Urban Intervention Corps: Planting the Seeds of Collaboration

Abstract

The goal for this project was to provide Growing Pathways with a platform to promote collaboration among greenspace stakeholders. Development in Copenhagen is making it increasingly important to produce multipurpose greenspaces which incorporate both social and environmental benefits. Through our research, we have found that environmental scientists, planners and developers, and community outreach organizations must be represented in the design to gain these benefits. To analyze the greenspace development processes, our team interviewed representatives in each of the three stakeholder categories mentioned above. From these interviews, we analyzed collaboration processes through the creation of workflow diagrams and case studies. We learned that some perspectives of the stakeholders are not represented in the development process due to differences in values and uneven stakeholder inclusion. This lack of stakeholder perspectives causes many greenspaces to provide limited benefits to citizens and ecosystems. We developed a social mapping platform, Mapotic, with advanced filtering techniques in order to facilitate future engagement and collaboration to create multipurpose greenspaces. To foster collaboration, we recommend the driving stakeholder form a project team to incorporate all perspectives throughout development.

Team Members

Kristen Antunes

Taylor Bergeron

Alexander Johnson

Dante Mauriello

A Term
October 11th, 2018

Advisors

Professor Holly Ault

Professor Katherine Foo

Sponsor

GROWING PATHWAYS

WPI

Planting the Seeds of Collaboration

Climate change and development are prevalent threats to cities worldwide. Increased rainfall and greenhouse gas levels jeopardize the weather consistency, horticultural health, and overall environmental well-being of the city. According to urban ecologist Kevin Gaston, urban development escalates these problems because it creates impervious surfaces, which increase pollutants carried by surface runoff and decrease infiltratration.[1] Additionally, the global climate will continue to increase over the next century, causing rainfall to become more uneven and increase by 25-55%[2] The presence of urban greenspace helps cities to handle the overall impacts of climate change.

Nature found within cities contributes to ecosystem services, which are "the multitude of benefits that nature provides to society."[3] Ecosystem services are classified into four categories: provisioning services, supporting services, regulating services, and cultural services.

1. Provisioning services- The ability to provide food and raw materials.

2. Supporting services- Nutrient cycling and soil formation.

3. Regulating services- Climate control such as CO_2 management, pollination, and purification of air and water.

4. Cultural Services- Recreational and spiritual benefits to residents.

Figure 1: Ecosystem services

Ecosystem services are facilitated by the diversity among living organisms; this is known as biodiversity.[3] Multipurpose spaces incorporate many social and environmental benefits into a single space. They combine, for example, cultural services for residents and regulating services for the environment.

In cities, interdisciplinary groups of greenspace stakeholders interact to design greenspaces. However, they each focus on their respective priorities and this leads to a problem in collaboration. Collaboration is necessary to start conversations between project stakeholders, showcasing their priorities and principles, allowing them to understand the others' frame of reference.

For example, community outreach organizations ensure that the desires and opinions of the community is actively represented in the development and operation of greenspace. Environmental scientists prefer spaces with ecosystem health in mind. Planners and developers focus on creating visually appealing spaces that will attract residents. When these varied stances are not shared, gaps in knowledge are developed between the stakeholders, leading to the creation of greenspaces which provide limited benefits.

In order to maximize the productivity of a site, each greenspace should incorporate the perspectives and expertise of multiple stakeholders. Growing Pathways is a Copenhagen based organization that acknowledges the gaps between stakeholders and works to bridge them.

Community Outreach Organizations

Environmental Scientists

Planners and Developers
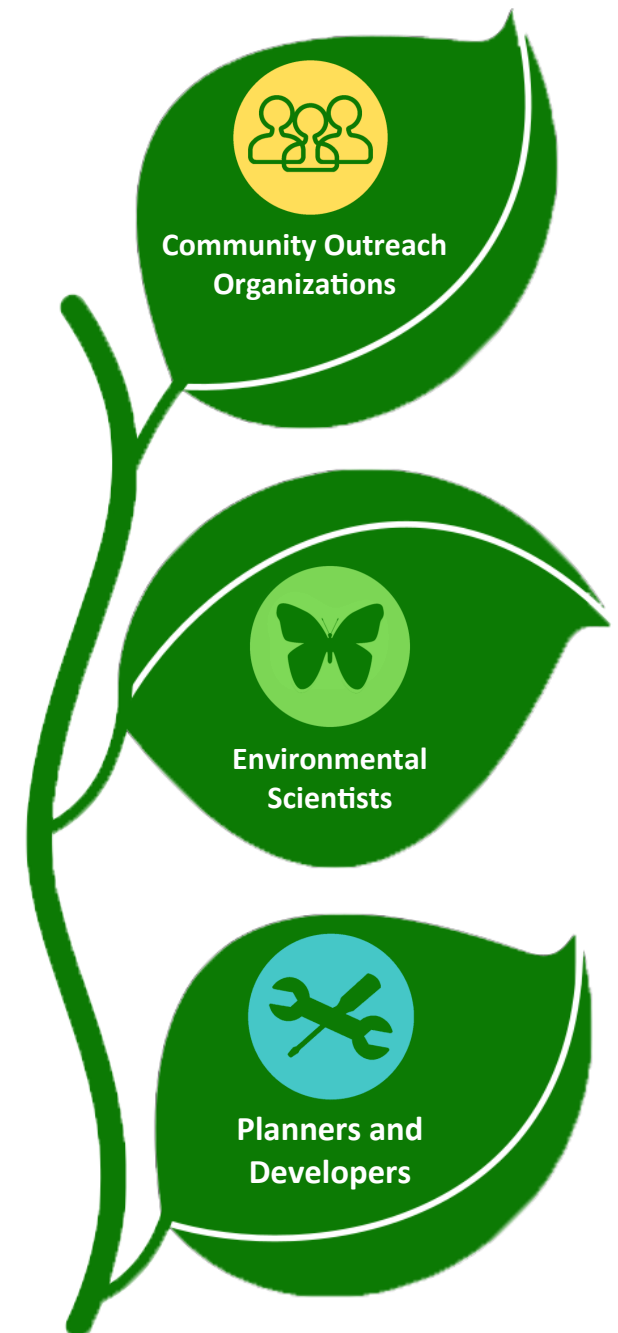
Copenhagen is a global leader in environmentalism and is dedicated to supporting green initiatives; however it still faces challenges associated with the effects of climate change and development.

To mitigate these effects, there is a growing need for collaborative solutions in the form of multipurpose greenspaces. To assist in this mission, our goal was to analyze and improve collaboration between the stakeholders through the development and use of an online collaborative platform.

We achieved this goal through the following objectives:

Objective 1: Plant the Seeds

Determine the principles by which different stakeholders develop greenspaces.

Objective 2: Encourage Growth

Analyze interdisciplinary collaboration through the construction and use of workflow diagrams.

Objective 3: Spread the Fruit

Develop a social mapping platform to facilitate interdisciplinary collaboration.

The following sections examine the deleterious impacts of climate change and development on urban areas and explain the ways in which diverse greenspaces help to mitigate these effects. Then we highlight the ways in which interdisciplinary stakeholder collaboration can produce different types of greenspaces with various benefits across Copenhagen.

Climate Change and Development Threaten Cities Across the Globe

Copenhagen is a global leader in environmentalism. The city has drastically cut down on carbon emissions in the city by placing a heavy emphasis on environmentally friendly modes of transportation, like the Metro and biking, which is already supported by the mindset of its residents. Copenhagen also has a large amount of greenspace, as "96% of Copenhageners live within 15 minutes' walk of a larger green or blue area."[2] However, Copenhagen's infrastructure has struggled to keep pace with the impact of rapid climate change. In 2011, the city was hit by massive rainstorms which resulted in overflowing storm drains, flooded streets, and damage costing billions of Danish kroner (Figure 2).[4]

Climate change and development threaten ecosystems in cities worldwide. In particular, climate change increases annual precipitation, through increased frequency and severity of storm events. Meanwhile, urban development increases carbon emissions and expands impervious surfaces, which increases flooding and stormwater runoff; therefore challenging urban stormwater management.[6] Stormwater runoff washes pollutants from

impervious surfaces into nearby bodies of water, which decreases water quality, impairs habitats, and increases costs of water purification.[1]

Development in cities also exacerbates the urban heat island effect. Urban heat islands are areas primarily dominated by buildings and roads with very little green present. Temperatures are higher in urban heat islands than the surrounding area, as there are little to no water pools or shade provided by tree cover. The problems created by climate change can be mitigated using multipurpose greenspaces.

Figure 2: Cloudburst flooding on a Copenhagen street, 2011[5]

Benefits of Multipurpose Greenspaces

Multipurpose spaces provide a wide variety of benefits in a single location. These benefits come in the form of ecosystem services: provisioning services, supporting services, regulating services, and cultural services

Regulating and supporting services benefit Copenhagen by decreasing the load on the city through natural processes. Greenspaces offset the negative effects of climate change, through the regulation of air and water. They provide rain beds that manage rainwater runoff, which helps reduce flooding and pollution. Plants and trees absorb CO_2 through photosynthesis and insulate buildings when planted in rooftop gardens, thereby reducing energy consumption and CO_2 emissions.[7] Since plants and trees provide shade and make urban areas up to 8°C cooler, they give people respite as heat waves increase.

Cultural services foster a sense of community and have a positive impact on mental health. Ulrich determined that natural views elicit positive feelings in people, boosting morale and reducing stressful thoughts and anxiety.[8] Cultural services, non-material benefits people obtain from ecosystems, create connection to nature and provide mental health benefits.

Community gardens are multifunctional greenspaces that provide provisioning and cultural services. They give residents access to locally grown produce, while also positively impacting mental health and building community connections. Community gardens give residents an opportunity to meet neighbors, discuss neighborhood issues, and learn about programs in the community.[9] People come together to maintain the gardens and establish goals, such as

ØsterGRO, An Urban Garden in Nørrebro[23]

growing, caring for, and harvesting the garden. An urban garden "creates a situation in which local residents are empowered to manage their own resources." In Copenhagen, the Nørrebro urban garden has created a stronger sense of community in active users of the garden.[9]

Another benefit of greenspaces is that they promote biodiversity within a city's ecosystem by giving a place for various plants and animals to inhabit. Biodiversity is a "variation in living nature, not just a varied selection of species but also a varied selection of genes, habitats and ecosystems."[1] Promoting biodiversity in cities will further improve the quality of ecosystem services. Biodiversity is an important regulator of ecosystem functions and ensures natural sustainability for all life forms.[10,11] A diverse ecosystem is healthy, and can better withstand and recover from a variety of disasters.[12]

Greenspace Rendering of Storm Water Management in Cities[22]

A Diverse Set of Greenspaces Provide Multiple Benefits

Greenspaces are categorized into four different groups: point-based, surfaces, patches, and corridors.

A point-based intervention (Figure 3) is a small-scale project that is inexpensive and easy to execute. These projects involve adding elements of nature throughout a city to enhance the beauty and presence of nature. For example, a tree can be planted to in an urban setting, like streets and sidewalks to provide cultural appeal, while also providing small scale storm water regulation. Other elements, like flowers, increase aesthetic appeal, enhance spaces, and bring nature to urban environments.

Green surfaces (Figure 4) are infrastructure in the form of green roofs and facades. These surfaces provide shade, causing buildings to absorb less heat. Since space is limited in cities, use of existing infrastructure allows nature to be added without taking up too much space.

Patches (Figure 5) are plots of green area that provide a habitat to wild species and benefit human users more effectively than a point space. Storm water runoff is better regulated through a patch space than a smaller point based space. Residents can also gain cultural appeal from patches as there are more opportunities for interaction within them. Furthermore, patches provide dwellings for small animals and different insects. More permanent living spaces for these organisms, and different size spaces help incorporate more biodiversity into the city while also providing spaces for people to use every day.

Point Intervention	Green Surface	Patch

Figure 3: Point-based[13]   *Figure 4: Surface[14]*   *Figure 5: Patch[15]*

Finally, corridors are linear elements of greenspace land that connect patches, like walking trails, streams, or animal paths (Figure 6). A corridor provides the benefits of patches and point-based spaces while providing animal and plant species a means to travel and spread throughout the city.

Richard Forman stated that urban patches and corridors of different sizes are integral in creating both habitats for urban wildlife and places of refuge for human beings.[16] A robust system of patches and corridors promotes biodiversity and creates a natural water management system.[16]

Corridor

Figure 6: Corridor

Greenspace Stakeholders: the Drivers of Change

Multidisciplinary collaboration ensures that spaces are designed to provide a variety of benefits to society and the environment. There are three major groups of experts involved in this process: planning and development groups, community outreach organizations, and environmental scientists.

Planners and Developers

Environmental Scientists

Community Outreach Organizations

Community outreach organizations work on environmental projects with an emphasis on the needs of the community. These organizations serve as a link between the community and the creators of the greenspaces. They also work with the municipality to ensure that the input of the local community is heard throughout the entirety of development.

Another subset of greenspace stakeholders are environmental scientists. To create a greenspace that benefits both humans and the natural ecosystem, environmental scientists must be consulted, as there is an "influence of human landscape modification on species distribution."[1] Beneficial greenspace design fits the needs of existing organisms through features that promote biodiversity.

The planning and development experts work with landscape architects and are involved with the design of spaces. Their input is valuable because they determine the majority of location and layout traits of the greenspaces. Depending on the ownership and location of the space, the development regulations and process of procuring funding change. Once funding is secured and the regulations are adhered to, the planning and development experts synthesize all the other stakeholders' information by creating the final greenspace design.

When stakeholders successfully collaborate, multipurpose spaces are developed that provide many benefits. An example of collaboration in action is Tåsinge Square (Figure 7), which was established in 2013 and is Copenhagen's first climate adapted urban area.[10] In a case study: the Think Tank on Climate Adaptation and Urban Nature called the space "an

Figure 7: Tåsinge Square a multipurpose greenspace in Copenhagen[10]

investment in rainwater management and improved city life," as this greenspace helps manage rainwater runoff, while also providing a connection to nature and an opportunity for relaxation.[7] Tåsinge Square reflects the perspectives of an interdisciplinary group of stakeholders, as a range of problems spanning diverse fields are mitigated. When various greenspace stakeholders share their expertise, collaboration occurs, and spaces are created with the environmental and social benefits in mind.

Achieving the level of collaboration seen in Tåsinge Square can be difficult and meeting the demands of all stakeholders can be a challenge, resulting in sites which only reflect a limited range of benefits. For example, Sundbyøster Plads Som Centrum is a wide open and vacant space which provides limited ecosystem services and contributions to biodiversity (Figure 8). Biodiversity features are lacking, as there are only a few different tree species surrounding the concrete development. There are no provisioning services, as none of the flora are edible. Visitors within the space find themselves within a unique position; they are surrounded by nature, but cannot interact with it (Figures 8 and 9). The absence of community involvement in Sundbyøster Plads Som Centrum demonstrates that cultural services are not sustained. Sundbyøster Plads Som Centrum is an indication of poor collaboration between stakeholders, as it is not multipurpose. It is not biodiverse and minimal ecosystem services are provided, to the point that is is currently being redesigned. Områdefornyelsen (area revitalization) Sundby is currently underway with projects to improve the area; spaces initially designed with a collaborative approach would be less likely to need subsequent attention.

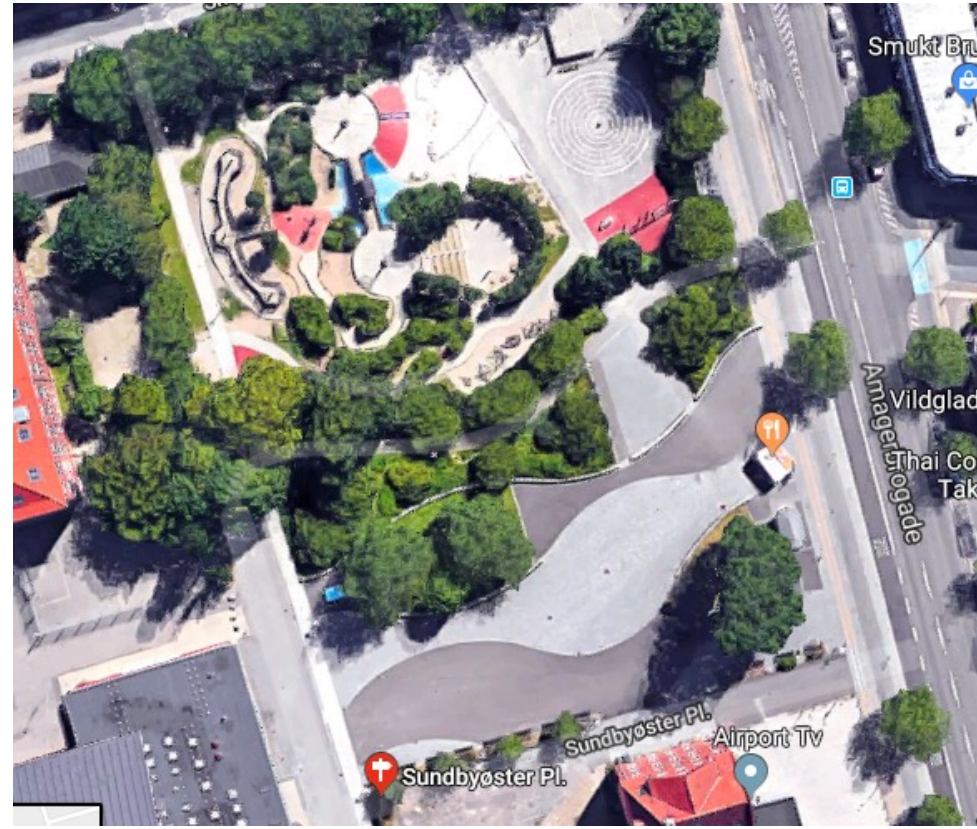*Figure 8: Sundbyøster Plads Som Centrum[17]*

Figure 9: Aerial Shot of Sundbyøster Plads Som Centrum

In order for greenspace collaboration to fit the changing needs of Copenhagen, gaps in stakeholder communication must be identified. Gaps occur when stakeholder input is either not taken into consideration or taken too late within the project timeline. Therefore, the spaces created do not include a variety of benefits and fall short of their maximum impact on the city. Each stakeholder possesses their own unique sets of knowledge, and it is important to know how these sets can be combined to create multipurpose greenspaces.

The effects of climate change and development are prevalent global threats. The threats can be mitigated through the benefits provided by multipurpose greenspace within cities. Multipurpose greenspaces are designed through the collaboration of interdisciplinary stakeholders and are the most effective way to provide ecosystem services to Copenhagen.

Growing Pathways recognizes the benefits involved in the creation of multipurpose greenspaces. Their organization aims to connect stakeholders through events and workshops, but would like to foster collaboration on a wider scale. To assist in this mission, we are using a platform called Mapotic as the tool to study the collaborative process in greenspace development. Mapotic is a collaborative mapping platform with different features that we will use to identify successes and challenges when stakeholders connect thereby improving the greenspace development process.

Contemplating Collaboration: Our Process

Our goal is to provide an online platform for Growing Pathways, to promote collaboration between greenspace stakeholders. To do this we will follow our three objectives:

1. Determine the principles by which different stakeholders develop greenspaces

2. Analyze interdisciplinary collaboration through the construction and use of workflow diagrams

3. Develop a social mapping platform to facilitate interdisciplinary collaboration

We executed our methods as shown in the flowchart to the right (Figure 10). First, our user surveys, interviews, and secondary research supplied us the perspectives of various stakeholder groups represented in greenspace sites. From our interviews, we analyzed the collaborative process through the construction of workflow diagrams and identified the problems and benefits associated with stakeholder collaboration. We created case studies to demonstrate that process in different sites. In our third objective, we developed a social mapping platform, as well as a test pilot for our sponsor, Growing Pathways to foster stakeholder collaboration.
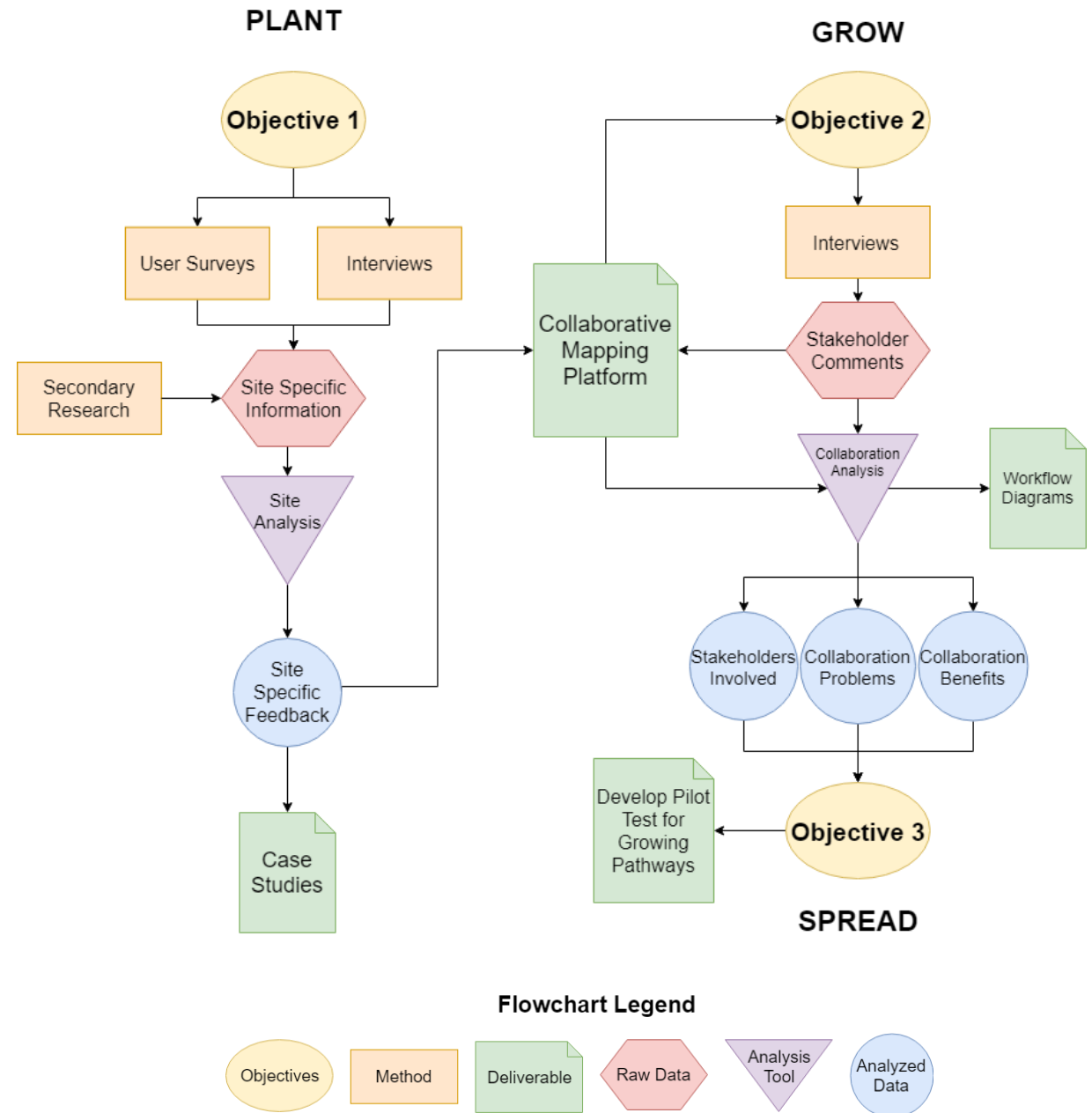

Figure 10: Methods Flowchart

Objective 1: Determine the principles by which stakeholders develop greenspaces

To accomplish this objective, we held semi-structured interviews with experts who work in the following fields: planning and development, community outreach, and environmental science. We interviewed four members of community outreach organizations, four planning and development professionals, and three environmental scientists. The purpose of the interviews was to gather different stakeholder perspectives about greenspace sites. We framed our interviews around stakeholders' perspectives and principles for site development. We asked interviewees about specific sites with which they had been involved, what types of stakeholders were involved, how they collaborated, and what challenges arose from collaboration (a list of full questions is located in Appendix F).

The site data were used to populate the mapping platform and we pulled specific quotes from the interviews to supplement the site description. Each pin includes the name of the site, the description, and a filter corresponding to the stakeholder who recommended and commented on the site.

The opinions and feedback of the greenspace visitors are an important and useful tool to greenspace project leaders. To provide this information, we conducted community surveys in three sites recommended by the interviewees. We surveyed greenspace users at sites of various sizes and locations. To get the most responses possible during our survey sessions, we chose times that people frequent greenspaces: the morning, and the afternoon after the workday had ended. Users within greenspaces were asked what they liked and disliked about the site, in addition to features they would like to see included in the future (Appendix D). We used a research instrument containing pictures of various greenspace features to spur creativity for the final question (Appendix E).

Objective 2: Analyze interdisciplinary collaboration through the construction and use of workflow diagrams

We also concentrated our interviews around the process of greenspace development to analyze interdisciplinary collaboration. We asked stakeholders about the development process from their perspectives with the intention of creating three workflow diagrams. For example, we started our interviews by asking interviewees about projects in which they were stakeholders. The interviewees were then asked to provide information about collaboration (a list of full questions is located in Appendix F).

We created three workflow diagrams, each from the perspective of a different stakeholder group: environmental scientists, community outreach organizations, and planners and developers. We categorized the interview data into "collaboration successes" and "collaboration challenges" for each of the main stakeholder groups and synthesized the data into the workflow diagrams. Trends found within the "collaboration challenges" category of each stakeholder perspective were identified as gaps. The diagrams and their phases were populated with the detailed information and steps for each group. These diagrams are not site specific; they are based on the stakeholder's general process. The workflow diagrams demonstrated the ways in which the groups collaborated, and more importantly where they failed to collaborate. We used case studies from the recommended sites to visualize how our discovered collaboration gaps manifest in the final development of specific greenspaces.

Objective 3: Develop a social mapping platform to facilitate interdisciplinary collaboration

Mapotic is an online tool which combines collaborative mapping with social media. The platform facilitates collaboration by providing a general forum for users, in addition to comment threads around specific location pins (Figure 11). The setup of our Mapotic consisted of three filters to categorize locations: community outreach organization, environmental scientist, planning and development experts. We used a Mapotic page to collect stakeholder collaboration information and test the viability of our platform. At the conclusion of each interview, we demonstrated how to use the Mapotic by adding a pin to the map for one or more of the greenspaces that the interviewee identified, and tagged it with the icon for their stakeholder group. We asked each interviewee about the map setup, how the map might be useful, and what could be improved.
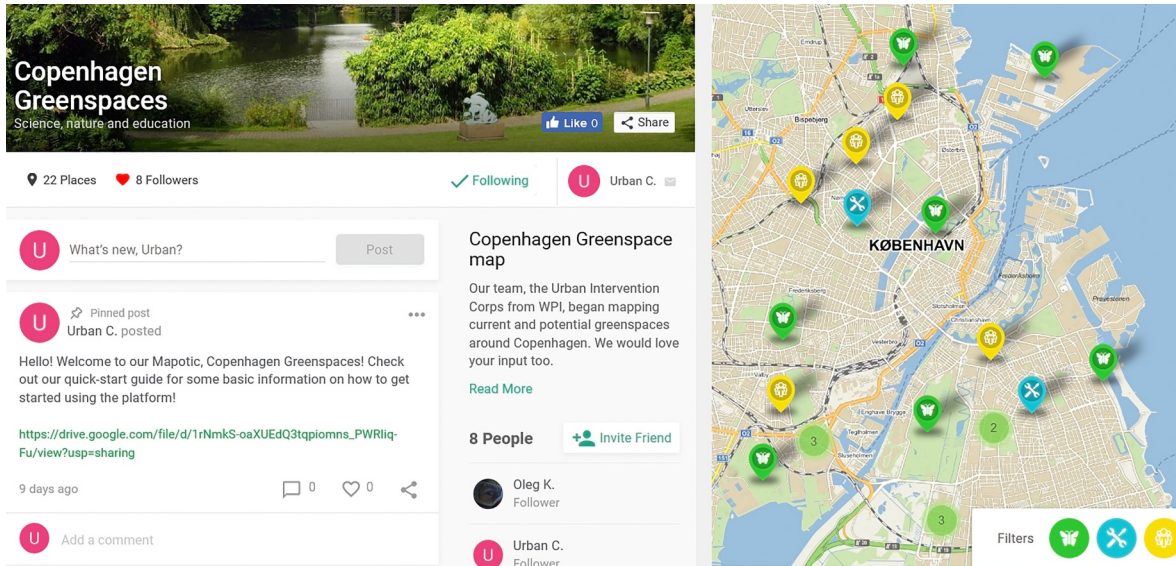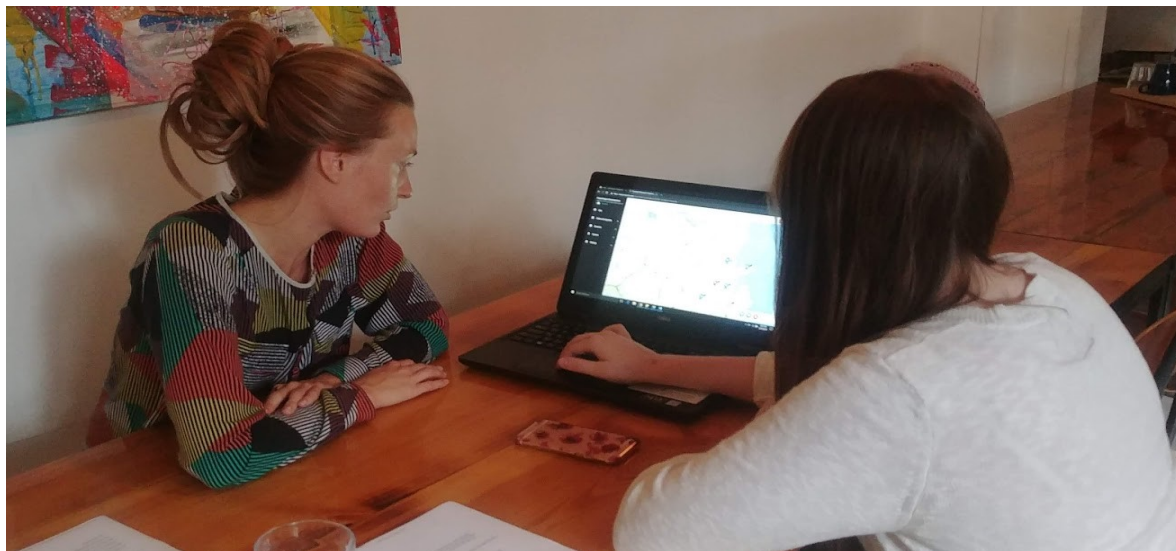
Figure 11: Mapotic forum and Mapotic collaborative mapping platform

Introducing an interviewee to Mapotic

Cultivating Collaboration

We gathered stakeholder perspectives around specific sites to identify greenspace value. In the end, we collected a diverse set of 22 sites in various parts of Copenhagen. We chose four sites to demonstrate the workflow diagrams: Mozarts Plads, Scandiagade, Metrohaverne, and Byparken (Figure 12). We chose Mozarts Plads, Scandiagade, and Metrohaverne because they align with our workflow diagrams, represent different driving stakeholders, and demonstrate collaborative gaps during project development. We chose Byparken because it is an example of a multipurpose greenspace that was developed with strong stakeholder collaboration.

Figure 12: Map featuring our four case studies

Planning and Development Group Perspective

The first workflow diagram shows the perspective of the **planning and development group** (Figure 13) and demonstrates the process that they follow during greenspace development. Planners and developers are usually brought into the project after initial goals are established. The planners and developers collect information about the needs of the site from the residents and community outreach organizations. A preliminary design is brought to the neighborhood residents to ensure it reflects their needs and site development begins. Through our interviews with this stakeholder group, we observed two gaps where they have difficulties communicating with other stakeholders.

The first gap in collaboration that we observed was between the environmental scientists and the planning and development group (Item 1 in Figure 13). The environmental scientist perspective is often not represented in site design plans. Numerous interviewees in the planning and development group reported that they did not consult an environmental scientist in the project development. When asked this lack in collaboration, a landscape architect said "we don't communicate with or collaborate with any biodiversity experts, it's a budgetary problem." When cost concerns prevent environmental scientists from entering a project, biodiversity benefits are lost.

The second gap that we observed was between the planning and development group and the neighborhood residents (Item 2 in Figure 13). Initially, input from the neighborhood residents is usually considered, but their input may be lost as the project develops. One greenspace site that illustrates this gap in collaboration is **Mozart Plads.**
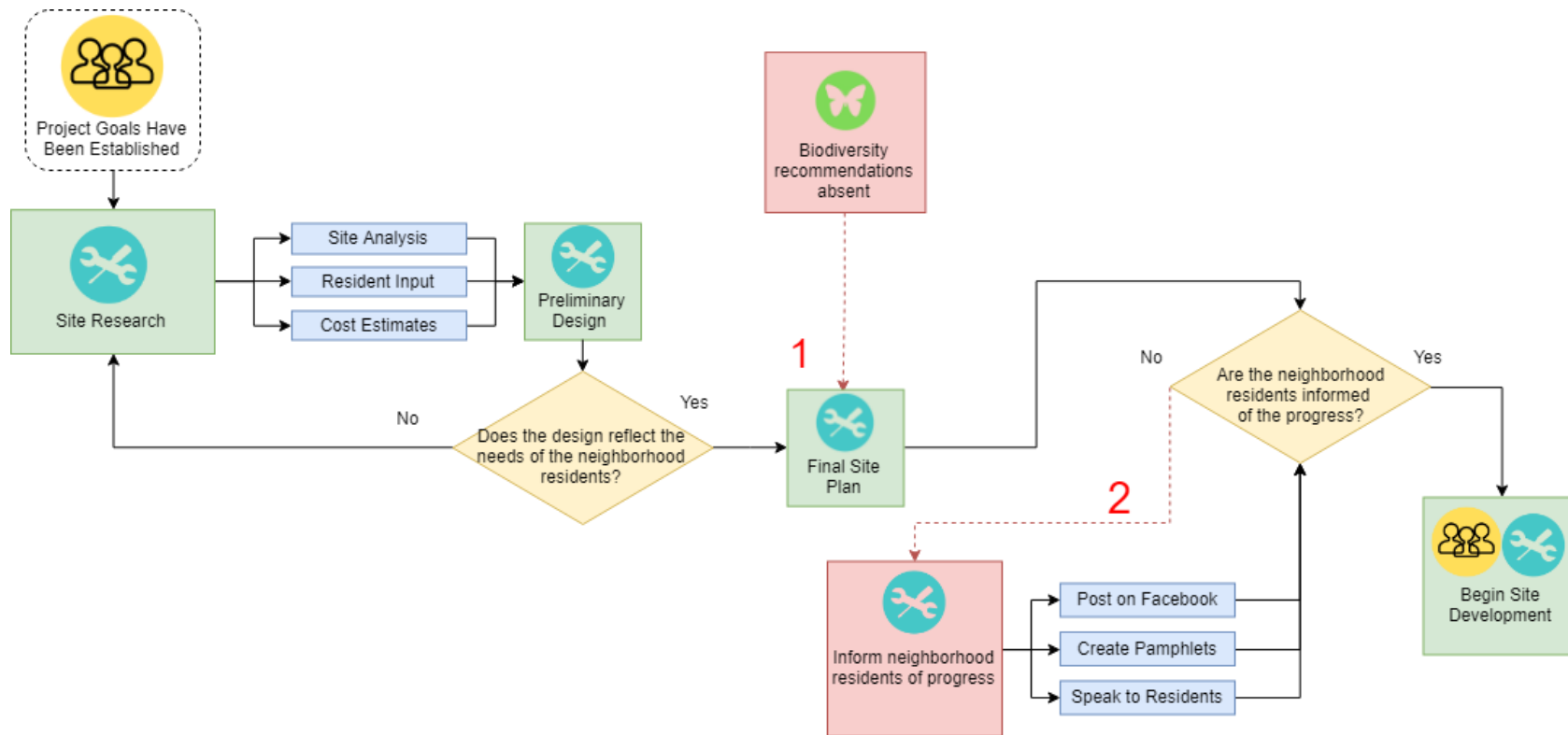

Figure 13: Workflow diagram representing the planning and development perspective

Mozart Plads

Mozart Plads is a pocket park located in central Sydhavnen that was revitalized in 2014 by a planning and development group; a small greenspace was built from a mostly concrete space. The planners and developers did not collaborate with the other greenspace stakeholders. Instead, they took on responsibilities of other stakeholder groups in an effort to include multiple perspectives. Without this multidisciplinary collaboration, limited benefits were provided by the space created.

In Mozart Plads, the lack of biodiversity is shown by the collection of homogeneous trees and greenery (Figure 14). A biodiversity expert commented that "planting the same tree over and over again offers very little to the surrounding ecosystem." The landscape architect that worked on the space said they did not have any connections to environmental scientists. Even though the landscape architect saw the value in biodiversity, he lacked access to a network that would provide him with biodiversity knowledge.

> **"We didn't have the connections"**
> *- Landscape architect who worked on Mozarts Plads*

The developers of Mozarts Plads also did not collaborate with a community outreach organization. A member of a community outreach organization, Områdefornyelsen Frederiksberg, explained the value of gathering

Figure 14: Monocrop trees in Mozart Plads[18]

input from a diverse group of residents. In an interview with a landscape architect involved with the project he stated that only a few people were surveyed, and only at the site. Other local residents were not included in the surveys, or informed for the remainder of the project. To make matters worse, many residents of Sydhavnen held extreme disdain for the usual denizens of Mozarts Plads, calling them "alcoholics," "drunks", or "the usual crowd." Therefore, the surveys of the architects not only represented a limited perspective, but a wrong perspective in the eyes of many Sydhavnen residents. The resident input was not thoroughly represented because a community outreach organization was not utilized by the planners and developers. Although the space met the goal of the architects, beautifying the area, it was met

with resentment from many local residents who felt marginalized and underrepresented throughout the process.

The shortcomings found within Mozarts Plads stem from the driving stakeholder, the architects, taking on responsibilities which fell outside of their expertise. The landscape architect we interviewed stated while he would have liked to collaborate with other stakeholders, he had a difficult time finding other groups to assist in the project.

> **"I just went out and talked to them myself."**
> *- Landscape Architect who worked on Mozart Plads*

Environmental Scientist Perspective

The next workflow diagram that we built was based on the environmental science perspective. We created this diagram from multiple interviews with three biodiversity experts (Figure 15). The environment scientists are brought in by other stakeholders for recommendations. To measure biodiversity in a current space, environmental scientists complete a thorough analysis of the current ecosystem. They then provide project recommendations about how to support the ecosystem and encourage biodiversity. A gap in perspective and value (Item one in Figure 15) that often exists within projects is that the environmental science recommendations are not included within the project.

Value gaps like this occur because other stakeholders don't usually see worth in the contributions of environmental scientists, particularly relating to biodiversity. Environmental scientists will give input and design ideas to teams working on the project, and other stakeholders will simply cast aside this input, choosing aesthetic or simplicity instead. A greenspace project that illustrates this gap is **Scandiagade**.
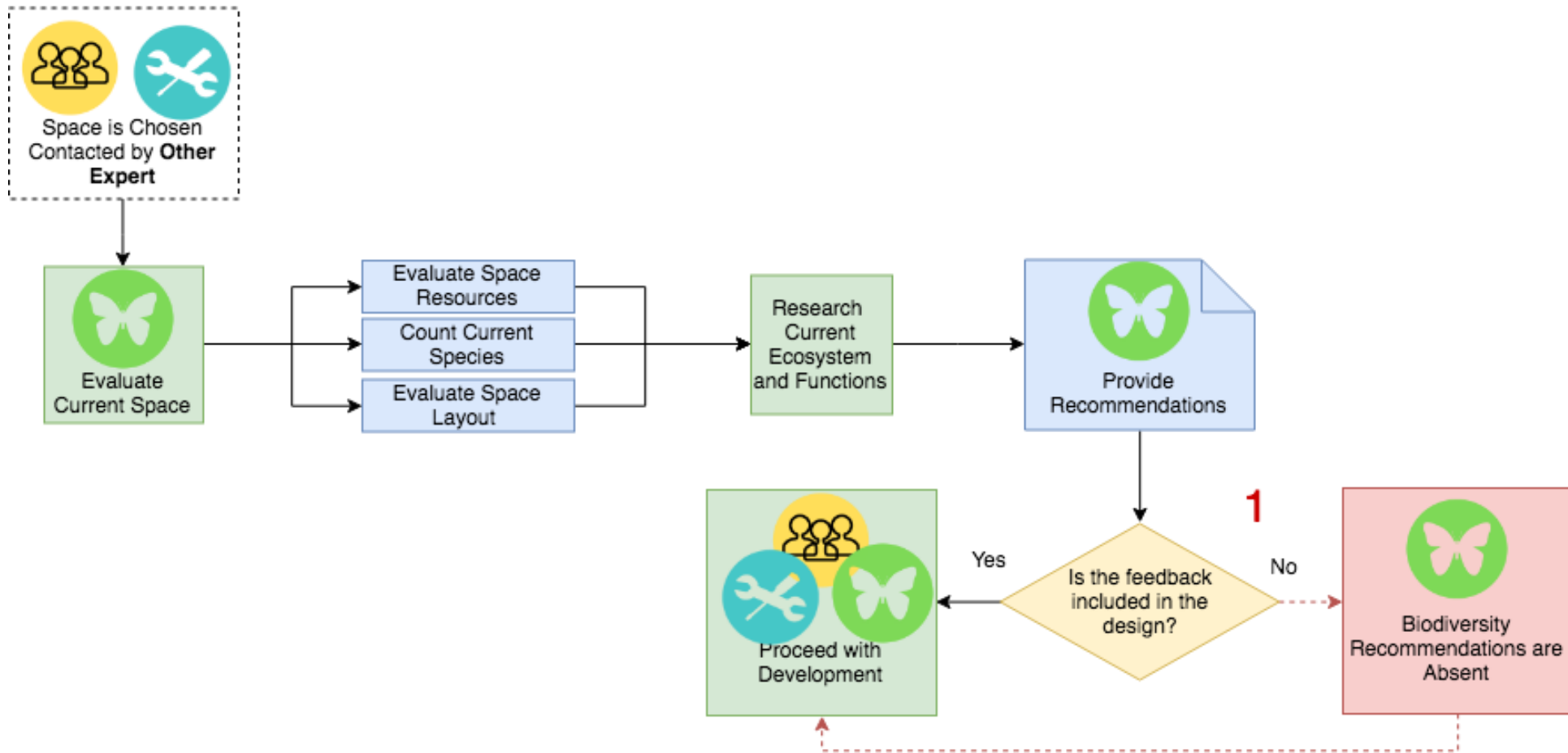

Figure 15: Workflow diagram representing the environmental scientist perspective

Scandiagade

A recent contest solicited designs for the revitalization of a street in Sydhavnen that has a large stretch of greenspace between the two lanes of traffic. The goal of the contest was to provide new areas of recreation, as well as to include climate adaptation features that would facilitate stormwater management. A contest requirement was to include basins designed to collect excess rainwater and prevent flooding (Figure 16). The local Municipality formed project teams to design spaces for the competition, consisting of people from different stakeholder groups.

A biodiversity expert who worked on one of these project teams noted that this was one of the few projects where environmental scientists were brought in early. Although there was collaboration between multiple stakeholders, their design was not selected. The plan of the scientists was too expensive and involved plants that were not readily available. The chosen plan was less expensive and more aesthetically focused, but it did not include any biodiversity features. According to the biodiversity expert, the Municipality "only cares about what looks good and is cheap," and that it's "much easier to just shop out of a catalog." According to the environmental scientist, finding local plants tends to be more expensive up front, but "costs less money to manage for processes that are natural over long term." Unfortunately, this cost structure is not well understood or prioritized amongst

The Municipality "only cares about what looks good and is cheap," and that it's "much easier to just shop out of a catalog."
-Biodiversity Expert

project leaders, as they prefer a low initial cost for the project. The biodiversity expert commented that the plants included in the chosen design contribute nothing to biodiversity of the space, grow aggressively, are hard to manage, and act as an invasive species. Although there was an opportunity to include biodiversity experts, their input was overlooked due to a lack of understanding of cost structure.
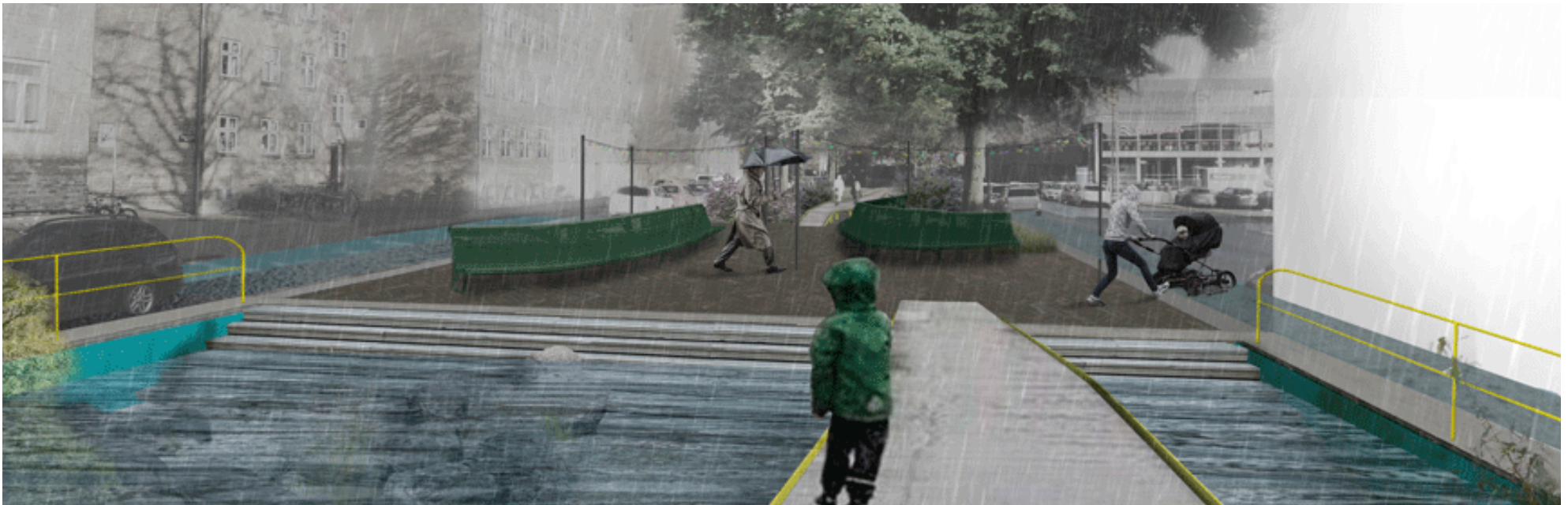

Figure 16: Rendering of the final design displaying climate adaptation features[20]

Reaching Out to the Community

Another workflow diagram we created was from the perspective of the **community outreach organizations** (Figure 17). The community outreach organizations often propose a space for revitalization and reach out to the residents to identify their interests for the greenspace. The community outreach organizations host open meetings and use social media to gather ideas for the space. The organization then does research on the feasibility of the idea to present to other stakeholders.

Through our interviews with this stakeholder group, we learned about the gaps between the community outreach organization and the community residents (Item 1 in Figure 17). Resident input often begins to drop out after the initial idea for the greenspace is created. The community outreach organizations fail to maintain community engagement after the completion of the project and residents lose interest. The gap creates underutilized spaces that, even though they aren't being used, still cost money to maintain. A member of the Områdefornyelsen Sydhavnen said that keeping the residents interested allows for project goals to grow; however, when the residents are disengaged, the project rests solely on the project initiator for support. The community never aids in the upkeep or usage since they weren't involved in the final steps and the consequent hand-off process. One space that demonstrates this gap is **Metrohaverne.**
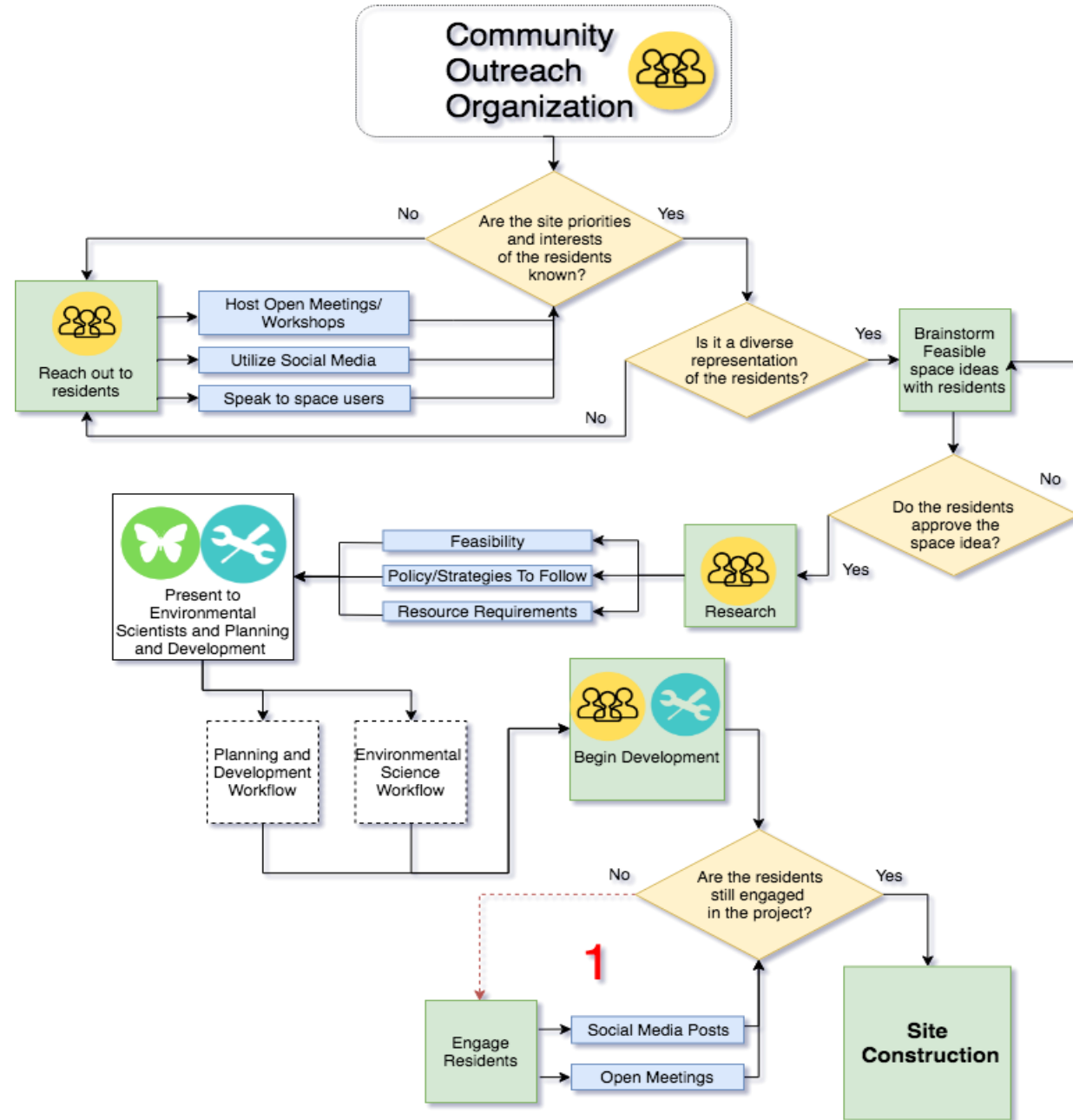

Figure 17: Workflow diagram representing the community outreach organization

Metrohaverne

Metrohaverne is a small garden located below the metro line in Ørestad and built by the Grundejerforening, or the landowners association. The Metro line often creates space that is unable to be developed due to land ownership and accessibility so the landowners association worked hard to secure this space for the project. The landowners association added greenery in the space, as well as planters for the community garden.

After the completion of this project, the landowners association did not make an effort to actively involve community members within the space. This resulted in a set of residents who were initially engaged in the project, but lost interest in the site. Since the landowners association did not make an effort to create a team of active community members around the space, residents did not take active ownership of the community garden after the initial group left. This left empty, disregarded planters in the community garden (Figure 18). In relation to community involvement within gardens, a member of the Områdefornyelsen Frederiksberg emphasized the importance of forming community associations. Community associations prevent the problems faced by Metrohaverne by creating a larger group of involved residents. The community garden

Metro in Ørestad[24]

association in Frederiksberg currently has 23 members with 6 members on the waiting list. The Grundejerforening continues to maintain the greenery bordering the space, but the public planters are barren.

In order to get the community interested in this space again, they have plans for 2019 to bring in a professional urban gardener. They will hold a workshop in the space, showing the community how to care for it, and the benefits of urban gardens. These plans stem from the collaboration between the urban gardener and the community for the edible garden section in **Byparken**. The residents now run the edible garden, and the landowners association plans to implement this education and handoff process in Metrohaverne.

> **The community outreach organizations fail to maintain community engagement after the completion of the project and residents lose interest.**

Figure 18: Empty planters in the Metrohaverne community garden.

Byparken: A Model for Multidisciplinary Collaboration

Byparken exemplifies a multipurpose space that was built through collaboration. It provides benefits to the neighborhood residents, as well as the ecosystem. This project began as a plot of barren land along a popular commuting path from a newly developed apartment block to the nearest Metro stop. In 2008, the management of the park was transferred from the city of Ørestad to the landowners' association who launched a series of improvements from 2008 to 2015 (Figure 19).

The area was again improved between 2015-2017 by the SLA architecture firm with the intention of including more wild nature within the city of Ørestad. To achieve this goal, biodiversity features were added to the park. A walking path flanked by various species of trees, shrubs, and groundcover bisects the area. The path is less manicured than the rest of the park and makes the user feel like they are walking along a forest trail. SLA utilized in-house environmental scientists to develop the biodiversity features.

The expertise manifested itself through many areas within the park that require less maintenance, and appeared more "wild." Two biodiversity experts praised the practice of leaving fallen or cut down trees, instead of removing them to increase aesthetic
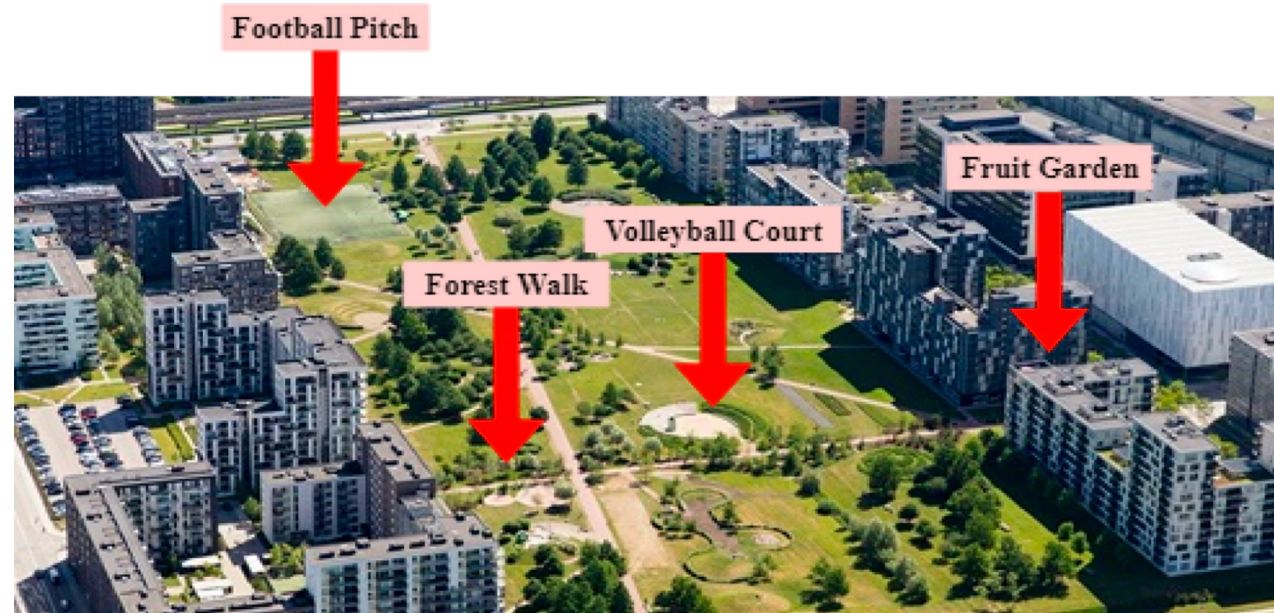

Figure 20: Deciduous forest with degrading tree

Figure 19: Comparison of Byparken before and after revitalization[21]

Deciduous forest with wild nature

Byparken playground with natural elements[25]

> **Two biodiversity experts praised the practice of leaving fallen or cut down trees, instead of removing them to increase aesthetic appeal.**

appeal. When fallen trees are not removed, they decompose slowly. A biodiversity expert we interviewed said "plant decomposition provides essential nutrients for the growth of new organisms," which leads to more biodiversity features growing in the space. In Byparken, this tree was left along the path to support the local ecosystem (Figure 20).

Byparken exemplifies a space where the community was involved throughout the entire development process. A representative of the Ørestad Grundejerforening explained how to represent the entire community with a condensed working committee. Before development began, the committee drafted the desired benefits to be included within the space before finding a design firm. The committee is still active and any resident is free to join to provide direct influence in the vision of projects. The success of this collaboration results in widespread resident engagement and usage of the park. Residents join football and volleyball leagues at the park, bring their kids to the playground, and contribute to a community fruit garden.

> **Residents join football and volleyball leagues at the park, bring their kids to the playground, and contribute to a community fruit garden.**

> **The landscape architect view is represented in the various structures in the park, such as the elevated green steps for aesthetic appeal.**

The architecture firm used in the project, SLA, was the main driving force of the project after the needs of the community board were understood. Their landscape architect view is represented in the various structures in the park, such as the elevated green steps for aesthetic appeal. The community was kept up to date through board meetings and social media posts. In this project, SLA brought in players from all stakeholder groups from the beginning. This allowed all stakeholders to collaborate and give their input before any designs were made.

Mapotic

As seen in Byparken, collaboration is imperative for multipurpose greenspaces to be formed. An effective mapping platform, tailored to the stakeholders needs, will help facilitate conversation between the stakeholders around sites. Our stakeholder interviewees provided us with information about the desired functionality of a platform that would facilitate collaboration. They advised that for the community to take hold of the platform, it must be user friendly and accessible. Interviewees also recommended that the platform include collaborative mapping features such as cross categorization of spaces using different filters and attributes and the ability for users to leave feedback on sites.

Many interviewees commented that having the stakeholders as a filter was confusing. The word filter lead interviewees to think about the type of area being pinned. They thought the three main stakeholder filters were where those three main stakeholders offices were, not that the stakeholder was the initiator of the sites being represented.

From the information we received, we changed our filters so the one assigned to a pin no longer represented the stakeholder who initiated that space's development. Instead, the filters will represent the different types of natural spaces found in cities. (Figure 21).

The attributes field, also known as advanced filtering, will further classify the space. We implemented three attribute filters, which are each multiple choice (Figure 22). The advanced filter "Expertise Represented" includes a list of the three stakeholders. This is more effective for portraying what stakeholders were involved in the site's creation, as more than one stakeholder can be checked off in the filter. "Flora Present" includes a list of common types of plants found in greenspaces. Finally, "Site Features" includes various physical features commonly found in greenspaces, such as walking parks, football pitches, or playgrounds. The further categorization of the space allows the users to find sites they would like to collaborate on quickly and easily.

Mapotic is an impactful tool that can connect stakeholders through site specific conversations; however, this does not mean that it is without limitations. Mapotic cannot replace the face-to-face interaction that must occur to produce multipurpose greenspaces. Stakeholders must physically interact with others to learn about and address the social issues and budgetary concerns surrounding a space. However, they can supplement in person meetings and promote early collaboration through online conversations.
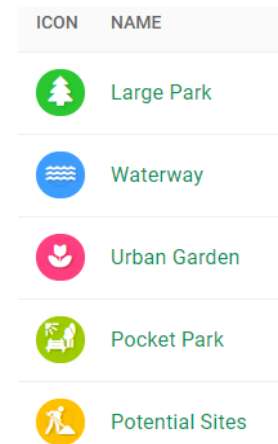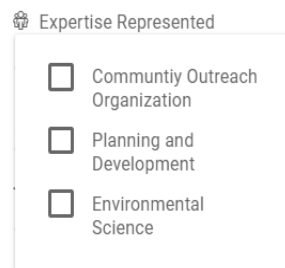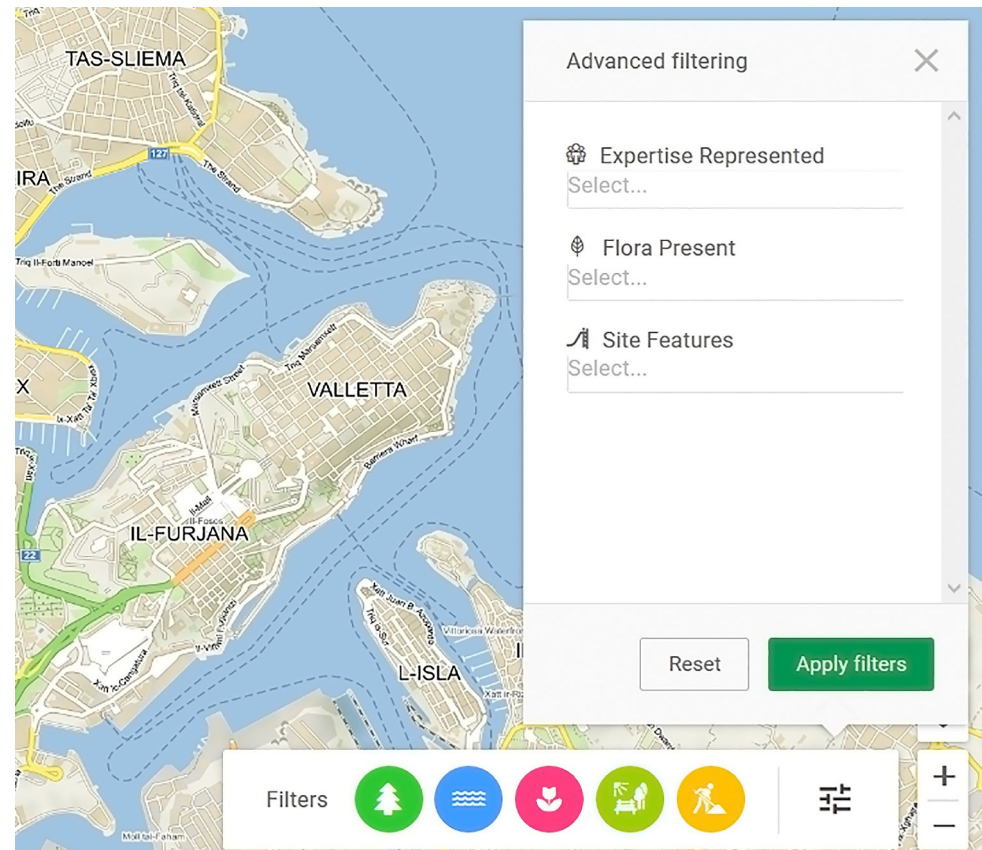

Figure 21: Mapotic Filters

Figure 22: Attribute Filters

Screenshot of Mapotic Platform with filters and attribute filters included

Projects with limited benefits waste time and money, as well as valuable greenspace within Copenhagen. The gaps in collaboration we identified have caused greenspaces to be developed which provide limited benefits. Stakeholders are included during different phases of the project, and sometimes are not included at all, causing certain perspectives to be excluded in the space. Collaboration between all stakeholder parties is needed to create multipurpose greenspaces and help those sites meet their full potential to benefit the community and the environment, and this collaboration can be started using platforms like Mapotic and facilitated through the following recommendations.

Stakeholders collaborating

Recommendations for Increasing Stakeholder Collaboration

Greenspace drivers should involve all greenspace stakeholders at the beginning to form a project team.

To promote collaboration in the initial stages of the project, we recommend that the driver of the greenspace project form a project team before designs or development begin. The driver of the greenspace development should initiate a project team that includes a representative of each stakeholder group. The project team model promotes trust between stakeholders and ensures each perspective is represented throughout the project, resulting in multipurpose greenspaces. Through collaboration of the project team, each stakeholder will be educated on the perspectives of other stakeholders and benefits of multipurpose greenspaces.

Growing Pathways should test the Mapotic platform through a pilot map.

To gain insights for improving the Copenhagen Mapotic platform, we recommend that Growing Pathways test a pilot map at a conference they are attending in Valletta, Malta. The conference will be attended by individuals from across the world. We recommend that Growing Pathways send the platform to the organizers of the conference so that it can be distributed to attendees before the event. Attendees should be asked to map three places in the following categories: places that mean the most to you in the city you live in, places you would like to add urban nature value, and three places about which you have particular knowledge/experience. Users should also be prompted to leave comments on locations within the previous categories. Growing Pathways should use this test to indicate how users interact

with the platform with limited guidance and build an understanding of what online collaboration will look like.

During the conference, we recommend that workshops are held where attendees who used the platform can ask questions and provide recommendations. Growing Pathways can use the results of the workshops to make improvements to the platform before it is implemented in Copenhagen. They should gather user feedback specifically on the general filters and advanced filters. This feedback should include filters to add or delete, as well as multiple choice options to add within the advanced filters. For analysis, we recommend investigating how users interact with the map filters, as well as the general forum to see if any features should be added. Once the conference ends, we recommend using this information to refine the platform, making it more effective when it is *released* to their local network Copenhagen.

Sources:

1. Gaston, K. J. (2010). Urban ecology. In K. J. Gaston (Ed.), Urban ecology (pp. 1-9). Cambridge: Cambridge University Press.10.1017/CBO9780511778483.002 Retrieved from https://www.cambridge.org/core/books/urban-ecology/urban-ecology/C03C352300D5F3A86F0C7E6D3394DE36

2. European Green Capital (Rep.). (2014). Luxembourg: European Union. doi:10.2779/31690

3. Ecosystem Services & Biodiversity (ESB). (n.d.). Retrieved from http://www.fao.org/ecosystem-services-biodiversity/background/cultural-services/en/

4. Koefoed, O., & Paludan, K. L. (n.d.). Wiring the Wildlings (Rep.)

5. Melbye, T. (2011, July 2). Flood in central Copenhagen [Photograph]. Copenhagen.

6. Denmark country briefing - The European environment — state and outlook 2015. (2017, September 27). Retrieved from https://www.eea.europa.eu/soer-2015/countries/denmark

7. Climate Adaptation and Urban Nature [Pamphlet]. (2016). Copenhagen, DK: City of Copenhagen.

8. Ulrich, R.S. (1984). View through a window may influence recovery from surgery. Science 224: 420–421

9. Community gardens in Copenhagen. (n.d.). Retrieved from http://danishdesignreview.com/blog/2015/5/3/community-gardens-in-copenhagen

10. GHB Landskabsarkitekter. (n.d.). Retrieved from https://ghb-landskab.dk/en/projects/taasinge-square

11. Biodiversity for Food and Agriculture. (n.d.). Retrieved from http://www.fao.org/agriculture/crops/thematic-sitemap/theme/biodiversity/en/

12. Ecosystem Services & Biodiversity (ESB). (n.d.). Retrieved from http://www.fao.org/ecosystem-services-biodiversity/background/cultural-services/en/

13. Houston Street Gets Tree-mendous New Sidewalks. (2011, April 12). Retrieved from https://nyc.streetsblog.org/2007/12/03/houston-street-gets-tree-mendous-new-sidewalks/

14. Evans, G. B. (2010). Europe in bloom living facade, Kongens Nytorv, Copenhagen, Hovedstaden Region, Denmark [Photograph]. Copenhagen.

15. Søndermarken. (n.d.). Retrieved October 10, 2018, from https://www.visitcopenhagen.com/copenhagen/sondermarken-gdk987556

16. Forman, R. T. (2008). Land mosaics: The ecology of landscapes and regions. Cambridge: Cambridge University Press.

17. Denmark, Områdefornyelsen Sundby. (2017). Sundby For Alle.

18. Fountain at Mozart's Square [Web log post]. (2008, September 18). Retrieved from http://springvand.blogspot.com/2008/09/springvand-p-mozarts-plads.html

19. Fountain at Mozart's Square [Web log post]. (2008, September 18). Retrieved from http://springvand.blogspot.com/2008/09/springvand-p-mozarts-plads.html

20. Park og skybrudssikring i Scandiagade. (2018, February 01). Retrieved from http://atkins.dk/nyheder/park-og-skybrudssikring-i-scandiagade/

21. Hele Ørestads Bypark Fylder 10 År - Og Er Stadig I Udvikling. (2018, June 13). Retrieved October 8, 2018, from http://www.orestad.dk/presse/nyheder/2018/hele+restads+bypark+fylder+10+r+-+og+er+stadig+i+udvikling.aspx

22. Aprilausgabe: Platz für alle. (n.d.). Retrieved October 11, 2018, from https://www.garten-landschaft.de/gl-im-juli17-klima-materialien/

23. A Shrub Grows in Copenhagen: A Look at Urban Farming. (2017, February 07). Retrieved from http://www.scandinaviastandard.com/a-shrub-grows-in-copenhagen-a-look-at-urban-farming/

24. Metro, Local Transport, Orestad, Island Amager, Copenhagen, Denmark, Scandinavia Photographic Print by Axel Schmies. (n.d.). Retrieved October 11, 2018, from https://www.allposters.co.uk/-sp/Metro-Local-Transport-Orestad-Island-Amager-Copenhagen-Denmark-Scandinavia-Posters_i14630155_.htm

25. Legepladserne i Ørestad Bypark. (n.d.). Retrieved October 11, 2018, from https://bornibyen.dk/aarhus/places/18257-legepladserne-i-oerestad-bypark

Supplemental materials for this project can be found at:

https://wpicpc.org