Growing Water: Rethinking Wastewater Treatment in Chicago

David Bruce, 2013.

Chicago removes 1 billion gallons of water from Lake Michigan every day to flush toilets, clean dishes, run showers, or water lawns. After use in households, businesses, and industries, that water is washed down the drain, cleaned at one of the gigantic municipal treatment plants, then flushed down the Mississippi River where it ends up in the Gulf of Mexico. Essentially, Chicago removes water from Lake Michigan, uses it, and then dumps it into the Gulf of Mexico, removing water from the natural system it fell in and putting it in an entirely new environment. Additionally, the billions of gallons of stormwater that fall on the city of Chicago hit the impervious concrete streets, absorb pollutants, and then flow into the drains, displacing water that was meant to naturally replenish the Lake. Water usage in Chicago is unsustainable. Given the looming shortage of fresh water in the next 25 years, Chicago and specifically Lake Michigan is in danger.

My research at UrbanLab, a small architecture and urban planning firm in the South Side of Chicago, focused on redefining the how wastewater is treated in Chicago. Specifically, I investigated how to change the way blackwater (from households) and stormwater runoff could be cleaned in an environmentally sustainable, yet efficient and effective way. Working alongside Martin Felsen, a principal architect at UrbanLab, and four architecture graduate students, we engaged in a design project that attempted to craft an urban Living Machine. The Living Machine was crafted by UrbanLab to be an eco-tower that takes water from a city block cleans it, then returns it right back to the city, right back on that block.

The Living Machine is a patented technology that was originally developed by Dr. John Todd. Basically, the Living Machine uses a series of tanks, each one filled with living micro-ecosystems that increase in complexity as the water progresses along the path of treatment. For example, there’s a tank of microbes, then a tank of plants and bacteria, then eventually right at the end, there could be a tank with everything from microorganisms, to freshwater shrimp, to goldfish. One of my main roles in this project was to convert this technology into a vertical tower so that it could clean a significant capacity of water in an efficient amount of space.

Our urban design recommended placing one living machine on each city block, taking the place of one or two parking spaces. The size of the living machine would depend on the density of the neighborhood. The design takes advantage of gravity but pumping water up to the top of the building and having the water trickle down through the tanks and down the levels. A living machine also incorporates very aesthetic opportunities: fish tanks, constructed wetlands, and lots of vegetation and it also provides space for public programing: bike storage, swimming pools, dog-wash stations, or urban farms. Ideally, the public program uses the water that the machine cleans.

The second research project I got involved looked at how to rethink the way we use gigantic pipeline technology to mitigate climate change, rather than enhance its effects with the traditional methods that we use now through pumping natural gasses and oils. The project was extremely theoretical and completely design based, but it basically looked to combat rising sea levels by using pipelines and massive pumps—such as the New Orleans pump which can move 300 million gallons a day—to move salt water into desert basins and create
wetland communities around the water. The whole idea was to create a useless geographic location and use it to make public good.

In both of these projects, I wrote essays about relevant topics, researched certain topics, did numerous practical calculations about how these designs would be practically implemented, as well as create a series of drawings using Adobe Illustrator:

**Graphs/images/figures (if applicable)**

![Image of two people looking at a wall of drawings]

Martin Felsen and me.
A design for a new drainage system connecting tree boxes to an impervious bike lane. The tree boxes and bike lane would collect water, acting as a massive volume for stormwater to collect in, trickle down through various layers of soil, then seep back into the groundwater and replenish Lake Michigan.
A diagram I created that shows how all living machines spread all across the city would have the same geographical footprint as the largest wastewater treatment plant in Chicago.
My diagram of the living machine built in a city block.

I made a lot more drawings, but these are the ones that would be included in UrbanLab’s publication of the research. These were the most finished and the most praised by those at UrbanLab.

**Faculty Mentor: Jill Pearlman**

**Funded by the Cooke Fellowship**

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http://www.bowdoindailysun.com/2012/07/bowdoin-senior-sees-the-future-of-urban-design/