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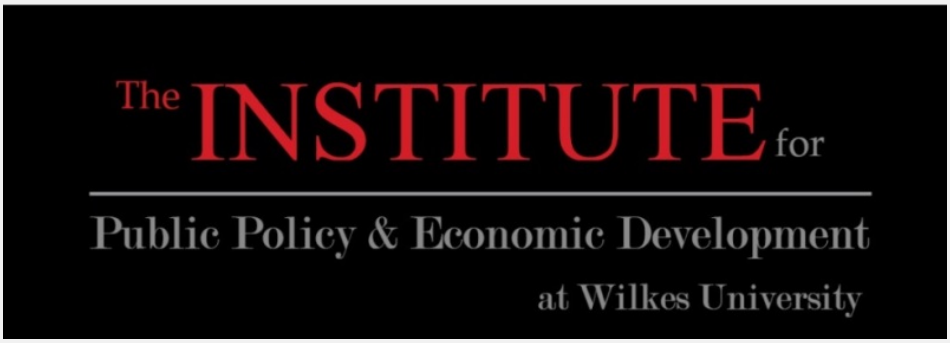

A partnership among Keystone College, King's College, Luzerne County Community College, Marywood University, Misericordia University, Penn State Wilkes-Barre, The Commonwealth Medical College, University of Scranton & Wilkes University

GREEN INFRASTRUCTURE TOOLKIT

A primer for local government officials on what green infrastructure is as it pertains to local communities. This report is a collection of secondary research and includes a selection of approaches that can be undertaken to increase sustainability.

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Definition

Green infrastructure uses vegetation, soils, and natural processes to manage water and create healthier urban environments. At the scale of a city or county, green infrastructure refers to the patchwork of natural areas that provides habitat, flood protection, cleaner air, and cleaner water. At the scale of a neighborhood or site, green infrastructure refers to stormwater management systems that mimic nature by soaking up and storing water.

Traditional infrastructure is what has mainly been used as a means of containing stormwater over the past several decades which includes storm drains, levees, and dams. With new technologies, communities can now limit the use of these methods by allowing natural water absorption into the soil. In many cases, green infrastructure has met success both financially and environmentally.

Description/Summary

This report contains a detailed account of what green infrastructure is and how it is being used today. Much of the traditional infrastructure that is used today across Luzerne and Lackawanna Counties was set in place during the 1970s. Around this time, Hurricane Agnes caused flooding along the Susquehanna River which resulted in massive damage to numerous communities. Since then, federal funding has helped improve the levee system.[1] In the fall of 2011, it protected neighborhoods from a crest of 42.66 feet, 1.75 feet higher than Agnes. However, a problem with constructing a higher levee is that it does not mitigate the river flooding, but rather channels the flood waters with the possibility of induced flooding in unprotected communities. Some theories suggest that the levees induced additional flooding in West Pittston, an upstream community without a flood control system.[2]

Local flooding continues to be a challenge in Northeastern Pennsylvania due to storm drains not having adequate upstream conveyance facilities. Combined Sewer Outflows (CSOs) are prevalent in both counties, adding to the capacity issues in local sewer systems. The recent patterns of major storms occurring in the region on a more frequent basis, potentially as a result of climate change, will continue to be a challenge for the regions stormwater infrastructure.

It is at this juncture that green infrastructure can help remedy the situation. Green infrastructure is environmentally friendly, but its greatest advantage is the natural hydrological process of water being absorbed into the ground. Impervious materials such as pavement and concrete stop the ground from absorbing rainfall. Allowing stormwater to seep into the ground rather than transport it along the surface solves three major problems that currently face traditional methods:

1: Absorption into the soil is a natural buffer which cleans the water and reduces the need for treatment plants

2: Transporting water through miles of traditional sewer systems is more costly, requires more maintenance, and furthers the pollutants contained in the wastewater.

3: Traditional infrastructure is not nearly as effective as green infrastructure at eliminating runoff caused by stormwater. This is a major problem throughout the nation in populated areas.

Philadelphia has been a national leader on this subject followed by New York City and certain areas of California. These areas have spent billions of dollars through donations, federal funding, fundraisers, and their own local accounts to correct the problem that centuries of urbanization have caused.

The mistake these cities and localities made is that some did not realize the increased flooding impacts resulting from changing the surfaces in developed areas to shed the water instead of absorbing it when it was open space. Now more than ever, urban, suburban, and rural communities need to consider implementing plans of green infrastructure as a way to mitigate stormwater problems. A large part of the cost of green infrastructure replacements is replacing the old traditional systems of stormwater management. Instead of replacing the old designs with the same problematic plans, municipalities need to consider modern approaches to control runoff. Future planning is dependent on foresight, and innovate green infrastructure systems can provide significant benefits to communities that have the foresight to implement them. Northeastern Pennsylvania can learn from cities such as Philadelphia and prevent the problem before it arises.

Green Infrastructure Strategies[3]

Over the last two centuries, the main way to deal with wastewater and storm runoff has evolved from dirt trenches, to vast underground concrete and metal sewer systems. Over the last few decades, control of wastewater and storm runoff has advanced through incorporation of green infrastructure in the design of stormwater systems. The most notable technological advancement is probably the creation of new engineering methods facilitated through using computers and computer modeling of stormwater retention and detention facilities. One example produced by these advancements is porous asphalt (3.1.6). Porous asphalt is a huge advancement in terms of promoting water infiltration into the ground in previously large impervious areas.

The list below contains ten other green infrastructure technologies provided by the Environmental Protection Agency.

Downspout Disconnection

Downspout disconnection refers to the rerouting of rooftop drainage pipes to drain rainwater to rain barrels, cisterns, or permeable areas instead of the storm sewer. This simple practice may have particularly great benefits in cities with combined sewer systems such as Scranton and Wilkes-Barre.

Rainwater Harvesting

Rainwater harvesting systems collect and store rainfall for later use. When designed appropriately, rainwater harvesting systems slow and reduce runoff and provide a source of water. Even though this system is more attractive to an arid region, office buildings with wide and long

roofs can harness this rainwater for later use such as irrigating lawn areas.

Rain Gardens

Rain gardens (also known as bioretention or bioinfiltration cells) are shallow, vegetated basins that collect and absorb runoff from rooftops, sidewalks, and streets. Rain gardens mimic natural hydrology by infiltrating and evapotranspiring runoff. Rain gardens are versatile features that can be installed in almost any unpaved space.

Planter Boxes

Planter boxes are urban rain gardens with vertical walls and open or closed bottoms that collect and absorb runoff from sidewalks, parking lots, and streets. Planter boxes are ideal for space-limited sites in dense urban areas and as a street beautifying element. New York City is currently underway with a city-wide planter box initiative to keep water out of the sewers and the harbor.

Bioswales

Bioswales are vegetated, mulched, or xeriscaped channels that provide treatment and retention as they move stormwater from one place to another. Vegetated swales slow, infiltrate, and filter stormwater flows. As linear features, vegetated swales are particularly suitable along streets and parking lots. Bioswales are one of the least costly infrastructures with one of the highest efficiencies of infiltration.

Permeable Pavements

Permeable pavements are paved surfaces that infiltrate, treat, and/or store rainwater where it falls. Permeable pavements may be constructed from pervious concrete, porous asphalt, permeable interlocking pavers, and several other materials. These pavements are particularly cost effective where land values are high and where flooding or icing is a problem. Impervious surfaces are the main cause of runoff; however, with these new materials, this problem can be solved at the source and costs can be comparable to regular asphalt.

Green Streets & Alleys

Green streets and alleys integrate green infrastructure elements into the street or alley design to store, infiltrate, and evapotranspire stormwater. Permeable pavement, bioswales, planter boxes, and trees are among the many green infrastructure features that may be woven into street or alley design. Philadelphia has made use of their own unused alleys in such a way.

Green Parking

Many of the green infrastructure elements described above can be seamlessly integrated into parking lot designs. Permeable pavements can be installed in sections of a lot and rain gardens and bioswales can be included in medians and along a parking lot perimeter. Heat mitigation slows the formation of ice keeping parking lots safe. In most cases parking lots become flooded during heavy rains and oil drip from cars parked augment the polluted state of the runoff.

Green Roofs

Green roofs are covered with growing media and vegetation that enable rainfall infiltration and evapotranspiration of stored water. Green roofs are particularly cost effective in dense urban areas where land value is particularly high. Structural integrity checks of candidate roofs must take place before implementation.

Urban Tree Canopy

Many cities set tree canopy goals to restore some of the benefits provided by trees, including shade and aesthetic benefits. Trees reduce and slow stormwater by intercepting precipitation in their leaves and branches. Homeowners, businesses, and government entities can all participate in the planting and maintenance of trees throughout developed areas.

Land Conservation

Protecting open spaces and sensitive natural areas within and adjacent to cities can mitigate the water quality and flooding impacts of urban stormwater while providing recreational opportunities for city residents.

Examples of these areas include parks, golf courses, vegetated town squares, wetland preservations, or open space.

All photos above are courtesy of the EPA.

Case Studies

Over the past few decades, major urban areas have been undergoing massive reform concerning water management practices. There are several reasons why it has had such success in the past few years. Bluntly stated, these areas were desperate for a new solution to keep their respective geographies beautiful and infrastructure costs within budget. At this intersection, green infrastructure not only became the financial solution, but also the right thing to do. As stated previously, a main hurdle these areas faced was that they had already built out their infrastructure and implementing green infrastructure was a daunting task logistically and financially.

According to an EPA case study, which included 17 locations that varied throughout the nation, low impact development (LID) costs were on average about 25 percent lower than traditional methods. The few locations that did not cost less were about equal to traditional methods. Only one location in the report had a significantly higher LID cost than traditional infrastructure which could possibly be attributed to the major redevelopment of land features that would have taken place to meet their goals. An important aspect to keep in mind about the case studies below is that many paramount benefits of green infrastructure cannot be monetized accurately and therefore are not calculated into a cost-benefit analysis. These benefits include improved aesthetics, expanded recreational opportunities, increased property values due to the desirability of the lots and their proximity to open space, increased number of total units developed, the value of increased marketing potential, and faster sales have all been observed after green infrastructure is developed.[4]

Below are two case studies that show successful green infrastructure planning. Lancaster and Philadelphia have been leaders in this field and are in close proximity to Northeastern Pennsylvania. Because they are within Pennsylvania, they share the same set of state regulations as Lackawanna and Luzerne counties, as well as comparable climates.

The Economic Benefits of Green Infrastructure: A Case Study of Lancaster, PA

In 2011, the city of Lancaster produced and released a green infrastructure implementation plan for a five year period as well as a 25 year period. In 2014, the EPA took this plan and used it as a feasibility/planning guide for the city. What the Lancaster report lacked was the estimates of value and the experience of taking on such a project. With the help of the EPA, the strategic plan now shows great promise as a viable solution to many of Lancaster's economic and environmental problems.

Just like the city of Scranton, Lancaster uses a combined sewer system (CSS) as well as a system designated only for stormwater (MS4). This system, during periods of heavy rain, discharges over 750 million gallons into streams and the Conestoga River. The city estimated that to improve grey infrastructure to the required level would cost around $250 million.

Using green infrastructure, along with their current system, the reductions in cost were estimated to be $50-$90 million. This would also reduce spending on grey infrastructure over the next 25 year period by more than $100 million and treatment and pumping costs related to polluted water by $661,000 per year. At the 25 year mark of implementation, it is estimated that just over 1 billion gallons runoff would be captured annually. To capture half of that amount in Lancaster, it was estimated that by using bio retention and infiltration methods, they would need to set aside 100 acres which is about the size of nine football fields.

The report broke down the four major areas of benefits: water, energy, air pollution, and climate change. When withholding the benefits of water in a green system, Lancaster reported an estimated $4 million in annual benefits per year. These benefits were ranged from reduced electricity use to a reduction in medical problems associated with polluted air.

Lancaster also developed 20 demonstration projects in various areas throughout the city. A permeable parking lot was put in place in the southeastern part of the City. Annual benefits due to the permeable parking lot project alone reached nearly $1,200, and $191,000 of capital costs were avoided when compared to grey infrastructure. Several other projects mirror this same story. Overall, the Lancaster case study was a success and will continue to be implemented over the coming decades.[5]

The Philadelphia Greenworks Program

This case study focused on the protection of the quality of life and the unquantifiable benefits that the Philadelphia program is producing rather than the financial cost. The health of people in a community and the ecological health of that community are important factors in stormwater planning.

Philadelphia was once one of the largest industrial cities in America. During the decades of explosive population and infrastructure growth, pollution became a major problem and is still observed today. Many other cities in this nation suffered environmentally during the industrial expansion.

Over the past five years, the City has instituted its Greenworks plan. The most recent progress report from 2014 shows promise in meeting the goals set back in 2009. The plan is made up of five goal areas, 15 measurable targets, and 164 initiatives. As of the release of this report, 30 percent of those initiatives have been completed, 68 percent are currently underway, and 2 percent of them are future initiatives. Some of these measurable targets include: reducing emissions, managing stormwater, reducing energy consumption, increasing tree coverage, green technologies and practices at the community level, and diverting pollution and landfill waste.[6]

Philadelphia has begun to implement even the smallest of green technologies. For example, the local government replaced 85,000 traffic lights with LED bulbs. This small practice saved the city nearly 10,000 MWh and in turn reduced air pollution by burning less fuel at their power plants. Another example of clean energy is the alternative energy initiative which aims to purchase and generate 20 percent of Philadelphia's needs. Since 2008, alternative energy production has gone from 932 MWh to an astounding 11,402 MWh. This is the equivalent energy use of 1,000 homes each year.

Leading by example is a great way to guide citizens. Mayor Michael Nutter of Philadelphia created a goal to reduce government energy consumption by 10 percent. Although it did rise for the first time in the last five years for this report, further explanation reveals that the harsh winter caused heating to spike not only in government buildings, but also private homes and businesses.

Reducing greenhouse gas emissions by 20 percent in five years is a massive undertaking. Through these multiple avenues of green infrastructure and green practices, the City surpassed their goal for limiting total AQI days (Air Quality Index) to only six unhealthy days. The 2014 calendar year produced the cleanest air that Philadelphia has had in over 20 years. By comparison, throughout 1990 to 2000 the average unhealthy days per year was about 50 days. That number translates to nearly one day of every week the EPA considered the air over the city toxic. The city accomplished this through complimentary techniques in other departments as well as using a bio-diesel fleet and hybrid bus systems. Nearly 14,000 megatons of greenhouse gas emissions were eliminated by these two solutions.

Recycling efforts in the City have grown exponentially and have a lot of support. Between the City, private collections, and construction efforts, about 1.375 million tons of material has been diverted from landfills and recycled.

Since inception, 100,000 trees have been planted in the city which have been reducing runoff, beautifying areas, and helping reduce CO_2 over the last 5 years. Philadelphia Parks and Recreation have taught a wide audience of children and adults about the importance of trees and tree care. Currently, an orchard of 180 fruit-bearing trees and berry bushes have been donated by PPR and TreePhilly to the Philadelphia Prison Orchard Project.

Engagement in Philadelphia has brought hundreds of volunteers out to assist in projects as well as teach others about some important green thinking. The city has hosted dozens of workshops and festivals to encourage participation from all over the northeast area. The annual progress report, along with social media and e-newsletters, has made this change transparent.[7]

Current Policy & Implementation Steps

Only until recently has green policy ever been considered when implementing a policy or code. Current policy, in most cases, does not express benefits or special exceptions to green infrastructure. Since the policy changes in Lancaster (for example, the clean environment initiative) the city has been able to implement green infrastructure without as much red tape concerning new projects. Usually the greatest difficulty an area faces is being able to build these structures under current zoning ordinances.

A crucial point that should be highlighted before delving into implementation of green infrastructure is the DEP's Best Management Practices Manual (BMPs). The green infrastructure systems highlighted in this toolkit are in line with the DEP's manual. Specifically, in a December 2006 report conducted for Pennsylvania, a portion of the report was dedicated to non-structural BMPs. This kind of green thinking focuses on the planning and development of future projects rather than correcting existing facilities. Non-structural BMPs involve guided development through conscientious planning. Major areas covered in this report are reducing impervious coverage and clustered or concentrated development. Dense

development and limited impervious coverage retain natural landscapes that are beneficial and unrestricted. As exemplified in the Philadelphia case study, it is never too late to start implementing green infrastructure, but the more developed a city becomes, the more difficult it is to retrofit the previous facilities.[8]

Zoning Ordinance

Zoning ordinances in Luzerne and Lackawanna Counties are different for nearly every municipality. In Luzerne County, there are less than 30 municipalities that follow the same uniform county code out of the total 76 municipalities. In Lackawanna County, all 40 municipalities have their own zoning ordinance. Many of these codes are congruent with each other, but they differ in specific requirements, level of detail, and the year in which they were adopted.

Reviewing zoning ordinances and revising them to better accommodate certain green infrastructure systems may help implementation and allow swifter action. Policies can also be proactive by capping the percentage of lots that are covered by impervious surface, if such regulations do not exist in the local ordinance. This helps to preserve natural hydrologic function as well as open space. Further, many ordinances throughout both counties have off-street parking minimums. Revisiting these codes and amending them if minimums are excessive may benefit the municipality by both reducing runoff and easing burdens on property owners.

Greater density is usually beneficial in a few different aspects of urban life. Notably, public transportation, walking, and biking are more feasible, which lessens the need for extensive impervious parking lots in the long term. Further, denser development allows for more conservation of open spaces for bio infiltration. Zoning ordinances that promote denser, clustered development while preserving open spaces will lessen stormwater impacts.

Zoning ordinances, particularly those that have not been recently updated, may be ill-equipped to handle requests for green infrastructure projects. These sections of zoning ordinance should be reviewed and amended. In some communities, it may be prudent to broadly allow green infrastructure systems under a special exception or conditional use regulatory structure. Permeable pavements should also be explicitly allowed whenever possible as an alternative to asphalt for parking lots or other paved areas.

The final zoning change that could be considered is an environmental protection section that includes broader environmental safeguards and stringent management controls. Erosion control, tree preservation, removal of top soil to a certain extent, and river or creek setbacks may also be considered. This section is important to the preservation and protection of natural resources. If such ordinances are not in place, many times the surrounding area can be impacted with negative environmental consequences.

Planning

Proper planning for implementation of green infrastructure is a chief concern. Local governments must engage in careful study to understand their specific stormwater needs. Communities must use the

recommendations in this toolkit within the context of their unique situations. For some, the most appropriate course of action may be the development of a Green Infrastructure Strategic Plan that outlines existing conditions and specific goals and objectives for green infrastructure implementation. Public participation is an important part of the planning process. Public workshops, online information, and public television broadcasts are ways to inform citizens about using this method properly. If done incorrectly, even more runoff from roofs could end up on the street, add pollution, and finally reach the streams and rivers.

Public engagement through social media and news services have been used in Philadelphia and New York City and have been met with tremendous support. More often than not, residents are unaware of the programs available in their community which results in poor turnout at public meetings. Generally, since the inauguration of Earth Day in 1970, concern with the environment has actually lowered according to a Huffington Post poll conducted in 2013. However, interestingly enough, people have showed greater support through actions such as reducing electric use. The motive behind these actions is probably financial, but the effect is still the same. Naturally, people also show a stronger support base for the environment in which they live, whereas they exhibit less support for another place.

Public and Private Involvement

Incentives are a way of encouraging the public to support a cause that benefits both parties. Tax breaks are given to businesses that use clean energy or create a certain amount of jobs each year. In other places, local governments will aid green infrastructure projects for a private residence. Privately owned businesses should be solicited as potential partners in a green infrastructure plan. Having a personal relationship with small businesses can go a long way to increase citizen enthusiasm about other projects and it supports awareness by word of mouth.

Public institutions and properties should also be engaged in a planning campaign. Hospitals, schools, higher education institutions, major employers, and public agencies can be a green asset as potential pioneers of green infrastructure within communities. These types of institutions likely have the desire to positively impact the environment and the resources to make an initial investment in green infrastructure.

Federal involvement is usually opposed because local governments want to keep projects and planning "in-house", but as it has been observed, the EPA and other federal agencies have contributed greatly and worked with local officials towards a plan. Both of the case studies in this toolkit are heavily supported by federal agencies through funding, expertise, resources, and accumulated knowledge of projects all across the U.S.

Specific Strategies

Using a combination of two or more green infrastructure elements can be beneficial to land used for green infrastructure. Just as development of housing or parking lots can be condensed, green infrastructure can be as well. For example, using a permeable pavement along with a swale or retention pond for a parking lot can exponentially increase capacity. Parking stalls may have an engineered soil trench between lots to infiltrate the ground or store water just as a rain garden would. When used in

conjunction with one another, green infrastructure can create a great positive impact at reducing runoff and absorbing rainwater.

Some of the most viable options for the counties of Luzerne and Lackawanna based upon this research would most likely be permeable pavements, reduction in requirements for impervious parking areas, downspout disconnections, and planter boxes in various size and vegetation strips/swales. These types of green infrastructure offer the most benefits that come from this new method of dealing with stormwater. However, the specific approaches that are most prudent will certainly vary from municipality to municipality.

The first, permeable pavements, are perhaps the greatest problem solving method concerning street runoff. It is impressive how well the water is essentially swallowed by the permeable surface and filtered through an engineered system. Implementing this type of infrastructure sounds costly, but in fact, this type of surface can be about the same as regular surfacing.[9]

The main cost of permeable surfaces comes from the site preparation. However, materials from the old site can be recycled into the design of the new lot. What many contractors do now to reduce costs is, for example, reusing an original concrete surface and breaking it down to use as the rock base.

Other frequently asked questions about this surface include is if it has to be cleaned. This surface does have to be maintained bi-annually by means of a street brush or vacuum. The porous material can be clogged. Winter conditions do not pose a problem for this material. Salt may be used on the surface as well as snow plows. Further, other implementations have found that permeable materials are more resistant to snow and ice buildup. Finally, permeable asphalt in particular has a life expectancy of 15-20 years, whereas porous concrete and interlocking pavers are expected to be viable for 20-30 years.[10]

The second best utilized strategy is the most effective in terms of its low cost and simplicity. Downspout disconnection when done properly and regulated by officials is a great way to reduce CSO occurrences. The main problem with this solution is resident involvement and upkeep.

A downspout disconnection, as stated, is very simple. It means to take the leading drainage pipe from roof runoff, and to lead the pipe to an infiltration source or a container for either future use or infiltration later on. In less dense areas with downspouts, homeowners have disconnected their spouts and led the water to a rain garden creating a small pond or hydrating water prone vegetation. The new lead must not lead to an impervious surface or overflow into one or it would defeat the purpose of the disconnection.

The final option that would be most beneficial to streetscape in particular in both counties are planter boxes. Planter boxes are perhaps the more costly of the two options, but they provide a wider array of benefits. Planter boxes are a massive undertaking that New York City is currently underway with.

Planter boxes use the same engineering method as what lies beneath permeable pavements, but instead it relies on engineered soil, mulch, and rock. These boxes can contain an array of vegetation depending on their size and can hold thousands of gallons of runoff which creates a large dent in CSO

overflow. A ballpark price of a 20'x5'x4.5' (LxWxD) is around $25,000. When this number is compared to the cost of treating thousands of gallons of water each year, in time, the benefits outweigh the costs.[11] [12]

This option has relatively low maintenance and what maintenance it does require is mostly due to the vegetation used. A vital concern of planter boxes is the specific vegetation that will be suitable for its environment or a person may just end up with a lot of dead plants. Ideally, the plant would consume a lot of water, possibly be active all year round, and does not overgrow its box. These decisions are key to keeping maintenance costs low. Despite the financial benefits, planter boxes add to the aesthetics of the area which influence much more than just cost-benefit ratios.

Resources: Financial & Technical

The biggest obstacle to overcome many times is how these projects will be funded. Many municipalities have tight budgets due to fiscal challenges and others are small and do not have a very large budget to begin with. Through proper research and proposal preparation, any municipality can apply for numerous federal and state grants as well as private and non-profit company donations. The flip side of this coin is the "who". Technical resources are just as important as financial resources. Without a thought out plan and strategy to complete projects, financial support may be wasted on an inefficient design. Technical resources may include local universities/colleges, representatives of federal and state agencies, advocacy groups, and foundations for green infrastructure based development.

Links to numerous financial and technical resources will be included in the appendix.

Financial Resources [13]

The EPA website contains an abundance of grant information. They also loan and grant billions of dollars annually to various organizations and governments for green projects. One way of raising funds is through low interest loans. Depending on the cost-benefit figures of implementing green infrastructure, these low interest loans may be outpaced by yearly savings and therefor pay for itself while the municipality pays nothing out of pocket. This program is called the Clean Water State Revolving Fund (CWSRF). This platform contributes over $5 billion annually to clean water projects.

The William Penn Foundation is a grant based program that has several opportunities for research, development, implementation, and monitor conservation efforts. The watershed protection program could be very useful for a community that would like to investigate the health of their watershed and identify key factors. The Northeastern Pennsylvania Healthcare Foundation has also done work with many municipalities. Their mission is to provide the residents of NEPA with a healthy life, which in turn means a healthy environment. The Sustainable Energy Fund is another financial aid organization that contributes through finances and educational practices.

Through another government run source called PENNVEST, the American Recovery and Reinvestment Act of 2009 was distributed. Financial endowments of $406 million that the state received went towards green projects and energy. However, at that time, not many green projects were in the works

and more than $14 million dollars went towards grey infrastructure in Luzerne and Lackawanna counties alone. Allocating these types of funds into green infrastructure whenever they come is crucial.

Finally, the Willary Foundation of Scranton has presented over $1 million in grants since 2008. These grants involve recreational, community development, and educational categories.

Technical Resources

Technical resources are just as abundant as financial resources if not more so. A multitude of universities and colleges would gladly partner with these efforts (especially public universities) and students would be eager for hands on experience. Pennsylvania State University already has a sustainability department with research and development programs in place. Wilkes University also has an environmental engineering program that may be able to lend expertise to green infrastructure efforts.

NEPA-Forestry and PA-Wildlife are two other organizations that are in place to teach and learn about wildlife and how we can protect it. The forestry organization would be very helpful in the vegetation choosing process if planter boxes were used. Both of these resources would most likely advocate projects and contribute freely saving on costs.

State run agencies are perhaps the most easily accessible. The Department of Conservation and Natural Resources and the Department of Communities and Economic Development are both invaluable sources of technical assistance. The DCDE also has a grant program called the Greenways, Trails and Recreation Program (GTRP) which allows up to $250,000 maximum on a project. The application date ends on June 30th of 2015.

The NEPA Conservation Alliance is an organization dedicated to the conservation, communication, and sharing of resources in Northeast Pennsylvania. The Lackawanna Heritage Valley is one group in particular that stems out from the alliance and has its own grant system which bestowed over $20,000 in 2014. They partner with various businesses and citizens to make powerful impacts every year.

Appendix

Links to Resources

American Rivers	http://www.americanrivers.org/
Department of Conservation and Natural Resources	http://www.dcnr.state.pa.us/
Department of Communities and Economic Development	http://www.newpa.com/
Department of Environmental Protection	http://www.portal.state.pa.us/portal/server.pt/community/dep_home/5968
Environmental Protection Agency	http://water.epa.gov/grants_funding/
Lackawanna Heritage Valley Authority	http://www.lhva.org/
NEPA Alliance	http://www.nepa-alliance.org/
NEPA Forestry	http://nepaforestry.org/
NEPA Healthcare Foundation	http://nepahealthcarefoundation.org/
Pennsylvania State University Sustainability	http://sustainability.psu.edu/sustainability-institute
PennVest	http://www.pennvest.pa.gov/Pages/default.aspx#.VRQzrdMg_cs
Pennsylvania Wildlife	http://www.pawildlife.org/
Scranton Area Community Foundation	http://www.safdn.org/
Stormwater Pennsylvania	http://www.stormwaterpa.org/
Sustainable Energy Fund	http://www.thesef.org/
U.S. Department of Agriculture – Rural Development	http://www.rd.usda.gov/
Willary Foundation	http://www.willary.org/index.html
William Penn Foundation	http://www.williampennfoundation.org/default.aspx

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