

**Analysis of Equity in Two Community-Based Public-Private Partnerships
Focused on Green Stormwater Infrastructure**

by

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Executive Summary

Urban areas presently are tasked with balancing the impacts of climate change, pollution burdens, and the effective management of resources. The challenges specific to stormwater infrastructure include achieving water quality standards, managing pollution sources and runoff, and addressing flooding are pertinent in many areas across the United States. Meeting the aging stormwater infrastructure improvement needs presents a large task. When conducting large scale or widespread infrastructure improvements, especially within urbanized areas, there is a potential for the increased investment to trigger shifts in property and rental values and possibly neighborhood changes that could be categorized as gentrification outcomes, such as when groups with higher income move into neighborhoods where residents have lower income and are then priced out of their neighborhoods. Gentrification outcomes in connection with green infrastructure investment have been discussed as ‘green gentrification’. Our study investigated whether preventing green gentrification and ensuring equity were present in two case studies employing a new model of stormwater investments through long-term innovative partnerships.

Community-based public private partnerships (CBP3s) represent a novel approach in green stormwater infrastructure improvements and developments while providing community co-benefits. The CBP3 model has been utilized to help cities and counties meet Clean Water Act and municipal stormwater permitting requirements around stormwater practices and water quality concerns. These public private partnerships are able to add flexibility and can potentially move through procurement and implementation of infrastructure projects more efficiently than public entities alone. Adding the community as a stakeholder in the CBP3 model aims to incorporate and involve community centered organizations and the broader public in the processes of this type of partnership. Community access, participation, and opportunity were

analyzed in this report from goals around community benefits to increased opportunities for jobs and education, to community feedback being incorporated throughout the partnership.

With communities identified as major stakeholders within the CBP3 approach, we wanted to better understand how, if at all, equity was incorporated in these types of partnerships and whether there were policies or procedures to ensure equity or help to prevent potential gentrification that could occur alongside green infrastructure investment within a community/city/county. To address our questions around the effectiveness of the CBP3 model in terms of equity and gentrification, we examined two CBP3 case studies each in 30-year contracts: the Clean Water Partnership located in Prince George's County (PGC), Maryland and the Stormwater Authority of the City of Chester located in Chester, Pennsylvania. We analyzed these two case studies using qualitative methods including reviewing and coding documents and interview transcripts from nine interview participants, each involved in one of the case study areas, allowing us to identify major themes and differences between the case studies as they emerged. Major themes revolved around equity in terms of phases of the partnerships, gentrification, community inclusion, and data tracked in each CBP3.

This report highlights our findings about each CBP3 case study on how they established and are progressing toward their goals based on different criteria and metrics as well as how they described and incorporated key themes related to ensuring equity and preventing gentrification. Our results included comparisons of the case studies from the conditions each partnership began, extent that the community was involved, differences across phases of the partnerships, key themes around equity, and a stakeholder analysis. The two case studies had differences in demographic makeup, opposite rates of homeownership versus renter status, and major differences in terms of population and area involved, given one case study is a city versus the

other being a whole county. Beyond these, we also found differences in terms of the goals for each partnership and what aspects were prioritized. For the Clean Water Partnership, there was emphasis on extensive community engagement, involvement, and participation through public meetings, educational programs, and workforce training and development programs. In Chester, goals were more aligned with meeting stormwater improvement needs, and community engagement was less robust.

Neither case study explicitly included equity goals or prevention of gentrification within the CBP3 approach. In the Clean Water Partnership, environmental justice areas were identified and considered within the county's project selection and identified socioeconomic metrics around historically underserved and minority-owned businesses, but these were not stated in specific equity terms within the partnership documents. The whole City of Chester was identified using state and federal level mapping tools to be an environmental justice area. We found efforts in the Chester partnership around local workforce development, but equity was not specifically included in their documents, similar to the Clean Water Partnership. The individuals and officials we interviewed did not find gentrification to be a current concern for either case study, so we were not able to determine how preventing gentrification may be specifically incorporated into the CBP3 approach.

The CBP3 approach was found to be flexible and adaptable, but the success of the approach depends on the goals and context of its community. In light of our findings, we offered recommendations about potential prerequisites for entering into a CBP3; suggested considerations for officials, advocates, or community members on ways to enhance current CBP3s; and answered our main research questions around whether the CBP3 approach is effective at achieving equity and preventing gentrification. A successful CBP3 for Green

Infrastructure development and maintenance relies on community buy-in, outreach, inclusion and involvement, thus these are some of our identified prerequisites for ideal CBP3 implementation.

Our recommendations include incorporating equity requirements within official documents, increasing transparency and involvement between the partnership and the community, providing more clear feedback and accountability mechanisms, and defining metrics for tracking any negative implications of green infrastructure projects.

1.0 Introduction

Urban areas and cities face rising pressures from varied impacts of climate change, natural resource depletion, and pollution. These factors have triggered innovation in urban infrastructure development and economic growth. We focus this study around innovations of natural resource conservation and development in terms of green infrastructure (GI) and green stormwater infrastructure (GSI). Green Infrastructure is defined as “*a system of interconnected ecosystems, ecological-technological hybrids and built infrastructures providing contextual social, environmental, and technological functions and benefits*” (Grabowski, McPhearson, and Pickett 2023). GI is largely used in conjunction with green stormwater management but includes other public spaces such as parks, parking lots, sitting areas, public buildings, etc. Because GI is inextricably linked with urban spatial and landscape planning, it therefore has potential connections to and risks of gentrification (Grabowski, McPhearson, and Pickett 2023).

Gentrification is defined by the Policy Development and Research Office of the U.S. Department of Housing and Urban Development as, “*a form of neighborhood change that occurs when higher-income groups move into low-income neighborhoods, increasing the demand for housing and driving up prices.*” (*Managing Community Change: A Dialogue on Gentrification* | HUD USER, n.d.). Urban sustainable development and GI interventions bring with them the risk of further marginalization of the vulnerable and underrepresented populations of the urban community (Anguelovski et al. 2019). There is rising concern about GI triggered gentrification and displacement issues for historically disadvantaged and marginalized urban communities and how this implicates equity in communities (Anguelovski et al. 2022). In its equity manifesto, PolicyLink, a research institute, defines equity as “*justice and fair inclusion into a society in*

which all can participate, prosper, and reach their full potential” (The Equity Manifesto | PolicyLink, n.d.).

Our study draws from multiple considerations of measuring equity across processes and through different proxies identified by the two following resources. Grabowski et. al. analyzed policy planning gaps for different equity dimensions in urban GI planning documents for 122 cities around the US. These dimensions include the envisioning phase, the planning & implementation phase and the distributional phase (Grabowski, McPhearson, and Pickett 2023). They found around 80% of the cities had unsatisfactory results in addressing equity and justice throughout the three stages of GI processes, despite research evidence of the availability of gentrification and inequitable socioeconomic impacts of GI projects. Correlation was shown to exist between community-sensitive approaches and GI dynamics but still fell short in addressing all dimensions of equity (Grabowski, McPhearson, and Pickett 2023). The second resource we identified with applicable measures of equity comes from an equitable urban toolkit developed by the International Council for Local Environmental Initiatives (ICLEI), which identifies ‘access’, ‘opportunity’, and ‘participation’ as the three main equity indicators (ICLEI 2022). Other similar toolkits such as the Inclusive Cities resource developed by Asian Development Bank also provide information about inclusivity and highlight different types of marginalized and under-resourced sections of a city (Asian Development Bank, 2016).

Socioeconomic disparities, especially tied with policy interventions related to GI, can lead to green gentrification and subsequent displacement of marginalized communities (Grabowski, McPhearson, and Pickett 2023). This unintended consequence of GI projects and environmental conservation presents a dilemma for environmental justice advocates and public administrators, as socioeconomic growth and environmental conservation appear to be mutually

exclusive. Alternatively, many disadvantaged sections of communities lack significant access to green spaces and live in areas with decreased environmental quality. These communities thus stand to benefit from investment in infrastructure that will improve environmental quality and reduce pollution. Lack of investment in disadvantaged communities is also an equity concern.

In an increasingly interconnected and informed global community, public service delivery is also seeing a shift towards community-led development and co-production in services. Policy that is sound in both economic and environmental terms requires a balance. Funding such sustainable development projects in overtaxed and under-resourced urban areas has been a challenge for public institutions, which are hard pressed to ensure equitable resource allocation while maximizing efficiency in all sectors of urban management (UN-HABITAT, *The challenge of local government financing in developing countries*, 2015). As public institutions are primarily funded through taxation and charges from the citizens, any additional tax/fee burden for perceived experimental solutions suffer from tax fatigue and further socio-economic polarization in urban communities.

Transferring management and development risks to the private sector in the long term through public private partnerships (PPPs) alone center around profit maximization and ultimately shift the burden back to the community through indirect fee/tax and consequential economic disparities. Public Private Partnerships are defined by the World Bank as: “*a mechanism for government to procure and implement public infrastructure and/or services using the resources and expertise of the private sector*” (The World Bank Public Private Partnerships Legal Resource Center 2022). A newer approach through modifying the structure of PPPs and including a third partner in the bilateral relationship, the community, has emerged, known as community-based public private partnership (CBP3). In its guidebook on community-based

projects in urban GI for stakeholders, the Environmental Protection Agency (EPA) labels CBP3s as a tool that utilizes local resources but are a cost-effective method to bring in technological expertise, especially for Low Impact Development (LID) (US EPA Region 3 2015).

Launched as the Clean Water Partnership in Prince George's County, Maryland in 2015, the CBP3 approach addresses water quality issues and stormwater management (SWM) as required under the Clean Water Act (US EPA 2016). CBP3s aim to address funding, administrative, and socioeconomic issues in urban areas simultaneously while implementing GSI programs and ensuring long term maintenance of stormwater improvements. The bottom-line upfront approach is directed at scaling up the local economy through community inclusion and empowerment, by creating a specialized local market in best management practices (BMPs), and LID expertise in stormwater management. This holistic value-based approach of community led SWM through GI, transfers risk to the private partner but at the same time equips local workforce, vulnerable groups, and businesses to take charge of their own economy ("Prince George's County's Use of CBP3 for Meeting MS4 Permit Requirements" 2016).

Our study analyzes and compares policy measures and methodologies to prevent inequities across income, race, socioeconomic factors etc. and potential green gentrification in two urban CBP3 programs for GSI projects:

- (1) The Clean Water Partnership a public-private partnership in Prince George's County, Maryland, and
- (2) The Stormwater Authority of the City of Chester in Chester, Pennsylvania.

We selected these two case studies because they are each in implementation stages of their respective partnerships, allowing for an analysis of the effectiveness of the CBP3 model in the urban GI context. Program design and planning measures, monitoring and tracking measures,

and distribution measures were studied to discover any potential impacts on ensuring equity and any potential gentrification outcomes that may have resulted from these two GSI programs.

1.1 Objectives

In this report, we sought to ascertain to what extent policy mechanisms during various stages, focus areas, and tracking / measurement metrics of a CBP3 can support equity outcomes as well as potentially prevent gentrification and displacement. We wanted to understand this through looking at two case studies of the CBP3 model. Identifying main themes and differences across case studies, addressing our major questions, and creating policy recommendations for those who may be involved in or considering a CBP3 were our main objectives.

Major Question:

Is a Community Based Private-Public Partnership (CBP3) an effective pathway for preventing gentrification and ensuring equity in green infrastructure?

Supporting Questions:

- 1. To what extent does the CBP3 model identify, engage and empower under-represented community groups in GI policies to ensure the effects of gentrification are prevented or avoided?*
- 2. Are there policies or guiding documents that address potential negative impacts of GI in the CBP3 approach?*
- 3. Are impacts of completed projects being tracked or addressed in terms of equity?*

2.0 Background on Case Studies

Our study compares the Clean Water Partnership in Prince George's County, Maryland and the Stormwater Authority of the City of Chester located in Chester, Pennsylvania. Both are dedicated to improving water quality through GI investment and are under 30-year timeframe

contracts within the CBP3 model. The Clean Water Partnership (CWP) is the first CBP3 of its kind and was launched in 2015. In Chester, a stormwater utility, the “Stormwater Authority”, was created before the community-based public private partnership began in 2018 (Corvias, “Stormwater Authority of the City of Chester”).

Prince George’s County in Maryland includes both urban and more rural areas in the county’s greater than 400 square mile area. The water quality focus of the CWP centers around meeting MS4 permit requirements and its downstream proximity to the Chesapeake Bay. Our second case study area, Chester, Pennsylvania is located in the southeast corner of Pennsylvania, about 20 miles outside of Philadelphia, along the Delaware River. As described on Corvias’s website and in several documents from the Stormwater Authority, the focus in the urbanized Chester environment is around improving the aged infrastructure, reducing flooding, and addressing the polluted waterways (“Stormwater Authority of the City of Chester”). Both of these partnerships originated years ago and have completed GI projects, thus we were able to look at how equity was considered from the beginning, how community has been involved throughout, how these areas have potentially been impacted after the GI investment, and if gentrification has taken place or has been considered under the CBP3 model.

3.0 Methods

To address our main research questions, we conducted qualitative research using documents relevant to each CBP3 project as well as interviews with key stakeholders and individuals within the partnerships. A stakeholder analysis contributed to our understanding of the partners involved in the CBP3 for each case study. Our approach utilized both primary and

secondary data sources to develop a deeper understanding of how equity is being considered and acted upon in the GI projects from perspectives internal and external to the partnerships.

Our primary data included transcripts from semi-structured interviews with individuals involved in or adjacent to our two case studies. To conduct this primary research, we went through the Institutional Review Board (IRB) process through Duke Campus IRB. We were granted approval in November of 2022 and then began reaching out to potential participants to set up semi-structured interviews. We recruited individuals from different stakeholder groups in the CBP3s to participate in our study from December of 2022 through March of 2023. We spoke with 9 individuals on background during this time, with each participant representing or familiar with one of the case study partnerships in some capacity. Our interviewees broken down by sector or role within the partnerships were as follows: 2 from public parties or governmental roles, 3 from private businesses/contractors, and 4 individuals from NGOs or representing the community. The interviews allowed us to better understand how the different partners within the CBP3 interacted and worked together and also how the partnerships were perceived by the public and community.

During the interviews with participants, we followed a semi-structured format. We had an established set of questions but asked follow up questions and introduced new questions as needed (see Appendix A for list of interview questions). We used a snowball approach to find new potential interview participants, asking each interviewee who they thought we should reach out to next. Interviews were conducted virtually via Zoom and were recorded for the purpose of transcription, only if the participant gave consent to be recorded. To preserve confidentiality of our interview participants, we were selective with the quotes included in this report and used generalized titles of participants to prevent identities from being deduced.

In addition to our interviews, one of us had the opportunity to visit Prince George's County briefly during our research. This visit included witnessing some of the completed projects and signage within the county and documenting with photographs (see images from this visit in Appendix B). The firsthand record of the informational signage present at completed projects allowed for a greater understanding of how a county resident or visitor may come across and better understand the work and role of the Clean Water Partnership, but this primary data does not play a role in our results.

For the policy analysis, we relied on secondary data which we collected through publicly accessible reports, policies, and documents from websites of each of the partnerships we are analyzing, as well as websites and news articles containing additional information about the partnerships. These documents included the project design, planning, stated goals and targets, progress updates, information on the tax and fee structures, presentations from community meetings, and policies relevant to the areas in our study. Secondary documents analyzed included 8 documents from the CWP and 13 from the Stormwater Authority partnership. An additional 21 news articles were analyzed related to the Chester Partnership.

Analyzing these documents in NVivo allowed us to draw out common themes and focuses across our two partnerships. We used both deductive and inductive coding in our process; the analysis began with looking for themes that would help answer our research questions (those related to equity, gentrification, community involvement/feedback, roles/interactions between partners), but themes also emerged in reviewing the documents. The structure of our deductive coding relied primarily on background reading and research and in terms of identifying equity and justice themes. We chose to use themes from the International Council for Local Environmental Initiatives' (ICLEI) *Equitable Transitions Guidebook (ETG)*

(Inspired themes from the Equitable Transitioning Guidebook by ICLEI and models in Grabowski et. al 2023), specifically ‘access’, ‘opportunity’, and ‘participation’ as the key dimensions in our equity analysis (ICLEI 2022). NVivo helped us to organize our documents and categorize themes, especially accounting for differences between the two partnerships. We used the same codebooks, but not all codes/nodes were as relevant to each partnership (see Appendix C for our NVivo Codebooks). For a thorough qualitative analysis and to be consistent in our coding, we collaborated on the creation of the codebooks across multiple meetings, compared coding results to ensure consistency, and reviewed each document in NVivo a minimum of two times.

4.0 Results and Discussion

We begin our discussion of results with more in-depth background and context learned in our research and analysis of the two case studies. We then discuss stakeholder analysis findings and differences between the two partnerships. Our third results section is broken into findings under key themes relevant to answering our main questions and evaluating the CBP3 approach.

4.1 Case Study Context and Comparison

Our results begin with additional context for each partnership and the respective city/county involved. Below we present a table summarizing key comparisons between the two CBP3s. The Clean Water Partnership, the first CBP3, began in 2015. The Chester Stormwater Authority CBP3 began in 2018. High level comparison of background research revealed the total area and population involved were very different between the two case studies, given one partnership represents a whole county and the other the area of just the city. We included

differences in Table 1 regarding the stormwater fees and homeownership versus renter rates, each discussed in more depth in the following sections.

Table 1: Case study information and demographics

Metrics	CBP3: The Clean Water Partnership Prince George's County, MD	Chester Stormwater Authority Chester, PA
Year Established	2015	2018
Stakeholders	Prince George's County, Corvias, Community NGO's, Local Construction firms, Community Outreach Organizations	City of Chester, Corvias, EPA
Program Funding & Sources	\$100 million for initial 3 years (EPA) Stormwater fee enacted in 2013, Water Quality State Revolving Loan Fund etc.	\$1 million grant from PENNVEST in 2017 to establish the Authority, Stormwater Fee, \$2.4 million grant from EPA in 2021, Clean Water State Revolving Fund loans
Area Included*	482.7 Square Miles	4.8 Square Miles
Stormwater Fee	Annual administrative fees=\$20.58 per tax account Impervious fee rate= \$20.90 per Equivalent Service Unit (=2465 sq ft of impervious area)	Bi-Monthly fees based on Equivalent Residential Units (ERU). - Impervious fee rate= \$8.25 per ERU. - 1 ERU=1,139 sq ft of impervious area. - Single family residential = 1 ERU - Other parcels calculated based on ERUs.
Population Involved*	955,306	32,535
Race & Ethnicity*	64.1 % African Americans, Hispanic or Latino 20.4%, White alone 27.2%	71.9% African American, Hispanic or Latino 9.0%, White alone 17.6%
Homeowners & Renters*	Owner-occupied housing unit rate = 62.2% Renters=37.8%	Owner-occupied housing unit rate: 36.8%
*Data Source: U.S. Census Bureau Quick Facts by City/County using the latest estimates from 2021		

4.1.1 Prince George's County, MD Clean Water Partnership

Prince George's county borders Washington, D.C. and has a predominantly African American population. According to the US Census Bureau, the total population of the county is around 9,46,971 as per 2022 figures ("U.S. Census Bureau QuickFacts: Prince George's County, Maryland" n.d.). The population per square mile is approximately 2004 with owner occupied housing unit rate greater than those of renters ("U.S. Census Bureau QuickFacts: Prince George's County, Maryland" n.d.). The county has urbanized areas and some rural communities as well, with 61.8% of the population being house owners ("Prince George's County, MD Household Income, Population & Demographics | Point2" n.d.). The Department of Permitting, Inspections and Enforcement (DPIE) for Prince George's County in its Environmental Justice Commission report 2019 highlighted "*inequities in zoning, planning and development*" as one of

the main issues in the natural and built environment in the county (“Prince George’s County Environmental Justice Commission” 2019). The report also recommends inclusion of community’s input to identify environmental justice issues (“Prince George’s County Environmental Justice Commission” 2019). The county also enacted a new legislation in 2022 to ‘promote racial equity and social justice’ and reduce any disparities in the diverse communities of Prince George’s County (“Prince George’s Council Civic Alerts” 2022).

The county has several watersheds, but the Anacostia River watershed is one of the prominent ones and covers about 49% of the county's land mass (“Characterization Of The Anacostia River Watershed In Prince George’s County, Maryland” 2005). Potomac and the Patuxent river also have streams and waterways passing through the county. The latest permit issued to the county in terms of water quality under the Clean Water Act and the National Pollution Discharge Elimination System (NPDES) had stringent requirements for stormwater treatment (“Prince George’s County Watershed Assessments and Studies” n.d.). Under the MS4 permit, issued in 2014 (“Prince George’s County Watershed Assessments and Studies” n.d.), Prince George’s County needed to come up with a comprehensive and efficient stormwater management program that could achieve its water quality goals as stated by the Environmental Protection Agency.

Consequently, Prince George’s County officially entered into a 30-year Clean Water Partnership with a private partner, Corvias, in 2015 to comply with the EPA’s MS4 permit by 2025 (“The Clean Water Partnership – Prince George’s County and Corvias Solutions” n.d.). Besides technical goals of project completion, the program introduced the concept of socioeconomic goals and criteria to satisfy community inclusion requirements, especially vulnerable groups, local workforce and minority businesses. Speedy and cost efficient (30%

lower cost than traditional stormwater programs) completion of the first phase led the partnership to commence with the second phase of retrofitting 4000 impervious acres (“Prince George’s County’s Use of CBP3 for Meeting MS4 Permit Requirements” 2016).

Inclusion of the local community in the CBP3 model marked a departure from the traditional procurement models and public private partnership methodologies. This inclusion was not the traditional feedback and brainstorming exercise but has effectively incorporated and created stakes for the community in the project through the CWP’s clearly defined partners and entities constituting the public sector and other stakeholders involved.

The concepts listed in the table below are the three main focus areas outlined by the County (Prince George’s County- Use of CBP3 for Meeting MS4 Permit Requirements, 2016).

Table 2: Key concepts in the PGC’s CBP3

Key Concept	Description
<i>Best Management Practices (BMPs)</i>	Fast-tracked local market creation for standardized green infrastructure technology and innovation
<i>Adaptive Management</i>	Reduces administrative and complex supervisory needs through a single fast-track private project manager and long term operational private partner
<i>Green Jobs and Socio-Economic uplifting</i>	From its Mentor Protege program to its training and capacity building drives for local enterprises owned by the local population, specifically minorities, and women; the partnership focuses on going beyond economic and infrastructure goals

4.1.2 Chester, PA Stormwater Authority

The second CBP3 case study we explore is the Stormwater Authority of the City of Chester partnership based in Chester, Pennsylvania. Chester is located along the Delaware River, less than 20 miles from Philadelphia. The city is highly urbanized, but the population of Chester has been in decline for decades, contributing to difficult financial circumstances in the city

(Corvias n.d.). Chester residents are over 70% Black, 28.5% of the city's residents are considered to be in poverty, and the residents are majority renters ("U.S. Census Bureau QuickFacts: Chester City, Pennsylvania" n.d.).

Chester has been under financial oversight from the state since the 1990s and more recently has been in receivership (Wood 2022). In November of 2022, the City of Chester filed for bankruptcy and was ruled eligible for bankruptcy in mid-March of 2023 (Ashley M. Chan 2023). Multiple factors have contributed to Chester's financial status over the years, including population and tax revenue decline, inefficient pension packages, and revenue directly tied to industry. This financial history of the City is an important context for understanding the conditions in which Chester entered a CBP3 and continues to operate.

Beyond the financial circumstances, water quality and environmental pollutant concerns have been prevalent in Chester, as the city has a long history of polluting industries located within the city's small area. Based on criteria used by Pennsylvania and the US EPA, the entirety of the City of Chester was considered to be an environmental justice area at the time of our research (see Figures A and B in Appendix D for reference maps). The metrics involved in the determination of an environmental justice (EJ) area from the Pennsylvania Department of Environmental Protection included "any census block group where 20% or more individuals live in poverty, and/or 30% or more of the population is minority" (Pennsylvania Department of Environmental Protection n.d.). Census tracts in Chester had multiple categories of being disadvantaged based on the Justice 40 Initiative Climate and Economic Justice Screening Tool criteria including: "*climate change, clean energy and energy efficiency, clean transit, affordable and sustainable housing, training and workforce development, remediation and reduction of legacy pollution, and the development of critical clean water and wastewater infrastructure*"

(“Climate and Economic Justice Screening Tool” n.d.). Across Chester, each of the 8 categories listed above were included in at least one census tract, with the majority of Chester’s tracts found to be categorized as disadvantaged for multiple criteria (“Climate and Economic Justice Screening Tool” n.d.). The level of existing financial burden, pollution burden, and affordability of those residing in Chester were stark differences for consideration of potential gentrification in Chester compared to Prince George’s County. This context raised questions around why a CBP3 model was selected as a financing mechanism for Chester, whether the partnership was considering equity, and how the partnership lived up to the community-based focus of a CBP3.

The Stormwater Authority of the City of Chester entered into a 30-year contract with Corvias, the same private partner as the CBP3 in Prince George’s County, in 2018 (Corvias n.d.). Prior to the partnership, the Stormwater Authority was incorporated as a municipal stormwater utility in 2016 in accordance with Pennsylvania state law for creating a municipality (Commonwealth of Pennsylvania 2016). Creation of the stormwater utility allowed for the City to act on their Green Stormwater Infrastructure plan which was released in June of 2017 (Delaware Valley Regional Planning Commission 2017). Fees collected by the Stormwater Authority based on square feet of impervious acres represented a key component of the financing structure of the CBP3 in Chester (Chester Stormwater Authority, n.d.). Delaware County, where Chester is located already had a separate wastewater utility and the City of Chester had a separate water authority at the time of the stormwater authority’s creation (DELCORA n.d.) (Chester Water Authority n.d.).

The decision-making structure in Chester’s Stormwater Authority includes an advisory board which holds regular meetings (Stormwater Authority of the City of Chester n.d.). The Stormwater Authority held a number of community meetings in 2017 to inform the public of

why the stormwater authority was created and that regular stormwater fees would be imposed (Stormwater Authority of the City of Chester n.d.). We did not find records of the attendance from residents at these meetings, but one person we spoke with on background from Chester attended at least one of these meetings and recalled that there was not a robust publication of the meetings ahead of time, compared to the advertising and outreach practices of other organizations in Chester.

Legal controversy and public pushback by local businesses and residents around the introduction of the stormwater fee took the form of multiple lawsuits. The courts ultimately sided with the Stormwater Authority's ability to charge fees (Ainsworth 2019). Many legal cases at the time of this writing were found on the city's docket in connection with the Stormwater Authority for residents refusing to pay fees, resulting in additional major fines and liens on people's homes (Delaware County Court of Common Pleas Civil Case Dockets and Judgment Index n.d.).

The public pushed back on the Authority's originally set fee amount of \$15.60 per month per equivalent residential units (ERUs) based on square feet of impervious acres, and the resulting fee structure was set for a lower monthly rate of \$8.25 per month billed bi-monthly (Rick Kauffman 2018). The public affordability concerns around imposing new regular utility fees on businesses and residents and their resistance against the major financing mechanism in the CBP3 in Chester was not equally present or discussed in the CWP. Public perception, ability to pay for new fees, and reactions to the city's involvement in the CBP3 partnership were especially important considerations in Chester due to the city's level of poverty, declining population, and bankruptcy status.

Like the CWP, the goals of the Stormwater Authority CBP3 went beyond just water quality improvements. The mission of this CBP3 was defined on a joint website by the

Stormwater Authority of the City of Chester and Corvias as “[a] partnership designed to support greater greening efforts in the region, generating hundreds of jobs and significant small business growth for this historically impoverished, overly burdened, urbanized community in the Delaware River Watershed” (SAC Corvias n.d.). Stated goals on the same website included retrofitting 350 acres and cleaning, inspecting, and replacing inlets throughout the city. Additional goals stated included “revitalizing the city”, economic growth and workforce development, addressing the city’s aging stormwater infrastructure, reducing flooding, and compliance with Clean Water Act (CWA) regulations and associated permits. At the time of our research, all of Chester’s waterways were considered impaired under the 303d list under the CWA (Pennsylvania Department of Environmental Protection 2022).

4.1.3 High Level Comparison

Through comparing two case studies following the same CBP3 model and operating with the same private party entity, we were able to identify differences in how the two CBP3s set priorities and goals, engaged the community, incorporated local demographic and historical needs for each area, and executed the programs overall. We found the CBP3 model to be customizable and able to address the different statutory or community level concerns in order to meet environmental regulation goals and address community needs and concerns. Context specific to the city and county demographics, financial status, and extent of community involvement between our two case studies revealed major differences in the approach utilized from the outset, how community was engaged throughout, and what defined the overall goals and needs of the partnerships. There was a high degree of overlap of themes that emerged in our interviews and in our secondary sources including scalability, risk transfer, adaptive management, circular economy, outreach and education, flooding and property concerns.

Differences in scale of the two partnerships were notable. Prince George's County spans almost 500 square miles compared to the City of Chester being less than 5 square miles. In PGC, developing the local workforce based on goals set by MD was emphasized. Alternatively, due to the priorities in Chester being more about finding financial mechanisms to meet environmental standards and requirements, the workforce development aspect was less clearly defined. In Chester, the partnership priority was more centrally about creating a way to get much needed improvements to the city's infrastructure using this innovative financing structure of the CBP3. Chester's CBP3 created jobs through the Stormwater Authority, just at a smaller scale than in PGC, given the area of the partnership is much smaller.

In Chester, "revitalization and crime reduction" and public health improvement were emphasized. Given Chester's history of disinvestment and blight, current concerns around the project's social goal and co-benefits were found to be different from those in PGC where there was found to be more of an environmental education throughline. The expansive involvement of schools and education and resulting co-benefits of the Clean Water Partnership throughout the county incorporated a long-term attention to the next generation of green jobs. Our results and differences by theme are discussed in more depth following the stakeholder analysis section.

In the following figure, we highlight differences between the two case studies on some of the key metrics. Though both CBP3s sought to address water quality concerns in entering into the partnership, there was a lack of awareness that such a partnership existed in Chester. In PCG on the other hand, there were clearly identified goals based on the 3Es. Differences in transparency and data tracking were also notable between these two cases. As the CBP3 model is a new approach, but also one that is increasingly being utilized across the nation, our findings of

major differences and policy recommendations in the final section of this report aim to be applicable and actionable for those involved in these partnerships.

PRINCE GEORGE'S COUNTY CWP	METRICS	CHESTER STORMWATER AUTHORITY
Identified goals - 3Es	Goals of the Program	Lack of awareness a CBP3 existed & financial troubles
Stakeholder inclusion across the County	Stakeholder Inclusion	Limited stakeholders directly involved
Adaptive management & data available publicly	Transparency	Low transparency role of Corvias not fully understood
Extensive data tracking & community feedback prioritized	Data Tracking & Feedback Incorporation	Data tracking / metrics not public

Figure 1. Case Study Comparison of Metrics

4.2 Stakeholder Analysis Results

Considering the new approach of the CBP3 to include the community as a stakeholder in addition to the traditional PPP model, we were interested in better understanding the roles and perspectives of the stakeholders involved in each CBP3 case study. Here we used stakeholder to mean those identified as most directly involved in the partnerships, not meaning any individual or entity that may be involved or impacted by the two partnerships. The three main stakeholder categories were identified in the CBP3 as: Government Officials, the Private Partner, and Community (Individuals & Representative organizations). In our interviewing process, we were interested in hearing from each perspective in order to understand the stakeholders and how the structure of a CBP3 functioned. We structured our questions to discover differences across stakeholder groups in terms of involvement in the program, priorities, or considerations for how the partnership could be improved.

There appeared to be some overlap between these categories observed during the interviews. Certain Non-Governmental Organizations (NGOs) and community engagement or

outreach organizations represented certain key areas and/or community groups, but also actively worked within the partnership programs in areas like education and outreach as subcontractors of Corvias. This overlap in stakeholder categories played a role in the associated influence, power dynamics, and extent of impact from the program on these stakeholders. A Venn diagram in the figure below represents this overlap more effectively than a stakeholder matrix or grid.



Figure 2. Key Stakeholders in the CBP3

A word cloud of secondary and primary data nodes coded in NVIVO for equity indicators access, participation, and opportunity, specific to the CWP case study, indicated ‘local outreach’ and ‘community’ as the highlighted terms respectively (see Appendix D Figures C and D). The community stakeholder groups were divided in six distinct groups and the roles for each of them were defined quite well in project planning and implementation. In terms of the equity indicators, ‘access’ appeared to be the least prioritized in our primary and secondary data. This diminished focus on ‘access’, in varied contexts, when compared to participation and opportunity, was also

reflected in one of the interviews with a community organization. The interviewee commented about the dynamics of working directly with the county and working through a private partner:

So [the private partner] took over.....So we were working a little bit with the county on some grants, and then [the private partner] jumped in and kind of got the whole PPP and they- it just it- I don't know it just didn't kinda it's the outreach piece of it. They didn't need us (NGO Interview 2023).

The role of community organizations and associations was less defined in the Stormwater Authority partnership in Chester than in the CWP. Identified Stakeholders involved in Chester included Corvias, the City of Chester, and the Stormwater Authority itself. Notably, specific community organizations were not included in the key partners or stakeholders in the Chester CBP3, though through our research, we found that community partners specific to watersheds, water quality, and environmental justice issues existed within the city. The community in Chester appeared to be discussed more in terms of being a general stakeholder in the area and impacted by the partnership, but not a specifically integrated stakeholder in the CBP3.

Although local residents and minority businesses along with vulnerable groups such as local, small, minority, woman, veteran, disadvantaged business enterprises (LSMWVBE) were routinely mentioned in the secondary data, it was mostly in relation to economic inclusion. Any social equity or justice outcomes to these groups appeared to be co-benefits. The program appeared to attempt to address equity issues through design and execution of infrastructure development projects via upskilling and economic integration of vulnerable groups with a potentially positive cascading effect on social indicators, especially in Prince George's County where there was a major focus on workforce development and creation of green jobs. Jobs created in the Chester Stormwater Authority's work were discussed as having a preference for local Chester residents, but additional information on workforce development beyond that criterion was not found.

Despite our efforts, we were unable to speak with individuals or stakeholders directly involved in the Chester CBP3 partnership. Our interviewees specific to Chester, rather, represented more community / public perspectives on the partnership. These conversations specific to the Chester partnership revealed that individuals involved in environmental community organizations connected to Chester were not fully aware of an existence of a Community-Based Public Private Partnership entailing anything beyond the creation of a stormwater utility. Insights into the role or view of Corvias as a manager or operator within Chester were limited by our lack of participants familiar with the operation of the CBP3 or its terminology. For example, one interviewee indicated only having heard of Corvias one time before our conversation. Chester city officials within varying departments were contacted to ask about their involvement in the partnership in attempts at recruiting interview participants, and responses in brief phone conversations included limited awareness of there being a community-based public private partnership. Having found many potential participants from the City of Chester had not been directly involved in the partnership, these conversations did not lead to an interview. Though our results in the stakeholder analysis section were more restricted with respect to the Chester partnership, this still gave insight into the lack of a defined role of community partners and perception of the partnership by community members being less comprehensive than in the CWP, despite Chester's program also found to be discussed as a community-based public private partnership in various resources.

4.3 Equity Indicators Across CBP3 Phases and Cross-cutting Themes

We structured the remainder of our results along major themes which were identified through answering our major research questions as well as themes that emerged from our analysis in NVivo. This section covers the following six themes: Goal Setting / Visioning;

Community Involvement, Inclusion, and Outreach; Equity Themes and Dimensions; Gentrification; Measuring and Tracking Data; and Future Considerations.

4.3.1 Goal Setting / Visioning

Prince George’s County tried to identify the common values of the community; they centered their design, planning, and implementation approach for the CBP3 around three pillars: Environment, Economy and Education (Prince George’s County-Approach to meeting stormwater regulation requirements, 2016). Besides meeting the MS4 permit requirements for stormwater, the County also focused on *“promoting economic development, improving education opportunities while restoring and protecting the environment”* (“Prince George’s County’s Use of CBP3 for Meeting MS4 Permit Requirements” 2016). These three pillars, as ascertained from primary and secondary data sources, were added to provide limited co-benefits, but were also a result of brainstorming about community’s interest, values, and priorities by the design architect(s) of the CBP3.

The 3Es are embedded into the Master Performance Agreement, the official agreement between the private partner and Prince George’s County, through various socioeconomic milestones and programs. This approach, which originates from the three-legged sustainability stool approach of Environment, Economy and Social (in the CBP3 the social leg is expressed as Education), appears to follow the Integration principle instead of the Equity/Justice Principles; the Integration Principle is focused around *“harmonious integration of socioeconomic and institutional development objectives with environmental ones”* whereas the equity/justice principle of sustainability believes in *“intergenerational, geographic, procedural, interspecies equity etc. in terms of development”* (Waas et al. 2011 p. 1645).

(The county) care(s) about the economy. They care generically about the environment. ... It was more about just everyday environment, and then also the education for the people, the children, the adults in the community... the 3 Es. and.... got unanimous County Council approval of this (CWP Interview 2023).

The quote above described how officials were thinking through the envisioning phase of the CBP3 in terms of the 3Es. While it was notable that there was unanimous approval of this concept, we did not learn of or find any data about any community listening sessions or more specific community involvement within the envisioning phase of the CBP3 in Prince George's County. Our findings with respect to goal setting and visioning within the CWP indicate an indirect community aspect, rather than a comprehensive stakeholder engagement specific to entering a CBP3. Goals and visions for the partnership were grounded in people's connections to the Chesapeake Bay and people's general amiability toward environmental initiatives in Prince George's County. There was a temporal gap between the stormwater fee introduction/hike in 2013 and the launch of the CBP3 formally in 2015.

Instead of using the "3Es" by name as in the CWP, the CBP3 in Chester focused similarly on how GSI can provide "triple bottom line" investment through providing environmental, social, and economic benefits, as stated in the Request for Proposals (RFP) connected to the partnership ("Request for Qualifications & Proposals (RFQ/RFP) for Establishing a Community Based Public Private Partnership (CBP3) for the Stormwater Authority of the City of Chester, PA" 2016). The goals outlined in the RFP for Chester stated: "The Program will ideally be a long-term 30-year contract with an established partnership with a private sector partner to better implement, manage and maintain integrated green infrastructure-driven stormwater controls to meet regulatory mandates for improving water quality, in addition to providing multiple community benefits and enhancements, supporting health, safety, education, employment and resiliency." (RFQ/RFP 2016). Like the CWP, the RFP for the CBP3

in Chester has an emphasis on job creation. The minimum requirement for MBE participation outlined in the RFP was set at 30% for the CBP3 in Chester (RFQ/RFP 2016). The process and extent of job creation, contractor development, and mentorship was unclear in this CBP3 compared to the CWP, which had an established Mentor Protege Program. Further, it was not as clear in the secondary data from Chester whether the partnership has social goals around conducting outreach and educational programs in schools, or how they have fulfilled MS4 requirements around education.

Most of the documents analyzed connected with Chester were from the initial stage of the partnership. Green Stormwater Infrastructure practices were described across the 13 reference documents, policies, and reports analyzed in connection to crime reduction, public health, and resilience. Interviewees from Chester perceived goals connected with the Stormwater Authority to include both greening the city and addressing water quality issues. Documents assessed in the Chester CBP3 focus more on goals and purpose of the partnership, with less emphasis on how to accomplish goals, whether there are specific policies or procedures for how goals will be achieved, how projects will be prioritized, or how communities will be engaged and involved.

4.3.2 Community Involvement, Inclusion and Outreach

Our results and findings with respect to community involvement, inclusion, and outreach considered the role of community members at each stage of the partnership. Building on the findings of the envisioning stage in the previous section, we considered the role of the communities for each CBP3 in the planning and implementation phases, as well as how feedback was incorporated for each partnership. We asked interview participants about how outreach efforts were conducted and reviewed secondary document materials from community meeting presentations.

Connected to our understanding of the different stakeholders involved, we learned through interviewees connected with the CWP that the private partner was oriented to and taught about the community's goals, priorities, and concerns when they began the partnership. While not the most robust community engagement process, this involvement of community groups at the outset of the partnership was notable. The following quote indicated how a private entity perspective viewed the role of community involvement within the CBP3 model:

I think one of the most important things to know when setting up a large-scale infrastructure program is nobody knows the community better than the community itself (Private Firm Interview 2022).

The extent that the private partner learned from community stakeholders in Chester was not able to be determined through our limited interviews or documents analyzed. Community outreach efforts in Chester were largely found to be in connection with raising awareness in the community of the creation of the Stormwater Authority and associated introductions of a stormwater fee. We did not find whether Corvias or any community engagement related contractors were involved in this initial outreach process or whether it was done solely by the stormwater utility. An interviewee expressed a view that officials in Chester tend to not conduct robust community outreach and involvement efforts. We found meeting announcement notices in the Delaware County Daily Times and flyers from the Stormwater Authority's website but were unable to determine exactly how extensive or successful the efforts were in reaching residents effectively.

We asked our interviewees about how feedback from the community was incorporated into the partnership throughout their operations and during the implantation phases. Participant responses indicated adaptive management tactics, flexibility, and contractors working within the CWP being present at community meetings in order to hear feedback directly. The following quote was from an interviewee from the private side of the partnership:

It's really a two-way conversation, because we're also listening to them to see what their issues are with respect to construction, with respect to what we're doing, with respect to the environment, with respect to social and environmental justice issues (Private Firm Interview 2023).

We heard from multiple interviewees about how projects in Prince George's County have built on feedback from community members around what was wanted, with examples from the aesthetics of pond retrofits to the inclusion of building a bridge after community members requested one. Interviewees expressed that not every request by the community was addressed, but that some projects were stopped due to rejection by community homeowners. The importance and prioritization of community buy-in and inclusion throughout the process was evident in the CWP. We additionally learned insight from a participant into how faith community members felt less included and valued as a prospective partner within the CWP compared to other community focused organizations during the contracting phase. For the most part, however, efforts to involve and engage the community in the CWP were discussed positively. Comparable incorporation of public and community feedback into the operations and implementation of projects by the partnership in Chester remained unknown.

In the CBP3 in Prince George's County especially, the role and emphasis on education and outreach was especially apparent. Our interview participants described the outreach and education efforts in the community as a demonstrated priority, doing more than simply checking a box that the community was engaged. Because education represents a part of MS4 permitting requirements, stormwater efforts must include ways of incorporating learning and involvement of the community to be in compliance. Within the CWP, this included projects located at schools, churches, and areas around the county where people were able to witness the stormwater controls in action. The partnership in PGC has a "Treating and Teaching" program where schools are directly engaged. Participation in the program spanned students to teaching staff to

custodians, with education around how rain gardens, bioswales, etc. functioned. These efforts in the CWP were extensive and have a goal of increasing environmental awareness and education and by teaching children in schools, developing the next generation of green job workers.

Despite education being mentioned in the RFP in Chester, we did not find explicit ways this goal was being achieved or acted upon. The official agreement document between Corvias and the Stormwater Authority of the City of Chester was not readily available, thus we were unable to compare how the partnership may be measuring up to its agreed upon goals regarding education and outreach or meeting its MS4 requirements around education.

This final quote indicated how the CBP3 approach can be seen most positively with respect to the role of community involvement, as expressed by an interviewee from a private entity perspective within the CWP:

When you're working in the community, there is a way to listen and a way to work with the community for a win-win. We're working for win-win with the community (Private Firm Interview 2023).

4.3.3 Equity Themes & Dimensions

We wanted to better understand how equity was being incorporated and thought about in each partnership to address our main questions and find any potential gaps in the CBP3 approach with respect to equity. Project site selection, prioritization, and distribution throughout the County and City involved were considered in respect to procedural and distributional equity. We also considered equity references in our document analysis in terms of various key equity themes and policy approaches expressed in ICLEI's Equitable Transitions Guidebook: equity in terms of access, participation, and opportunity (PolicyLink n.d.). Research by Grabowski et al. 2023 also influenced our consideration of equity in terms of process: vision, procedure, and distribution phases of each program (Grabowski, McPhearson, and Pickett 2023). In this section, we reported

findings of equity incorporation and prioritization for each partnership as well as comparisons across the two case studies.

In the official guiding document from the EPA about CBP3s for local governments, the term ‘equity’ is only discussed in the financial sense. During the analysis of secondary data in NVivo, a search for the word ‘equity’ in documents associated with the CWP revealed usage of the word also only in the financial context, such as ‘debt equity’. We found little to no mention in terms of social equity, equity principles, or in terms of fairness within a community. The word ‘justice’ is mentioned once as ‘environmental justice’ under social benefits in one of the County’s informational documents about the CBP3 (Prince Georges Maryland Clean Water Partnership, US EPA). In the documents analyzed with respect to Chester, ‘equity’ was also found in the financial context or in terms of the fee structure specifically being ‘equitable’ due to each property being assessed based on square feet of impervious area. We refrained from reporting word usage for the interviews, as questions we posed centered around equity and thus influenced the use of the words by the interviewees. The term equity, based on our understanding and framing of the word in this report, was not explicitly found in any document we analyzed with respect to the CBP3s of our case studies to date.

Our coding approach in NVivo considered equity in terms of Access, Opportunity, and Participation. Nodes/codes specific to access included considerations on how easily accessible the benefits of the partnership or outcomes were to participants and residents (see the full list of nodes in Appendix C). Green jobs, local workforce development, training, and inclusion of minority businesses and vulnerable groups were coded under opportunity. Participation nodes included mentions of key partners and stakeholders, local community, and outreach and inclusion within the partnership processes or meetings.

Our semi-structured interviews revealed that those involved in the CWP especially were more concerned with equity in the partnership's outcomes than was originally understood through policy analysis alone. Though equity was not stated as a primary goal of the partnerships, there was a great deal of consideration for social justice and EJ communities in how projects were distributed and planned throughout the partnership area(s). We heard from multiple interviewees associated with the CWP that project selection and consideration was done with identified EJ areas in mind, using tools like Maryland's EJ map or the EPA's EJSCREEN. We found this incorporation to be notable in terms of how the CBP3 approach considers and can contribute to distributional equity. The following quote shows how the partnership was being discussed by someone connected to the CWP:

So if you're doing social and environmental justice, I don't think there's a program in the country that is as cognizant as the Clean Water Partnership with respect to social and environmental justice (Private Firm Interview 2023).

We were unaware if the same distributional equity consideration using EJ tools or other criteria was included when prioritizing project locations in Chester, but as stated in the background section, the whole city of Chester was considered to be an environmental justice area across various criteria at the time of writing. We found reporting on a GI focused project completed in Chester in an area that was prone to flooding and had debris and trash that was cleared out through the partnership's work but did not find reasoning for why this was the first project prioritized.

Because we were able to speak with more interviewees connected with the Clean Water Partnership, we were able to determine differences between different stakeholders through analysis in NVivo. The intensity of the shade in the heat map blocks in the figure below indicate the number of mentions or quotes related to the equity themes and equity considerations across various phases of the CBP3 by various interviewees. The greatest focus and mentions appear to

be about the feedback loops or mechanisms of incorporating community feedback and then with varying intensity on planning and implementation stages, siting and distribution stages, and stakeholder inclusion. Envisioning stage is the least considered/mentioned/talked out phase in terms of equity considerations. NGO as a stakeholder appears to be overall more in touch with all the different dimensions of equity and equity themes. This might be due to the broad spectrum of projects being handled by the NGO, direct coordination/ relationship with the community and the awareness about latest equity frameworks and environmental justice issues.

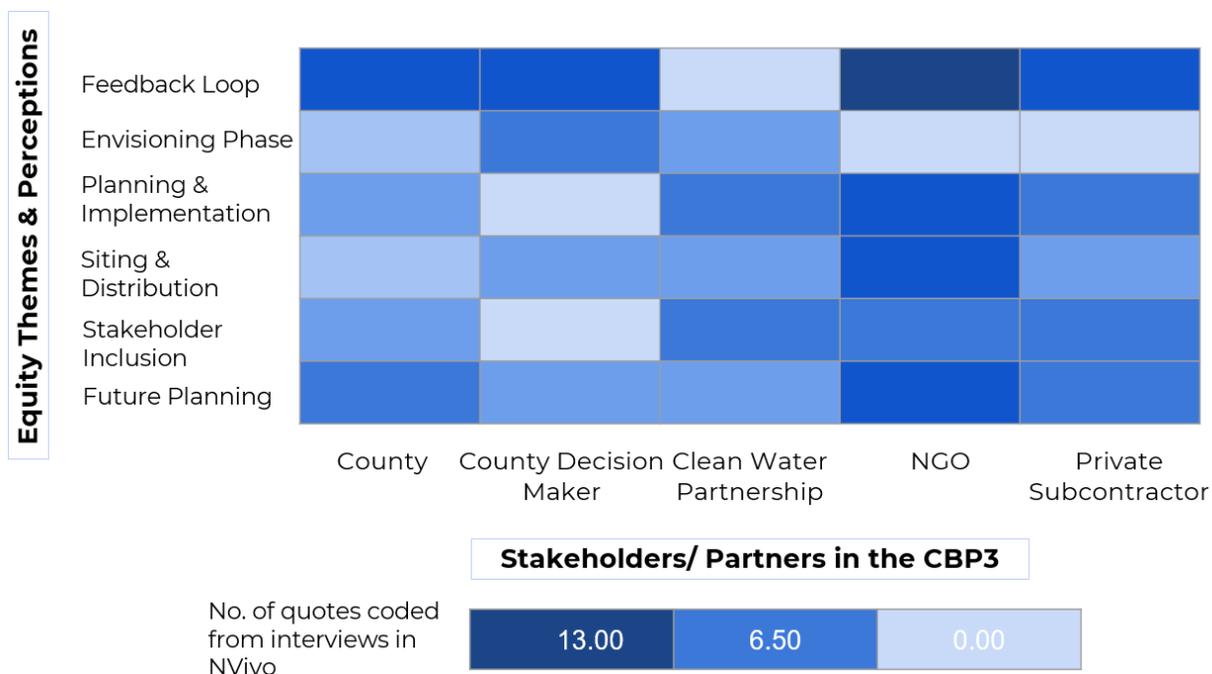


Figure 3. Heat Map Stakeholder Matrix for CWP Interviewees. Heat Map showing perceptions and mentions of various themes and dimensions of Equity expressed across various policy planning stages and approaches in semi-structured interviews.

Equity specific to participation was discussed by many of the interviewees connected to the CWP. The partnership's focus on participation ensured local residents benefited from the program through job opportunities, training programs, educational initiatives, and improved environmental outcomes. The following quote from a Private Entity Perspective indicates equity in terms of access, opportunity, and participation in the CWP:

I was told we don't think we can have a stream restored by minority firms because they don't have the competence. We've had 2 full streams done by 2 completely minority firm based groups. And that's kind of almost unheard of (Private Firm Interview 2023).

It was indicated from the interviews that the CBP3 in PGC was dedicated to meeting local and minority participation targets. The program exceeded expectations in many respects. In Chester, we were unable to learn as directly how participation in their CBP3 has incorporated equity. Chester residents are prioritized for the Stormwater Authority's jobs, but beyond that we are unsure what participating in the partnership involves.

We shift now to considerations of equity in terms of financial changes and potential affordability burdens connected with each CBP3. In Prince George's County, residents were already paying stormwater fees starting in 2013. The fee, communicated in the property tax bill, was composed of a variable fee which depended on the impervious acres in addition to a fixed administrative fee. The variable fee was able to be waived for community organizations and businesses if they retrofitted their property with GI for stormwater cleaning through the 'Alternative Compliance Program' (ACP). Besides introduction of a temporal gap in the CWP launch in 2015 and the stormwater fee imposition, the CWP, even unintentionally, appeared as a gain (ACP) rather than a loss. We found that another dynamic of the CWP was that any perceived gentrification concerns and reduced economic abilities of disadvantaged residents due to the stormwater fee hike were apparently addressed by inclusion of the ACP and mandatory employment of minority businesses for the retrofit and prolonged maintenance to a certain extent.

This was a completely different approach than that observed in Chester, where residents perceived the stormwater fee as a loss due to its imposition of new fees along with the stormwater program launch. In Chester, the stormwater fee applied to all businesses, nonprofit entities, homeowners, public and government facilities (Chester Stormwater Authority, n.d.). The

existence of a comparable alternative compliance program in Chester was not found. In Chester lots of people did not pay the fee when it first got announced and imposed. An interviewee told us that people in Chester were concerned they would have to pay fees and get no results. As discussed previously, the original fee amount was set much higher than the later settled upon rate due to public pushback. News reporting at the time indicated concerns by business owners especially around shifts in affordability and increased utility rates (Rick Kauffman 2018). At the time of writing, there were many active lawsuits regarding nonpayment of the stormwater fees, resulting in additional financial burden to a number of Chester residents.

The reactions by the public when fees/taxes were imposed to help fund the CBP3 programs were not the same across our two case studies. There were differences in the financial mechanism and policy framing but also notable differences in home ownership and level of poverty in the two areas that contributed to their ability and perception about new utility bills or taxes being imposed. Considering how changes to fees and taxes incorporated into a CBP3 program requires attention to how they will be done equitably or based on fairness, taking into account changes to affordability based on residents' ability to pay.

The following table represents our summary findings with respect to equity across different dimensions of the CBP3 model in each case study. The CBP3 program has done a decent job in achieving equity in terms of opportunity, participation and to some extent access. Equity in visioning; monitoring & tracking of indicators specific to equity and gentrification; and including equity principles in future goals, we found room for improvement and areas to consider for any new CBP3s. Distribution here refers to the geographical spread or spectrum of different projects within CBP3, the criteria associated with it and the ethnic and racial diversity of the sites.

Table 3. Comparison of the Two CBP3s in Terms of Equity Indicators & Dimensions

Comparison of the two CBP3s in terms of Equity Indicators & Dimensions		
Equity	CWP- Prince George's County	CSW- Chester
Goals of the Program	Improve water quality through GI by developing local minority businesses & community education for environmental stewardship	Support greening efforts in the region, generate jobs and small business growth, and comply with Clean Water Act (CWA) regulations and permits
Stakeholder Identification	Clearly identified stakeholders and their roles in the CBP3	Stakeholders include private and gov. parties. Community groups / roles as stakeholders largely undefined
Approach during Envisioning of CBP3	Consideration given to community values but no available record of community participation including minority/vulnerable groups	Consideration around how to meet CWA requirements and create a revenue stream in order to conduct needed infrastructure improvements
Approach in Procedure	Community meetings & communication for projects & feedback informs manner of implementation	Informing public of creation of stormwater authority, imposing of fee, but lack of comprehensive involvement
Approach in Distribution	Some indication of community inclusion in siting of projects & use of EJ tools	Potential sites were assessed but measures of comparison and prioritization is unclear
Monitoring & Tracking data	No data being tracked in terms of equity or gentrification	Undetermined if data is being tracked in terms of equity or gentrification
Incorporation in future Goals	Individual awareness & consideration of EJ issues & priorities but not as an integral part of the CBP3	Undetermined. Lack of direct input from interviewees.

4.3.4 Gentrification

From the beginning of our research, we were interested in determining whether the CBP3 model is considering or incorporating measures to prevent potential green gentrification that could occur when such green infrastructure investment is directed to a community/city/county. To answer our research questions specific to gentrification in GI projects, we asked each interviewee to describe their understanding of gentrification before asking whether they felt such outcomes were occurring, being measured, or tracked in the respective city and county of our study. Interviewee answers regarding what gentrification entails aligned with our understanding and with the definition of gentrification included in our introduction section.

The people we interviewed specific to the CWP stated perspectives that gentrification was not a current concern in PGC, nor was it being directly tracked by people within the partnership. Interviewees indicated concerns around gentrification could be more of a priority in

areas that are already fully developed, and where any development would require some displacement of residents, but that was not discussed as the case for PGC where there is a range of density within the county. There was also a sense that the work of the partnership itself has not driven the type of economic development that may further gentrification outcomes. Rather, the work has included developing businesses and local residents and improving smaller scale areas around the county. We discussed with participants how “green gentrification” is a rising concern with development, having the potential to impact affordability and lead to gentrification outcomes. Participants explained they have not seen evidence of that in Prince George’s County, as indicated in the following quote:

We haven't seen gentrification from the work that we're doing, but maybe it's so early to tell, you know, and I don't know who's looking at it, to be honest with you (Private Firm Interview 2023).

We followed questions about understanding of gentrification with whether there was any gentrification tracking happening. Several interviewees responded similarly to the following quote:

So yes, it does potentially have an impact on gentrification, but it's hard to measure that an infrastructure program is the sole purpose of gentrification (Private Firm Interview 2022).

In Chester, gentrification does not appear to be a primary present concern based on interviewee perspectives and media coverage. A situation where too much development and investment is happening to the point that residents are being priced out or displaced was not described. Rather, Chester residents have faced rapid declines in the city’s population, lack of businesses, and thus the city and residents have been in a state of financial strain. The circumstances did not appear to be due to gentrification. While there could be concerns in the future about gentrification, our analysis did not reflect it as a current concern for Chester.

Because our research involved a qualitative analysis, we did not attempt a statistical quantitative determination of what amount of gentrification may be occurring in either case study location, nor did we attempt to determine how much gentrification could be attributed to the CBP3 specifically. We were interested in understanding whether gentrification was currently being discussed by those involved in the CBP3, and if so, how that was being incorporated into the partnership. Several interviewees indicated gentrification as something to consider as they move forward, acknowledging the long time scale of these partnerships.

Though we did not analyze gentrification related data, we researched changes in property related values and taxes for each case study. It is important to mention that no tangible evidence from secondary data analysis indicated any links between GSI development or the CBP3 and house value and rent increases in the County. There were overall concerns and hotspots related to environmental justice, but environmental justice hotspots also have varied origins and infrastructural or development sources associated.

Real property tax in Prince George's County is levied triennially but is tied with the assessed market value of the property. Even though certain caps like the Homestead Tax Credit at a 5% cap ("Prince George's County, MD Household Income, Population & Demographics | Point2" n.d.) and the Tax Reform Initiative by Marylanders (TRIM)-which does not allow an increase beyond a certain amount for every \$100-the rising market/sale values of houses increases the overall tax levied ("Prince George's County, MD Household Income, Population & Demographics | Point2" n.d.). The housing prices and rental housing prices in PGC are increasing when compared to the region's prices ("Prince George's County Housing Snapshot" 2021).

The financial situation in Chester has been assessed in depth in recent years by the state appointed Receiver for the City of Chester. Property taxes in the city of Chester were found to be much higher than the average for Delaware County, where Chester is located, after they were raised for the first time in several years in 2020 (Dowearly 2020). The receiver's Recovery Plan for Chester outlined plans for upcoming development, plans for addressing blight, and included mentions of the Chester Stormwater Authority specifically (Dowearly 2020). Gentrification was not mentioned in the Recovery Plan document, but the term 'blight' was used 9 times, indicating where the concerns around Chester's property values and loss of resident population originated (Dowearly 2020).

We did not determine that gentrification is of as high importance or concern at the present stage of the CBP3 partnerships according to the participants we spoke with. Multiple interviewees stated gentrification was important to think about, but that it has not been something they have witnessed at this stage of the partnership, especially with the dispersed nature of the specific infrastructure investment for the CBP3s. Participants claimed there has not been development that does any displacement, instead pointing to jobs created and increased opportunities as outcomes to date in PGC especially. Instead of major concerns about how home prices have increased, concerns were more about addressing and avoiding future negative property value outcomes from flooding, a risk discussed for both partnerships.

The impact of gentrification on a community has the potential to be a positive impact for some and a negative impact for others. For homeowners, and for historically marginalized homeowners in particular, increases in one's property values can be a positive thing. This positive outcome importantly must be considered alongside whether property taxes may also be increasing and potentially balancing or canceling the benefits earned to a property owner. For

renters, increased rent prices potentially lead to pricing out residents and does not tend to have a positive outcome. In assessing the role of gentrification in a community with or considering a CBP3, the potential infrastructure improvement impacts on housing prices in combination with the understanding of different impacts based on home ownership or renter status were found to be important contexts for the program's design.

Though we did not see specific links between the CBP3 partnerships and gentrification, there remained the potential for the infrastructure investment and beautification involved in the larger green infrastructure improvements within the partnerships to result in changes to property values. Differences in rates of home ownership versus renters in Chester and Prince George's County were notable and important to understand in order to assess whether gentrification may begin to occur in either case study over the course of the remaining decades of the partnerships. These differences also implicate differences in how funding mechanisms for the CBP3 program were designed and how resident affordability was impacted. In consideration of future CBP3 programs in other areas, it will continue to be important to consider the baseline affordability of the area and whether the scale and level of development involved may impact affordability, whether as a renter or homeowner, in order to avoid or prevent displacement and gentrification outcomes.

4.3.5 Measurement / Tracking Different Metrics

Through our document analysis of resources for each partnership and our interviews, we were able to determine what metrics are being tracked within our CBP3s of our case studies, with more understanding of this data from the CWP. In the interviews, we asked questions about data tracking and measurement in order to gather insight about tracking/measurement carried out specific to the CBP3 and not just data collected at the County/City level where the CBP3 is

located. Data tracking was found to revolve largely around MS4 permit requirements, but additionally, the number of resident hours, business development milestones, training and capacity building, impervious area credits, sediment and pollutant reductions, and finances and dollars spent within the partnership were being tracked by the CWP. Anything required under State or County law was also being tracked, such as local workforce inclusion under the Jobs First Act in Maryland. There were defined metrics and indicators for both the education and economy components covered under various separate programs of the CBP3 such as the Mentor-Protege Program, CWP Schools Programs, the Youth and Educational Partnerships.

So whatever those performance-based metrics are, whether it's a certain, you know, minority owned business participation, or resident participation, or something else, you need to track all that data, so you're actually holding the private sector accountable (Private Firm Interview 2023)

The economic metrics detailed on the CWP's website indicate the success of the CBP3 in meeting their socio-economic goals. Project outcomes in meeting and maintaining goals of the CWP to date were viewable on their website dashboard. The CWP has exceeded initial expectations, as expressed by several of our interview participants, especially with goals around local and minority business and resident participation. We learned through interviewees anecdotally that monthly meetings are held between the private partner and contractors or organizations under contract to check up on project progress. Overall, there was found to be an abundance of data being tracked and measured within the CBP3 in PGC, but not all of that is directly related to our questions around equity and gentrification.

We did not learn directly from participants in the Chester partnership what is directly being tracked, but from available reports and articles, we found that number of jobs created, local resident participation, dollars spent, and number of acres or assets retrofitted or installed were the main metrics being measured and tracked by the partnership. We were unable to speak to

whether the measuring or tracking was primarily Corvias's role or if it has been conducted by the Stormwater Authority staff. The community stakeholders we interviewed in Chester were unaware of any metrics that may be tracked with respect to the partnership or the Stormwater Authority itself.

There appeared to be no data being measured, tracked, or reported in terms of equity, justice, or gentrification specific to the CBP3s. This does not mean that no data is being tracked for these social indicators by the County or City generally, but our interviewees did not express awareness of these areas being tracked within the partnerships. There were mentions of County and State level Environmental Justice Tools available for identification of hotspots as well as awareness reflected about such issues and generally about gentrification in the interviews. Equity and gentrification data, though not being measured in the CBP3s, could be incorporated more specifically or in collaboration with other departments or entities that may be tracking such data.

And the goal that we have in our program- is that an equity goal? That's an attempt at that, right? To write the wrongs that have occurred through for so many years, right? And to enhance the economic situation, you know, of Prince George's county. So you know the idea of us planning for future projects in EJ Areas....So from the Clean Water partnership, perspective, right? Environmental justice is a number one in this county (Private Firm Interview 2023)

Awareness about equity and inclusion considerations were highlighted by almost all stakeholders but more as a trend and less as a procedural prerequisite. However, with the general consensus on use of an equity lens, there were also some indications of equity being driven through external factors more than internal ones (CBP3 requirement or codification) such as prevalent community sentiment, or personal prioritization of partners involved in the CBP3.

You get a change in leadership, and then you get a change in these priorities (NGO Interview 2023).

We were unable to ask participants directly involved in the Chester CBP3 about what data is being tracked and measured there, and there is not a metrics dashboard of progress

towards goals on a website like there is for the CWP. A resource published by the National Municipal Stormwater Alliance CBP3 Center for Excellence in 2020 indicated that the CBP3 has exceeded the goal of local resident participation (34% versus the 15% goal) (CBP3 Center of Excellence 2020). An article in the Delco Times from 2019 reported “To date, 25 city residents are employed with the Stormwater Authority of Chester or Corvias through this endeavor” (Carey 2019). We were unable to determine how measures of community outreach were tracked or reported on with respect to any partnership goals. Conclusions about whether equity and gentrification were being tracked, if at all, by those involved in the CBP3 in Chester were unable to be determined.

4.3.6 Future Considerations

Community-Based Public Private Partnerships in our two case studies are operating on 30-year time frames. Because both of our case studies at the time of writing were less than 10 years into their operations, we were interested to determine what was being considered for improvement as the partnerships continued. In this section, we discuss how participants were considering the future of the partnerships and the incorporation of adaptive management.

The term ‘adaptive management’ was extensively mentioned in various policy and regulatory documents for the CWP CBP3. However, it remained unclear whether active or passive adaptive management style was being adopted by PGC’s CWP. Adaptive management is defined as: “*Adaptive management [is a decision process that] promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood*” (Williams et.al, 2009) by the US Department of Interior. The inclusion and prioritization of Environmental justice hotspots was stated as a consideration going forward with the program, as indicated from representatives of the CWP

above, but, again, was not manifested in any policy documentation, public statement or the CWP webpage. Prioritization along EJ hotspots are one aspect of addressing disproportionate environmental benefits to communities but do not necessarily constitute an effective policy measure for gentrification redressal and ensuring equity in project implementation.

We are 100% looking for good projects in these areas that are deemed environmental- the EJ layer on their DE website, dark green areas that'll be a priority for us (CWP Interview 2023).

When asked about specific things the partnership should change or adjust in the years to come, we received a variety of responses. Participants mentioned the need to address how efficiently funds are used in terms of addressing water quality at the same time as efforts within the partnership to center water quantity. Additionally, the need to continually engage communities and not have that viewed as a check box was expressed as a continual focus moving forward within the partnership. We also heard from interviewees that transparency about the processes and procedures within partnership could be increased.

Transparency within the CBP3 in PGC was discussed in multiple ways. Ensuring more transparency in project siting in terms of location and in terms of more understanding of how projects are prioritized or evaluated was expressed in one interview as important for some community stakeholders. Additionally, an interviewee expressed an interest in understanding more transparency around how community partners can plug in or enter into contracts within the CWP. With the interviewees we spoke to familiar with Chester, transparency also came up as something that should be improved upon as the partnership and Stormwater Authority continues efforts there. A separate interviewee familiar with Chester expressed concerns about how the CBP3 in Chester fits into the City's current financial situation, questioned whether it should continue, and debated whether it is actually a beneficial partnership for the city. We also heard from an interviewee that the Chester partnership should revisit some of the reports from the city

around climate adaptation, a green stormwater infrastructure document that was published before the partnership began, and should continue to work on greening efforts in the city (Delaware Valley Regional Planning Commission 2017). Because we were unable to speak with participants directly involved in the partnership in Chester, we cannot speak to how the management or Corvias felt the partnership should change at this stage of their partnership or what their thoughts are moving forward.

Each CBP3 in our study addresses economic inequities through empowerment of disadvantaged populations. However, tracking and measuring any indicators of gentrification, displacement, or social inequity require introduction or amendments of laws or regulations around the CBP3 to ensure systemic adoption. Even if there are not any statutory or legal requirements within a State or City when a CBP3 is introduced, adaptive management should allow for such oversight mechanisms to be included into the partnership framework as soon as highlighted in the area. Furthermore, effective communication across all stages of the CBP3 in a transparent manner can be an effective tool for inclusivity, identification of any potential green gentrification concerns, and for meaningful community involvement in future goals for the two CBP3s of our study.

4.4 Our Research Questions Revisited

Our results above outlined major differences between our case studies across focus themes and metrics. The following sections revisit our main questions, include considerations of prerequisites for a CBP3, and reveal our toolkit for considering equity in CBP3s. Throughout our research, we found context and themes that went beyond our initial main research questions. Some of the information we were seeking was not specifically incorporated, considered a current concern, or being explicitly tracked. Our findings nevertheless were important as the CBP3

model operates in long term timescales and our case studies are still evolving. The following figure is a visual representation of our research questions revisited.

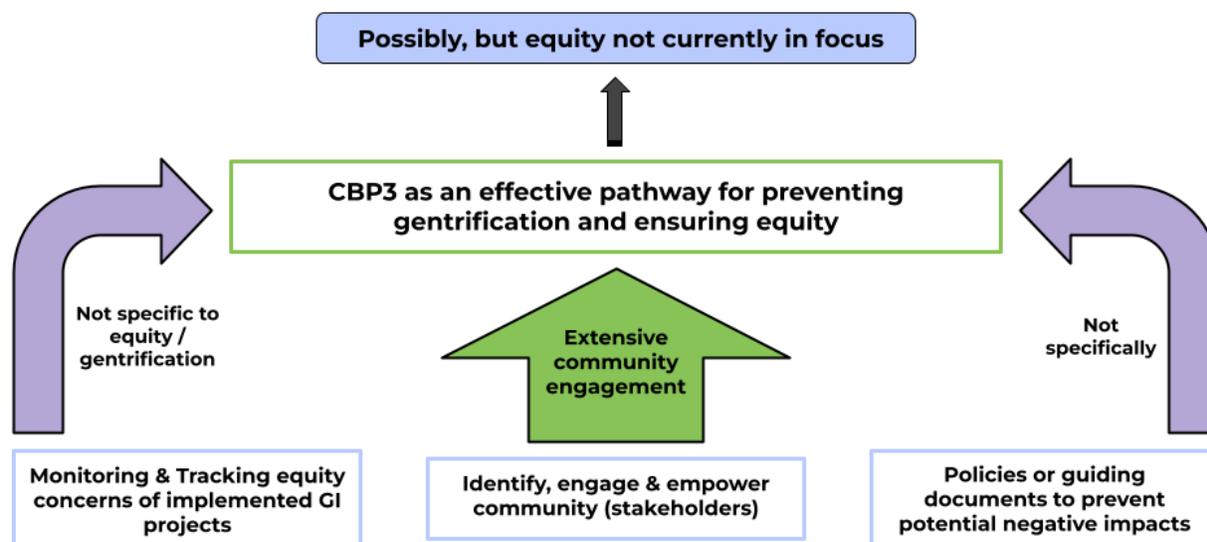


Figure 4. Visually Mapping Out Answers to Main Questions. Sub questions are listed across the bottom, outlined in blue. Arrows indicate connection to and partial answers of questions as they relate to the main question in the center outlined in green. Text at the top indicates the overall answer to the main research question.

We wanted to know from the outset of this project whether a CBP3 would be an effective pathway for preventing gentrification and ensuring equity. Through our research, we found no specific integration of considering gentrification and displacement outcomes in how the goals and guidelines of the CBP3 programs are designed. This does not mean that they are not considering equity, but that gentrification specifically is not a defined metric being tracked by those involved in the partnership. We did find extensive community engagement to be a crucial part of the CBP3 approach, especially evidenced in the CWP. Equity was not found to be a central pillar of the CBP3 model based on the conversations we conducted and resources we analyzed. Because the CBP3 model is adaptable, however, we determined it to possibly be an effective pathway for achieving equity and preventing gentrification, but that its effectiveness

would be dependent on how goals are identified and acted upon with respect to equity more integrated into the program.

We found that the CBP3s were tracking a number of metrics to assess progress toward project goals and environmental compliance with their specific stormwater permits. The partnerships were meeting and exceeding their goals at the time of our research, but we found limitations in terms of goals being connected to concrete equity and gentrification tracking mechanisms. Due to the outlined goals of the CBP3 approach in the stormwater context being to meet the MS4 permitting requirements, there are some parts of addressing community needs or water quantity concerns that are not as easily incorporated into the program. There were a number of metrics being tracked in each case study, as outlined previously, but the ability to determine how these efforts directly relate to changes in water quality or any potential impacts to gentrification are beyond the scope of this study or any reports we have seen to date. We did not find that gentrification was specifically being tracked by those involved in the CBP3 partnerships. At this stage of the partnerships, there does not seem to be an integrated focus on preventing gentrification or ensuring equity in a broader sense.

In terms of the CBP3 approach identifying, engaging, and empowering the community stakeholders, we found a significant level of engagement with the local community in the CBP3 approach in the CWP primarily in the implementation phase but not for the program envisioning or future planning. There was an impressive level of development and inclusion specific to minority and historically underrepresented groups in the involvement and capacity building of the CWP. We found the CBP3 approach in this area to be largely dependent on the specific goals and metrics defined or considered to be priorities in the location of the partnership with respect to the community stakeholders. For Chester, we found evidence of preference for local resident

employment with the Stormwater Authority, but little beyond that to address this question. That said, we did not find specific links between those priorities and gentrification prevention or avoidance. While not specifically defined in the partnership's goals, implications can be inferred about the relationship between local resident affordability and increased workforce capacity, but not all residents impacted by the partnership's work are employed by the partnership.

Environmental and socioeconomic benefits to the areas involved in the partnerships were discussed, but not in terms of preventing or avoiding gentrification outcomes specifically.

There is a level of flexibility in the CBP3 approach, so if it were to be applied to a community, county, or city already experiencing or especially concerned about gentrification, more specific metrics and measures could be tracked and more directly integrated into the defined partnership goals in the contracts and agreements between the parties involved.

Through analyzing policy documents and reports connected to each case study, we did not find specific documentation around potential negative impacts of the projects regarding gentrification. Participants were concerned with how the partnership goals partially limit the scope of what work is able to be done with respect to water quality and quantity concerns and also indicated that gentrification is not a major focus of the CWP. We were unable to determine from a partnership perspective in Chester whether this is being discussed internally but found no mention of gentrification in documents or policies specific to that partnership.

4.5 Prerequisites for a CBP3

Before initiating a CBP3, our research determined that the values and priorities of both the community and the institutions need to be identified and/or highlighted to ascertain whether the CBP3 goals align with those values. The CBP3 approach ideally can be structured to help achieve the community's goals and strengthen their values while providing benefits and

improving environmental quality. The process adopted for the value, objective or goal identification cannot be limited to the institutions involved in decision making but should rather rely on collective decision making and incorporation of community perspectives, including all stakeholders in the earliest stages.

Determining certain prerequisites before a formal CBP3 process is initiated or when the feasibility of a CBP3 is being discussed for a city or county is important to ensure that the conditions are favorable for the partnership to be executed well and to ensure an equitable outcome. Therefore, the reason for initiating the CBP3 and the economic, social, historical, cultural, and environmental context in which its being launched matters significantly. The presence or absence of intergenerational equity is an important consideration before the CBP3 goal setting is initiated.

CBP3s are partnerships and as such need buy-in from all partners not just the public partner. To ensure equity the first step is to acknowledge the reasons for a CBP3 approach for green infrastructure or other so that all stakeholders have a shared understanding of this emergent approach. Secondly, CBP3 with its range of stakeholders and the community as an important decision maker require adoption of an adaptive management style or co-creation of knowledge principles to allow for flexibility, scalability, and replicability.

The CWP focused around achieving its socioeconomic goals and for a specialized market creation in GI for stormwater management, while the Chester Stormwater Authority was more interested in generating revenues through the stormwater fee to provide utility services and infrastructure development. The CWP was approved unanimously by the County Council; as members of the Council, they are representatives of the community itself. However, for such large-scale projects, the voice of the people directly impacted and marginalized or disadvantaged

sections of the community needs to be incorporated to ensure community buy-in for the CBP3. In Chester, we were unable to find what specific events unfolded in the creation of the CBP3, who specifically was involved in that decision making process, or whether any concerns around community buy-in and prerequisite considerations outlined in this section were a part of that ultimate decision to enter into the long-term partnership.

4.6 The Equity Toolkit

We created an Equity Toolkit for CBP3s which incorporated our findings from this report. Presented in the figure below, this prototype toolkit for implementing an equitable CBP3 model is based around the phases of the program, the policy dimensions, and major themes.

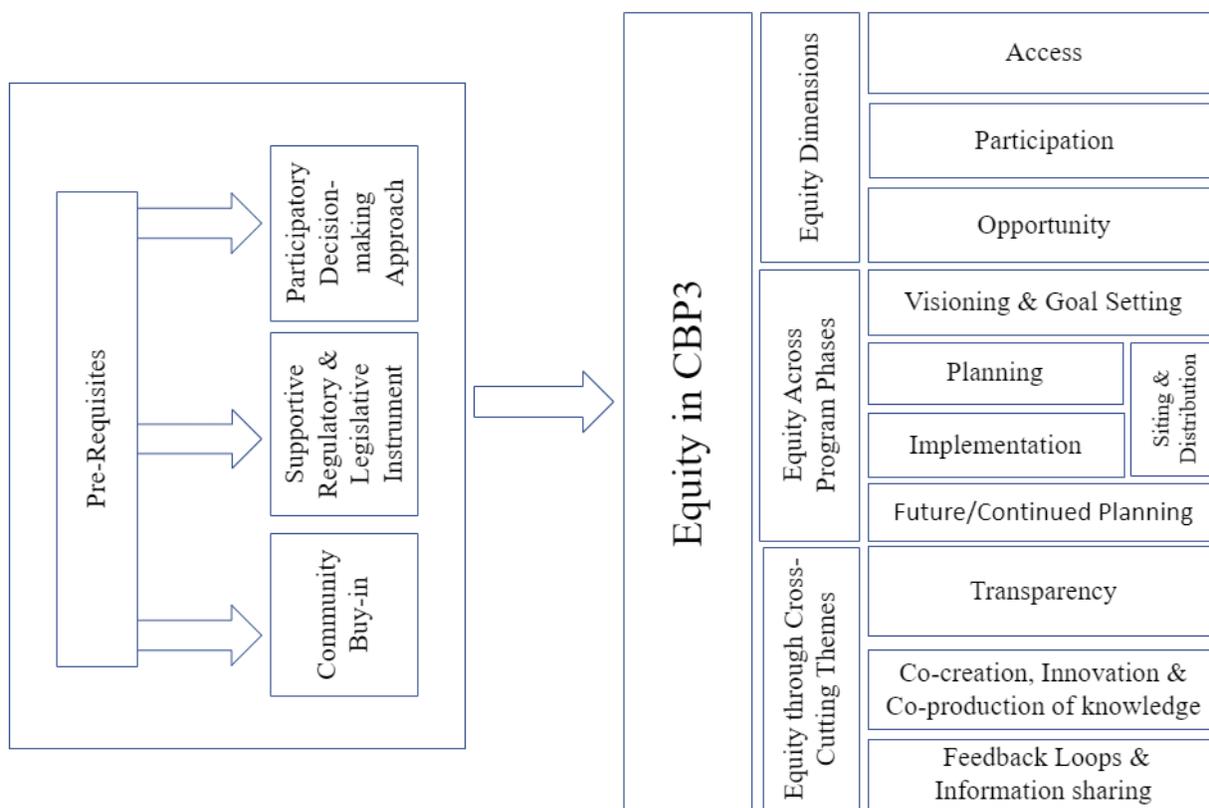


Figure 5. Proposed Equity Toolkit for Community-based Public Private Partnership in Green Infrastructure Stormwater Management. Toolkit based on Equitable Transitions Guidebook by ICLEI, Grabowski et.al 2023 Equity Framework and the results of our case study.

The CWP appears to fulfill most of the steps mentioned in the toolkit whereas the Stormwater Authority of the City of Chester even in its name is more an authority than a partnership. From Figure 3 it was apparent that the CWP emphasizes a lot on community feedback and stakeholder inclusion, especially during the implementation and project siting phases. But as ensuring equity or tracking gentrification were not incorporated as part of the MPA, it was not a program requirement and could only be ascertained through certain socioeconomic indicators indirectly.

Opting for nature-based solutions, green infrastructure development and conforming a community's development approach to the natural ecosystems has to be augmented with equity principles. The policy instruments and mechanisms required to facilitate this requires looking at equity from the lens of its various dimensions, from the lens of developmental phases, from the lens of management and legislative approach and in any cross-cutting themes. As the CBP3 is categorized as an alternative market-based mechanism by the EPA, it needs to be augmented by other environmental policy instruments to allow for equitable processes. Additionally, without a conducive environment, a system wide shift through a CBP3 may bring infrastructural changes but may trigger or exacerbate socioeconomic disparities. In its sixth assessment report, the Intergovernmental Panel on Climate Change (IPCC) lists equity and inclusion as one of the important elements for climate change mitigation and adaptation. The report also deems policy design choices as instrumental in advancing equity and as such is included in our toolkit as a prerequisite ("IPCC AR6 Working Group 1: Summary for Policymakers" n.d.). Supportive regulatory and legislative framework coupled with community based participatory approaches may facilitate incorporation of equity principles in CBP3 methodologies and applicability.

5.0 Limitations

This was a preliminary study to understand potential policy measures adopted for the CBP3 model in the GI context. As the CBP3 model for GSI is an adaptive process and presents flexibility to allow for local requirements and needs, the equity toolkit is limited in its applicability and suitability. Further research is required to ascertain if the conclusions reached in terms of equity are applicable and useful in other programs or whether they could be reliably replicated. We were not able to make conclusions specific to gentrification occurrence in our findings, but future studies could attempt to assess whether CBP3 projects have impacted the affordability of the communities within our case studies. We used NVivo to better understand how equity was being discussed through proxy terms, but our analysis in the software was not done with the intention of reporting statistics of these codes. Future studies could build on our limited scope and lack of quantitative results.

Time, accommodating schedules, and difficulty receiving responses from potential participants limited our number of completed interviews. We were able to speak to a variety of individuals connected to the partnerships but would have liked to have more perspectives represented. Most of the participants in our study represented the Clean Water Partnership; a lack of representation of the partners most directly involved from the Stormwater Authority in Chester is a limitation of full context and accuracy of our findings with respect to the Chester Partnership. For Chester, we relied more on news coverage and documents from the Stormwater Authority than on personal accounts through interviews, but not all information we sought was readily publicly available. We were unable to speak with a representative directly from the primary private party entity involved in both case studies.

6.0 Recommendations

The following recommendations serve as our findings of existing gaps and areas for improvement in the community-based public private partnership model. We consider these recommendations to be useful for government officials, private entities, or community or advocacy focused groups wanting to learn from the impacts of the two CBP3 case studies or considering a CBP3 in a new location. This study and our recommendations especially consider the role of community, equity, and potential for gentrification outcomes.

1. Incorporate Equity Requirements into Partnership Framework

Specifically incorporate how equity is considered internally and in the external facing documents/websites and for legal requirements. We learned that equity was being considered through speaking with people involved, not entirely through the documents we analyzed. Ensuring inclusion of voices from disadvantaged sections that might be affected by these projects or for whom the existing social, economic and cultural opportunities and access is impacted, is also an important dimension of equitable services provision.

2. Stakeholder Inclusion across Phases

Inclusion of all partners in the CBP3 in all phases equally: the goal setting phase, the planning and implementation phase, and the future aspects. The community needs to be at the forefront with active involvement and power to decide the course of action for each phase. Planning, either for the whole CBP3 or individual projects within the CBP3, pivots on transparency and communication. Siting of GI projects usually follows planning but the whole sequence of phases need not be a linear process. As the CBP3 employed adaptive management and co-creation methodologies, the siting decisions may be amended as and when decided via collaborative consultation and decision making. To eliminate or limit the impacts of green gentrification which

may follow the GI interventions through the CBP3, planning, implementation and siting of the projects need to be transparent, non-linear, and flexible. This transparency is not solely disclosure of underlying drivers and criteria for siting decisions as well as for original site selections to all stakeholders but participation of these stakeholders in defining the criteria itself.

3. Increase Transparency and Ensure Prerequisites

Increase transparency across all phases of the partnership's processes and transparency with and between stakeholders and the community at large within the CBP3 model. With the transfer of certain project implementation and risk responsibilities to the private partner, the applicable laws around information disclosure might not be always applicable. For example, while hiring local subcontractors to benefit the community, competitive minority firms or NGOs from neighboring Counties and States might not be aware of the structure around the CBP3 of hiring only local firms. Transparency is also paramount in understanding the siting, distribution, and elimination criteria of projects and well as for communicating any justifications to the stakeholders.

Accessibility to the private firm for various community members might not be as easy when compared with that of a government institution. Increased transparency within the CBP3 model has the potential to help ensure equity in the process by having more stakeholders aware of how processes and procedures function.

Transparency also needs to be ensured before planning or when considering CBP3 as one of the possible options for green infrastructure. This transparency is intended to foster meaningful social agreements and community buy-in through a participatory process.

4. Track Property Value Changes Within Project Areas

Data tracking about increases in housing prices, property taxes, demographic changes in the community, or social surveys are usually carried out by various local departments. Tracking of

property value changes within the project area (county or city scale). While it would require advanced analysis to attempt to assess the impact of a GI focused CBP3 on gentrification specifically, we believe there should at least be someone tracking property related data in order to have any potential gentrification outcomes more quickly addressed and considered if effects become apparent, especially if larger scale GI projects are a part of the partnership projects. While it may not be a requirement on the part of the private partner in the existing CBP3 partnerships in our study, we think it important for someone to be tracking this data.

5. Consider Potential Gentrification Outcomes for Homeowners and Renters

Consider potential gentrification outcomes to renters and to homeowners in monitoring of housing prices/housing insecurity. Renters must be given consideration in order to actually achieve equity in how fees are included.

6. Coordinate across Government Offices / Departments

Ensuring coordination with all governmental departments such as the local tax office, treasury, public works department, and the Department of Environment (DoE) so that internal stakeholders are on board. Adding requirements within the internal oversight mechanism of the (DoE) or any other department overseeing the CBP3 will create space for collaboration with other departments for collaboration in terms of such data sourcing. Various departments such as the public works and transport department, the DPIE, the DoE, and the finance or treasury divisions collect different data for various purposes but may not be as well connected in terms of data considerations specific to the CBP3. As internal stakeholders, their relevance cannot be undermined. Any decisions around such changes that might be required for the CBP3 should therefore include all internal and external stakeholders.

Feedback loops and communication with the community members and the stakeholders is the bedrock of adaptive management and co-creation of services. The flexibility of the CBP3 model allowed for practically incorporating the requests and suggestions of the affected populace into the project. Increased coordination and communication across departments and stakeholders specifically about the data being tracked in the project area(s) can contribute to equitable implementation by making tracking and measuring of equity, displacement and gentrification specific indicators for the CBP3.

7. Switch from Passive to Active Adaptive Management

The CWP is currently following adaptive management practices, but it remains unclear from the policy documents if the style of management is active or passive adaptive management. The CBP3 offers the flexibility to allow active style of adaptive management wherein multiple choice options can be tested and based on the collaborative learning process facilitate equitable GI development.

7.0 Conclusion

Future research is needed on the potential impacts programs like this focused on dispersed stormwater improvements may have at the aggregate level specific to increased property values, beautification, and potential for gentrification. Our study does not enter into a statistical analysis, but future studies could attempt to determine how the wide-ranging benefits of this type of program could be considered alongside the potential for gentrification outcomes, especially relevant for any area considering a CBP3 approach where gentrification is a present concern.

Because the focus of our study of the two CBP3s centered around smaller, dispersed stormwater improvements, our findings are not generalizable to larger scale green infrastructure projects, but the major themes around goal setting and visioning, community involvement, measuring and tracking, transparency, and considerations around equity we mention would apply to green infrastructure projects at larger scales. Our recommendations can be considered for future CBP3 approaches, including for other types of infrastructure investments or improvement partnerships. Regardless of the improvement being made in a community, it is important how you engage and involve the community, how you track and prioritize projects especially in a way that is equitable and transparent, and how you incorporate metrics around preventing gentrification. Each of these are important for partnerships happening at long time scales.

There is a major lack around how the CBP3 approach incorporates expressed or felt needs of community which can potentially lead to lack of community buy-in for the CBP3. Something that was clear and is of high importance is how a program's success depends on the level of involvement, engagement, and connection to the community as a crucial piece.

During the time of our research, at least two additional Community-Based Public Private Partnerships have been launched across the United States. We hope our context, findings, and recommendations can be applied to new areas as the CBP3 model continues to expand and provide a variety of benefits to areas conducting infrastructure improvements. Our study considered how the CBP3 approach currently incorporated equity and gentrification consideration into the model. Though our findings were limited to specific incorporation, the model is flexible and able to be adapted to incorporate equity and gentrification concerns based on local community makeup and goals. We determine this to be of great importance for any community-based model.

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Appendix A - Semi-Structured Interview Questions

1. What is your current position?
2. What is the role of your organization/ department/institution/ community group in the Community-based public private partnership?
3. What is the policy/goal of your organization/ department/institution/ community group in terms of equity in green infrastructure initiatives?
4. Who do you see as potentially impacted by GI projects in your city/county?
 - a. Are any of these groups/populations underserved?
5. Can you outline the general process carried out for inclusion of any marginalized communities during the project?
6. At what stages or phases of the project were these communities included in the project?
7. How does feedback from the community get incorporated into planning or work in the partnership?
8. How does your organization/ department/institution/ community group view the results/outcomes of the project thus far?
 - a. Economic outcomes? Environmental outcomes?
9. What kinds of data are being tracked by the CBP3?
10. The CBP3s seem quite focused on providing benefits to communities, but are potential negative outcomes ever discussed?
11. What is your understanding of gentrification?
12. To your knowledge, are any data being measured specific to gentrification?
13. Are there things you think will need to be changed as the partnership continues for the next few decades?
14. Is there anything we haven't talked about that you would like to share?
15. Who should we reach out to next in our research?

Appendix B - Images from PGC, MD

Images of Prince George's County Maryland Clean Water Partnership Project Sites from Greenbelt, MD



Appendix C - NVivo Codebook

NVivo Nodes for Interview Transcripts

Nodes: Interview Analysis				
Parent Node	Sub Node	Sub Node	Sub Node	
Equity	Access			
		Access to Jobs		
	Approach towards Equity			
	Codification			
	Opportunity			
		Education & Awareness		
		Local Workforce		
		Small Minority Businesses (MBEs)		
		Training, Capacity Building, & Standardization		
	Participation			
		Communication		
		Key Stakeholders		
		MBEs & Local Workforce		
		MBE Local Workforce Inclusion		
		Minority, Marginalized, Underrepresented Groups		
	Outreach			
Future Planning & Focus				
Main Goals of CBP3				
	Goal of Community & NGOs			
	Goal of Private Partner			
	Goal of the Government			
Monitoring, Measuring, & Tracking Mechanisms				
	Business Development			
	MS4 Permit & Environmental Requirements			
	Other			
		Stormwater Fee & Funding		
	Resident Hours			
	Satisfying Financial & Legal Requirements			
	Social Goals			

<p>Outcomes of CBP3 Program</p> <ul style="list-style-type: none"> Benefits for Community <ul style="list-style-type: none"> Environmental Problem Solving, Adaptive Management Socioeconomic Equity Outcomes Fee & Tax Implications Potential Negative Outcomes
<p>Perceptions about Gentrification</p> <ul style="list-style-type: none"> Measurement of Gentrification Perceptions about Equity
<p>Policy Framing, Design, & Planning</p> <ul style="list-style-type: none"> Adaptive Management Approach towards Community Participation CBP3 Structuring <ul style="list-style-type: none"> Business Development Circular Economy <ul style="list-style-type: none"> Economy of Scale & Circular Economy Market Creation Community Building & Inclusion <ul style="list-style-type: none"> Feedback Mechanism Management Style Private Partner Selection, Approach & Priorities Risk Transfer Role of Private Partner Underserved, Disadvantaged, Minority Population <ul style="list-style-type: none"> Envisioning Feedback Loop <ul style="list-style-type: none"> Community Outreach & Inclusion Goal & Priorities Identification Inclusion in Fee, Tax Proposals, and Statute Enactment Incorporating Local Ecological Knowledge Involvement in Envisioning Planning & Implementation <ul style="list-style-type: none"> Process Transparency Siting Stakeholder Inclusion <ul style="list-style-type: none"> Siting & Distribution

NVivo Nodes for Secondary Policy Analysis

Nodes: Secondary Data Analysis		
Parent Node	Sub Node	Sub Node
Economy of Scale		Benefits of the Program Socioeconomic
Equity	Access Opportunity	Education Green Infrastructure & Low Impact Development Green Jobs Local Workforce, County-based Enterprises (CBEs) Minority Business Enterprises (MBEs) Standardization, Innovation, Training and Capacity Building Vulnerable Groups
	Participation	Key Partners & Stakeholders Local Community Participation Outreach & Inclusion
Fee & Tax Implications		
Monitoring Mechanisms		
Performance Indicators		Performance Based Compensation Risk Transfer Third Party Certification
Policy or Administrative Measures		Adaptive Management CBP3 Criteria Financial Funding Mechanism Goal Identification & Achievement Incentive Fee Monitoring Private Partner
Resource Protection & Conservation		Natural Resource Conservation Physical Assets, Time and Financial Resources

Appendix D - Additional Figures

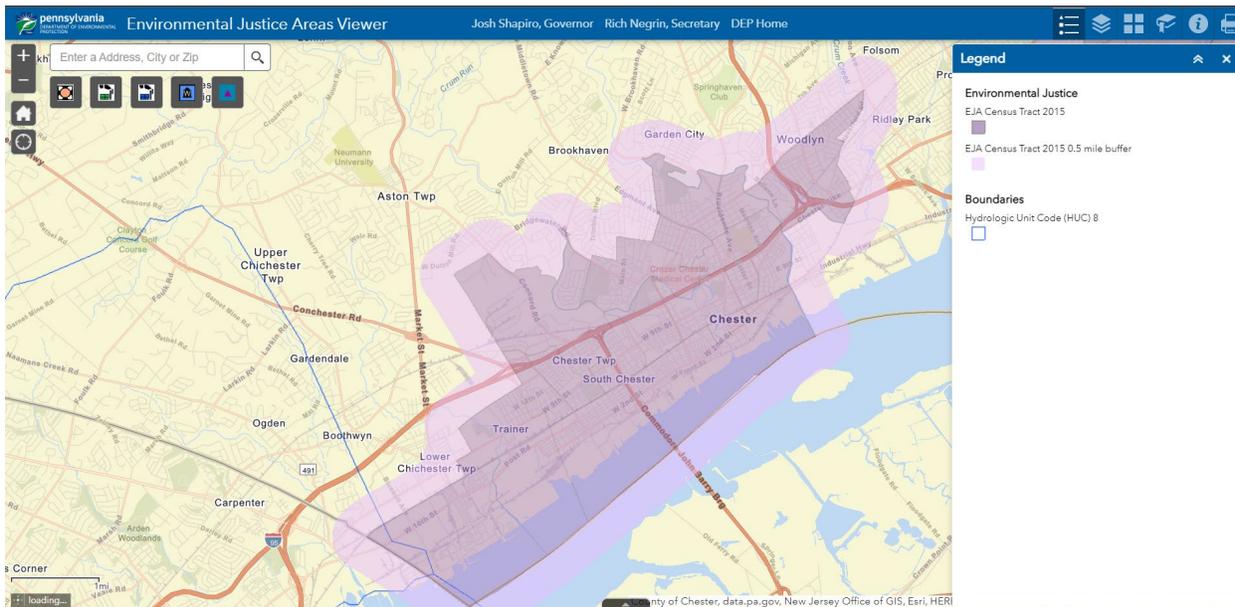


Figure A. Map of Chester Using Pennsylvania’s Environmental Justice Areas Viewer.

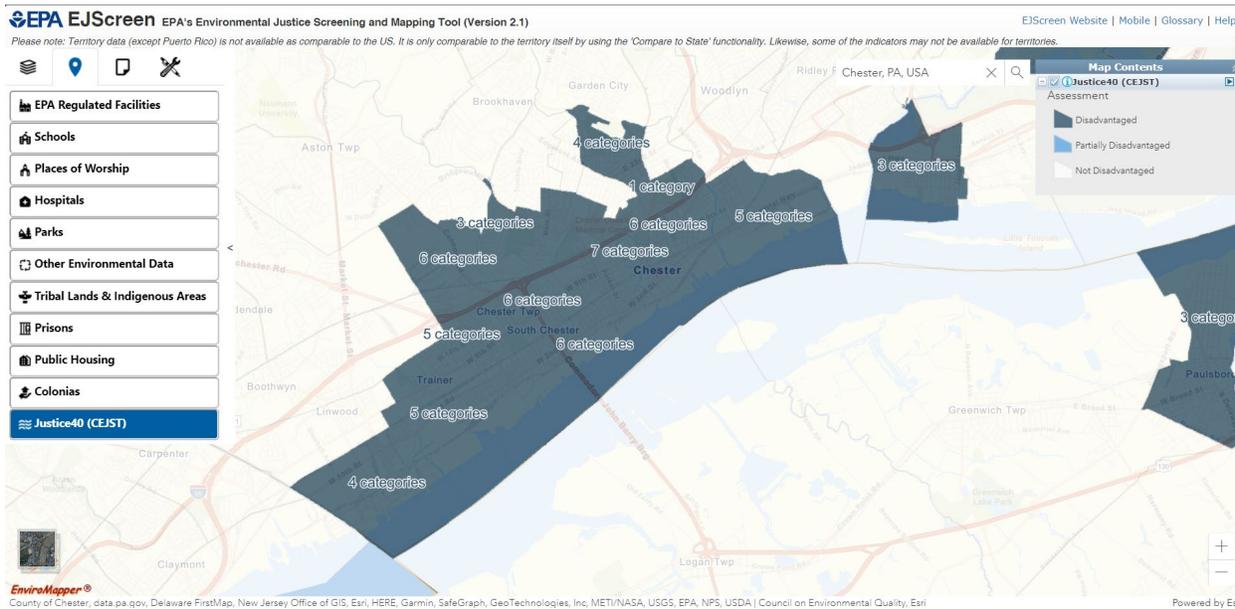


Figure B. Map of Chester Using EPA EJScreen Justice 40 Initiative Categories.

