CHAPTER 3: THE ROLE OF AGGREGATION

3.1. BACKGROUND

Encouraging private capital to finance stormwater retrofit projects can be difficult, in part because many of the projects tend to be small with relatively high fixed costs and transaction costs. These challenges are not unique to stormwater finance; indeed, they also impact other resource efficiency projects like energy finance. In the energy finance world, large projects tend to be more financially attractive than small projects because they achieve the scale and efficiencies to overcome fixed costs and transaction costs. In other words, the cost of, for example, legal fees can be a small percentage of total overall costs for a large project, while the same fees can be a considerable percentage (or even an insurmountable one) for a smaller project.

It is important to note that fixed costs and transaction costs are related concepts. Fixed costs are costs that are not dependent on the amount of goods or services produced. In other words, they will remain relatively stable regardless of the size of a project. Fixed costs for project identification, contracting, monitoring, and collection. Each of these represents some expenditure. The challenge with investments in small projects is that the fixed costs and transaction costs can overwhelm the projects’ expected revenues and returns, making these projects financially unattractive.

Project aggregation can help overcome many of the barriers to financing smaller projects. The packaging of numerous stormwater projects into an aggregate portfolio could help increase the financial attractiveness of stormwater retrofit projects in a number of ways. First, aggregation can present opportunities to work through intermediaries that are willing and able to reduce and/or absorb transaction costs. Second, by efficiently managing many projects simultaneously, aggregation can reduce project development costs through economies of scale. Third, aggregation may help investors manage risk by diversifying the quantity and character of projects in a stormwater investment portfolio. In essence, aggregation, when done correctly, can help a group of smaller projects operate somewhat like one larger project, which may help to overcome the barriers that usually inhibit private investment in small projects.

This chapter will look at how aggregation can be used as a way of encouraging private capital to invest in stormwater project finance. Transaction costs will be reviewed from the point of view of an investor, fixed costs will be reviewed from the point of view of project developers, and the role of aggregation in minimizing these costs will be explored. This chapter will also survey the universe of organizations that could play an instrumental role in stormwater project aggregation, including discussion of why some of these entities might be willing to shoulder stormwater retrofit transaction costs. The chapter will conclude with a look at how governments, NGOs, and other interested parties can help encourage the aggregation of stormwater management projects as a way of attracting private capital to this space.

3.2. REDUCING TRANSACTION COSTS THROUGH AGGREGATION

The study of transaction costs is a fundamental component of modern economic theory. Although the use of the term goes back to the 1930s and has a number of specific meanings in the field of economics, for the purposes of this report, transaction cost is defined as “any expenditure that is not directly involved in the production of goods or services but is essential for realizing the transaction.”

In order to implement a successful retrofit project, an investor would likely have to bear transaction costs for project identification, contracting, monitoring, and collection. Each of these represents some expenditure of money, time, or resources in order for an investment to take place. These investment transaction costs can be summarized as follows:

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Transaction Costs</th>
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| IDENTIFICATION | • Identification of potential projects  
• Collection of information on project characteristics  
• Project assessment and due diligence (modeling expenses and revenues, assessing risks)  
• Legal fees  
• Evaluation of a project and deciding whether to invest |
| ACQUISITION | • Negotiation with project owners (and/or landowners)  
• Preparation of contracts  
• Procurement |
| MONITORING | • Establishing mechanisms to monitor projects and ensure they are delivering the promised returns  
• Ensuring that counterparties fulfill their obligations  
• Reaction to problems that threaten returns |
| COLLECTION/EXIT | • Billing, collecting returns  
• Enforcement of contracted terms  
• Activities associated with exiting a project |
For an investor, these transaction costs are essentially fixed: They do not change significantly with the size of the project or the amount of money being invested. These fixed transaction costs therefore incentivize investors to finance bigger projects—projects that have the potential to generate revenues that are much larger relative to the size of the associated transaction costs.

How significant are these transaction costs in the field of stormwater retrofit finance? It is difficult to say. Since private financing for stormwater retrofits is not yet commonplace, there is limited empirical evidence to estimate the average range of transaction costs for a typical stormwater retrofit investment. In addition, it is challenging to accurately track transaction costs because many of these costs are not directly visible, but instead take the form of employee time and effort. As a proxy for transaction costs in the context of stormwater retrofits, it may be illustrative to consider the transaction costs incurred in the energy efficiency and carbon finance industries. Much like the stormwater management practice (SMP) market, both the carbon and energy efficiency markets are characterized by small projects that require significant transaction cost in search, contracting, monitoring, etc. In the energy efficiency field, transaction costs have been found to account for 10 to 40 percent of total project costs.44 The chart below, which is based on interviews with energy service companies (ESCOs) in the U.S., highlights the fact that a significant amount of overall project costs are transaction costs, particularly those related to the identification and sourcing (also known as the origination) of projects.

Again, since many transaction costs are fixed, one way to overcome the economic challenges of project transaction costs is to increase project size so the transaction costs are smaller relative to the project’s expected total revenue. Unfortunately, in many cities (including Philadelphia), there are few opportunities to finance large stormwater retrofit projects, owing to the spatial constraints of small urban parcels. Instead of making individual projects larger, another way of addressing the transaction cost problem is to have intermediaries aggregate projects so that the origination, acquisition, and collection costs of multiple projects function more like those of a single project. Aggregation of this type does not eliminate transaction costs, but rather reduces them or transfers them to entities that are more willing to shoulder the costs. In some cases, the transfer of transaction costs makes sense because other organizations are in a better position to find and originate stormwater management projects. In essence, aggregation serves to “outsourcing” transaction costs to improve the desirability of projects to outside project developers and investors.

An intermediary might be willing to absorb some transaction costs for one of several reasons, including these:

1. **The intermediary has specific policy goals to address stormwater pollution.** For example, governments might subsidize the process of project origination and aggregation on private property in order to achieve clean water goals at lower cost. Likewise, an existing NGO or a specially created stormwater entity could be interested in serving as a project aggregator to meet a given organization’s conservation or community development goals. In both of these scenarios, third-party nonprofit entities can help subsidize transaction costs in an effort to encourage additional private capital into financing stormwater retrofit projects.

2. **The intermediary has a financial interest in financing and developing stormwater management projects.** For instance, businesses whose products or services are utilized to construct stormwater retrofit projects have a financial interest in seeing the market for SMP projects flourish. By aggregating smaller projects, they are creating new markets for their products or services. Examples here include engineering service firms that sell “green infrastructure” solutions, and vendors of green roofs. Such a dynamic has already been seen in the field of energy efficiency finance, where the makers of energy efficiency products (such as high-efficiency HVAC systems) have created ESCOs (see box 3.3, below) that serve as project aggregators. Some of these ESCOs have been able to attract large amounts of private capital.

3. **The intermediary represents stakeholders who stand to benefit from stormwater projects and is situated in a position to aggregate.** For example, business improvement districts (BIDs) could be used by property owners to share in the benefits of stormwater fee reductions and the co-benefits of green infrastructure such as site beautification and public space improvements. BIDs are particularly attractive as aggregators because they have existing...
relationships with property owners, who might consider participating in an aggregated project portfolio with fellow members and neighbors. In such a scenario, the transaction costs (particularly those related to origination) could be cut significantly because relationships with project beneficiaries already exist. Moreover, a BID may be willing to serve as an aggregator because BID-wide stormwater improvements can be consistent with the organization’s mission, which often includes making physical improvements within the district, and would add relatively little cost to its ordinary business operations.

3.3 REDUCING PROJECT DEVELOPMENT COSTS THROUGH AGGREGATION

In addition to helping reduce transaction costs, project aggregation of stormwater retrofits could lead to project cost savings through economies of scale. In this section we will look at how project aggregation could help lower specific SMP implementation costs.

Figure 3.3 presents a general list of cost line items involved with production of a stormwater retrofit. Those activities denoted with an asterisk are areas where opportunities exist for cost savings through project aggregation (e.g., where material or services can be acquired in bulk).

<table>
<thead>
<tr>
<th>Figure 3.3: Indicative List of Stormwater Retrofit Costs</th>
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<tbody>
<tr>
<td><strong>1. Design</strong></td>
</tr>
<tr>
<td>a. Survey of site</td>
</tr>
<tr>
<td>b. Proposal of stormwater management practices to be used</td>
</tr>
<tr>
<td>c. Collection of site data</td>
</tr>
<tr>
<td>i. Mapping of location of subsurface utility structures</td>
</tr>
<tr>
<td>ii. Infiltration testing</td>
</tr>
<tr>
<td>d. Modeling of facilities to be installed</td>
</tr>
<tr>
<td>e. Creation of installation specifications for facilities used on project*</td>
</tr>
<tr>
<td>f. Creation of construction plans</td>
</tr>
<tr>
<td>g. PWD preapproval and construction permitting*</td>
</tr>
<tr>
<td><strong>2. Project Bidding and Contracting</strong></td>
</tr>
<tr>
<td>a. Construction</td>
</tr>
<tr>
<td>b. Mobilization of equipment and materials to site area*</td>
</tr>
<tr>
<td>c. Purchase of materials*</td>
</tr>
<tr>
<td>d. Purchase or rental of equipment*</td>
</tr>
<tr>
<td>e. Labor</td>
</tr>
<tr>
<td>f. Transportation</td>
</tr>
<tr>
<td>g. Survey and documentation of completed installation</td>
</tr>
<tr>
<td>h. Closeout*</td>
</tr>
<tr>
<td><strong>4. Approval by PWD</strong></td>
</tr>
<tr>
<td>a. Submission of documents to PWD and completion of PWD site visit</td>
</tr>
<tr>
<td><strong>5. Operation and Maintenance</strong></td>
</tr>
<tr>
<td>a. Monitoring*</td>
</tr>
<tr>
<td>b. Erosion control</td>
</tr>
<tr>
<td>c. Vegetation upkeep</td>
</tr>
<tr>
<td>d. Damage repair</td>
</tr>
</tbody>
</table>

Opportunities to realize economies of scale by conducting development activities on an aggregated level rather than on a project-by-project basis may be found in the steps of design, project bidding and contracting, procurement of construction materials and equipment, PWD preapproval and permitting, and operation and maintenance.

In the design stage, there may be opportunities to develop one set of specifications that could apply to many different retrofit projects. Construction specifications detail how a particular feature of a construction should be built. On each project site, specific dimensions will need to be planned for each feature, but one set of SMP retrofit specifications could be developed and applied (with minor modifications) to all similar SMP retrofits being developed.

If multiple projects are being developed simultaneously, the project developer will be able to purchase materials in larger quantities and secure equipment for longer periods. Such bulk purchasing should enable project developers to secure materials and equipment at lower unit costs. Similarly, when working with contractors, the aggregation of multiple projects will provide leverage for the negotiation of better rates for each individual project.

There may also be opportunities to reduce costs by coordinating activities across multiple projects simultaneously. If the development of multiple projects can be carried out in parallel and staged appropriately, equipment and personnel can be deployed more effectively. For example, if a construction company can mobilize equipment, workers, and materials to work on 10 sites in close proximity simultaneously, it can allocate its resources more efficiently than it could if it were working to mobilize resources for a singular retrofit project.

Opportunities to reduce time spent and costs incurred exist not only in project development but also in project documentation. For example, the retrofit preapproval process could be streamlined if documentation for multiple retrofits were prepared, submitted, and evaluated at the same time. Similarly, if multiple projects conclude within a narrow window of time, all can be closed out at once, which may be more efficient than closing out many projects separately.

3.4 POSSIBLE AGGREGATORS

3.4.1 Government Agencies as Facilitators of Aggregation

There are various motivations for governments, at both the state and municipal level, to serve as aggregators for stormwater retrofit projects on private lands. First, governments may see this form of aggregation as a cheaper, easier way of achieving their stormwater management goals. If governments can attract additional private capital through project aggregation, they can more effectively leverage their scarce resources to spur stormwater retrofits and a reduction in stormwater runoff events. Alternatively, governments can facilitate or endorse other NGOs or private companies to serve as project aggregators.
Which role a government assumes may be location specific. Governments may find that there are no existing nonprofit or private sector firms willing to take on the role of local project aggregator. In this case, a government may decide that it makes sense to serve as an aggregator until another entity emerges to take on that role. Chances are, however, that most governments will find that they gain more leverage by simply encouraging aggregation via appropriate policy changes.

One way in which local governments can facilitate SMP project aggregation is through the provision of information that helps connect property owners, project developers, and investors. For example, PWD has access to information regarding properties that have large impervious areas, high scheduled fee increases, and favorable property characteristics for SMP retrofits. If this information could be aggregated and provided to project developers and investors in an appropriate way, it could help developers/investors efficiently identify potential projects that have favorable characteristics and economics for an SMP retrofit. Alternatively, to help property owners better understand their financing options, PWD could distribute materials informing parcel owners about emerging financing options and terms. Finally, it could set up an exchange whereby interested property owners and aggregators can contact one another.

Beyond assistance with project aggregation, governments could encourage investment by helping reduce the risk of SMP project investment. On-bill and tax lien financing (as discussed in Chapter 2) could serve to catalyze aggregation mechanisms by which individual retrofit projects could join other projects that are subject to similar participation requirements. Under a financing mechanism similar to the PACE programs in the energy efficiency industry, stormwater retrofit providers could use the government’s ability to collect property taxes as a way of guaranteeing repayment of investments. For more details on the PACE system, see Chapter 2 of this report.

### Box 3.1: Government Facilitating Aggregation: The Case of SMEDs in Philadelphia

One particularly interesting example of a government agency using its unique position to facilitate aggregation is the creation of what PWD refers to as Stormwater Management Enhancement Districts (or SMEDs). A SMED is an area that the water department has identified as having potential for large, coordinated green infrastructure projects. In essence, the city is trying to encourage the development of economies of scale by creating new geographic units where stormwater management is most effective when developed across many properties simultaneously.

PWD has a two-step process that it uses to identify SMEDs. First, PWD identifies large, multiproperty areas in which green infrastructure retrofits are technically, economically, and practically attractive (lowering one set of transaction costs for retrofit projects, those related to project identification). As PWD identifies SMEDs, it then contracts with an engineering specialist to evaluate potential projects and prepare a Stormwater Improvement Plan. Once this plan is finished, it will be clear whether a retrofit project is financially attractive, and a specific project implementation strategy will be made available to an eventual project developer. In essence, the government here is helping lower the costs of project assessment and analysis.

In the case of SMEDs, PWD helps to reduce the transaction costs of the deal by taking the initiative to identify projects, conduct a feasibility study, and begin retrofit planning. Once a SMED evaluation and stormwater improvement plan has been created, the identification step of a transaction may be largely completed, which could reduce transaction costs significantly.

Once PWD identifies a promising project through the SMED process and has estimated the amount of investment needed to make the retrofit, there are various ways in which private investment could be used to fund the project. Under one potential scenario, it may be necessary to identify an organization that could serve as a project developer, perhaps a nonprofit with community development goals that would benefit from a completed stormwater improvement plan created by PWD. This organization would coordinate the negotiation of terms with the constituent property owners within the SMED, and then serve as a representative of the project to potential investors (effectively serving as an aggregator). It would also work with property owners to implement the plan, therefore helping to address the transaction costs related to negotiation and contracting.

### 3.4.2 Government Agencies as Project Aggregators

If a government agency were appropriately positioned, it could undertake aggregation itself. Chapter 4, section 4.3.3., contemplates how a government agency could aggregate projects on public land in order to generate credits that could be purchased by private property owners who are covered by parcel-based stormwater fee. A concern here is that, by serving as an aggregator of projects on public land, the government could be competing with potential private sector aggregators. In addition, it could be possible for a government agency to set up a third-party organization, either a nonprofit or a public-private partnership, responsible for aggregating projects on public or private land. An example of such a partnership in the energy efficiency space can be found in the discussion of the New York City Energy Efficiency Corporation, below.

Alternatively, for a municipality to issue bonds, backed by property owner payments via utility bill or tax assessments, on the capital markets. The municipality would then make the funding available to property owners along with an approved list of project implementers and project types. Such a structure would significantly reduce transaction costs associated with project search and identification, information search, and project provider search. It would also help facilitate repayment of private capital that is channeled into this space. A variation on that idea might be to use the bond proceeds to guarantee or insure a private capital investment in the retrofit space. These ideas are discussed in detail in Chapter 2.

The cost of originating projects is one of the most important transaction costs in many areas of investment (e.g., energy efficiency finance and carbon project investments). Beyond the identification of projects, other important transaction costs relate to monitoring projects and collecting/obtaining repayment. In all of these areas,
governments could help private investors overcome some of these costs. In terms of project identification, governments can connect investors with project developers needing money; in terms of monitoring, governments can use their existing infrastructure to facilitate the monitoring of retrofit projects; and in terms of collection/repayment, governments can tap into on-bill finance or tax-collection infrastructure as ways to facilitate repayment.

There are a number of potential concerns that might be associated with government serving as an aggregator (or even facilitating aggregation) in this space. These include:

1. **Claims that government might be unduly subsidizing private capital gains.** It is true that any government spending that facilitates investment by private companies could be seen as a subsidy. But it could also be seen as a way for government to prime the pump of private investment, leveraging its scarce dollars to stimulate private investment and achieving results much greater than what the public sector would be able to achieve on its own. This is no different from governments’ leveraging private capital for traditional infrastructure investments.

2. **Concern that additional costs would be placed on government agencies as they shoulder the burden of transaction costs.** This concern is warranted, but it can be overcome if governments are very clear on the cost-benefit analysis surrounding their investments. It is likely that any transaction costs absorbed by government (in the form of staff time, for instance) would, if they lead to more retrofits, be a good use of government dollars since such expenditures might achieve greater stormwater benefits than other uses of that money.

3. **Concern that the cheapest, most profitable, and lowest-hanging fruit might be handed over to private investors, while government is left with the most expensive retrofits.** This concern would be valid if the private sector retrofits were being undertaken on public property. If, however, the projects are on private properties, then these are stormwater improvements that would otherwise be difficult for government to access. Even on public properties, allowing private actors to undertake the “cheapest” or “easiest” retrofits may make sense if the private sector can undertake them more efficiently and less expensively than government (see Chapter 5 for additional details on proposed partnership structures).

In short, the response to these arguments is that by facilitating aggregation (or, in rare instances, serving as an aggregator), government can leverage its scarce resources to use private capital for projects that create public value—projects that would not otherwise occur without government facilitation.

**3.4.2.1 NGOs as Aggregators**

Some municipalities create nonprofits to help facilitate private investment in public policy outcomes. The New York City Investment Fund (NYCIF) and the New York City Energy Efficiency Corporation (NYCEEC) are two examples of nonprofit aggregators. NYCIF was founded by business leaders working through the Partnership for New York City, an economic development organization, to catalyze job creation and economic development through innovative financing for entrepreneurship.45 NYCEEC was founded by the City of New York to support the city’s energy and climate action goals by catalyzing an energy efficiency retrofit financing market for private building owners.46 NYCIF is funded by business leaders while NYCEEC receives a mix of public and philanthropic funding, including from NRDC and the Rockefeller Foundation.

NGOs like NYCIF and NYCEEC can serve as project aggregators by absorbing the transaction costs associated with project origination, information gathering, and due diligence. Their functions can include:

- **Project facilitation/matchmaking.** An NGO can serve as a single point of contact for parcel owners and investors in a region, thereby limiting the search process for both interested property owners and investors.

- **Project vetting.** Similar to a government aggregator, an NGO can pre-approve a list of project developers and project types, reducing transaction costs.

- **Provision of lower-cost capital.** NGOs can provide lower-cost capital, helping to make smaller projects more economical. Lower-cost capital, which can be used to leverage returns for traditional capital partners, can come from foundations through program-related investments (PRIs), philanthropic donations, or loan guarantees (see Chapter 2 for an illustration of how NGO capital could be deployed in a stormwater retrofit fund.)

**3.4.2.2 NGOs as Aggregators**

**Business Improvement Districts (BIDs)**

To help realize economies of scale, local organizations with existing relationships with property owners could leverage those existing relationships to aggregate viable stormwater retrofit projects.

BIDs are a particularly attractive potential partner in Philadelphia and nationwide. Their aims can vary, but BIDs serve generally to facilitate cooperation among local businesses to develop neighborhood economic development and beautification projects. Established by local ordinance, BIDs collect fees from local businesses to fund improvements that benefit the overall business atmosphere of the neighborhood. BIDs can provide services such as cleaning, security, landscaping, and marketing of the business district to neighborhood consumers.

As BIDs are already aimed at improving the aesthetic and economic vitality of a neighborhood marketplace, there may be a strong mission fit to serve as an SMP project aggregator. By actively managing stormwater retrofits, BIDs could reduce the operating costs of local businesses as well as improve and differentiate the appearance of the local marketplace.

BIDs could also serve as effective managers of SMP projects because they are established to coordinate with numerous property owners to manage landscaping and small-scale construction projects. Transaction costs such as outreach and project identification should be significantly
cheaper when working with a BID, since the organization already has a relationship with property owners. Moreover, a BID could ease negotiations with potential investors by serving as a single counterparty for contract negotiations.

3.4.2.3 BID Project Aggregation Process
While there are many ways in which a BID could facilitate SMP project aggregation, here we present one potential example of how such a process might work.

A BID manager could begin the process by finding suitable projects for financing. A BID could search for projects by conducting a feasibility study, preparing documentation on costs and expected fee savings, and initiating conversations with property owners regarding the commitments that would be required to embark on a project. Once a BID identified a promising set of projects, it could present the aggregate project to an investor and serve as the single point of negotiation between the investor and the underlying property owners. This would enable the investor to analyze the project as one large investment with one counterparty, which would be more efficient than analyzing many projects and negotiating with many smaller counterparts.

A BID could facilitate the process of negotiation by setting up contracts between the retrofit project manager (which may be the BID manager or another organization) and the property owners. This would allow investors to enter into one contract with the BID. Under such a scenario, the investor could disperse funds to the BID manager, which would then be responsible for fund dispersal to specific projects. After SMP construction, property owners would realize stormwater fee savings, which the BID manager could collect from member businesses to repay the loan/investment amount. Throughout the life of the project (even after loan repayment), the BID manager would oversee maintenance of the green infrastructure project to ensure adequate performance.

Under the structure outlined above, the BID would be serving as a stormwater project aggregator and manager, absorbing ongoing transaction costs that private capital might not be willing or able to provide. The BID would thus help capture economies of scale and reduce risk by bundling various small-scale projects into a larger portfolio of SMP projects.

3.4.3 Service Providers as Aggregators
Under the third party “project developer” financing model described in “Financing Stormwater Retrofits” and in Chapter 2 of this report, property owners would transfer a portion of their stormwater fee reductions over a set number of years to the project developer in exchange for the up-front capital financing required to build the retrofit. This offers property owners the opportunity to benefit from lower stormwater fees over the life of the project without being required to make the initial capital investment in the SMP retrofit. Moreover, structuring a deal on a pay-for-performance basis has tax benefits for the client (i.e., the building owner). It allows the owner to treat the work as a services contract for tax purposes, which means it can be written off. (In contrast, if the project were treated as an operating expense, the owner would have to amortize the costs over an extended period.)

Project developer models achieve economies of scale by focusing on large projects—universities, hospitals, and other large institutions (See Section 2.1). Some administrative work would be required to create an aggregation mechanism via project developers: marketing the opportunity to property owners, synthesizing projects according to type or geography. However, firms would benefit from such work by generating additional revenues from projects made more economical by aggregation. In addition, a partnership among project developers and PWD could help facilitate this process.

Box 3.2: BID Case Study: The Aramingo Shopping District
The Aramingo Shopping District is a Philadelphia BID composed of 73 individual properties, which include businesses such as Lowe’s Home Improvement, Walmart, and Chick-fil-A. The Aramingo BID has communicated an interest in managing stormwater retrofit installations, in large part because the green infrastructure enhancement would beautify the area, increasing the attractiveness of the constituent properties.

The affairs of the Aramingo BID are managed by Impact Services, a nonprofit community development corporation. Impact Services has obtained funding from PWD to conduct a feasibility analysis to identify potential stormwater retrofit projects within its district. Once projects are identified through the feasibility analysis, Impact Services may be in a position to aggregate the retrofit projects that would generate the greatest stormwater fee savings at the lowest cost, and could present this aggregated investment opportunity to a financial institution.
In trying to understand how stormwater projects might be aggregated, it is useful to look at how aggregation works in the energy efficiency sector. The energy efficiency field faces some of the same challenges as stormwater retrofits: Projects are small, transaction costs are high, and there is a desire to leverage private investment. In response to these challenges, energy services companies (ESCOs) have emerged to serve as aggregators of smaller energy efficiency projects. By understanding how ESCOs work, we can better understand how similar structures might also serve as aggregators in the stormwater space.

Many ESCOs stem from companies that manufacture energy efficiency equipment and install energy efficiency retrofits. In the 1970s, during the height of the oil crisis, these companies realized that they could generate more business and attract outside financing if they turned themselves into “virtual utilities,” capitalizing the installation of turnkey energy efficiency retrofits and then taking a share of the energy savings. This approach allowed them to aggregate smaller projects and also to overcome customer skepticism—that the promised energy savings would never materialize.

ESCOs work by undertaking all of the necessary energy efficiency retrofits for buildings or businesses (including conducting feasibility studies, designing the systems, developing proposals, and installing the retrofits) at little or no risk to the property owners. Rather than pay for the retrofit up front, customers pay the ESCOs a share of the energy savings realized as a result of the retrofit. In order to finance this work, ESCOs obtain loan financing, other private financing, or are part of large component manufacturers (e.g., GE, Honeywell) or energy companies (e.g., Chevron). By aggregating smaller projects and taking on the risk of the promised energy savings, ESCOs minimize transaction costs and help achieve economies of scale in the energy efficiency business. A similar mechanism might provide similar benefits in the stormwater management sector.

According to a survey conducted by the Energy Analysis Department at Lawrence Berkeley National Laboratory, ESCOs as a sector generated $4.1 billion dollars in revenues in 2008, with the majority of that revenue coming from large energy efficiency projects in what is informally known as the “MUSH” sector (municipal and state governments, schools, and hospitals). Residential projects accounted for only around 6 percent of ESCO business.

One way to encourage the development of aggregating project developers might be for governments to contract with retrofit providers to undertake the work in return for a portion of the fee rebates. For instance, the Philadelphia Water Department could work with engineering firms to deliver third party project-developer services for stormwater retrofits within some of its newly created SMEDs.

3.5. CHAPTER CONCLUSIONS AND RECOMMENDATIONS

Aggregation can play a key role in attracting private capital into stormwater retrofit finance. Through reducing transaction costs, increasing economies of scale, and spreading risk across multiple projects, aggregation can simultaneously help increase returns and reduce the risk of SMP retrofit projects. Given these benefits, there are several steps that PWD can take to encourage aggregation in the field of stormwater retrofits. These include:

- **Address the transaction costs of finding and originating smaller projects.** Experience in the energy efficiency retrofit industry illustrate that one of the highest transaction costs impeding project implementation is project origination. Therefore, anything that can be done to facilitate project origination would go a long way toward attracting additional private finance to the stormwater market. In an effort to encourage project aggregation, PWD should:
Identify the costs of retrofits. Develop Philadelphia-specific cost ranges for stormwater retrofits that could be used on educational materials to prospective nonresidential property owners.

Inform interested parties of local stormwater opportunities. Make publicly available information detailing which properties face large stormwater fee increases and which properties show promise as sites for low-cost green infrastructure retrofits.

Educate parcel owners. Include information on billing statements regarding the cost and potential savings of SMP retrofits as well as potential options for retrofit financing. This will provide ratepayers with a clear understanding of project costs and savings, as well as potential financing options.

Solicit interested parcel owners. Through billing statements, encourage interested ratepayers to sign up for stormwater retrofits. PWD could then pass on lists of these interested customers to appropriate aggregators.

Permit streamlining. In order to reduce project implementation costs and encourage aggregation, explore how permitting rules might be streamlined to simplify the permitting process for aggregated projects.

Encourage nongovernmental organizations to engage in project aggregation. PWD should explore working with foundations and NGOs to channel capital (grants, subsidies, etc.) toward potential aggregators that originate, negotiate, and group stormwater retrofit projects.

Encourage BIDs to act as aggregators of stormwater management projects. BIDs are natural aggregators of stormwater management projects. BIDs have an inherent interest in undertaking the sort of beautifying neighborhood improvements that many stormwater retrofits entail. In addition, they are already connected with relevant landowners; they are set up to conduct outreach to local property owners, and based on the authors initial discussions have an interest in serving as green acre project aggregators. In order to encourage BIDs to take on this role, PWD should:
- Conduct outreach sessions with BIDs to determine their interest in taking an active role in stormwater project aggregation.
- Put interested BIDs in touch with potential sources of private capital interested in investing in this space, to help match investors to available projects.
- Subsidize feasibility studies for BIDs to become stormwater aggregators, as it has already done with the Aramingo BID.
- Capitalize on the case study of the Aramingo BID. The Aramingo BID has already demonstrated interest in serving as an aggregator of stormwater management projects. PWD might help the organization accomplish this and then use it as an illustrative case study for other BIDs.

Clarify how project aggregators could work within the SMED process to develop projects. SMEDs provide a ready-made construct to facilitate the aggregation of stormwater management projects. Already, PWD is working with engineering services firms and others in select SMEDs to undertake stormwater management projects. In addition to what it is already doing, PWD should:
- Help encourage (or even create) NGOs or other entities in specific SMEDs that might serve as relevant aggregators for the stormwater management projects outlined in the SMED’s stormwater improvement plan.
- Link the relevant organizations in each SMED with sources of private capital interested in this space.
- Design a process by which an aggregator can benefit from the conclusions of the SMED process and can gain access to the property owners within the management district.

Create processes that facilitate economies of scale. Preliminary research indicates that permitting, design, and the acquisition of parts/materials are among the aspects of stormwater retrofit projects that are most amenable to achieving economies of scale. Therefore, any actions that help potential aggregators take full advantage of these are likely to lead to increased aggregation. To facilitate project cost reduction through economies of scale, PWD could ensure that permitting requirements don’t inadvertently discourage aggregation, and/or write rules to permit aggregators to submit retrofit designs across a broad array of small properties. There may also be ways of helping retrofit project developers purchase items and materials in bulk, though it is unclear how governments and others might help in that regard.

Beyond activities that could facilitate aggregation, it is important to note that different types of aggregators might be best suited for different types of projects. For instance, BIDs and SMEDs might be better suited to aggregate larger commercial properties, while NGOs and government agencies might be more adept at aggregating smaller, residential-type properties. In theory, service providers should be willing to aggregate both commercial and residential properties, but in practice they are likely to seek out the larger projects. Economies of scale will likely mean that the larger projects have the highest returns, so private capital will almost certainly focus on larger projects at the outset. In terms of achieving low-cost stormwater management retrofits, this should not pose a problem, since these are also the retrofits that will likely deliver the biggest bang for the buck. However, if there is interest in ensuring that smaller projects get done, then additional subsidies may be required to cover the much higher transaction costs that smaller projects entail.