Water Resilient Communities:
A guideline for the design a water resilient Jefferson Chalmers neighborhood
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Introduction:

The aim of the project is to develop a communal network of plug-in solutions which are resilient to rising water levels and flooding. Through an evaluation of the current "kit-of-parts solutions" for flooding and stormwater management, a solution is created to restore Jefferson Chalmers into a water resilient community, demonstrating a step process for evaluating solutions to create water resilient communities. *(Title Slide)*

Start with World/United States:

Worldwide climate change is leading to rising sea levels, warmer temperatures. This is increasing overall rainfall that is overwhelming combined sewer systems and causing an increase in overall flooding. *(Image of US with precipitation increases; Graph that shows Rise in Temperature and Precipitation for Midwest Region)*

*Next, Detroit:

Located along the Detroit River surrounded by the Great Lakes, Detroit is becoming more and more vulnerable to the effects of climate change and flooding due to its low elevation, high number of impervious surfaces, and combined sewer system.
The high stormwater runoff overwhelms the combined sewer system, leading to polluting the Detroit River, which flows into the Great Lakes, which are the largest system of fresh surface water on Earth - 84% of North America's surface fresh water and about 21% of the world's supply. Therefore, the demand for stormwater management systems is not only crucial for the Metro Detroit area, but all over the world. *(Map of Detroit combined sewer systems and impervious surfaces...possibly topography of Jefferson Chalmers too?)*

Our Site, Jefferson Chalmers:

Jefferson Chalmers, a neighborhood located on the eastside of Detroit, between Downtown and Grose Point, faces flooding hazards on a regular basis, yearly. Jefferson Chalmers is at the epicenter of flooding in the Detroit area. As mentioned before the flooding here is a result of a combination of factors including,

1. historically high water levels in the Great Lakes,
2. weeks of heavy rain,
3. the low-lying nature of the area itself, and
4. a lack of adequate seawalls.

(Map showing its location in Detroit; flood map, topography, images of flooding areas)

*Kit-of-Parts of Existing Solutions:

To figure out what type of stormwater management solutions fit the Jefferson Chalmers area, these existing "kit-of-parts" solutions for stormwater and water sensitive measures were evaluated to determine which are the best to be adapted and applied. All of these are water management interventions that are meant to propose a sustainable solution for stormwater management and are designed to keep areas livable, while also preventing the need to reinvest a couple of years later. *(icons with descriptions for stormwater management system solutions)*

*Evaluations:

An Evaluation was taken into consideration into determining the best solution.

Example #1: Let it Flood!

One of those considerations was to simply let things continue (as in continue to let Jefferson Chalmers flood. This would mean moving all the people who still live in the area or at least renovate their homes to be better equipped for flooding.

Additionally, a clearing process for all the vacant homes would need to take place to make sure that the debris doesn't pollute the River and Great Lakes more

- Expensive clearing away vacant homes
- Need to convince people to move/ abandon their homes

Example #2: Dikes, Levees, Berms, and Seawalls

In 1980 or actually a bit before in the 1970s, a Study was conducted to find solutions for the Detroit Shoreline. This was meant to tie into an existing steel sheet pile seawall that protects Grosse Pointe Park.

- A man-made sediment barrier placed at the edge of a slope or a wall to protect against erosion, run off and high water.
- The cost of building a lateral berm ranges depending on size, use (transverse or lateral) and materials.
- Overall, it is expensive and a lot of upkeep.

Example #3: Other

Windmills, Water Pumps, and Storm Surge Barriers

Windmills, Water Pumps, and Storm Surge Barriers were also looked at for possible solutions but were thought of as not optimal for the Jefferson Chalmers site.

- Storm Surge Barriers are mostly to work horizontally along a river, so in this case would go across the Detroit River. Although something like this might help Detroit as a whole, it is a larger, more expensive infrastructure project.
- Similarly, the Windmills and Water Pumps would help solve some of the flooding issues, but again is expensive.
- Additionally, the Netherlands, although has many Dikes and Windmills, Water Pumps, they too are moving away from these infrastructures with the Room for the River Project that has started to be implemented.

Ultimately, through this process it was discovered that Jefferson Chalmers location is more of a bowl. When heavy rain comes, the water fills the bowl with little to no place to drain away, blocking up the sewer system as well as creating flooding.

(Each example is accompanied by a site map or section showing how solution(s) works or doesn't)

Solution/ Implementation:

Therefore, Jefferson Chalmers' overall topography was divided into Four different layers to maintain Jefferson Chalmers existing conditions.

- Zone 01-Highest, Untouchable Area;
- Zone 02-Touchable Area;
- Zone 03-Floodable Wetlands; and
- Zone 04-Permanent Water Features. *(Site Map with Flood Zones)*

*Solution/ Implementation:

From there, an Areas of Potentials map is established for more major stormwater management implementation. *(Areas of Potential Map)*

*Solution/ Implementation:

Overall, the best solution for the Jefferson Chalmers neighborhood consists of opening up the river to provide more access to the Neighborhood, giving a place for the water to drain. Additionally, similar to the Room for the River project, using Jefferson Chalmers natural topography dictate areas for water management to take place.

- Ponds/ Lakes are placed in the lowest areas
- Relief Channels, Creeks and Streams are extended to provide more areas for the water to drain directly into the Detroit River
- Water networks, both as little channels, exposed, or covered underground
- And Wetlands surround those as the second lowest zones. *(Site Map with overall Neighborhood solution)*

Solution/ Implementation:

To help explain, a series of Sections showing the different areas help to shed light on all the pieces work together to direct water towards storage areas as well as back to the Detroit River directly, rather than the combined sewer system.

So here, an example of how a floodable park can collect and store excess stormwater, before draining back into the Relief Channels and Side Rivers/Creeks that lead back to the Detroit River. *(Implementation Section: Floodable Parks, Flood Relief Channel and River)*

*Solution/ Implementation:

Similarly, this section depicts the wetlands infrastructure of storing and filtering the water, before draining back into the rivers. *(Implementation Section: Wetlands, Flood Relief Channel and River)*

Solution/ Implementation:

In just looking at buildings, and roads and their relation to both a flood relief channel here, or... *(Implementation Section: Building with Flood Relief Channel)*

Solution/ Implementation:

...a wetland situation here. *(Implementation Section: Building with Wetlands)*

Solution/ Implementation:

Although not being designed, each general building provides their own water management infrastructure systems. These being,

- Green Roofs and walls
- Rain Gardens
- Rainwater Harvesting
- Flood Storage

This led to an exploration of building typologies that work within each of the different new environments that have been added to the site. These include:

- Normal, untouched houses that will remain,
- Dry Proof - Water exclusion Strategy
    - Designed to keep water from entering a building using waterproof materials and construction
    - These would go in areas that are surrounded by our Area of Potentials, as they are on the highest ground within this area
- Dry Proof - Water Entry Strategy
    - Designed to prevent water from entering the building to avoid structural damage
    - They are also designed so that the impact of flooding is minimized and the time to clean up and used is also minimized
    - Therefore, these are located in the second highest areas, or Zone 02 (dark green), floodable parks and such.
- Elevated
    - Where the floor levels are raised above the predicted flood level
    - That is why these are placed in the wetlands. With them being raised, the wetlands can exist below, as the undercroft area of elevated buildings are typically not supposed to be used or occupied in order to allow for flood storage and such.
- Amphibious

    - These are essentially floating buildings that are designed to rest on a fixed foundation for the most part. Only when floods occur, it is allowed to rise, buoyed by the flood water.
    - Therefore, these can go both in the wetland areas as well as along the ponds and lakes
- Floating
    - These, as the name suggest, rest on a buoyant base that is designed to float on the water (rise and fall with it) *(Implementation Section: Single Building)*

Solution/ Implementation:

Different Building Typologies for each level having to do with water management. *(Implementation Section: Building Typologies)*

End:

Conclusion

Lastly, this just shows some precedent examples of similar sites using similar ideas. *(Site with existing implementation examples to show what each would look like)*

End:

Thank you!