RE-PROTECT

a new sustainable flood control system

DETROIT

Gaia Cavallero

Having reached the end of this journey, I would like to thank all the people who have accompanied me up to here through their support. The first people I want to thank are my parents, Valeria and Francesco, my brothers Sofia, Marylanda and Dejan and all my family who through their love have given me strength.
Thanks to Professor Ingaramo who, through her support and constant availability, helped me in the drafting of this thesis Thanks to my friends and to all the people who continue to share with me every day.
Gaia

Politecnico di Torino
Architecture for the sustainable project

February 2021

RE-PROTECT DETROIT

a new sustainable flood control system

Professor: Roberta Ingaramo
Student: Gaia Cavallero

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SUMMARY

RE-Protect Detroit a new sustainable flood control system is a research work that should have been developed in the United States at the Lawrence Technological university of Detroit.
Due to the global pandemic, the thesis work was carried out by Italy.
The thesis work mainly concerns the Jefferson Chalmers neighborhood, an area situated in the east side of Detroit.
The theme underlying the paper is the one of floods as a direct consequence of the impacts of climate change.
The thesis work was developed starting from the problems that the city of Detroit has to face trying to find a sustainable solution. Consequently, a sustainable water control system has been devised by exploiting as much as possible the resources that the city offers, such as the large number of vacant lots
The city of Detroit is expected to face more and more consequences of climate change, in particular a temperatures rise.
Jefferson Chalmers is one of the neighborhood most prone to flooding,infact here flood is a result of a combination of factors: historically high water levels in the Great Lakes, weeks of heavy rain, the low-lying nature of the area itself and a lack of adequate flood control tools.
In addition, as many other amercian cities, Detroit is characterized by the presence of combined sewer system and it means a problem. This system requires that rainwater is drained into the same pipes that lead to the city's wastewater treatment plant. During periods of heavy rainfall or snowmelt, the wastewater volume in a combined sewer system can exceed the capacity of the sewer system or treatment plant. These overflows, called combined sewer overflows (CSOs), contain not only stormwater but also untreated human and industrial waste, toxic materials, and debris and theese are one of the main pollution factors of the Great Lakes.

The project is therefore based on others aims: to reduce the volume of stormwater present in the neighborhood during storms events ; to make a greener neighborhood and improve the quality of life of Jefferson Chalmers population.
The thesis is divided into several chapters: the first one describes the history of the city of Detroit, analyzing and reporting its repeated transformations. In the final part of this chapter, the present-day city is introduced like a city in continuous transformation with a sustainable view.
This concept introduces also the theme of urban agriculture, increasingly widespread in particular in large American cities. Urban agriculture represents an important and effective flood control tool that at the same time brings several benefits to the community.
The second chapter examines the underlying theme of the thesis, which is the impact of climate change on the city and consequently the phenomenon of flooding related to green infrastructures as a flood management tool.
The last part of the thesis is focus on the Jefferson Chalmers neighborhood, located in the east side of the city of Detroit. Following a careful analysis of the territory and the problems that characterize it. The project is based on the design of a sustainable flood control system for Jefferson Chalmers.

1.THE CITY OF DETROIT AND ITS REBIRTH

THE DEVELOPMENT OF THE CITY OF DETROIT UNTIL ITS DECLINE

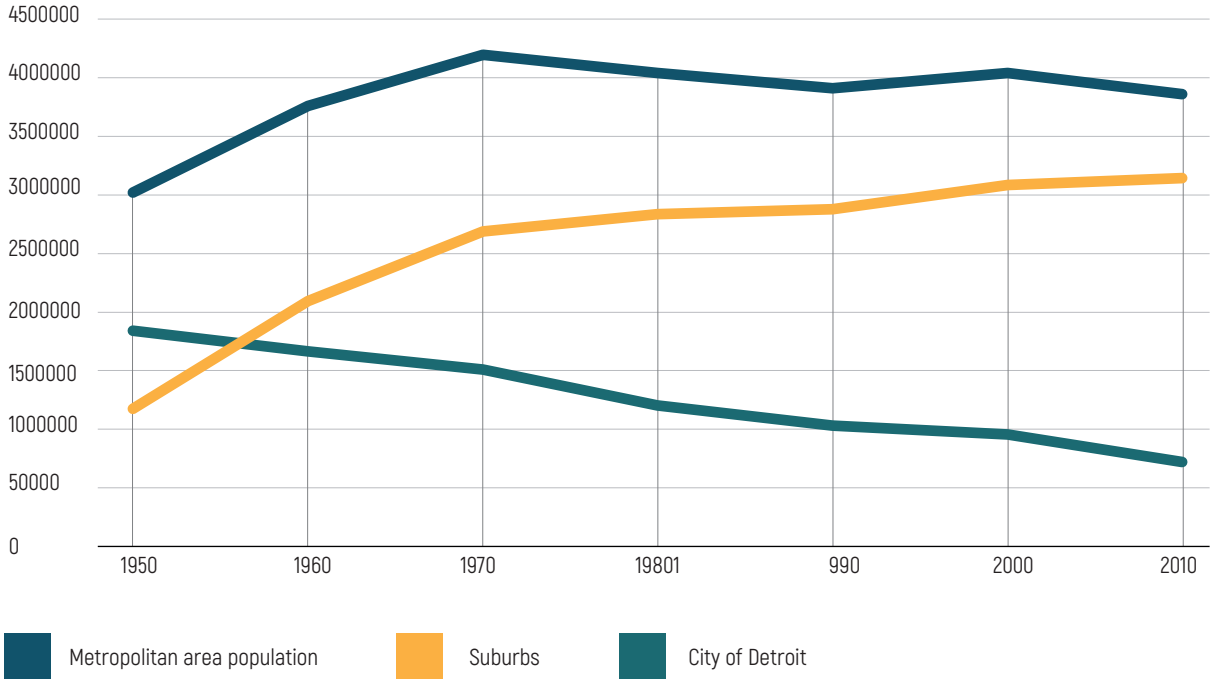
The city of Detroit in history was characterized by several events and phenomena that led the city to a strong need for change. Detroit at the end of the nineteenth century represented an important commercial center characterized by strong economic and demographic growth.
At the beginning of the XX century Detroit was one of the largest cities in the United States with one of the fastest growing urban centers. The city recorded a large portion of non-native speakers but the first 20 years of 1900 were those that saw one of the main migratory flows, people migrated to the area in search of jobs.
(Dessantis, 2017)
Given these large migratory flows, attempts were constantly made to "americanize " foreigners but despite this, discriminatory practices were undertaken against the black population with the consequent formation of forms of extreme racism such as the Ku Klux Klan sect. Large sections of the population were closed in an obtuse and fanatical defense of the values of the white and Protestant civilization.(Sabbattucci, Viddotto, 2008)
In years there was a more and more increase in population thanks to the fame that the city had in the first decade of the 20th century. Detroit became the main center of the automotive industry thanks to the foundation of the Ford Motor Company, the creation of an innovative car model and the foundation of another car manufacturer, the General Motors.(Rosenberg, Mowery, 2001)

Motor city
Source: web

An important development factor for the city on an industrial level was the introduction of a production system based on an assembly line oriented towards standardized systems. The US economy, in the early decades of the twentieth century, experienced a phase of strong growth that seemed to confirm the superiority of the American capitalist model. It was characterized by poor constraints on business activities, weak social protection and a relatively underdeveloped state apparatus. (Bergamini, 2010)

The dark side of suburbia
Source: web

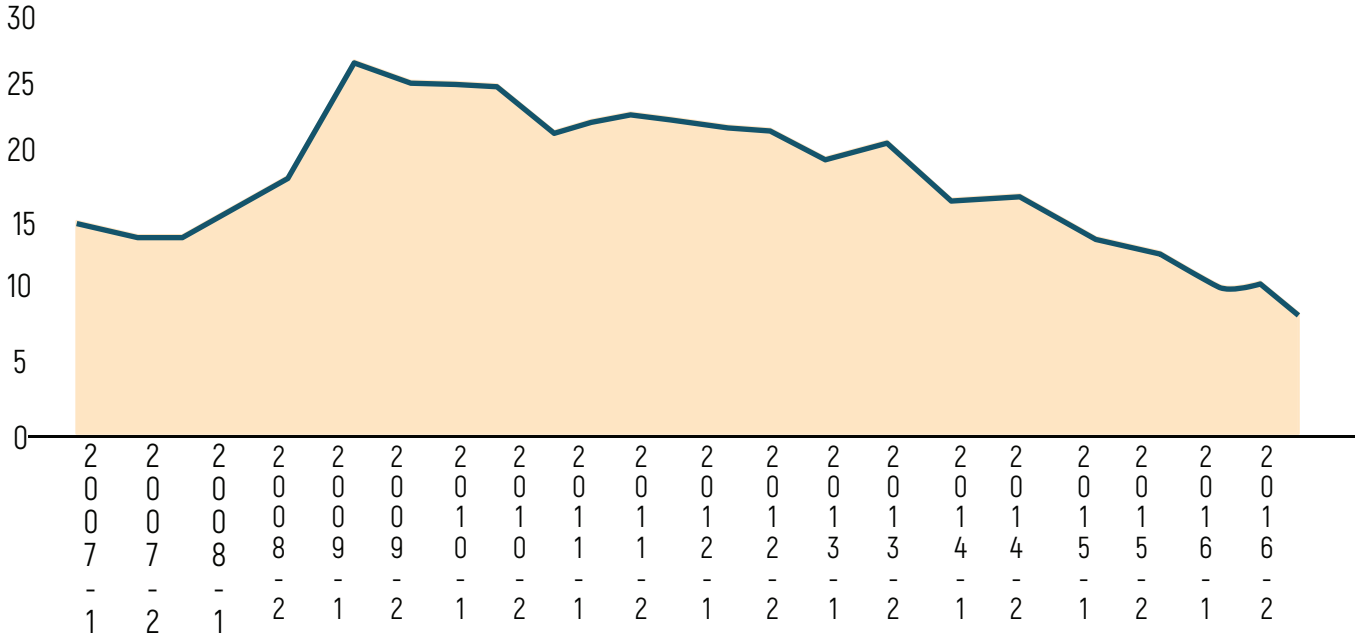
The 1960 recorded a strong response in the census data with a sharp drop in population, there was a drop of nearly 200 units since 1950.
During the second half of the sixties United States saw the explosion of the protest of the movement against racial segregation which in the years between 1965 and 1967 turned into a series of bitter revolts of the metropolitan ghettos, inspired by revolutionary ideology and Black power separatist. The purpose of the movement and consequently of the riots was to integrate blacks more closely into white society.
In the years to come, therefore, more and more violent riots occurred and in 1967 it was the turn of Detroit. This was one of the bloodiest american racial riots and it was known as the Twelfth Street riot. These events aggravated the racial and class divisions represented territorially by suburbanization and industrial decentralization. The black rebellion saw a struggle of the black neighborhoods against american society. (Darden, Hill, Thomas, Thomas, 1987)



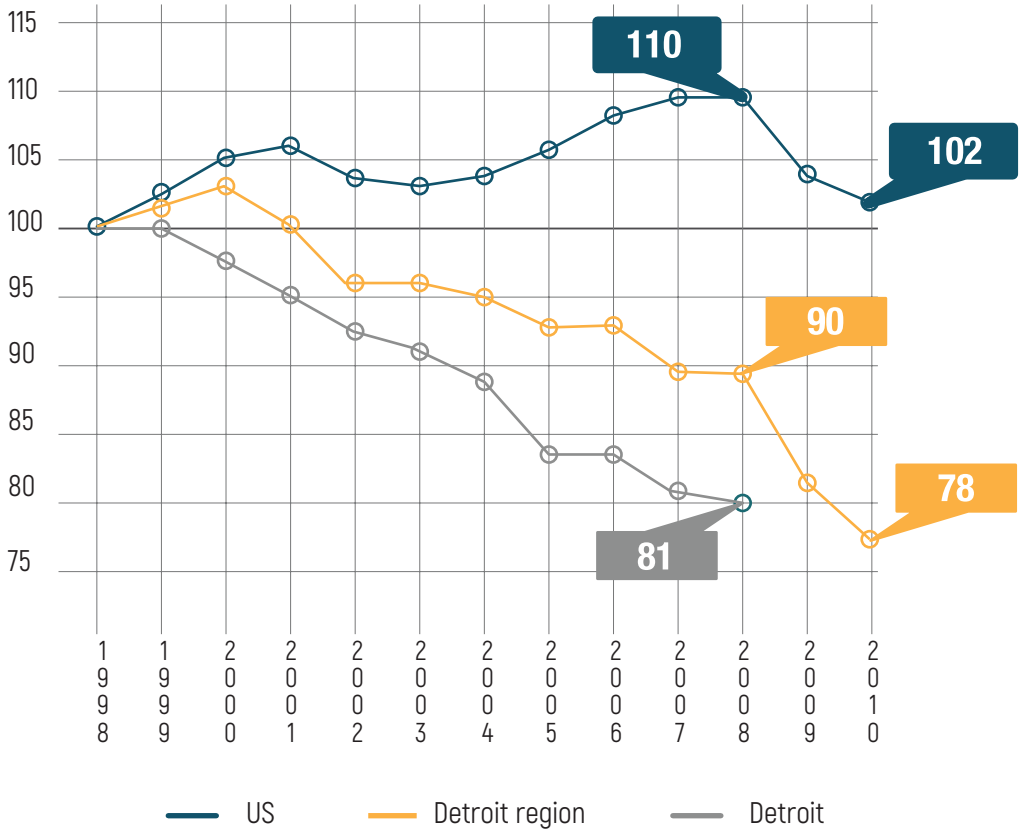
Demographic history of Detroit
Source: web

Two other events worsened the already declining conditions of the city. The first, which dates back to 1971, was to suspend the convertibility of the dollar into gold and the second, which dates back to 1973 was the increase in the cost of oil. The latter brought a strong economic crisis and devastating consequences as the increase in economic inequalities. (Petrignani, 2001)
One of the worst was unemployment which remained very high throughout the coming decade.
Another important factor that led the city of Detroit to worsen its situation was the phenomenon of housing segregation that occurred in the 70s. The main cause of this phenomenon was the placing on the market by the Department of Housing and Urban Development (Hud) of a large number of properties at exorbitant prices that the population was unable to buy. This fact led the Hud to have thousands of empty houses that can no longer be sold at the original price. (Dessantis, 2017)

In the 70s Detroit, as many other american cities, was hit by the fiscal crisis typical of large urban agglomerations. This resulted in a sharp increase in spending in the city, already in economic and demographic decline. In addition, the tax crisis in Detroit was closely connected to territorial transformations such as the suburbanization of higher-income families and the decentralization of economic and productive activities.
The displacement of industries, the loss of businesses and residents increased the decline of the city leading to a shortage of services for the population residing within urban borders with the increase of abandoned buildings and lots.(Conti, 1983)
The following years saw the appearance of several initiatives to try to relieve the city from the decline but despite the attempts, the ruling class proved inefficient and unable to solve the problems that arose.
The last decades of the twentieth century were years characterized by great transformations both for the economy and for society in the industrialized world.
Just as at the end of the nineteenth century the emergence of new technologies and new productive sectors had led to a strong transformation of economic structures and daily life in the more developed countries.
Therefore the end of the twentieth century saw the decline of the industries that had played a role central for over a century.
At the basis of this transformation process there were electronics, whose most revolutionary application was in the sector of computing machines and communication systems. The electronic revolution contributed to the transition process towards the so-called post-industrial society. In cities the role of industries lost value and importance.(Dessantis, 2017)
In the years to come, the city faced more and more problems and entered in the 21st century with a situation of decline that was difficult to solve.
The financial crisis and the bankruptcy filed by Chrysler and General Motors in 2008 and 2009 respectively worsened the already low employment levels in Detroit. Between 2000 and 2010 the city saw several dips. According to the Census of Manufacturers, the sectors that have experienced the most significant drops were the manufacturing industry (55.1%), wholesale trade (50.6%) and the information sector (49.5%). The industries that suffered the least decline werethose of entertainment, art, entertainment and catering services (6.6%) and the education, health and social care sector (15.3%).(Mcdonald, 2014)
Given Detroit's severe financial conditions, the city was commissioned in December 2012. An external commissioner was appointed to carry out financial audits on the part of the state of Michigan.



Unenployment rate in Detroit during 2007-2016
Source:US Bureau of Lavor Statistics Detroit area economic summary 2017



Indexed Employment Growth 1998-2010
Source: Red fields to green fields, Parks Revitalize &Connect Communities Greenway Connections, Environmental Health and Urban Transformation

THE REBIRTH OF THE CITY

Detroit is the example of a city that collapses and is reborn from its ashes. After being the capital of the automotive industry and having been one of the most powerful american cities, an inexorable decline began in the late 1980s becoming the emblem of shrinking cities. (Carta, 2017)
The term shrinking indicates places such as Buffalo, New York, Cleveland, Detroit and Pittsburgh in the U.S. These places are also classified as "legacy cities" or 'post-industrial".
These cities were characterized by class and race discriminations that led the city to experience a series of complex social and economic processes underlying depopulation.
Other consequences of these factors were the high abandonment of houses and land.(Badger, 2020)
Just from the failure the city had the opportunity to reborn.
In July 2013 the city of Detroit filed for bankruptcy with 18 billion dollars in debt. The responses to the default occurred in 2013 were different. The Detroit Future CIty Strategic Framework Plan was one of them and it was developed from 2010 to 2013. This plan allowed to the city to restart immediately and it was conceived by Detroit's civic leaders who had worked through city's decline.

Detroit bankrupt
Source: web

In 2010 DFC Framework was launched but it took a couple of years to result the Detroit Future City Strategic Framework Plan.(Donald, 2016)
It was considered the most radical reimagining of a post-industrial city to date. The plan reconceptualized urban infrastructure and the city's role in providing basic services to its citizens. (Safransky, 2013)
It also created a vision for Detroit's future to share with citizens and recommended specific actions to lift the city from decline. (Detroit Future City, 2012)
This document is not an official master-planning and shows a large number of right-sizing land-use ideas in order to exploit and reuse the abandoned spaces and lots that characterize the city of Detroit.
These are divided in two land use categories "innovative productive" and "innovative ecological". The first category sees landscapes used for large-scale commercial farming and innovative ecological means the return to untended urban forests and prairies.(Smith, Kirkpatrick, 2017)
In addition the rebirth of Detroit sees a series of transformations explained in the document Detroit future city I 2012, in the part related to city systems and sustainability.
The city of future in 2012 provided three city systems transformative ideas in order to let the city change. The first one was related to a strategic infrastructure renewal, adapting the landscape to act as an infrastructure of rainwater and wastewater systems, energy, roads and waste made up of water landscapes. According to this transformation ponds and retention lakes would have the task of capture and purify rainwater, reducing the quantity and improving the quality of water entering the sewage system.
The second transformation was related to a strategic abandoned land use, in order to face up to Detroit's critical environmental and public health issues. The third was related to the diversification of transport in Detroit from regional transport.
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(Detroit Future City, 2012)

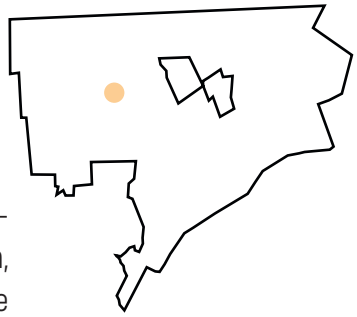
Detroi Future City
Source: web

Over the years the city has seen a succession of numerous changes. In 2015 with the new director of urban planning Maurice Cox the situation improved. The director of change planning followed up on the work done by the Detroit future city just mentioned.
At the basis of his urban and strategic studies there was the idea of redeveloping the abandoned lots of the city through specific projects for the different neighborhoods.
His studies supported by the City's Strategic Neighborhood Fund have led to important transformations, the results of which can already be seen today. In fact, for example, the Fitzgerald district has seen the creation of a park to replace abandoned spaces. At the same time, this project has transformed a vacant part of the city, benefiting the community and the population that lives there.

The key points of the intervention of the planning director Cox touched different areas, these were:
-the promotion of design excellences in Detroit, this factor led the city to be proclaimed UNESCO City of Design;
-thanks to his intervention, the East Riverfront Framework Plan was emitted;
-his studies involved the insertion and transformation of abandoned spaces into green areas, with the creation of greenways and public parks, like Ella Fitzgerald Park in the Fitzgerald neighborhood, the Esplanade along the Woodward downtown, the Joe Louis Greenway and other greenways on the city's east side that will connect more neighborhoods to Detroit's Riverfront;
-he and his staff handled the facilitation of the ordinance on community services of the city.
Maurice Cox for his project to redesign the city starting from abandoned lots and collaborated with a landscape architecture firm from New Orleans, Spackman Mossop and Michaels.

Unesco Detroit city of design
Source: web

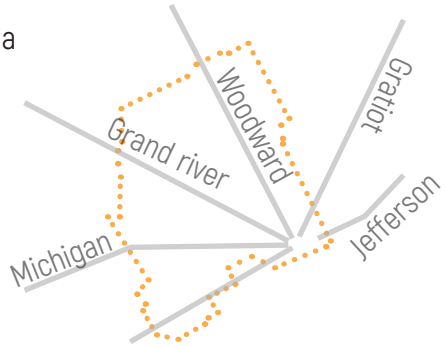
The collaboration led to the development of an important project, the Fitzgerald Revitalization Plan, which involved the rehabilitation of 100 homes and 257 vacant lots. The goal was therefore to create a flexible landscape plan to activate and improve every publicly-owned parcel.
The transformation process involved planning a series of community meetings so that they could interface with the residents and ask them what changes they felt were necessary.
The intervention involved 43 vacant parcels and 4 historic buildings.
A consistent goal of the project is to restore the landscapes exploiting the abandoned spaces.
These transformations constitute the will and resourcefulness of the city in triggering a change towards social, economic and sustainable growth.



Over the years, almost ten since the emanation of the Detroit Strategic Framework Plan, the city of Detroit has changed thanks to the possibility of exploiting abandoned properties.Several transformations have taken place over the years thanks to the birth of new movements..
The Detroit's Urban Farmers are now a large and powerful movement that sees urban farming as one of the most popular ways for Detroiters to get involved in a community while also tackling problems like poor diet and inadequate nutritional education.
Over the years the city has also become an epicenter from a musical and cultural point of view.
(http://www1.unipa.it/mcarta/DETROIT/Detroitutopia.html)

Fitzgerald Revitalization Plan
Source: Berg, Fitzgerald neighborhood groundbreaking is lifting development interest in Detroit, 2017.

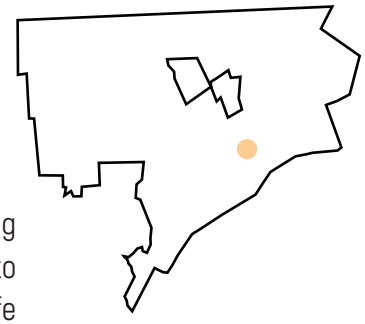
The slow recovery that has characterized the city of Detroit has seen the succession of numerous projects in different areas of the city but in recent years the development has mainly concentrated in the neighborhoods.
As well as the project mentioned before that is linked to the Fitzgerald district, in the last few years the city has been characterized by a series of developments. Some of these are reported to help understand the transformation that is taking place.



The Joe Louis Greenway project is a walking and cycling route that runs from Detroit Riverfront to Highland Park, Dearborn and Hamtramck. In addition, connectors along Livernois and McNichols are also part of this route. The greenway project idea was born in 2007 and in 2009 it became part of the Detroit Greenways Coalition Network Visio. In the following years, the project began to take shape when in 2017 the Ralph C. Wilson Jr. Foundation allocated $ 2 million to the City of Detroit for the realization of the project's framework plan.
The framework plan is a tool for evaluating and analyzing the existing conditions of the project area before the realization of the final drawings.
The project described here shows how the development and approach to sustainable mobility in particular through the use of bicycles have picked up in Detroit and this represents a healthier way of life for people.
(Runyan, 2019)

The Joe Louis Greenway
Source: https://detroit.curbed.com/2019/12/12/21013056/joe-louis-greenway-update-detroit-transit-biking

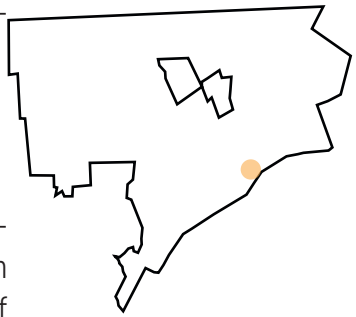
Another important transformation that has characterized the city of Detroit in recent years has been related to the Brush Park neighborhood.
In this area of the city, change is visible almost every day.
Brush Park was established in 1860 and it was formed by 24 blocks that were bordered by Woodward Avenue, Mack Avenue, Beaubien Street, and the Fisher Freeway.



The area was filled with Victorian buildings that over the centuries have been abandoned, burned or partially destroyed. The numerous interventions that have taken place on this area, including the one called The Scott at Brush Park, aim to bring these buildings back to life, giving life to the neighborhood.Changes to the neighborhood in the years to come are expected to bring in large numbers of new residents. An example of an important development is the Brewster-Douglass site, an area that will host thousands of square meters of residences, housing, educational spaces and much more.
(Runyan, Mondry, 2019).

City Modern - The Brush Park Detroit
Source: https://www.citymoderndetroit.com/index.html

Another project relevant to Detroit's transformation is the East Riverfront redevelopment. The Detroit RiverFront Conservancy (DRFC), the City of Detroit Planning & Development Department and the Detroit Economic Growth Corporation's goal was to create a framework plan for the Detroit riverfront. It was based on four main points: expanded parks and green open space; creation of greenways; streetscapes improving street safety of Detroit's residents and the Development of local businesses preserving the rich storied and architectural heritage of Detroit's riverfront.



The framework east riverfront's plan was released in 2014 and so it included the creation of more greenspaces, the redevelopment of old warehouses and the creation of more public spaces. It has received the the American Institute of Architects (AIA) Honor Award for Regional and Urban Design in 2019 for its functionality.

Even Maurice Cox, the Commissioner of the Department of Planning and Development, believed the plan was important to the change that the city of Detroit needed.

(Runyan, 2019)

East riverfront

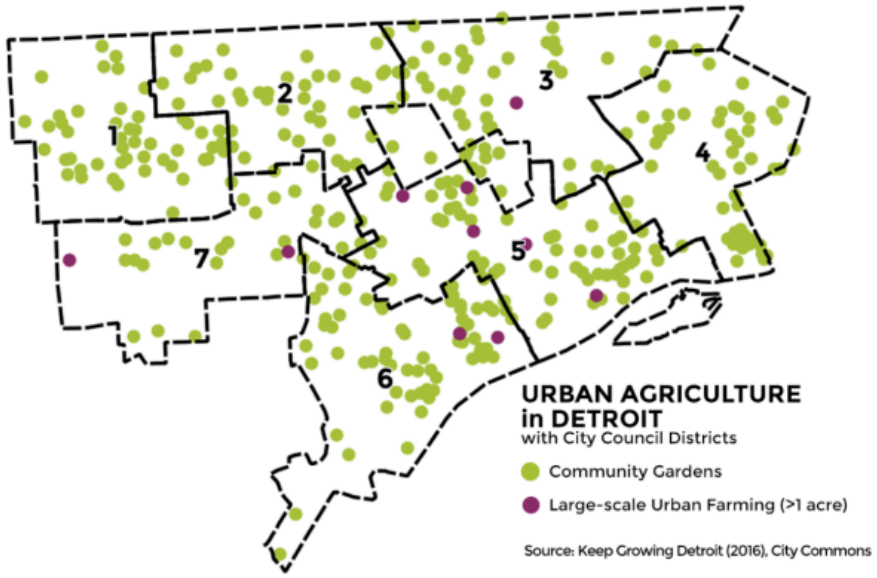
Source: https://detroitmi.gov/departments/planning-and-development-department/neighborhood-plans/central-design-region/east-riverfront

A GREENER DETROIT

Detroit still today displays a landscape that cannot be called urban, in fact the vegetation has covered the burnt houses and the local fauna. The empty and abandoned spaces are invaded by the "prairie".
This vision of the city in 2008 is reported by the shots of the photographer Andrew Moore who proves fascinated by how nature has settled in abandoned spaces and has dominated them. He defined the city as "a landscape where the evidence of human endeavor was slowly being subsumed by nature".(Cialdella, 2020)
Despite the abandonment, the city is continuously growing and over the years various scenarios have been devised for the transformation of the city. Alessandro Coppola's vision in his novel "Apocalypse Town: Cronache dalla fine della civiltà urbana" suggests a Detroit of the future as a rural landscape where agriculture urban assumes a key role and a city where gardens and green spaces are a practical and functional way to redevelop abandoned places.(Coppola, 2012)
In order to make the city more smart, green and sustainable in 2008 severals nonprofits groups proposed the creation of a sustainable design assessment team study. Thanks this group the administration rethought their way of intervening and released a report called "Greener, Leaner Detroit" that shows a strategic green plan for the city. This proposed a city formed by a mosaic of urban villages based on commercial and residential neighbourhoods connected by light rail that transforms what's left in parkland, gardens, area for agriculture and reforestation.(Tumber, Gritty, 2012)
Another important project that was born with the intention of making an ever greener Detroit is called "Red Fields to Green Fields". It consists in a vision and plan to revitalize the city using public-private partnerships to create green space, parks and conservation land while putting people back to work. It was born as a possible solution to the main problems that Detroit has to face, these are: population decline, environmental and nutritional health, vacant property and unemployment and economy problems.
(http://rftgf.org/PP/pdf-presentations/CityStudies/Detroit.pdf)

URBAN AGRICULTURE IN DETROIT

Urban agriculture is defined as the production of agricultural products and livestock within cities (Zezza, Tasciotti, 2010) that is a production inserted in the local urban economic and ecological systems.(Mougeot, 2005)
In order to define the concept of urban agriculture it is necessary to clarify that of urban. By urban areas we mean man-made surfaces, with high concentrations of people that constitute the fulcrum of economic activities. (Martellozzo, Landry, Plouffe, 2014)
Urban agriculture often includes peri-urban agricultural areas around cities and urban centers, which can provide products and services to the local urban population.(Mougeot, 2005)



Urban agriculture in Detroit
Source: Detroit Future CIty, 2012 Detroit Strategic Framework Plan, Detroit, Inland Press, 2013.

Urban agriculture: benefits for community

Urban agriculture could be considered an important tool of transformation for the city thanks to benefits it brings to the community. These are: the improvement of local economy, increment of nutritional health, the connection between community and environment and a green infrastructure tool for stormwater management. Urban agriculture can represent a powerful economic factor by transforming vacant lands into urban farms, bringing value and income to the neighborhoods in which they are inserted. The creation of urban farms has a dual value as it constitutes an economic factor for the city and at the same time exploits unused land by increasing the value of the lot.(http://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/key-statistics-graphics.aspx)

Health impacts of urban agriculture

As mentioned before there are many benefits we can associate to urban agriculture. Since the beginning of the Industrial Revolution it's possible to demonstrate how development took place also through urban farming which has social, economic, political and environmental dimensions.
Urban agriculture is also connected to the food security theme.
The culture of consumerism that has spread in recent years in many cities has no longer allowed the poorest realities to have the opportunity to obtain the necessary nutritional foods.This shows how urban agriculture can represent security from this point of view. A lot of urban agriculture projects could be considered benefits for the community not only because let people have fresh and vegetables but also for increase marginalized groups health. This is demonstrated by the decrease of consumption of junk food in particular between young people. Although urban agriculture is not sufficient to meet all the necessary food needs but it represents an efficient and sustainable solution to address the problem.

Economic impacts of urban agriculture

Urban agriculture is not only a healthy element for people but also an important economic factor. In fact, this represents an income producing activity because the different urban agriculture projects have brought with them skills, training and jobs.Not by chance many projects are located in neighborhoods where unemployment is high and this can be a solution to address the problem. Another economic benefit of urban agriculture is the development of local realities. The increasingly effective dissemination of the benefits of urban agriculture allows local producers to make their activity more known and economically advanced.

America's first sustainable urban agrihood is growing in Detroit
Source: https://detroit.curbed.com

Environmental impacts of urban agriculture

The effectiveness of urban agriculture projects, that have the potential to create sustainabe cities, is linked to the ability to improve the microclimate or the general surroundings of cities. Green spaces around condominiums and houses, as well as the neglected spaces of the city become the protagonists of this change and transformation, helping to improve the physical climate.
Another important benefit of urban agriculture is the reduction of miles traveled by food and the consequent reduction of Co2 emissions due to transport.
In addition, urban agriculture which therefore represents a local food production brings with it different advantages such as: the
crop diversity and increases availabilityof organic products.
The environmental benefits of urban agriculture are also linked to the use of water, in fact the creation of new green spaces requires a greater quantity for irrigation. At the same time, green areas strongly contribute to the reduction of rainwater flow caused by thunderstorms. The management of rainwater therefore leads to the design of new sustainable water cycle systems that lead to a reduction in the use of public water and the amount of water that reaches the combined sewer, optimizing water resources and energy needed for wastewater treatment. (Proksch, Roehr, 2010)

Vegetation can: increase humidity, lower temperatures and introduce more pleasant smells into the environment. It has also the ability to capture dust and gases from polluted air by deposition and capture by plant foliage.
Urban agriculture has also managed to encourage people to pay attention to waste management and recycling within cities. The production of food allows the reduction of the use of packaging especially in plastic.
In addition food growing allows to create recyclable materials, such as organic waste that can be used as fertilizers. Urban agriculture also represents a means of reducing CO_2 emissions because plants and trees are able to capture it. The collection capacity is maximum in the growth phase of the vegetation.

Greening as a new Planning Strategy for Shrinking Cities
Source: http://projects.mcrit.com

Thanks to the presence of agricultural activities in cities, urban ecosystems are continuously maintained in their primary production phase.
It means they have the ability to capture a large amount of CO_2.
Despite this, in cities a large part of the carbon is stored in vegetation and it will be quickly released through the decomposition of organic matter. (Walker, 2014)

Vacant lands and urban agriculture as a tool for stormwater management

It is well known, given its history, how the city of Detroit is characterized by vast abandoned and vacant areas that over the years it is trying to retrain in a functional way. The City of Detroit has approximately 10,950 acres of vacant land throughout the city (12.3% of the city area). (http://rftgf.org/PP/pdf-presentations/CityStudies/Detroit.pdf)

In order to exploit these extensive areas cities has started to direct vacant lots to greening projects. (https://www.americanrivers.org/conservation-resource/urban-farms-green-infrastructure/)

Connecting with the transformation of vacant land in agricultural areas there is the problem of stormwater runoff, that represents one major across the United States.

A basic framework was also realized by the federal Clean Water Act of 1972 to regulate pollutant discharges in order to preserve water quality and human health. (U.S. EPA, 2012)

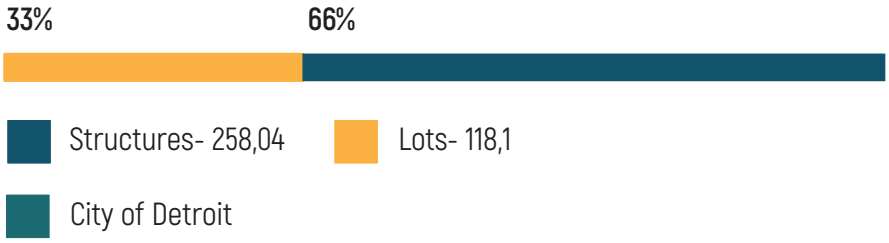
An helpful solution to face up to this problem are green infrastructures used as a tool to mitigate stormwater runoff by restoring natural ground cover which allows precipitation to infiltrate into the soil. Greenspace helps to reduce stormwater runoff by allowing the water to soak into the ground. Rcently urban farms have become a popular way to add more green spaces to cityscapes.

Green areas and agricultural ones can also be used to improve the local economy, increase nutritional health and connect communities to their local environment.

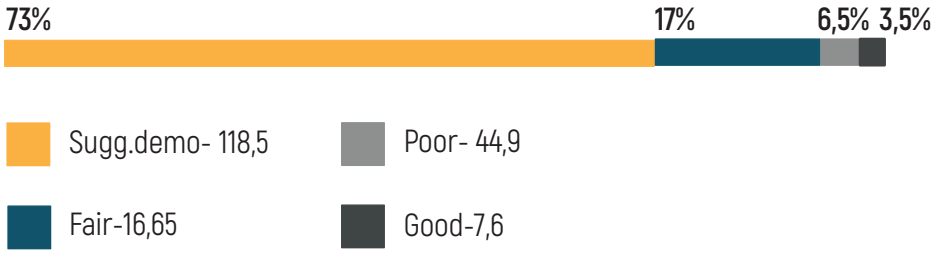
Vacant lots are usually unmaintained spaces and they provide minimal value to the city and surrounding neighborhood. The creation of a farm turns unused and unattractive lands into a productive greenspace. This increases also their values.

In addition urban farms can reduce the amount of money families spend buying healthy food options due to the presence of fresh and affordable produce. According to the USDA, in 2013 about 49.1 million people lived in a household without access to nutritious food and it could represent a mean to face this problem.

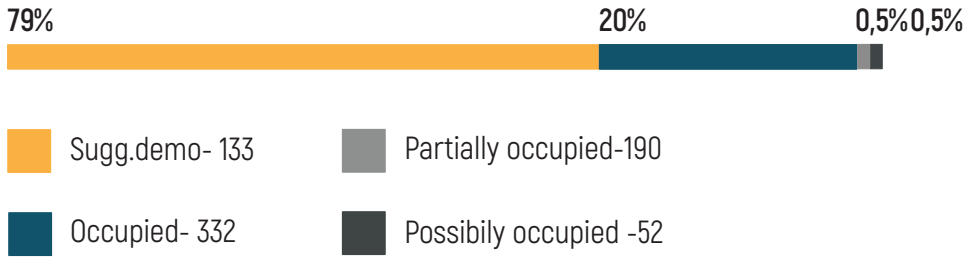
STRUCTURES VS LOTS



STRUCTURES CONDITIONS



STRUCTURE OCCUPANCY



Source: Motorcitymapping

2.DETROIT AND CLIMATE CHANGE

Climate change is defined as an average of the changes that happen to weather patterns in decades.
The climate has always suffered and will continue to suffer changes due to natural causes. However, natural causes can only partly explain the rise in the average atmospheric temperature we are witnessing.This increase in temperature is due to excessive emissions of greenhouse gases such as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) into the atmosphere. The greenhouse effect is the phenomenon of natural thermoregulation of the Earth due to the presence of some gases in the atmosphere. The sun's rays reaching the Earth's surface are partly reflected upwards by the surface itself in the form of infrared rays or heat. Part of the reflected infrared rays is retained by the greenhouse gases of the atmosphere and this allows to create on the Earth a hospitable climate for life but an excessive emission of greenhouse gases due to anthropogenic activities causes the overheating of the planet. (IPCC, 1990)
According to the definition of IPCC, the vulnerability of a territory to climate change is given by the potential damage that can be produced and how much a system could be modified. (Fabian, Viganò, 2010)
Worldwide population size and economic activity, resource use, energy use and land use are the main causes of human-caused GHG emission. In addition, some of the main consequences of climate change on the environment are wildfires, droughts, heat waves, and flooding and so dramatic weather events such as hurricanes, thunderstorms and tornadoes. These events are expected to occur more and more frequently. These changes to climate are also felt in the city of Detroit and by its citizens.
(City of Detroit, 2016)

Detroit and climate change
Source: https://www.metrotimes.com/

DETROIT CLIMATE ACTION PLAN- DCAP

In recent years, the city of Detroit has begun to devise and scheme strategic plans to deal with climate change and to create different organizations to address this problem.
In 2011 The Detroiters Working for Environmental Justice established the Detroit Climate Action Collaborative (DCAC), a non-profit coalition of residents, business leaders, institutions and others to help the city of Detroit identify short-and long-term actions to reduce greenhouse gas (GHG) emissions.
In particular the objectives of the DCAC are:
- in order to achieve the city's first CAP, documenting the basic greenhouse gas emissions from public and private sectors, mapping vulnerabilities and projection of climate change;
-devising strategies for adaptation and mitigation of the impacts of climate change.
In 2017, after many years of working, DWEJ wrote and published the city's first climate action plan. The Detroit Climate Action Plan (DCAP) is one of few plans written not from the government down.
To understand the impact of climate change in Detroit, DWEJ commissioned three studies shown in the plan, these are: a greenhouse gas inventory, a climatology report and a vulnerability report.
Detroit's first Greenhouse Gas (GHG) Inventory was conducted by graduate students from the University of Michigan School for Environment & Sustainability (SEAS).
For this research were used inventories of 2011 and 2012 that provide a reference point to measure Detroit's progress toward reductions.
Detroit's total GHG accounting included carbon dioxide, methane, and nitrous oxide.
The inventory shows how in 2012 the 63% of Detroit's 6.7 million metric tons of CO_2 emissions were a result of electricity and natural gas use in Detroit's buildings and facilities and that the 69% of emissions were caused by stationary sources. The commercial and institutional sector accounted for half of the buildings and facilities total emissions in 2012. In addition, the 30% of total emissions were caused by cars, trucks and road freight. The 11% of the total emission for 2012 were generated from municipal sources with the Detroit Public Lighting Authority, the City of Detroit Water & Sewerage Department and the City of Detroit Public Works Department.
(detroitenvironmentaljustice.org/climate-action-plan-GreenhouseGas (GHG) Inventory)

The second study of the plan is a climatology one. This study collected in a report provided fundamental informations from the Climatology Report prepared by Great Lakes Integrated Sciences & Assessments (GLISA).
As previously mentioned the main impacts of climate change in Detroit are related to precipitations and temperature fluctuations and in fact historical data let us have projections that show an increase in temperature and precipitation and increasingly frequent storms.

Climatology report

The DCAC partnered with the Great Lakes Integrated Sciences and Assessments Center (GLISA), a collaborative effort of Michigan State University and the University of Michigan, to conduct analyses and report on Detroit climatology. Analyses considered past and current trends in temperature, precipitation, air quality, water quality, and stormwater management. The analyses resulted in projections for heat-related mortality over the next century that the DCAC aims to prevent.

Vulnerability Assessment

The DCAC partnered with the University of Michigan College of Architecture and Urban Planning to prepare vulnerability assessments for Detroit. A team of graduate students used spatial data to map various environmental factors including temperature, land cover type, soil type, slope, and amount/type of impervious surfaces; and risk factors including age, access to transportation, household income, and education level. Drawing on these data, they generated heat and flood vulnerability maps.

Greenhouse Gas Emissions Inventory

The DCAC partnered with the University of Michigan Center for Sustainable Systems and the City of Detroit to develop the City's first comprehensive greenhouse gas inventory. A team of graduate students assessed municipal and city-wide sources of carbon dioxide, methane, and nitrous oxide for 2011 and 2012: buildings and facilities energy use; public transportation; municipal vehicle fleets; passenger car, truck, and on-road freight; industrial processes; solid waste landfill disposal and incineration; and wastewater treatment. This inventory will help to direct the DCAC's emissions-reduction goals, mitigation strategies, and creation of a baseline tracking system for regular emissions inventories.

Community Engagement

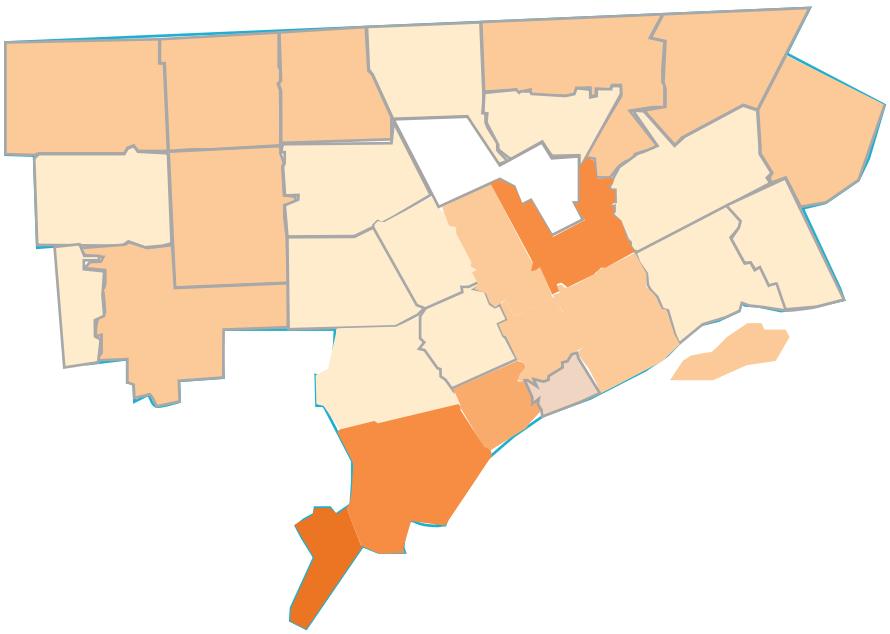
The DCAC has developed an extensive community engagement plan, including focus groups with diverse stakeholders, a local climate summit, sector-specific meetings with business and faith communities, a public comment process on the CAP, a community survey, and documentary shorts in collaboration with local filmmakers. Public comments and key findings from the focus groups and surveys will inform and be reported in the CAP.

Workgroup Recommendations

The DCAC convened the following 6 workgroups and charged them with developing mitigation and adaptation strategies for the DCAC Climate Action Plan: 1) Businesses and Institutions, 2) Energy, 3) Homes and Neighborhoods, 4) Parks, Public Space, and Water Infrastructure, 5) Public Health, and 6) Solid Waste. Workgroup members include community, government, academic, and business leaders with local and expert knowledge. Groups of 5-8 members have met regularly for over a year to assess related issues, goals, action steps, challenges, opportunities, leaders, and metrics related to their topic, culminating in a summary report that recommends strategies.

Table key components of the Detroit Climate Action Collaborative's climate action plan
Source: Sampson, Hill Knott, Smith, Mekias, Heeres, Sagovac, 2014.

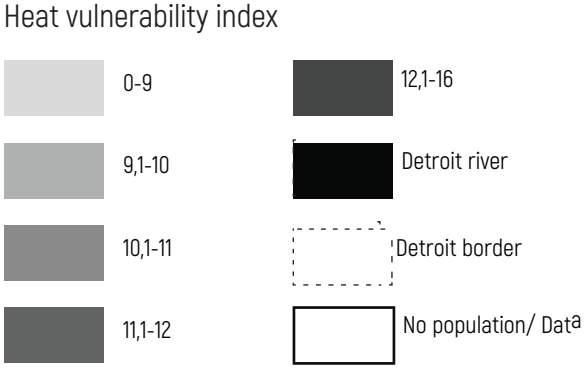
By comparing 1961–1990 with 1981–2010, it is possible to observe how there has been an increase in temperature of 4,3 ° F. In the same way, the average night temperatures increased 4.3 ° F from 1959 to 2011. During the same period, the number of hot and humid days and the number of hot and dry days in summer increased by 3.5 days (172%) and 3 days (338%) and also the number of cold and dry days has decreased by 70%. This trend is expected to continue and it will depend on the amount of future greenhouse gas emissions. If greenhouse gas emissions are significantly reduced (a lower value emissions scenario), the number of days beyond 90 ° F will increase further, but will be limited to 30 (from the current 15) days per year by the end of the century. In a higher emissions scenario, there will be approximately 65 days warmer than 90 ° F. (University of Michigan Taubman College of Architecture & Urban Planning, 2012)



Stationary emissions (Mt COe), 2012
Source: detroitography

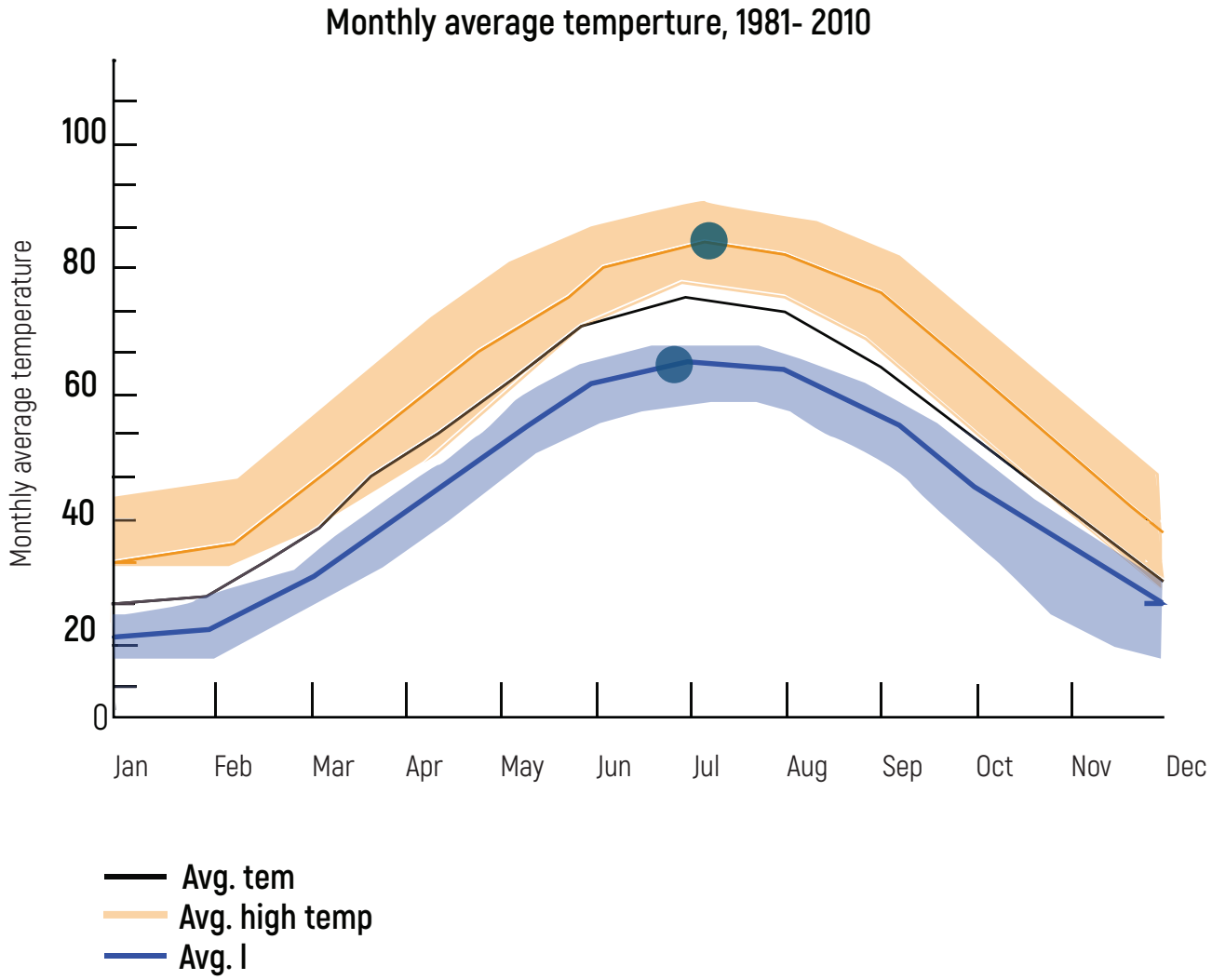
MAIN EFFECTS ON THE CITY

Detroit is a historical city surrounded by the Great Lakes and it constitutes one of the main commercial, financial and transportation centers in Michigan. As already mentioned, the city undergoes various impacts related to climate change and land use, pre-existing infrastructure and socio-economic capacity could be factors to respond to impacts.
Detroit is expected to face the following critical challenges in the coming decades:
-As average temperatures rise throughout the region, the probability of heat waves and hot days will grow, increasing the risk of heat-related illnesses.
-As severe rainstorms become more frequent and more intense, flooding will increase the risk of sewage overflows and water contamination.



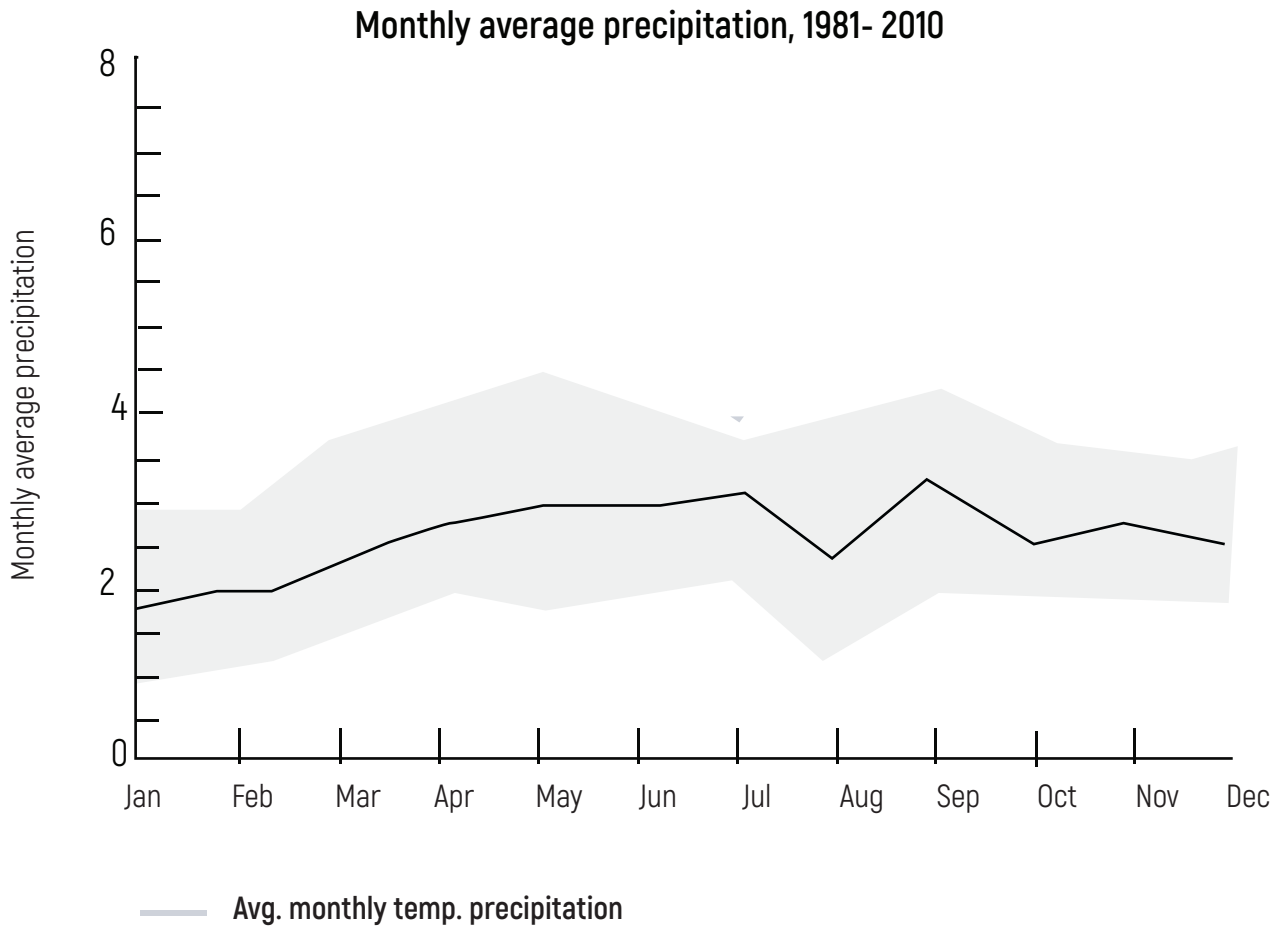
Heat vulnerability
Source: researchgate

The third study is a vulnerability report for Detroit realized by University of Michigan Taubman College of Architecture & Urban Planning with DWEJ. This document shows the most vulnerable areas to climate change impacts in Detroit. It represents an important information because it shows the areas of the city where immediate action is needed. After that, the report focus on factors determine community's vulnerability to climate change.
These are: exposure, the extent to which an individual or community might experience the impacts of climate change and sensitivity, to what extent being exposed to a climate impact will affect an individual or community.
(University of Michigan Taubman College of Architecture & Urban Planning, 2012)
After this part the plan focuses on five major themes related to the city of Detroit: solid waste; public health; businesses and institutions; parks, public spaces and water infrastructure; homes and neighborhoods.
The plan shows strategies related to these themes to face climate change impacts and advices obtained during public meetings.
The report "Historical Climatology: Detroit, Michigan" released in 2016 by GLISA, Great Lakes Integrated Sciences and Assessments, reports a summary of changes in climate related to the city of Detroit comparing two time range, the first is from 1981-2010 and the second from 1951-2014.
Because of its close proximity to Downtown Detroit, all information is provided by the Summary of Observed Changes climate station for Windsor, ON.



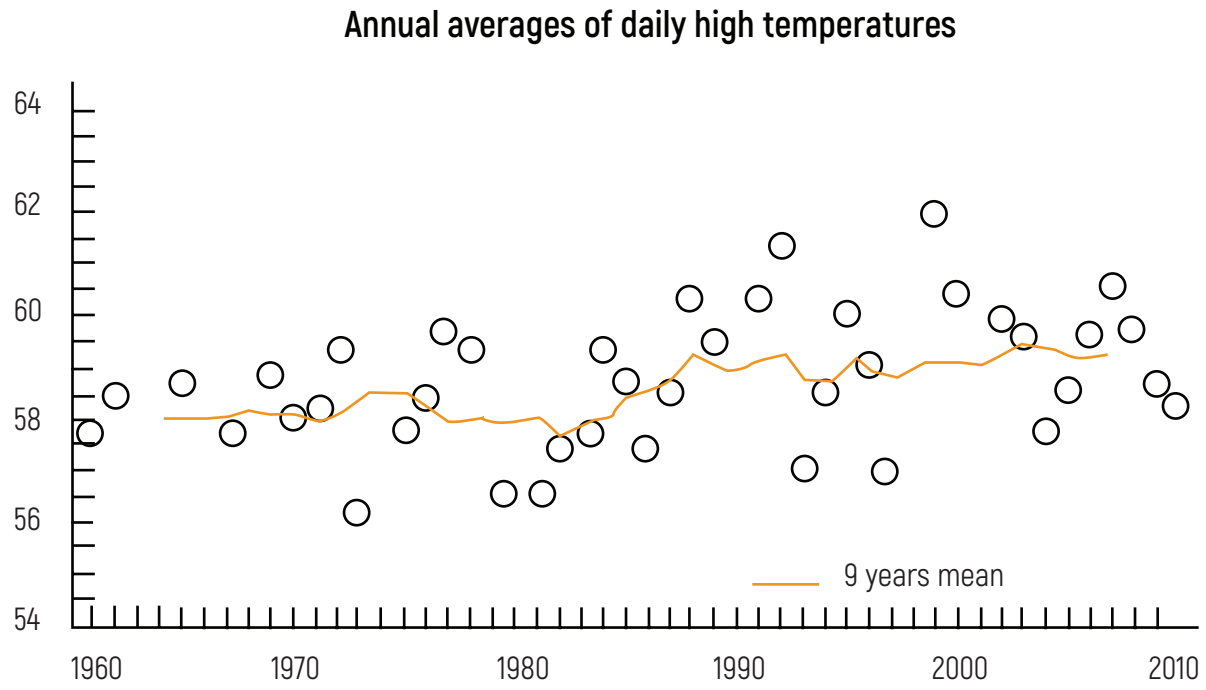
Average monthly temperatures during 1981-2010
Source: GLISA, 2016

The temperature peaks reported in the considered period are highlighted in order to show how the high temperatures have increased exponentially compared to the low ones, placing the same period of the year in parallelThe graph shows average monthly temperatures during 1981-2010 and shaded bands represent the standard deviation in the 30-year monthly average.

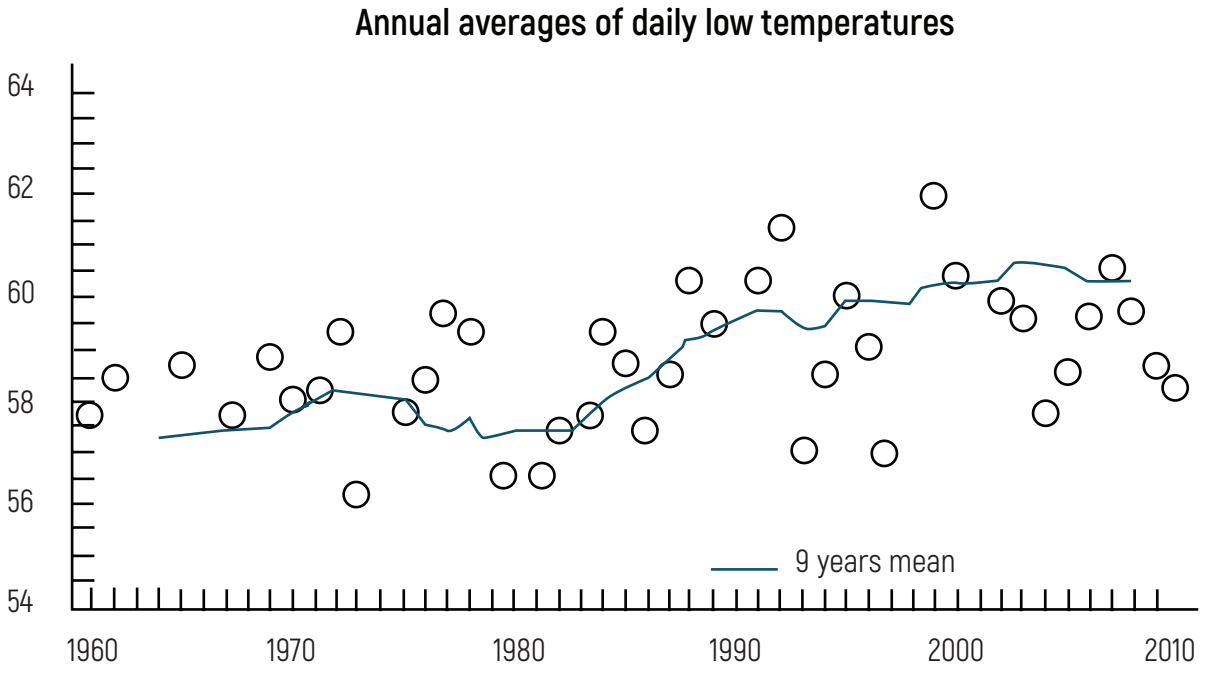


Monthly average precipitation, 1981-2010
Source: GLISA, 2016

The graph shows average monthly precipitation during 1981-2010 and the shaded band represents the 25th to 75th percentile.
The report "Historical Climatology: Detroit, Michigan" released in 2016 by GLISA shows also a graph related to annual departures from the 1951-1980 average annual temperature in which the line indicates the 9-year moving average.

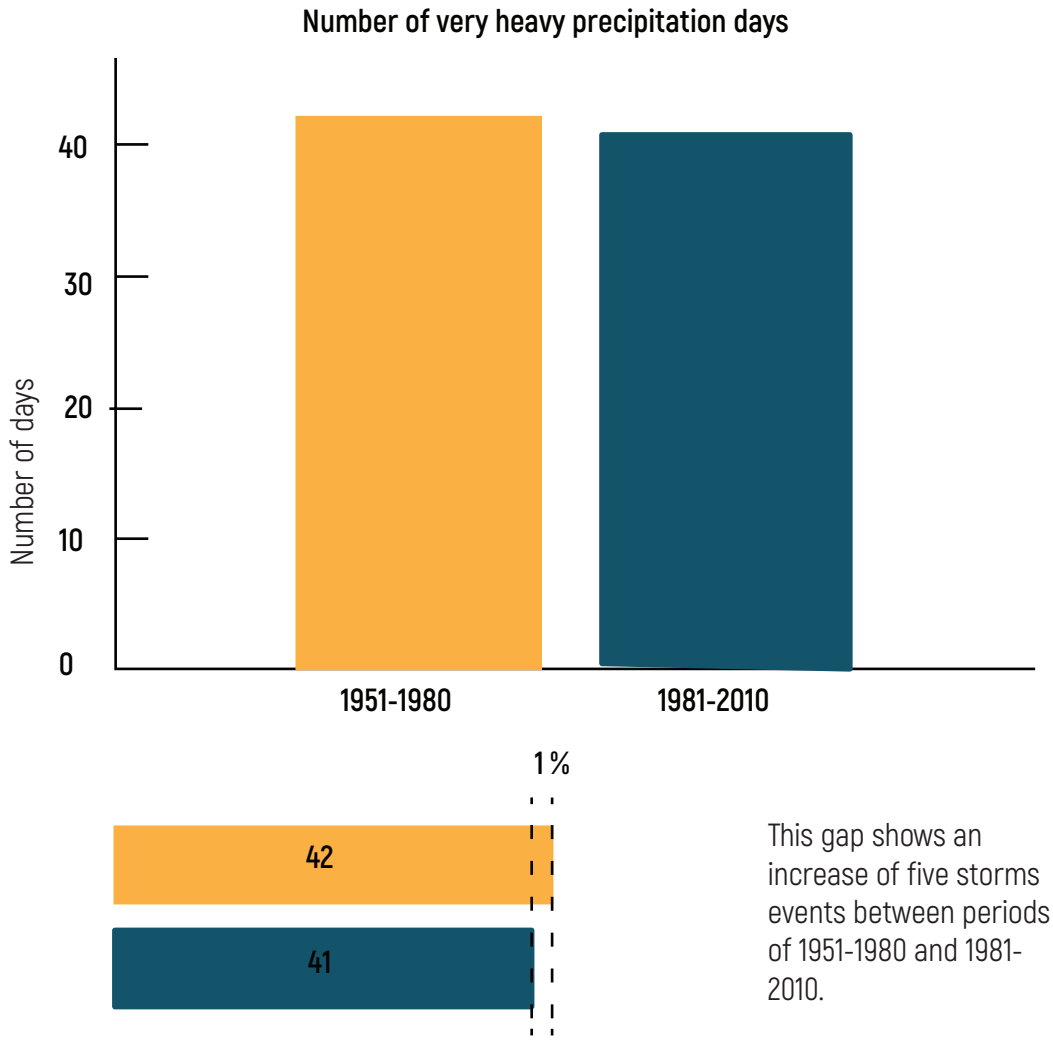


Annual average of daily temperatures
Source: GLISA, 2016

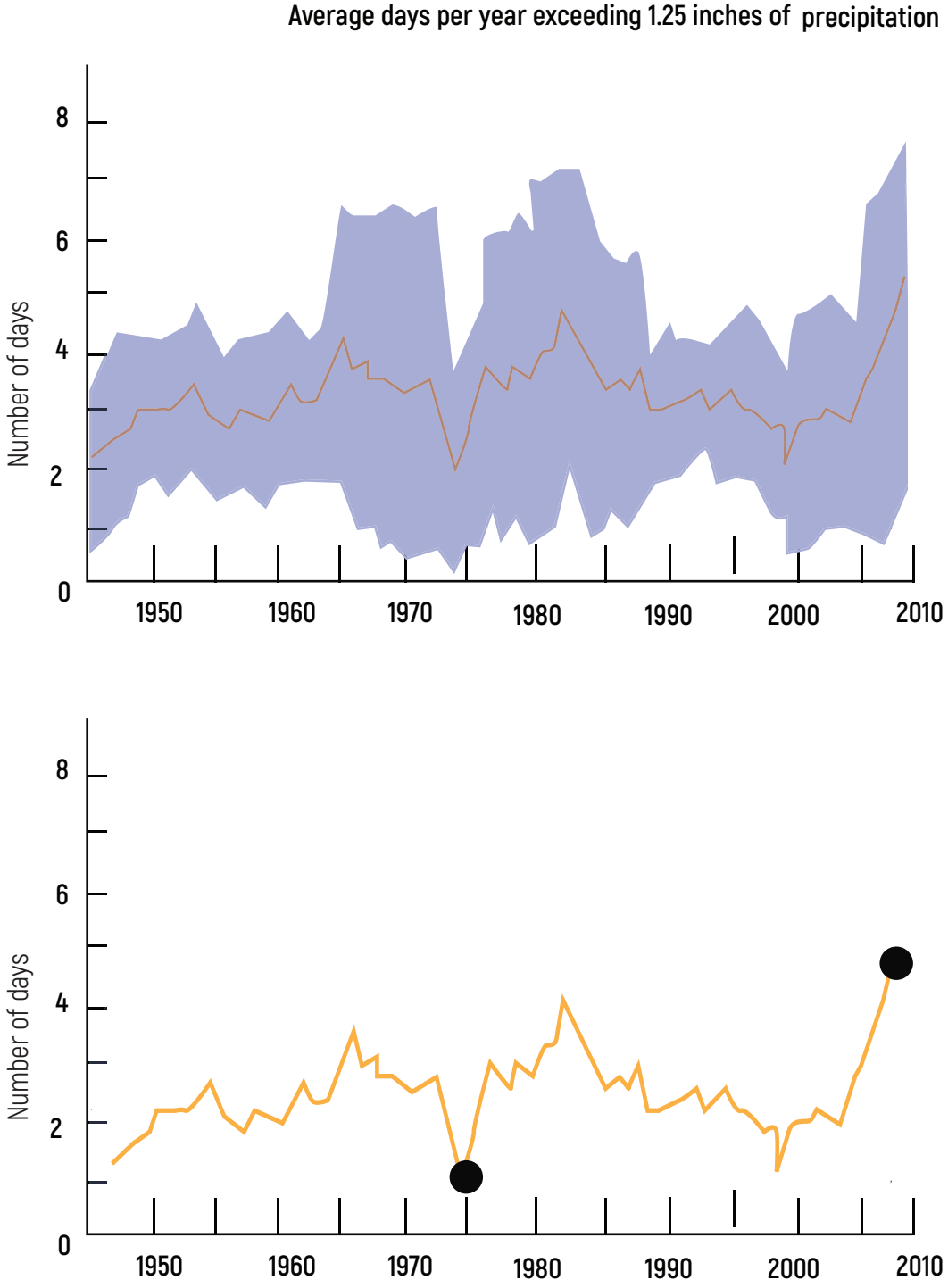


Annual average of daily low temperatures
Source: GLISA, 2016

The report shows also changes in heavy precipitations.
The graph reports the number of daily precipitation totals for the 1951-1980 and 1981-2010 periods that exceeded the size of the heaviest 1% of storms as defined by the 1951-1980 period. Detroit has seen a miniscule decrease in these precipitation events (42 storms from 1951-1980 to 41 from 1981-2010) as defined by the National Climate Assessment, it means an increase equivalents to a 1% that is really significant in terms of disasters and damage.



Number of very heavy precipitation days
Source: GLISA, 2016



Number of very heavy precipitation days
Source: GLISA, 2016

The first graph shows the number of days in which severe thunderstorms occurred with certain levels of rainwater. The two extremes are highlighted such as 2 and 6 which occurred before 1950 and after 2010.

CLIMATE CHANGE IMPACTS-EXTREME STORMS AND FLOODING

One of the main climate change impact is represented by extreme rain storms that flood Detroit streets and homes with increasing regularity. (Detroit Environmental Agenda, 2013)

The report "Extreme Storms in Michigan" released by The Rocky Mountain Climate Organization (RMCO) and Natural Resources Defense Council (NRDC) in 2013 reports and documents an 89 percent increase in the annual frequency of extreme precipitation events - defined as 2 inches or more in one day, across the state for the past 50 years. The most populated part of the state of Michigan, that is the southern part, has recorded a 128% increase in the last half century.

In fact, the state of Michigan saw an 11% increase from the 1961-1990 average compared to the 1981-2010 average. Extreme storms have become increasingly severe due to climate change.

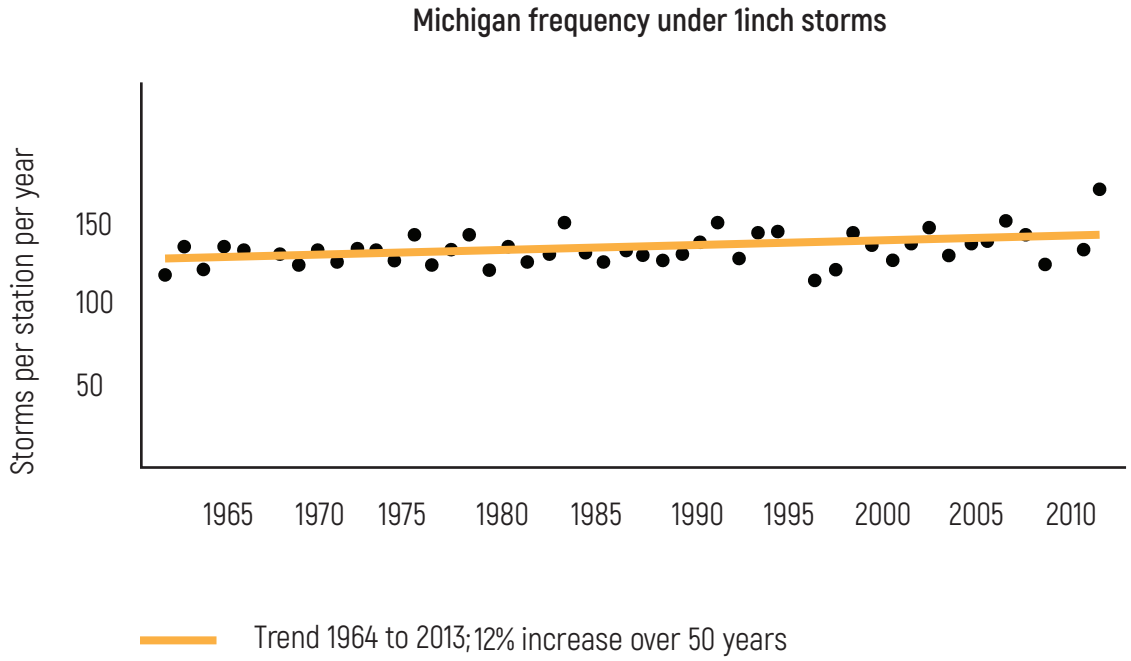
(City of Detroit, 2016).

The RMCO-NRDC report is based on an analysis of daily precipitation records from 37 weather stations over 50 years and it represents the most complete analysis of daily precipitation trends in Michigan of 2013.(Saunders, Easley, 2014)

Extreme storms count in Michigan because of their impacts represented by destructive floods. For Michigan and other Midwest states floods could be compared with hurricanes in the areas of the Atlantic coast so the natural disaster that is repeated with more frequency. Floods are the second most expensive type of natural disaster across the United States due to the damage they report.The 2013 is one of the years in which Michigan showed more of his vulnerability. In fact, in that year, the storms that occurred caused floods so widespread that it led to a federal disaster designation covering 16 counties in the state.

To report a comparison, in 2008 the storms led to floods destructive enough to have 11 Michigan counties designated by the federal government as a major disaster area.

A demonstration of extreme storms in Michigan is represented in particular by three years in which there were floods that brought serious consequences: 2013, the year with the fourth most two-inches-plus storms in Michigan in the past half century; 2008 was the year with the most extreme storms for 50 years and Michigan's second-place year for extreme storms was 1986, when those storms caused "the worst flooding event ever recorded in the state according to the National Weather Service (NWS).
(Saunders, Easley, 2014)

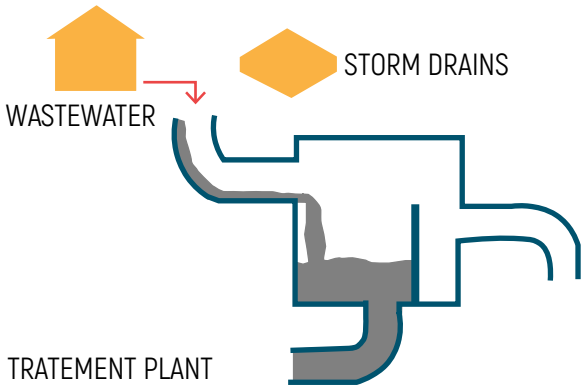


Michigan frequency under 1inch storms, 1964-2013
Source: The Rocky Mountain Climate Organization, Extreme storms in Michigan, 2014

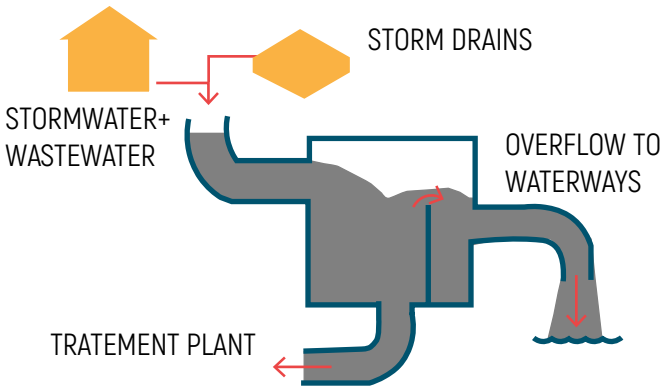
COMBINED SEWAGE SYSTEMS AND FLOODING

An important problem related to the extreme storms that Michigan has to face is the combined sewage systems. As many other cities, Detroit has a combined sewage and rainwater system. This system requires that rainwater is drained into the same pipes that lead to the city's wastewater treatment plant. During periods of heavy rainfall or snowmelt, the wastewater volume in a combined sewer system can exceed the capacity of the sewer system or treatment plant. For this reason, combined sewer systems are designed to overflow occasionally and discharge excess wastewater directly to nearby streams, rivers, or other water bodies.
These overflows, called combined sewer overflows (CSOs), contain not only storm water but also untreated human and industrial waste, toxic materials, and debris and are one of the main pollution factors of the Great Lakes. Moreover residents basements are often flooded with waste water and people can get in touch with contaminated water. These sewage discharges, or combined sewer overflows (CSOs) are regulated and limited by the U.S. EPA (United States Environmental Protection Agency) under the Clean Water Act.

NORMAL CONDITIONS



HEAVY RAINS



Detroit, like any other city with CSO, must have an authorization from the National Pollutant Discharge and Elimination System (NPDES), which ensures compliance with limits to address this problem.(Detroit Future City, 2012) The problem has been addressed in different ways and programs including the one designed by Detroit water sewer department, the DWSD's Capital Improvement Program (CIP) launched in 2018.

DWSD is one of the largest water and sewage services companies in the United States, with over 235,000 accounts. DWSD's water network includes over 2,700 miles of water pipes and nearly 3,000 miles of sewage collection pipes. The Detroit Water and Sewerage Department (DWSD) has embarked this plan to minimize combined sewer overflow, flood insurance claims and events related to intense storms.

(University of Michigan Taubman College of Architecture & Urban Planning, 2012. The goals of this program are to improve the level of service and the quality of life in Detroit by:

-Reducing water main breaks;

-Reducing street flooding and sewer system failures;

-Reducing future investment in new CSO facilities (wet weather treatment);

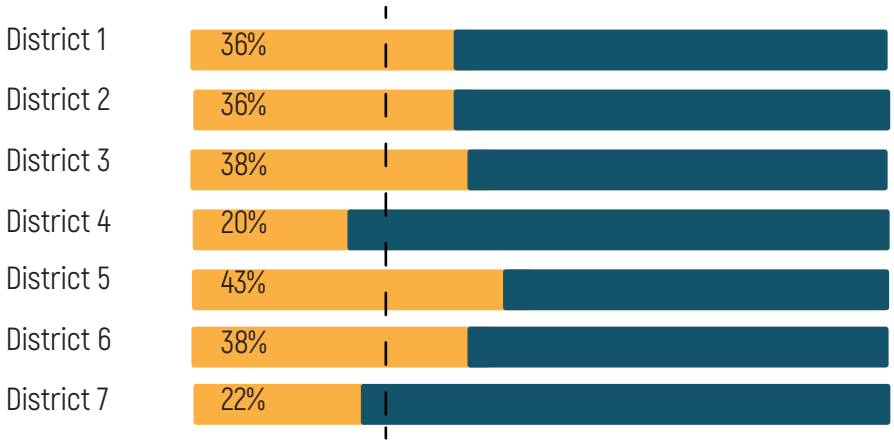
-Increasing acres managed by green stormwater infrastructure;

-Coordinating with other public and private agencies to maximize dollars invested and minimize disruption from construction activity;

-Increasing job opportunities for Detroiters;

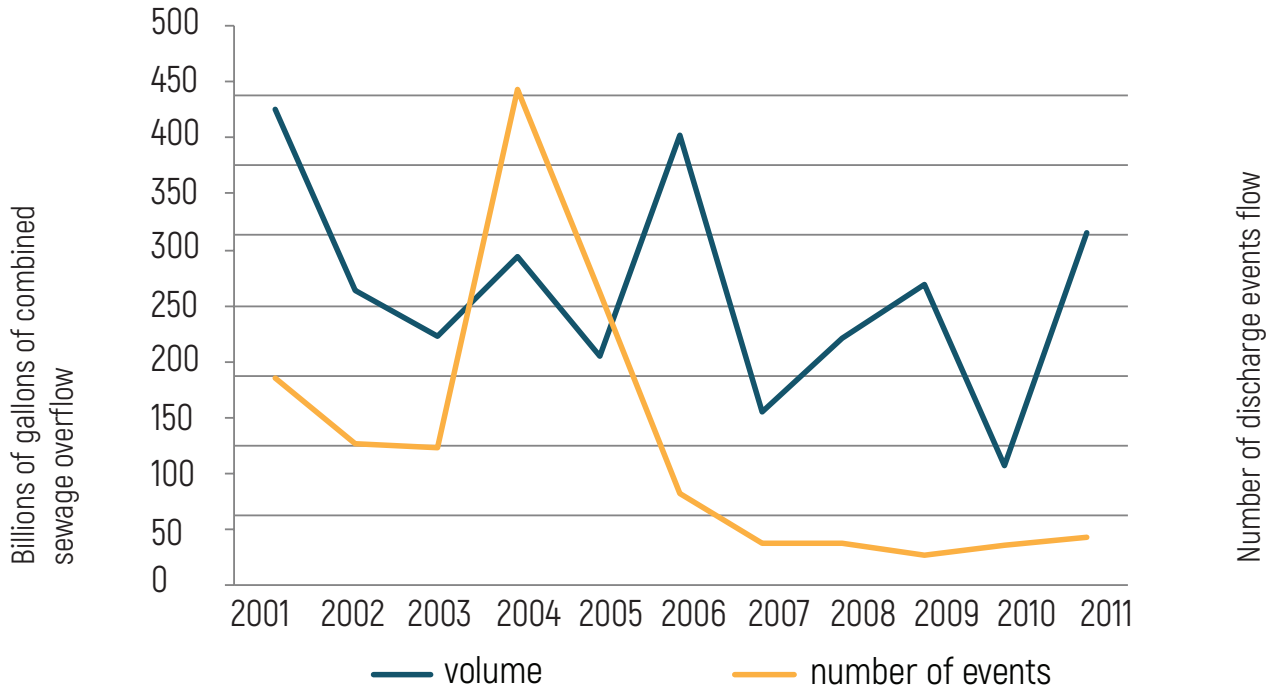
-Upgrading and maintaining facilities, equipment and systems for effective operations.(Water and Sewerage department, 2018)

Since the program was launched in 2018, the city has seen numerous improvements repairing miles of water main, of sewer collection piping and lead service lines.

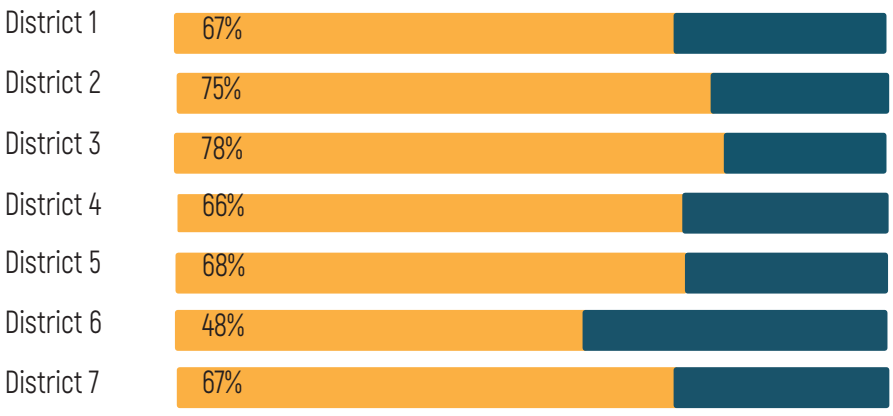


Sewage in rivers, waterways

Source: Detroit environmental agenda

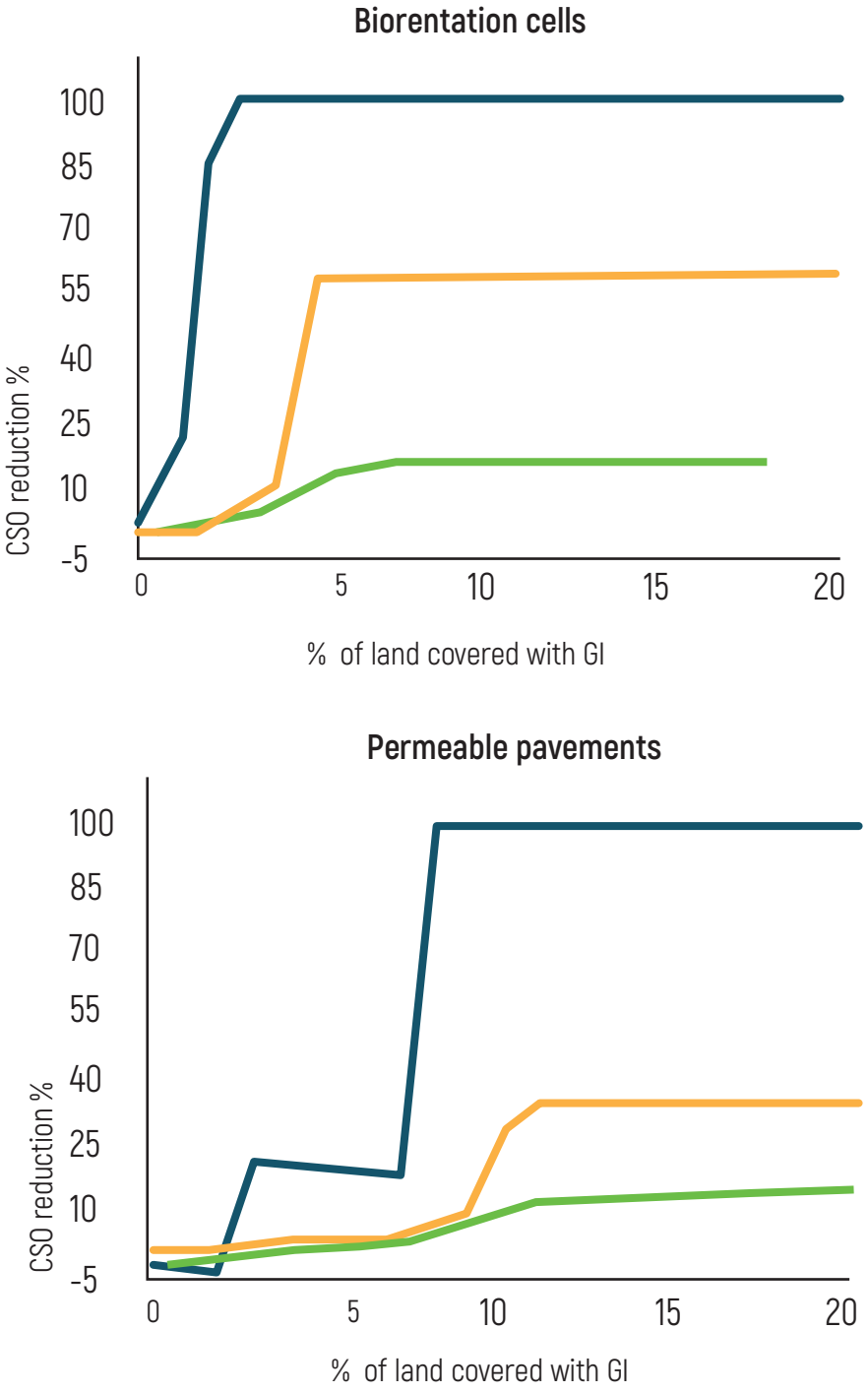


Annual Combined Sewage Overflow Volume and Number of Events
Source: Detroit environmental agenda



High water bills
Source: Detroit environmental agenda

The graph realized after an analysis shows how in 3 out of 7 districts people receive an high water bill. It's important to show these data beacuse it's necessary to find an efficient stormwater management. In addition the Detroit population should be encouraged to conserve water.



The graphs shows the efficiency of two green infrastructures in terms of reduction in percentage of CSO oveflow in relation to the percentage of land occupied by the GI. Looking at the second graph it's possible to notice how permeable pavements have a high and constant ratio, this value is represented by the straight line.

STORMWATER MANAGEMENT AND GREEN INFASTRUCTURES

When it rains in Detroit, rainwater falls on roofs, roads, sidewalks and parking lots and then this rainwater flows into sewer system. As previously explained, the Detroit sewerage system is a combined one.
During extreme storms too much rainwater can overload the combined system because it also collects rainwater that flows from the streets and houses with untreated wastewater. That means the volume of flow in that single pipe can be 10 to 100 times greater than the volume of flow that passes through the pipe on a dry day. This could cause backups of basements, road floods and polluted wastewater flowing into the Rouge River, the Detroit River and finally into Lake Erie.
To date, the city of Detroit has made significant investments to deal with CSOs and floods. The city has in fact invested in infrastructures that had the function of temporarily storing and treating rain and sewage water. Through these infrastructures, the Detroit Water and Sewerage Department (DWSD) managed to prevent 95% of the untreated combined waste water from entering the Detroit and Rouge rivers. For the management of the remaining 5%, in order to reduce the volume of runoff are being created the GSI , Green Stormwater infrastructures.

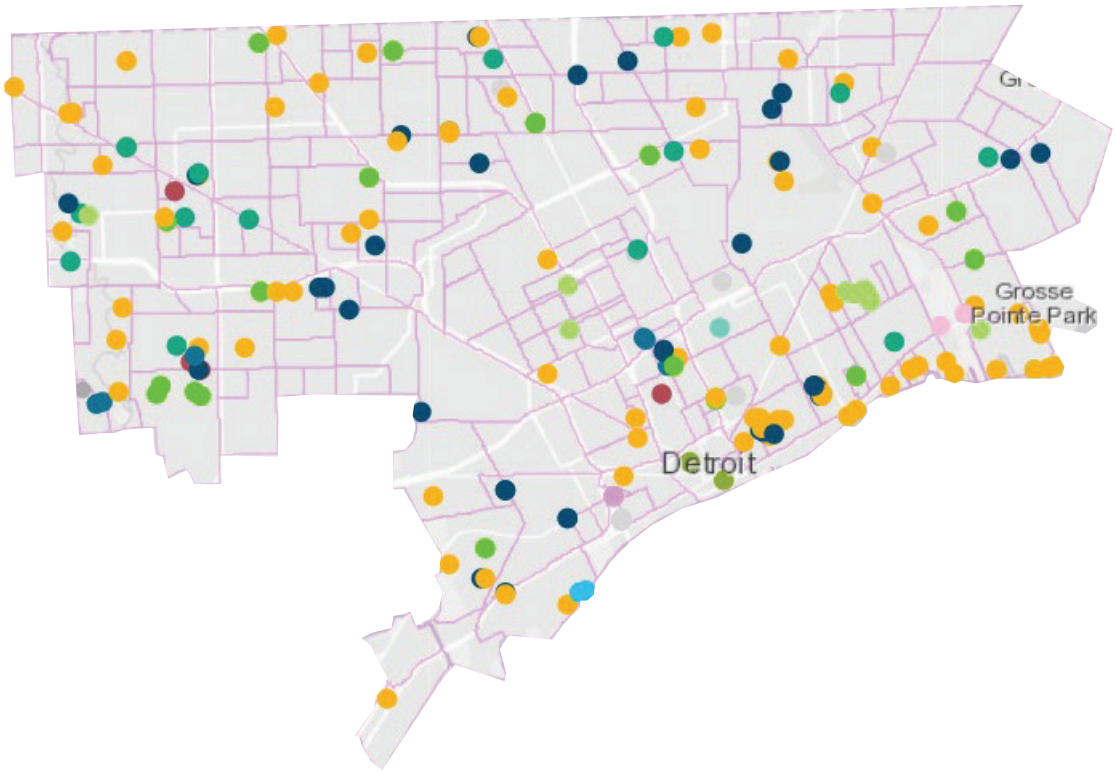
GREEN INFRASTRUCTURE BENEFITS:


Social benefits


Economic benefits


Phisical benefits


Environmental benefits



Green infrastructures map
Source: Detroit stormwater hub

Total acres managed

645,5

Millions of gallons managed annualy

379,1

Total projects nowdays

206

Legend

- All stormwater stays on site
- Biorentation
- Bioswale
- Direct discharge
- Disconnected impervious
- Downspout disconnection
- Green roof
- Impervious surface removal
- Permeable pavement
- Rain barrel
- Residential rain garden
- Stormwater/ constructed wetlands
- Surface detention
- Subsurface infiltration
- Tree-based practices
- Water harvesting
- Surface detention
- Water reuse
- Multiple
- Other

Water Harvesting
A stormwater management practice where runoff is captured and reused in various processes such as irrigation, toilet flushing, and other graywater uses. This includes above surface cisterns and storage tanks over 100 gallons. Rain barrels (under 100 gallons) are a type of water harvesting but should be listed under the specific practice type for the purposes of this project.

Bioswale
A linear practice consisting of a modified swale that uses soil filter media to increase water intake at the soil surface. A bioswale helps improves water quality and helps reduce runoff volume and attenuated peak runoff rates for small storms while also providing conveyance of excess runoff. Bioswales are usually long and narrow, have amended soil, and include retention and/or infiltration components.

Direct Discharge
Runoff generated by the impervious areas discharges directly to the Detroit and/or Rouge Rivers.

Disconnected Impervious
A stormwater management practice that directs runoff from impervious surfaces onto properly sized, sloped, and vegetated surfaces. Downspout disconnection is a type of disconnected impervious but should be listed under the specific type for the purposes of this project.

Downspout Disconnection
The process of disconnecting roof downspouts from the sewer system and redirecting the roof runoff onto pervious surfaces, most commonly a lawn.

Green Roof
Conventional rooftops that include a covering of vegetation that intercepts and stores rainfall in the layers of growing media.

Permeable Pavement
A pavement type that allows rainfall and runoff to pass through the pavement surface and enter the subsurface layer. Permeable pavement is considered a storm water practice and is not considered a pervious surface. Such permeable pavements may be constructed of concrete, asphalt, pavers, and open-graded aggregate.

Impervious Surface Removal
Removal of impervious surface on a property.

Rain Barrel
Rain barrels are very small cisterns. Rain barrels commonly collect rain water from a residential roof gutter and downspout and most commonly use the collected water for irrigation needs. Rain barrels are commonly thought as holding less than 100 gallons of water.

Residential Rain Garden
Rain gardens are bioretention practices sized for smaller lots, like residences. They consist of a depressed area with an amended soil or soil filter media capable of infiltrating and filtering stormwater runoff and supporting vegetation.

Stormwater/constructed wetlands
Stormwater wetlands are engineered, shallow-water ecosystems designed to treat stormwater runoff. This only includes engineered GSI wetland solutions, not naturally occurring wetlands.

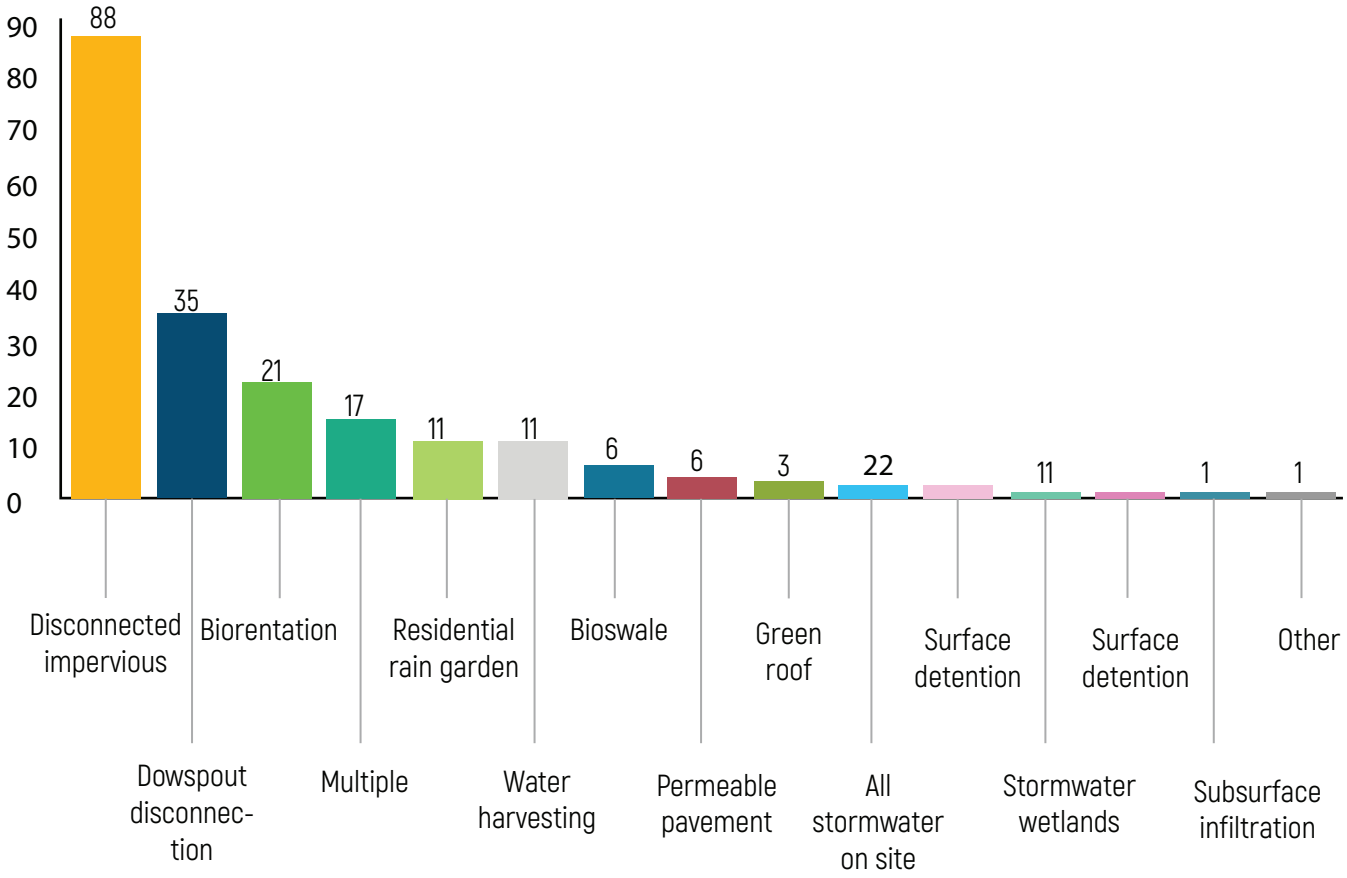
Subsurface Detention
An underground system consisting of a one or more underground pipes or structures designed to provide the required storage volumes. The system can be designed to allow for infiltration through the bottom.

Subsurface Infiltration
Infiltration practices are designed to encourage percolation and groundwater recharge, which in turn, reduces stormwater runoff from the site along with many of its negative side effects. Infiltration practices come in a variety of configurations that can be fit onto most sites (infiltration basin, infiltration bed, infiltration vault, infiltration swale, infiltration trench, dry well).

Tree-based practices
Tree-based practices are variations on the standard bioretention practice designed to infiltrate runoff and support the growth of trees in highly urbanized areas. The two most common types of tree-based practices are suspended pavement systems and tree boxes. This only includes engineered GSI tree-based solutions.

Bioretention
A water quality practice of non-linear, landscaped, shallow depressions that capture and temporarily store stormwater runoff. Runoff intercepted by the practice is then filtered through the soil (often engineered soil filter media). Residential rain gardens, bioswales, and tree-based practices are forms of bioretention, but should be listed under the specific type for the purposes of this project.

Source: Detroit stormwater hub



Projects by GSi Type
Source: Detroit stormwater hub

City council of Detroit	Percent impervious
District 1	40,11 %
District 2	47,35 %
District 3	47,89 %
District 4	46,60 %
District 5	47,06 %
District 6	50, 97 %
District 7	42,63 %

46.18%*
of Detroit's land is impervious, meaning that water cannot filter naturally into the ground.

Source: Detroit environmental agenda

Another important type of infrastructure is vacant land, in fact it can be adopted to serve stormwater and wastewater.
In particular Detroit has an estimated twenty-three square miles (59.6 sq. km) of "vacant land" that it's equivalent to the entire island of Manhattan. (www.researchgate.net/publication).
With the term vacant land we refer to parcels without structures on them, excluding parcels with abandoned structures, parks, cemeteries, and related forms of land use. Many people in Detroit still think of reuse of vacant land as redevelopment of new buildings to replace the old ones that have been thrown down.
In the last years vacant lands are been taught as new purposes with the possibility to create greener neighborhoods.
In cities as Detroit vacant land may create an opportunity for GIS to be designed in order to manage stormwater and also to serve as attractive green spaces for neighborhoods. (Lichten, Nassauer, Dewar, Sampson, Webster, 2017).
In years the Detroit Water and Sewerage Department (DWSD) and other city departments, agencies, and organizations have taken different projects to transform vacant lands into exploitable areas hosting green infrastructures.
In 2016 they removed approximately 3,141 acres of impervious cover citywide, with approximately 1,399 acres of impervious cover reduced in the Upper Rouge Tributary area of Detroit. In addition DWSD has also collaborated with the group Greening of Detroit to restore ten Michigan Land Bank vacant lots in the area of Cody Rouge.
Landscape systems have also benefits excluding their main function:
-Environmental benefits: cleaner air, soil, and water; captured stormwater; habitat for local wildlife and migrating birds.
-Fiscal and economic benefits: reduced maintenance and utility costs, fulfilling some roles of traditional systems; job creation, production of fresh food and other tangible products; an attractive, unique environment that can draw new businesses to Detroit.
-Social benefits: recreation and social life opportunities; neighborhood stabilization by acting as an amenity that helps to increase property values; improvement of resident health and comfort; new uses for and management of currently vacant land; renewal of the physical image of the city (Detroit Future City, 2013)

Given the great importance of green infrastructures, the city of Detroit has decided to collect all of them through a website and an interactive map, the Detroit Stormwater Hub. The Detroit Stormwater Hub Map contains locations, images, and project information for green stormwater infrastructure projects in the city of Detroit and it's used to explore GSI examples throughout the city.
From this website it's possible to obtain data related green infrastructure in the city.
Looking at the map of the green infrastructures present in Detroit, it is possible to notice a large presence of disconnected impervious.

Green infrastructures in Detroit
Source: web

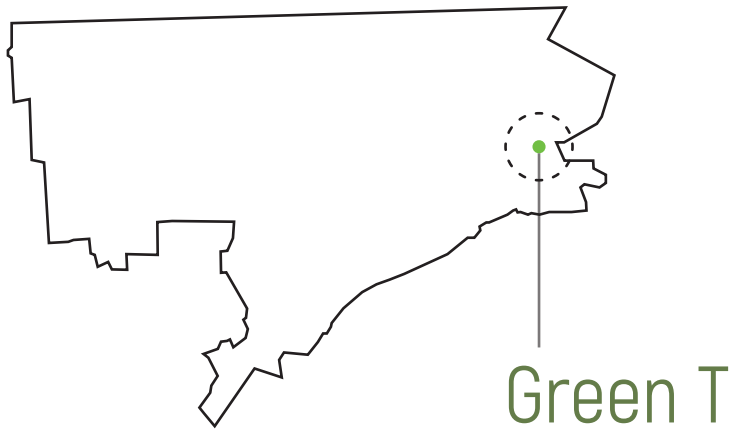
Green infrastructures in Detroit
Source: web

The images show strategic solutions used in the city of Detroit. In fact, these solutions represent strategies for the absorption of excess rainwater which causes numerous damages to the community.
These systems not only serve stormwater management and CSO's but also for energy production, water storage, air quality and to reduce the urban heat island effect

Green infrastructures in Detroit
Source: web

Green infrastructures in Detroit
Source: web

It' here reported an exemple of green infrastructure present in the neighborhood of Fox Creek. It's also indicated in the map Green infrastructures map reported above.



Neighborhood: Fox Creek
Practice Type: Bioretention
Practice width: 6.00 FT
Practice lenght: 47.00 FT
Acres managed: 0.13 Acres
Million gallons managed annualy: 0.03 MILLION GALLONS

Source: https://detroitstormwater.org/projects

Green infrastructures in Detroit
Source: web

3.JEFFERSON CHALMERS NEIGHBORHOOD

NEIGHBORHOOD PROFILE

The Jefferson Chalmers Neighborhood is located on the lower eastside of Detroit and is geographically bound by Alter Road on the east, Conner Street/Clairpointe Avenue on the west, Kercheval Street on the north and the Detroit River on the south.

Jefferson-Chalmers is a neighborhood associated with the Jefferson East Business Association (JEBA), an organization working to foster new development within the east Jefferson corridor (Jefferson East, Inc., 2018). Jefferson Avenue is one of the most important street of the city and it runs along the southern edge of the city, paralleling the Detroit Riverfront. It links the Jefferson-Chalmers neighborhood with the downtown district (lying west) and the wealthy Grosse Pointe suburbs bordering the neighborhood to the east. Jefferson Avenue runs approximately located in the center of the Jefferson-Chalmers neighborhood and is primarily commercial zoned. The neighborhood is also flanked by Conner Creek to the west and Fox Creek to the east. The road that is now East Jefferson Avenue has always existed in Detroit's history. In the early days it was known as "River Road" and linked French farms by tape to Anne Street. After the disastrous fire of 1805, thanks to a new project Ste. Anne St. was enlarged and the River Road was renamed "Jefferson Avenue". This street became the commercial network of the city, in fact in 1820 over half of the city's businesses were located on the avenue. Even at the moment of maximum industrialization of the city, this road played an important role. During XX century, the area around Jefferson Avenue became more industrialized. Also with the increase in population and the departure from the city center in the 20s and 30s of the twentieth century East Jefferson Avenue became an epicenter for the new luxury condominiums.

The neighborhood is characterized by three strength elements on which the Jefferson Chalmers Framework Plan is based, these are: East Jefferson Avenue, a 63.71-mile-long (102.53 km) scenic road along the eastern part of the Detroit metropolitan area that is home to a number of economic strengths; neighborhood fabric which describe the character of Jefferson Chalmers through history and the waterfront, the neighborhood boasts 160 acres of waterfront parkland. (City of Detroit Planning and Development Department, April 2017). The waterfront constitutes a resource for the area as it brings value in high recreational use in public open space.

(City of Detroit- Planning and Development Department, Jefferson Chalmers Neighborhood Framework, April 2019)

Freud Street
Dickerson Street
Victoria Park Drive West
Lenox Street
South Park Street
Jefferson Square
Victoria Park Drive South
Essex Avenue
Remus Robinson Building
Carstens Elementary-Middle School
West Continental Street
Kitchener Street
Avondale Street

Conner Creek
Source: web

Fox Creek
Source: web

Jefferson Avenue
Source: web

Waterfront
Source: web

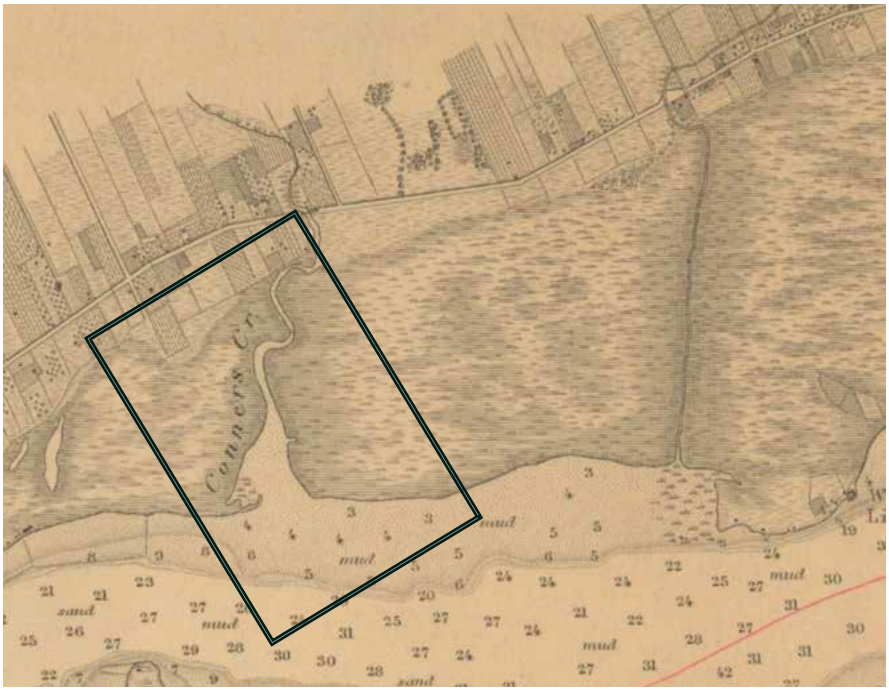
JEFFERSON CHALMERS IN HISTORY

The area of the city of Detroit known as Jefferson Chalmers has undergone numerous transformations throughout history and was inhabited by a succession of inhabitants including Fox, Iroquois, Anishinaabe, French, English and eventually American settlers.

Jefferson Chalmers
Source: Jefferson Chalmers Neighborhood Framework, April 2019.

The French inhabitants of the area called this area of the city "Gran marais" because of the large swamp that stretched along the Jefferson Chalmers area.
In the history of the area the river has always been of great importance, in fact it has represented the main corridor of the city of Detroit. Due to the importance of the river, various activities were practiced along its banks, among these there were fishing and hunting. Later the river became an attractive pole for the community in fact taverns and resorts developed along the river. Despite the marshy land the area was exploited from an agricultural point of view and in the eighteenth century the French decided to divide the area into small agricultural lots, the ribbon farms.

This territorial subdivision can still be seen today as traces of the subdivision into lots and they have remained in the alignment of some roads.

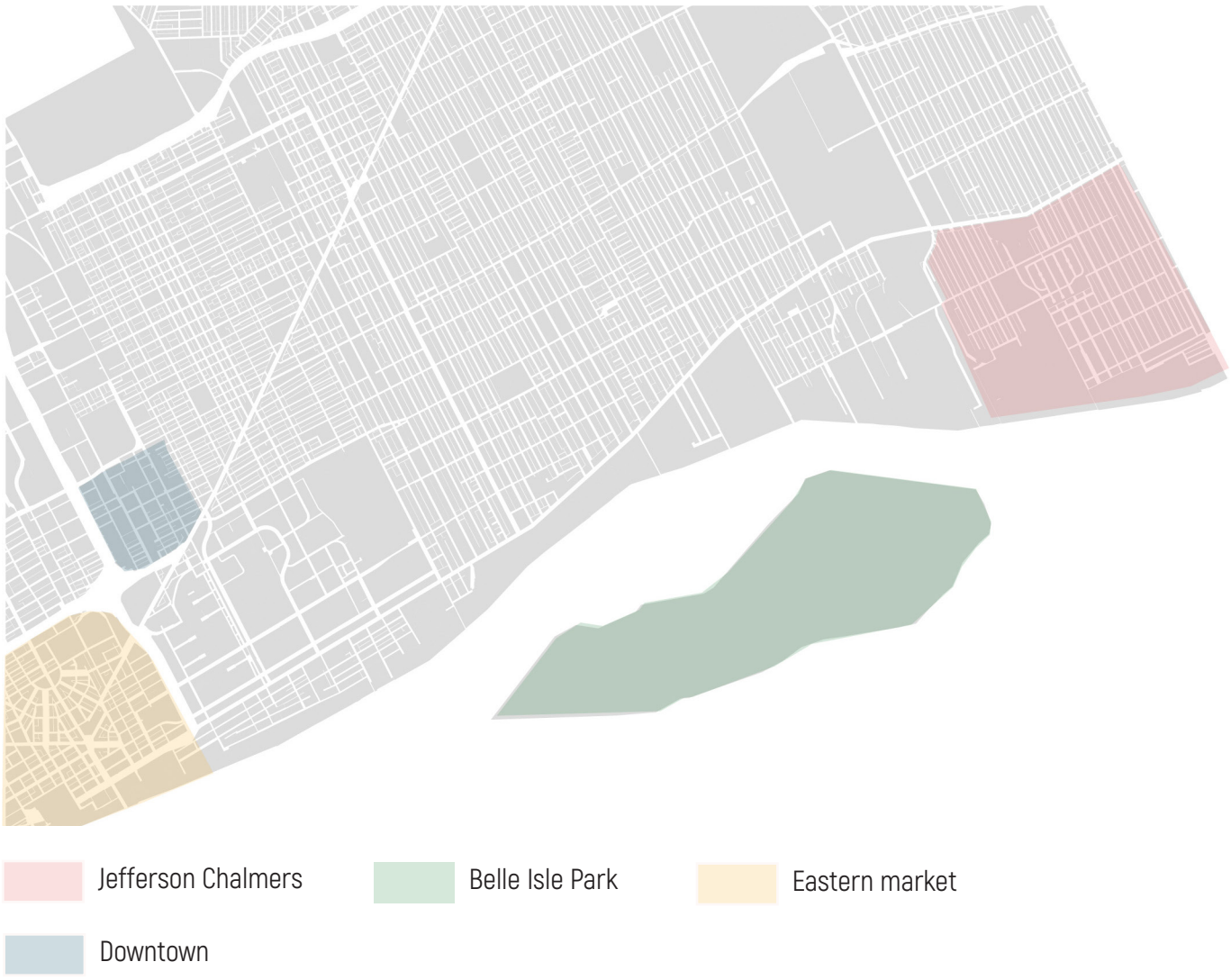


Jefferson Chalmers
Source: Jefferson Chalmers Neighborhood Framework, April 2019.

The 1800 was an important century for the agricultural development of the city of Detroit and for the Jefferson Chalmers area. In the nineties of the 1800s two horseracing tracks were built in the southern part of the area, these were: The Driving Club and the Detroit Jockey Club Race Track. Physical traces of this impact also remain, such as Algonquin and Marlborough Streets.
In the early 1900s, following industrial and residential development, churches, shops and houses were built in the district. In those years Jefferson Chalmers became a center of commercial activities, business and commercial corridors such as Freud and Essex Avenue. At the same time various industrial enterprises arose in the district which allowed a fast and strong development on a social and economic level.
The following years saw the onset of racial segregation, financial crises, injustices and difficulties that led the neighborhood to resist. Another determining factor for the neighborhood was the Great recession of 2008 and related the foreclosure crisis, which further worsened the situation.
(City of Detroit, 2019)

LARGE-SCALE NEIGHBORHOOD ANALYSIS

The Jefferson Chalmers neighborhood is located on the lower eastside of Detroit. The location is considered strategic for several reasons: proximity to the river and proximity to Downtown, the central district of Detroit. Co-finating with this district, therefore not far from Jefferson Chalmesr, is the Eastern market district, an area of significant importance for the population as it hosts one of the largest markets for local products on weekends. Another attractive pole located near the district in question is Belle Isle park, consisting of a main island and smaller islands. This constitutes an attractive pole that hosts sporting and cultural attractions.



As mentioned before, a strong point of the neighborhood is represented by the East Jefferson Avenue road axis. This is a 63.71-mile-long (102.53 km) scenic road along the eastern part of the Detroit metropolitan area. This road axis plays an important role as, in addition to the fact that it is bordered by a large number of commercial activities, it connects the Jefferson Chalmers district with the central area of the city that is the Downtown district.
In fact, as shown above, this road connects the area where the ribbon farms were historically located with the central area.

Jefferson Chalmers Downtown East Jefferson Avenue

Along East Jefferson Avenue (Jefferson Chalmers- Downtown):

2 h 16 min 19 min 39 min

The Jefferson Chalmers neighborhood is characterized by the presence of numerous green spaces. Most of these are located along the riverfront, this location has a strategic function which consists in containing the water of the river that often floods. Green areas therefore have the purpose of absorbing part of the amount of water. The Detroit River often floods because heavy storms cause the rise of water level.
The district would therefore need the increase of green areas in the district that act as green infrastructures.

Source: Motorcitymapping

Green area

Green areas can act as green infrastructures because the land, unlike roads or pavements, has a water absorption coefficient of 0.2.
(University of St. Thomas, 2016)

Below is an analysis of the services present in the neighborhood. Through the map shown it is possible to see that East Jefferson Avenue is an axis flanked by several services. In fact, this area of the neighborhood represents the commercial area on the east side of the city.
The central area of the neighborhood, on the other hand, does not report a large number of services as does the area closest to the river. The Jefferson Chalmers neighborhood is mostly residential.

Source: Motorcitymapping

Commercial Grocery Retail Service

Other

Continuing the analysis of the Jefferson Chalmers neighborhood the SWOT analysis was used. This was useful for identifying the strengths, weaknesses, threats and opportunities related to the area under consideration.
The Jefferson Chalmers neighborhood is located on the lower eastside of Detroit and overlooks the river. This topographical feature represents both a threat and a strength as its proximity to the river allows the neighborhood to be an attractive pole for the Detroit population but at the same time constitutes a threat because the neighborhood is often flooded.
The green areas located along the riverfront are an element of strength for the neighborhood both because they represent spaces in which the population can enjoy clean air and practice outdoor activities and for their contribution to rainwater management.
East Jefferson Avanue is also a strong point because it connects the Jefferson Chalmers neighborhood and the city center and because it constitutes an important commercial axis.
The Jefferson Chalmers neighborhood also sees many development opportunities such as the transformation of the many abandoned and unused spaces through a process of re-functionalization. This urban development also foresees the possibility of creating new activities and consequently job opportunities.
As already mentioned above, the proximity to the river also represents a threat as also the presence of a limited number of services, particularly in the central part of the district.
In addition, the large number of abandoned lots also pose a threat. The city of Detroit has a high percentage of unused area linked to the particular history and series of events that have characterized the city.
An element of threat is linked to crime. Detroit has a high rate of crime and vandalism due to several factors including the presence of many vacant lots. As mentioned in the previous chapter, the sewer system characteristic of many American cities constitutes a weakness for the neighborhood.
The combined sewer system in fact considerably worsens the situation linked to floods as it constitutes an increase in water pollution and causes damage to homes.
The impacts of climate change such as the increase in rainfall make this system even more subject to criticalities as these cause increasingly frequent floods.

STRENGHTS

- Near to the river
-Lower cost for vacant properties
-Presence of large green areas
-Jefferson Avenue axis

OPPORTUNITIES

- Create new job opportunities
- Creation of new green area to improve quality of the community
-Unused spaces could be refunzionalized

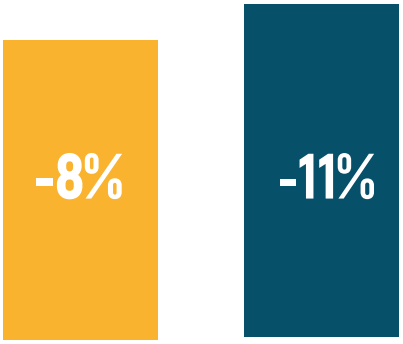
WEAKNESSES

- Near to the river
-Lack of services
-Floods prblem also linked to CSO
-Vacant lots

THREATS

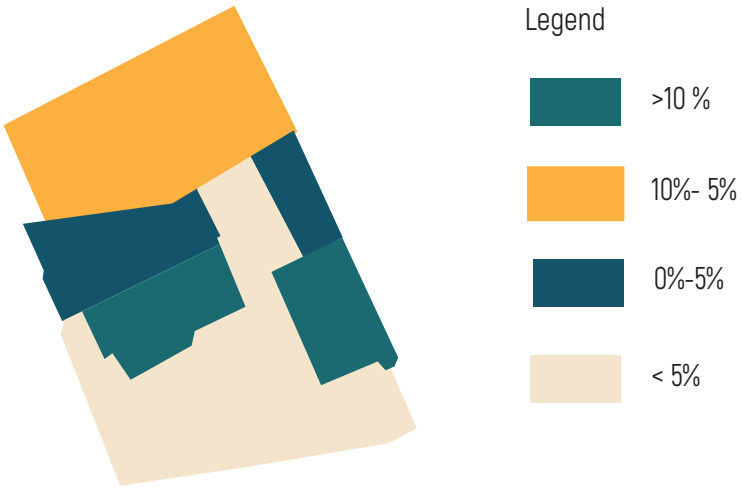
- Abandoned spaces can be places of vadalism and crime

JEFFERSON CHALMERS IN NUMBERS

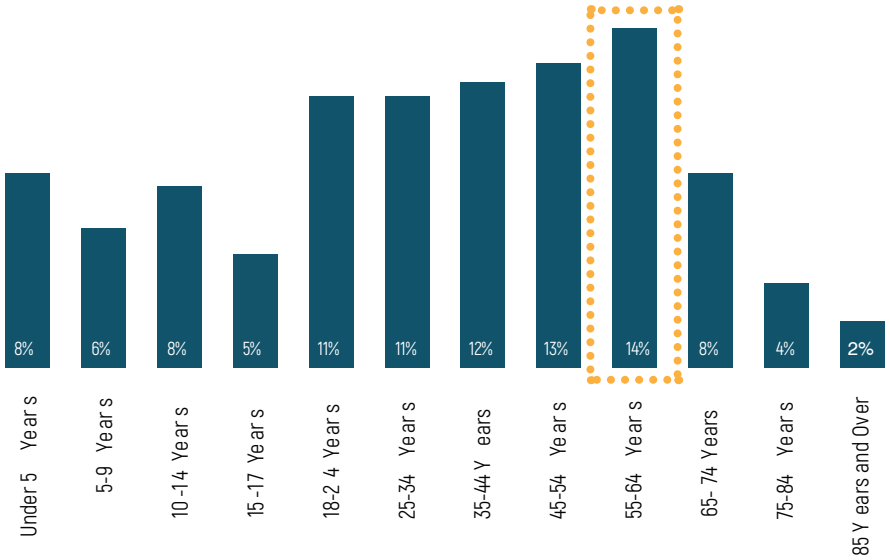


Population decline, 2010-2016
Source: Jefferson Chalmers neighborhood framework plan.

The graph shows a demographic decline in population. The colored rectangles represent the demographic declines in relation to the population of Detroit and Jefferson Chalmers one.
It's possible to notice how in the period between 2010 and 2016 the neighborhood under examination had a greater demographic decline, respectively 11%. Analyzing the demographic trend of the city of Detroit, it is possible to note that in the period between 2010 and 2016 Detroit had a population decline of 8% .In 2016 population of Jefferson Chalmers was 7881.
A graph is also shown below which relates the different areas of the neighborhood to the respective demographic loss. Observing the graph it is possible to see how the central area of the neighborhood and the eastern part were the most subject.

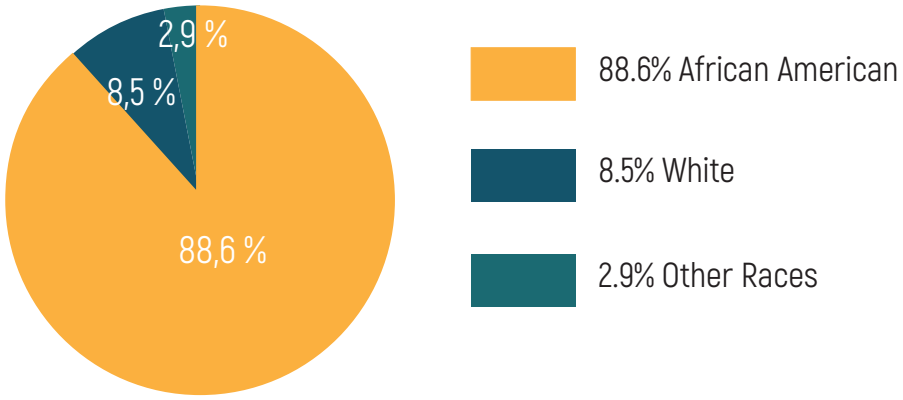


Population loss 2010-2016
Source: Jefferson Chalmers neighborhood framework plan.



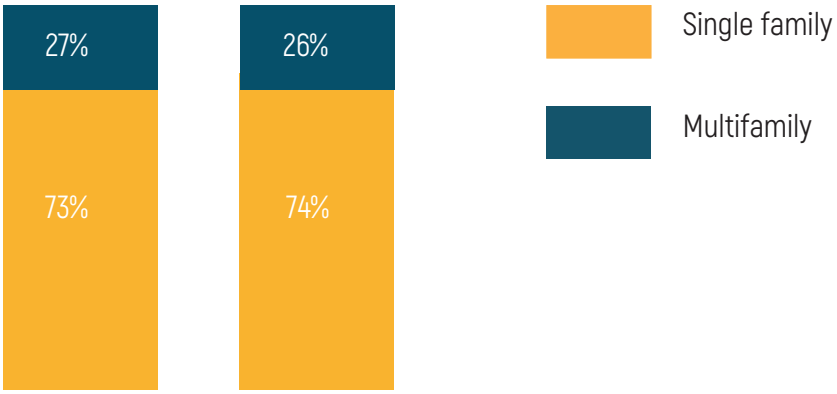
Age
Source: Jefferson Chalmers neighborhood framework plan.

The neighborhood has a prevalence of middle-aged residents, this figure is quantified with 14% of the total. The next higher values are related to the population between 18 and 40 years of age.
The minority age group is that of the elderly aged 85 and over.



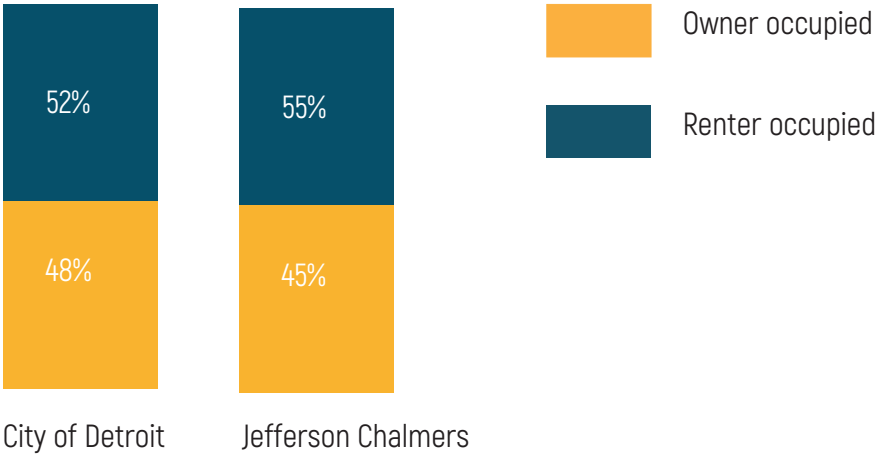
Race and ethnicity
Source: Jefferson Chalmers neighborhood framework plan.

The graph shows a strong presence of African American people in the Jefferson Chalmers neighborhood, this reaches almost 90%.



Housing type, 2016
Source: Jefferson Chalmers neighborhood framework plan.

The housing stock chart shows nearly equal values for the city of Detroit and the Jefferson Chalmers neighborhood. Both report a greater number of homes that do not house a single family.

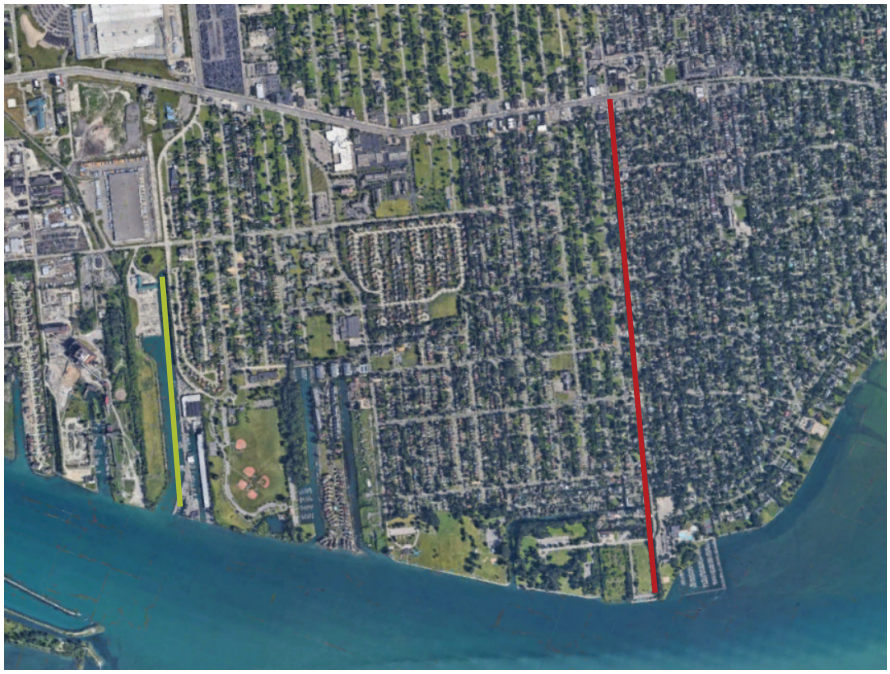


Housing tenure
Source: Jefferson Chalmers neighborhood framework plan.

The percentages of people in the city of Detroit and the Jefferson Chalmers neighborhood own a home and those who rent are nearly equal. This value is close to 50% for both those who own their own home and for those who rent on both analyzes.

FLOODING PROBLEM

The neighborhood Jefferson Chalmers is one of the most affected by floods, increasingly frequent and harmful consequences of heavy storms related to climate change impacts.
In recent years have occurred record high water levels in the Great Lakes with flood consequences. The neighborhood borders a series of canals at the point where Lake Saint Clair becomes the Detroit River and this is one the reason for which residents are always on alert.
The neighborhood is flanked by Conner Creek to the west and Fox Creek to the east.
According to the Jefferson Chalmers Neighborhood Stabilization Plan the neighborhood is affected by two types of flooding issues, river flooding and stormwater flooding.
(Detroit Vacant Property Campaign, 2013)



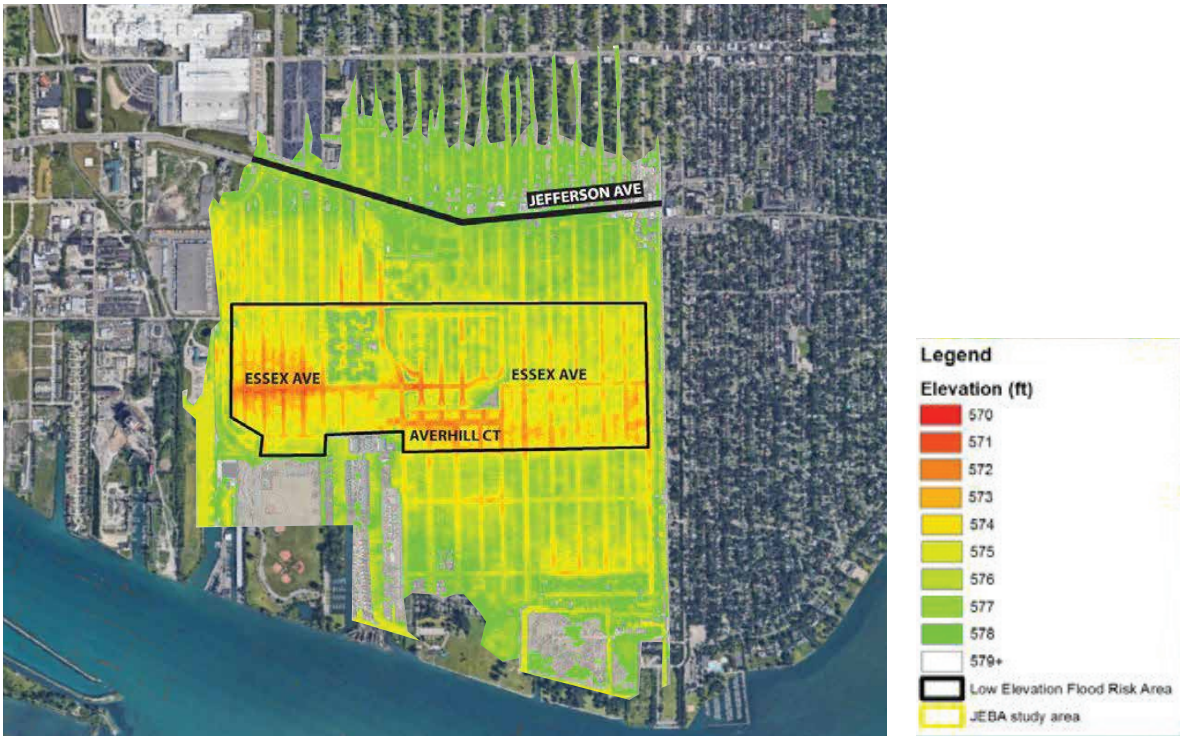
Fox Creek

Conner Creek

Jefferson Chalmer neighborhood
Source: web

Jefferson Chalmer neighborhood
Source: https://detroit.curbed.com/2019/7/11/20690626/flooding-jefferson-chalmers-detroit-emergency-order

The riverfront was designed at high altitude in order to prevent high river flows from reaching the low-altitude portions of the Jefferson-Chalmers neighborhood as surface flows. The relatively higher riverside creates a topographical condition which can prevent flows of rainwater to reach the river. This demonstrates the need for an efficient means of transport for surface water flows at an outlet of the river. Several factors such as the combination of maintenance problems caused by the aging of the sewage infrastructure system, the low topography and contextual relationships of the neighborhood within the Detroit sewage infrastructure network suggests that this area will be increasingly subject to flood and therefore needs action.



Elevation and flood prone areas
Source: University of Michigan Detroit Vacant Property Campaign, 2013.

Topography of the Jefferson-Chalmers neighborhood forms a "bowl" with areas in red representing lower elevation and green representing higher elevations. Sewer backup water within this "bowl area" would not be able to leave as runoff, making this area flood prone.
(University of Michigan Detroit Vacant Property Campaign, 2013)
Jefferson Chalmers neighborhood is flood prone due to its low elevation, for its proximity to the river as mentioned above and for the combined sewer system .

The Detroit River Interceptor (DRI), an important rainwater collector of the city, runs under the neighborhood in question. In addition, the part of the sewer located below the neighborhood is extensive and this means that all the outflow of the eastern part of the city converges under this area. This results in all intercepted runoff from the east side of the city being conveyed under the Jefferson-Chalmers neighborhood. Below the neighborhood, the Conner Creek pumping station is required to channel all the rainwater into the sewer lines in the portions of the DRI that are further downstream in the infrastructure network.

Sewershed associated with conveyance
Source: University of Michigan Detroit Vacant Property Campaign, 2013.

Map displaying the extensive sewershed areas lying upstream of the stretch of DRI running under the Jefferson-Chalmers neighborhood. The red arrow represents the general path of intercepted runoff through the sewer system.
(Detroit Vacant Property Campaign, 2013)

Jefferson Chalmers neighborhood and sewer infrastructure context
Source: University of Michigan Detroit Vacant Property Campaign, 2013.

Map displaying the Jefferson-Chalmers neighborhood within the context of major sewer infrastructure. (Detroit Vacant Property Campaign, 2013)
In addition billions of gallons of combined sewer overflows (CSOs) being released into the Detroit and Rouge Rivers with consequent effects on water quality. Reporting some data there were 113 CSOs events in 2018 and 2017, 118 in 2016 and 124 in 2015. (Michigan Department of Environment, Great Lakes, and Energy Combined Sewer Overflow (CSO), Sanitary Sewer Overflow (SSO), and Retention Treatment Basin (RTB), 2018).
High level of pollutants including nutrients, oil, grease, chloride, and ammonia are presented in the Detroit River and more concentrated amounts of toxic organics and heavy metals are present in sediment deposits at various locations along the water body. (City of Detroit, 2011)
For these reasons the EPA has identified urban stormwater runoff as a major source of the contamination impairing the Detroit River. Green infrastructures can represent a means to improve water quality of Detroit river.

Jefferson Chalmer neighborhoodDeep water is flooding Essex and Ashland streets in the Jefferson Chalmers neighborhood in Detroit. Bill Laitner, Detroit Free Press
Source: web

Jefferson Chalmer neighborhood
Source: web

AGRICULTURE AS A GREEN INFRASTRUCTURE

As mentioned in the last chapter green infrastructure is a relatively new and flexible term referring to systems designed to manage stormwater through the use or mimicry of a site's natural hydrologic processes as an alternative to piped stormwater infrastructure.
(http://water.epa.gov/infrastructure/greeninfrastructure)
Green infrastructures consist in different ways of water control incorporating rate vegetation, soils, and other natural processes. These elements allow to mitigate the stormwater runoff before it reaches the piped infrastructure systems and provides treatment for associated runoff pollutants.
(National Research Council (NRC), 2009)
It is well known, given its history, how the city of Detroit is characterized by vast abandoned and vacant areas that over the years it is trying to retrain in a functional way.
Infact the high amounts of vacant land in Detroit could have an important role in address stormwater management through the use of green infrastructures.
Vacant land as a green infrastructure can be used to improve water quality and ensure that the abandoned land is exploited.
Focusing on Jefferson Chalmers neighborhood, it presents a large area of vacant lands, in fact today there are over 10,000 vacant lots and structures in the Lower East side neighborhoods of Detroit and Jefferson-Chalmers occupies a portion of these lower east side neighborhoods. Urban agriculture is not considered a green infrastructure for its main purpose, that of local food production, it can be used for the management of rainwater converting free lots into garden land. In order to understand how urban agriculture could be used as a green infrastructure to reduce stormwater runoff in cities it's helpful to examine runoff coefficients.
Runoff coefficients are a measurement of the fraction of precipitation that ends up as surface runoff, rather than being absorbed in soils and either ending up as groundwater or being removed through evapotranspiration.
Comparing some of these coefficients we can demonstrate how agriculture lot can absorb more stormwater then asphalt and so streets. It's here reported a table that shows coefficients related to different kind of soil and agriculture lots.

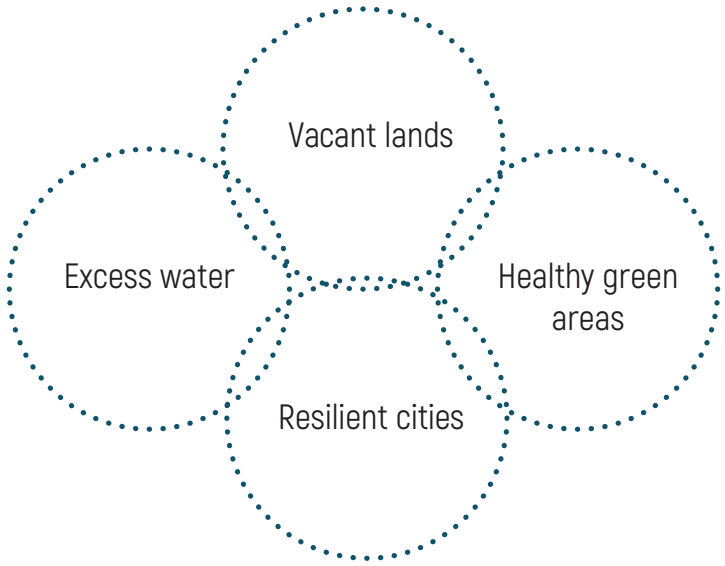
			Agricultural lot		
	Type of lot		Generic	Heavy oil flat	Sandy soil
		Runoff coefficient	0,2	0,15	0,3
Vacant lot	Generic	0,7	1,3	1,4	2,8
	Gravel area	0,5	0,8	0,9	1,5
	Neighbor-hood	0,7	1,3	1,4	2,8
	Downtown area	0,95	1,9	2,0	4,4
	Asphalt/ concrete	0,95	1,9	2,0	4,4

Runoff coefficients
Source: University of St. Thomas, 2016.

Looking at this table it's possible to estimate the annual volume of water absorbed or not (in cubic feet) if the lot was kept in vacant lot or transformed in an agriculture area. Infact, for example, multiplying the generic runoff coefficient of vacant lot (0,7) and the number of vacant lots present in the Lower East side neighborhoods of Detroit (10,000- data mentioned before) and in the same way the runoff coefficient of the generic agriculture lot (0,2) and 10,000 vacant lots, it's obtained the volume of stormwater could be absorbed through urban agriculture.
Converting vacant lots to urban lots decreases stormwater by 85%.
This value demonstrate how urban agriculture could represent a significant tool to face up problem of inondation in Detroit.
(Hankard, Reid, Schaefer, Vang, 2016)

4.CASE STUDIES

The case studies chosen were selected as an example for the design of the project. The projects considered are mainly part of American and European realities, excluding the Chinese project. This choice was targeted as America is often subject to damaging floods caused by large-scale flood phenomena.
All the projects considered and placed as case studies propose, in a similar but not equal way, efficient and functional strategies for reducing the quantity of excess water, the one that causes floods and damage to the community.
Different areas and projects are united by the creation of green and usable spaces that have the function of absorbing a large amount of water. In fact, as already mentioned above, green spaces have a higher absorption coefficient than urban surfaces characterized by the presence of asphalt or concrete.
Although the selected examples see the creation of areas to address the issue of flooding, they are all united by the creation of social, entertainment and functional realities for the community that will experience them.
Here are the main objectives of the proposed projects, these are:
-refunctionalize abandoned and unused areas
-reduce the amount of excess water
-create livable and healthy green areas for the population
- create increasingly resilient cities and bring benefits to the population through urban transformations .



ROOM FOR THE RIVER

PLACE: Nijmegen, The Netherlands

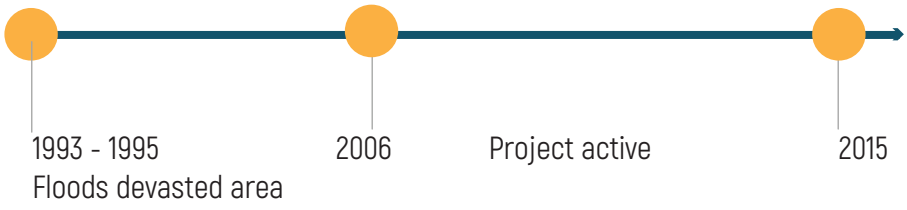
ARCHITECT: H+N+S Landscape Architects

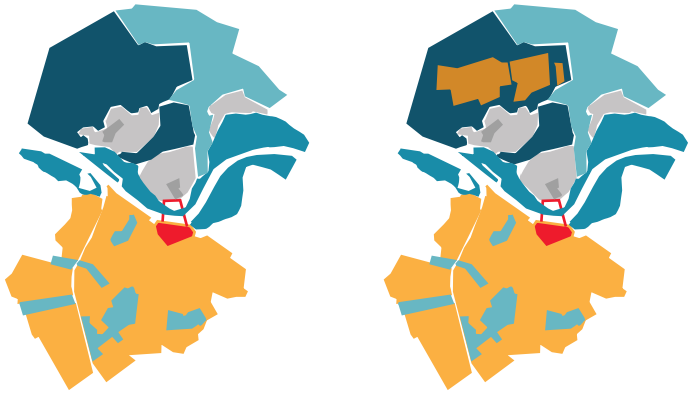
AREA: 120 ha

LINK:https://worldlandscapearchitect.comroom-for-the-river-nijmegen-the-netherlands-hns-landscape-architects/#.XorabogzZPY

GOALS OF THE PROJECT:

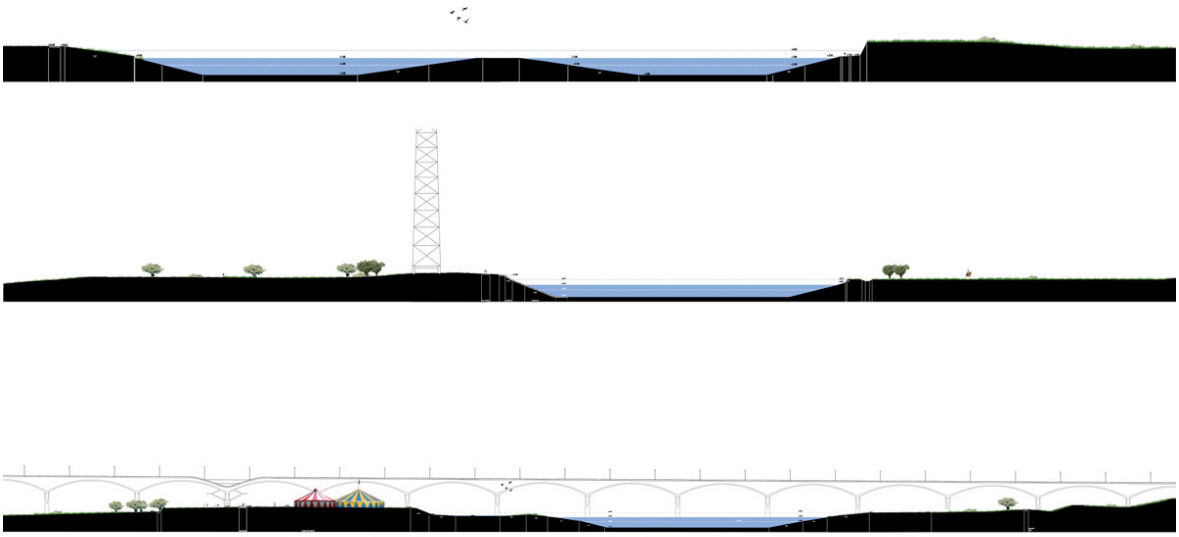
- Reduce stormwater volume
- Give more space to the river
- Prevent future floods





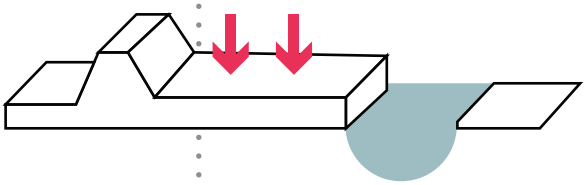
Before After

Climate change and its impact on the territories mean that the amount of water present in rivers is always increasing and in response to this phenomenon the course of over 30 rivers in the Netherlands is undergoing transformation in order to prevent future floods. These measurements taken along the IJssel, Lek, Maas and Waal rivers are known as "Room for the River". (http://www.ruimtevoordewaal.nl/en/room-for-the-river-waal)
The Room for the River program was born and was developed following an important flood phenomenon that caused a lot of damage. The project was conceived to address this problem and to reduce the risk of floods.
The main objective of the Dutch Room for the River program is to give rivers more space, so that they can ensure higher levels of water safety and thus more easily control floods. There is also the aim of creating an elongated island on the Waal River, located between the historic center of the city and the north bank of the Waal River.
The area is characterized by the presence of several bridges built with the aim of connecting isolates and the bypass channel creating a space that not only reduces the risk of flooding but also offers recreational, ecological and aesthetic values.
The project develops on the concept of dividing the floor into three levels, these are the creation, growth and movement of water. The "creation" layer represents the physical elements that are built, excavated or raised during the construction phase. The second layer, "growing", shows the possible changes the landscape could have over time. The third layer, "water movement", shows the movements of the water levels. To the objectives mentioned above is added that of making this space a livable and meeting place. (https://urbannext.net/room-for-the-river/)

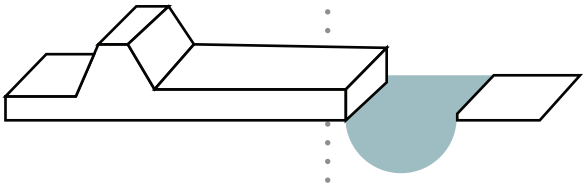


Section

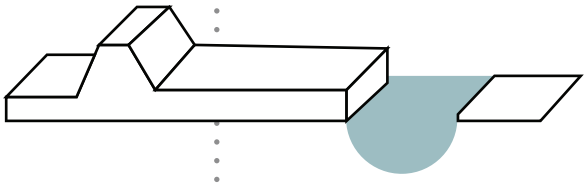
Lowering of floodplains



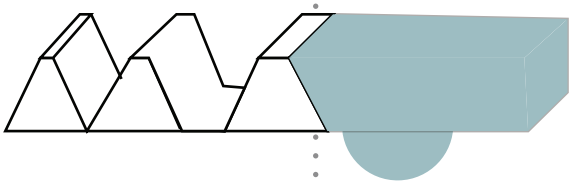
Lowering groyens



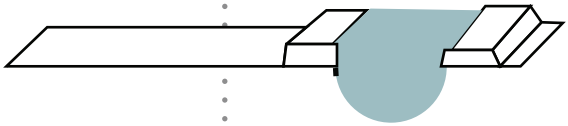
Deepening summer bed



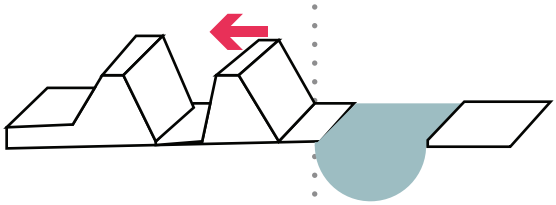
High water channel



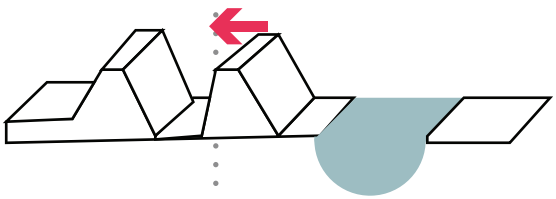
Water storage



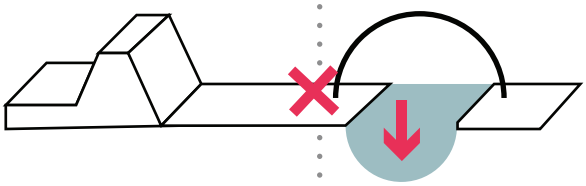
Depoldering



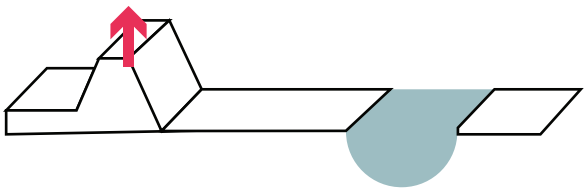
Dike relocation

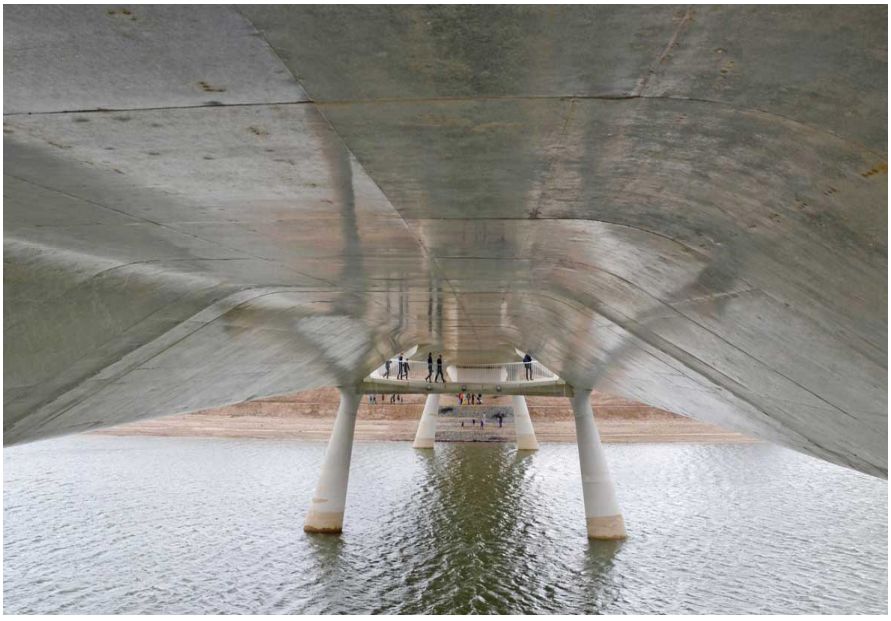


Removing obstacles



Strengthening dikes





WEILIU WETLAND PARK

PLACE: Xianyang, China

ARCHITECT: Yifang Ecoscape

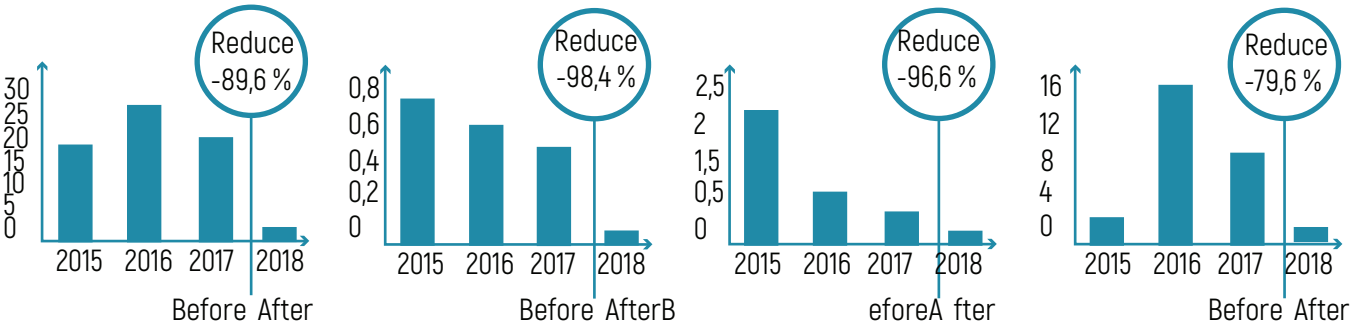
AREA: 125 ha

LINK:https://worldlandscapearchitect.com/weiliu-wetland-park-xianyang-china-yifang-ecoscape/#.Xors1YgzZPY

GOALS OF THE PROJECT:

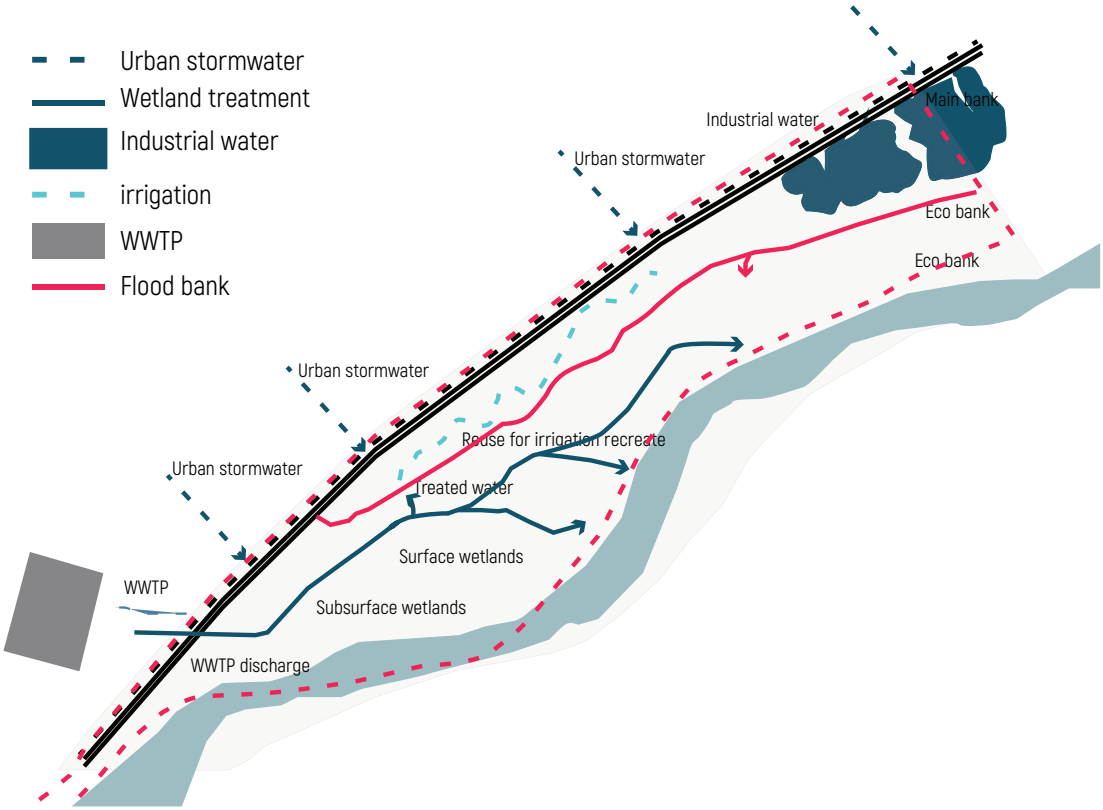
- Create resilient, flood adaptive landscape
- Reuse the original dyke for green corridor
- Reduce quantity of stormwater

WATER TREATMENT THROUGH WETLANDS

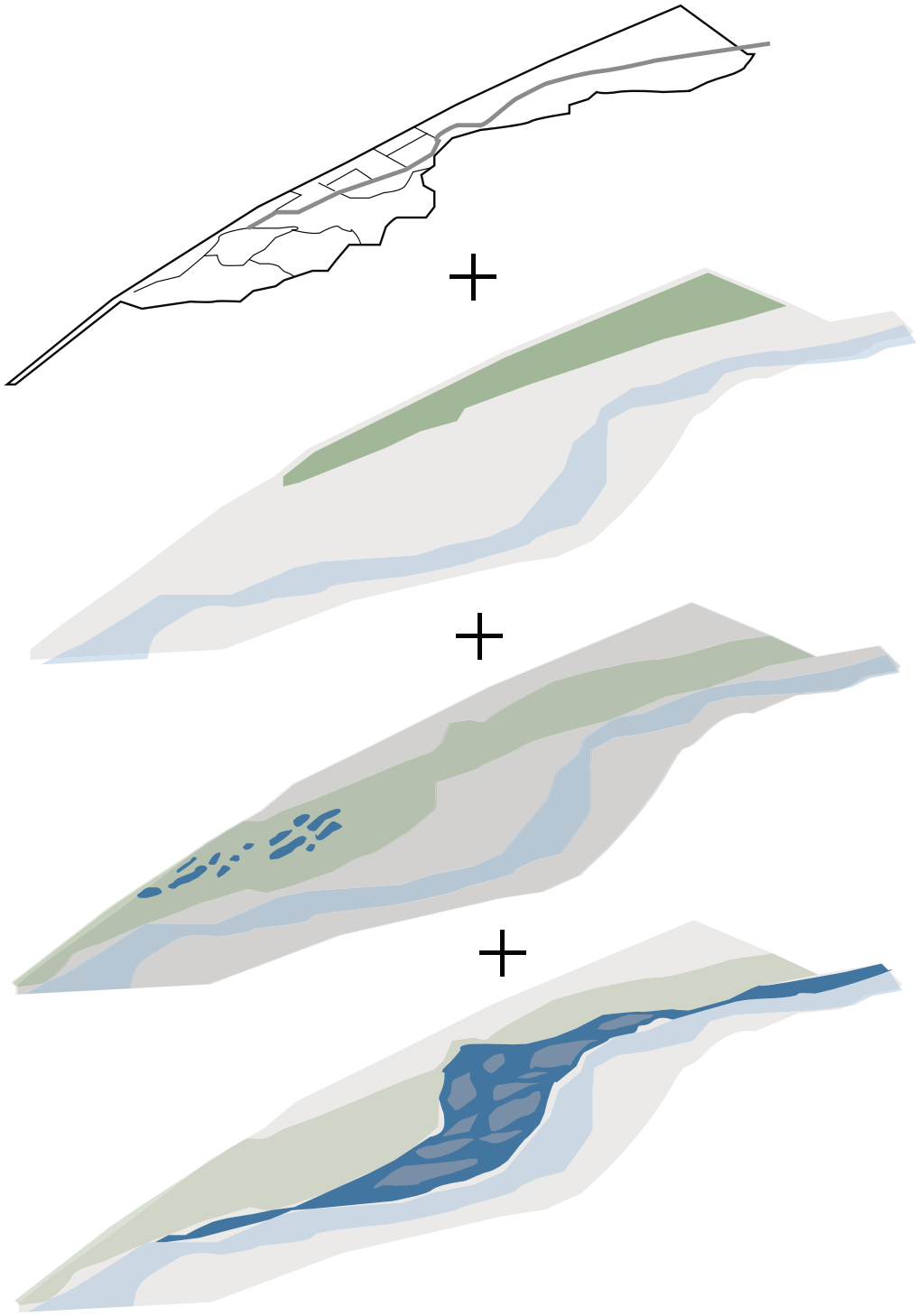


Source: http://landezine.com/index.php/2019/01/weiliu-wetland-park-by-yifang-ecoscape/

The Weiliu Wetland park is located in a section of the Wei River outside the city of Xianyang, which often floods the surrounding area. The park has dimensions of 3200 m in length and 470 m in width and its surface is 125 ha. At the base of the park project there is a specific idea that is proposed in the design and this has the intent of not making the park lose its ecosystem. The project involves the creation of a green urban infrastructure that allows for adaptive flood control, rainwater management, improvement of water quality, reuse of wastewater and restoration of biodiversity.
At the same time, the design idea is based on the creation of a green corridor that connected the center of the park and which was built on a pre-existing earth dam flanked by willows. It also includes the issue of water pollution and its reuse, all the polluted water from the drainage channels that crossed the site was initially collected in the purification plant and then in the wastewater treated by the wetlands built, producing water which can be used for landscape irrigation and other functional uses.
The intervention also sees the insertion of two intertwined structures that rise and fall over the landscape, forming walkways, bridges and observation platforms.
(https://worldlandscapearchitect.com/weiliu-wetland-park-xianyang-china-yifang-ecoscape)



Source: http://landezine.com/index.php/2019/01/weiliu-wetland-park-by-yifang-ecoscape/



S4

Urban park:
Interact with water

S3

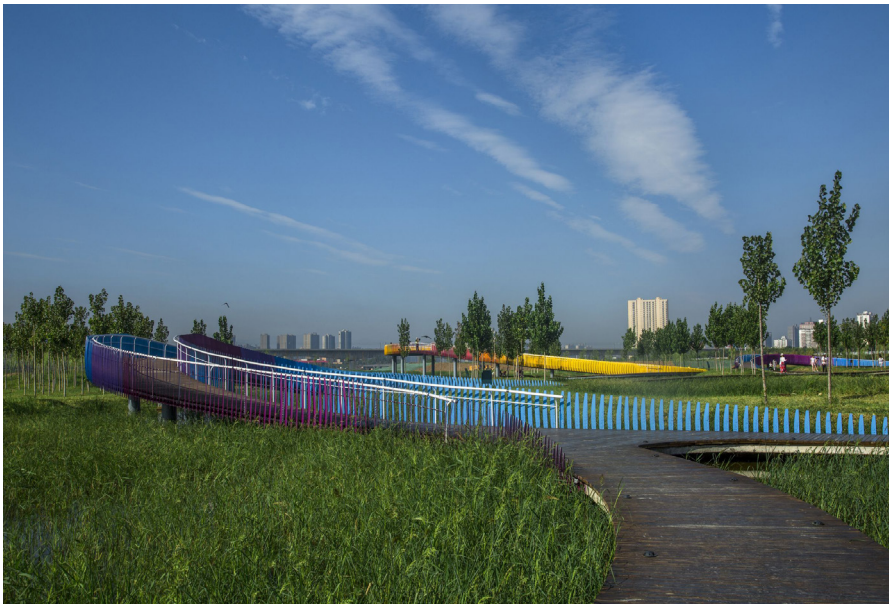
Wetland Park:
Stormwater management
reuse of wastewater

S2

Floodable Park:
Adaprtive flood management

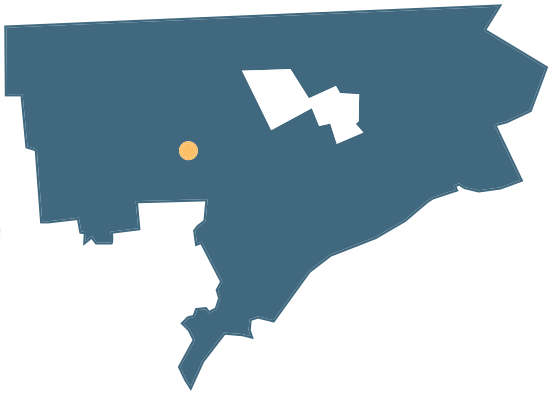
S1

Source: http://landezine.com/index.php/2019/01/weiliu-wet-land-park-by-yifang-ecoscape/



THE BLOODY RUN CREEK GREENWAY

PLACE: Detroit, United States



ARCHITECT: NTH
Consultants, Ltd.
Adi Shamir
The Mannik & Smith Group,
Inc. Urban Resource Alliance
Zachary and Associates, Inc.

AREA: 3000 ha

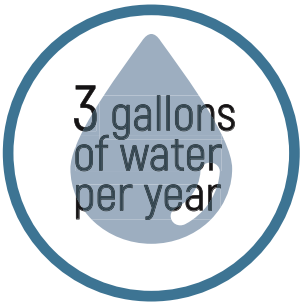
LINK: http://www.dcdc-udm.org
/projects/strategies/bloodyrun/

GOALS OF THE PROJECT:

- Refunctionalize vacant lots
- Make the city greener
- Face up to stormwater problem

2010
Project start

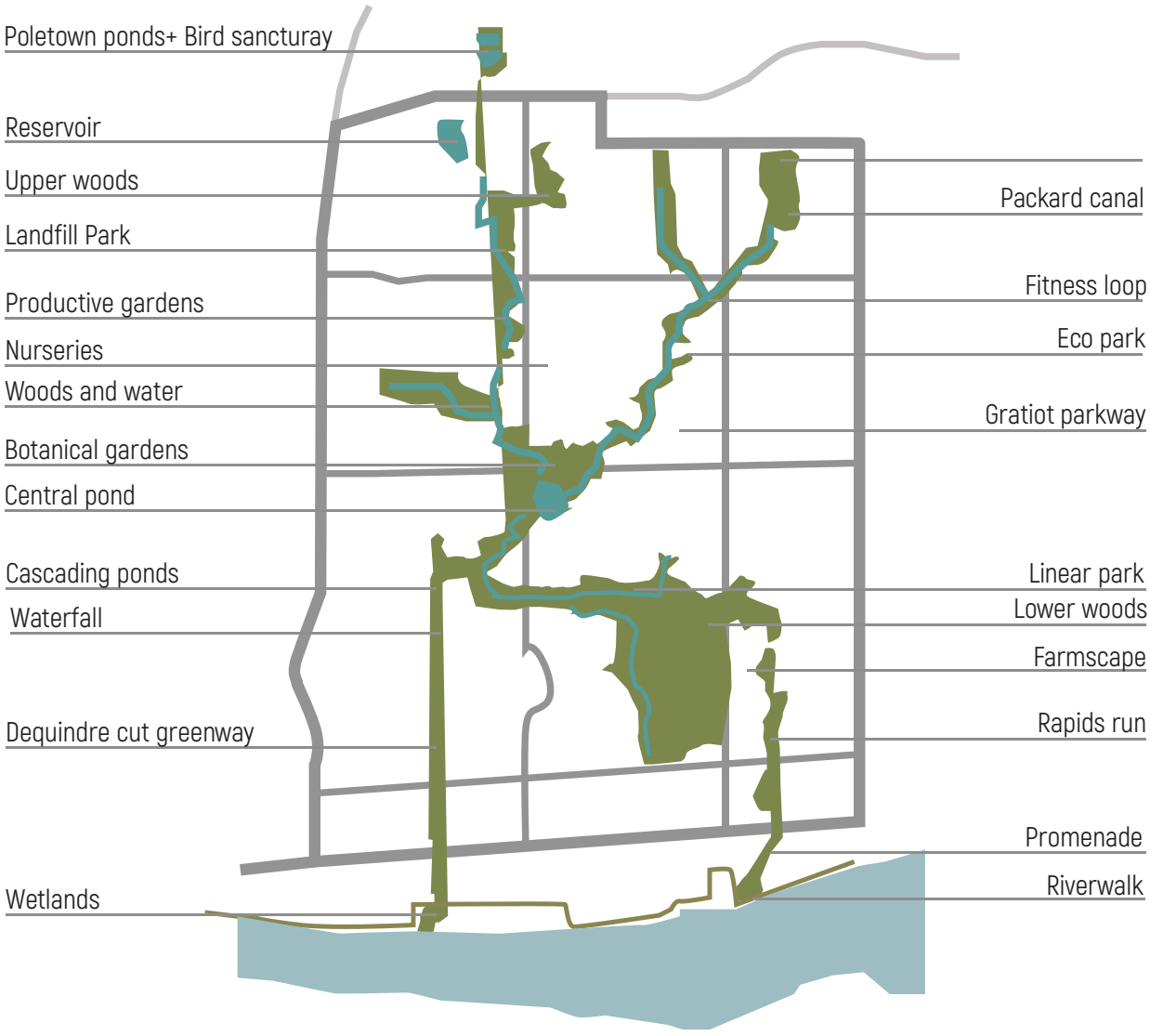
ON GOING

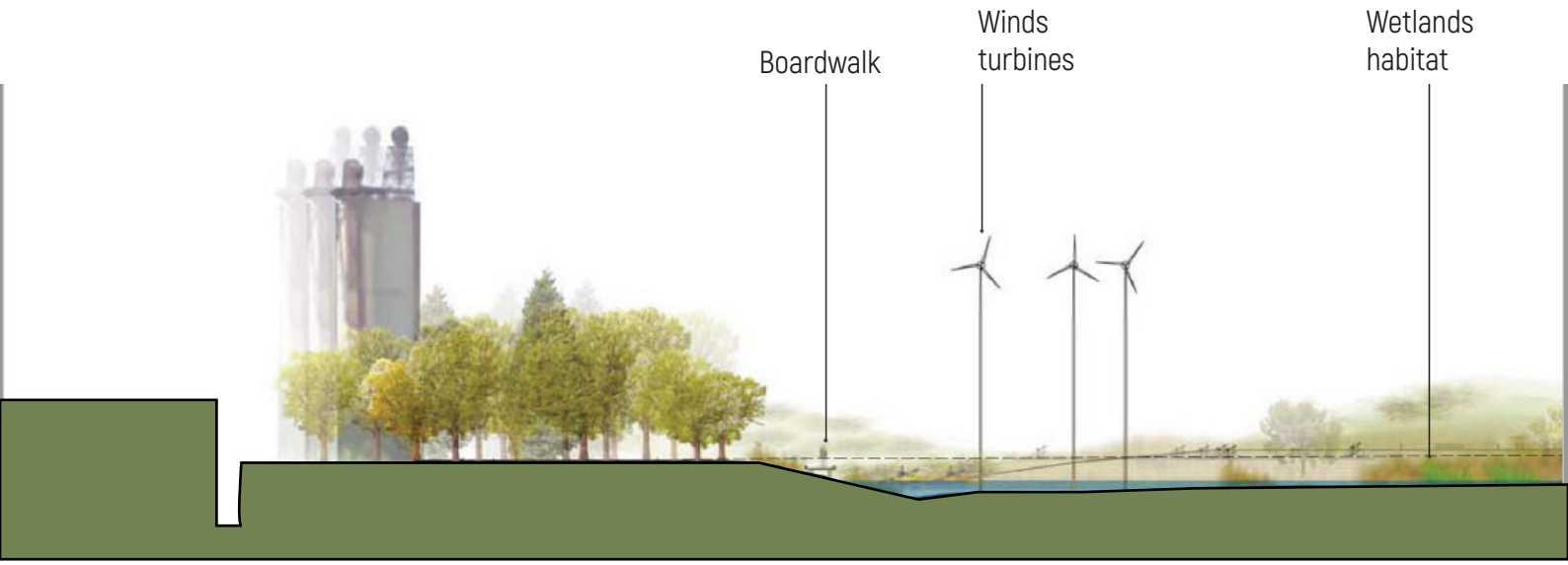


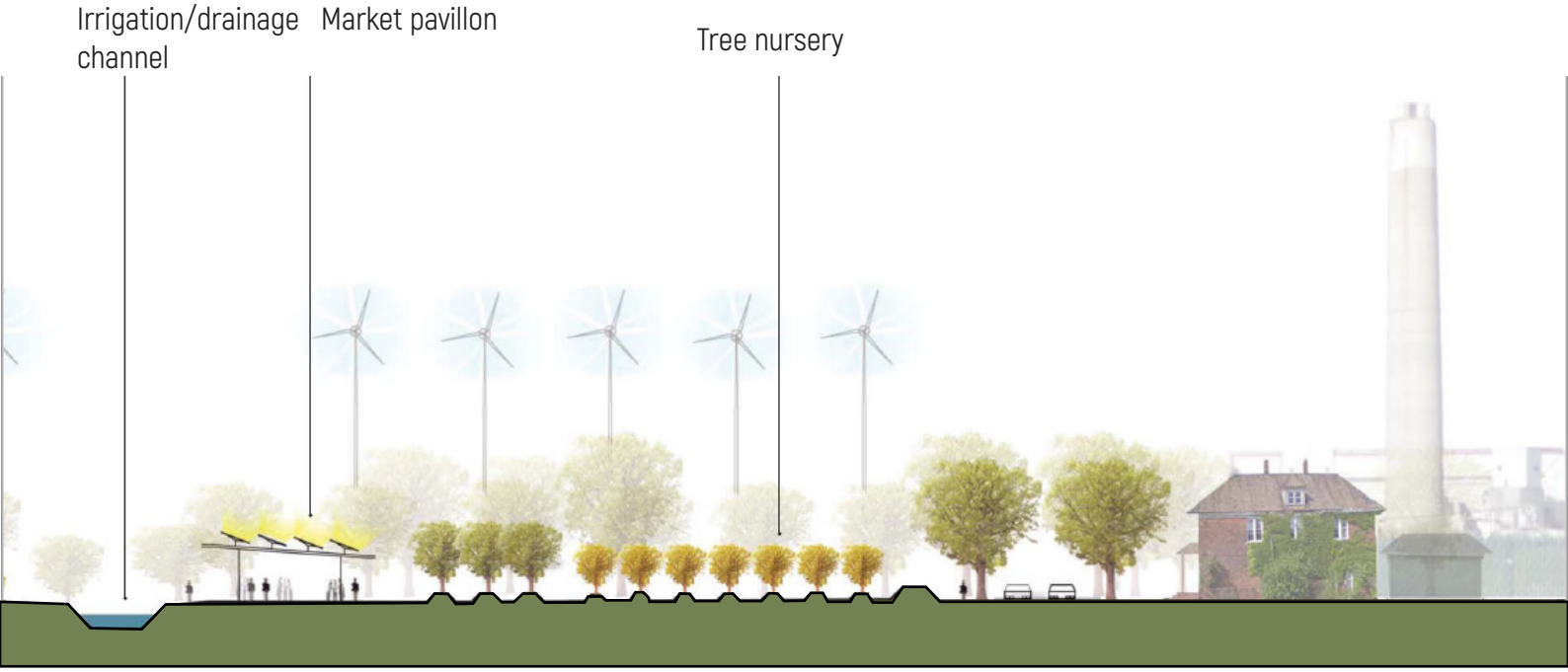
Through Bloody Run Creek the city of Detroit can reduce the amount of water in its sewer system by 3 million gallons per year.

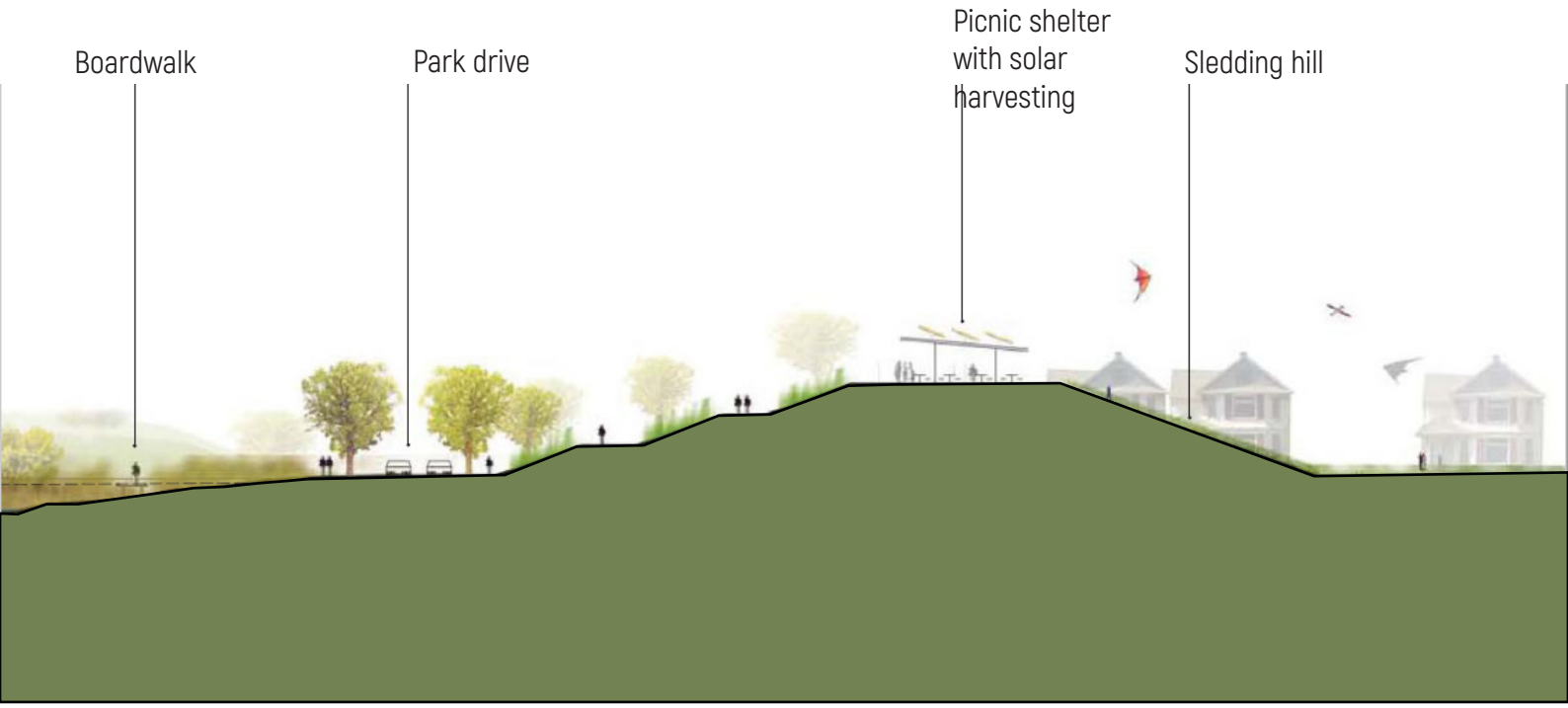
Source: The Bloody Run Creek Greenway Redevelopment Project, 2011

The objective of creating an important ecological public landscape and a transformative destination for the city of Detroit is at the basis of the redevelopment project of Bloody Run Creek Greenway, placing the Bloody Run Creek in the foreground.
The site that forms the project area is spread over 3,500 acres and it is located on the east part of the central business district of Detroit and Midtown. In addition it is connected to the main assets and districts through its interstate connections.
Despite the well-known history of the city of Detroit, the area is still home to the rich cultural, natural and community goods of the Eastern market, the Dequindre Cut and the riverfront, as well as strong neighborhoods such as Lafayette Park, McDougall-Hunt and Farnsworth.
The Bloody Run Creek Greenway is designed as a new type of public ecological landscape: a landscape that encompasses leisure, culture, education, and ecology, creating a unique place of interaction with the stream and the earth.




Boardwalk
Winds turbines
Wetlands habitat


Irrigation/drainage channel
Market pavillon
Tree nursery


Boardwalk
Park drive
Picnic shelter with solar harvesting
Sledding hill

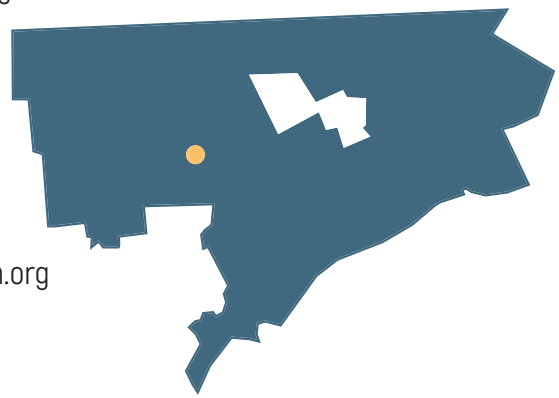
FITZGERALD REVITALIZATION PLAN

PLACE: Detroit, United States

ARCHITECT: Spackman Mossop Michaels

AREA: 160 acres

LINK: http://www.dcdc-udm.org/projects/strategies/fitzrevitalization/



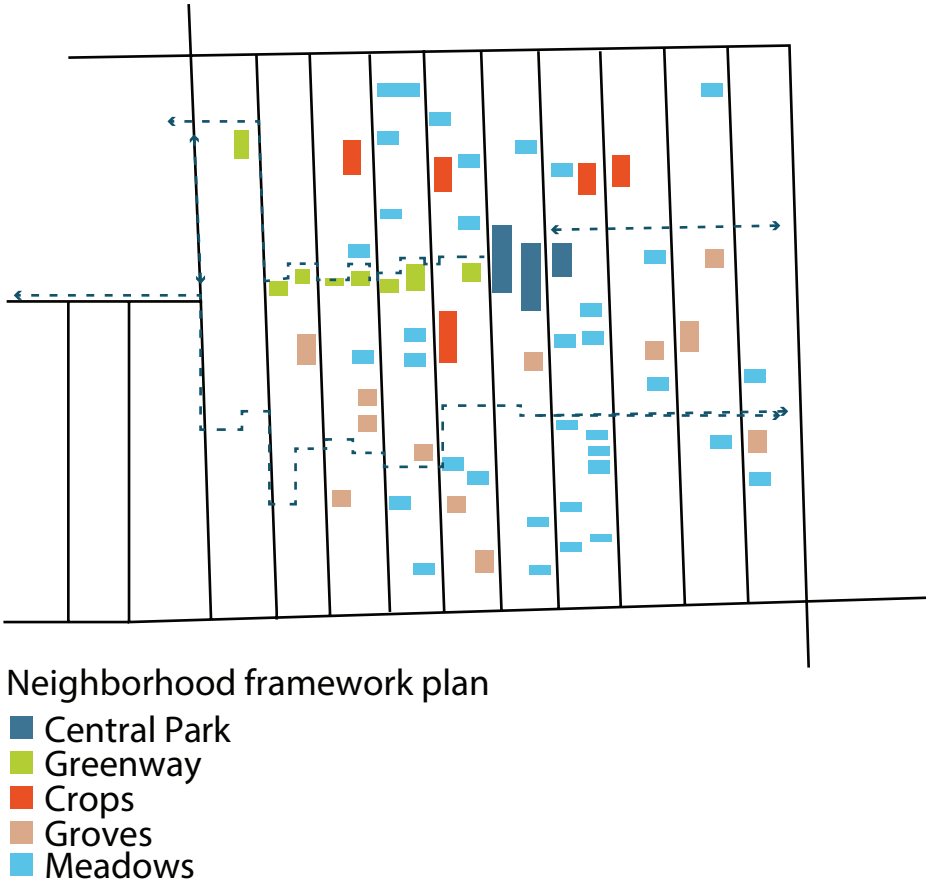
GOALS OF THE PROJECT:

- Refunctionalize vacant lots
- Make the city greener
- Create new homes

Source: http://www.dcdc-udm.org/projects/strategies/fitzrevitalization/

The Fitzgerald Revitalization Project is a project initiated by the city of Detroit around the time Maurice Cox took over as director of planning. Through his intervention and collaboration with HNN architects. The project was based on the intent to stabilize and strengthen the Fitzgerald district by placing vacant land and publicly owned structures in the foreground, transforming them into areas that can be used by the community. The preliminary phase of the project saw the planning of meetings with the citizens of the neighborhood with the aim of meeting their needs. The intervention involved landscaping vacant lots in the neighborhood Spackman Mossop Michaels led the design process and DCDC provided advice on design and community involvement.

Spackman Mossop Michaels' goal was to transform an area of a quarter of a square mile by examining the transformation of each vacant lot in the neighborhood. The project is based on the intention to focus on the removal of degraded structures, the beautification of vacant lots and the construction of new homes for the residents of the neighborhood today and in the future.



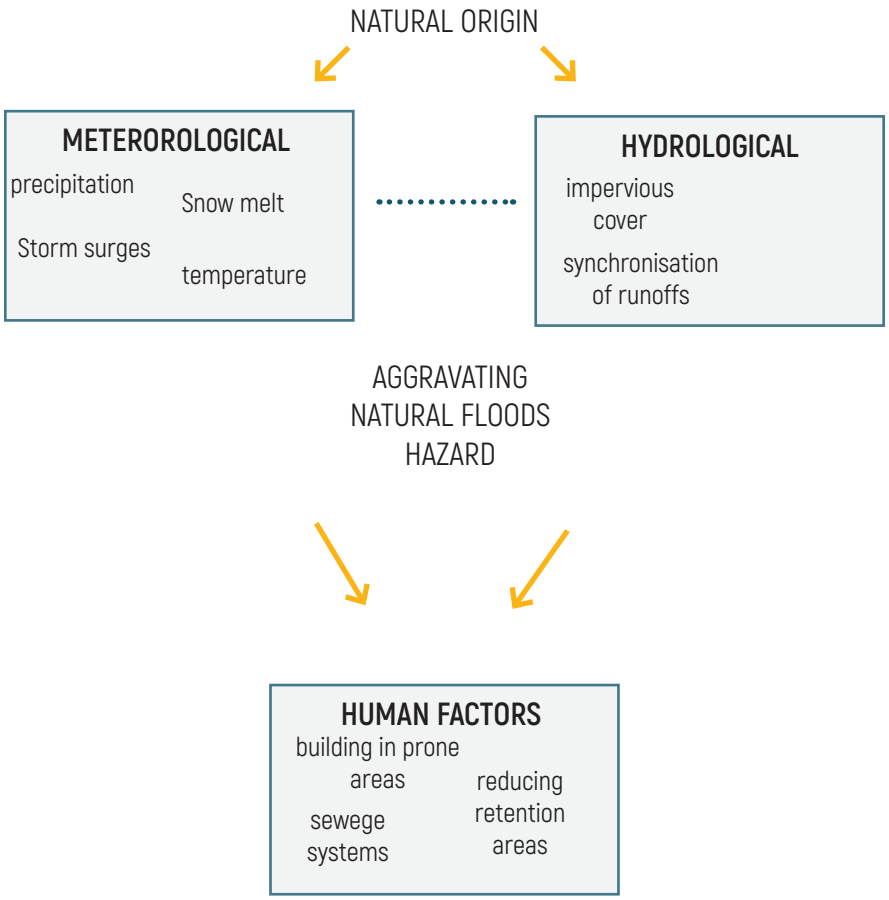
Fitzgerald Neighborhood Revitalization Plan
Source: http://spackmanmossopmichaels.com/project/fitzgerald-neighborhood-revitalisation-plan/

5.FLOOD CONTROL SYSTEM

FLOOD CONTROL

The term flood control refers to all methods and techniques used to reduce or prevent the effects of flooding of water. Floods are the consequence of several factors, including heavy rainfall, tsunamis, overflow of structures containing water, increase in river levels with consequent flooding. During heavy storms and heavy snowfalls typical of the Michigan region, water is retained by lakes, reservoirs, the ground, part evaporates and part flows along roads and meadows. Floods occur when the quantity of water exceeds a certain limit and the basins, the ground and the structures used for its collection are no longer able to contain the water.
The impacts of floods are of different types and cause a lot of damage both to the population and community and to the territory subject to this phenomenon. These damages can be of various kinds, from soil erosion, to compromising traffic in flooded roads that have a large amount of water, to structural problems of bridges or sewage systems.

FLOODS



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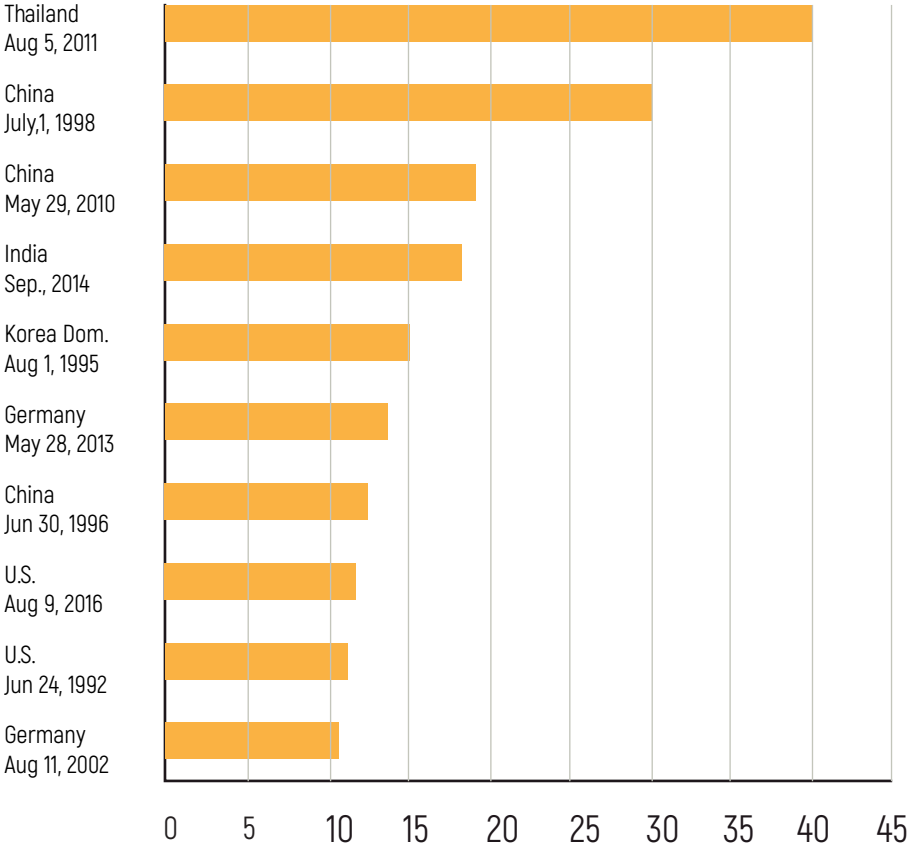
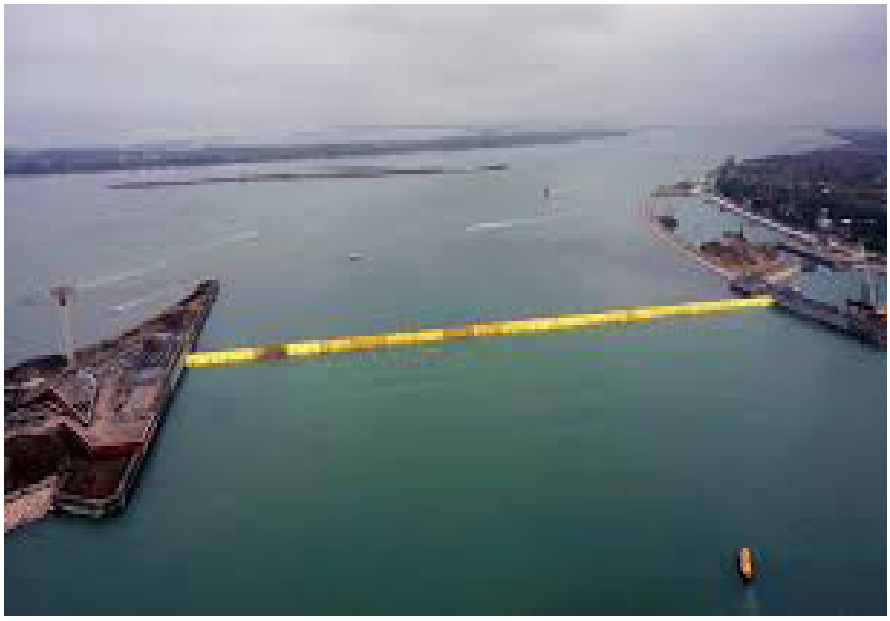


Economic demage caused by significant flood worldwides from 1900 to 2016

Source: https://www.statista.com/statistics/267750/economic-damage-caused-by-floods-worldwide/

In addition, floods have important consequences in the agricultural sector. In fact, according to a report released by the United Nations Food and Agriculture Organization (FAO) in the period between 2003 and 2013, floods and storms caused the loss of 83% of the plantation. This figure demonstrates the importance that must be given to the impacts of climate change.
There are several methods of flood control such as increasing green areas and vegetation, excess water control systems and the creation of systems for slowing the flow of water. Several major flood protection systems exist in both Europe and North America, one example being London which is protected by a mechanical barrier on the River Thames, which allows for river level control. Themes barrier is considered to be the second most important flood defense system in the world. It is part of a larger system but constitutes a functional and indispensable element for water control.
Just like the city just mentioned, Venice also has a water control system, but despite this both systems often prove to be inadequate and insufficient for flood control and management. Similarly, many large American cities have a flood defense system but which often fails due to the increase in rainfall both in intensity and frequency. Another important example is the flood control system used in the province of Manitoba, Canada. In this area the Red river flows to north from the United States. Its course is intertwined with that of other rivers and consequently there is an increase in the level of water present which often causes floods with damage to the population. To address the issue, the Manitoba City Government undertook the construction of a huge levee system. this system allowed for the reduction of damage caused by the great flood that occurred in Winnipeg in 1997.
(Alcoforado FAG, 2018)

The closure of the Thames barrier
Source: https://21stcenturychallenges.org/the-thames-barrier/



Mose flood barrier
Source: https://www.designboom.com/architecture/mose-flood-barrier-venice-storm-alex-10-05-2020/

Red river floodway
Source: https://globalnews.ca/news/6012020/manitoba-to-open-red-river-floodway-in-advance-of-snow-rain/

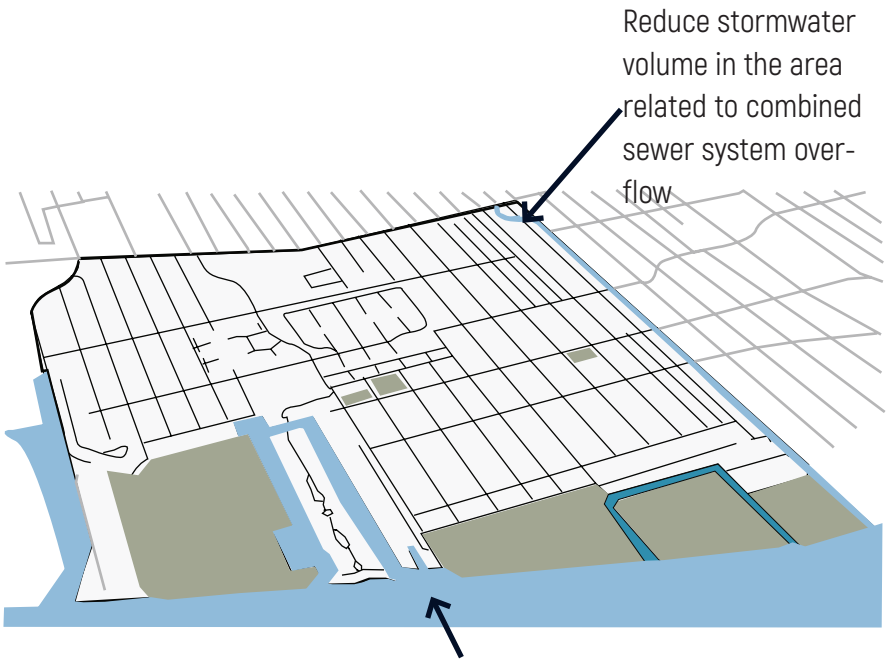
INTEGRETED FLOOD CONTROL IMPORTANCE

The traditional approach to flood prevention involves the use of structural measures that separate the river from the strategic flood control plan. Over time, this separation strategy has proved not to be fully effective and an integration of the various solutions has been proposed in order to make the flood prevention system more efficient.
At the basis of this integration are the concepts of flood control and flood management. There is therefore the need to control the management of water resources in order to optimize the social and economic impact from a sustainable perspective but at the same time it is necessary to minimize the damage that floods in prone areas can suffer and protect the community that lives them.
In this regard, a new approach called Integrated Flood Management (IFM) is introduced. It's an approach that aims to maximize the benefits that can be obtained through a floodplain and at the same time reduce the risks that the population can suffer.
This system identifies some main points, these are:
- the choice of a basin approach to flood management;
-a multidisciplinary approach to flood management; focuses on the vulnerability and risks deriving from floods, reducing their consequences;
-allows community participation participation; it allows to counteract the impacts of climate change while preserving ecosystems.
The Integrated Flood Management (IFM) therefore constitutes a process that integrates water management by minimizing risks by exploiting land and water resources. (World Meteorological Organization, 2009)
This concept is linked to the one expressed above linked to the importance of using an integrated flood prevention system. Strategic measures are often decentralized and used separately, losing their effectiveness. The best solution, on the other hand, is to integrate them making the most of their potential.

FLOOD CONTROL SYSTEM IN JEFFERSON CHALMERS

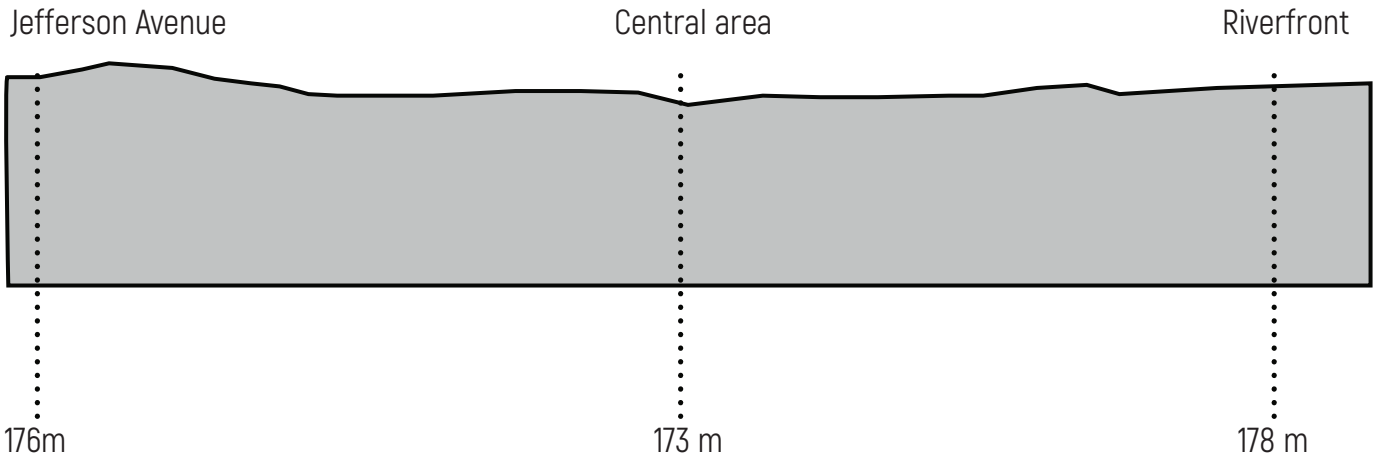
The aim of the thesis is to find a strategic and sustainable solution to face the problem of frequents floods in the neighborhood of Jefferson Chalmers situated on the east side of Detroit.
As mentioned in the other chapters this phenomenon is related to impacts of climate change that occur with increasing frequency. In particular Detroit is expected to face the following critical challenges in the coming decades: average temperatures rise throughout the region (the probability of heat waves and hot days will grow); increase of the risk of heat-related illnesses; severe rainstorms become more frequent and flooding will increase the risk of sewage overflows and water contamination.
Rainstorms represent one of the main causes of flooding problem in the neighborhood.
Jefferson Chalmers is one of the most flood prone areas in the city of Detroit. Flood here is a result of a combination of factors: historically high water levels in the Great Lakes, weeks of heavy rain, the low-lying nature of the area itself and a lack of adequate seawalls.
In addition Detroit's combined sewer system represents a problem. Treatment facilities are forced to handle stormwater as well as sewage, treating all the water flowing into the sewers and sending it back into the river further downstream. A failure of this system like the ones caused by heavy storms–mean sending untreated sewage into the river.
As effect of this, the project is thought to contrast floods through systems of control and sustainable strategies located in different areas of Jefferson Chalmers.
The objectives of the project are so: reduce the volume of stormwater present in the neighborhood during storms events; make a greener neighborhood exploiting the fact that soil has the capacity to reduce and absorb water in excess and improve the quality of life of Jefferson Chalmers community.
The objectives of the project are summarized below. These constitute the key points on which the project idea develops.

The design idea was a consequence of Jefferson Chalmers' historical analysis, territory and population. The project is developed by focusing on three specific areas of the neighborhood chosen with specific functions.
The first analysis carried out on the neighborhood was the topographical one. The neighborhood has three different levels of altitude, although this difference is only a few meters, these constitute an obstacle to the flow of rainwater and from the combined sewage system. The idea of arranging three different elements at the ends of the neighborhood and one in the central part was therefore linked to this topographical feature. Due to this feature, the central area, where the Essex Avenue axis develops, is often flooded and needs a new water management system.



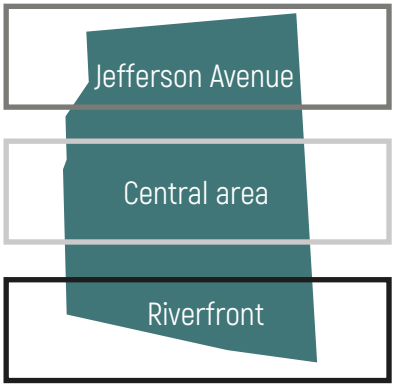
To reach objectives just mentioned has been designed a new strategy for the neighborhood that sees in the foreground the three topographical levels that characterized Jefferson Chalmers.
In the analysis, part of the project area has been highlighted because it presents a particular topographic trend from Jefferson Avenue to the riverfront. This trend creates a "bowl" shape that doesn't let stormwater flow with the consequence that central area of the neighborhood is often flooded.

This particular shape demonstrates the area presents three differents levels: the riverfront one, the central area one and the Jefferson Avenue one.



The project is based on making a strategic tool, infact the concept sees the distribution of flood controls elements according topographical levels. The graph here reported shows the conceptul division of the area linking this portion of neighborhood to different flood tools that together represent the system of control.These elements are: an agricultural areas, a commercial activity and water sensitive design.

The strategic points underlying the project are therefore to reduce the amount of rainwater present in the neighborhood through the creation of a control system. At the basis of the design idea there is therefore the exploitation of the topographical conformation and the three levels of altitude.
The three elements characterizing the intervention are:
- Essex agriculture: the creation of a new agricultural area
- Essex shop: a commercial activity for the sale of agirculture products
- Waterspace: a strategic water collection system placed near the river to control water when the river overflows, especially during strong storms.
Each of the mentioned interventions has been designed with a specific functionality, in fact the agricultural space was born as an area to benefit the community by allowing them to spend more time outdoors and producing exploitable food without spending large sums of money.
The shop located on Essex Avenue was created with the aim of making the products grown in the new green area accessible to all by creating a system of solidarity between the people of the neighborhood.
Also the area located along the river has a fundamental importance, creating another flood control tool..
Through this system stormwater in excess could be controlled in two different ways and times thanks to the mentioned flood control tools.
In order to take advantage of the vacant lots in the neighborhood, flood control tools were therefore arranged and to make the project functional and strategic the intervention is designed on vacant lots that are abandoned lots awaiting re-functionalization.
Vacant lots were identified in the three different areas highlighted in the scheme.
This trasformation can represent a change for the city of Detroit according two different aspects, the first one is the exploitation of abandoned land that needs to be transformed and the second the need to face flood problem. The project therefore sees the integration of three elements, all three aspiring to the same objectives.




BUILDING
AGRICULTURAL AREAS
WATER
SENSITIVE DESIGN

The city of Detroit is known for its history and for the great heritage of abandoned areas that are still waiting to be re-functionalized today. The city today has thousands of square meters of unused space and among these also part of the Jefferson Chalmers neighborhood.
Over the years there have been various initiatives and projects to find solutions to these spaces, in fact the administration has been active with the drafting of strategic and urban plans. An example of these is the project that sees the Fitzgerald district as the protagonist and the elaboration and implementation of the Fitzgerald Revitalization Plan.

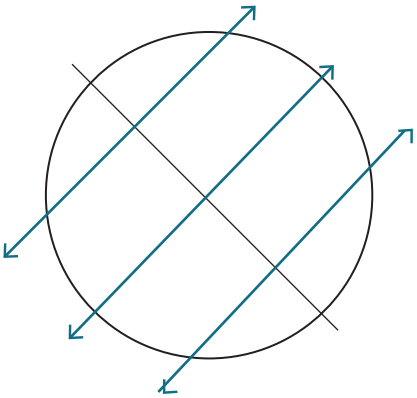
Jefferson Chalmers neighborhood

Vacant lot

Vacant parcels in Jefferson-Chalmers neighborhood
Source: Motorcitymapping

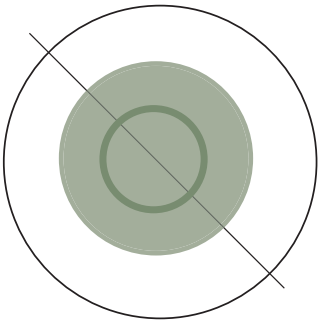
OBJECTIVES

REDUCE STORMWATER VOLUME IN THE AREA



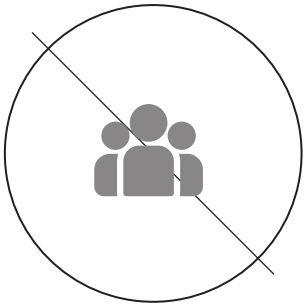
The neighborhood Jefferson Chalmers is really prone to floods for many reasons.
Two main causes are its proximity to Detroit river and the combined sewer system that characterized a lot of american cities. This excess of water is caused by storms event that are increasingly frequent due to climate change's impacts.

MAKE A GREENER AREA



The project aims to increase and create new green areas primarily to address the issue of floods and therefore reduce the amount of rainwater.
At the same time to make the city of Detroit greener.

IMPROVE THE QUALITY OF LIFE IN THE NEIGHBORHOOD



The project, like any intervention, aims to improve the life of citizens by creating in particular agricultural and cultivable spaces. The project objectives see their development through a green and sustainability perspective.

6.MASTERPLAN

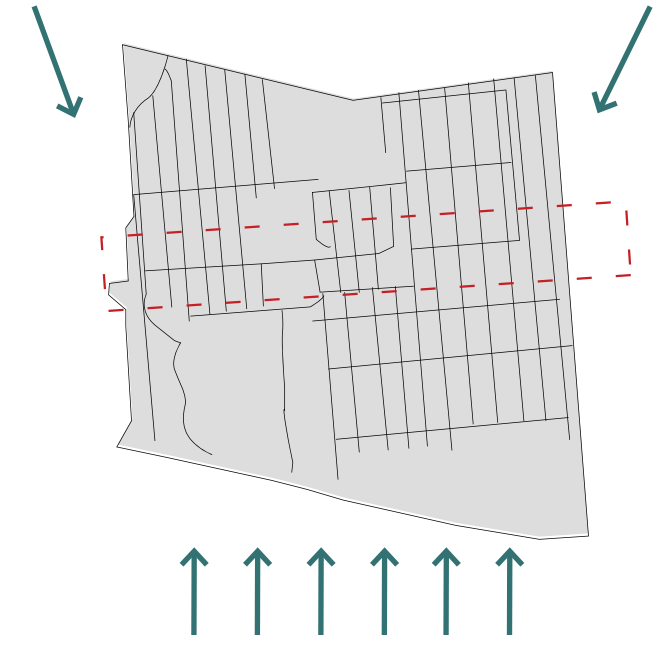
The goal of Re protect Detroit is intervene in a strategic way to the problem of flooding in the Jefferson Chalmers neighborhood in Detroit.
As previously mentioned, the neighborhood has particular characteristics that lead it to be one of the most likely to be flooded. These are: its exposure on the Detroit River, its topographical conformation with different altimetric levels and the presence of a combined sewere system.
Today the neighborhood is characterized by the presence of various prevention measures for floods but despite this the population more and more frequently suffers damage to their homes due to water. The project therefore sees the creation of three strategic points for the neighborhood:
-Essex agriculture: the creation of a new agricultural area that allows residents of the neighborhood and the city of Detroit to rent a lot and cultivate it;
-Essex shop: a commercial space that allows users to sell and buy agricultural products that have the particular characteristic of having a low environmental impact as they are grown at a distance of a few meters from the place of sale;
- Waterspace: a strategic space for water collection which, during river floods, can avoid numerous damages to the community;
The project sees as its objectives the reuse of abandoned and disused lots by addressing the above mentioned problem. The solutions found have been conceived in a sustainable way while serving their functions at the same time. The project therefore has the objective of transforming the neighborhood by improving it and offering the community additional services.
The sustainable system conceived allows the user who uses it to make the most of his own territory, this by cultivating an abandoned land and buying and selling products grown by himself.
The project is spread over three areas of the neighborhood, the first two Essex agriculture and Essex shop located along the same road and the Waterspace located in an area adjacent to the river. The choice of positioning the three different elements in these areas is not accidental but has specific and functional characteristics so as to maximize their potential for the benefit of the population.

GUIDELINES FOR THE DEFINITION OF THE MASTERPLAN

Due to the vast extension of the district, a master plan was created for each area under consideration.
Some fundamental aspects have been identified for the realization of the masterplan, these are: addressing the problems relating to the topographical conformation of the neighborhood, the riverfront and the high percentage of vacant land.

Topographical conformation of the neighborhood

Due to the topographical conformation of the neighborhood, it was chosen to intervene in a central area of the neighborhood, developing a few meters below the extremes of the neighborhood, collecting a large quantity of rainwater.



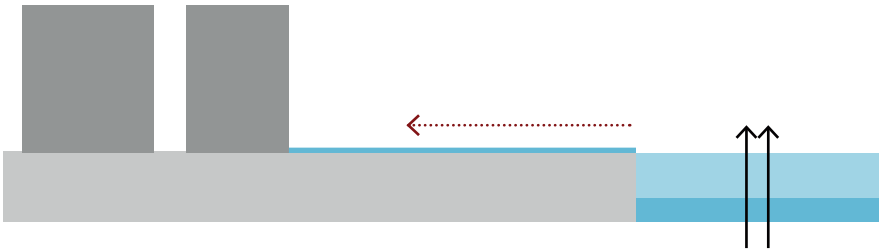
Essex Avenue- central area

Stormwater

As shown in the diagram, excess water tends to stagnate in the central area of the neighborhood, for this reason an area with the specific function of absorbing water has been placed.

Riverfront

The river is a very important attraction for the city of Detroit, but in particular in that area of the neighborhood it cannot be exploited due to the flood risk. Over the years, various preventive measures have been devised and implemented but they have not demonstrated maximum effectiveness. The choice to intervene in the Jefferson Chalmers neighborhood area located along the river was made because that area is often flooded due to the rising level of the river. Severe thunderstorms result in excessive water in the Detroit River embankment and this floods along the adjacent area until it reaches the residential housing area.



Increase in the level of the river due to an excessive amount of water

The flooded area is a serious damage for the population because the water often reaches the basements of the houses.
In addition, the river branches into several canals present in the Jefferson Chalmers neighborhood and the level of their amount of water also increases.

High percentage of vacant lots

A further guideline that led to the determination of the masterplan was the presence of a large number of vacant lots.
The design interventions were strategically arranged in order to re-functionalize the abandoned territories. The Jefferson Chalmers neighborhood features a large number of abandoned lots that belong to the Detroit municipality. Over the years, several projects have been launched with the aim of re-functionalizing these spaces in order to make them livable and functionally accessible.
The project focuses specifically on three vacant lots these are:
- 501 Philip street, the area located between Essex Avenue and Philip street which houses the agricultural area and therefore the urban gardens;
- 690 Philip street, the area that houses the commercial activity for the sale of agricultural products grown in urban gardens;
- area adjacent to the river;

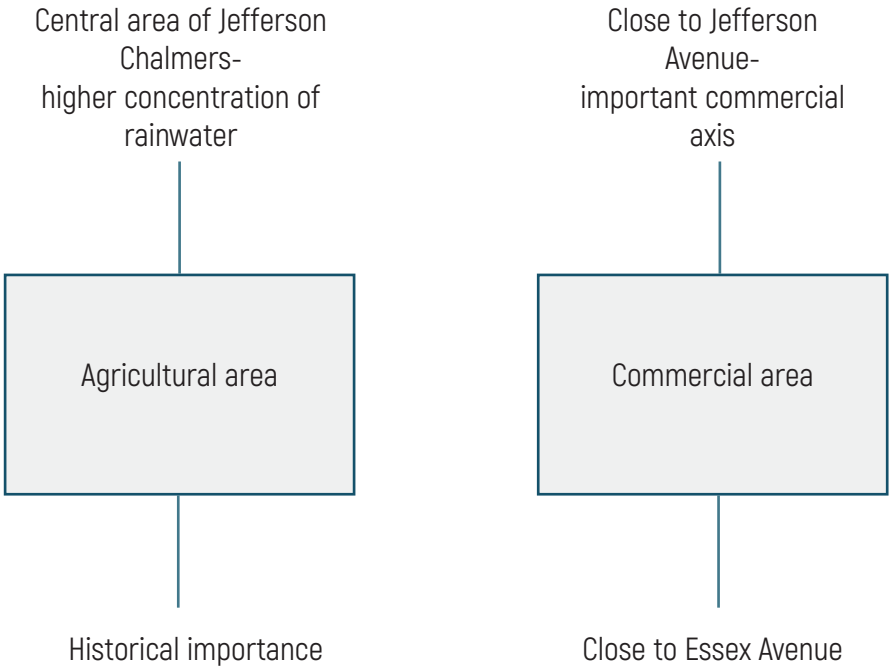
501 Philip street
Source: Google maps

690 Philip street
Source: Google maps

Riverfront
Source: Google maps

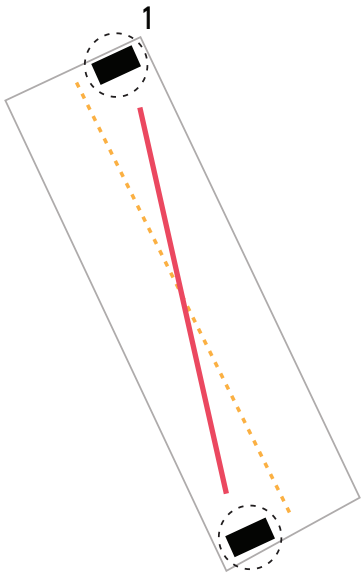
Location choices

The project develops with the creation of two attractive poles in the neighborhood. These poles are: the urban vegetable garden area located at 501 Philip street and the commercial activity located at 690 Philip street. The two neighborhood hubs are located on the same road axis in a strategic and functional way so as to allow the community that uses them an easier and faster movement. In addition this allows to create a strategic system on Philip street.
The agricultural area was arranged in a specific area of the neighborhood for two reasons: to address the problem of excess rainwater and also because historically the area hosted various agricultural realities.
Similarly, the choice to locate the commercial activity in 690 Philip street was not accidental. It was located in ths area because it's close to an important commercial axis of the city, Jefferson Avenue. Throughout history, this street has always hosted shops and businesses.



Further reasons for selecting the areas will be analyzed below.
The most importante it's their location with respect to the Philip street axis. The two lots are located on opposite part of the road just mentioned. This allows to create a direct connection between the two places, allowing the community to exploit them in a functional and practical way.

Location



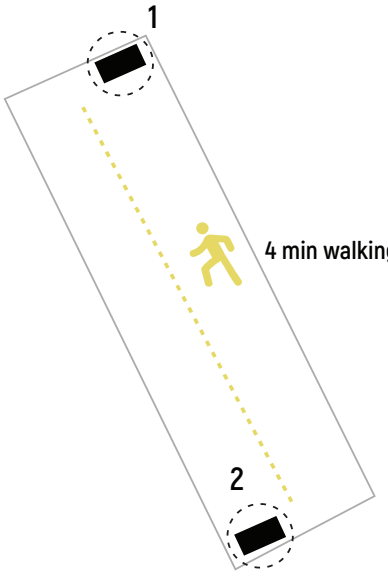
1 690 Philip street

2 501 Philip street

NEIGHBORHHOOD HUBS

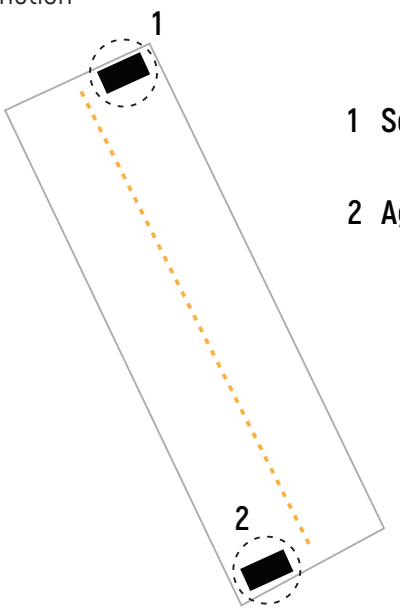
This connection is facilitated by their proximity, the distance between the two areas is 0.2 miles, which can be covered in about 4 minutes on foot.

Distance



Funcitions attributed have been carefully studied. The choice was based on the placement of a new green area located in the central part of the district in order to absorb excess rainwater, reducing the risk of flooding and producing agricultural products for the population. In addition, these products are grown and consumed by the community itself, reducing the cost of transport and the environmental impact.

Function

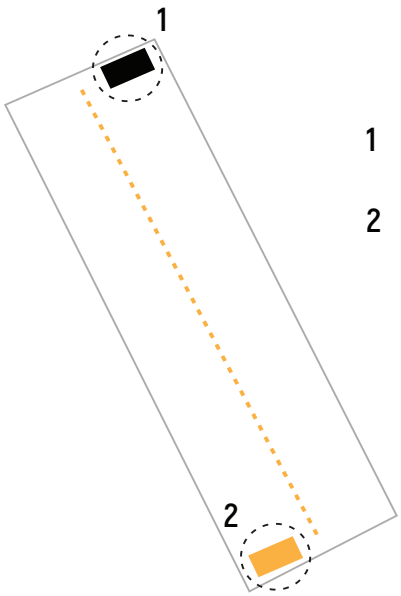


1 Service — Shop

2 Agricultural area — Urban gardens

The selected areas are two very large spaces suitable for hosting a large number of people during the different activities.

Dimensions



1 8200 ft

2 10950 ft

7.PROJECT

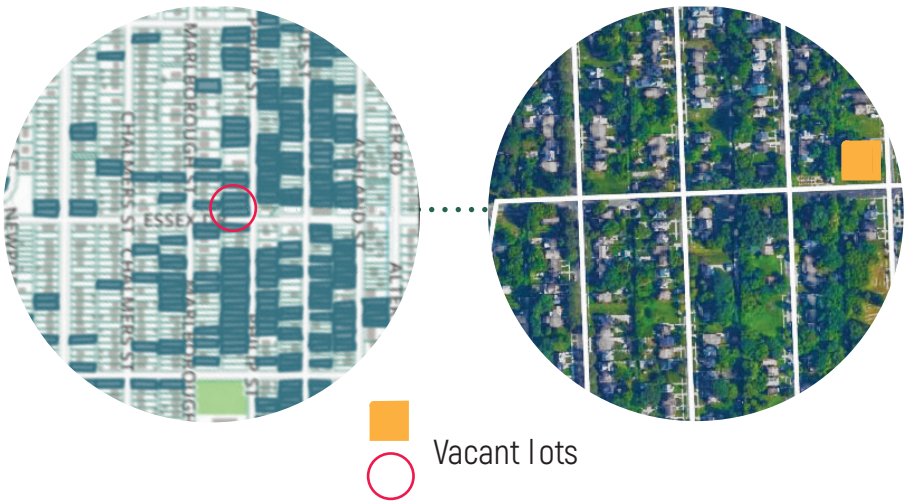
PROJECT

In the following chapter the project idea of the sustainable flood control system will be developed in more detail. The intervention lots will be analyzed and identified, analyzing their characteristics, the strategic points of the intervention and the design part.
The system aims to bring various benefits to the community of the neighborhood, such as: connecting the areas to the system, re-functionalizing the abandoned lots, creating new green areas, creating a quarterly agricultural production system, creating a commercial point for the sale and reduce the quantity of rainwater.
The system therefore wants to redevelop the area of interest proposing a resilient and sustainable strategic solution.
The main purpose is to create an interaction between spaces, outlining functions that can be exploited by the population of the neighborhood and the entire city.

Benefits of the system

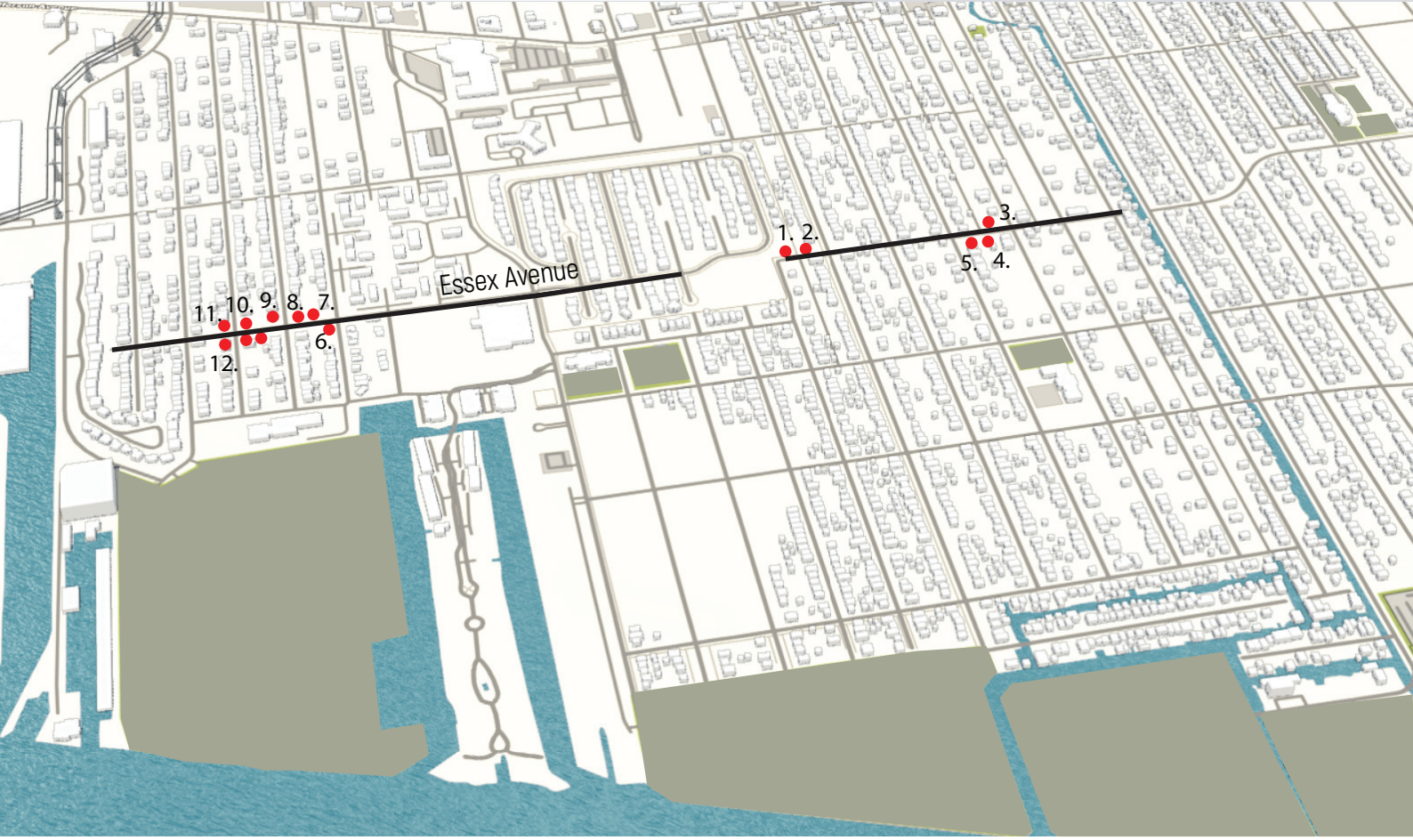
The design aspects relating to the various areas are reported below. The first area examined is the agricultural area located in 501 Philip street, the second is the area hosting the commercial activity located in 690 Philip street and the water collection area on the riverfront.

AGRICULTURAL AREA- ESSEX AVENUE



Source:motorcitymapping

In particular, the idea behind the project sees the transformation of an important road axis located in the center of the neighborhood, Essex Avenue. As many others areas of the city, this street is flanked by a large number of vacant lands that could represent instruments to reduce stormwater runoff. Vacant lands just mentioned make up a large part of public land that could be used. Essex Avenue is a central street of the neighborhood Jefferson Chalmers. It is long 1,75 Km and it presents in particular residential buildings and a green central area that hosts a wide park.



- Vacant land close to Essex Avenue

— Essex Avenue

Focusing on Essex Avenue area have been highlighted vacant lots owned by the municipality that today are abandoned, these spaces are twelve.
The map shows vacant lots that flanked the street with the intent to transform them in green agricultural areas. Their aim is to make a greener city bringing benefits related to urban agricultural.
As mentioned in the last chapter these are the improvement of local economy, the increase of nutritional health and the connection between community. In addition urban agriculture can be also a powerful economic factor that gives the opportunity to trasnform abandoned spaces in areas with a added value. (http://www.ers.usda.gov/topics/food-nutrition-assistancfood-security-in-the-us/key-statistics-graphics.aspx)

1. 503 Lakewood

Structure: no
Use: vacant lot
Maintained: yes
Dumping: no

2. 502 Lakewood

Structure: no
Use: vacant lot
Maintained: yes
Dumping: no

3. 501 Philip

Structure: no
Use: vacant lot
Maintained: yes
Dumping: no
Ownership: public
Public Owner: City of Detroit

4. 495 Philip

Structure: no
Use: vacant lot
Maintained: yes
Dumping: no
Ownership: public
Public Owner: City of Detroit

5. 490 Marlborough

Structure: no
Use: vacant lot
Maintained: yes
Dumping: no
Ownership: public
Public Owner: Detroit Land

6. 497 Kitchener

Structure: no
Use: vacant lot
Maintained: yes
Dumping: no
Ownership: public
Public Owner: City of Detroit

7. 503 Kitchener

Structure: no
Use: vacant lot
Maintained: no
Dumping: no
Ownership: public
Public Owner: City of Detroit

8. 508 Algonquin

Structure: no
Use: vacant lot
Maintained: yes
Dumping: no
Ownership: public
Public Owner: City of Detroit

9. 501 Algonquin

Structure: no
Use: vacant lot
Maintained: no
Dumping: no
Ownership: public
Public Owner: City of Detroit

10. 500 Navahoe

Structure: no
Use: vacant lot
Maintained: no
Dumping: no
Ownership: public
Public Owner: City of Detroit

11. 501 Navahoe

Structure: no
Use: vacant lot
Maintained: yes
Dumping: no

12. 495 Navahoe

Structure: no
Use: vacant lot
Maintained: no
Dumping: no
Ownership: public
Public Owner: City of Detroit

Source: motorcitymapping

The table above shows the data relating to the individual pieces of land which are indicated and numbered in the previous map. For each of these areas is shown: the current conditions, the owner and if the land is public or private. Despite this, only the land belonging to the municipality has been reported.
The project is based on the idea of transforming vacant lots along Essex avenue into agricultural gardens.

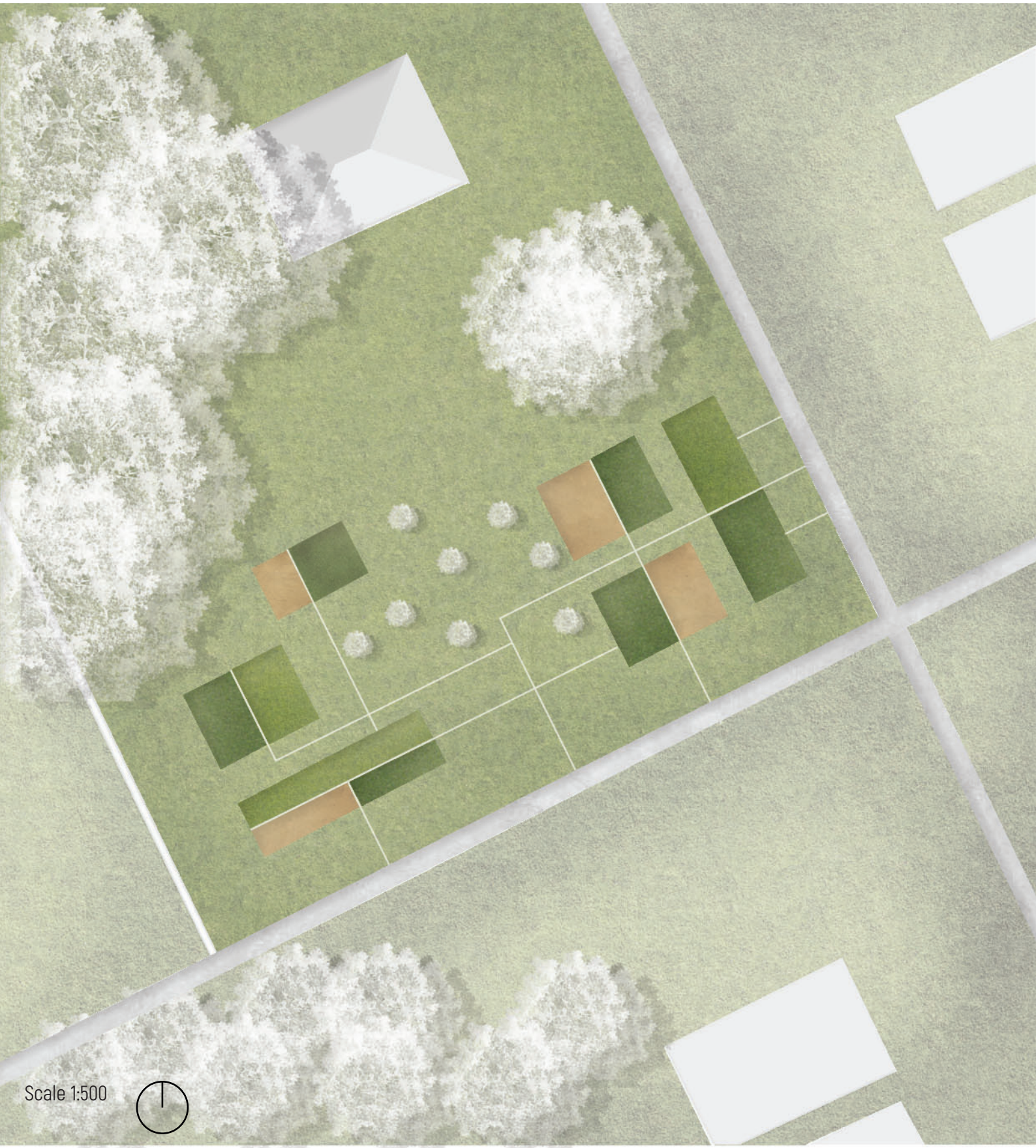
3. 501 Philip

Structure: no
Use: vacant lot
Maintained: yes
Dumping: no
Ownership: public
Public Owner: City of Detroit

The project area that sees the realization of an agricultural area with urban gardens is situated in 501 Philip st. in the Jefferson Chalmers neighborhood. It is a vacant lot which now has no function.

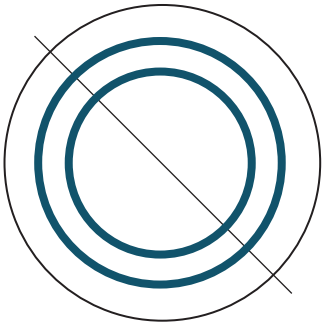
Urban gardens area

MASTERPLAN AGRICULTURAL AREA



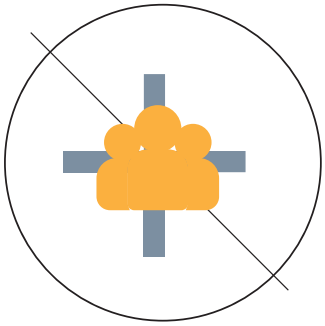
STRATEGIC POINTS OF INTERVENTION

EXPLOIT UNUSED LANDS



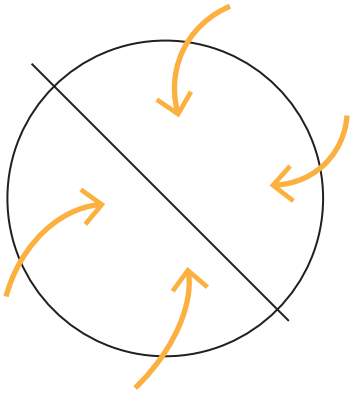
The project sees the realization of an agricultural area in a vacant lot in order to attribute a specific function to a space that has long been abandoned.

BRING BENEFITS TO THE COMMUNITY



The project aims to increase and create new green areas primarily to address the issue of floods and therefore reduce the amount of rainwater.
At the same time to make the city of Detroit greener.

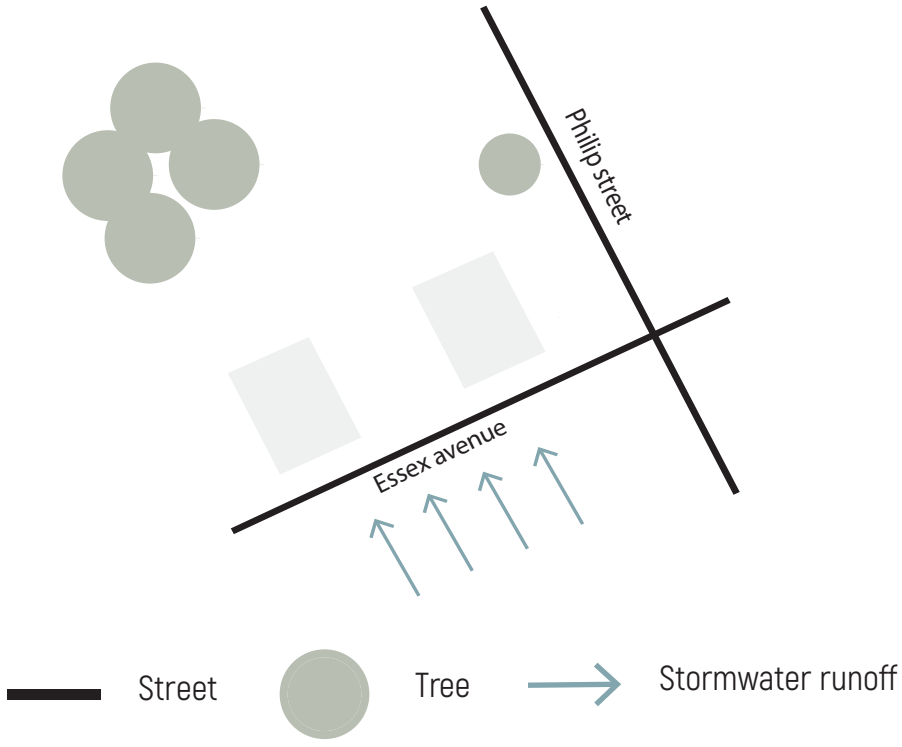
CREATE A COLLECTIVE SPACE WITHIN THE NEIGHBORHOOD



The design of urban gardens means the creation of a collective space for the community, a space where people can meet and socialize.

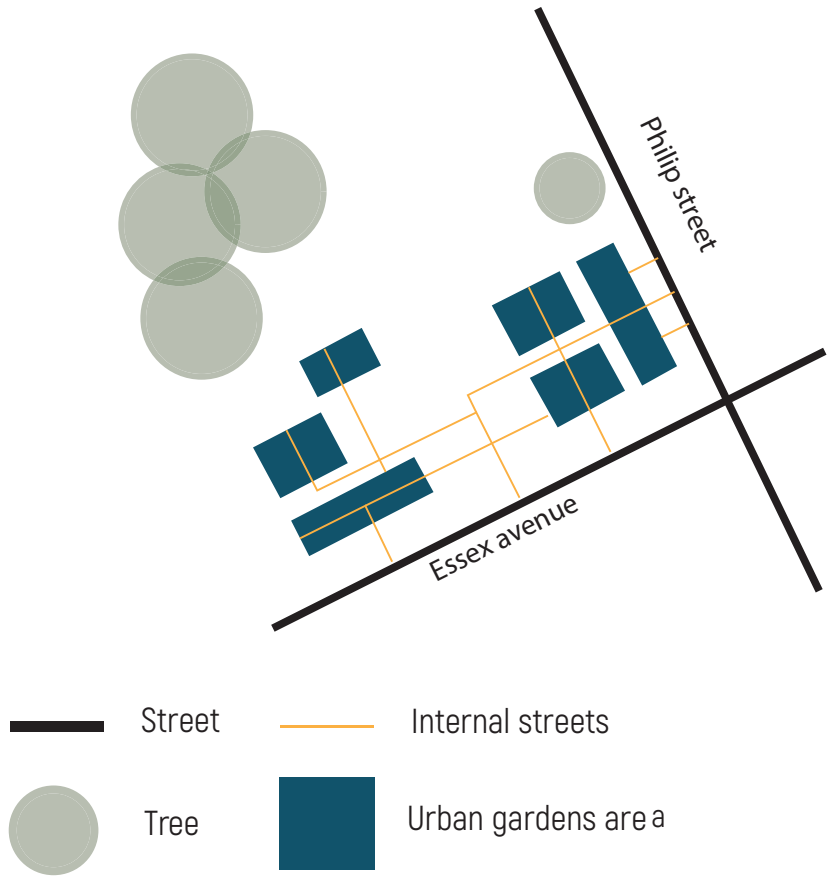
The diagram shows the position of the urban gardens respect the two roads, such as Essex avenue and Philip street.
The vacant lot situated in 501 Philip street is spread on 1.125 square metres, with dimensions of 25X45 m.
As mentioned before Essex Avenue has a particular topographical shape, in fact it is located in the center of the "bowl" shape that characterizes the neighborhood. This particular shape doesn't let water to flow and this is one of the main cause of flooding.
The graph also shows the direction from which, in the event of a flood or severe thunderstorms, the water could come. The direction from which the water comes is indicative of what the topographical conformation is, in fact, as previously mentioned, the Jefferson Chalmers neighborhood has a difference in altitude in the central part and at the extremes.

501 Philip street



The urban gardens designed report different sizes to have a large area for different crops.
The total number of urban gardens is six and each of these is divided into smaller portions given by internal streets.
The first aim of the placement of urban gardens is to absorb excess rainwater that causes flooding.
The various portions of arable land can be rented by the community through an application (see last part of the chapter for the app interface) that allows them to book the total of square meters desired for the period of time indicated.
The design of the urban gardens was conceived following the guidelines given by the main road axes, such as Essex Avenue and Philip Avenue.

501 Philip street



CASE STUDY - AGRICULTURE AREA

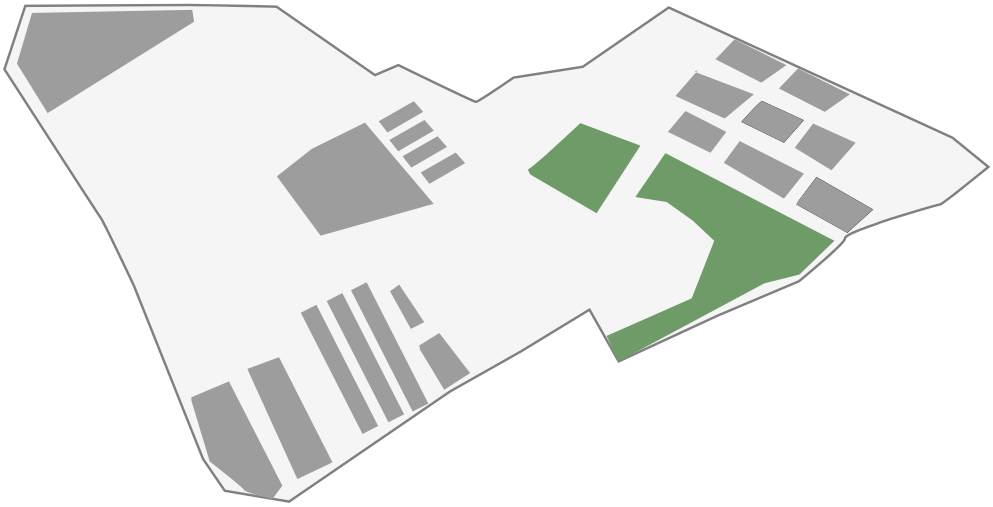
1. OrtiGenerali

Place: Strada Castello di Mirafiori, Turin, Italy
Area: 1200 mq
Year:2019
Use: urban garden

The phenomenon of urban gardens is now widespread throughout the world. Different types of gardens have spread all to achieve the same objectives: recover uncultivated land, generate a sense of sharing and collectivity, produce healthy and tasty vegetables.
This phenomenon has also developed in the outskirts of the city of Turin, more precisely in the Mirafiori district, an area that in recent years has seen the birth of a social and environmental redevelopment project called OrtiGenerali. Before being re-functionalized, the area concerned was an abandoned and unused area which, thanks to the project, saw the creation of a park of urban gardens open to citizens and visitors.
The OrtiGenerali project was born with the aim of creating a social enterprise model that allows the transformation and management of residual agricultural areas in the city. At the basis of the project there are some key points, such as: environmental sustainability, through the reintroduction of trees of ancient varieties; technological innovation using technology as a tool at the service of the environment (reduction of water waste, humidity detection, temperature) and social sustainability through the introduction of work grants and training internships. OrtiGenerali is a place of urban agriculture, innovation and inclusion that offers the community the opportunity to cultivate and learn through theoretical and practical training courses in the field of agriculture.
The project not only sees the allocation of spaces to be cultivated but also the realization of social, therapeutic and educational activities related to aspects of urban agriculture.
(https://www.ortigenerali.it/agricoltura-urbana-nel-parco/)


ORTI
GENERALI

ORGANIZATION OF THE AREA



Agricultural area

Urban garden

Area of individual agricultural production

FUNCTIONS

Before **Unused area**

After Urban agricultural area | Place of training | Social innovation place

BUILDING-PHILIP STREET

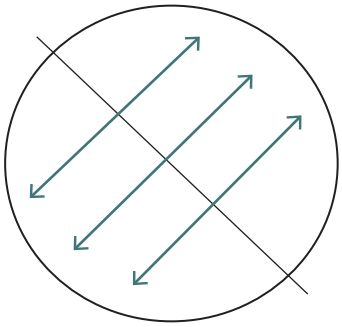
Source:motorcitymapping

In the area near Jefferson Avenue has been chosen to locate one of the three flood control tools, the building.
In order to face flooding problem it has been projected to manage stormwater. The building has been located in a particular area between Philip Street and Manistique Street at high of Freud Street.In the area reported above in orange are highlighted three vacant lands owned by the municipality.
The building has been situated in that spot for a particular reason, infact these vacant lots are located along the same road axis as the vacant lots choosen to host urban gardens. It represents a strategic advantage because it constitutes a connection point between the building and cultivated spaces along Essex avenue (vacant lots n.3, 4, 5 mentioned before).
The location of the building has been chosen strategically as its function is linked to urban gardens. In fact, the building hosts a commercial activity that consits in the sale of agricultural products grown in the area of Essex Avenue.

MASTERPLAN BUILDING

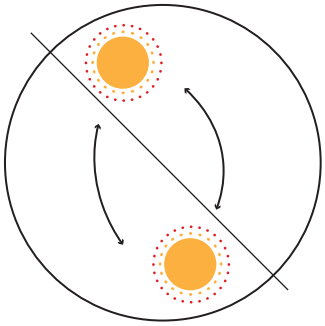
STRATEGIC POINTS OF INTERVENTION

CONNECT DIFFERENT AREA OF THE NEIGHBORHOOD MAKING A FLOOD CONTROL SYSTEM



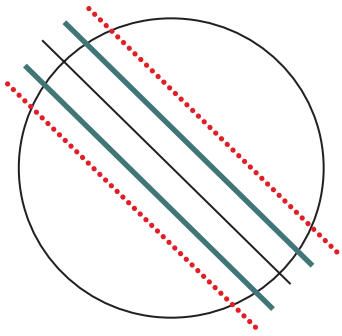
In addition to the first aim of the three elements, that of reducing the flow of rainwater, there is the one to create a quartierial system that integrates the different components improving the neighborhood.

ACTIVATE MANY AREAS OF THE NEIGHBORHOOD



The project sees the activation and exploitation of two vacant lots. The city of Detroit is characterized by a large number of abandoned plots that await a recasting. This project gives value to a territory not used for a long time.

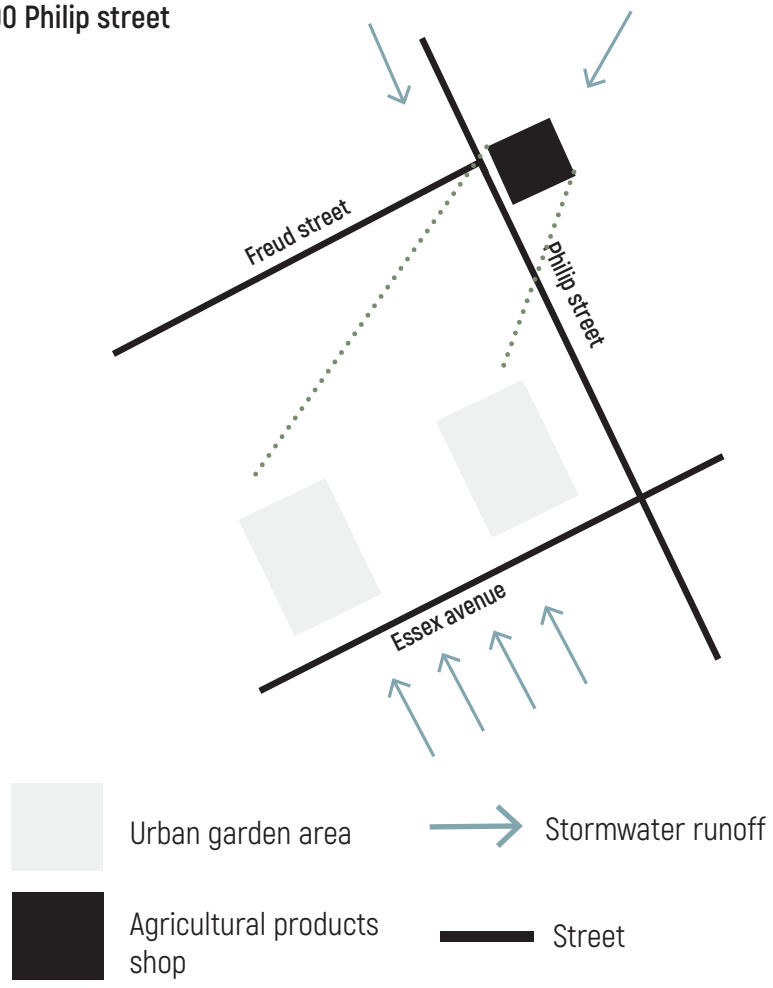
INTEGRATE NEW ACTIVITIES IN THE COMMUNITY OF JEFFERSON CHALMERS



Through the development of the project and the birth of a commercial point of sale based on the production of agricultural products at km0 the neighborhood sees the birth of a new reality.

One of the features of the new building is the lot in which it was chosen to place it, in fact the building is located at 690 Philip Street. An area that is located a few meters away from the new agricultural area. As already mentioned above, the building has a strategic and functional position in relation to the urban gardens and they are closely linked..
The shop is located along the same axis, Philip street.
This to create a physical and functional connection between the two spaces and to make the two poles more accessible to the community.
The diagram also shows the direction from which the rainwater that often causes flooding comes from. In addition to the topographical characteristics of the neighborhood, there is also the problem of the combined sewer system that characterizes several american cities. This system during severe storms does not support the water load by flooding streets and entire cities.

690 Philip street

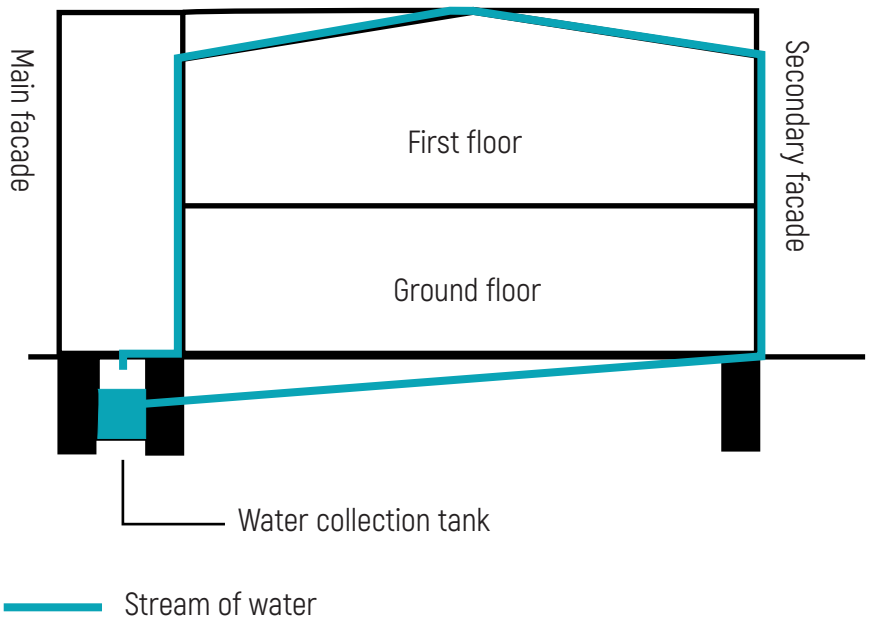


BUILDING FEATURES

The new building is part of the flood control system that characterizes the Re protect Detroit project. This constitutes one of the three elements of preventing and combating floods. The main function of the building located at 690 Philip street is for commercial activity. The building is spread over two floors above ground, like most of the buildings in the Jefferson Chalmers neighborhood.

Flood control

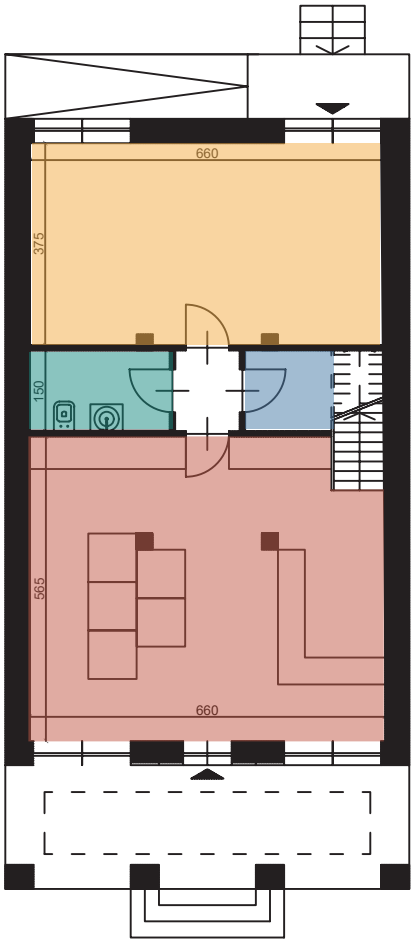
The building has some peculiarities that allow it to be identified as a flood control tool. The main feature that makes it possible to identify it as a flood control tool is given by the presence of a water collection tank in the base which, in the event of a flood, allows to collect the quantity of excess water, not releasing this in the street or nearby of the building.
The building is therefore designed to defend itself from floods and at the same time be an instrument of contrast. These two characteristics reflect them through the use of the water collection tank which allows both to reduce the amount of water in the street and to collect and reuse it.



Definition of functions

The building is spread over two floors above ground with different functions. The main one is located on the ground floor, namely that of a shop / point of sale for agricultural products grown by the population in the agricultural area located at 501 Philip street. There is also a warehouse for the storage of products. The first floor, on the other hand, has a different function, namely that of a multifunctional center.
This space is in fact also intended for quarterly meetings related to the organization and management of urban gardens. Also on the first floor there are two offices, spaces reserved for those who manage the commercial activity. The building thus also becomes a symbol of the agricultural activity of the Jefferson Chalmers neighborhood, it becomes a place of sale of the products grown by the citizens themselves but also a place of community, meeting and exchange.
The system that sets up this space and the urban gardens is managed through an application that can be used by the entire population. The application (explained in detail below) allows users to rent a portion of arable land based on availability and use it for the production of agricultural products. The user can later consume these products or sell them at the shop just mentioned allowing the community to buy them.

Ground floor



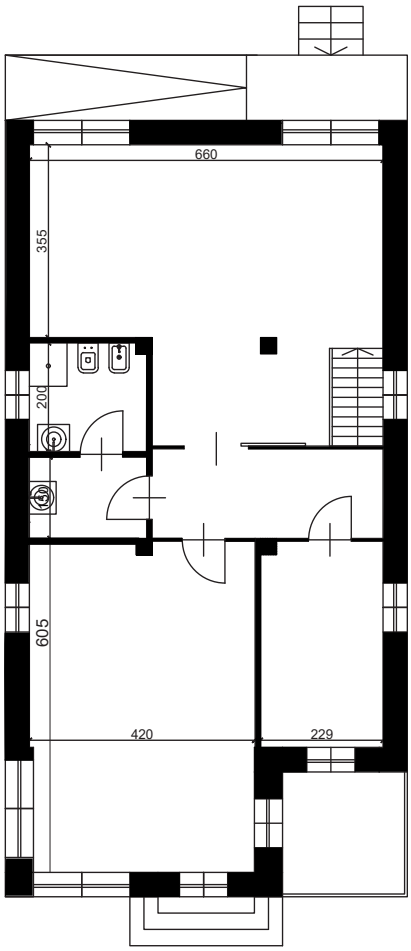
Warehouse

Toilet

Locker room

Sales area

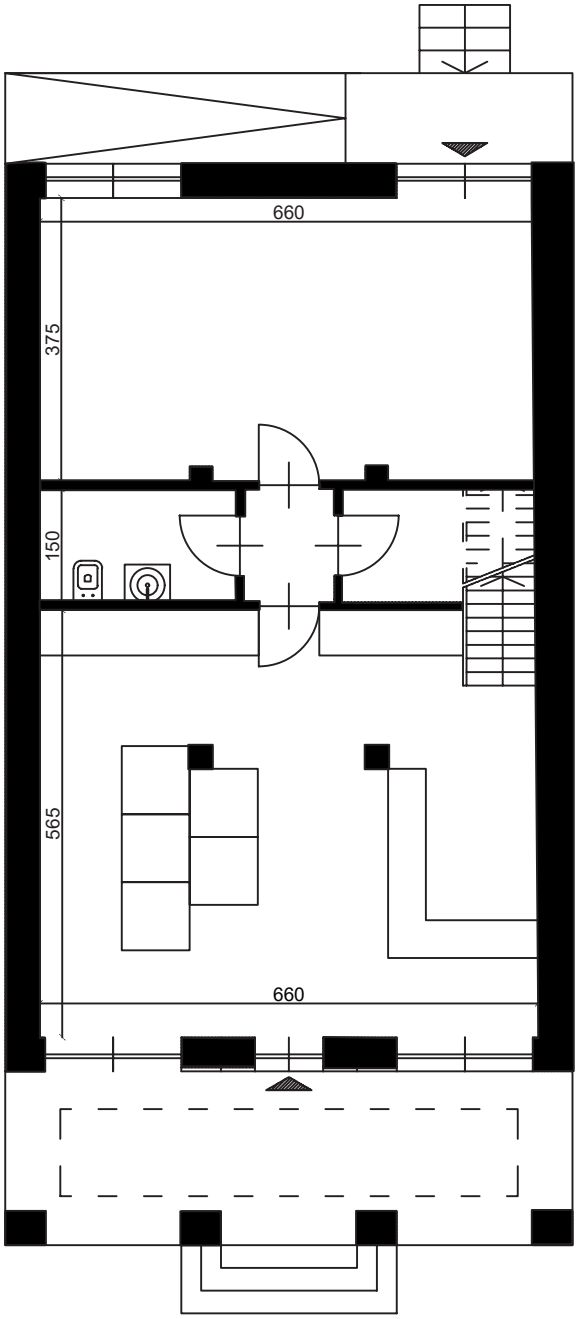
First floor



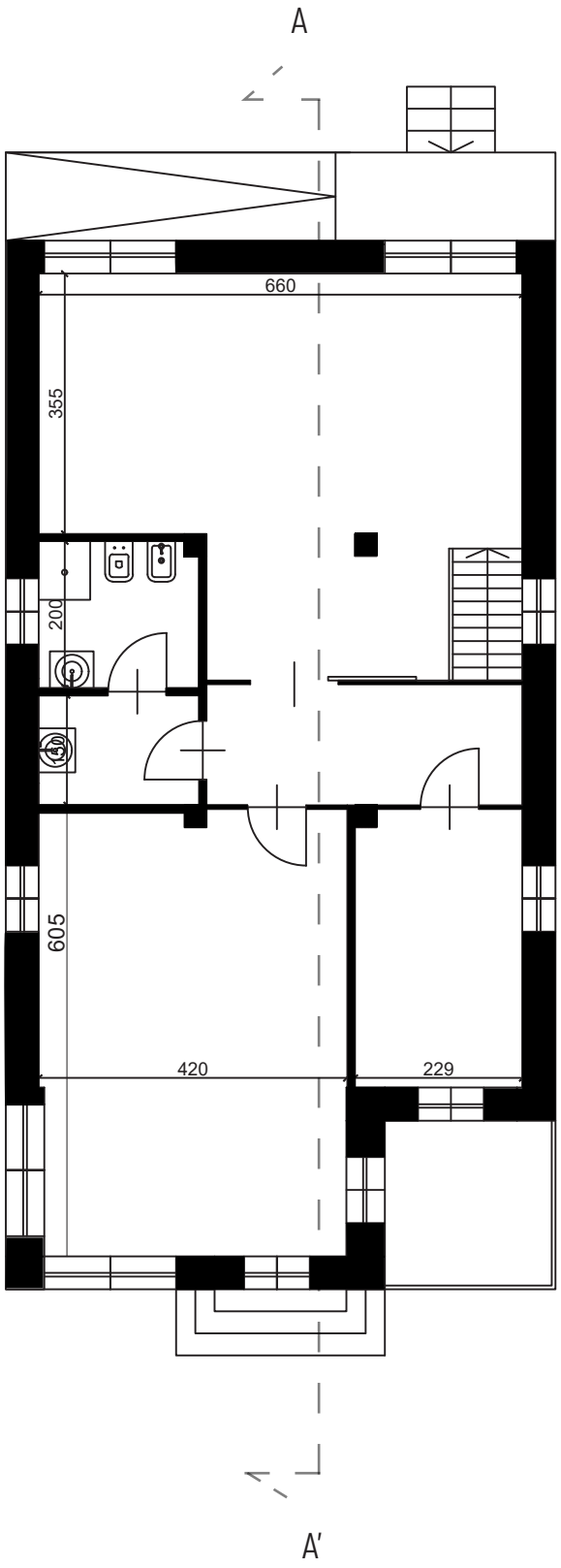
Multifunctional center

Toilet

Office



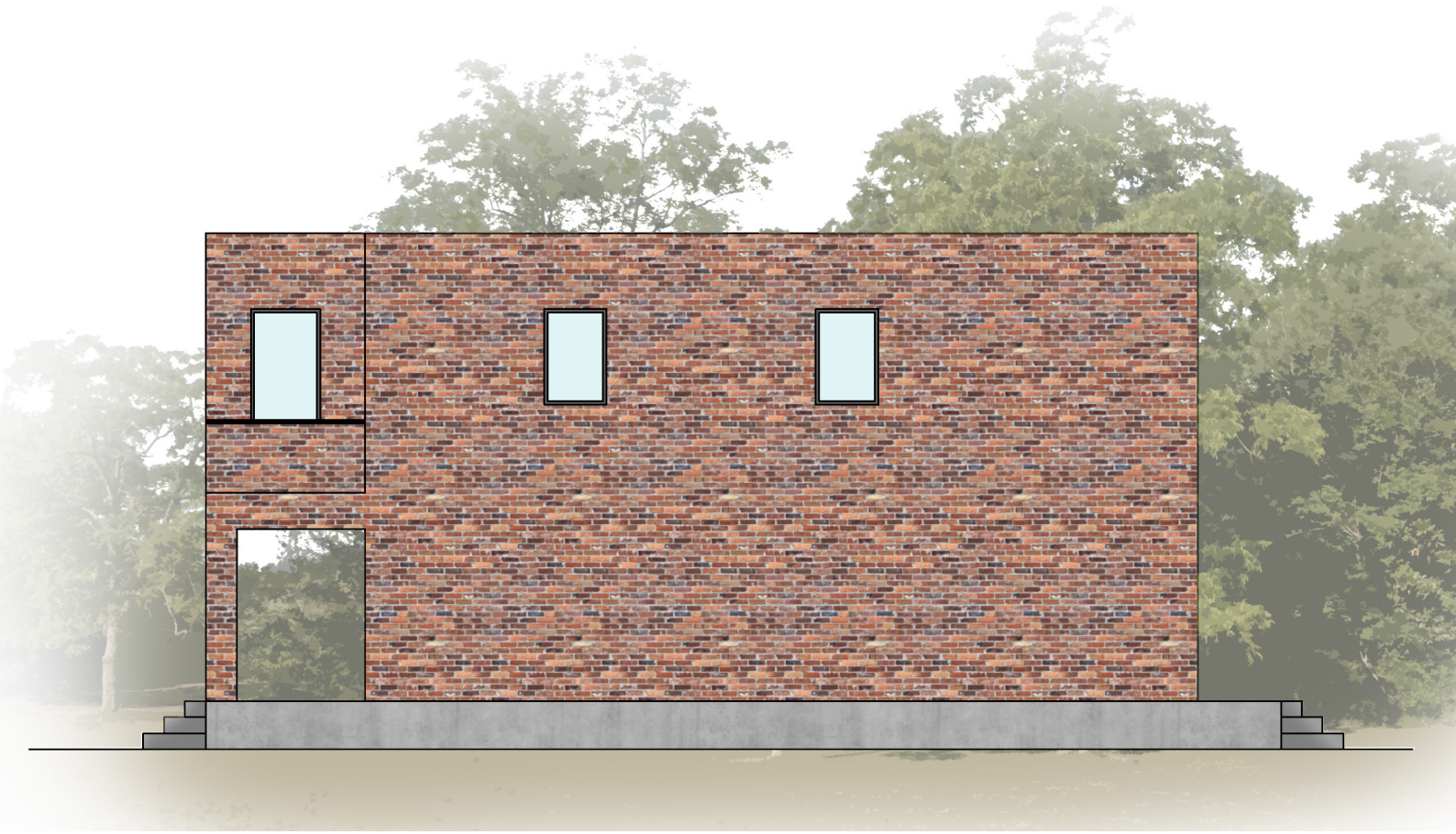
Ground floor, scale 1:100



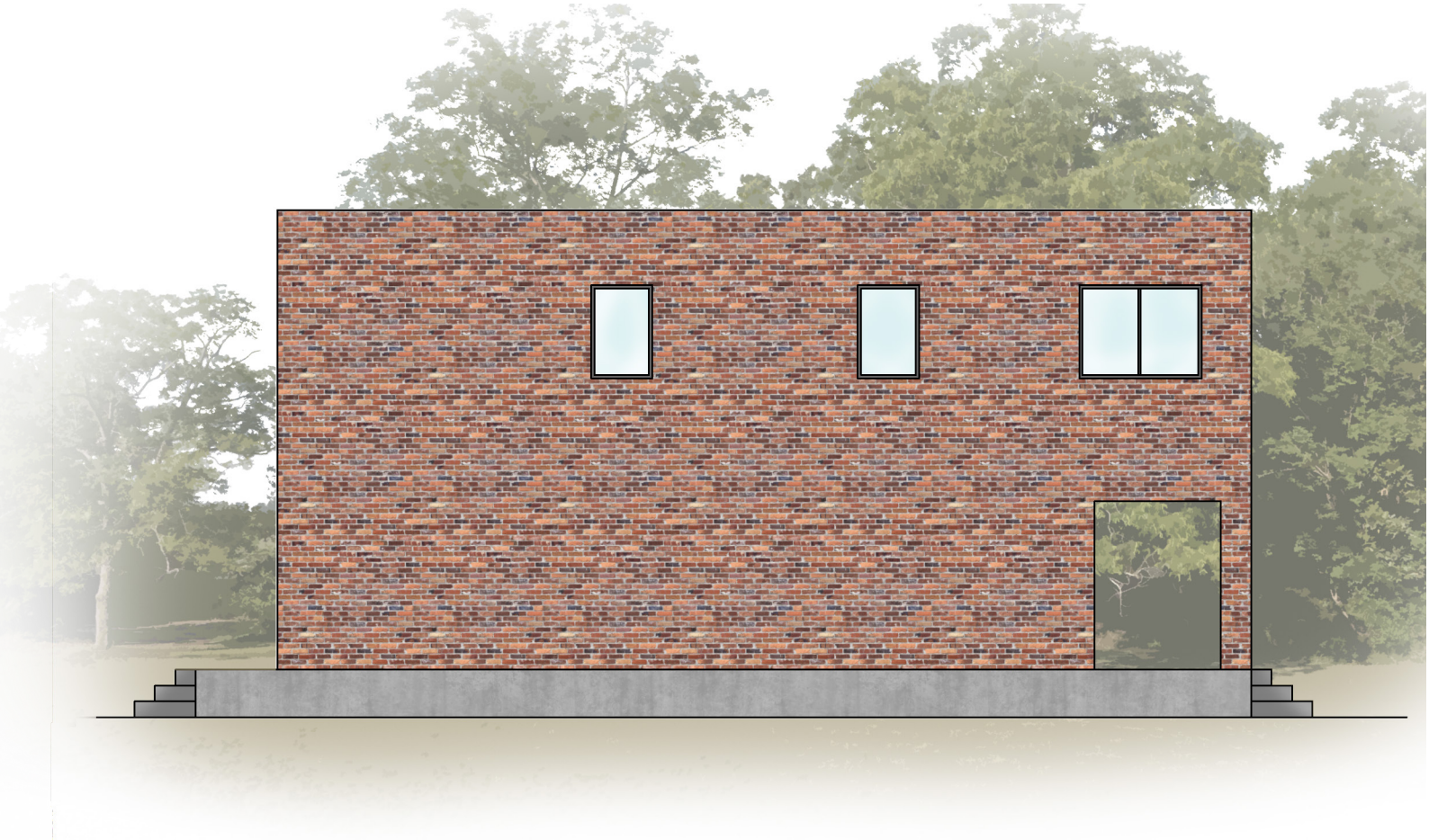
First floor, scale 1:100

West facade, scale 1:100

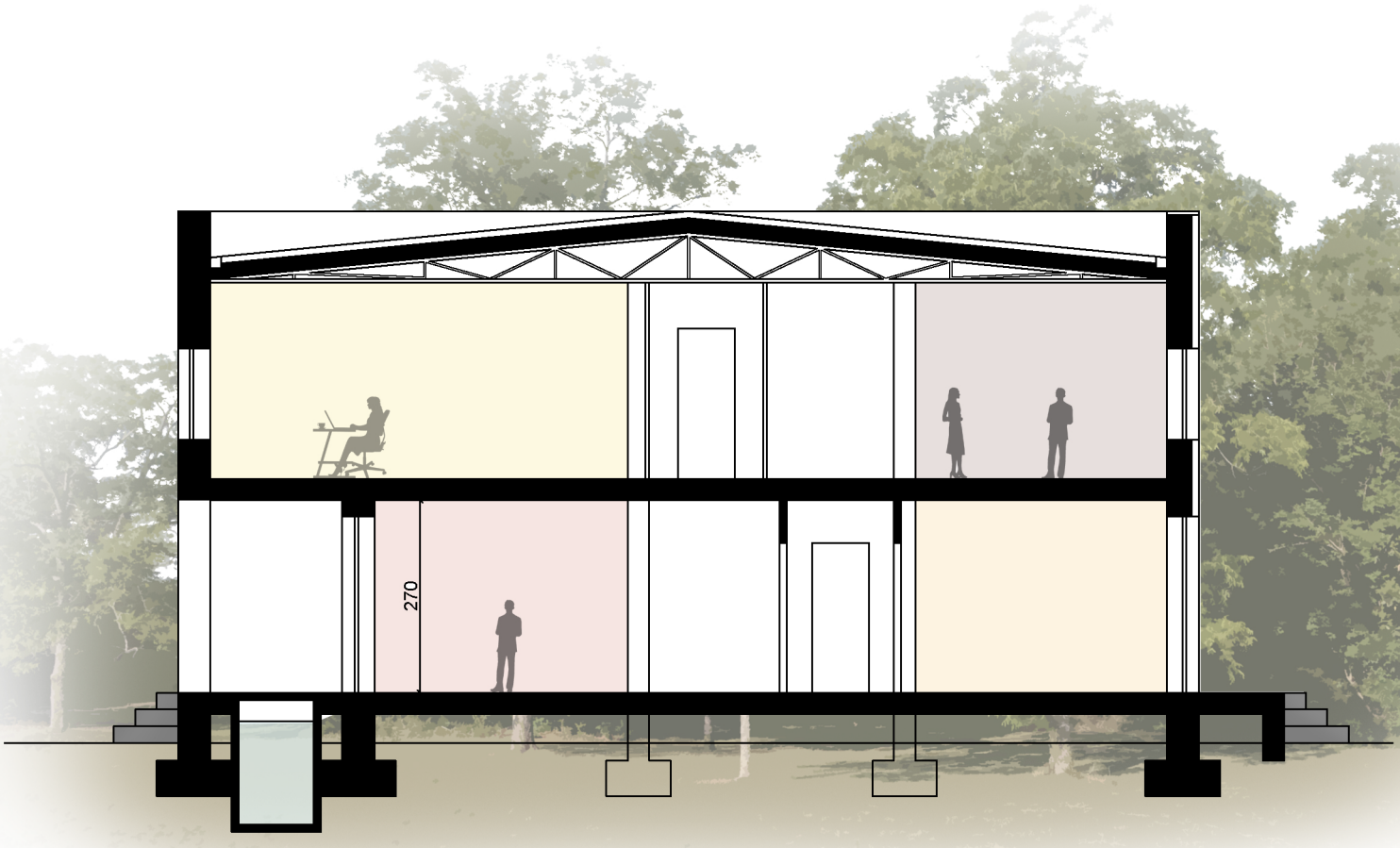
East facade, scale 1:100



Sud facade, scale 1:100



Nord facade, scale 1:100



Section, scale 1:100

CASE STUDY - BUILDING

1. Amphibious House

Place: Buckinghamshire, UK
Area: 205 mq
Year: 2015
Use: house

The Amphibious House was designed by the British studio Baca architects for a London family. The project area is at high risk of flooding in fact it is located on the banks of the River Thames in Marlow.
The house is located on a small island in the picturesque stretch of the Thames that crosses Marlow, in Buckinghamshire, this area constitutes a high risk area of flooding, is identified as Flood Zone 3b and Conservation Area.
In order to conceive and design a building that could respond to this problem, a house was designed whose structure, in case of flooding of the area, is able to rise supported by the force of the water.
At the base of the project of the Amphibious house there is the Archimedes principle, according to the buoyancy of the house is given by the fact that the mass and volume of the house are lower than those of water.
The foundations of the house are an element of fundamental importance as they house a basin and a concrete hull that allow the house to bring the living spaces upwards and away from the water.
It is therefore a building that rests on the ground on foundations and that in the event of a flood it rises and floats. This type of building constitutes an element of flood control and represents a solution for the mitigation and prevention of flood risks. (https://www.archilovers.com/projects/138869/amphibious-house.html#info)

WATER SENSITIVE DESIGN-RIVERFRONT

Source: Google maps

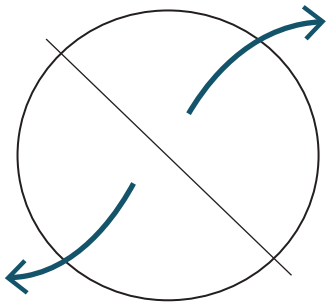
Water Sensitive Design (WSD) is an emerging urban development paradigm aimed to minimise hydrological impacts of urban development on environment.
In practice, the WSD integrates stormwater, groundwater water supply and wastewater management to:
-protect existing natural features and ecological processes;
-maintain natural hydrologic behaviour of catchments;
-protect water quality of surface and ground waters;
-minimise demand on the reticulated water supply system;
-minimise wastewater discharges to the natural environment;
-integrate water into the landscape to enhance visual, social, cultural and ecological values.
In the whole conception of the project it sees the realizatoin of WSD flood control tools like retention basin and bio swale in order improve stormwater management.
These tools of flood control has been located in the area of riverfront, a prone zone to be flooded because it situated in proximity to the river and during storms events, that are more and more frequently due to climate changes, occurs an increase of the Detroit river level that causes floods. This phenomenon brings to citizens many damages with economic consequences.

MASTERPLAN RETAIN BASIN

Scale 1:5000

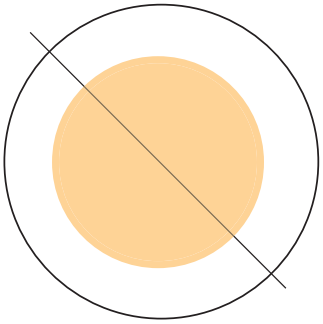
STRATEGIC POINTS OF INTERVENTION

REDUCE STORMWATER RUNOFF



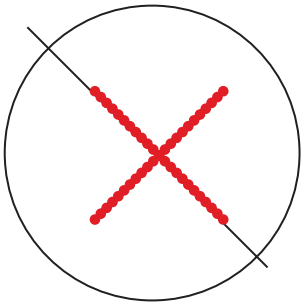
In order to reduce the flow of rainwater that floods the neighborhood, a green infrastructure has been designed.
The retention basin has the task of retaining excess rainwater during storm events.

RE-FUNCTIONALISING A LAND



The basin has been positioned along the Riverfront where today there is a public park.
With the aim of reducing the volume of water present along the streets of the neighborhood during the floods was designed the basin.

FACE UP THE IMPACTS OF CLIMATE CHANGE



As previously mentioned, the city is often subject to strong storms that flood the neighborhoods causing serious damage.
The intervention would be an additional tool to address the issue.

Retention ponds are ponds or pools designed with additional storage capacity to attenuate surface runoff during rainfall events.
They consist of a permanent pond area with landscaped banks and surroundings to provide additional storage capacity during rainfall events.

In the area located along the riverfront will be realized a micro-basin of 2,500 cubic meters that will have a double objective: that of holding and slowing the outflow of water mainly during the storm events and that of guaranteeing, even in periods of drought, the water resource to the agricultural activities of the area.
The retention basin has been located in a strategic area for water management in the city of Detroit, as it is known that due to frequent storm events the river level increases flooding the city and causing serious damage. In this regard, the basin aims to retain part of the excess water, creating an additional tool used for the absorption of stormwater.
The base of the project is therefore the management of the rainwater but at the same time the exploitation of a vacant land today used like public park. The retention consists in creating a volume of accumulation for meteoric waste water, with the aim of regulating the quantities disposed of, reducing the outflow peaks.
The retention is therefore intended to laminate the flow peaks, allowing the evacuation of a regulated flow and thus avoiding a hydraulic overload of infiltration systems, ducting and small receptors.
These are therefore accumulation volumes always available at the beginning of a rainy event. In this perspective the rainwater recovery volumes are not considered as retention plants, as in case of subsequent rainy events the volume is not available.
Retention does not affect the mode of disposal of water but allows a controlled evacuation of water thus helping to avoid overloading infiltration systems, manifolds or receptors.

CASE STUDY - RETENTION BASIN

1. Beacon biorentation basin

Place: Denning's Point, part of Hudson Highlands State Park; Beacon, NY
Year:2008
Use: biorentation basin

The biorentation basin is an example of green infrastructure often used in urban contexts in order to protect the population from the phenomenon of floods. This infrastructure makes it possible to avoid polluting or reducing pollution of the Hudson River water by capturing and filtering the runoff of rainwater from the building and site. The basin is designed to reduce the flow of water and at the same time allow the sediments of the flow of water from the building and the road to settle on the bottom where they are filtered by the plants. This filtering process also takes place when the soil adjacent to the basin absorbs the outflow, starting the filtration.
The intent of this green infrastructure is therefore to protect the water quality of the nearby Hudson River. The choice of plants used and arranged in the circumstances of the basin is strategic. In fact, non-invasive plants are inserted that require a low level of maintenance and that have good filtering capabilities.


2:36 PM
Mail
Calendar
Photos
Camera
Maps
Clock
Weather
Wallet
Notes
Reminders
Stocks
Videos
iBooks
iTunes Store
App Store
Home
Health
Settings
Touch ID
Passbook
Phone
Safari
Messages
Music

8. THE APP

THE APP

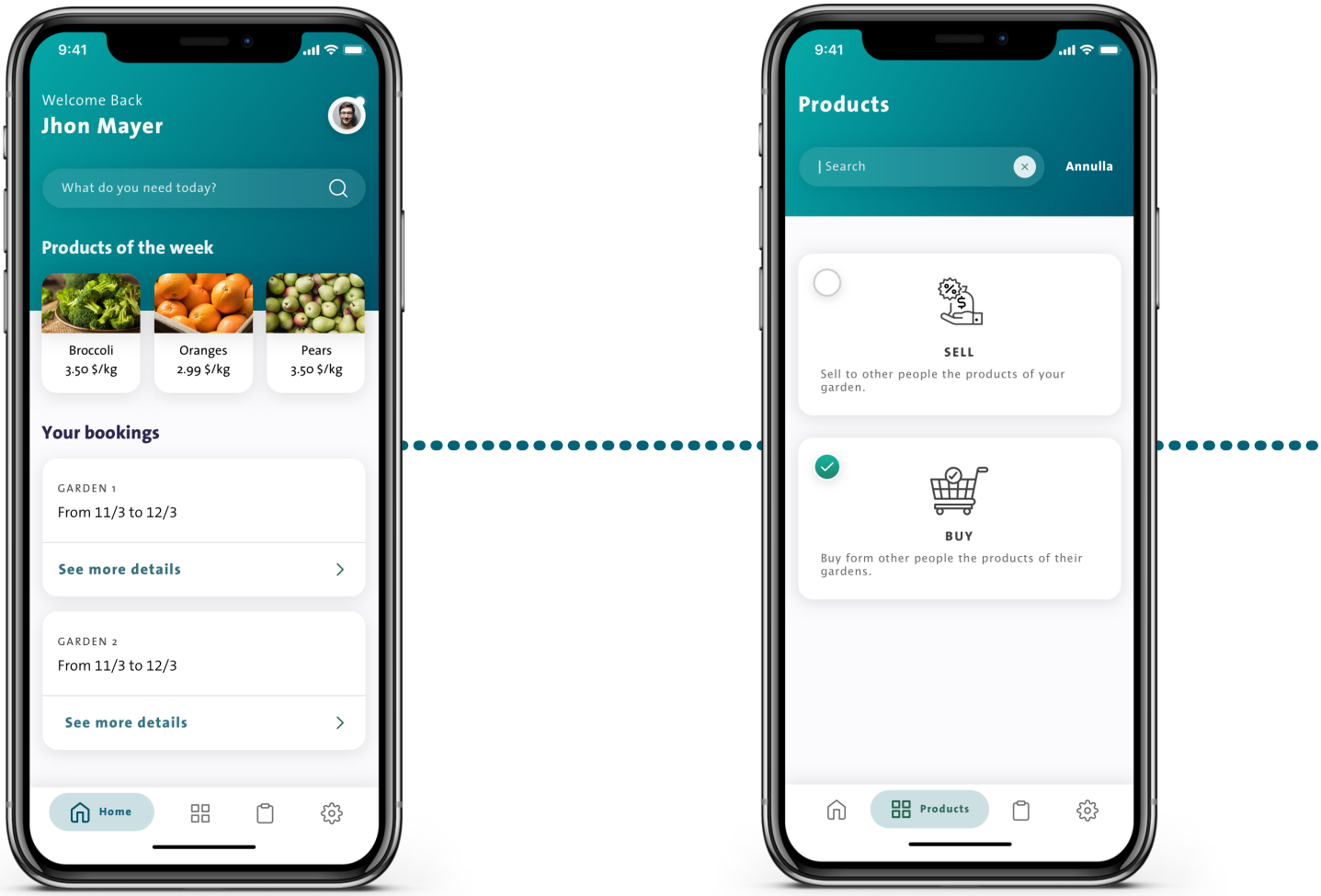
In order to make the water control system designed for the Jefferson Chalmers neighborhood more efficient and easy to use, an app called JCA, Jefferson Chalmers agriculture, was created.
JCA is an app designed to respond to different needs of users by allowing them to make greater use of the activities and possibilities that are offered to them.
The application shown here is only a design idea and the interface.
Both residents of the neighborhood and citizens residing outside can use the app's services.
The application offers various services to users, these are: the possibility of renting the urban gardens in the agricultural area located in Essex Avenue; the possibility of buying products grown in the commercial space located at 685 Philip street and the possibility of selling their own products grown in the same shop.
This tool constitutes a means by which to exploit both agricultural space and commercial space.
The various services it offers have been designed in such a way as to make the water control system more efficient.The app also offers these possibilities given the two areas of the district concerned, in fact these are located along the same road axis that allows the creation of a direct link.
Below are the flows related to the possibilities that the APP offers, the first is the product sales flow and the second the urban garden booking flow.

App project

The app was therefore designed to allow users to make the most of the system designed for the neighborhood. The app facilitates the user in carrying out various activities

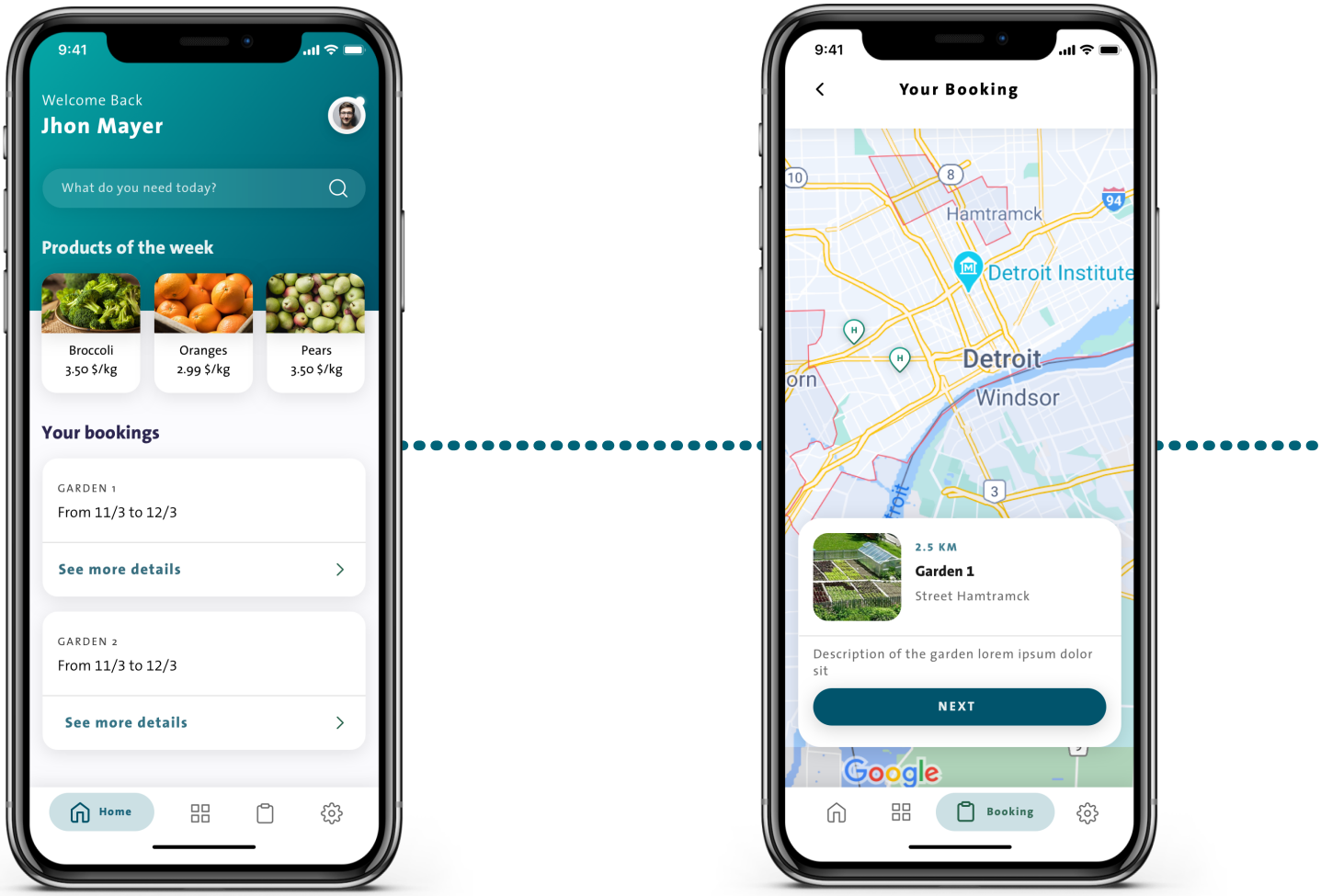
PRODUCT SELLING FLOW

The app allows the user to purchase agricultural products such as fruit and vegetables at the shop located in 690 Philip street. Moreover, the user can sell the products he grows in his own urban garden to the shop that will be subsequently purchased by another user. This mechanism creates a functional system between users.

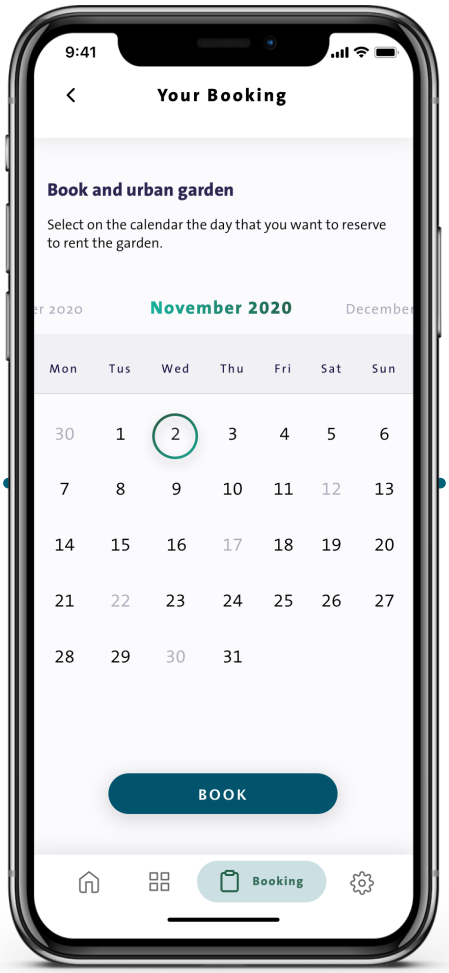


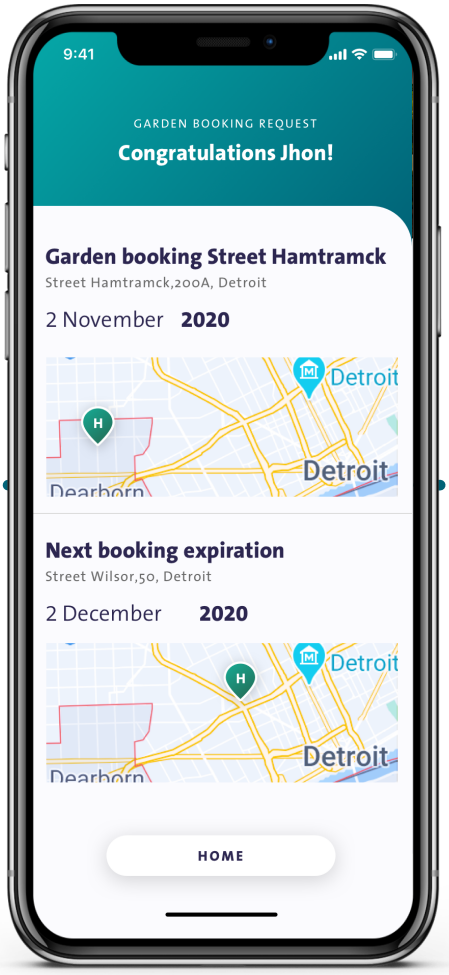
GARDEN BOOKING FLOW

The app allows the user to book a portion of arable land located in the agricultural area in 501 Philip street. At the time of booking, the user can select the period in which he decides to use the land by checking its availability.



GARDEN BOOKING FLOW

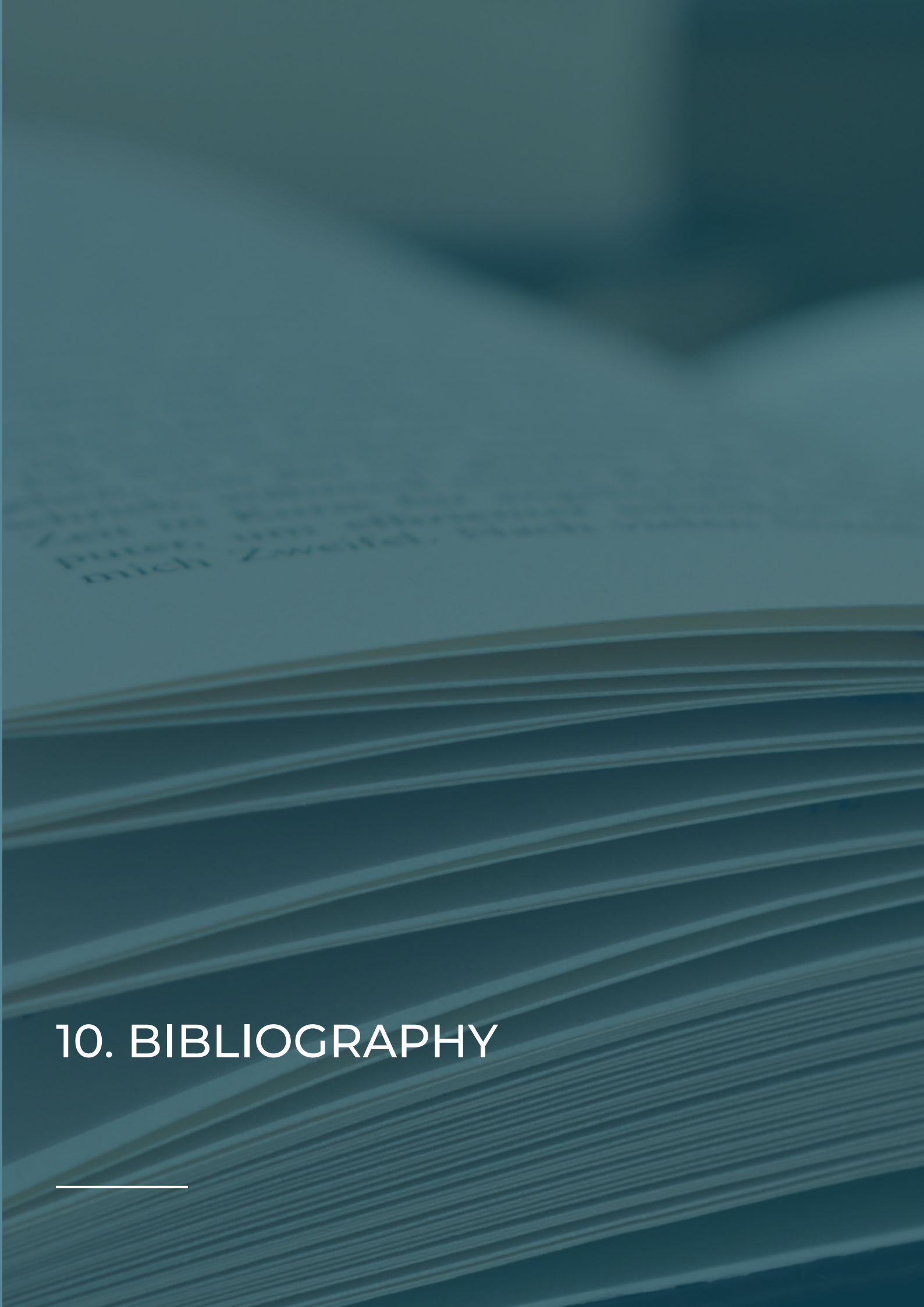




9. CONCLUSION

CONCLUSION

RE-Protect Detriot: a new sustainable flood control system addressed today's issue of climate change by designing a possible solution for the Jefferson Chalmers neighborhood.
After a careful analysis of the history of the city of Detroit and the district under consideration, the issues of urban agriculture and green infrastructures as tools for controlling rainwater were studied.
The city of Detroit experienced a period of strong rebirth for about a decade, which sees a sustainable transformation as the protagonist, focusing on the redevelopment of abandoned areas through the creation of new green areas.
The project is based on the creation of three new areas for the neighborhood. These are developed along three topographically characteristic areas for the theme of floods.
The project therefore highlights the famous Jefferson avenue, an important road axis characterized by a large number of commercial activities; Essex Avenue, a road axis located in the center of the neighborhood and the riverfront, an area often subject to flooding which causes damage to the community.
The choice of these three areas allows the creation of a system for the neighborhood. Through this, in fact, there is the possibility of creating connections between the population, connecting different areas of the neighborhood that today appear detached from each other.
The system mentioned above is defined sustainable because: it allows the redevelopment of abandoned lots through their transformation, addresses the problem of flooding due to the impacts of climate change and intervenes on an economic level with the creation of a commercial activity for the community
In conclusion, the thesis stands as a possible strategy for the frequent floods that the Jefferson Chalmers neighborhood has to face. All this represents the current and future vision at the basis of the design.
The project could represent an important transformation for the jefferson chalmers neighborhood which often faces difficult situations caused by the presence of an excessive amount of water.



10. BIBLIOGRAPHY

BIBLIOGRAPHY

TEXTS

Beauregard R. A., When America became suburban, University of Minnesota Press, Minneapolis, 2006.

Bergamini O., Storia degli Stati Uniti, Laterza, Bari, 2010.

Cialdella J.S., Motor CIty Green: a century of landscapes and environmentalism in Detroit, University of Pittsburgh Press, 2020.

Conti S., Dopo la città industriale. Detroit tra crisi urbana e crisi dell'automobile, Franco Angeli Editore, Milano, 1983.

Coppola A., Apocalypse Town: Cronache dalla fine della civiltà urbana, Gius. Laterza e Figli, 2012.

Darden J.T., ChilD Hill R., Thomas, J., Thomas R., Detroit: Race And Uneven Development, Temple University Press, 1987.

Donald K.Carter, Remaking Post-Industrial City:Lessons from North America and Europe, Routledge, New York, 2016.

Fabian L., Viganò P., Extreme CIty climate change and the transformation of the waterscape, Università Iuav di Venezia, Venezia, 2010.

Ingaramo R., Rust remix, Architecture: Pittsburgh versus Detroit, Lettera Ventidue, 2017.

Petrignani R. , L'era americana. Gli Stati Uniti da Franklin D. Roosevelt a George W. Bush, il Mulino, Bologna, 2001.

Poremba D. L., Detroit in Its World Setting: A 300-Year Chronology, Revised and Enlarged Edition, Detroit, Wayne State University Press, 2001.

Rosenberg N. - Mowery D., Il secolo dell'innovazione. Breve storia della tecnologia americana nel XX secolo, Università Bocconi Editore, Milano, 2001.

Sabbatucci G., Viddotto V., Storia Contemporanea. Il Novecento, Editori Laterza, Bari, 2008.

Saunders S, Easley T., The Rocky Mountain Climate Organization, Extreme Storms in Michigan, December 2014.

Smith M.P., Owen Kirkpatrick L., Reinventing Detroit:The Politics of possibility Comparative Urban and Community Research, Routledge, 2017

Tumber C., Small Gritty and green, The promise of America's smaller industries cities in a Low Carbon World, The MIT Press, London, 2012.

Zezza A, Tasciotti L., Urban agriculture, poverty, and food security: Empirical evidence from a sample of developing countries, 2010.

Zunz O., The Changing Face of Inequality. Urbanization, Industrial Development and Immigrants in Detroit, 1880-1920, The University of Chicago Press, Chicago, 1982.

ARTICLE

Alcoforado FAG, Flood Control And Its Management, Journal of Atmospheric & Earth Sciences, 2018 in https://www.heraldopenaccess.us/openaccess/flood-control-and-its-management.

Martellozzo F, Landry JS, Plouffe D., Urban agriculture: a global analysis of the space constraint to meet urban vegetable demand, Environmental Research Letters, 2014.

Mcdonald J. F., What happened to and in Detroit?, in Urban Studies 2014, vol. 51 (16), Sage, 2014.

Mougeot LJ, Agropolis: the social, political and environmental dimensions of urban agriculture. Routledge, London, 2005.

Runyan R., East Riverfront framework wins prestigious urban design award, 2019. https://detroit.curbed.com/2017/3/1/14785116/east-riverfront-detroit-development

Runyan R., Mondry A., 12 developments set to transform Detroit, 2019. https://detroit.curbed.com/2017/3/1/14785116/east-riverfront-detroit-development

Proksch g., Roehr D., Urban Cultural Greenways: The Potential of Urban Agriculture as Sustainable Urban Infrastructure, 2010.

THESIS

Chitsaz A., Kholdani R., Targeted redevelopment area Southwest Detroit, Politecnico di Torino, 2020.

Dessantis, L. Detroit:dalla crisi agli esperimenti di rinascita, Università degli studi di Sassari Dipartimento di scienze politiche, scienze della comunicazione e ingegneria dell'informazione, 2017.

Falletta E., RE-INC. Rivertown Innovation District, Politecnico di Torino, 2020.

Meli G.M, Reusing Detroit Heritage from Rivertown, Politecnico di Torino, 2020.

Polverini D., Remaking PIttsburgh- Urban Manufacturing, Politecnico di Torino, 2018.

Walker J. E., Homegrown in Detroit How Urban Agriculture has not only brought food security to Detroit but has also had social and political implications that resist the pressures of a consumer culture, Webster University, 2014.

PAPER AND REPORT

Badger, Emily, "The Problem with Calling Cities 'Post-Industrial,'" CityLab, 2013, in http://www.citylab.com/work/2013/04/problem-calling-cities-post-industrial/5283/,accessed May 16, 2020.

Camuffo D., Bertolin C., Schenal P., A novel proxy and the sea level rise in Venice, Italy, from 1350 to 2014, Springer, 2016.

Carta M., Detroit Utopia: la rivoluzione urbana del neoantropocene, in http://www1.unipa.it/mcarta/DETROIT/Detroitutopia.html, accessed in May 18th.

City of Detroit, Detroit Climate Action Plan, Detroit, 2016.

City of Detroit- Planning and Development Department, Jefferson Chalmers RFP- Neighborhood development & implementation plan, April 2017.

City of Detroit- Planning and Development Department, Jefferson Chalmers Neighborhood Framework, April 2019.

City of Detroit, Stormwater Management Program Plan Detroit, 2011.

City of Detoit, Water and Sewerage department, Detroit water quality report, 2018.

Detroit Future CIty, 2012 Detroit Strategic Framework Plan, Detroit, Inland Press, 2013.

Detroit Environmental Agenda, Detroit Environmental Agenda Report in http://detroitenv.org/read-the-report, 2013.

Detroit Vacant Property Campaign, Neighborhood Stabilization Plan: Jefferson-Chalmers, 2013.

Foster A., Newel J.P., Detroit's lines of desire: Footpaths and vacant land in the Motor City in https://www.researchgate.net/publication/334523960_Detroit's_lines_of_desire_Footpaths_and_vacant_land_in_the_Motor_City.

Glisa, Historical Climatology:Detroit, Michigan, Detroit, 2016.

Hankard M., Reid M., Schaefer R., Vang K., Stormwater Runoff Benefits of Urban Agriculture, 2016.

IPCC, FAR Climate Change: Scientific Assessment of Climate Change, Summary for Policymaker, Working Group I of the Intergovernmental Panel on Climate Change, 1990.

Jefferson East, Inc, Our neughborhood impact 2018, 2018.

Lichten n., Iverson Nassauer J., Dewar M., Sampson N.R., Webster N.J., Green Infrastructure on Vacant Land: Achieving Social and Environmental Benefits in Legacy Cities, Neighborhood, environment, and water research collaborations for green infrastructure, 2017.

Michigan Department of Environment, Great Lakes, and Energy Combined Sewer Overflow (CSO), Sanitary Sewer Overflow (SSO), and Retention Treatment Basin (RTB) Discharge 2018 Annual Report, accessed June 8th).

National Research Council, Urban Stormwater Management in the United States, 2009.

Red fields to green fields Parks Revitalize & Connect Communities Greenway Connections, Environmental Health, and Urban Transformation in http://rftgf.org/PP/pdf-presentations/CityStudies/Detroit.pdf, accessed May 19th.

Safransky S., Greening the urban frontier: Race, property, and resettlement in Detroit, Department of Geography, University of North Carolina at Chapel Hill in https://www.greencitycoalition.org/uploads/8/7/1/3/87139164/greening_the_urban_frontier_[safransky_2014_geoforum].pdf, accessed in May 13th.

Sampson N., Hill Knott K., Smith D., Mekias L., Heeres J.H., Sagovac S., Planning for Climate Change in Legacy Cities: The Case of Detroit, Michigan, in "Michigan Journal of Sustainability", Fall 2014, 2, accessed April 8, 2020.

The Rocky Mountain Climate Organization, New Report: Climate Change Has Extreme Rain Storms in Michigan Trending Way Up, in https://rockymountainclimate.org/images/MichiganStormsRelease.pdf, accessed June 8th.

United States Environmental Protection Agency, 2012 Guidelines for Water Reuse, 2012.

University of Michigan School for Environment& Sustainability (SEAS), Greenhouse Gas (GHG) Inventory, 2005.

University of Michigan Taubman College of Architecture & Urban Planning,Foundations for Community Climate Action: Defining Climate Change Vulnerability in Detroit, 2012.

University of St. Thomas Environmental Problem Solving, Stormwater Runoff Benefits of Urban Agriculture, 2016.

Water and Sewerage department, Detroit water quality report, 2018.

World Meteorological Organization, Integrated flood Management Concept paper, 2009.

SITOGRAPHY

http://www1.unipa.it/mcarta/DETROIT/Detroitutopia.html

https://issuu.com/taubmancollege/docs/ud742_v3_nineurbanthesis_arquero

https://detroitfuturecity.com/wp-content/uploads/2017/07/DFC_CitySystems_2nd.pdf

hhttp://www.city-data.com/world-cities/Detroit-Environment.html

https://www.agritecture.com/blog/2018/1/2/americas-first-100-organic-self-sustainable-neighborhood-is-in-detroit

https://detroitenvironmentaljustice.org/dcac-dcap/

https://detroitenvironmentaljustice.org/wp-content/uploads/2017/11/CAP_WEB.pdf

https://motorcitymapping.org/#t=overview&s=detroit/kettering&f=all

https://www.michigan.gov/documents/mdhhs/MI_Climate_and_Health_Profile_517517_7.pdf

https://jalopnik.com/the-ruins-of-detroit-industry-five-former-factories-5110995

https://cfe.umich.edu/detroit-goes-green-4-ways-sustainability-and-reinvention-are-booming-in-the-motor-city/

https://detroitmi.gov/government/mayors-office/office-sustainability/sustainability-action-agenda

http://glisa.umich.edu/projects/detroit-climate-action-collaborative

https://www.modeldmedia.com/features/climate-change-detroit-103116.aspx

https://metropolitiques.eu/Demystifying-urban-agriculture-in-Detroit.html

https://issuu.com/extremecities/docs/extremecity

https://www.architetturaecosostenibile.it/architettura/progetti/agricoltura-urbana-agrocite-127

https://datausa.io/profile/geo/detroit-mi/#health

https://data.detroitmi.gov/

https://worldlandscapearchitect.com/room-for-the-river-nijmegen-the-netherlands-hns-landscape-architects/#.XorabogzZPY

https://www.floodmap.net/Elevation/ElevationMap/?gi=4990729

https://detroitography.com/2014/08/25/detroit-flood-insurance-map-1981/

http://landezine.com/index.php/2015/03/a-resilient-landscape-yanweizhou-park-in-jinhua-city-by-turenscape/

https://www.archdaily.com/931112/kjellander-sjoberg-wins-competition-to-climate-proof-the-coastal-town-of-faaborg-in-denmark

https://www.agritecture.com/blog/2018/1/2/americas-first-100-organic-self-sustainable-neighborhood-is-in-detroit

https://www.dezeen.com/2019/03/26/lower-manhattan-climate-resilience-new-york-mayor-bill-de-blasio-climate-change/

https://www.world-architects.com/en/turenscape-haidian-district-beijing/project/sponge-greenway-ningbo-eastern-new-town-ecological-corridor-phase-iii

https://www.wired.com/2013/07/mapping-detroit/

https://portal.datadrivendetroit.org/datasets/land-survey-parcels-2017/data

https://www.mapacad.com/tienda/north-america/eeuu-north-america/detroit/

http://rftgf.org/PP/pdf-presentations/CityStudies/Detroit.pdf

https://www.americanrivers.org/conservation-resource/urban-farms-green-infrastructure/

https://detroitenvironmentaljustice.org/climate-action-plan-GreenhouseGas%20(GHG)%20Inventory

https://worldlandscapearchtect.com/room-for-the-river-nigen-the-netherlands-hns-landscape-architects/#.XorabogzZPY

https://urbannext.net/room-for-the-river/

http://www.ruimtevoordewaal.nl/en/room-for-the-river-waal

http://www.dcdc-udm.org/projects/strategies/bloodyrun/

https://www.researchgate.net/publication/305805985_GROW_the_City_Innovations_in_Urban_Agriculture

https://www.grin.com/document/170585

https://quod.lib.umich.edu/cgi/p/pod/dod-idx/adaptation-to-climate-change-context-matters.pdf?c=mjs;idno=12333712.0001.004;format=pdf

http://detroitenv.org/wp-content/uploads/2017/08/DWEJ195_Climate_Resilience-2.pdf

https://detroitstormwater.org/

https://www.jeffersoneast.org/new-page

http://water.epa.gov/infrastructure/greeninfrastructure

https://21stcenturychallenges.org/the-thames-barrier/

https://www.designboom.com/architecture/mose-flood-barrier-venice-storm-a-lex-10-05-2020/

https://globalnews.ca/news/6012020/manitoba-to-open-red-river-floodway-in-advance-of-snow-rain/

http://www.ers.usda.gov/topics/food-nutrition-assistancfood-security-in-the-us/key-statistics-graphics.aspx

https://www.ortigenerali.it/agricoltura-urbana-nel-parco/

https://www.archilovers.com/projects/138869/amphibious-house.html#info