How can local governments in NC change stormwater management policy to encourage downtown redevelopment and improve environmental outcomes?

Report prepared for the Nicholas Institute for Environmental Policy Solutions

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EXECUTIVE SUMMARY

Policy Question: How can local governments in North Carolina change post-construction stormwater management policy to encourage downtown redevelopment and improve environmental outcomes?

Recommendations (Page 13)

We recommend that local governments in North Carolina adopt Alternative 3, off-site mitigation for stormwater, and Alternative 4, capital construction cost-sharing between the local government and developers in downtown areas. If adopting Alternatives 3 and 4 is not feasible for a local government, then at a minimum it should adopt Alternative 1, which maintains the status quo policy structure but mandates that developers and property owners maintain an escrow account to fund operation and maintenance for stormwater best-management-practices (BMPs).

Problem Statement (Page 1)

The most common stormwater policy structure across North Carolina local governments is for developers to bear full responsibility for stormwater BMP construction and the associated costs, and for the subsequent property owners to bear full responsibility for operation and maintenance of BMPs. This policy structure creates two problems. First, it deters redevelopment in urban areas, where BMPs are particularly expensive to install. Second, it delegates responsibility for operation and maintenance of BMPs to private citizens who are not able to sufficiently carry out that task because they have no engineering expertise.

Options for improvements to the policy framework to solve these problems are constrained. Local governments have been forced to make deep budget cuts due to the economic recession, and will be reluctant to adopt any policies that require new expenditures. Public officials might be especially reluctant to adopt innovative stormwater policies due to the perception that all benefits from improved stormwater management will accrue to downstream communities.

This student paper was prepared in 2010 in partial completion of the requirements for PPS 304, a course in the Masters of Public Policy Program at the Sanford School of Public Policy at Duke University. The research, analysis, and policy alternatives and recommendations contained in this paper are the work of the student team who authored the document, and do not represent the official or unofficial views of the Sanford School of Public Policy or of Duke University. Without the specific permission of its authors, this paper may not be used or cited for any purpose other than to inform the client organization about the subject matter. The authors relied in many instances on data provided to them by the client and related organizations and make no independent representations as to the accuracy of the data.
Criteria (Page 4)

- Maximize Positive Environmental Outcomes.
- Minimize Budgetary Impact to Local Governments.
- Minimize Barriers to Downtown Redevelopment.

Alternatives (Page 4)

1.) **Status Quo + Escrow Account for Operation & Maintenance.** The developer retains full responsibility for capital construction and the associated costs. Property owners retain full responsibility for operation and maintenance and associated costs. In addition, the developer is required to pay some amount (e.g., 25 percent of BMP construction cost) into an escrow account that is set aside to fund future maintenance or replacement needs of the BMPs. The property owner is required to replenish the escrow account as funds are withdrawn. The account acts as a guarantee that funds will be available for necessary maintenance activities. Several municipalities in North Carolina already require such an account.

2.) **Local Government Operation & Maintenance + Escrow Account.** The developer retains full responsibility for capital construction and associated costs. Developers and property owners are required to fund an escrow account as in Alternative 1, but the local government assumes full responsibility for carrying out operation and maintenance activities, as well as any maintenance costs not covered by the escrow account. The portion of operation & maintenance costs that falls on developers, property owners, and local governments respectively will be determined by specific policy design. Additional local government expenditures are funded by raising stormwater fees. The key difference between this Alternative and Alternative 1 is that in this case, local government staff is actually carrying out the operation and maintenance of stormwater BMPs, whereas in Alternative 1, that responsibility still falls on the private sector.

3.) **Off-Site Mitigation.** The local government assumes responsibility for capital construction of BMPs. However, BMPs are constructed in an off-site area away from the actual development site, and the resulting stormwater management improvements are sold as “credits” to developers. The developer pays capital construction and operation and maintenance costs through the purchase of credits. The local government is responsible for operation and maintenance of the off-site BMPs. Charlotte is the only city in North Carolina that currently employs an off-site mitigation program for stormwater.
4.) **Capital Cost-Sharing Within Downtown Area.** The developer is responsible for capital construction. Within downtown areas (as defined by the local government), the local government and the developer share capital construction costs. The local government contribution is funded by raising stormwater fees within the downtown district.
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Policy Question: How can local governments in North Carolina change post-construction stormwater management policy to encourage downtown redevelopment and improve environmental outcomes?

Problem Statement

The most common stormwater policy structure among local governments in North Carolina is to place all responsibility for stormwater management on the private sector. That policy creates two problems: First, it deters redevelopment in urban areas, where stormwater best-management-practices (BMPs) are particularly expensive to install. Second, it delegates responsibility for operation and maintenance of BMPs to private citizens who cannot carry out that duty because they generally have no engineering expertise. Options for improvements to the policy framework to solve these problems are constrained by the tight budgetary environment, as well as the perception that all benefits from improved stormwater management will accrue to downstream communities.

There are two main types of stormwater regulations: those dealing with construction activities, and those dealing with post-construction activities. This report will focus only on issues with post-construction stormwater regulation. The goal of post-construction stormwater management is to mitigate the runoff that results when development creates impervious surfaces. In order to achieve that goal, developers are required to install stormwater BMPs that retain or slow down water as it runs off of those impervious surfaces, filtering out nutrients, sediments, and chemicals, before they reach creeks, rivers, and lakes.

For post-construction stormwater BMPs, as with any permanent infrastructure, there are two main phases: capital construction – the process of building the BMPs, and operation and maintenance – ensuring they work well and repairing them when they do not. For each phase, there are two fundamental public policy questions: (1) Who is responsible for funding the BMPs? and (2) Who is responsible for carrying out the work?

Local governments across North Carolina have answered these questions in various ways, but the most common policy framework is to place the burden of stormwater management entirely on the private sector. In that case, developers generally bear responsibility for capital construction and the associated costs, and the subsequent property owners generally bear responsibility for operation and maintenance of BMPs and those associated costs. Local governments must use enforcement powers to ensure that the private sector adequately carries out those responsibilities.
BMP Capital Construction Issues Deter Urban Redevelopment

The economics of stormwater BMPs are significantly different in dense urban areas than in suburban areas. In general, BMPs that are feasible in urban areas are considerably more expensive than those that are feasible in suburban areas. For a suburban, greenfield development, it is typical for a developer to install a large retention pond to catch stormwater runoff. On average, a retention pond designed to control for a 10-acre watershed costs about $65,000 to construct. Marketing retention ponds as an amenity that increases the value of the surrounding properties may offset some of these costs. For a development project in an urban area, space constraints and land prices generally preclude the use of retention ponds. Instead, developers generally build BMPs, such as underground sand filters that remove sediments and pollutants from stormwater before discharging it into an existing drainage system. On average, a sand filter designed to control a 5-acre watershed costs approximately $198,000 to build — over three times as much as the retention pond to control stormwater for a watershed twice the size. Underground BMPs, such as sand filters, also do not increase the value of surrounding property in the same way as retention ponds.

The permitting process for stormwater BMPs can also act as a deterrent for would-be downtown redevelopers. Local governments certify that developers have built adequate BMPs by issuing permits. The process of issuing permits takes some time. The more money a developer has leveraged for a project, the more that time is worth, meaning that permitting delays can be a significant problem for highly leveraged downtown development projects. Indeed, Michael Lemanski, managing partner of the Durham urban developer, Greenfire Development, indicated that permitting delays were an even bigger deterrent to downtown development than explicit BMP capital construction costs.

Despite the differences in capital construction costs, urban developers are held to the same standard for stormwater management as suburban developers. This means that stormwater policy effectively favors suburban development over urban development. To the extent that local governments wish to encourage downtown redevelopment, this bias in favor of suburban development presents a problem.

Property Owners Lack Expertise to Adequately Maintain Stormwater BMPs

Stormwater BMPs are complex systems that require engineering expertise to thoroughly understand and maintain. Property owners who are responsible for operation and maintenance of stormwater BMPs may not know a BMP exists on their land. If they are aware of the BMP, they likely do not have the requisite engineering expertise to know if the BMP is functioning properly. Even when

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3 Ibid.
4 Email correspondence, April 16, 2010.
property owners are able to detect BMP failures, they typically are not able to make the appropriate repairs. When problems occur, they must hire third-party engineers to correct the BMP failures. It is typically a time-consuming and inefficient process to hire third party engineers, determine the necessary repairs, and certify the repair operations with the local government.\textsuperscript{5} Thus, many BMPs on private land function suboptimally, contributing to water quality problems across the state.\textsuperscript{6}

The lack of BMP maintenance expertise among private landowners is exacerbated by the inability of local governments to hold them accountable when they fail to adequately manage stormwater. If local governments perfectly monitored and enforced stormwater ordinances, lack of engineering expertise among private landowners could be overcome. However, because stormwater BMPs are numerous and dispersed – the City of Durham has over 500 BMPs across its jurisdiction – it is virtually impossible for municipal stormwater staff to provide adequate oversight. In addition, once polluted stormwater combines with surface waters, it is difficult to determine where it originated. The resulting lack of accountability further undermines effective management of stormwater when the responsibility to do so is given to the private sector.

**Policy Options are Constrained by the Tight Budgetary Environment**

The economic recession of 2008-2010 has created a tight budgetary environment among local governments in North Carolina, limiting their ability to adopt policies that require additional expenditures. A 2009 survey of North Carolina local governments by the University of North Carolina School of Government found that 58 percent of local governments across the state had imposed departmental budget cuts, 67 percent had imposed hiring freezes, and only 8 percent had made no budget cuts\textsuperscript{7}. At a time when local governments have already made budget cuts and are facing the prospect of even deeper cuts, policy proposals that require additional expenditures are likely to be met with skepticism at city halls across the state.

**Policy Options are Constrained by the Downstream Nature of Benefits**

Efforts to improve stormwater management have become hamstrung by economic externalities. Those responsible for polluting the water are generally not those who must deal with the consequences of the pollution. Thus, in the absence of corrective policies, the benefits of improved stormwater management will accrue to downstream communities, while the costs will be borne solely by upstream

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\textsuperscript{5} Personal correspondence with Glenn Barnes, Project Director at the University of North Carolina Environmental Finance Center.

\textsuperscript{6} Stormwater managers from several different North Carolina cities cited this as a problem in personal correspondence.

communities. This implies that those upstream communities have no incentive to spend funding on stormwater management improvements. This situation is mitigated in watersheds where state-level laws and regulations require cleanup from upstream communities, but in the absence of such laws and regulations, local government officials will be reluctant to spend limited funds on stormwater management improvements.

Criteria

- **Maximize Positive Environmental Outcomes.** The principal goal of stormwater management policy should be to prevent environmental damage. Successful policies will cause improvement in the ability of stormwater infrastructure to prevent degradation of the state’s surface waters, and may enable additional environmental improvements, such as water conservation.

- **Minimize Budgetary Impact to Local Governments.** It is unlikely that local government officials will consider adopting stormwater management policies that create the need for large new expenditures. Successful policies will be feasible to implement cheaply.

- **Minimize Barriers to Downtown Redevelopment.** Stormwater management policy should not advantage suburban development over urban development. Successful policies will address the disparity between capital construction costs for stormwater BMPs feasible in urban areas and those feasible in suburban areas, and may reduce waiting times for stormwater permits.

Alternatives

**Status Quo:** For the purposes of this analysis, we assume that local governments currently practice the status quo policy described in the problem statement above. In that case, developers are fully responsible for capital construction of stormwater BMPs and the associated costs, and subsequent owners (or groups of owners, such as homeowners associations) are fully responsible for operation and maintenance of stormwater BMPs and the associated costs.

We will consider four alternatives to the status quo:

1. **Status Quo + Escrow Account for Operation & Maintenance.** The developer retains full responsibility for capital construction and the associated costs. Property owners retain full responsibility for operation and maintenance and associated costs. In addition, the developer is required to pay some amount (e.g., 25 percent of BMP construction cost) into an escrow account that is set aside to fund future maintenance or replacement needs of
the BMPs. The property owner is required to replenish the escrow account as funds are withdrawn. The account acts as a guarantee that funds will be available for necessary maintenance activities. Several municipalities in North Carolina already require such an account.

2.) **Local Government Operation & Maintenance + Escrow Account.** The developer retains full responsibility for capital construction and associated costs. Developers and property owners are required to fund an escrow account as in Alternative 1, but the local government assumes full responsibility for carrying out operation and maintenance activities, as well as any maintenance costs not covered by the escrow account. The portion of operation & maintenance costs that falls on developers, property owners, and local governments respectively will be determined by specific policy design. Additional local government expenditures are funded by raising stormwater fees. The key difference between this Alternative and Alternative 1 is that in this case, local government staff is actually carrying out the operation and maintenance of stormwater BMPs, whereas in Alternative 1, that responsibility still falls on the private sector.

3.) **Off-Site Mitigation.** The local government assumes responsibility for capital construction of BMPs. However, BMPs are constructed in an off-site area away from the actual development site, and the resulting stormwater management improvements are sold as “credits” to developers. The developer pays capital construction and operation and maintenance costs through the purchase of credits. The local government is responsible for operation and maintenance of the off-site BMPs. Charlotte is the only city in North Carolina that currently employs an off-site mitigation program for stormwater.

4.) **Capital Cost-Sharing Within Downtown Area.** The developer is responsible for capital construction. Within downtown areas (as defined by the local government), the local government and the developer share capital construction costs. The local government contribution is funded by raising stormwater fees within the downtown district.
Analysis

In our analysis, we weighed each of the alternatives against each of the criteria listed above. We assigned each alternative a score on a scale from -3 to 3 for each criterion. A score of -3 denotes the complete failure of the alternative to meet the criterion. A score of 3 denotes that the alternative completely satisfies the criterion. The results of that analysis are summarized in the decision matrix depicted in Figure 1 below, and subsequently explained in detail.

**Figure 1: Decision Matrix**

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<td>Capital Cost-Sharing Within Downtown</td>
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<td>-2</td>
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Note: A score of -3 indicates the alternative completely fails to meet the criterion, and a score of 3 indicates the alternative completely meets the criterion.

The detailed analysis underlying the scores follows below.

**Alternative 1: Status Quo + Escrow Account**

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<td>Status Quo + Escrow Account</td>
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*Maximize Positive Environmental Outcomes:* Alternative 1 would create modest improvements in environmental outcomes of stormwater management. It would not address the issue of lack of engineering expertise among those responsible for operation and maintenance of BMPs, but it would ensure that some level of funding was available for those activities. Daryl Hammock, Manager of Charlotte’s Stormwater Services Division, believes that commercial property owners are able to hire people and maintain the BMPs themselves.\(^8\) However, private homeowners

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\(^8\) Email Correspondence, March 17, 2010
and homeowner associations are not adequately equipped or funded to maintain BMPs. Mr. Hammock added, “These people often cannot raise funds to maintain their landscaping and swimming pools. So, there is even less chance that BMPs will be maintained.”

The guaranteed funds provided by the escrow account would mitigate that problem.

Minimize Budgetary Impact to Local Governments: Alternative 1 minimizes the budgetary impact to local governments to the greatest possible extent, as it imposes no additional costs to local governments.

Developers are still responsible for the cost of capital construction, and both developers and landowners fund operation and maintenance activities through an escrow account. Thus, the financial burden on the local government will be minimal. If the escrow account achieves its purpose of improving stormwater management, it could reduce local government expenditures by minimizing the potential for cleanup liability.

Minimize Barriers to Downtown Redevelopment: Alternative 1 likely increases barriers, as developers must pay upfront costs for operation and maintenance. The upfront cost, as a percentage of capital costs, will be much higher in downtown areas than in rural areas.

Alternative 1 requires the creation of an escrow account to provide guaranteed funding for stormwater management. A uniform payment structure – such as a percentage of capital construction costs – unfairly imposes constraints on downtown redevelopment. Given that the cost of constructing a BMP in downtown is more expensive than BMP construction in a suburban area, developers will have fewer incentives to invest in downtown redevelopment projects. Although BMP construction costs are a small percentage of the total project cost (Mike Lemanski, an urban developer in Durham, estimates it is less than 1 percent of the total project cost\(^9\)), the difference in expenses in urban and rural areas may induce developers to build away from urban areas. Alternative 1 also does not address the length of the permitting process.

The City of Durham proposed a similar ordinance in 2009, but some felt the uniform restrictions would hurt downtown investment. Melissa Norton of Downtown Durham, Inc., an urban development organization, believes such an “ordinance still fails to distinguish between downtown redevelopment of existing impervious surfaces and new greenfield development in a meaningful way.”\(^{11}\) Ms. Norton added that, “the regulation as proposed could tend to push development towards suburban Durham

\(^{9}\) Ibid.
\(^{10}\) Email correspondence. April 16, 2010
\(^{11}\) Quoted in “Stormwater runoff proposal draws flak from downtown stakeholders.” Bull City Rising. February 17, 2009.
sites where runoff mitigation could be handled on-site more easily, or to neighboring counties with looser restrictions.\footnote{12}

Downtown stormwater BMPs must be built underneath existing structures or within a small land area. Aside from the higher cost of downtown real estate, such nuanced construction is expensive and difficult. A *Herald-Sun* editorial mentioned that conventional practices for controlling runoff, such as retention ponds or other land-hungry devices, work well in suburban development, yet redeveloping urban environments presents “a different challenge.”\footnote{13}

**Alternative 2: Local Government Operation & Maintenance + Escrow Account**

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*Maximize Positive Environmental Outcomes:* Alternative 2 leads to positive environmental outcomes because it assigns responsibility for operation and maintenance of stormwater BMPs to an entity with the requisite expertise to carry out that task. There would be city stormwater staff whose job is to maintain the city’s stormwater infrastructure, resulting in a greater integrated management system than the current practice, with individual property owners responsible for maintaining BMPs on their land. The escrow account provides the same benefits as described in Alternative 1.

*Minimize Budgetary Impact to Local Governments:* Alternative 2 does not minimize the budgetary impact to local governments. The local government would need to increase expenditures to implement this Alternative, compared to the status quo.

Local governments would be responsible for carrying out BMP operation and maintenance, which means they would need to expand operations and hire additional staff. In the likely event that the additional costs to the local government exceed the amount at which the BMP operation and maintenance escrow accounts are funded, the local government must shoulder the excess portion.

*Minimize Barriers to Downtown Redevelopment:* The upfront payment to an escrow account likely increases barriers (in same way as Alternative 1). However, the local government’s increased role may slightly decrease these barriers.

\footnote{12}{Ibid.}  
\footnote{13}{Editorial. *Herald-Sun*. February 22, 2009}
Similar to Alternative 1, the developer will need to contribute to an escrow account and therefore pay an additional cost upon construction. This is a barrier to downtown redevelopment. The developer will need to pay a similar upfront cost for stormwater maintenance, but in this case, the local government will undertake greater responsibility and assume control of operation and maintenance.

In general, whether the private owners or local government assumes responsibility, the upfront costs are still quite large for urban redevelopment, due to the cost of downtown real estate. Ron Horvath, a land developer in Durham, in comparing the "before" and "after" of such a stormwater policy, assesses the cost as escalating "from about a hundred and a quarter [$125,000] to two-fifty [$250,000] on a two-acre site."14

The added assistance from the government will decrease formal responsibilities of landowners. Thus, a developer might view the involvement of local government as an asset. However, this alternative does nothing to change the inequitable high costs imposed on downtown redevelopment. Bill Bell, mayor of Durham, states, “It's not so much that we can't provide the facilities to meet these requirements, it's that it's going to be too costly to do that type of development if you're required to do that.”15

Alternative 2 also does not address the length of the permitting process.

**Alternative 3: Off-Site Mitigation**

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*Maximize Positive Environmental Outcomes:* This alternative leads to positive environmental outcomes to the extent that off-site BMPs are placed in an area that effectively mitigates stormwater runoff.

There are several policy design variables that will affect the impact of an off-site mitigation program. See Appendix 1 for a brief discussion of some of those variables. This analysis assumes a small-scale, government-run mitigation program for stormwater.

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14 Quoted in “Stormwater runoff proposal draws flak from downtown stakeholders.” Bull City Rising. February 17, 2009.
Maximize Positive Environmental Outcomes. An off-site mitigation program would improve environmental outcomes from stormwater management. It would allow for stormwater infrastructure improvements to be targeted to important conservation areas. It would also allow for larger-scale, more comprehensive projects than those that occur when each individual developer is responsible for on-site mitigation.

However, off-site mitigation would not decrease the current high level of contaminants that are caused by poorly managed stormwater in downtown areas. Kathi Beratan, an environmental resources professor at North Carolina State University, mentioned, “land banking must be coupled with urban stormwater treatment or reduction to improve conditions.” Hence, in urban counties like Wake and Mecklenburg, it may be ineffective to implement this alternative as a standalone option.

Minimize Budgetary Impact to Local Governments: Alternative 3 greatly minimizes the budgetary impact to local governments. It enables local governments to meet environmental standards without assuming significant additional costs or liabilities. Although local governments would take on responsibility for construction, operation, and maintenance of off-site stormwater BMPs, the associated costs would be completely covered through developers’ purchases of credits, assuming credits are appropriately priced.

The local government would need to budget for the construction and maintenance of stormwater BMPs, but the savings achieved through off-site rather than on-site construction would most likely offset the costs. Darryl Hammock, Charlotte Stormwater Manager, commented on the cost difference for the local government between on-site and off-site mitigation, “On one three-acre urban site, the costs for underground stormwater treatment were estimated to be about $700,000. By allowing them to pay a fee, in this case, $180,000, everyone was happy. The City is able to take $180,000 and treat a much larger area – approximately 18 acres – for the same cost.”

Minimize Barriers to Downtown Redevelopment: This alternative provides a lower-cost alternative than building the stormwater BMPs on-site. The BMPs will be installed in areas where capital construction costs are much cheaper than downtown.

This alternative will do the most to generate incentives and reduce barriers to downtown redevelopment. A downtown redevelopment project will not be burdened by the high costs of constructing a stormwater BMP on-site. Rather, the developer will purchase credit offsets through the local government, thereby allowing off-site mitigation and construction of a stormwater BMP on a cheaper land area within the watershed.

16 Email correspondence 3/30/10.
17 Ibid
A credit-offset program recognizes the burdens that developers face in urban environments. Daryl Hammock, Charlotte Stormwater Manager, stated, “We realized that huge development costs could occur at times, and that it was not fair for developers to bear such high costs, when the same amount of money could be applied elsewhere.”\(^\text{18}\) Off-site BMPs are generally less expensive than urban BMPs. For example, the construction cost for a wet pond is approximately $13,900 per acre watershed, whereas a sand filter is approximately $47,900 per acre watershed.\(^\text{19}\) Similarly, the average 20-year maintenance cost of a wet pond is $9,200 per acre watershed, whereas the cost is $10,600 per acre watershed for a sand filter.\(^\text{20}\)

This alternative reasonably balances improving stormwater management with keeping costs low. While it does not directly improve the stormwater management of downtown areas, it likely has a significant overall impact. It achieves this without enormous barriers to redevelopment. Daryl Hammock, when speaking of the benefits to developers with a credit-offset program, noted, “Developers really like the flexibility. They like options, and many simple and rigid ordinances do not allow this.”\(^\text{21}\)

This alternative will likely lessen the lengthy process of obtaining a stormwater permit for downtown development. A developer will need to purchase only a credit for off-site mitigation, rather than engage in the process of building on-site.

### Alternative 4: Capital Cost-Sharing Within Downtown Area

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<td>Capital Cost-Sharing Within Downtown</td>
<td>Minimize Barriers to Downtown Redevelopment</td>
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*Maximize Positive Environmental Outcomes:* This alternative maximizes positive environmental outcomes to the fullest extent. The stormwater issues that plague downtown are directly addressed.

This cost-sharing mechanism overcomes the barriers of downtown stormwater BMP construction. By sharing costs with and hence reducing costs to the developers, the government creates incentives for developers to invest in innovative on-site BMPs. Such innovative measures can capture grey water for re-use, which has many

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\(^{18}\) Email correspondence. March 17, 2010


\(^{20}\) Ibid.

\(^{21}\) Ibid
positive environmental effects. Recapturing stormwater can lessen some issues concerning water supply and decrease the amount of contaminants that reach lakes and rivers. These practices could lead to a reduction in downtown stormwater pollutants.

*Minimize Budgetary Impact to Local Governments:* Alternative 4 does not minimize the budgetary impact to local governments. Through this alternative, the local government shoulders the greatest financial burden compared to the status quo.

The local government must share the cost of capital construction with the developer, thereby impacting the local government’s budget to the greatest extent. Retrofitting BMPs in developed areas is more costly than constructing BMPs in undeveloped areas. For example, the construction cost of retrofitting a wet detention pond in an urban area is approximately 5 - 10 times more expensive than constructing the same sized pond in a rural area. Furthermore, the local government will face additional financial burdens, as it would pay a portion of the operation and maintenance costs and would need to hire staff to conduct the operation and maintenance services and to ensure these services are conducted properly.

The local government can institute a loan program to maintain program funds. This type of mechanism would help negate some of the long-term costs. A loan program would provide funds for BMPs that generate energy or other utility savings, such as green roofing projects. John Cox of Durham Stormwater Services summarized a plan: "Funds would be loaned to pay for the differential cost of green roof projects (about $21/sq. ft. versus $13/sq. ft. for conventional roofing) for downtown, and the loan recipient would pay back the loan out of energy savings, preserving capital to fund another project in five to seven or so years." Such a mechanism would provide financial stability overall, but the upfront costs and maintenance costs cannot be easily avoided.

*Minimize Barriers to Downtown Redevelopment:* This alternative provides a subsidy or a loan that reduces barriers to downtown redevelopment. The local government helps the developers meet the high cost of building downtown.

Cost-sharing for BMP construction is the best solution for on-site mitigation. However, even with the subsidy, the construction costs remain substantial. It is unlikely that the subsidy will be cheaper to the developer than a credit-offset program. The application process to receive the subsidy might impose barriers on the developer.

A cost-sharing alternative might be necessary to improve stormwater management downtown. Danny Bowden, the Stormwater Utility Manager of Raleigh, stated, “BMPs, particularly for water quality, in downtown areas will require innovative

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23 Email correspondence. April 9, 2010.
This measure is innovative, as it requires a heightened responsibility and financial commitment from the local government. Cost-sharing will reduce the barriers for developers, as they will no longer need to finance and manage the stormwater BMPs alone.

This alternative addresses the burdens that uniform standards place on downtown redevelopment. A cost-sharing program provides incentives to build downtown in a manner that uniform requirements would constrain. Developers will welcome the additional funds for capital expenditures, while marketing the new stormwater BMPs as an asset to the property. Mike Lemanski of Greenfire Development added that "allowing the developer to gain higher value out of a development site" would encourage better stormwater management and provide incentives for development.

**Recommendation**

We recommend that local governments in North Carolina adopt Alternative 3, Off-Site Mitigation, and Alternative 4, Capital Cost Sharing Within Downtown Area. Allowing for off-site mitigation would reduce stormwater costs for potential downtown developers without compromising environmental integrity. It would also ensure that local governments incur minimal costs. Although it would require a new revenue stream, implementing a capital cost-sharing program within downtown areas would reduce stormwater costs for potential downtown developers, and also would incentivize the use of innovative stormwater BMPs. If adopting Alternatives 3 and 4 is not feasible for a local government, then Alternative 1 should be adopted. The Status Quo + Escrow Account would improve environmental outcomes at no significant cost to the local government.

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24 Email correspondence. February 17, 2010.
Bibliography


Beratan, Kathi <kathi_beratan@ncsu.edu>. “Stormwater Management Consulting Project.” Private e-mail message to Matthew Jentgen. March 30, 2010

Bowden, Danny <Danny.Bowden@ci.raleigh.nc.us>. “Inquiry from Duke Policy Grad Student Re Urban Stormwater in Raleigh.” Private e-mail message to Gray Wilson. February 17, 2010

Cox, John <John.Cox@durhamnc.gov>. “Falls Lake watershed plan as of now would cost $169M, miss targets.” E-mail message to Matthew Jentgen. April 9, 2010


Hammock, Daryl <dhammock@ci.charlotte.nc.us>. “Inquiry from Duke Policy Grad Student Re Urban Stormwater in Charlotte.” Private e-mail message to Aroha Bahuguna. March 17, 2010


Appendix 1: Policy Design Issues for Off-Site Mitigation

There are several policy design variables that will affect the impact of an off-site stormwater mitigation program. Two of the most important – how to define service areas for mitigation banks and whether to use government or private mitigation banks – are discussed below:

How to Define Service Areas for Mitigation Banks

For any mitigation bank, the service area is the geographic area within which developers are permitted to offset impacts by buying credits at that bank. In designing a stormwater off-site mitigation policy, local governments will need to decide the manner in which to define service areas. There are two main considerations: how large should service areas be, and what type of boundaries should they follow?

How large should service areas be? In answering this question, local governments will have to balance the desire to maximize positive environmental outcomes with the desire to minimize barriers to downtown redevelopment. Smaller service areas would do a good job of maximizing positive environmental outcomes. They would ensure that stormwater impacts due to development were mitigated for close by areas, preventing the development of stormwater pollution “hot-spots” in areas where controlling stormwater is expensive.

Larger service areas would do a much better job at minimizing barriers to downtown redevelopment. They would expand developers’ options for purchasing stormwater offset credits, allowing mitigation to take place in areas where it is the cheapest. However, they would not be as effective at maximizing positive environmental outcomes. Stormwater mitigation would be highly concentrated in areas where controlling stormwater is cheap, leaving urban areas, where controlling stormwater is expensive, to be stormwater pollution “hot-spots.”

What type of boundaries should service areas follow? There are two types of boundaries that local governments could consider using to define service areas: hydrologic boundaries and political boundaries. The type that is appropriate depends on the principal goal of the off-site mitigation program. If the goal is simply to mitigate stormwater impacts and nothing more, then hydrologic boundaries (e.g., USGS HUC cataloguing units) are most appropriate, as they ensure that stormwater impacts are offset in the same river basin or watershed. However, if local governments also decide to use an off-site mitigation program to drive some other land use goal, such as developing urban green space, then using a political boundary (e.g., the downtown district) may be more appropriate.
Government Mitigation Banks versus Private Mitigation Banks

Our analysis above assumes that local governments will develop stormwater mitigation projects and sell offset credits to developers. However, many existing off-site mitigation policies, notably those for wetlands, allow private “mitigation bankers” to take over that role. These are private firms that buy land, restore or preserve a hydrologic function on it, and then sell mitigation credits to developers.

The main advantage of using private mitigation bankers is that it prevents the local government from being exposed to financial risk. In some cases, such as the North Carolina Ecosystem Enhancement Program, government off-site mitigation programs have not been designed in a way that allowed for full cost-recovery from the sale of credits, and thus have been perpetually underfunded. By outsourcing the task to private mitigation bankers, local governments could avoid that possibility. However, in doing so, they would forfeit their ability to target stormwater mitigation projects to important conservation areas or to develop stormwater mitigation projects in conjunction with a larger land use plan. Private mitigation bankers will seek the cheapest land that qualifies for stormwater mitigation, regardless of how important it is for conservation goals or how it fits into land use plans. Local governments will need to decide if they will allow private stormwater mitigation based on how important it is to them to be in control of where and how the mitigation occurs.