

# Sustainability Impact Assessment

*for the proposed Da Vinci Science City, Easton PA*

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*Prepared by*

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*for the Alliance for Sustainable Communities–Lehigh Valley*

## About the Alliance and its internship program

Since its organization in 2003, the Alliance has focused on sustainability at the community level, and this commitment goes beyond environmental concerns and looks at the many inter-related aspects of sustainability as they apply to communities here in the Lehigh Valley.

This project on sustainability assessments is part of the Alliance's initiative on Community Planning for Resilience & Sustainability. Earlier internships have included such topics as Climate Action, Changing Communications in a Warming World, Community & Restorative Justice, Fair Trade, Let's Talk About Climate! (for K-12 teachers), Healthy Food for Healthy Communities, Health Concerns with Synthetic Turf, and Sustainability in Business.

The Alliance wants to thank the hard-working team of students who prepared this report: Olivia Barz (Lehigh University '19), Ryan Dougherty (Lafayette College '19), Harris Eisenhardt (SUNY – Environmental Science and Forestry '19), Ashley Kushner (Lafayette College '19), and Brandy Moser (Boston University '21)

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# Contents

|                                               |    |
|-----------------------------------------------|----|
| Executive Summary .....                       | 1  |
| Introduction .....                            | 3  |
| Why a Sustainability Impact Assessment? ..... | 3  |
| What does Sustainability Mean? .....          | 3  |
| Types of Impacts Considered .....             | 3  |
| The Easton - Phillipsburg Area .....          | 5  |
| Impacts .....                                 | 7  |
| Building Design & Systems .....               | 7  |
| Transportation .....                          | 9  |
| Food .....                                    | 11 |
| Educational Programming & Operations .....    | 12 |
| Construction .....                            | 14 |
| Recommendations & Opportunities .....         | 17 |
| Building Systems .....                        | 17 |
| Transportation .....                          | 18 |
| Food .....                                    | 19 |
| Educational Programs & Operations .....       | 20 |
| Construction .....                            | 22 |
| Attachments .....                             | 25 |



# Executive Summary

This assessment outlines potential impacts associated with developing and operating the proposed Da Vinci Science City (DVSC) in Easton, Pennsylvania. The facility plans to offer science education on various topics, hands-on learning experiences, and interactive exhibits focused on the Lehigh Valley. Given this project's location, we examined potential impacts on the interconnected topics of climate change, community, health, environment, and local economy. This document also features a list of recommendations related to the impacts, intended to offer suggestions and guiding principles for the DVSC and the City of Easton to serve as a model for sustainable development.

There are many challenges associated with the DVSC site. It sits at the confluence of two rivers in both the 100- and 500-year floodplains. The area adjacent to the proposed DVSC contains high concentrations of people who live below the poverty line or have a disability, raising concerns for environmental justice. It is also adjacent to historic Downtown Easton, raising questions about the scale of the proposed building.

Building design and systems, transportation, food, educational programming, operations, and construction all impact climate, community, environment, health, and local economy. The DVSC will contribute a substantial amount of greenhouse gas emissions, particularly from the energy consumption of the building and associated transportation activities. This project also has the opportunity to work closely with the surrounding community to increase resiliency. Impacts to the local environment are most severe in regards to water use and pollution. The impacts of transportation have the potential to degrade air quality and discourage walkability and physical activity. DVSC could present significant competition or opportunity to local businesses, affecting surrounding economic dynamics. The construction process emphasizes the adverse impacts of further local pollution, detriments to quality of life, and worsened traffic and parking conditions.

There are many opportunities to reduce or eliminate adverse impacts. Our recommendations include, but are not limited to, ways to improve downtown walkability, integrate local organizations and businesses into DVSC programming, incorporate renewable energy and building efficiency measures, protect the environment, and reduce greenhouse gas emissions.

A systems-based approach was essential because the areas of climate, community, health, environment, and local economic impacts are so intertwined. DVSC's potential role in education, community interaction, and innovation creates an opportunity for partnership with other organizations and institutions in Easton. This project also demonstrates why the City of Easton needs regulatory standards that work with and protect the local and global community.

Finally, attachments include a projected greenhouse gas inventory, a checklist of Leadership in Energy and Environmental Design (LEED) credits, the City of Easton Comprehensive Plan, recommended ordinances, and a recap of recommendations for the City of Easton.

“ Realize that everything  
connects to everything else. ”

—Leonardo da Vinci

# Introduction

## Why a Sustainability Impact Assessment?

Some municipalities require impact assessments for proposed projects, but they often are inadequate and disregarded in favor of economic gains. An integrated and comprehensive sustainability impact assessment process is essential to understand the impacts a project will have on climate change, community, health, environment, and economy.

The Pennsylvania state constitution declares in Article I, §27 that

“The people have a right to clean air, pure water, and to the preservation of the natural, scenic, historic and aesthetic values of the environment. Pennsylvania’s public natural resources are the common property of all the people, including generations yet to come. As trustee of these resources, the Commonwealth shall conserve and maintain them for the benefit of all the people.”

However, the Pennsylvania Constitution does not present a means of action to protect these rights. A more comprehensive assessment process, in the early stages of planning, could address both current and future conditions and assess impacts to climate change, community, health, environment, and local economy.

Easton's current planning ordinances provide for limited impact assessments, but do not require a comprehensive assessment of all these areas. This assessment analyzes these impact areas and offers recommendations to mitigate negative impacts and provide opportunities to improve community well-being. If the DVSC project goes forward, the City can require an up-to-date impact assessment.

## What does Sustainability Mean?

Almost 30 years ago, the Brundtland Commission defined sustainability as “meeting the needs of the current generation without compromising the ability of future generations.” The global Earth Charter Initiative<sup>1</sup> attempts a more-holistic definition of sustainability, but is difficult to operationalize. Sustainability can and should be interpreted in many ways, considering education level, socioeconomic status, and cultural influence. Sustainability means to be conscious of both local and global communities, to conserve and manage resource consumption as regenerative rather than destructive, and to consider human welfare and economic success for future generations.

Development projects often concentrate on one or two major dimensions, such as profitability, environmental consciousness, or protection of human health. Truly-sustainable projects weave these components into a single cohesive whole. For the DVSC project, we chose to examine the facets of climate, community, health, environment, and local economy because of the clear overlaps within these topics and their direct relevance in the area of the DVSC site.

## Types of Impacts Considered

### Climate

Climate change effects can be seen most clearly with changed storm patterns and frequency, rising temperatures and water levels, increased spread of disease, and the prevalence of asthma. These global consequences are the result of additive effects from years of individual projects and processes. Greenhouse gas emissions from new projects continue to contribute to climate change, so we evaluated emissions from Da Vinci Science City (DVSC) construction, operations, and programming.

The City of Easton recently adopted a Climate Action Plan, with a goal of reducing greenhouse gas (GHG) emissions 80% by 2050, based on a 2016 baseline, and has already switched city operations to 100% renewable sources<sup>2</sup>. Since their baseline does not include this project, DVSC will have to minimize emissions to avoid disrupting this plan—otherwise, this responsibility would fall on the residents, businesses, and organizations of Easton.

The international GHG Protocol<sup>3</sup> establishes standards for reporting GHG emissions. First, the organization must clearly define the boundaries of what will be considered in its GHG inventory. Once the boundaries are set, three types of GHG emissions are considered: Scope 1, emissions generated on-site; Scope 2, emissions generated off-site for the organization (such as electricity); and Scope 3, emissions that an organization causes indirectly (such as visitor travel). GHG Protocol standards suggest that at least the most significant sources of Scope 3 emissions should be included in an organization's GHG inventory.

The most cost-effective way for DVSC to minimize its climate impacts is to (1) reduce energy usage as much as possible, (2) source energy from renewable sources, and (3) purchase offsets for any emissions that cannot be avoided. Many carbon-offset opportunities can provide communities with considerable co-benefits such as reduced pollution, increased jobs, and energy reduction, possibly also resulting in economic savings. These concepts normally apply to offset opportunities in developing countries, but if available locally, choosing these offsets can benefit both the climate and the neighboring community.

## Community

New development projects affect the way people in the community live their daily lives and can contribute to accessibility concerns, gentrification, displacement, and community engagement. Well-planned projects can minimize these negative effects to the community. Many of the impacts from construction and operations of DVSC raise concerns for environmental justice. This project provides an opportunity to engage the community in planning programming that reflects the culture and concerns of the local community.

## Health

New projects influence both physical and mental health. The Health Care Council of the Lehigh Valley's Community Health Needs Assessment (CHNA)<sup>4</sup> identified the key influences as housing, air and environment, poverty, employment, education, and individual behaviors. After evaluating these determinants of health, they identified three top health priorities as promoting healthy lifestyles, improving mental health, and improving child health. DVSC has a unique opportunity to make a positive impact on the health of the community and its visitors by working towards these three key identified areas of need.

## Environment

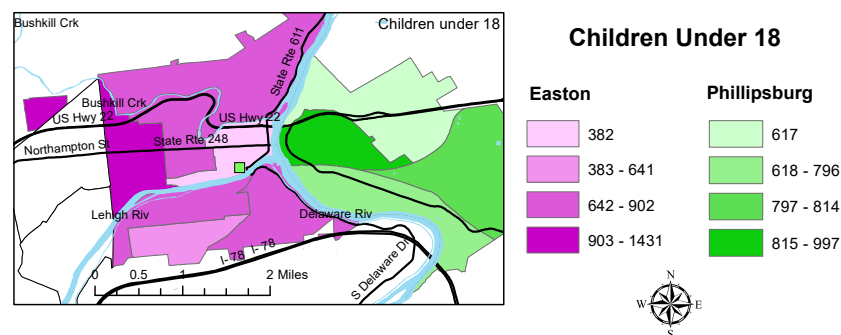
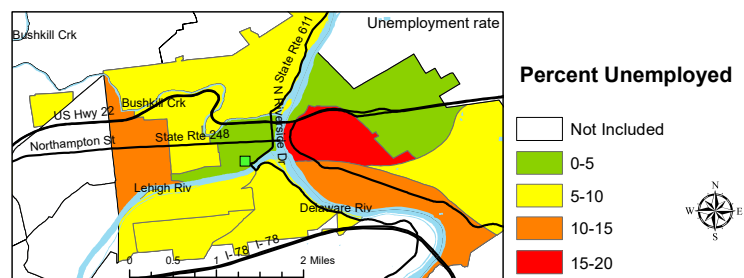
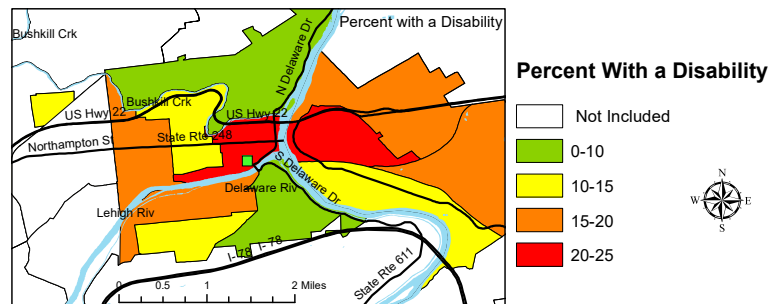
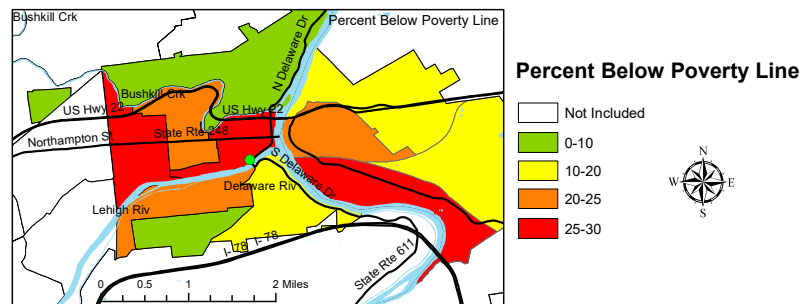
As human actions continue to destroy the world's ecosystems, and international corporations and governments continue to obstruct progress towards renewable energy and environmental education<sup>5</sup>, it becomes more important than ever to mitigate local and global adverse impacts on the environment. In addition to mitigating its own impacts, DVSC can have a positive role in environmental awareness of deforestation, local emissions, stormwater, biodiversity, embodied carbon, recycling practices, and waste.

## Local Economy

Development projects have many impacts on local businesses, employees, residents, and visitors. DVSC may increase local spending on recreation, lodging, and services; however, the facility may also redirect spending away from local businesses and existing establishments. This analysis examines ways for DVSC to enhance rather than weaken the local economy and to integrate principles of sustainability in both local and global communities, which align with the goals of DVSC and the City of Easton.

## The Easton - Phillipsburg Area

Using data from the U.S. 2016 Census (5-year projection), we created maps of the DVSC project area, which includes both Easton and Phillipsburg. These maps draw attention to demographics that raise community and environmental justice concerns.





# Impacts

## Building Design & Systems

The impacts of building design and operations are combined because many operational decisions will be dictated by the design. (DVSC has expressed a goal of being “climate neutral”, which requires DVSC to consider how all aspects of their operations impact climate, not just the building itself.)

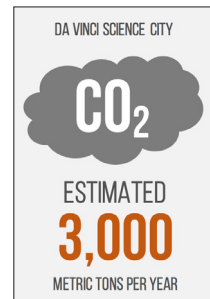
### Energy use ☀️💰

According to current data from the Energy Information Administration, most of Pennsylvania’s electricity is generated by coal, natural gas, and nuclear power. Renewable electricity accounts for only 4.6% of the total state electricity mix<sup>6</sup>.

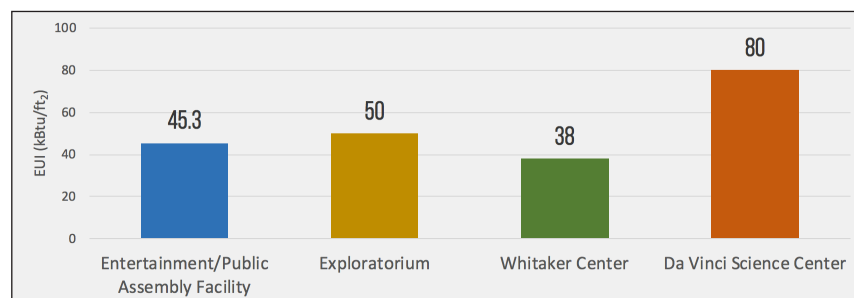
The proposed living exhibits will require temperature control, ventilation, and illumination at all times to artificially recreate 24-hour cycles and seasonal changes. Another concern is the proposed indoor “sky-diving” unit. Power for the 2,450-horsepower motors that power these wind tunnels could add to GHG emissions.<sup>7</sup> DVSC operations could contribute to power demand during peak grid use hours, which may result in fossil-fuel-powered plants coming online to create enough electricity, thus resulting in greater GHG emissions.

Additionally, heating is usually the result of fuel combustion, and cooling frequently utilize refrigerants with high global warming potentials. There are many renewable energy technologies that generate electricity, heat, or other forms of useful energy without emitting GHG. (see Attachment F) Investments in renewable energy technologies reduce GHG emissions and costs during their operational life.

Even more significant than on-site energy generation is the proper design of the building to operate efficiently. With a properly designed structure, less energy is required to perform building functions, and thus the energy generated by on-site renewables will make up greater percentages of the overall load profile for the facility.



Energy Use Intensities



This graph shows the site Energy Use Intensities (EUIs) of several similar structures to the existing Da Vinci Science Center compared to the median EUI value for buildings used for entertainment/public assembly. These values were calculated based on Energy Star<sup>®</sup> guidelines for calculating site EUI.



Climate



Community



Health



Environment



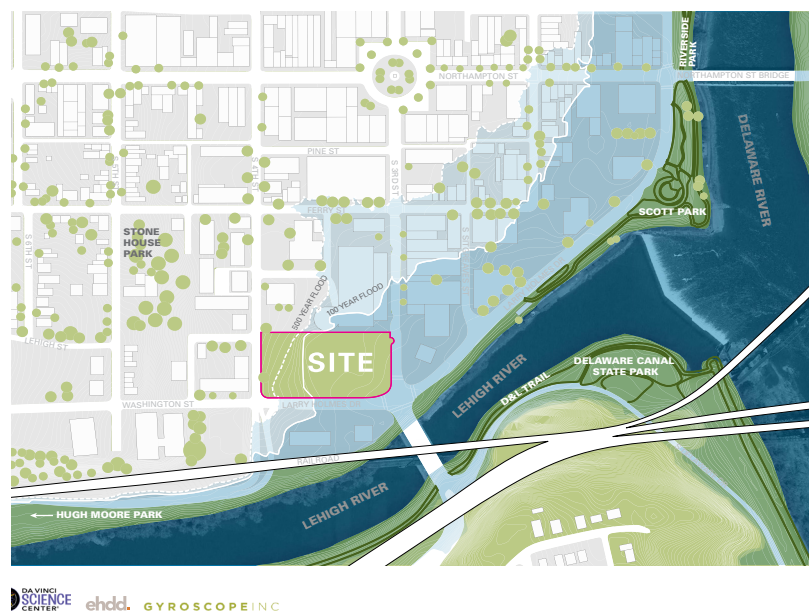
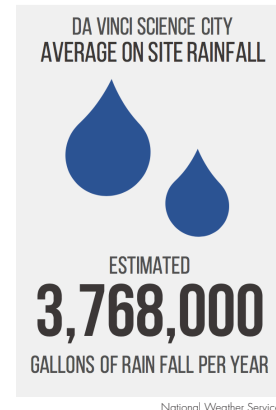
Local Economy

## Water management 🌍💰

The DVSC Master Plan document outlines that the building will be able to treat both wastewater and stormwater on site<sup>8</sup>. In the Downtown area, Easton's sewage system collects wastewater and raw sewage from housing and buildings as well as storm water. When there is a heavy storm, this can cause raw sewage to overflow into Lehigh and Delaware Rivers, killing fish and shellfish, creating algal blooms, and spreading disease-causing bacteria such as *E. coli*.

Although DVSC's proposal for on-site water processing might increase GHG emissions, it is especially important for this project, given its location in the floodplain and adjacency to the two rivers. The Frick Environmental Center in Pittsburgh, PA provides an example of effective ways to manage wastewater and stormwater in a city with a combined sewer system<sup>9</sup>.

This image from the DVSC Master Plan shows the 100 and 500 year floodplains at the DVSC site. The location of this site as well as the climate of Eastern Pennsylvania making effective stormwater management essential.



## Waste disposal ☀️👥❤️🌍💰

Landfills produce millions of tons of the potent greenhouse gas methane every year, accounting for 14.1% of the total GHG emissions in the United States<sup>10</sup>. Recycling and composting not only reduce emissions from waste facilities, but can also reduce demand for the materials used to make the products, thus reducing emissions from mining, drilling, and deforestation. For example, recycling 1 ton of paper saves around 682.5 gallons of oil, 26,500 liters of water and 17 trees<sup>11</sup>. Transportation of waste also contributes to GHG emissions, however reducing the need for this service could reduce GHGs.

Poor waste management detracts from community well-being and a perception of safety and can lead to negative health consequences.

## Air quality

Poor air quality practices and the use of paint, adhesives, solvents, cleaners, and disinfectants that contain volatile organic compounds (VOCs) can have negative impacts on indoor air quality, and can contribute to cardiovascular diseases, asthma, and other respiratory complications<sup>12</sup>.

## Green space

Green space can improve the quality of life and health of individuals by reducing air pollution and providing relaxation and stress relief. This has been tied to improved mental health and reduction of obesity and cardiovascular disease<sup>13</sup>. Green space may also improve storm water management by minimizing runoff and providing flood mitigation.

## Building scale

The Easton Comprehensive Plan calls for preservation of its historic atmosphere. One concern about DVSC is that its large footprint and modern design may create a sharp visual contrast among surrounding community features, altering the community feel of Downtown Easton.



## Transportation

With an area of approximately five square miles, Easton is accessible through a variety of transportation means. On average, most of the population owns two personal vehicles, commutes approximately 24 minutes daily to work, and tends to favor driving alone. About 6% of commuters walk to work, while less than 1% ride a bicycle, and only 10% of commuters commit to carpooling<sup>14</sup>.



Climate



Community



Health



Environment



Local Economy

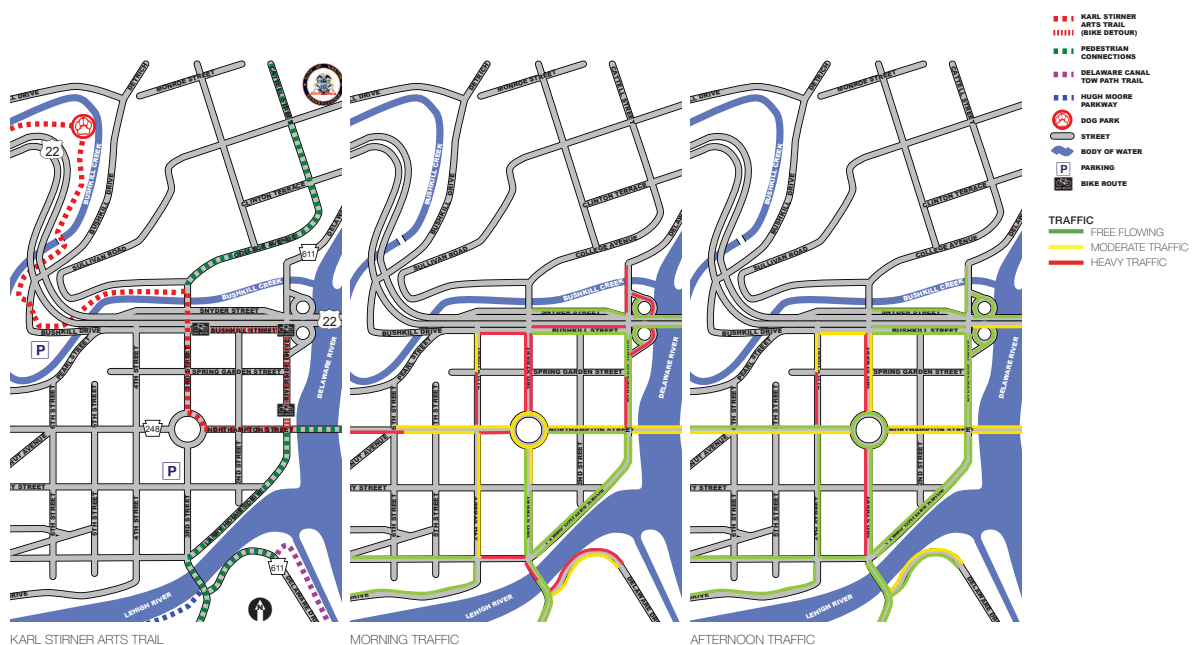
Up to 480,000 of DVSC's projected 600,000 visitors are expected to come from outside the Lehigh Valley (mostly by personal car or bus), so transportation becomes a significant issue for this project.

### Increased vehicle presence and traffic 🌞👥❤️🌍💰

DVSC's operations and programming events could impact GHG emissions in both positive and negative ways. DVSC may increase the likelihood of people staying in Downtown Easton (as opposed to driving to another city), but may also attract more people to drive into Easton, increasing the GHG emissions within the City's bounds.

More traffic and vehicle idling will increase GHG emissions. DVSC's planned shuttle service could also add to traffic and GHG emissions (a Scope 1 emission) in addition to the emissions from cars, trucks, and buses.

#### SITE ANALYSIS: CIRCULATION



Increased traffic to and from the proposed project site could also increase noise pollution in the area, which can be stressful and frustrating for nearby residents. Noise pollution can contribute to lack of sleep and other physical and mental health concerns in the surrounding community. Because many of the local residents are below the poverty line, these unequal effects are an environmental justice concern.

Local emissions can have adverse effects on the environment. Two studies done in the UK found that some species of plants have an adverse reaction to exhaust pollution while others, due to the emission of nitrogen oxides, receive a slight increase in shoot length<sup>15,16</sup>. Vehicle emissions can heavily impact urban ecosystems and reduce biodiversity within the City. Sulfur and nitrogen emissions contribute to the formation of acid rain, which lowers the pH in rivers and can destroy entire populations of aquatic species<sup>17</sup>. Vehicle emissions such as ozone, sulfur dioxide, and nitrogen oxides can affect the respiratory systems of animals, especially birds.



Climate



Community



Health



Environment



Local Economy

Such vehicle emissions also exacerbate already-poor air quality conditions, affecting the community's health and working against the goals addressed in the CHNA<sup>18</sup> and leading to higher rates of asthma and lung complications, particularly among children. It also has the potential to increase stress due to difficulty crossing streets, which could negatively impact the mental health of individuals in the community.

The increased number of people expected to visit Easton with the introduction of DVSC may create the opportunity for investments in infrastructure in parking, walkway revitalization, and alternative transportation. The City has already pursued the 13th Street Corridor Project, which sought to utilize green infrastructure to remodel the street to be more accommodating, adhering to the 'Complete Streets' guidelines<sup>19,20</sup>.

DVSC may increase demand for goods such as parking spots and gasoline. Increased traffic may positively impact businesses as increased volumes of people travel through and stop for food or retail goods in the area. However, this could have negative impacts on local businesses, as some potential customers may not want to deal with increased traffic.

## Food

DVSC plans three 'Grab n Go' style cafés, and one larger central food preparation facility to supply the other three sites and to provide catering for large scale events.

### Food production and transportation 🌞👥❤️🌍💰

The production of food is a significant source of GHGs globally, as fertilizers, pesticides, and soil disruption all release GHGs into the atmosphere<sup>21</sup>. The production of meat alone accounts for a significant portion of the GHG emissions from food. Additionally, the transport of food through all stages of its production and consumption introduces significant amounts of GHGs into the atmosphere through the burning of fossil fuels.

Pesticides use in "conventional" agriculture wreak havoc in delicate ecosystems, which can affect entire food chains and biodiversity<sup>22</sup>. It has also been shown that the bee population is significantly affected by use of insecticides<sup>23</sup>.

Pesticides can be toxic to humans, resulting in respiratory illnesses, headaches, and extreme weakness<sup>24</sup>, and long-term exposure has been linked to cancer, asthma, and the development of Parkinson's disease. If food is not sourced locally, it could also increase the risk of air pollution and related health complications due to the emissions produced from transporting the food to the DVSC site. Local, organic food not only alleviates both of these potential impacts, but also mitigates the risk of pesticide exposure in the community. It discourages conventional farming, and could collectively reduce the amount of pesticides used in local agriculture.

### Healthy food options 👥❤️

In the Lehigh Valley, 28% of adults are obese, while over 40% of school age children are either overweight or obese<sup>25</sup>. The CHNA established a goal of improving child health and promoting healthy lifestyles. DVSC could mitigate health risks of obesity and other nutrition related health complications by providing healthy food and education on healthy food.

## GREEN ALLEY PROGRAM CHICAGO, IL



### FAST FACTS

- Applications throughout urban space
- Four alternative design options
- Collaborative effort among city departments, environmental groups, and community members

### GREEN IMPACTS

Stormwater management, energy conservation, glare reduction, material recycling and Heat Island Effect remediation<sup>47</sup>.



Climate



Community



Health



Environment



Local Economy

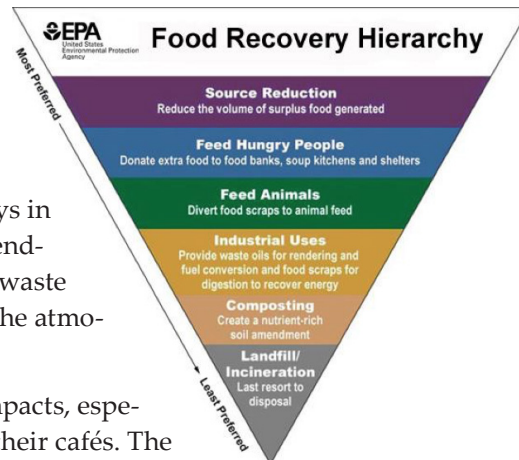
Additionally, providing healthy, nutritious food at an affordable price to low-income guests at DVSC can positively impact people who face barriers to healthy food.

### Food waste and packaging 🌞🌍💰

The United States wastes about \$165 billion worth of food a year, about 20 pounds per person<sup>26</sup>. Food waste can occur at several different points along the supply chain, but this waste can be easily minimized<sup>27</sup>.

The EPA's Food Recovery Hierarchy, pictured here, details ways in which food waste can be recovered. As shown in the image, sending waste to landfills is the least climate-conscious method of waste disposal, as decomposition in landfills releases methane into the atmosphere.

Food packaging and single-use plastic are additional waste impacts, especially due to the "Grab 'n Go" concept DVSC is proposing for their cafés. The production of plastics utilizes fossil fuels, releasing GHGs into the atmosphere, and plastic products persist in the environment. The cost of disposal would be higher than the extra cost to clean and maintain reusable settings.



### Relationships with local restaurants 🍷💰

Local restaurants may have to compete with the museum if visitors remain in the museum to eat and do not explore the surrounding area for restaurant or food options. Increased traffic from DVSC visitors may increase business at local restaurants.

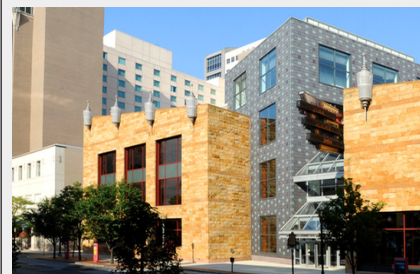
## Educational Programming & Operations

### Education & exhibits 🌞🍷❤️🌍

DVSC programs can inspire visitors and encourage thought and discussion of scientific topics otherwise unexplored by the public, raising awareness and empowering visitors. This also can give the community a sense of pride in the DVSC for its educational value. Programming at the museum could educate many children and adults about technology, health, and nature and how it is relevant to them personally, as well as to the local community. Ultimately, this can inspire children and adults to pursue careers and hobbies in the sciences.

DVSC programming can impact the health of both the community and its visitors through health education and programs. DVSC proposes a Science + ME exhibit, focused on the health categories of physical health, genetics, growing and aging, mental health, medicine and disease, exercise, and nutrition. DVSC has the opportunity to benefit the physical health of its visitors and community through education about the body and integrating experiences that encourage physical activity. This programming can complement the goals of the CHNA to improve mental and child health and promote healthy lifestyles.

### WHITAKER CENTER HARRISBURG, PA



#### FAST FACTS

- Built in 1999 to promote science, the arts, and downtown culture
- 130,000 square feet
- Offers movies, live performances, and a science center

#### COMPARISON TO DA VINCI

The Whitaker Center in Harrisburg, PA is the same size as the proposed DVSC and is in the same climate area, operating at an energy usage intensity of about 38 kBtu/ft<sup>2</sup>. This shows that it is possible to operate a building of this size in this climate at low energy intensities<sup>48</sup>.



Climate



Community



Health



Environment



Local Economy

Exhibits discussing the often-overlooked topic of mental health can be valuable in removing the stigma and serving as a resource to visitors and the community. Integrating mental health into other health exhibits could be beneficial in showing the interconnectedness of physical and mental health. Providing community resources and connecting visitors with organizations that work with mental health could also improve the well-being of the community<sup>28</sup>.

The presence of renewable energy technologies on site can serve as a valuable educational tool, linking to DVSC's idea of using the building as a "Living Laboratory." The Science + NATURE exhibits are closely linked to the local ecosystem, which could make it easy to incorporate education about ecosystem loss, deforestation, pollution, and waste.

### Community implications 🧑‍🤝‍🧑❤️💰

If there are barriers to location, mobility, language, culture, price, or disability, there could be inequalities in who can attend and participate in programs and education at DVSC. Barriers to accessibility could also result in negative feelings toward DVSC, and fewer people may visit the facility.

Outreach programs can reinforce programming concepts throughout the community. Programs such as those currently in existence at the Da Vinci Science Center (scholarships, Women in Science support, festivals, mentoring coalition, Toys for Tots, Dream it Do it, school field trips, senior science Mondays, Scout Programs, little learner activities, camps, career exploration days, outreach programs and shows, educator professional development) can affect the lives of diverse groups of people and greatly increase community engagement and support<sup>29</sup>.

An engaged community that has pride in their accomplishments and offerings is more likely to have lower crime rates, less vandalism, and more involved members<sup>30</sup>. The programming at the DVSC offers could create diverse, thriving community that takes pride in their city and community members<sup>31</sup>.

DVSC could also serve as a hub for events sponsored by municipal services such as the library, art galleries, or educational institutions. This could improve the health of the community by providing a place for community members to develop social associations, which have been correlated with improvements in both mental and physical health.

DVSC may offer local residents well-paying and reliable jobs, which could benefit the community and the local economy. The area surrounding the project site contains a high concentration of people with low incomes or who live below the poverty line, so offering local residents a steady, accessible, and well-paying job may allow them to maintain their finances more easily. This could also impact the health of the surrounding area as poverty and unemployment are important social determinants of health<sup>32</sup>. Hiring locally could decrease the amount of vehicle traffic to and from the museum as employees could walk to work, helping to increase health in the community and reduce GHG emissions. Additionally, offering community members jobs can help create local support for the project. Providing training for positions can educate and empower local community members, giving them a larger sense of pride and belonging in their community. This can be seen with the training programs provided by Northampton Community College for positions at the Sands Casino in Bethlehem, PA<sup>33</sup>.

### DA VINCI SCIENCE CENTER ALLENTOWN, PA



#### FAST FACTS

- Moved to Allentown in 2005
- 30,000 square feet
- Promotes creativity, artistry, and current day applications of qualities of greatness embodied by Leonardo Da Vinci

#### COMMUNITY OUTREACH

Da Vinci Science Center is deeply rooted in its surrounding community, offering dozens of programs such as unique special events, field trips, Women in Science, professional development, summer and after school programs, and outreach to the underserved.



Climate



Community



Health



Environment



Local Economy

DVSC could either detract from or add to the customer bases of surrounding businesses. If DVSC works to integrate their programming into already existing events or to complement other types of businesses in the immediate area, Easton could see more visitors and gain the economic impacts of this effect. However, if DVSC's programming does not aim to include the community, visitors may attend DVSC and leave Easton without ever having explored the area, potentially harming surrounding businesses.

A high-interest project in a low-income area can increase property values, making it difficult for established businesses and residents to remain in the area. It could also result in nearby businesses raising their prices, which could in turn make it harder for low-income residents to contribute to their local economy.

### Retailers within museum space 🌞🌍💰

DVSC plans to include private retailers for their cafés and museum store. Though these retailers seem separate from DVSC, their GHG emissions contribute to DVSC's total, and therefore to the goal of climate neutrality.

DVSC's retailers may utilize single-use plastics such as plastic bags. Every year 1 trillion plastic bags are used worldwide, and plastic that makes its way into the ocean kills millions of animals every year<sup>34</sup>.

Clothing and other goods that may be sold in the museum store can also have a significant impact on the environment. The world's cotton crop accounts for 25% of global insecticide and more than 10% of global pesticide use<sup>35</sup>. Not only do these chemicals infect waterways, persist on food, and kill millions of animals in the US per year, but they are also the cause of death of over 10,000 U.S. farmers per year due to their carcinogenic effects.

Paper products that may be used at DVSC can contribute to the use of chlorine-based bleaches that release toxic materials into the air, water, and soil. Additionally, 19.5 million tons of paper are thrown away per year in the United States, contributing to the climate crisis as it decomposes in landfills<sup>36</sup>.

Plastic, paper, cotton, and food are all examples of the greater issue of supply chain consciousness. The upstream and downstream effects of products bought and sold by DVSC can be disastrous for the environment and the climate. Drawing attention to these effects could have a ripple effect on the visitors of DVSC and the community, and could lead to more climate- and environmentally-conscious practices in the future.

## Construction

Impacts due to construction differ from the operations of DVSC in that much of the process is controlled by the architects and engineers who specify materials, and outside contractors actually do the work. Construction impacts typically include energy use and GHG emissions; air, water, and noise pollution; and life-cycle impacts of materials used.

### EXPLORATORIUM SAN FRANCISCO, CA



#### FAST FACTS

- Renovated historic building from 1914
- 330,000 square feet
- LEED Platinum
- Targeting net-zero energy consumption

#### LEED & COMMUNITY PROGRAMS

Innovation in design and energy conservation credits achieved extensive community programming and accessibility, and relationships with community members including discounted rates and special events with local organizations<sup>49</sup>.



Climate



Community



Health



Environment



Local Economy

## Planning and administration 🌞👥❤️🌍💰

The DVSC project outlines construction as beginning in March of 2020. The process of construction is energy, time, and cost intensive, and DVSh of these regards from the beginning. This way, environmental damage and remedial costs can be minimized and return to natural resources can be maximized<sup>37</sup>.

The DVSC project presents an opportunity to cultivate a new standard for contractor choice that sets an expectation of sustainability and eco-consciousness, emphasizing the need to reduce GHG emissions<sup>38</sup>. If the DVSC project were to be carried out adhering to only baseline requirements for economic, environmental, and social welfare assurance, it is possible that many hidden costs will be incurred, ecosystems will be exploited, and some stakeholders will be ignored and excluded.

## Noise, light, air, and water pollution 🌞👥❤️🌍

Local residents and businesses may have to deal with loud construction vehicles, the sounds of construction, and possible light pollution if construction continues after dark. This may affect business at local retailers or restaurants, as well as the health and attitude of local residents. Noise pollution and light pollution during both the construction and operation phases can contribute to lack of sleep and other health concerns that could potentially worsen physical and mental health of the surrounding community. This is important to keep in mind as many of the local residents are below the poverty line and these unequal effects on low-income residents could be seen as an environmental justice concern.

Additionally, construction can result in an increase in GHGs and degraded air quality from dust and other particulates being released into the air. The Lehigh Valley was ranked 14th-worst in the country for asthma rates in 2005, and Northampton county ranks among the top 2% in the country for risk from diesel soot and air toxins<sup>39</sup>.

Construction practices can also threaten the environment. Particulate matter can lead to increased sedimentation into rivers and impact the local ecosystems. Given the DVSC's proximity to river ecosystems, this concern may be of particular importance during the construction process.

## Traffic 🌞👥❤️🌍

Construction may create increased traffic, more difficult commutes, or even close roads for vehicles, pedestrians, and cyclists. Detours or closed roads as a result of construction can cause confusion, tension, delays, and frustration within the community. Increased traffic and construction vehicles may pose a threat to exposed pedestrians and bikers, making it more difficult to travel by foot or bike. Because some citizens' only transportation option may be walking or biking, this creates a concern for equality.

Car travelers may have to take longer routes or idle for longer periods of time during construction, increasing GHG emissions during construction. Construction may also impact traffic and travel patterns in such a way that visitation to existing attractions like the Crayola Experience could be altered, impacting revenues in the local area.

### FRICK ENVIRONMENTAL CENTER PITTSBURGH, PA



#### FAST FACTS

- Public facility dedicated to experimental environmental education
- 16,440 square feet
- PV supplies > 100% of energy needs
- Certified Living Building

#### WASTE & STORMWATER MANAGEMENT

The site captures enough rainwater to offset all potable and non-potable water use. It is collected in a 15,000-gallon underground cistern and treated in a three-stage process: 5-micron stainless steel filter and two UV treatment units.



Climate



Community



Health



Environment



Local Economy

Construction may create barriers to parts of neighborhoods, which can create disparities and inequalities within the community.

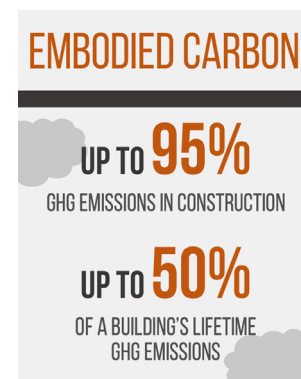
### Community impacts 🧑‍🤝‍🧑💰

Construction of a new project may create excitement, hope, and pride in a community, as the project could create economic and social opportunities. Many local residents and businesses may see the DVSC project as a significant positive influence on the local economy and neighborhoods.

DVSC projected it will create 650 temporary positions<sup>40</sup> for up to 2 full years during the construction process. With these employees commuting to the construction site on a near-daily basis, there may be increased revenues for the City from parking influx, as well as spending at local shops for food, drinks, and other amenities<sup>41</sup>.

### Material sourcing and disposal 🌞🧑‍🤝‍🧑❤️🌍

There are several important components to GHG emissions in construction, including the embodied carbon in the construction materials and the disposal of construction wastes. The embodied carbon in construction materials is something that cannot be avoided—only minimized. These emissions result from the manufacturing process and transportation of materials to the site of construction. Embodied carbon can account for up to 50% of a building's lifetime GHG emissions, and 95% of the emissions in the construction process<sup>42</sup>. It is possible to reduce embodied carbon through reuse of construction materials, sourcing materials locally, and utilizing alternative products with lower embodied carbon values.



The prospect of sustainable forestry can help to further manage GHG emissions. Deforestation is the second leading cause of carbon pollution, causing nearly 20% of global GHG emissions. It is estimated that forests are home to almost 50% of the world's species, including many that are endangered<sup>43,44</sup>.

Additionally, hazardous building materials can pose a threat to the visitors of DVSC and the community. DVSC could potentially use common hazardous materials (Living Building Challenge's red list: carcinogens, endocrine disruptors, known human toxins, compounds that bioaccumulate easily, ozone depleting compounds such as refrigerants) during construction, including solvents and human-made fibers, which can have drastic health consequences on workers, the surrounding community, and future visitors if used or controlled improperly<sup>45</sup>.



Climate



Community



Health



Environment



Local Economy

# Recommendations & Opportunities

This section takes a holistic view in providing recommendations to mitigate the challenges associated with the Da Vinci Science City and opportunities that could potentially create benefits in the five impact areas (climate, community, local economy, health, and environment). The impact areas relevant to each recommendation or opportunity are noted by colored symbols. LEED and Living Building Challenge provide guidelines to operationalize a commitment to sustainability.

All recommendations are directed to the Da Vinci Science Center unless otherwise stated. To operationalize these recommendations, the City should require sustainability assessments for all future projects (see Attachment E).

## Building Systems

### Energy use 🌞💰

- Minimize energy use and increase energy efficiency, for example:
  - Set thermostats to maintain moderate indoor temperatures (68 degrees in winter, 78 degrees in summer)
  - Use LED lighting wherever possible
  - Utilize daylight (use controls to shut off artificial lighting when daylight is sufficient)
  - Utilize windows (shading, tinting, dual panes, photovoltaics)
  - Maintain systems carefully to uphold efficiency and avoid unexpected energy costs
  - Building Automation Systems
  - Indoor living wall systems
- Use climate-friendly heating and cooling systems
  - Avoid use of any fossil fuels
  - Use refrigerants with global warming potentials of 50 or lower
  - Electric heat pumps drawing from solar power
  - Recapture heat from warm water, exhaust air, and passive solar
- Conduct annual Greenhouse Gas Inventories, including retailers and food services, and publicly publish the results

### Renewable energy

- Consider potential renewable energy systems on-site 🌞🌍
  - Solar photovoltaic panels on all appropriate surfaces
  - Solar water heating with thermal energy storage
  - Biodigestion
- Encourage other local businesses and residents to consider renewable energies
- Allow for the public to voice their concerns about the sight of renewable technologies and attempt to mitigate these concerns through education about the importance of renewable energies 🧑🏫❤️
- Purchase offsets for any greenhouse gas emissions that cannot be avoided 🌞🌍

### Offsets and co-benefits 🌞🧑🏫❤️🌍💰

- Pursue offsets in developing countries that align with the mission of DVSC
- Consider local offsets if they have substantial co-benefits for the community



Climate



Community



Health



Environment



Local Economy

## Water management 🌍💰

- Minimize water use by following Living Building standards<sup>50</sup>
  - Specifically low-flow faucets, dual-flush toilets, waterless urinals
- Rainwater collection, gray water recycling
  - Use underground cisterns to store rainwater
  - Gray water recycling for toilet flushing
- Treat potable water on-site using natural systems
  - Treat waste water with constructed wetlands, sand, UV filters and use the water for irrigation, toilet flushing, janitorial purposes, and equipment uses
- City of Easton: offset impervious surfaces, such as new parking lots, with planting trees and developing green space in other locations

## Waste disposal

- Reduce waste ☀️👥🌍💰
  - Consider sustainable supply chains and source reductions
- Maintain an effective waste and recycling program ☀️🌍
  - Clearly label conveniently located indoor and outdoor waste, recycling, and compost receptacles
  - Compost all food waste
  - Ensure packaging of all salable items is recyclable

## Air quality ❤️

- Minimize use of hazardous materials to maintain high indoor air quality
  - Use low-emitting supplies to reduce volatile organic compounds (VOC)
- Optimize ventilation and filtration systems addressed by the LEED "Enhanced Air Quality" requirements<sup>51</sup>

## Green space ☀️👥❤️🌍

- Maintain ample public green space

## Building scale 👥

- Consider design, environment, land use, and historic preservation
- Attempt to maintain the downtown main street atmosphere in the project area

# Transportation

## Increased vehicle traffic ☀️👥❤️🌍💰

- Encourage alternative forms of transportation such as walking, biking, public transport, and ride-sharing for visitors and employees
- Work with the City to provide bike share stations at DVSC, parking facilities, major attractions throughout Easton, as well as along the trail system to expand the museum experience to an outdoor space
- Ensure deliveries do not arrive during peak hours to avoid congestion.
- Use shuttles and fleet only when necessary; power with renewable energy
- City of Easton: complete a follow-up traffic study after the DVSC opens



Climate



Community



Health



Environment



Local Economy

## Infrastructure investments 🌞👥❤️🌍💰

- City of Easton: develop a Complete Streets program
- Work with the City to accelerate plans to connect with the D&L trail, including concepts in the 'River Walk' plan proposed in 2017 by Lafayette College students<sup>52</sup>
- City of Easton: consider alleyway revitalization including potential art installations, permeable pavement, efficient lighting, low-albedo materials, and increased green space (see City of Chicago Green Alley Handbook)
  - Improve alley from Northampton Street (south from Sigal Museum) to Pine Street
  - Accommodate pedestrians on South Bank Street
  - Incorporate Bank Street alley continuation in Pine Street Garage plans
  - Improve Sitgreaves Street to improve functionality and walkability
- Develop wayfinding, signage, and online resources for all transportation
  - Implement visible connections between parking areas through downtown to the Da Vinci Science center, such as signs or in the sidewalk (e.g. Freedom Trail in Boston)
  - Include connections to the walking paths with signage
  - Ask St. Luke's Community Health to incorporate DVSC into a WalkWorks path
- City of Easton: ensure there are enough electric vehicle charging stations and sheltered bike racks in all parking facilities
  - Ensure the infrastructure for future electric vehicle charging stations exists, such as conduits for additional wires

## Food

### Sustainable cafés 🌞👥❤️🌍💰

- Consider café names that reinforce the message of sustainability DVSC hopes to convey
- Use reusable plates, containers, and utensils
- Provide straws only upon request and utilize paper straws
- Offer salable items such as metal straws and reusable containers at café locations to encourage sustainable eating practices beyond DVSC

### Food production and transportation

- Serve organic and locally sourced food 🌞👥❤️🌍💰
- Require caterers to follow the same local, organic food standards as cafés 🌞👥❤️🌍💰
  - Source pasture-raised meat, dairy, and eggs
- Ensure that food prepared off-site is responsibly sourced ❤️🌍

### Healthy food options

- Serve affordable and healthy food throughout DVSC ❤️
- Offer vegan and vegetarian options 🌞👥❤️🌍
- Accommodate food allergies (i.e. nuts, soy, dairy, gluten, etc.) ❤️
- Consider cultural foods for visitors and the local community 👥
- Provide educational material & signage about the importance of organic, local, fair trade, vegetarian, and vegan options 🌞👥❤️🌍💰
- Provide nutrition facts, estimated carbon footprint, and details of sourcing with regard to food options 🌞👥❤️🌍



Climate



Community



Health



Environment



Local Economy

## Food waste and packaging

- Reduce food waste and minimize packaging 🌞🌍💰
  - Avoid ordering excess food, offer smaller portions
- Compost all food waste 🌞👥🌍💰
- Use reusable utensils, plates, and napkins for large-scale events serving food 🌞🌍💰

## Relationships with local restaurants 👥💰

- Consider local vendors for produce and food for use at DVSC
- Encourage guests to explore nearby restaurants to support the local economy

## Offsets and co-benefits 🌞👥❤️🌍💰

- Pursue offsets in developing countries that align with the mission of DVSC
- Consider local offsets if they have substantial co-benefits for the community

# Educational Programs & Operations

## Education

- Incorporate DVSC's efficient building systems into educational programming 🌞👥🌍
  - Visual access to on-site water filtration system and cistern
  - Display energy savings compared to similar buildings
- Strive to be present in schools and local educational institutions to expose youth to career prospects in Science, Technology, Engineering, Art, and Math (STEAM) fields 👥
- Develop research programs on diversifying sustainability education (consider the Institute of Museum & Library Services and Pennsylvania Historical & Museum Commission for funding and sponsorships) 🌞👥💰
- Create community outreach programs, classes, and workshops specifically for local children and adults as well as after school and summer programs to spark interest in science education and provide entertainment 👥
- Ensure educational programs cover alternative transportation, renewable energy, GHG emissions, deforestation, loss of biodiversity, pesticide use, and the importance of sustainable agriculture 🌞👥❤️💰
- Ensure that "NatureDome" planning considers both daily and seasonal rhythms, including seasonal variations in length of day and temperature 🌍
- Educate about the importance of proper recycling techniques, waste minimization, and how the waste stream works by using signage on waste receptacles 🌞👥❤️🌍💰
- Grow food on-site as a resource to educate about sustainable agriculture 🌞👥❤️🌍💰
- Incorporate exhibits that integrate physical activity, health education, and other educational programs together to educate on health and provide resources to visitors and the community 👥❤️
  - Develop exhibits on mental health and provide community resources (e.g. Northampton County mental health resources, Clubhouse, etc.)
  - Integrate physical health exhibits with physical activities (e.g. incorporate a bike)
  - Consider We Watt bikes to charge phone while pedaling which combines both health and technology
  - Develop small-scale interactions with outdoor activities on site and work with partners on outdoor activities in the watershed (e.g. biking, rafting, etc.)
  - Work with the City to have signage developed by DVSC on local trails and outdoor activity locations to extend the education to the outdoor sites



Climate



Community



Health



Environment



Local Economy

## Accessibility 🧑🏿‍🦼

- Provide full access in all areas, exhibits, and attractions for people with visual, hearing, or mobility impairments
- Be culturally sensitive and provide guides or other materials for accessing the exhibits through different languages
  - Also, be aware of the disparities between scientific jargon and common language such as “theory”, “trend”, “hypothesis”, etc.
- Provide discounted admissions and food prices for lower-income guests.
- Partner with institutions and organizations such as Museums for All and Public Engagement with Science

## Community engagement 🧑🏿‍🦼💰

- Explore ways to partner with local businesses and other organizations rather than compete with them in an attempt to keep prices steady in the surrounding area
  - Nurture Nature Center, Crayola Factory, Lafayette College, Northampton Community College, local school districts, various restaurants
- Use flexible spaces within the facility to diversify exhibits relevant to local community economics
- Encourage hosting events for local businesses to hold introductory classes, workshops, or other promotional gatherings to foster productive relationships with local economy
- Find ways to link nighttime programming to other attractions and restaurants to encourage exploration of the city
- If property values in the surrounding area increase dramatically, attempt to assist the tenants in any way possible so they do not have to relocate

## Jobs 🧑🏿‍🦼❤️💰

- Hire local citizens at a living wage
- Give hiring preference to low-income residents
- Maintain a diverse workforce
- Provide affordable training programs to train local citizens for various jobs at the museum
  - If possible, collaborate with Northampton Community College

## Retailers within the museum space 🌞🌍💰

- Include retailers and caterers in DVSC's GHG inventory
- Extend gift shop inventory to include products from local artists, craft-workers or other industries
- Implement retail programs to accommodate commonly-used items by visitors, such as sale of reusable bottles if it is observed that many visitors bring single-use plastic bottles

## Supply chain 🌞🧑🏿‍🦼❤️🌍💰

- Consider the supply chain impacts such as the following:
  - Sell products made with organic cotton
  - Use 100% post-consumer recycled paper (non-chlorine bleached) in all operations.
  - Don't use plastic bags (minimally, put in place a plastic bag fee)



Climate



Community



Health



Environment



Local Economy

## Construction

### Planning and administration 🌞👥❤️🌍💰

- Require contractors to embrace the principles of resilience, sustainability, and whole system approaches to construction:
  - Seek to manage waste and divert from landfills to be used on site for unique applications such as decoration, art installments, or landscape features
  - Utilize the most efficient technologies for the temporary construction processes, such as LED lights
  - Strive to purchase supplies with low potential for environmental damage

### Noise, light, air, and water pollution 🌞👥❤️🌍

- Minimize land disturbance and leave maximum vegetation
- Require construction contractors to follow best practices to reduce particulate matter in the air, including use of fine water sprays
- Cover equipment and piles of building materials
- Go beyond erosion mitigation laws and storm water management for the safety of nearby residents and businesses
- Ensure that construction bid specifications require minimizing idling and maximizing use of renewable energy
- Avoid construction at peak rush hours as well as early in the morning and late at night so as to minimize effects on local residents

### Traffic 🌞👥❤️

- Create easy and effective detours around construction to impact traffic as little as possible
- Create convenient walking and biking detours around construction areas
- In any case where a sidewalk must be closed for more than a day or two, create a protected walkway to reduce disruption and encourage walking following the example of the City of Philadelphia's ordinance

### Community outreach 👥❤️

- Allow citizens to voice their ideas and concerns
- Be transparent about the project and do not hide important details from local residents that they may be unhappy about later
- Listen to concerns and suggestions of local citizens and businesses and try to mitigate their concerns as much as possible through actual change
- Focus outreach on the positive outcome the finished product will have (increased education, community pride, entertainment, programs, etc.) rather than dwelling on the short term negative impacts construction may have on the area

### Material sourcing and disposal

- Avoid hazardous materials at all stages of construction ❤️🌍
- Minimize waste by recycling and ordering only what is needed 🌞🌍💰
- Utilize materials with low embodied carbon 🌞
  - Source materials locally, reuse existing products, use products such as carbon-sequestering cement<sup>53</sup>



Climate



Community



Health



Environment



Local Economy

- Follow Living Building Challenge’s Diversion of Waste Materials standards (Table 1)  
  

**Table 1. Living Building Challenge – Diversion of Waste Materials**

| Material                               | Minimum<br>(by Weight) |
|----------------------------------------|------------------------|
| Metal                                  | 99%                    |
| Paper and cardboard                    | 99%                    |
| Soil and biomass                       | 100%                   |
| Rigid foam, carpet, and insulation     | 95%                    |
| All others – Combined weighted average | 90%                    |

Offsets and co-benefits     

- Pursue offsets in developing countries that align with the mission of DVSC
- Consider local offsets if they have substantial co-benefits for the community



## Attachments

- A Calculation of Estimated Greenhouse Gas Emissions
- B Estimated LEED Certification Credits
- C DVSC in Relation to Easton's Comprehensive Plan
- D Recap of Recommendations for the City of Easton
- E Requiring Sustainability Assessments in City Ordinances
- F Renewable Energy Technologies



## Calculation of Estimated Greenhouse Gas Emissions

This calculation assumes that DVSC will achieve LEED Platinum standard, and meets minimum point requirements in the energy use category. The LEED Certification Credits (Attachment B) illustrates the number of LEED credits that DVSC can achieve based on their current plan. LEED Platinum is a worthwhile benchmark for building performance, but this estimate shows that this certification does not guarantee that the building will be climate neutral.

This calculation does not include GHG emissions from the construction process.

### Heating and Electricity

We compared energy usage of the existing Da Vinci Science City (a 30,000 square foot facility) and the Whitaker Center (130,000 square feet) to estimate a value for heat usage of DVSC (130,000 square feet). We multiplied data from Da Vinci Science Center by 4 to account for the increased size of DVSC, including a 10% energy reduction as stated in LEED's "Optimize Energy Performance" credit (3 points out of 10 possible points). We then averaged these data, resulting in an estimate of 30,010 CCF of natural gas per year for DVSC.

Electricity usage followed the same procedure as above, resulting in an estimate of 1,193,680 KWh per year.

In order to fulfill the LEED credit of "Green Power and Carbon Offsets," either 50% (1 point) or 100% (2 points) of the facility's energy must be sourced renewably or offset. As a starting point towards climate neutrality and DVSC's expressed interest in renewable energy, we assumed that 50% of DVSC's energy was sourced from renewables.

### Transportation (Shuttles)

We recommend that DVSC's shuttles be electric vehicles charged with renewable energy, and therefore will result in no carbon emissions.

### Chemical Usage

We assumed that DVSC will not use synthetic fertilizers and will use a refrigerant with a Global Warming Potential of less than 50 (fulfilling LEED's "Enhanced Refrigeration Management" credit) and no artificial fertilizers will be used, as they could use compost materials instead.

### Solid Waste

We assumed DVSC will recycle or compost a large proportion of the waste produced, and therefore will contribute only about 140 tons of solid waste to landfills each year calculated by CalRecycle's Estimate Solid Waste Generation Rates calculator based on building use and square footage.

### Scope 3 Emissions

#### Visitor Travel

We calculated values for visitor travel based on Da Vinci's projection of 600,000 visitors and their estimated geographical distribution.

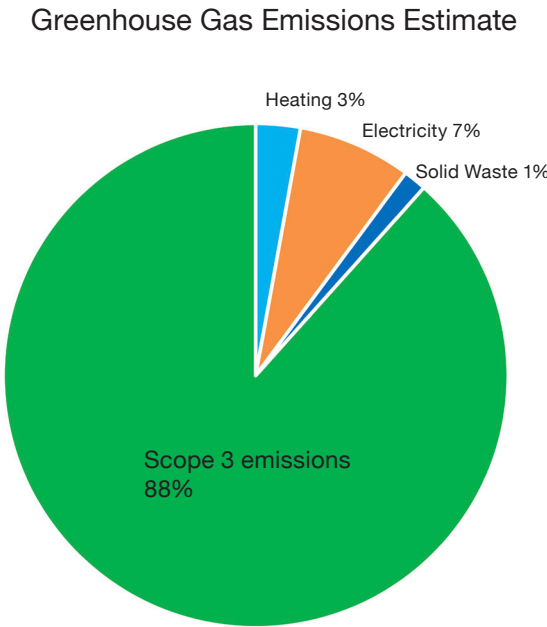
Employee Commuting

DVSC estimates that it will employ approximately 200 people (FTE). We first assumed that these employees will be from the Easton Area. We then assumed that 20% will walk or bike to work, 30% will use public transit, and 50% will drive to work. A car load was assumed to be 1 person, and average distance was assumed to be 15 miles.

Totals

We converted all of the estimates from above into metric tons of CO<sub>2</sub> equivalent, using data regarding emission factors from the EPA. The total of about 2,800 mTCO<sub>2</sub>e consists of 3% heating, 7% electricity, 1% solid waste, and 88% Scope 3 vehicle emissions.

DVSC has indicated a desire to be climate neutral, which, according to GHG Protocol standards, includes its significant Scope 3 emissions.



## Estimated LEED Certification Credits

LEED's Building Design & Construction is the most appropriate guideline for DVSC, because it is the basic standard for all new construction. Based on available information from the master plan and our recommendations, we think it is possible for DVSC to achieve up to 104 points.

| LEED Categories                                                                   | DVSC | Max. |
|-----------------------------------------------------------------------------------|------|------|
| Access to quality transit                                                         | 3    | 5    |
| Acoustic performance                                                              | 1    | 1    |
| Advanced energy metering                                                          | 1    | 1    |
| Bicycle facilities                                                                | 1    | 1    |
| Building life-cycle impact reduction                                              | 4    | 5    |
| Building product disclosure and optimization - environmental product declarations | 2    | 2    |
| Building product disclosure and optimization - material ingredients               | 2    | 2    |
| Building product disclosure and optimization – sourcing of raw materials          | 2    | 2    |
| Construction and demolition waste management                                      | 2    | 2    |
| Construction indoor air quality management plan                                   | 1    | 1    |
| Cooling tower water use                                                           | 2    | 2    |
| Daylight                                                                          | 2    | 3    |
| Demand response                                                                   | 2    | 2    |
| Enhanced commissioning                                                            | 6    | 6    |
| Enhanced indoor air quality strategies                                            | 2    | 2    |
| Enhanced refrigeration management                                                 | 1    | 1    |
| Green power and carbon offsets                                                    | 2    | 2    |
| Green vehicles                                                                    | 1    | 1    |
| Heat island reduction                                                             | 2    | 2    |
| High priority site                                                                | 1    | 2    |
| Indoor air quality assessment                                                     | 2    | 2    |
| Indoor water use reduction                                                        | 6    | 6    |
| Innovation                                                                        | 5    | 5    |
| Integrative process                                                               | 1    | 1    |
| Interior lighting                                                                 | 1    | 2    |
| LEED accredited professional                                                      | 1    | 1    |
| Light pollution reduction                                                         | 1    | 1    |
| Low-emitting materials                                                            | 3    | 3    |
| Open space                                                                        | 1    | 1    |

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| LEED Categories                               | DVSC       | Max.       |
|-----------------------------------------------|------------|------------|
| Optimize energy performance                   | 18         | 18         |
| Outdoor water use reduction                   | 2          | 2          |
| Quality views                                 | 1          | 1          |
| Rainwater management                          | 3          | 3          |
| Reduced parking footprint                     | 1          | 1          |
| Regional priority                             | 4          | 4          |
| Renewable energy production                   | 3          | 3          |
| Sensitive land protection                     | 1          | 1          |
| Site assessment                               | 1          | 1          |
| Site development - protect or restore habitat | 2          | 2          |
| Surrounding density and diverse uses          | 5          | 5          |
| Thermal comfort                               | 1          | 1          |
| Water metering                                | 1          | 1          |
| <b>Total</b>                                  | <b>104</b> | <b>110</b> |

## DVSC in Relation to Easton's Comprehensive Plan

The City of Easton has a comprehensive plan to “Transform, Unify, and Thrive” by 2035. As of July 2018, plans for the DVSC show alignments and contradictions to the Comprehensive Plan.

### Transform

#### **“Establish area around Centre Square as Easton's premiere business district”**

DVSC will develop the Southern Gateway into town as the plan intends. It may succeed in bringing in more businesses to the area, assisting in establishing the premiere business district. The effect this may have on community could go several different ways: local residents may accept the new growth and tourism and interact with the new businesses and boost the local economy—or they may stay away from this area to avoid increased traffic and busy roads and sidewalks.

#### **“Connect and redevelop Easton's River Corridors as an integral part of the City”**

The proposed DVSC is planned for the area across the street from the rivers. Although increased traffic may make crossing less safe, dedicated pedestrian crossings can prevent this. This project may improve access by implementing safe methods of access for educational purposes and programming. Increased walkability and access to the waterfront would benefit the community, as there is currently little access for local community members.

#### **“Manage and reduce vacancy, underutilization, and blight throughout the City”**

The proposed DVSC will replace a blighted hotel that has already been cleared from the property, therefore directly aligning with this goal. However, if the proposed museum is constructed and fails, there will be a large, unused building blighting the corner that would be difficult to reuse because of its specific construction design. If the site is abandoned, property values in the surrounding area may go down and the residents and businesses in the area could suffer.

#### **“Discourage irresponsible development and renovation, and prevent deterioration of historic buildings”**

As mentioned above, development of the DVSC site may be irresponsible if the success of the project is uncertain. Also, the design of the museum does not reflect the historic preservation goals of the City and the community. Although the new building will not be in the historic style of Downtown, the focus on sustainability and climate during the construction of this building can be viewed as a responsible way of redeveloping downtown and set a precedent for sustainable development.

## Unify

### **“Re-envision public right of ways for multimodal travel and public transportation”**

Walkability of the city will be essential for access to DVSC. Because parking will not be on site, there should be safe and accessible methods of reaching the entrance. Many methods described in the comprehensive plan could make this possible if implemented in the area of DVSC. The community could benefit from increased walkability in the area, providing safe and healthy means of transportation and recreation, and reducing the GHG emissions of the City.

### **“Adapt and reuse critical sites at the seam of neighborhoods”**

The planned DVSC site, previously a hotel complex, will potentially be reused. However, because the hotel was demolished, no materials will be reused. It is a critical site because of its location at the entryway to the city.

### **“Integrate Delaware and Lehigh Rivers, and Bushkill Creek with upland communities through a connected system of pedestrian, bike, and open space networks”**

The Da Vinci group has expressed interest in connecting the trails along the river to promote walkability and access. Connectivity to the rivers, trails, and other communities would benefit DVSC and the surrounding area as it increases accessibility between DVSC and the community.

### **“Improve access to and create new parks and open spaces”**

DVSC has proposed an outdoor area in front of the facility with an artificially made “wetland” that would serve the purpose of mitigating flood risk and providing education. This area, if allowed for public access, could serve as a public park for local community members and create more open space and more park space in the area. However, if the area is, or is perceived as, only for guests of the museum, this may not allow for this goal to be met.

### **“Manage parking and promote sustainable transportation”**

Because the DVSC project does not have on-site parking, there may be issues with parking availability and traffic. The project should promote alternative methods of transportation such as walking, biking, or taking public transportation, which are more sustainable than individual cars. Promotion of these sustainable transportation methods may also alleviate some of the parking issues as there will be less cars trying to park. This would benefit the local community as it would decrease possible traffic from DVSC, as well as allow them greater access in the city through sustainable transportation methods. Promoting alternative transportation will also help the city’s climate goals by reducing the number of vehicles on the roads, therefore reducing greenhouse gas emissions from vehicles.

## Thrive

### **“Attract new businesses through a ‘business-ready’ environment”**

Increased tourism and traffic may naturally attract businesses to the area. New businesses may boost the local economy and provide new goods and resources to local community members.

### **“Promote strong and well-balanced neighborhood centers”**

This goal focuses on providing a grocery store, better public transit options, and historic preservation of different areas of the city. This site could have been ideal for a central hub location of transportation or a large grocery store, but DVSC may attract enough people to the area to help revitalize the public transportation system. DVSC does not preserve the historic feel; it has a very modern feel.

**“Connect residents with employment and workforce training centers, and increase resident earning capacity”**

The City and the Da Vinci group plan to employ local community members at DVSC. Training for these positions is also planned. This will benefit the local community by providing employment and resident earning, directly correlating to this goal.

**“Diversify and strengthen economic activities, entrepreneurship opportunities and tourist attractions”**

DVSC plans to be a large tourist attraction for Easton, which will likely strengthen economic activity as well. This may benefit the local community as their economy improves, however, results of large tourist attractions like increased traffic and congestion may cause unease.

**“Promote closer regional ties”**

This goal focuses on increasing Easton’s population by portraying the city as having a “charming scenic setting, contemporary housing developments, and walk-to-work compact urban form”. These attributes attract tourists and residents alike. The introduction of a science museum such as DVSC will further increase tourist traffic, and may contribute to the “creative hub” characteristic of Easton. This shifting toward a more contemporary, creative, and modern city with historic characteristics could lend itself to a different demographic than what currently resides in most parts of the area. This could force current residents to adapt to a quickly-changing environment, or even relocate.

**“Strengthen emergency response and services throughout the City”**

DVSC may bring many more people into the city, which can create more situations in which emergency response and services are required. In order to ensure the safety of the community and the tourists in the area, it is important to address this goal.

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## Recap of Recommendations for the City of Easton

### Transportation 🌞👥❤️🌍

- Encourage alternative forms of transportation such as walking, biking, public transport, ride-share for visitors and employees
- Provide bike share stations at DVSC, parking facilities, major attractions throughout Easton, as well as along the trail system to expand the museum experience to an outdoor space.
- Complete a follow-up traffic study after the DVSC opens

### Infrastructure investments 🌞👥❤️🌍💰

- Develop a Complete Streets program
- Work with the City to accelerate plans to connect with the D&L trail, including concepts in the 'River Walk' plan proposed in 2017 by Lafayette College students<sup>54</sup>
- Consider alleyway revitalization including potential art installations, permeable pavement, efficient lighting, low-albedo materials, and increased green space (see City of Chicago Green Alley Handbook)
  - Improve alley from Northampton Street (south from Sigal Museum) to Pine Street
  - Accommodate pedestrians on South Bank Street
  - Incorporate Bank Street alley continuation in Pine Street Garage plans
  - Improve Sitgreaves Street to improve functionality and walkability
- Develop wayfinding, signage, and online resources for all transportation
  - Implement visible connections between parking areas through downtown to the Da Vinci Science center, such as signs or in the sidewalk (e.g. Freedom Trail in Boston)
  - Include connections to the walking paths with signage
  - Ask St. Luke's Community Health to incorporate DVSC into a WalkWorks path
- Ensure there are enough electric vehicle charging stations and sheltered bike racks in all parking facilities
  - Ensure the infrastructure for future electric vehicle charging stations exists, such as conduits for additional wires
- Counteract unavoidable impervious surfaces with planting trees and developing green space in other locations

### Construction 🌞👥❤️

- Create easy and effective detours around construction to impact traffic as little as possible
- Create convenient walking and biking detours around construction areas
- In any case where a sidewalk must be closed for more than a day or two, create a protected walkway to reduce disruption and encourage walking

### Planning infrastructure 🌞👥❤️🌍💰

- Require Sustainability Assessments for all future projects



Climate



Community



Health



Environment



Local Economy



## Requiring Sustainability Assessments in City Ordinances

The following language covers essential components of sustainability-related requirements to be considered for addition to the existing development ordinance. These are designed to be adaptable to any city, and should be considered required submissions for development project plans.

1. An analysis and discussion of climate change impacts related to the project construction and operation. Project authorities shall develop a projected greenhouse gas inventory, including expected emissions associated with all aspects of the development proposal.
  2. Energy efficiency plan drafted and approved prior to construction, including possible use of renewable energy, demonstrating stricter requirements than those of ASHRAE 90.1 2016.
  3. Environmental considerations beyond code requirements. Project authorities shall produce a projection of local pollution threats associated with all stages of development, including innovative strategies for remediation and prevention.
  4. A description of how any exhibits, events and/or ticketed occasions will be focused on local topics.
  5. Human, environment, and community health impacts projected for all stages of the development.
  6. Disclosure of expected commercial endorsements and anticipated local funding source. Financing shall consider local funding and welfare a priority throughout the development timeline.
  7. Analysis of conflicting or synergistic strategies in relation to the City's comprehensive plan.
  8. Resilience prioritized in planning and outlining of project timeline, highlighting sustainability as a function of long term impacts.
  9. Commitment to report on sustainability impacts annually, including a greenhouse gas inventory.
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## Renewable Energy Technologies

The following are examples of potentially feasible renewable energy and building efficiency systems that could be considered for the operation of the Da Vinci Science City. These technologies require professional site assessments in order to ensure functionality and economic sustainability.

**Solar Photovoltaic** technology converts solar energy directly to carbon-free electricity, and can have a lifetime of up to twenty years. It is widely used for generating renewable energy on site for commercial, industrial or residential facilities.

**Solar thermal** technology captures and efficiently utilizes heat energy from the sun. The DVSC structure has high potential for the implementation of these types of on-site energy generation, due to its large southern facing façade.

**Biodigestion** is the mechanical and chemical breakdown of organic wastes and extraction of useful methane gas (biogas). In the absence of oxygen, this system can biologically capture energy from these waste sources.

**Wind energy** relies on natural wind flow, but is most effective if the wind is typically uniform, which is uncommon in urban settings.

**Small-scale hydro** technologies offer efficient ways to generate electrical power without disrupting river flow.

One passive technology that has high educational potential is an **indoor living wall system**, which is essentially any array or vertical façade containing plants<sup>55</sup>. The purpose of an indoor living wall is, like that of an outdoor wall, to regulate temperature and humidity, providing energy savings. Reduced carbon dioxide also means less air will need to be mechanically flushed from the building space, thus utilizing less energy.

Another potentially worthwhile energy system to research for the DVSC is **Thermal Energy Storage (TES)**. This technology consumes energy during off-peak hours when it is cheapest, and typically greater portions are generated by renewable sources. The energy consumed is used in a storage capacity, such as freezing water to create ice, which is then used during the day, as opposed to the continued on-peak consumption of energy for thermal regulation needs. This can be an effective and beneficial technology for economic energy balance.

A more technical option to achieve this balance is the use of **Building Automation Systems (BAS)**, which operate on schedules and sensors to only cool or heat rooms when they are occupied, or shut and open shades according to the time of day and season. These systems allow the building to be self-sustaining and less harmful to the climate over its lifetime, requiring little human intervention to operate.



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