

ABSTRACT

Title of Thesis: **BEYOND SUSTAINABILITY: BIOPHILIA
AS A TOOL FOR REGENERATIVE URBAN
DESIGN**

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ABSTRACT

The concept of urban revitalization deals with measures to improve the features of the urban environment whilst promoting community engagement to improve the quality of life for all. Many Low-income neighborhoods in the DC area have experienced urban distresses resulting from changes in urban growth. These conditions have led to the physical deterioration of neighborhoods and have increased the number of poor and vulnerable citizens. Research establishes that positive public spaces foster and positively impact the quality of life in low-income neighborhoods. Regenerative design provides a rationalized approach to create restorative environments that encourage community engagement to promote economic and social benefits. Regenerative and biophilic urban design aims at eliminating the gap between the built environment and nature in modern cities to create restorative environments. This study examines how biophilic and regenerative architecture principles can foster quality in an urban environment through the redesign of the Anacostia Recreation Center and Park.

Keywords: Urban revitalization; Regenerative Architecture; biophilic design

BEYOND SUSTAINABILITY:
BIOPHILIA AS A TOOL FOR REGENERATIVE URBAN DESIGN

by

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Dedication

To my biggest fan, my mentor, my husband, Enoch Acquah, your selfless support, sacrifices, patience and prayers got me through this journey. Thank you for being enthusiastically supportive and pushing me beyond my abilities to always be the best version of myself.

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Table of contents

Dedication	ii
Acknowledgements	iii
Table of contents	iv
List of Tables	vi
List of Figures	vii
Chapter 1: Synopsis	1
Section 1: Introduction.....	1
Section 2: Research questions	3
Section 3: Aim and Objectives.....	3
Section 4: Scope of Research	3
Chapter 2: Urban Blight: Contextual background	5
Section 1: Urban distress: Background and Characterization.....	5
Section 2: The case of Anacostia:.....	6
Subsection 1: Location and History	6
Section 3: Urban Regeneration	8
Chapter 3: Regenerative Design Theory	11
Section 1: Regenerative Design.....	11
Subsection 1: Implications of regenerative design.....	14
Section 2: Regenerative design Framework.....	18
Section 3: Biophilic Design	20
Subsection 1: Kellerts Strategies for Biophilic design.....	21
Chapter 4: Precedent Analysis	23
Section 1: Application of Regenerative Design Principles	23
Section 2: Maryland Heights Community Center	25
Chapter 5: Site Documentation and Investigation (Anacostia Recreation Center)	27
Section 1: Site Selection.....	27
Section 2: Site Context and Inventory.....	29
Section 3: Site Analysis.....	34
Subsection 1: Connectivity and Approach.....	34
Subsection 2: Site Peripheral Studies.....	36
Chapter 6: Design response	38
Section 1: Program Defined	38
Section 2: Site Strategies.....	39
Subsection 2.1: Application of Regenerative Principles on site	42

Section 3: Design Proposal.....	43
Subsection 3.1: Application of Biophilic design Principles.....	50
Chapter 7: Conclusion	51
Bibliography	53

List of Tables

Table 1: Design Strategies for the Frameworks of Regenerative Design.....	19
Table 2: Biophilic Design Strategies (Source: Stephen Kellert, 2018).....	22
Table 3: Matrix for Site Selection (Source: Author).....	28
Table 4: Site Scoring System for Site Selection (Source: By Author).....	29

List of Figures

Figure 1: Household Income and Poverty Rate, Ward 8, 2018.....	7
Figure 2: AWII Framework Plan	10
Figure 3: Positive Impacts of Regenerating Urban areas	12
Figure 4: Trajectory of Regenerative design Credit: Regenesis Group (Reed 2007).....	13
Figure 5: Approaches to Regeneration. Credit: Hassan 2012	15
Figure 6: Before and After, Puerto Madero Urban Regeneration Project.....	16
Figure 7: Before and After Cheonggyecheon Restoration Project. Source: Global Cities Initiative .	16
Figure 8: Cheonggyecheon Regeneration project.	17
Figure 9: Framework for Regenerative Design based on 3 key Strategies (Source: Shady Attia)	19
Figure 10: Characteristics of Urban life in relation to benefits of contact with nature.....	21
Figure 11: Illustration of Regenerative design Principles for Building Retrofits	23
Figure 12: Before and after the retrofitted building Façade (Source: (Craft, et al. 2017)).....	24
Figure 13: Retrofitted Balconies and Green Roof (Source: (Craft, et al. 2017))	25
Figure 14: Exterior View and Main Entrance (Source: Gayle Babcock, Peaks View LLC, Mark Kemp)	25
Figure 15: Building Section (Source: Gayle Babcock, Peaks View LLC, Mark Kemp).....	26
Figure 16: Center Floor Plan_ Level 1 (Source: Gayle Babcock, Peaks View LLC, Mark Kemp)	26
Figure 17: Site A- SE Tennis & Learning Center; Site b- Harlem Park; Site C- Anacostia Recreation Center (Source: By Author)	27
Figure 18; Top: Maps of the Wards of DC (Source: District of Columbia Office of Planning (DCOP)):	30
Figure 19: Boundaries of the proposed Site (Source: Author).....	31
Figure 20: L'Enfant Plan and Anacostia, Washington, Dc (Source: Corey, 2007).....	32
Figure 21: 11th Street Bridge (Source: DC DDOT, 2017).....	33
Figure 22: Illustrative Plan of the Anacostia Waterfront Initiative (Source: Adrian Fenty, 2010)	34
Figure 23: Site Connectivity; Vehicular and Pedestrian (Source: Author)	35
Figure 24: Site Connectivity; Pedestrian and Bike Trails (Source: Author)	35
Figure 25: Pedestrian Bridge Connection to Existing Anacostia Recreation Center (Source: Google Maps)	36
Figure 26: Site Inventory (Source: Author)	37
Figure 27: Site Topography and Site Section (Source: Author).....	37
Figure 28: Illustrative diagram of program design guidelines (Source: Author/ Image credit: Anacostia Waterfront Initiative)	39
Figure 29: Proposed Site Plan (Source: Author).....	40
Figure 30: Site Section (Source: Author)	40
Figure 31: Perspective View of the Pool with direct view and access to the riverfront (Source: Author)	40
Figure 32: Roof Garden- provides Spaces for relaxation (Source Author).....	41
Figure 33: Roof top Amphitheater -Provides a place for gathering and celebration (Source: Author)	41
Figure 34: Perspective View of the proposed Permeable Shoreline (Source: author)	42
Figure 35: Schematic detail of Permeable Shoreline (Source: Author)	42

Figure 36: Schematic representation of Regenerative and Biophilic design guidelines (Source: Author)	43
Figure 37: Building Design Strategies (Source: Author)	44
Figure 38: Aerial View of the proposed design (Source: Author)	44
Figure 39: Perspective View of the Entrance Lounge (Source: Author).....	45
Figure 40: Perspective View of the Reception Area (Source: Author)	46
Figure 41: Perspective View of the demonstration Kitchen view to the community gardens (Source: Author)	46
Figure 42: Ground Floor Plan_Level 1 (Source: Author)	47
Figure 43: 2nd Floor Plan_Level 2 (Source: Author)	47
Figure 44: Sections (Source: Author)	48
Figure 45: Building Elevations [top-NW view; Middle - SW View; Bottom- NE View] (Source: Author)	48
Figure 46: Perspective View of Pedestrian Promenade illustrating users' direct experience with nature (Source: Author)	49
Figure 47: Proposed Indoor Pool area with Natural materials and greenery (Source: Author)	49
Figure 48: Sustainability Principles (Source: Author).....	50
Figure 49: Exterior View of the Proposed Anacostia Recreation Center (Source: Author)	51
Figure 50: Perspective view of the Proposed Anacostia Recreation Center(Source: Author).....	52

Chapter 1: Synopsis

Section 1: Introduction

This thesis seeks basically considers how the principles of regenerative urban design can be used to enhance and improve the quality of life in blighted urban areas. It explores how these principles can be applied to the design of a recreation/learning center to boost the quality of life of low-income blighted neighborhoods. The tremendous surge in global urban growth is accompanied by several physical, social and economic challenges. Many low income neighborhoods in major U.S Cities especially in the Washington DC area are experiencing some form of urban blight which many researchers have attributed to changes in urban growth. These neighborhoods tend to be characterized by physical deterioration in the environment which sequentially leads to a decline in the quality of life of people.

According to the federal government, low-income blighted neighborhoods usually have low property values and tend to be dangerous to “the health, safety, comfort and quality of life” of people who live in these areas¹. Quality of life in urban areas, is a multidisciplinary term basically referring to the general wellbeing of people in a society. It is affected by several factors and has to do with opportunities offered to members of a society.² This thesis will focus on recreation and leisure resources of a city as one of the factors affecting the quality of life of members of a society. Low income blighted neighborhoods usually lack community amenities or are barely used if any exists and tend to have high unemployment and crime rates. Revitalization of distressed low-income neighborhoods aims to provide

¹ Mechele A. Dickerson, “Revitalizing Urban Cities: Linking the Past to the Present.”(May 2016)

² Psatha, Eva, Alex Deffner, and Yannis Psycharis. “Defining the quality of urban life: Which factors should be considered?” (*European Regional Science Association 51st European Congress*,. Barcelona, Spain, 2011). 3;10;11.

people-centered solutions to improve the quality of life, health, education and better standards of living³ of inhabitants of these areas.

Improving the quality of life in neighborhoods is directly or indirectly proportional to the provision of healthy neighborhoods in terms of a quality physical environment, which basically promotes public safety, improves public health and offers a considerable amount of community amenities with respect to public open spaces⁴ for recreation and learning. Research suggests natural elements and urban restorative spaces, which are critical aspects to the development of cities, have the potential to restore and upsurge the quality of life (urban living influenced by the quality of public spaces, recreational opportunities, etc. that increases community cohesion, civic identity and guarantees safety, security of lives and property)⁵ and standard of living in blighted neighborhoods⁶ because they stimulate interaction between people and nature which have perceptible health benefits. This falls under the principle of regenerative design which simply re-aligns human and natural systems.⁷

The second chapter looks at the problem of urban decay in low-income neighborhoods and its associated challenges and how other cities have responded through urban revitalization through recreation centers and urban green spaces. The third and fourth chapter explores principles of regenerative architecture, specifically biophilia; how these principles can be used as tools for a regenerative design of a recreation and learning center

³ DR. Stacy A. Sutton, "Urban Revitalization in the United States: Policies and Practices (2008)

⁴ Alan Mallach, "State Government and Urban Revitalization: How States Can Foster Stronger, More Inclusive Cities." (*JSTOR*, October 2017)

⁵ Blanes, Núria, Miquel Sáinz, Roger Milego, and Raquel Ubach, *Health and Quality of life in Urban Areas*. (URBAN NEXUS Synthesis Report, Barcelona, 2012) 10.

⁶ Weber, Anke Maria, and Jörg Trojan. "The Restorative Value of the Urban Environment: A Systematic Review of the Existing Literature (Nov. 2018)

⁷ Craft, W., L. Ding, D. Prasad, L. Partridge, and D. Else. "Development of a regenerative design model for building retrofits (2017)

for Anacostia. An analysis of these principles in relation to the proposed site will inform the final chapters of this thesis by proposing an architectural design response.

Section 2: Research questions

The questions that will drive this thesis are

- What are the effects of regenerative architectural design on improving the quality of life in an urban setting?
- How can we achieve restorative environments in inner cities with the principles of biophilia?
- How can Biophilic design be used achieve productive, versatile & adaptive public space design?

Section 3: Aim and Objectives

This thesis seeks to examine how regenerative design can be a major design consideration in the design of a recreation and learning center to foster quality of life for the historic low-income neighborhood of Anacostia in Washington DC.

The objectives that would guide this thesis research in conformity with the research question and aim are:

- a) To explore the principles of regenerative design systems, their application and the impacts and to develop and apply site specific principles.
- b) To explore the impact and value of quality public spaces on the health and quality of life of urban dwellers in revitalizing neighborhoods.

Section 4: Scope of Research

Located in Washington DC's 8th Ward, Anacostia is mostly described as a struggling community facing deep rooted challenges.⁸ With its history laden with the African-American

⁸ WashingtonDCNeighborhoodProfiles. Esri. (2018)

struggle, residents, and mostly black, faced issues of eviction as a result of urban renewal policies instituted in the 1950's. The subsequent outcome was an increase in poverty rates in the 1970's and 80's and still remains one of the highest in the district⁹. With redevelopment being one of its most vital necessities, the Department of General services requested proposals for the design of a new recreation center for Anacostia, located in Fairlawn, Southeast Washington. This thesis will seek to explore what regenerative and biophilic design principles can be employed in the design of a new recreation center for Anacostia.

⁹ Anguelovski, Isabelle. *BCNUEJ- Barcelona Laboratory for Urban Environmental Justice and Sustainability (2019)*

Chapter 2: Urban Blight: Contextual background

Section 1: Urban distress: Background and Characterization

Anacostia is just one of many neighborhoods in urban areas battling with the tenacious challenges of urban growth including deteriorating infrastructure, high-priced housing, and economic decline and segregated neighborhoods,¹⁰ which consequently decreases the quality of life of residents. Urban decline and decay has a long legacy dating back from the era of the industrial revolution. In the 1980's, it was extensively associated with deindustrialization, abandoning of buildings, racial segregation, to mention a few.¹¹ Many of these challenges resulted from urban areas transitioning from industrial to post-industrial knowledge-based economies,¹² where most of these industries had to move their companies from cities resulting in an increase in low-income populaces.

Today, urban distress in low-income neighborhoods is and has continued to be one of the effects of urban growth accompanied by the effects of the 2007-2009 recession. In a report by The World Bank group, almost every city has areas of distressed urban areas which weakens its image, livability and productivity.¹³ According to Dickerson, most of these neighborhoods are dilapidated with cases of high crime rate and a lack of community amenities such as high-quality educational and recreational facilities.¹⁴ The author further explains that these neighborhoods are characterized by the presence of physically deteriorated buildings and environments with very minimal public spaces which leads to lack

¹⁰ Charles Lee, "Environmental Justice, Urban revitalization, and Brownfields: The Search for Authentic Signs of Hope (1996)

¹¹ Conte, Julia, and Janet Li. "Neoliberal Urban Revitalization in Chicago (2013)

¹² DR. Stacy A. Sutton, "Urban Revitalization in the United States: Policies and Practices (2008)

¹³ TheWorldBank. *How Eight Cities Succeeded in Rejuvenating their Urban Land.* (2016)

¹⁴ Mechele A. Dickerson, "Revitalizing Urban Cities: Linking the Past to the Present." (May 2016)

of businesses investments, resulting in low economic gains from employment opportunities which in turn reduces the value of these neighborhoods.

Section 2: The case of Anacostia:

Subsection 1: Location and History

Anacostia and several neighborhoods in Ward 8 of D.C. have long been through of as a blighted under-resourced historic neighborhood which has become an economic and cultural divide from the District. According to Anguelovski,¹⁵ a recent study the Washington DC area has the highest percentage of gentrifying neighborhoods with most of them in Anacostia, specifically the east of its name-sake river. As a historic neighborhood, Anacostia is presently a predominantly an African American community and is characterized by the effects of unemployment, high poverty rate and physical distress.¹⁶

But it wasn't always that way. Over 400 years ago, the eastern banks of the Anacostia River used to be the home of Native American Indians (Nacotchtanks) who were known to be farmers and traders throughout the Chesapeake area¹⁷. For these natives, the River was a source of food while they also grew corn, beans, etc.

In 1864, the Anacostia district was known as Uniontown which was a designated affordable neighborhood for working class people in Washington (restricted to Whites). These restrictions forced the African American community towards the east of the river to adjacent neighborhoods which experienced neglect by the government. After the segregation law, which changed the "look" of Anacostia,¹⁸ the middle-class dwellers moved out of Anacostia and over time, it became predominantly low income and till today lags behind in

¹⁵ Anguelovski, Isabelle. *BCNUEJ- Barcelona Laboratory for Urban Environmental Justice and Sustainability* (Sept.,2019)

¹⁶ Rachel Ramirez, *Building Bridges*. (August 2020).

¹⁷ Dana Hedgpeth, "A native American Tribe Once Called D.C. home." *The Washinton Post; Democracy Dies in Darkness*. 22 November 2018.

¹⁸ Elahe Izadi, *The Surprising History of Anacostia*. *wamu.orgdcentric*. (September 2011).

development.¹⁹ Most of these blighted neighborhoods in Ward 8, are just a few miles away from the upscale neighborhoods located at the opposite bank of the river. Their poverty level has continued to increase from 27% to 33% in 2015²⁰ with 47% of residents living below the poverty line, three times higher than the rest of the DC district which was averaging an 18% poverty rate ²¹(figure 1). The poverty level and blighted neighborhoods characterized by physical deterioration, vacant buildings, Health and safety issues including an increase in crimes and dilapidated schools and local amenities (parks & social centers).²²

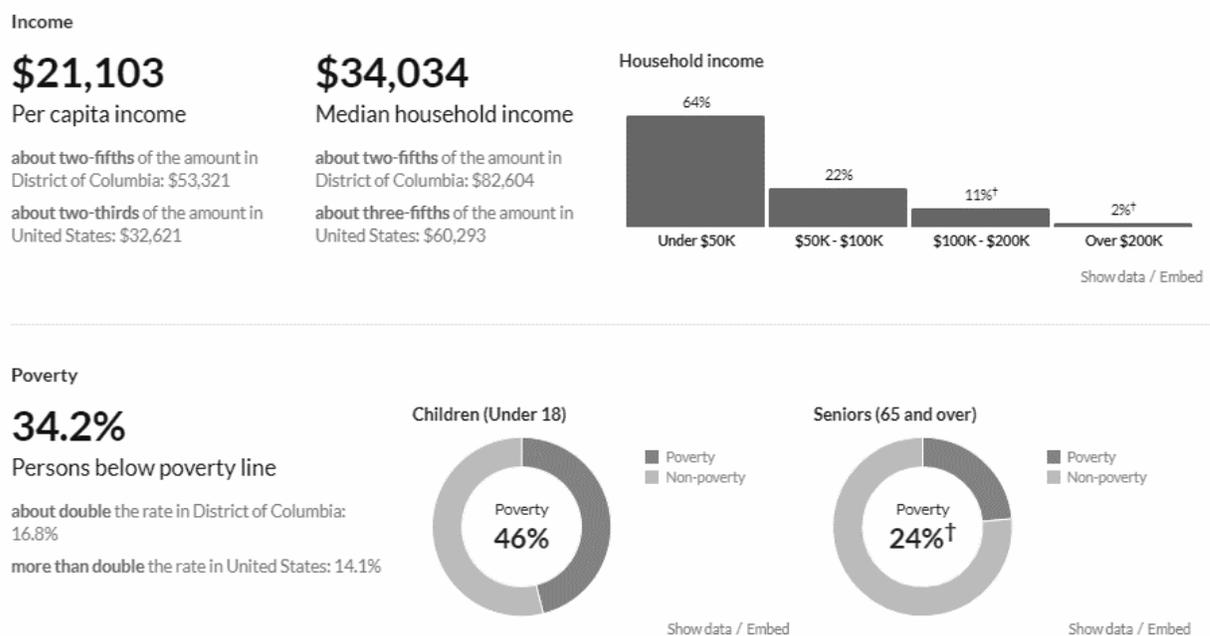


Figure 1: Household Income and Poverty Rate, Ward 8, 2018
(Source: Census Reporter Profile)

¹⁹ Mi Casa, Inc. *Reshaping History and Building the Future in Historic Anacostia.* (2020)

²⁰ Andrew Giambrone, *Poverty In D.C. Is Getting Worse East of the Anacostia River, Study Finds.* (Washington Citypaper Member Supported, September 2016).

²¹ Andrew Giambrone, *Poverty In D.C. Is Getting Worse East of the Anacostia River, Study Finds.* (Washington Citypaper Member Supported, September 2016).

²² Mechele A. Dickerson, *“Revitalizing Urban Cities: Linking the Past to the Present.”* (26 May 2016): 977.

In measuring quality of urban life, Din, et al., 2013 describes it as living that enhanced by quality of public spaces, recreational opportunities, etc.²³ which can be achieved through the redevelopment and urban regeneration that Anacostia badly needs.

Section 3: Urban Regeneration

In the United States, the concept of urban regeneration was officially introduced in the 1960s as an integrated and all-inclusive action that leads to the resolution of problems in urban areas to improve its physical, environmental, and economic conditions.²⁴ It evolved from the basic renovation of deteriorating infrastructure to the reformation of the urban fabric, the image of the city, and renewing the urban economy aiming for more social interaction and equity in a multi-functional context. According to Mallach, (2017), one of the important elements of the 5 which makes total urban regeneration is “Healthy neighborhoods and quality of life”. The author describes this element as the extent to which the residents of a community can access good quality of life reflected in their safety, quality of the built environment, and the level of amenities in terms of public open spaces, culture, arts, etc. ²⁵

In the United States, several post-industrial cities which have successfully undertaken urban regeneration projects have had their local governments responding by improving schools, increasing tax revenues, repaving streets, etc., which leads to a transformation and added value to the physical, economic, and quality of life of neighborhoods in these cities at

²³ Din, Hamam Serag El, Ahmed Shalaby, Hend Elsayed Farouh, and Sarah A. Elariane. *“Principles of urban quality of life for a neighborhood.”* (HBRC, Elsevier, 9 (October 2013): 88.

²⁴ Hassan, Ghada Farouk. *“Regeneration as an approach for the development of informal settlements in Cairo metropolitan.”* (Alexandria Engineering Journal, 2012.)

²⁵ Alan Mallach, *“State Government and Urban Revitalization: How States Can Foster Stronger, More Inclusive Cities.”*(*JSTOR.*, 2017).

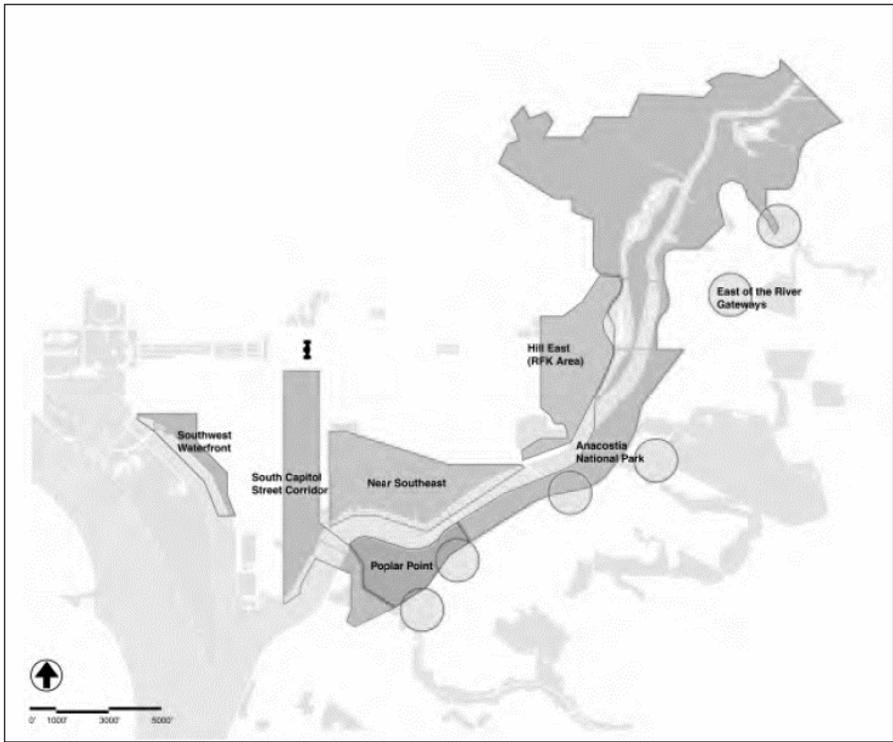
the end of the regeneration cycle – usually a decade.²⁶ Regeneration strategies that are people-oriented aims to improve the health and mobility of residents, improve education, and better standards of living.²⁷

In November 2003, the office of Planning of the District of Columbia established the Anacostia Waterfront Framework Plan, a partnership between the District, the federal government and the citizens of Anacostia, in an effort to formulate solutions to the “vast challenges of the long-neglected Anacostia River”. One of the aims of this plan was to reconnect city Anacostia to the waterfront that offers opportunities to live, work and play in order to promote sustainable development.²⁸

²⁶ Aaron Seward, *Urban Regeneration: Designing Beyond the Building*. (The journal of the American Institute of Architects, 2012).

²⁷ DR. Stacy A Sutton, *Urban Revitalization in the United States: Policies and Practices*. U.S. Urban Revitalization Research Project (USURRP, 2008).4.

²⁸ Anacostia Waterfront Initiative Partner Agencies, *The Anacostia Waterfront Framework Plan*. (Washington Dc: District of Columbia, Office of Planning, 2003).



Framework Themes

1

A Clean and Active River

2

Gaining Access to, Along, and Across the River

3

A Great Riverfront Park System

4

A Riverfront of Distinct Places and Cultural Destinations

5

Building and Sustaining Strong Waterfront Neighborhoods

Figure 2: AWI Framework Plan
 (Source: Anacostia Waterfront Framework Plan, 2003)

Chapter 3: Regenerative Design Theory

Section 1: Regenerative Design

Many environmental enthusiasts and writers, including Pamela Mang and Bill Reed²⁹ have emphasized that regenerative design goes beyond sustainable design in the sense that, it emphasizes designing to promote a symbiotic relationship between a local community and the natural environment³⁰ through a restoration process in order to restore and renew natural systems for the mutual benefit of both parties. Though a comprehensive definition has not yet been developed,³¹ Mang and Reed recognizes that it is possible to direct human activities toward the development of human potential through synchronization with nature³². Most of the current definitions of sustainable design describes its aim to minimize pollution and energy rather than using and restoring renewable resources,³³ but on the other hand, the basic concept of regenerative design process factors users of a building and the environment in which the design is located. Here, the technical and material choices facilitate renewal of resources through efficiency in use and waste reduction.

Regenerative design focuses on building performance and conservation through a deliberate reduction in the environmental impacts of a building while treating the environmental context as a stakeholder in the architecture (Figure 1).

²⁹ Pamela Mang and Bill Reed, *Designing from Place: A regenerative Framework and methodology* (Jan. 2012) 24.

³⁰ Lyle, John Tillman. *Regenerative Design for Sustainable Development* (1994)

³¹ Hand, Gunnar Hauser, and Roger Weber and Nathan Bluestone. "Regenerative Cities: Moving Beyond sustainability_A Los Angeles Case Study.(2017)

³² Mang, Pamela, and Bill Reed. "Designing from Place: A regenerative Framework and methodology (Jan. 2012)

³³ Zari, Maibritt Pedersen. *Regenerative Urban Design and Ecosystem Biomimicry*. New York: Routledge, 2018.

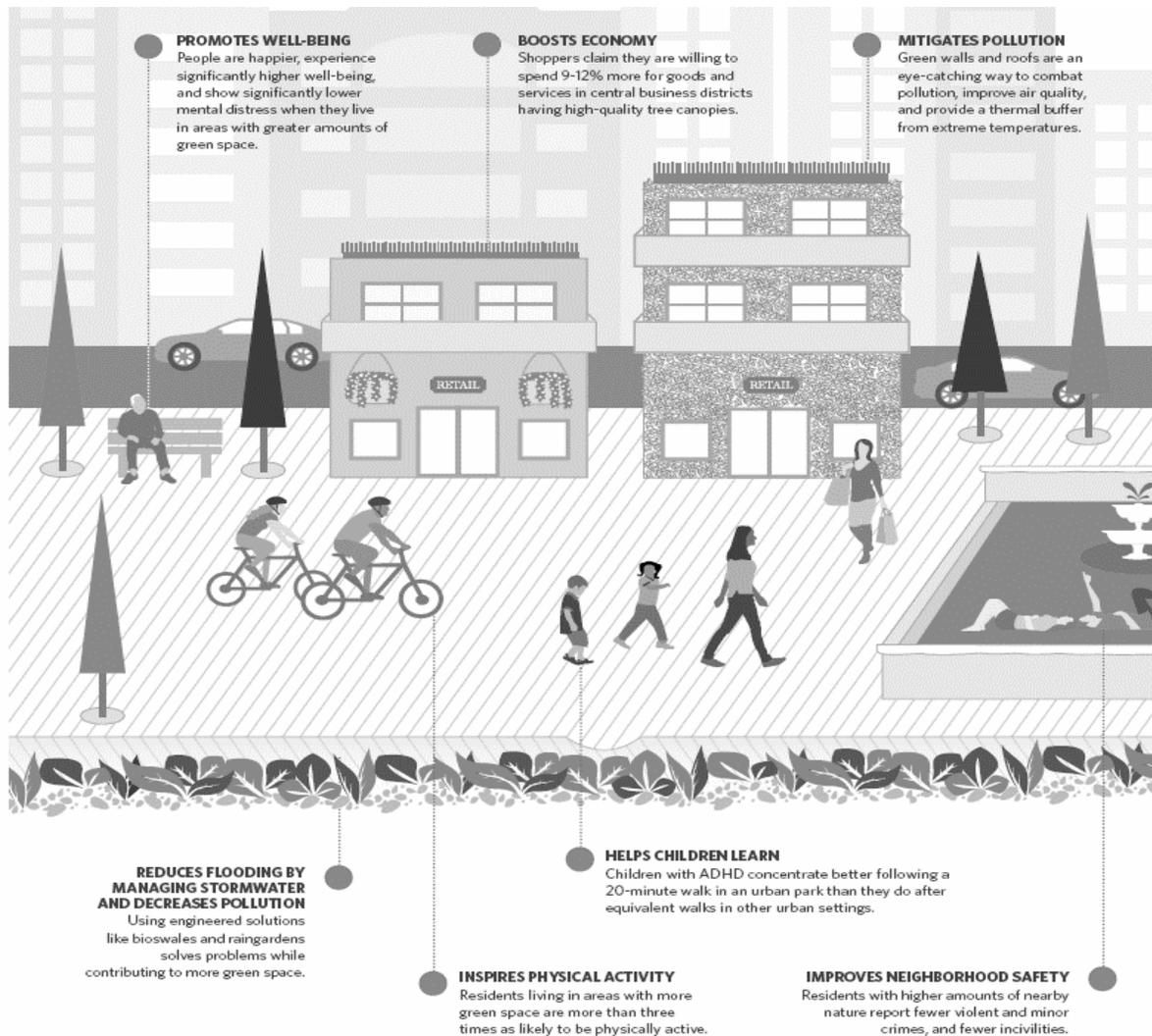


Figure 3: Positive Impacts of Regenerating Urban areas
(Source: Israel, Jessie, and Kathleen L. Wolf 2016) ³⁴

Figure 1 above highlights the fact that regenerative design doesn't need to be expansive to have a positive impact on people, communities and the environment in degenerating urban areas.

In its simplest form, the concept of regenerative design strives for positive impact which involves a deeper understanding of a project's context through the influences of design decisions. With its theoretical roots in the broader bracket of sustainability, it moves beyond

³⁴ Israel, Jessie, and Kathleen L. Wolf. "Outside Our Doors: The benefits of cities where people and nature thrive.(2016)

it to the concept of designing and engaging with nature with emphasis on reversing harm and to have a net-positive influence on the environment.³⁵

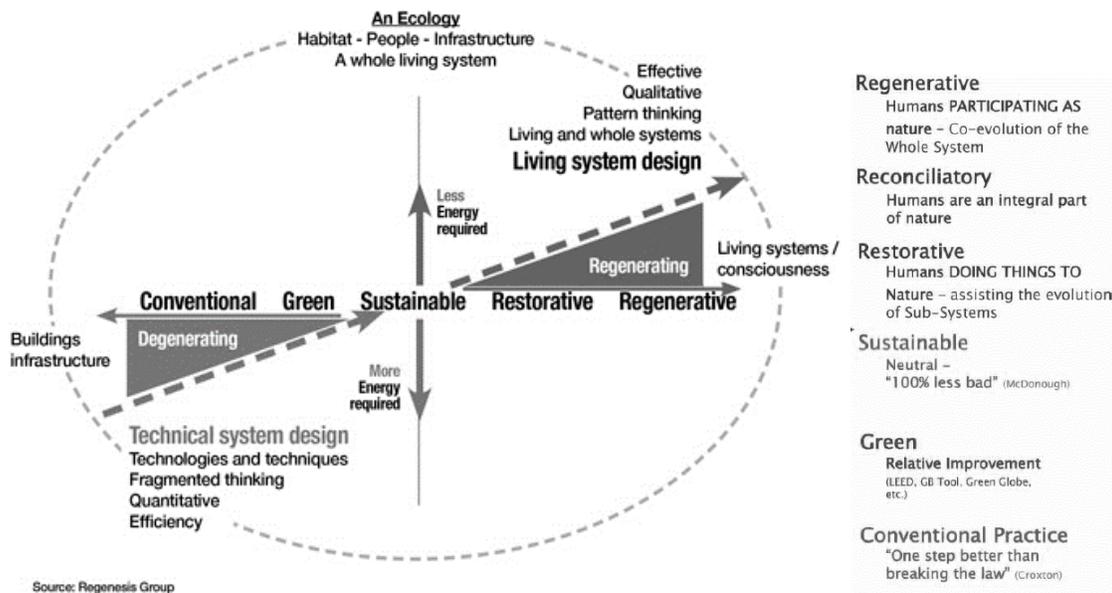


Figure 4: Trajectory of Regenerative design³⁶ Credit: Regenes Group

Figure 2 above explains the trajectory of attaining regenerative design, which is an evolving from “less bad” techniques of sustainability and green design to systems that integrate the needs of the society, nature and building through a Living System design.³⁷ According to Reed, the direction of improvement is primarily towards doing no harm. He emphasizes further that in truly attaining regenerative design, there must first be an understanding of place (context/ site) in relation to the human aspirations of the project. The first step to study the historic and present patterns of human and site interrelationship and then designing a framework of guidelines for conceptual design through an integrated design and construction approach.³⁸

³⁵ Babbawale, Eera. *HMC Architects*. (2019).

³⁶ Reed, Bill. “Shifting from ‘sustainability’ to regeneration.” *Buildig Research & Information*(2007)

³⁷ Kessler, Helen. “Sustainability from Building To Community: On Regenerative Design(2017)

³⁸ Reed, Bill. “Shifting from ‘sustainability’ to regeneration.” *Buildig Research & Information*(2007)

Subsection 1: Implications of regenerative design

As discussed in earlier sections, regenerative design is aimed at operating to create better environmental conditions to support life - enhancing quality of living, repairing the ecosystems and the building.³⁹ In a report by Israel and Wolf, Puget Sound region, coastal area of Washington State, invested in regenerative design to make the built environment, especially commercial spaces to make them more appealing and enhance and attract skilled and productive workforce to it rapidly growing built environment.⁴⁰ Regenerative engineered solutions such as rain gardens, green roofs and walls, bioswales and streetscapes were implemented into innovative urban designs to optimize ecosystems services and this created social connections and opportunities that helped the people and the communities to thrive.⁴¹ The authors emphasized that incorporating natural systems in urban built up environments increases their restorative values. In as much as the built environments may vary in their restorative potentials, encouraging results have turned up.⁴²

Regenerative design in urban environments have been proven to improve the general appeal of a place. Research has suggested that, its incorporation in the form of renovation, adaptive re-use or the rehabilitation of existing structures in the urban fabric renews the image of the city and brings about long-term improvement in the physical, environmental and economic conditions of the area in context,⁴³ which in turn improves the quality of life of the people. It redefines the built environment to include relationships among people,

³⁹ Nugent, Sarah, Anna Packard, Erica Brabon, and Stephanie Vierra. *Living, Regenerative, And Adaptive Buildings*.

⁴⁰ Jessie Israel and Kathleen L. Wolf, (*Outside Our Doors: The benefits of cities where people and nature thrive* (2016)7.

⁴¹ Jessie Israel and Kathleen L. Wolf, (*Outside Our Doors: The benefits of cities where people and nature thrive* (2016)7.

⁴² Weber, Anke Maria, and Jörg Trojan. *The Restorative Value of the Urban Environment: A Systematic Review of the Existing Literature*.

⁴³ Hassan, Ghada Farouk. "Regeneration as an approach for the development of informal settlements in Cairo metropolitan (2012)

buildings and the environment including the culture, politics and economies of the communities in context.⁴⁴ Hassan, writes that, the approaches to regenerative design can be described as cultural and social, physical and environmental, economic and governance as illustrated in figure 3.

Dimensions	
Economic	Job creation, income, employment, skills, employability, development
Social/cultural	Quality of life, health, education, crime, housing, quality of public service
Physical/ environmental	Infrastructure, built environment and natural environment, transport and communication
Governance	Nature of local decision-making, engagement of local community, involvement of other groups, style of leadership

Figure 5: Approaches to Regeneration. Credit: Hassan 2012 ⁴⁵

In several cities across the world, there has been a rise in a new stream of regeneration projects as a pathway to solving economic, social and environmental problem associated with urbanization and urban growth. In a report by The World Bank, Cities like Puerto Madero-Buenos Aires, and Seoul, South Korea, have been successful in finding solutions to decaying declining areas of the city with regenerative design projects.⁴⁶ In Puerto Madero, the regeneration project was aimed at transforming an almost unsustainable former industrial port city, when urban sprawl moved away from the town, creating a significant underuse of

⁴⁴ Mang, Pamela, and Bill Reed. "Designing from Place: A regenerative Framework and methodology (Jan. 2012)

⁴⁵ Hassan, Ghada Farouk. "Regeneration as an approach for the development of informal settlements in Cairo metropolitan (2012)

⁴⁶ TheWorldBank. *How Eight Cities Succeeded in Rejuvenating their Urban Land.* (2016).

the built up area. The initiative redeveloped and reused underused infrastructure such as port warehouses to create attractive mixed-use waterfront neighborhoods (Figure 4).

Similarly, in an effort to revitalize a decrease in commercial and residential activities due to deterioration of the urban fabric in its downtown areas, Seoul launched the Cheonggyecheon restoration project, a regenerative design initiative which redeveloped an 18-lane elevated freeway over the Cheonggyecheon River into a “revitalized stream with green public space”⁴⁷. The ripple effect resulted in enhancing the urban environment and restoring the historical value of the downtown (figure 7,8).



Figure 6: Before and After, Puerto Madero Urban Regeneration Project.
Source: The World Bank⁴⁸



Figure 7: Before and After Cheonggyecheon Restoration Project. Source: Global Cities Initiative⁴⁹

⁴⁷ TheWorldBank. *How Eight Cities Succeeded in Rejuvenating their Urban Land.* (2016).

⁴⁸ TheWorldBank. *How Eight Cities Succeeded in Rejuvenating their Urban Land.* (2016).

⁴⁹ GlocalCitiesInitiative. *Case Study: Cheonggyecheon; Seoul, Korea.* n.d.



Figure 8: Cheonggyecheon Regeneration project.
Source (TheWorldBankGroup 2015)⁵⁰

With the widespread adoption of regenerative design in urban areas, there have been some arguments about challenges facing designing regeneratively. According to Michael Pawlyn, a British architect known for his innovation and design of nature-inspired objects, the biggest challenge to regenerative design projects is the “short-term Profit incentive” of modern-day living.⁵¹ The long-term return characteristic of regenerative design and development serves as a deterrent. Other challenges faced have been linked to economic pressures for scalability, uneven organizational structures of ownership and governance.

Nonetheless the successes of sustainability and building green has shown that these issues can be addressed.⁵² One of such mitigations is for governments and cities to invest to provide grants and subsidies as incentives for private sectors to invest in development of deprived areas of the city, explains Andrew Tallon of the Journal of Urban Regeneration and

⁵⁰ TheWorldBank. *How Eight Cities Succeeded in Rejuvenating their Urban Land*. (2016)

⁵¹ Hill, Kelly. *HAUSvonEden*. 2020.

⁵² Mang, Pamela, and Bill Reed. “Designing from Place: A regenerative Framework and methodology(2012).

Renewal.⁵³ This would encourage the private sector to render their services in support of urban regeneration⁵⁴ and revitalization projects. On a report of The World Bank, in the face of the provision of all the necessary resources for regenerative development, participation by the private sector and community is key to the success of regeneration of underutilized and decaying urban areas.⁵⁵

Section 2: Regenerative design Framework

The goal of designing regeneratively is to achieve net-positive and beneficial impacts on both ecological and cultural systems.⁵⁶ With the broad range of definitions for regenerative design involves a broad range of design framework. In his book on “*Regenerative design and Positive Impact Architecture*” Shady Attia describes a framework of regenerative design based on five sustainable design principles which are: Safety and healthy materials; Materials Reuse; Renewable Energy and Carbon Management; Water Stewardship and Social fairness. The framework, explained in 3 broad strategies (Figure 9), provides a logical planning and guidance to designers and accelerate innovation in regenerative design process.⁵⁷

⁵³ Seward, Aaron. “Urban Regeneration: Designing Beyond the Building(2012).

⁵⁴ Washington, D.C.–based Jair Lynch Development Partners as well as AECOM offer economist consulting services for urban regeneration projects .

⁵⁵ TheWorldBank, *How Eight Cities Succeeded in Rejuvenating their Urban Land* (2016).

⁵⁶ Devon Miller, *Regenerative Design- An exploration of practice, Process and the rolr of Planners* (Masters Thesis, School of Community and Regional Planning, University of British Columbia, 2012).14

⁵⁷ Shady Attia, *Regenerative and Positive Impact Architecture: Learning from Case Studies*. (Liege: Springer, 2017),

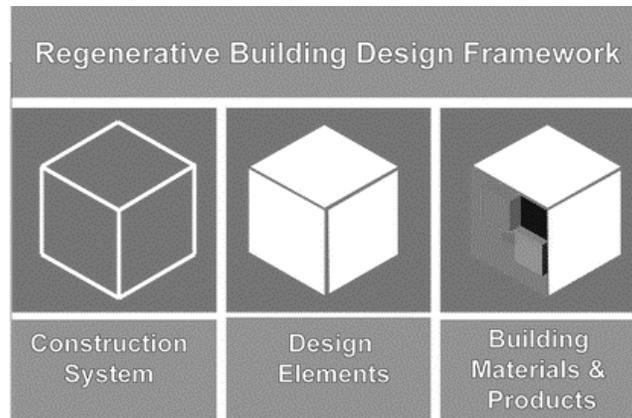


Figure 9: Framework for Regenerative Design based on 3 key Strategies (Source: Shady Attia)⁵⁸

The five fundamental principles of sustainable design are translated into architectural design decisions for regenerative design described in the table below:

Regenerative Construction System	Regenerative Design Elements	Regenerative Building Materials and Products
Modularity of systems	Integration with construction systems	Eco-certified Products
Ease of assembly and disassembly	Renewable energy production	Fire safety
Flexibility of systems	Enhance air quality and Human Health	Embodies Energy
Adaptability of Systems	Energy Saving	Carbon Content
Ease of handling and transportation	Water management	Structural, Mechanical and acoustic performance
	Design with Nature (Biophilia)	Preference for Biosphere materials

Table 1: Design Strategies for the Frameworks of Regenerative Design

(Source: By Author, Credit: Shady Attia)⁵⁹

Attia emphasizes incorporating green infrastructure to connect the building and its users to the ecosystem as one of the essential strategies to obtaining regenerative design. This concept known as biophilia, enhance the buildings recovery from the effects of heat island,

⁵⁸ Shady Attia, *Regenerative and Positive Impact Architecture: Learning from Case Studies*. (Liege: Springer, 2017), 22.

⁵⁹ Shady Attia, *Regenerative and Positive Impact Architecture: Learning from Case Studies*. (Liege: Springer, 2017), 22-31.

noise and air pollution and degrading quality of life.⁶⁰ Achieving regenerative design and lasting sustainability is highly dependent on a combination of biophilic and design low-environmental-impact designs.⁶¹

Section 3: Biophilic Design

Biophilic design as a strategy to regenerative design aims to create good habitats for people as biological animals by providing informed approaches to beneficially incorporate nature into modern built environment.⁶² Incorporating natural elements in urban environments has restorative potentials, which has been realized to have very promising positive results,⁶³ especially when incorporating with physical activity. According to E.O. Wilson, a Harvard Biologist, research have proven that physical activities and natural elements play an important role in restorative spaces for urban dwellers.⁶⁴ While the concept of biophilic design unapologetically advocates for incorporating nature into the built environment, Steven Kellert explains that,⁶⁵ this is not at all the case but rather doing so in ways that responds to human natures inclination to affiliate with the natural environment.

According to Kellert, a growing body of research has proven that exposure to natural environments at the community and urban level (e.g. recreational facilities) has significant health and social benefits. Research at a public housing project in Chicago for low income

⁶⁰ Shady Attia, *Regenerative and Positive Impact Architecture: Learning from Case Studies*. (Liege: Springer, 2017), 29.

⁶¹ Stephen R Kellert, *Nature by Design_ The practice of Biophilic design*. (New Haven & London: Yale University Press, 2018)

⁶² Stephen R Kellert, *Nature by Design_ The practice of Biophilic design*. (New Haven & London: Yale University Press, 2018)

⁶³ Anke Maria Weber and Jörg Trojan, *The Restorative Value of the Urban Environment: A Systematic Review of the Existing Literature* (Environmental Health Insights (SAGE)12.

⁶⁴ Jessie Israel and Kathleen L. Wolf, *Outside Our Doors: The benefits of cities where people and nature thrive* (The Nature Conservancy: Washington Nature 2016).

⁶⁵ Stephen R Kellert, *Nature by Design_ The practice of Biophilic design*. (New Haven & London: Yale University Press, 2018) 4.

and poor residents proved that those exposed to vegetated areas had superior coping abilities, less crime, better cognitive function and greater optimism,⁶⁶ an overall improvement in the quality of life of the inhabitants, which wasn't the case for those living in areas surrounded entirely by only hard landscape. Figure 10 below summarizes research findings of a collaboration between the U.S. Forest Service and researchers from the University of Washington indicating the physical, mental and community level benefits of biophilic design in urban areas with data from around the world over a period of almost 45 years.

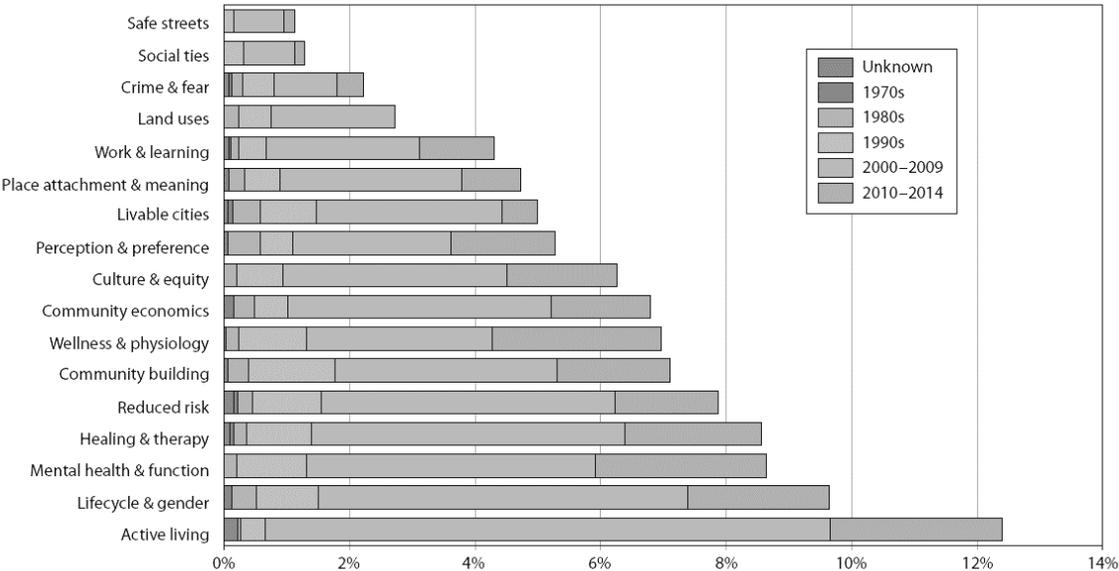


Figure 10: Characteristics of Urban life in relation to benefits of contact with nature (Source: Stephen Kellert, 2018. Credit: USDA Forest Service and Wolf et al., 2015)

Subsection 1: Kellerts Strategies for Biophilic design

For the purpose of understanding and designing with biophilia, Stephen Kellert sets out specific design strategies to assist with the practice of biophilic design. For added clarity, he emphasizes for successful biophilic design, that the application of these strategies must be

⁶⁶ Stephen R Kellert, *Nature by Design_ The practice of Biophilic design*. (New Haven & London: Yale University Press, 2018) 13.

tailored to the conditions of each individual site and not applied with the “one-size-fits-all mentality”.⁶⁷ In the table 2 below, these strategies, are grouped into three basic elements with their accompanying attributes.

Direct Experience of Nature	Indirect Experience of Nature	The experience of Space and Place
Light	Images	Prospect and Refuge
Air	Materials	Organized Complexity
Plants and Landscape	Texture	Mobility
Animals	Color	Transitional Spaces
weather	Shapes and Forms	Place
Views	Information Richness	Integrating parts to create wholes
Fire	Change, age and patina of Time	
Water	Natural Geometrics	
	Simulated Natural Light and air	
	Biomimicry	

Table 2: Biophilic Design Strategies (Source: Stephen Kellert, 2018)⁶⁸

⁶⁷ Stephen R Kellert, *Nature by Design_ The practice of Biophilic design*. (New Haven & London: Yale University Press, 2018) 23.

⁶⁸ Stephen R Kellert, *Nature by Design_ The practice of Biophilic design*. (New Haven & London: Yale University Press, 2018) 26-27.

Chapter 4: Precedent Analysis

Section 1: Application of Regenerative Design Principles

*Chemical Science Building, University of New South Wales*⁶⁹

The 10 storey chemical Science building, built in the 1960's had become an unwelcoming experience for its users due to its old-fashioned design and domineering size resulting in a detrimental effect on users of the building. It became a candidate for regenerative retrofitting because it did not actively engage its environment and exhibited very minimal spaces for social interaction. The retrofit design concept implemented various regenerative design principles with the aim of strengthening occupants' (students and staff) connection with nature to improve their overall wellbeing while improving the structure's performance and the health and productivity of the occupants and of the immediate natural systems.

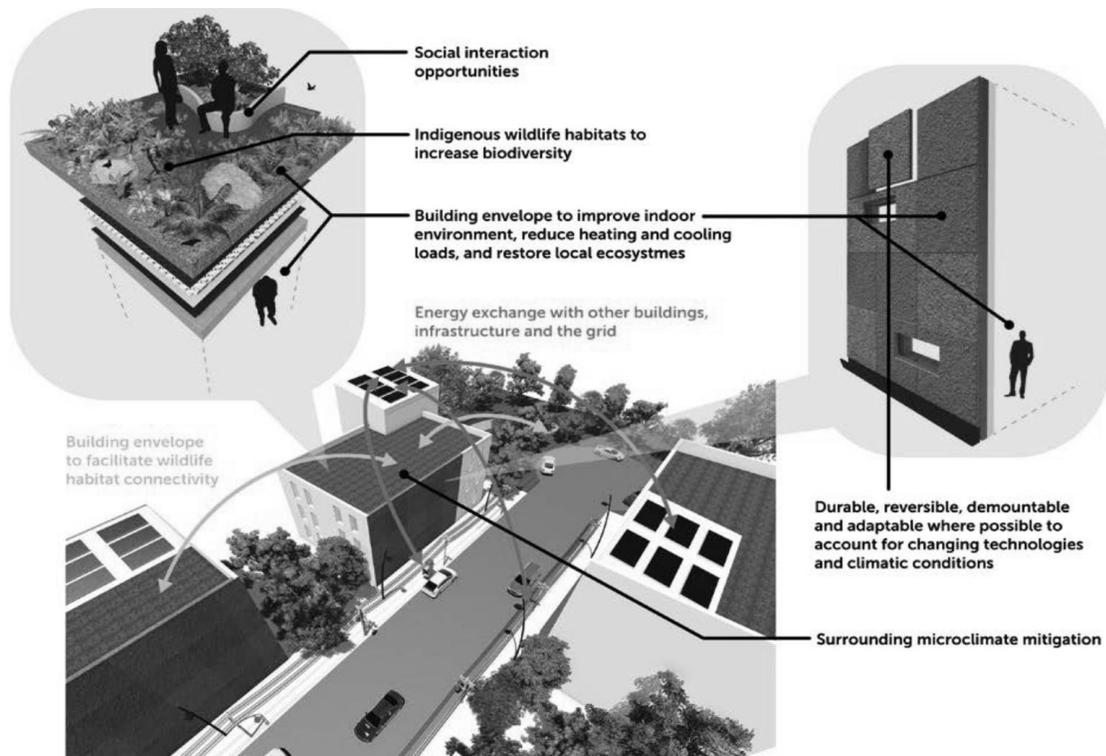


Figure 11: Illustration of Regenerative design Principles for Building Retrofits
(Source: (Craft, et al. 2017))

⁶⁹ Craft, W., L. Ding, D. Prasad, L. Partridge, and D. Else. "Development of a regenerative design model for building retrofits.(2017)

Some of the regenerative principles, illustrated in figure 8, implemented include:

- Redesign of the building's envelope to act as a vertical ecosystem. This was achieved with the use of new building materials which are compatible with the surrounding environs to reduce cooling and heating loads (high performance glazing on north and south Facades- figure 9).
- Improved construction quality and integrity to provide additional opportunities for the implementation of other regenerative principles (future development).
- Creating visually engaging spaces in support of symbiotic relationships between the building's occupants and nature.
- Provision of balconies incorporated with planters that provided new habitation for local flora and fauna to strengthen connection with nature. This was achieved by the addition of additional columns and strengthening of the existing floor slabs (Figure 10).
- Provision of a raised green roof bridge to provide a space for social interaction and facilitate the building and its occupant's connectivity to nature (Figure 11)

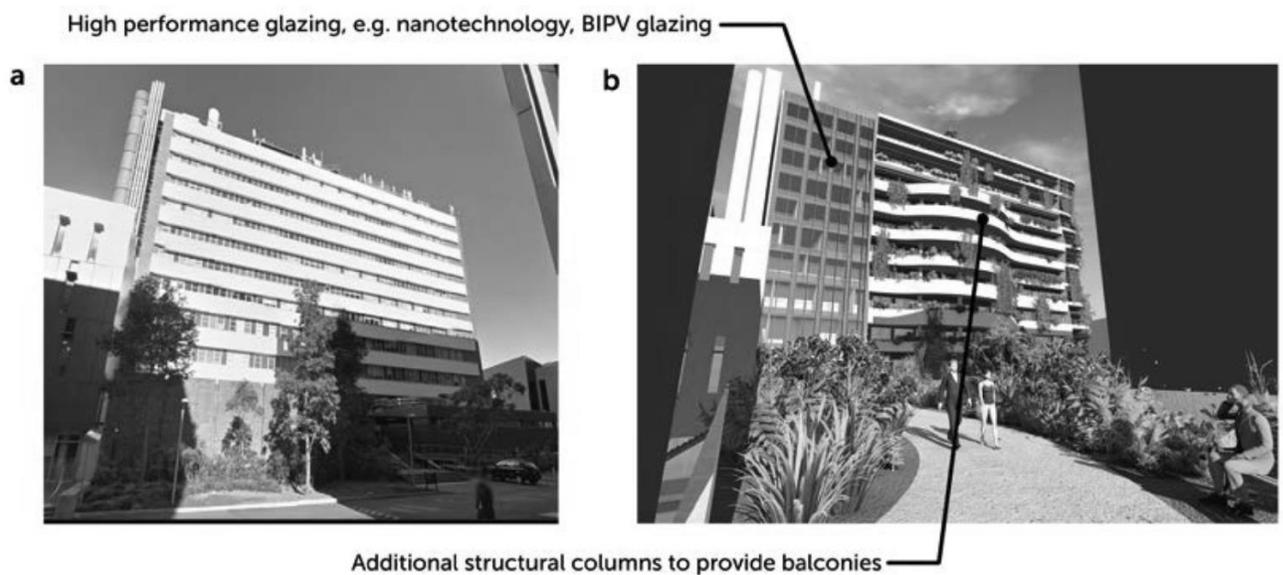


Figure 12: Before and after the retrofitted building Façade (Source: (Craft, et al. 2017))

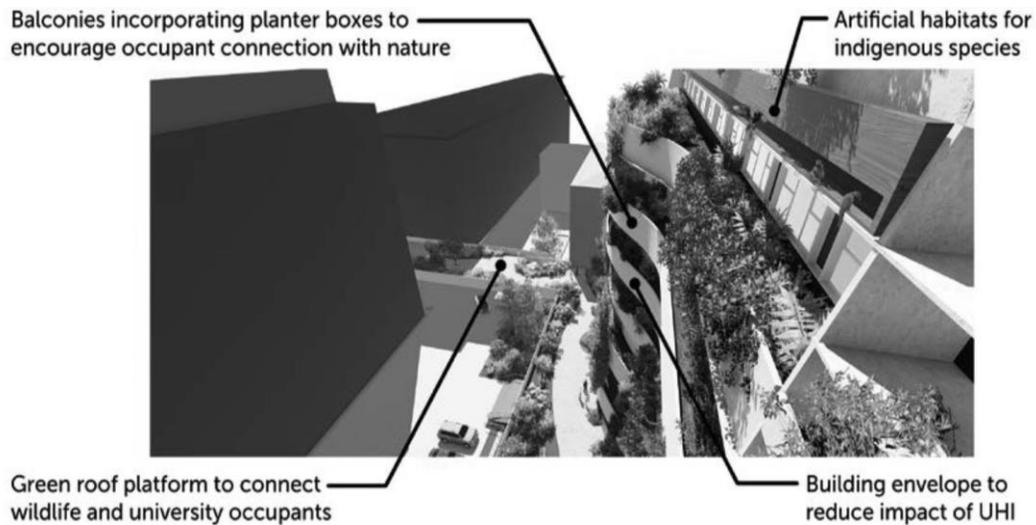


Figure 13: Retrofitted Balconies and Green Roof (Source: (Craft, et al. 2017))

Section 2: Maryland Heights Community Center

Built in 2017, the 91800ft² community recreation center located in west St Louis for was designed to serve as a vibrant hub for recreational activities, wellness and community engagement. Designed by CannonDesign to meet LEED silver standards, the new energy efficient building was designed to serve as a “destination” recreation center with improved facilities and a wider range of activities to replace a former center on the same site⁷⁰ (Figure 14).



Figure 14: Exterior View and Main Entrance (Source: Gayle Babcock, Peaks View LLC, Mark Kemp)

⁷⁰ Paula Pintos, “Maryland Height Community Center/ CannonDesign” *Archdaily*,. October 08,2019. https://www.archdaily.com/926109/maryland-heights-community-recreation-center-cannondesign?ad_source=search&ad_medium=search_result_all.

The site is located along the City’s beltway and adjacent an outdoor waterpark .The design was snuggled into the landscape to create a sheltering form while maintaining and engaging with an existing berm toward the park. It preserves a functional green space while trying to mediate harsh acoustical environment from the highway. The form of the building created an acoustical shadow which solved the one of the major design challenges ⁷¹ (Figure 15).

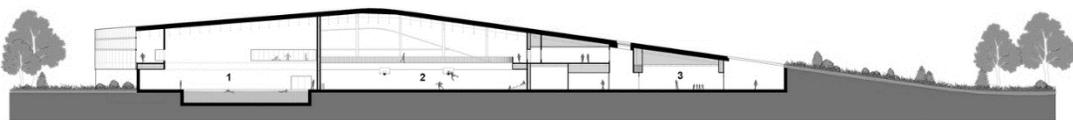


Figure 15: Building Section (Source: Gayle Babcock, Peaks View LLC, Mark Kemp)

The design is programmed to include a multi-purpose gymnasium, an indoor pool and indoor track, climbing walls, kid’s area, community meeting rooms, a seniors center and administrative offices and a diverse range of recreational activity spaces (Figure 16).

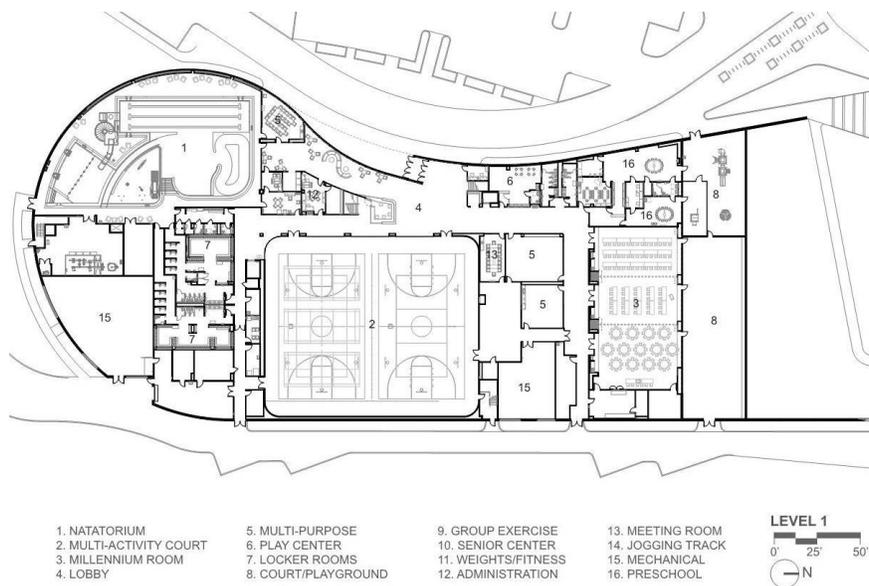


Figure 16: Center Floor Plan_ Level 1 (Source: Gayle Babcock, Peaks View LLC, Mark Kemp)

⁷¹ Paula Pintos, “Maryland Height Community Center/ CannonDesign” *Archdaily*,. October 08,2019. https://www.archdaily.com/926109/maryland-heights-community-recreation-center-cannondesign?ad_source=search&ad_medium=search_result_all.

Chapter 5: Site Documentation and Investigation (Anacostia Recreation Center)

Section 1: Site Selection

Three sites, all located in Low income neighborhoods were considered for the selection of site for this thesis. The sites included, SE Tennis & Learning Centre in Congress Heights, Dc; Harlem Park, Baltimore; and the Anacostia Recreation Center.



Figure 17: Site A- SE Tennis & Learning Center; Site b- Harlem Park; Site C- Anacostia Recreation Center (Source: By Author)

Site Selection Criteria

Findings from the theoretical underpinnings of regenerative and biophilic design led to the consideration of certain factors for the selection of the site for this thesis, the criteria for site selection included;

- Accessibility
- Connection to target population
- Existing landscape
- Availability of Utilities
- Land size
- Topography/ Soil
- Location of site
- Zoning Regulations
- Possibility of adaptive reuse
- Proximity to alternate Transportation

This criteria was formed the basis for the selection of the Anacostia Recreation center for this thesis. Table 3 below summarizes the comparison of the possible sites selected for this thesis.

Site Selection Matrix	Site A Anacostia Recreation Center	Site B S E Tennis & Learning Center, Congress Heights	Site C Harlem Park Baltimore
Accessibility: <i>Circulation, Parking,</i>	Pedestrian access -Anacostia river walk trail	Within walking distance to middle school	The site has ease of access on all sides and is pedestrian friendly.
Connection to target population	Site is in close proximity to low income neighborhood	In close proximity to low income congress heights neighborhood	Vacant and blighted Harlem Park neighborhood.
Existing landscape : <i>to greenery / water</i>	Adjacent to Anacostia river and Park	Presence of water feature on site	Harlem Square Park
Availability of Utilities <i>to greenery/ water / Energy/ gas</i>	Availability of utility & resources	Availability of utility & resources	Open Park for visibility and ease of construction
Land size <i>Reasonable size / configuration</i>	1,787,417.50 <i>sqf.</i>	517,182.17 <i>sqf.</i>	646,441.68 <i>sqf.</i>
Topography/ Soil <i>Feasibility of Mitigating steep grades/ Surface and subsurface drainage</i>	Relatively low-lying site	Relatively flat site	Relatively flat site
Location of site <i>Safety</i>	The site is currently the location of the Anacostia recreation center	The site is an existing location of the tennis and learning center.	The site is an existing location of the Harlem park recreation center and Harlem square park
Zoning Regulations <i>Compatible with zoning regulations</i>	Compatible with zoning regulations	Compatible with zoning regulations	Compatible with zoning regulations
Possibility of adaptive reuse	Existing facility qualifies for adaptive reuse .	- Qualifies for adaptive reuse and redesign scheme	- Existing Harlem Park recreation center
Proximity to alternate Transportation	- Approx. 1 mile proximity to Anacostia Metro - Approx. 0.6 mile proximity to SE Pennsylvania & SE Potomac AV. Metro	Approx. 0.63 miles proximity to Congress Heights Metro	Approx. 0.530 miles proximity to - Upton Metro Station - State Center Metro

Table 3: Matrix for Site Selection (Source: Author)

With this criteria and matrix, a scoring system was tabulated and the Anacostia recreation center was selected (Table 4). This site was best for the thesis because of its location. One of the most important considerations for a site for regenerative design is proximity to an existing landscape (Water feature/ greenery). The site lies along the Anacostia Riverfront and is marked for revitalization as part of the Anacostia waterfront Initiative. As mentioned earlier in Chapter 3, the initiative is a framework plan to create widespread access to new and improved parks and recreation facilities along the long-neglected Anacostia River⁷².

⁷² Anacostia Waterfront Initiative Partner Agencies, *The Anacostia Waterfront Framework Plan*. (Washington Dc: District of Columbia, Office of Planning, 2003)

	Site A Anacostia Recreation Center	Site B S E Tennis & Learning Center, Congress Heights	Site C Harlem Park Baltimore
Accessibility:	1	3	2
Connection to Target Population	2	3	1
Existing landscape :	1	2	3
Availability of Utilities	1	3	2
Land size	1	3	2
Topography/ Soil	1	2	3
Location of site	1	2	3
Zoning Regulations	1	2	3
Possibility of adaptive reuse	1	2	3
Proximity to alternate Transportation	1	3	2

Table 4: Site Scoring System for Site Selection (Source: By Author)

Section 2: Site Context and Inventory

The site for the proposed design is the current location of the Anacostia recreation center, located in Fairlawn, South-east Washington. The site has been designated for redevelopment as part of the Anacostia Waterfront Initiative Plan (Figure 14).

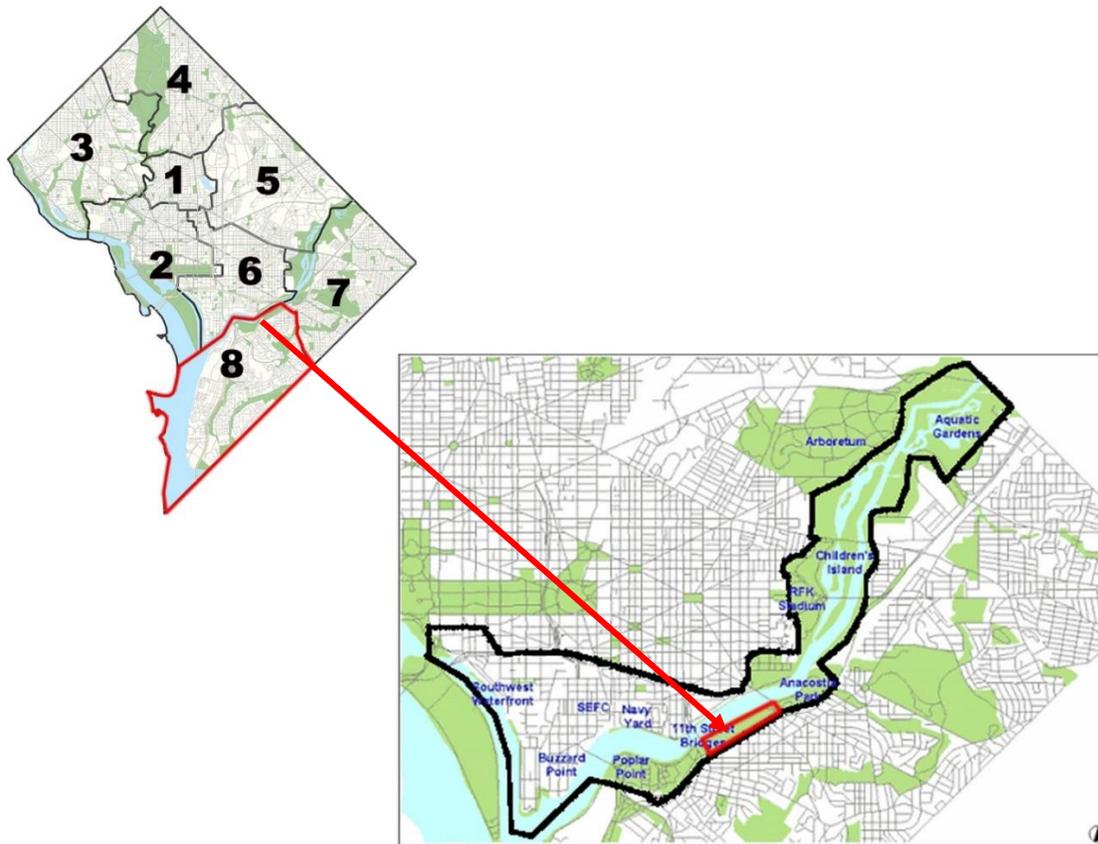


Figure 18; Top: Maps of the Wards of DC (Source: District of Columbia Office of Planning (DCOP));
 Bottom: Anacostia waterfront Initiative Boundary (Source: District of Columbia Office of Planning (DCOP))

The site is bounded to the north by the Anacostia Drive, River walk trail and the Anacostia River, to the south by the Anacostia and Kenilworth Avenue Freeway, to the West by the 11th Street Bridge and to the East by the John Philip Sousa Bridge. The expanse of the site stretches approximately 3,800 ft. in length by 650ft in width (Figure 15).

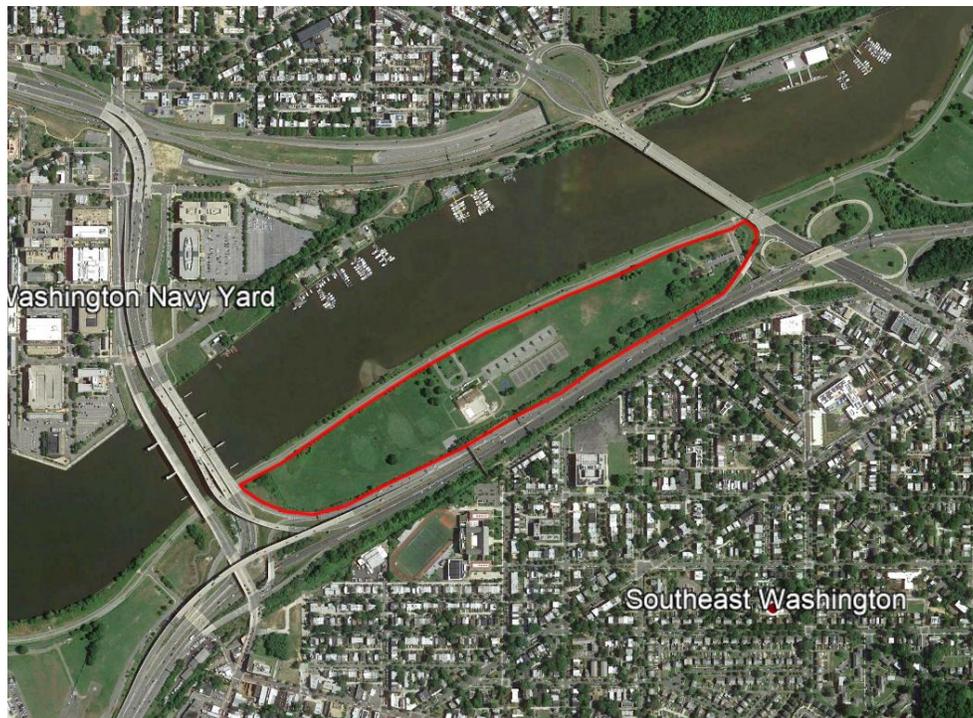


Figure 19: Boundaries of the proposed Site (Source: Author)

Site History

Located in South East Washington, DC, the Site of the Anacostia recreation center has been battling with the tenacious challenges of urban growth including deteriorating infrastructure, high-priced housing, and economic decline and segregated neighborhoods.⁷³ The site is in close proximity to the Historic Anacostia, Fairlawn and Twining communities. These communities are predominantly African American dominated and characterized by the effects of unemployment, high poverty rate and physical distress,⁷⁴ which have raised questions about whether these communities are even part of Washington DC. One of the reasons being possibly being that Anacostia and these communities on the East of the river were not part of the L'Enfant Plan for Washington DC (Figure 16)⁷⁵

⁷³ Charles Lee, "Environmental Justice, Urban revitalization, and Brownfields: The Search for Authentic Signs of Hope (1996)

⁷⁴ Rachel Ramirez, Building Bridges. (August 2020).

⁷⁵ Joseph Powell Corey, *Bridging Anacostia* (Masters Thesis, College Park, Maryland, 2007).

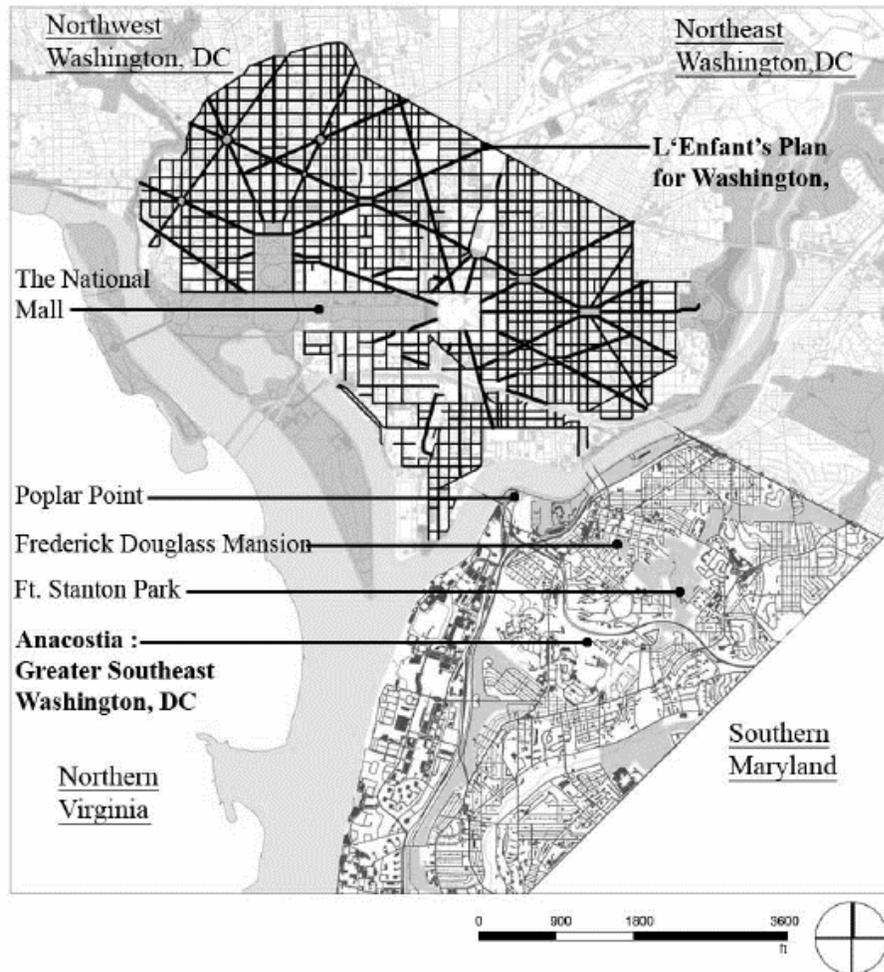


Figure 20: L'Enfant Plan and Anacostia, Washington, Dc (Source: Corey, 2007)

Anacostia was once a predominantly white neighborhood until the construction of the I-295 Freeway and public housing for low income residents, which changed the demographics of the area and a decline of social services to the area. The public housing project was designated and restricted to white working class residents which forced the African American community to move towards the east of the river to adjacent neighborhoods which experienced neglect by the government. The poverty level of these neighborhoods has continued to increase from 27% to 33% in 2015⁷⁶ with 47% of residents

⁷⁶ Andrew Giambrone, *Poverty In D.C. Is Getting Worse East of the Anacostia River, Study Finds*. (Washington Citypaper Member Supported, September 2016).

living below the poverty line which has led to blighted and physically deteriorated neighborhoods characterized vacant buildings, Health and safety issues including an increase in crimes.

Future Development

For the most part, Anacostia and it surrounding communities have been neglected but the city has put in place several plans to revitalize this part of the city. One of these is the proposal of the design of the 11th Street Bridge to connect Anacostia to greater DC. In 2017, the project was commissioned by the Department of Transportation (DDOT) with the aim of creating an urban destination and park to bridge the gap between the neighborhoods of Anacostia, Fairlawn and the rest of Washington, DC.⁷⁷



Figure 21: 11th Street Bridge (Source: DC DDOT, 2017)

The Proposed site and Anacostia recreation center is also located within the boundaries of the Anacostia Waterfront Initiative Framework Plan (part of its larger Anacostia Waterfront Initiative [AWI]) a plan by the Government of the District of

⁷⁷ District of Columbia Department of Transportation, *11th Street Beidge Park*. (Staff Presentation, Washington,DC: National Capital Planning Commission, 2017)

Columbia, to revitalize South East of DC and create access to the Historic Anacostia River for recreation, improved parks and facilities and most importantly, reintroduce the river and waterfront into the life of the city.⁷⁸ (Figure 18)

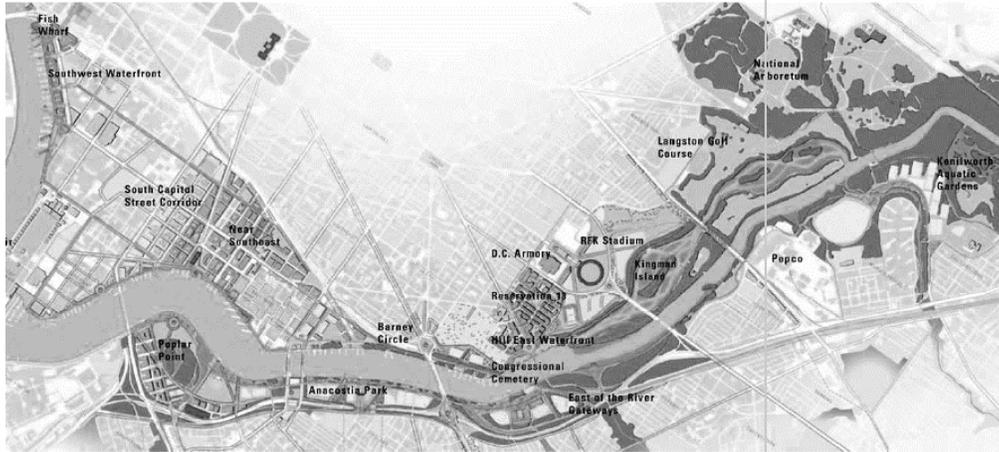


Figure 22: Illustrative Plan of the Anacostia Waterfront Initiative (Source: Adrian Fenty, 2010)⁷⁹

Section 3: Site Analysis

Subsection 1: Connectivity and Approach

Running parallel to the Anacostia River, the site's vehicular access is by the Anacostia drive which connects from the South Capitol Bridge over the Anacostia River from the Nationals Stadium or through the Baltimore -Washington Parkway, the Good Hope Road or from Nicholson Street. The site is also located within a 1 mile radius of the Potomac Avenue and Anacostia metro stations. The Anacostia Riverwalk trail connects pedestrians to the site and beyond. It stretches along the river to the Nationals Park, Historic Anacostia and 16 communities, 12 of which are still very heavily used⁸⁰ (Figure 23).

⁷⁸ AnacostiaWaterfrontInitiativePartnerAgencies, *The Anacostia Waterfront Framework Plan*. (Washington Dc: District of Columbia, Office of Planning, 2003).

⁷⁹ Adrian Fenty, *Anacostia Waterfront Initiative: 10 Years Progress* (Progress Report, Washington, DC: Government of the district of Columbia, 2010)

⁸⁰ Lott, Everett. District Department of Transportation : Anacostia Riverwalk Trail. 2021. <https://ddot.dc.gov/page/anacostia-riverwalk-trail>

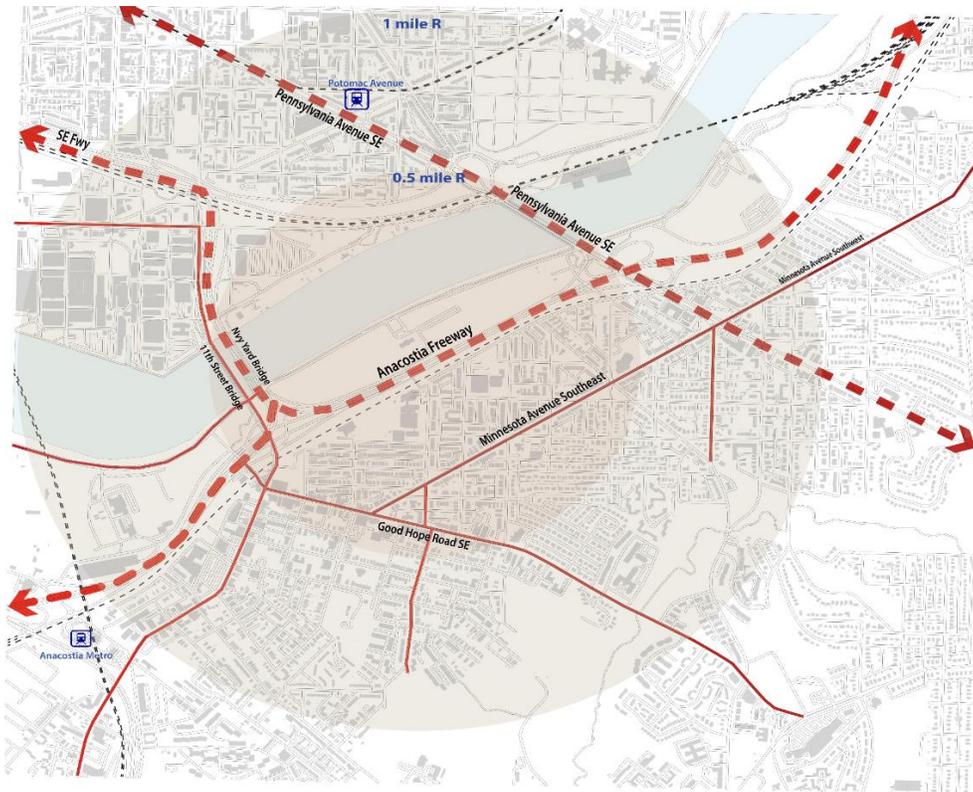


Figure 23: Site Connectivity; Vehicular and Pedestrian (Source: Author)

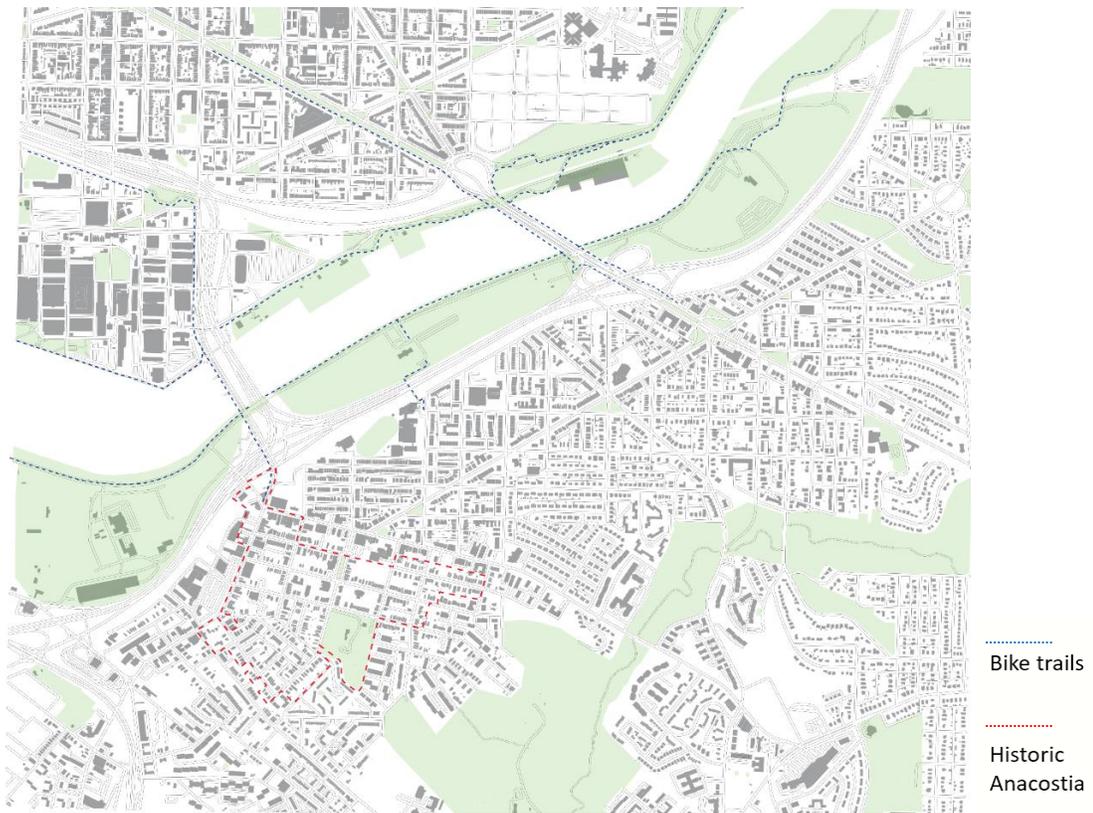


Figure 24: Site Connectivity; Pedestrian and Bike Trails (Source: Author)

A major site constraint is the separation of the site from the immediate neighboring communities by existing highways and infrastructure. Pedestrian access from these neighborhoods is by an old pedestrian bridge which this thesis also proposes to replace (Figure 25).



Figure 25: Pedestrian Bridge Connection to Existing Anacostia Recreation Center (Source: Google Maps)

Subsection 2: Site Peripheral Studies

The inventory was studied to get a better understanding of the site, its topography, existing conditions, flooding conditions, etc. The existing recreation center sits an approximate 41 acre park land, with a pool, an access bridge, soccer fields and tennis courts (figure 26). Parking for vehicles is located along the Riverwalk. The site is barely flat towards the river but runs and lies beneath a range of high lands towards South East Washington. This makes the sites a topographical bowl that receives a lot of run off and storm water (Figure 27).

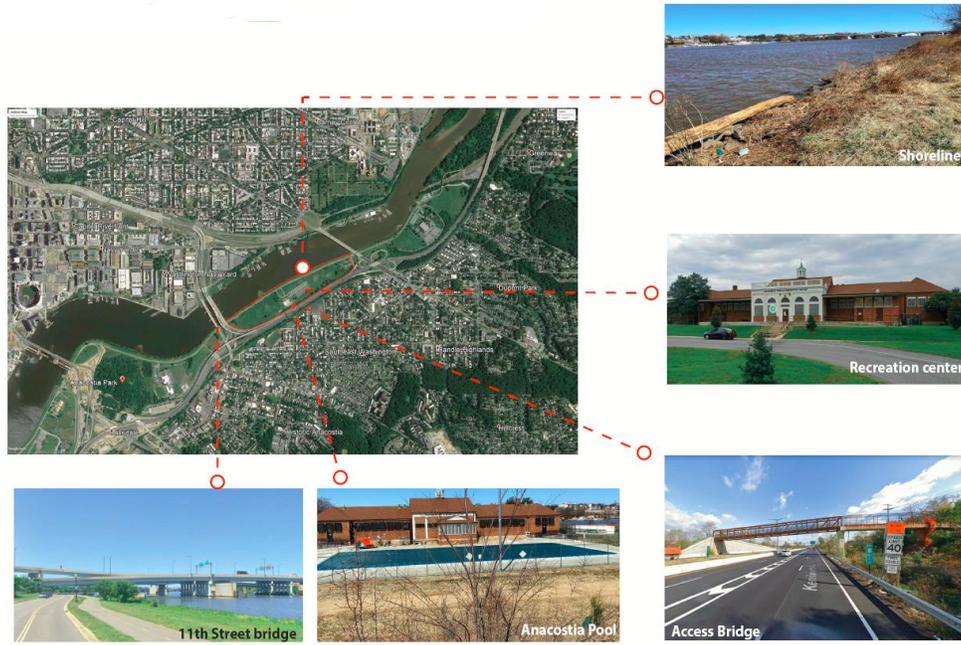


Figure 26: Site Inventory (Source: Author)

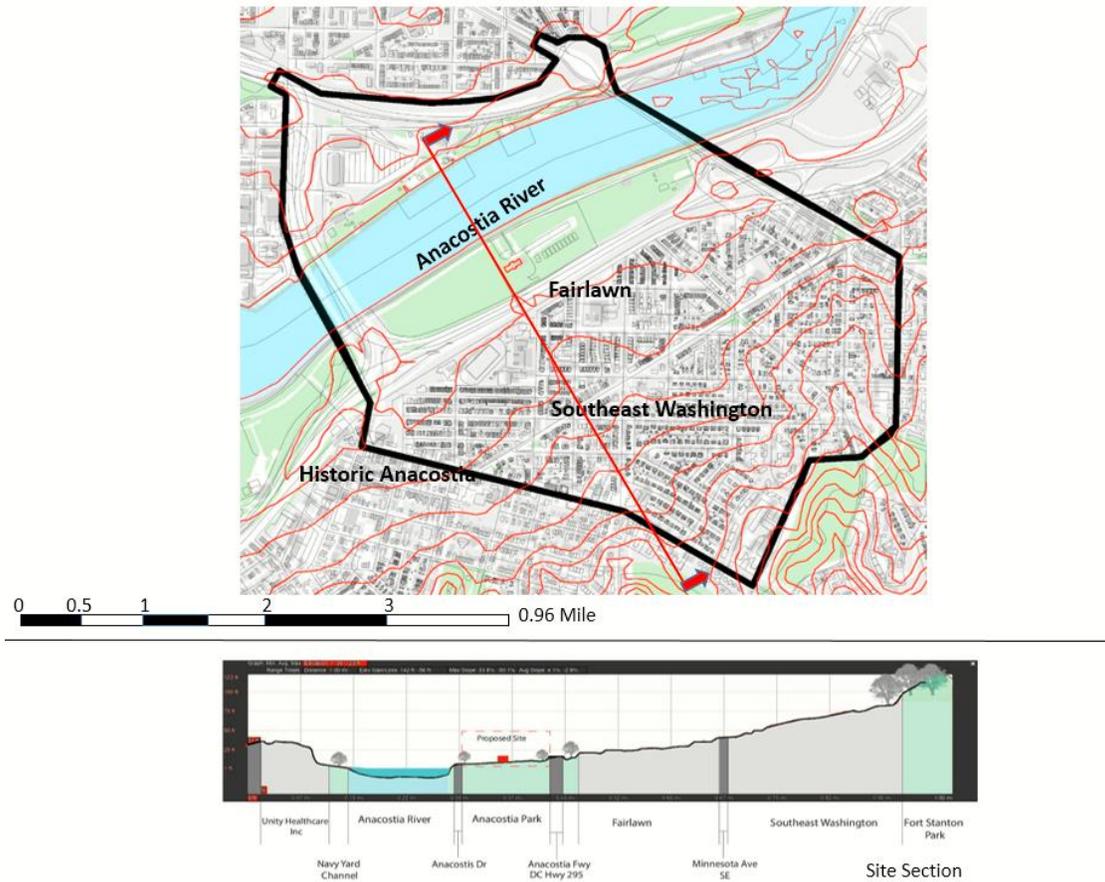


Figure 27: Site Topography and Site Section (Source: Author)

Chapter 6: Design response

Section 1: Program Defined

Program Abstract

The Proposed site, Anacostia, Located in Washington DC's 8th Ward, is often dismissed as a struggling community facing deep rooted challenges. With redevelopment being one of its most vital necessities, the Department of General services requested for the proposal of a new recreation center for Anacostia in January 2020. This thesis will seek to explore what regenerative and biophilic design principles can be employed in the design of a new recreation center for Anacostia. Some principles of regenerative architecture to be considered will include whole systems design integration, Integration into the landscape, Intelligent Construction, ecology and biophilic design which includes direct and indirect experiences with nature, integration of landscape and greenery, incorporation of natural light and air which promotes environmental restoration.

After an Analysis of precedent such as Renzo Piano's Zentrum Paul Klee Museum, and the Lubber Run Community Center, the program will include human and environmental – centric spaces based on the criteria laid out by the principles of biophilia and regenerative design.

Program

The guidelines driving the planning of the site of the proposed Anacostia recreation center are the design of an engaging waterfront, food sovereignty and providing a sense of place through an efficient site design. The proposal seeks to provide spaces for learning and playing, gathering, relaxing and growing (Figure 28).

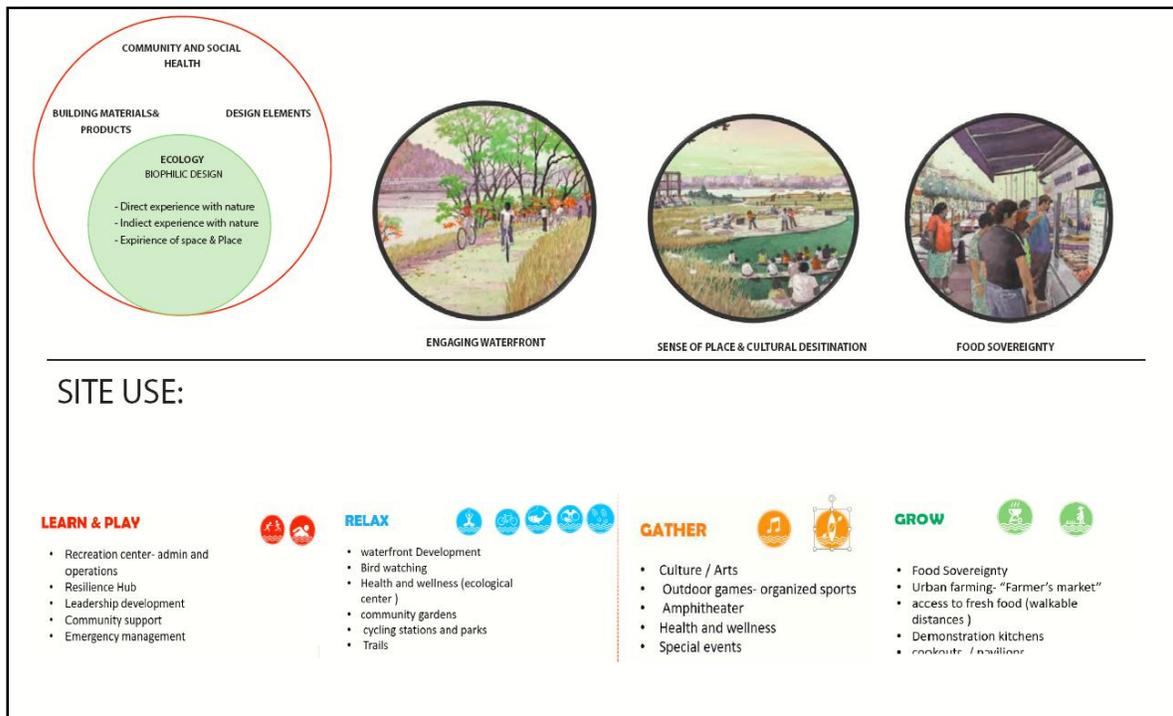


Figure 28: Illustrative diagram of program design guidelines (Source: Author/ Image credit: Anacostia Waterfront Initiative)

Section 2: Site Strategies

Based on the continuation of the urban grid, the site is zoned into 3 main sectors. The recreation Hub center, playground and sports fields and community gardens. The design proposed makes the bike and walking trails along the river more organic and pedestrianized. A major design guideline was the maintenance of the existing pool because of its historic significance (Figure 32). The proposed design of the new Anacostia Recreation Center allows for direct access and views to the Anacostia River and riverfront promenade from the pool area. The site plan and site section (Figure 29, 30) shows the efficiency of proposed site zones with a new proposed green bridge connecting to the neighborhoods beyond the highway for easy access to the site. The site also proposes to use all untouched land, towards both ends of the site as community farms to provide readily accessible fresh food to the community.

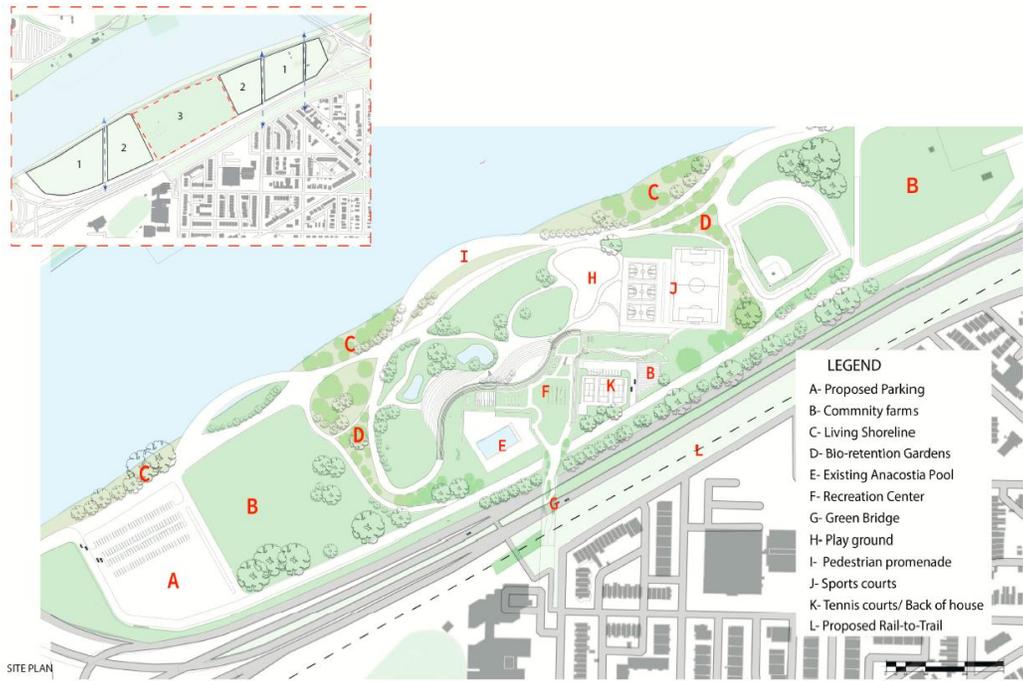


Figure 29: Proposed Site Plan (Source: Author)

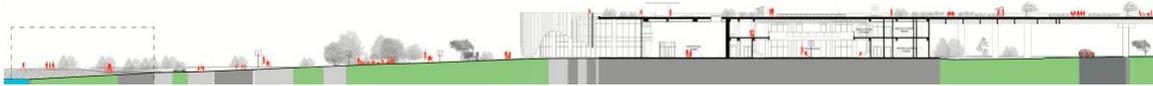


Figure 30: Site Section (Source: Author)



Figure 31: Perspective View of the Pool with direct view and access to the riverfront (Source: Author)

The proposed green bridge which includes an amphitheater, roof gardens, a running track and pedestrian's walkways provides a variety of open areas for relaxation with views to the river and outdoor sporting areas (figure 33). The open areas are distributed with Native American sculptures for exhibition and to allow users to learn about the history of the site. These provide unique experiences for users to gather and celebrate culture (figure 32).



Figure 32: Roof Garden- provides Spaces for relaxation (Source Author)



Figure 33: Roof top Amphitheater -Provides a place for gathering and celebration (Source: Author)

Subsection 2.1: Application of Regenerative Principles on site

In planning of the site using regenerative and biophilic design principles, the thesis proposed the sponge park system for the shoreline and green areas of the site. This system includes a permeable riverfront shoreline which changes from Terra Forma to wetland during high rains and floods, restoring and regenerating the site's ecosystem (Figure 35). Design of the sponge park system also includes bio retention gardens and bioswales which collect and filter storm water onsite.



Figure 34: Perspective View of the proposed Permeable Shoreline (Source: author)

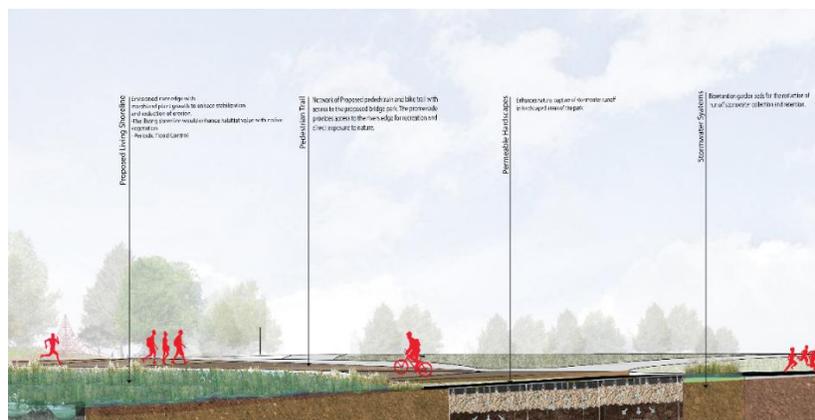


Figure 35: Schematic detail of Permeable Shoreline (Source: Author)

Section 3: Design Proposal

The design of the new Anacostia recreation center was guided by biophilic principles which proposes to provide spaces that enhance direct and indirect experiences with nature (Figure 36).

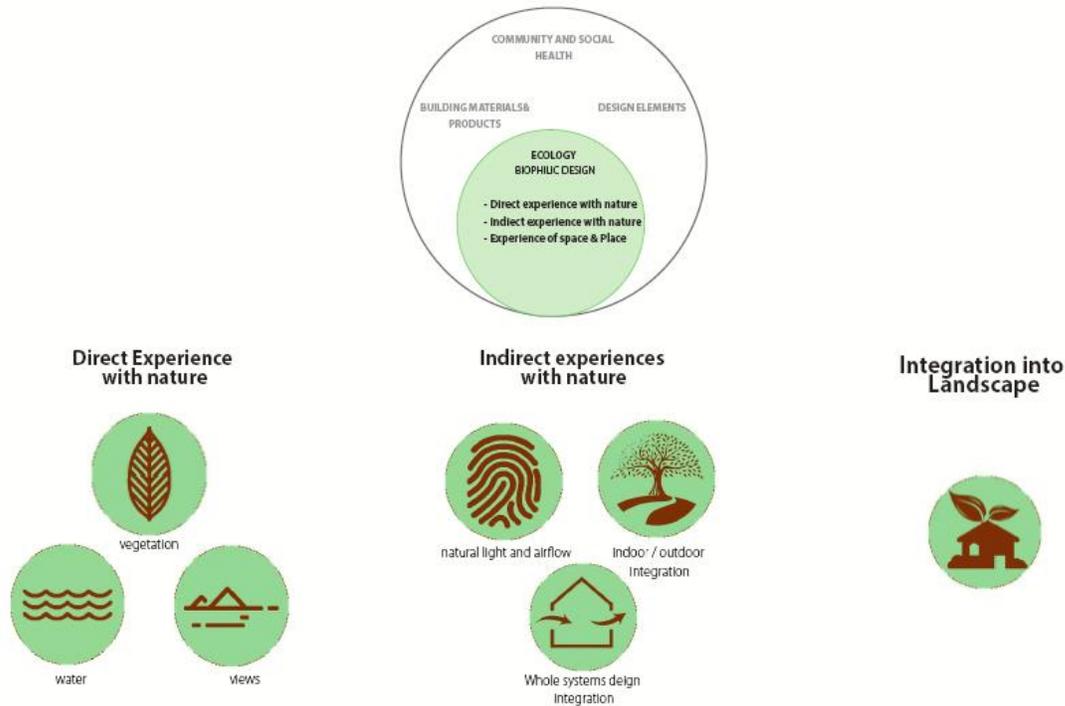


Figure 36: Schematic representation of Regenerative and Biophilic design guidelines (Source: Author)

The building form was guided by a linear layout to enhance the flow of natural light and air. Circulation is based on the continuation of the city grid which merges with the building to form a pedestrian bridge, providing direct access into the site and recreation center (Figure 36).

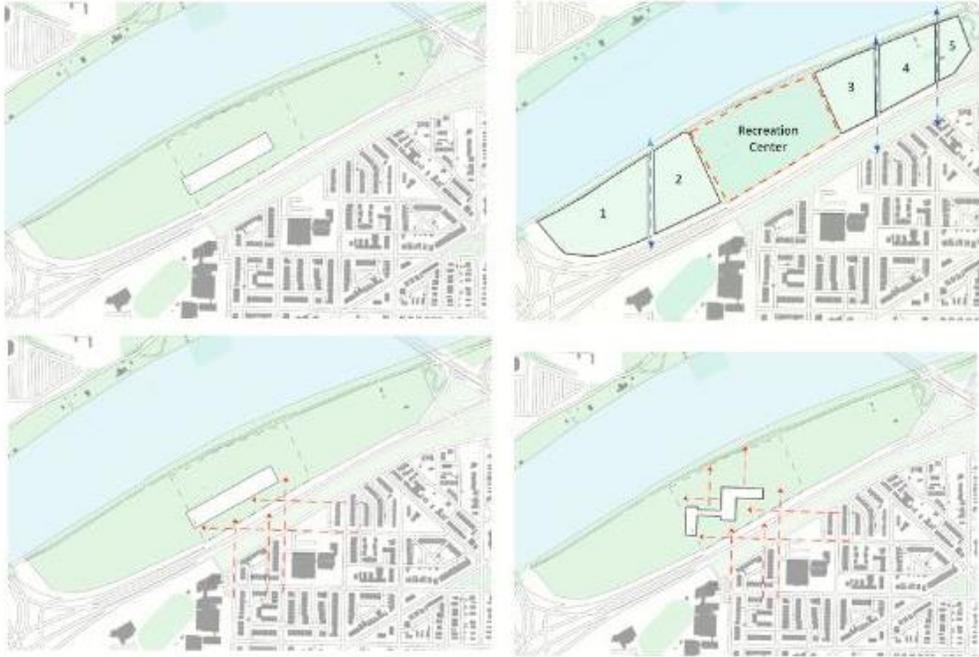


Figure 37: Building Design Strategies (Source: Author)

The building is designed to be a continuous pedestrianized public waterfront connecting the park and surrounding neighborhoods, creating an active living waterfront experience. The building emerges from merging the strict city layout with the more organic layout of the waterfront. The building integrates with the topography and includes a sequence of reception, learning and recreation spaces (Figure 38).



Figure 38: Aerial View of the proposed design (Source: Author)

On the ground floor plan (Figure 42), users of the building can access it from the main entrance or an entry pavilion from the bridge park on the roof of the building. Users are then oriented to learning spaces, multi-purpose meeting halls, gym, indoor swimming pool and a demonstration kitchen which all connected and accessed from any point of the building (Figure 39,40). The use of vegetation and natural materials in the interior spaces blurs the boundaries between the outdoor and indoor which enhances the users' indirect experiences with nature.



Figure 39: Perspective View of the Entrance Lounge (Source: Author)



Figure 40: Perspective View of the Reception Area (Source: Author)

The new Recreation center also includes a demonstration Kitchen which provides a space for the showcasing of culture through food. This space provides a sense of place for both Native and African American historical heritage of the site (Figure 41).



Figure 41: Perspective View of the demonstration Kitchen view to the community gardens (Source: Author)

The second level houses administrative spaces and other meeting and exercise spaces for users. These includes an indoor running track and other spaces for community engagement. It also houses almost all administrative spaces of the Center (Figure 43).

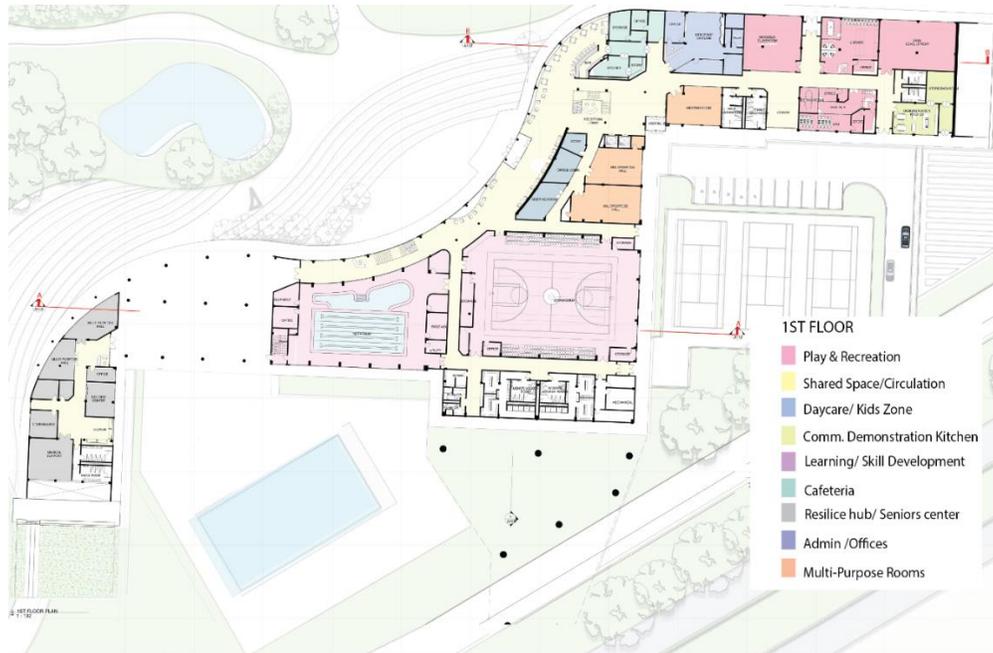


Figure 42: Ground Floor Plan_Level 1 (Source: Author)

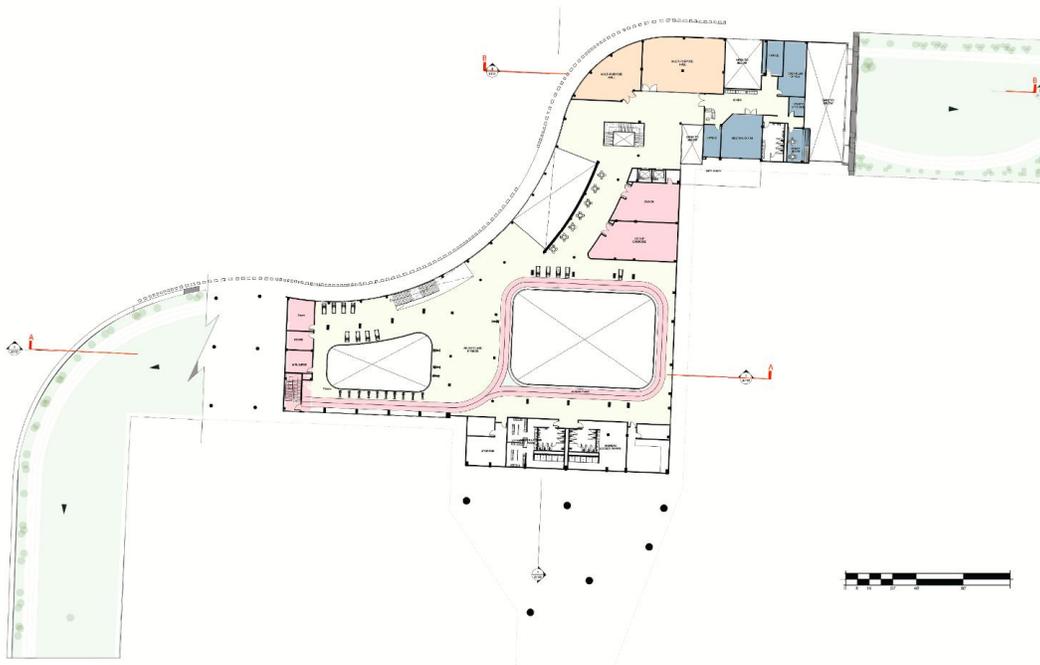


Figure 43: 2nd Floor Plan_Level 2 (Source: Author)

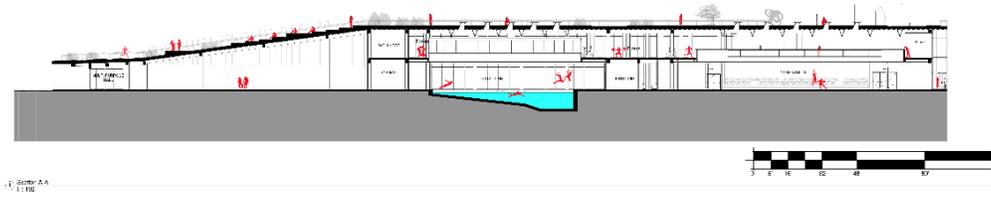


Figure 44: Sections (Source: Author)

The elevations (Figure 45) shows how the building merges into the topography and crates access, which includes running tracks and walkways to the bridge park. The green roof solution responds to the desire for the building to passively cool itself, reducing the reliance on cooling systems during warmer temperatures.



Figure 45: Building Elevations [top-NW view; Middle - SW View; Bottom- NE View] (Source: Author)

Other Perspectives



Figure 46: Perspective View of Pedestrian Promenade illustrating users' direct experience with nature (Source: Author)



Figure 47: Proposed Indoor Pool area with Natural materials and greenery (Source: Author)

Subsection 3.1: Application of Biophilic design Principles

The planning and design of the Proposed Anacostia Recreation Center guided by biophilic principles which proposes to provide spaces that enhance direct and indirect experiences with nature. These principles were achieved through the design of rainwater collection system for irrigation; Connection of the green roof system which responds to the desire for the building to passively cool itself, reducing the reliance on cooling systems during warmer temperatures; use of natural materials and textures as well as providing views to nature and capitalizing on natural ventilation and air. Figure 48 below is an illustration of how these principles were applied to the design of the center.

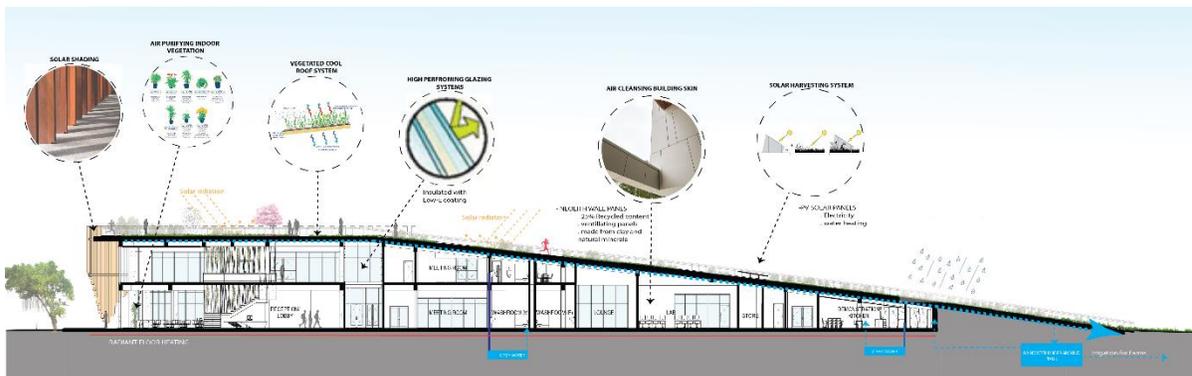


Figure 48: Sustainability Principles (Source Author)

Chapter 7: Conclusion



Figure 49: Exterior View of the Proposed Anacostia Recreation Center (Source: Author)

As mentioned in earlier chapters of this thesis, emphasizes designing to promote a symbiotic relationship between a local community and the natural environment⁸¹ through a restoration process in order to restore and renew natural systems for the mutual benefit of both parties. The concept of Regenerative design in urban environments, especially in areas of physical deterioration, have been proven to improve the general appeal of a place.

The restoration of existing structures in the urban fabric renews the image of the city and brings about long term improvement in the physical, environmental and economic

⁸¹ Lyle, John Tillman. *Regenerative Design for Sustainable Development* (1994)

conditions of the area in context,⁸² which in turn improves the quality of life of the people. Research also suggest that projects that included a lot of green and open social spaces in low-income neighborhoods such as the housing project in Chicago resulted in a significant improvement in the overall quality of life of inhabitants of the area.

With efforts such as the Anacostia Waterfront Initiative which have been put in place to regenerate and restore the Anacostia River and its environs, this thesis proposes a contribution to restore the Anacostia recreation center into a vibrant and active neighborhood recreation space with new and improved park facilities. I believe this will be a catalyst for development and regeneration of South East DC to improve the quality of lives in blighted neighborhoods.

The proposal provided by this thesis is just one example of how we can use the principles of regenerative design and biophilic design as tools for urban regeneration.



Figure 50: Perspective view of the Proposed Anacostia Recreation Center (Source: Author)

⁸² Hassan, Ghada Farouk. "Regeneration as an approach for the development of informal settlements in Cairo metropolitan (2012)

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