accommodating the same levels of growth.

36. "How" we develop also plays a significant role in preserving clean water and protecting natural resources and community values.

37. A host of design techniques, often referred to as Low Impact Development, LID, or Better Site Design, exist for reducing polluted runoff through mimicking natural infiltration.

38. Polluted runoff diverted to raingardens…

39. or bioretention areas where it is filtered and absorbed, removing significant amounts of pollutants; nearly all of the sediment, one third of the phosphorous, half of the nitrates and nearly all of the zinc.

40. For example, we often plan parking lots for the handful of busiest shopping days of the year. The rest of the time these hard surfaces sit empty, flushing polluted runoff to sewers and streams. Pervious and vegetated pavers can replace significant expanses of these parking areas,

41. Roads can be designed to be more narrow with open drainage swales, not curb and gutter…

42. …or have the ability to infiltrate runoff.

43. And the roof tops of commercial and public buildings can be designed to capture runoff and reduce heating and cooling costs.

44. Bottom Line: How do these strategies affect the economics of growth? It really comes down to the bottom line, right? A recent survey of case studies comparing conventional development and low-impact development estimates a total project cost saving of 15 -50%.

45. At a development site in the Mid-Atlantic, LID principles saved $200,000 by eliminating stormwater management ponds; $160,000 was saved from reduced clearing and grading and $60,000 was saved in infrastructure costs by using swales. The developer was also able to add two additional lots adding about $90,000 to the value of the project. (In many cases cost savings are realized during site preparation, stormwater infrastructure and landscaping.)

46. One public utilities company estimated that retrofitting a street project cost 25% less than traditional curb, gutter and storm drain, savings mostly from reduced paving and stormwater infrastructure.

47. One study analyzed 184 randomly selected lots in one community. The study found that conservation subdivisions are more profitable than conventional subdivisions. Lots in the conservation subdivision carry a premium, are less expensive to build and sell quicker:
    - Lots on conservation subdivisions cost an average of over $7,000 less to produce.
    - Lots in conservation subdivisions sold in about half the time (9.1 mo – vs – 17 mo).
    - Lots in the conservation subdivisions had additional values of 12% - 16%/ acre over lots in conventional subdivisions.

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48. The USA EPA summarized several projects around the country and demonstrated realized cost benefits ranging from 15-80% (with an avg of 26%) through the use of LID as opposed to a conventional swm design (not including the 96% increase in cost due to LID).

49. A subdivision in Southern New Hampshire proposed a typical, conventional design for 24 lots and stormwater management that included ponds, curbs and typical asphalt roadways.

50. By considering an LID approach, the development was able to avoid over 8 catch-basins, 2 detention basins,

51. …avoided over 1600ft of curbing, 785' pipe, and 2 outlet control structures

52. When provided the opportunity to implement LID, the project was able to install porous asphalt at a cost increase of $45,000….

53. …that was generated from a savings of $5,000 in Site preparation, $72,000 in drainage costs, $6,500 by eliminating curb and gutter and $19,500 in permanent erosion control. The overall cost gain was nearly $50,000 or 6% of the total project costs.

54. Greenland Meadows, in Southern NH is a 28ac commercial development that typically would have at least 95% impervious surfaces, but by integrating LID, the site was able to achieve less than 10% impervious surfaces through such practices as…

55. …porous asphalt, rooftops and pavement with subsurface infiltration, and a gravel wetland.

56. You can clearly see the porous asphalt in the left image.

57. Greenland Meadows…

58. …was able to save over $70,000 on earthwork, $1.7M in stormwater due to the elimination of ponds and underground storage and had a net gain of $930,000 or 26% of the project stormwater costs.

59. Lets shift gears and look at big municipal CSO infrastructure. Portland Oregon…

60. …when faced with the costs of separating their storm sewers, estimated $144M for a traditional grey approach for the Tabor River. This 2.3mi sewershed needed upgrades that would improve the reliability, contain street flooding, stop sewer backups into basements and reduce the discharges into the Willamette River.

61. But an alternative plan that combined both a green and grey approach was developed that incorporated $11M in green alternatives and reduced the cost estimate by $63M…

62. …for an estimated budget of $81M. The green solutions included adding more than 500 green streets with vegetated curb extensions or stormwater planters…

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63. …green roofs and bioretention…

64. …and planting nearly 4000 street trees.

65. Kansas City, Missouri…

66. …has a 318sq mi sewer system with 58 sq mi of combined sewer with overflows averaging 6.4B gals annually. When faced with the costs of separating their CSO, estimated $6B+.The goals of the CSO separation were to capture 88% of the flows, reduce the frequency of overflow by 65% and lower the overflow volume to 1.4B gals/annually. In the Middle Blue River, a 744 ac. 34% impervious area, the cost was $54M for a grey approach and would be capable of reducing the overflows to less than 6/yr…

67. However, when considering a green-grey, integrated approach the cost estimates were $35M, $19M less than the original plan and would eliminate the need for storage tanks and still maintain the goal of 6 overflows/yr.

68. The Kansas City plan included practices such as rain gardens, bioretention cells, pervious pavement and infiltration areas. However, due to fiscal uncertainties, the green solutions budget has been set at $45M.

69. Chicago, Illinois has certainly been in the headlines as being a leader in green solutions…

70. …one of their more progressive approaches, to achieve their goal of addressing the separation of the CSO, was to alleviate the extensive flooding in their 1,900mi of alleys and approx 3,500 ac of impervious surface…

71. …through the implementation of the Green Alleys program. This resulted in an estimated total of over 70M gals of stormwater diverted in 2009 alone.

72. The City's program not only converted the alley areas but also implemented green roof installations (such as this on the City Hall), rain gardens, downspout disconnections and a turf to native grass restoration program

73. The decisions to implement these programs are up to you. But the challenges don't end at the understanding of cost.

74. New challenges, based upon changes in the earth's atmosphere, have demonstrated changing trends in our precipitation patterns…

75. These trends have demonstrated increases in the frequency of storm events over 1" from 1948 to 2006…

76. Looking at a watershed in southwestern NH and the changes to return rates for, or the means by which we design our culverts, the 75 yr storm happens every 25yrs and the 25yr is the 10.

77. Ice core measurements of CO2 have shown a significant spiking trend, in the last century.

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78. Ice out days are happening earlier, many cause by rain on snow events

79. The New England Climate is projected to continue these trends of more frequent extreme events. Winter precipitation is projected to increase between 20-30% and more will fall as rain than snow.

    Temperature changes are likely to appear as if NH has moved to NC, like one big snowbird.

80. Following suit, a future MN will have similar climate as Arkansas has currently.

81. With these changes, our infrastructure could be at risk and vulnerable such as our roads and bridges…

82. …our sewers…

83. …and fish habitat…

84. …and we may see more events such as these…

85. …with precipitation events resulting in greater discharges of pollution to our waterways…

86. In Spring 2005, some parts of New England suffered from an 11.5in rainfall in 24hrs that was calculated as a 500yr storm event and caused $6M in damages to private property and infrastructure. This storm happened much sooner than the once in 500yrs as "calculated".

87. To answer those questions, we need to understand what adaptation is. Adaptation is a means to resilience, or steps to changing our actions to address an outside force. What does this mean to municipal managers?

88. Lets look at a road lost due to a recent flood. The repair cost was $93,000 but the projected replacement cost was $28,000 had it been upgraded to accommodate the changes in storms.

89. The Oyster River is one of the tributaries of the Great Bay, in southeastern NH and contains the towns of Durham, Nottingham and Barrington. Antioch University conducted a build-out analysis to assess the changes to streams from land use changes based upon current zoning and conventional development

90. The goal of the study was to determine the vulnerability of stormwater infrastructure due to changes in climate and the resulting changes in hydrology. The study was also to illustrate the benefits of LID as a CC adaptation measure and the cost savings.
    Red are catchments of the culverts that are deemed undersized to pass the peak flow for a 24hr-25 years storm event
    Yellow at great risk of being undersized
    Green is adequately sized

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91. Currently impervious surfaces cover approximately 8% of the basin. As population grows and economic pressures increase, this is projected to increase through this century.

92. Projected precipitation for climate change for the Oyster by the mid 21st century could see the amount of rain from a 100 year storm event is projected to be the amount of rain in future 25-year storm events

93. The Antioch study was to determine the existing culvert capacity to pass peak flow

94. …and to identify which culverts where vulnerable to changes due to climate and land use conversion.
    Red symbols indicate vulnerability

95. LID practices reduced the number of culverts determined to be undersized on both the build out and climate change scenarios modeled

96. The additional runoff from build-out increases the per-culvert marginal cost by 22 percent. The additional runoff from build-out with LID also increases the per-culvert marginal cost, but only by 14 percent.
    LID methods reduce the marginal cost per culvert by one third

97. One way of looking at it is that LID can help address the impacts to aquatic ecosystems by addressing the increased rainfall at the source.
    As shown, the increased rainfall leads to a series of impacts on natural habitats.

98. Such as these practices like rain gardens, bioretention cells, pervious pavement and infiltration areas the watershed can capture the runoff at the source.

99. An active engaged community, addressing things like economy, future development patterns and clean water have the ability to affect their future.

100. Communities have the power – You have the power - to define a vision of the future…

101. ..that encompasses growth…

102. ..and community character,

103. ..quality of life…

104. ..and natural resource protection.

105. END

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