REFLECTION

The Bio-refinery expo

Niels van der Salm
4020642
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Teachers:
Mick van Gemert
Suzanne Groenewold
Christian van Ees
The relationship between the theme of the graduation lab and the subject/case study chosen by the student within this framework (location/object)

Research theme: Chicago’s industrial corridors
The theme of the graduation lab of Complex projects focused on the industrial areas within Chicago. We started with a research on three different topics, Industry, Education and Living-working relationships, each investigating the relationship between industry and Chicago from a different perspective, which resulted in three research booklets. Together with the research booklets we also made an atlas of our research area, The lower-west-side often referred to as “Pilsen”, which we also visited during our field-trip to Chicago. The Pilsen neighbourhood located quiet close to city centre, is divided in two distinct separate areas, a residential zone and an industrial corridor located along the Chicago river, which formed a representative case-study for the other (23) industrial corridors in Chicago, that are scattered throughout Chicago, all facing similar problems of decay, pollution and vacancy.

Urban strategy
Our research combined with the atlas and the research books of the previous Complex projects Chicago studio’s formed a starting point for the development of a urban strategy for the Pilsen industrial corridor.

The studio brief of our graduation lab summarized some of the core questions to be answered:

“Which spatial and urban models will help to re-invent the (obsolete) industrial areas? Considering the present signs of recovery of American economy and the increasing trend towards re-shoring, could these areas retake their original functions? Or could they support new production concepts and functional combinations? Are there new emerging industries in need of space? What is the new relationship with surrounding (living) areas? What infrastructure is needed? What about sustainability and energy issues?”
Our urban strategy aimed at re-inventing the industrial corridors as described in the studio brief. Concluding from the research books we saw opportunities for creating a mix-use industrial corridor where working and living co-exists. New ways of manufacturing make it possible to create smaller, cleaner and less noisy manufacturing businesses than conventional (manufacturing) industry. By aiming on particularly small and medium sized businesses, creative industry and digital manufacturing businesses combined with sustainability measures opportunities arise to integrate industry within a mix-use urban environment.

From our research and our field-trip to Chicago we concluded that many of the industrial areas and infrastructures in Pilsen were obsolete, polluted and not open to the public. The sanitary and shipment canal is one of these pieces of infrastructure that is heavily polluted and not publicly accessible, while big opportunities lay in making these areas open to the public and to use them for recreational and ecological purposes.

Our strategy proposes to transform the industrial corridor into a mix-use urban environment that becomes a real part of the city. One of the core concepts in our urban strategy was to transform the Chicago river/ Sanitary canal from an unaccusable and polluted place that forms a barrier between many neighbourhoods into a connecting element and ecological back-bone with parkways along the waterfront connecting different neighbourhoods on both side of the river (which are now often isolated from each other)and both creating a safe, fast and green bike-route towards the city-centre. The waterfront park with constructed wetlands to improve the water quality combined with places for recreation is placed along the river with several extensions facing inwards into the neighbourhood to bring those qualities to the whole area.
Since our strategy aims at creating a liveable neighbourhood in these polluted industrial areas, sustainability and improvements in the environmental condition are crucial. For that reason we came up with a plan to remediate the polluted water and soil by making it a part of the development strategy. A green (park) layer within the urban strategy should improve the ecological condition further, with green roofs, permeable surfaces, parks and wetlands that enhance water-retention, water & air quality and improve biodiversity while also providing space for recreation.

Next to that we proposed to set even higher ambitions in relations to sustainability and the improvement of the ecological conditions of the area by striving to create a neighbourhood that is largely self-sufficient in its energy supply by generating its own renewable energy as well as recycling its own waste streams within the neighbourhood. One of the ways we want to achieve that is by making local heat and electricity grids were surplus heat and electricity can be exchanged and stored.
Another challenge was to find a strategy to transform the area in different phases, because some of the existing industry need to be replaced over time. Therefore we created a development strategy that took advantage of the existing subdivision of strip-formed plots within the industrial corridor. We used the sub-division in strips to transform the area strip-by-strip and relocate existing industries strip-by-strip over time, making sure that already vacant strips can meanwhile already be transformed.

In order to make sure each strip should get a mix of functions we introduced “the bar-code” concept, which ensures this by opposing a defined functions sequence in each strip. However each developer has freedom in which way he will create the function-mix so that the quantity of each function can differ in each strip.
In the end the mix of functions combined with measurements to improve sustainability and the environment should create a symbiotic relationship between industry, recreation, living, the urban landscape and utility systems that work together like an urban eco-system providing energy, treating waste (water) and both improving the ecological condition of the area in order to create a liveable a healthy place to live. Waste (water or energy) of one industry or function becomes resources for the other one and vice versa.
Building proposal: Bio refinery

My building proposal fits in this urban strategy by creating a visible object within the neighbourhood that reflects the ambitions of the urban strategy towards self-sufficiency, sustainability and a circular economy. The Bio-refinery even plays a crucial role in the urban strategy since it’s houses one of the main utility systems needed to fulfil the neighbourhood’s ambitions to become largely self-sufficient, by treating organic- waste and wastewater from the neighbourhood and converting them into energy and resources.

The goal of my project was to create a building that could become more than just an utility facility. For this I was inspired by was “the Organica solution”, a water-treatment technique that used botanical plant within a public greenhouse to treat water. I wanted to combine this solution with other possible functions to see what other combination could be made within the building. It turned out that there is lot of heat trapped within the sewage water which can be re-used to heat up for instance a swimming pool, some reference projects in The Netherlands and France showed this was possible, so I included this in the building because it also combined very well with the water-treatment and the botanical garden. In this way several other functions were added to the building. The building eventually serves both the neighbourhood in its energy supply and astre-treatment and provides recreational and educational functions for the public.

*Figure 1: Organica water-treatment system*
The building thereby reacts on the urban strategy in multiple ways, its indoor garden connects with the waterfront park in front of the building providing recreational and both ecological functions (water-treatment) along the waterfront park. Next to that the building houses a certain symbiotic mix of function similar as proposed in the urban strategy. Because of its variety of public functions the bio-refinery becomes a kind of community/leisure centre where people can go to benefit of recreational functions like public gardens, community gardens (urban farming) and a swimming pool heated with energy retrieved from waste-streams.

Another important function of the building is raise awareness among residents for the circular economy, our waste-producing way of life and the necessity of sorting waste by educating the people about the processes that are involved in treating our waste(-water) and experience the amount of waste we daily produce by themselves within the building, in the form of a visitors route. Since further research and innovation is needed for a full transition towards a circular economy, the Bio-refinery also offers a place for research labs where new technologies in waste recovery can be developed and tested.
One of the aims of the complex projects studio is to transcend scale and embed your design in a larger frame-work or context. I think as the circular economy becomes more important these waste recovery solutions can play an important role in improving sustainability and the ecological condition within Chicago and its industrial corridors. My project could form an interesting pilot-project to test possibilities of local energy generation and waste-(water) treatment to see if these solutions could also work for other areas in Chicago.

The urban strategy can work very well for Pilsen I think, because of its convenient location along the river in proximity of the city centre and because of the already ongoing trend of gentrification the area will assumingly have little problems with attracting new people and businesses. I therefore think this strategy is not directly applicable for all industrial corridors in Chicago, since some industrial corridors have a less strategic location in the city.

**The relationship between the project and the wider social context**

When understanding the transition our economy is making from an oil-based (linear: take, make, consume, waste) economy towards a sustainable, circular or bio-based economy, (whatever you want to call it) you see that some things need to change radically, among them is the way we look at waste and energy. In this context you see that Chicago performs very bad, only 8% of Chicago’s waste stream is recycled, (meaning 92% end up at a landfill) and only 5% of their energy supply is renewable. Meaning new plans are needed to improve that condition.
The Biorefinery expo aims at doing so by integrating a waste and waste water recycling facility within the city. The transition towards a circular and bio-based economy creates the need for facilities within the city that convert our waste into valuable resources and energy. Where conventional large-scale utility systems like power-plants, wastewater-treatment plants and landfills are mostly located (far) outside the city and associated with pollution and odour, new utility systems can be brought closer to the people, meaning also closer to the (waste)source or consumer of energy and water.

My personal project aimed at giving these facilities extra (social) value for the community by combining the utilitarian function of the building with public and commercial functions for recreation, education, research and social gathering. I personally think such facilities can only be adopted by local communities when they create extra value for their residents and don’t harm or cause inconvenience for their surroundings (from Nimby “not in my backyard” to Yimby “yes in my backyard”). I think my project shows that there are good possibilities to combine those utilitarian functions with public functions, whereby such a facility can become a valuable place for the neighbourhood, almost functioning as a community centre, while also treating waste and wastewater and generating energy.

One of the other outcomes of my research is that it seems possible to place such an facility close to residential neighbourhoods without causing problems with noise, odour or pollution. Especially odour problems are dealt with by applying a separate air (bio-)filter system and to make sure all trucks deliver their waste indoors in a closed off environment. The water-treatment system with botanical plants also claims to be odour-free. Noise problems are prevented by the fact that the use of garbage trucks is limited by implementing a system where organic kitchen-waste combined with toilet-water are transported via a vacuum-tube system within the newly developed part of Pilsen, meaning that only the waste collection of the existing neighbourhood requires the use of garbage trucks, that will drive only at limited times during the day. One aspect I am not sure of is the noise coming from the installation in the building itself and what their impact would be on the surroundings.
One of the difference with a conventional waste or water-treatment facility is its scale and service area, where conventional systems often serve an entire city; my system works on a neighbourhood scale, treating waste(water) locally.

Decentralization of these facilities has some advantages over large-scale remote utility systems; they require less transport, less investments and maintenance in infrastructure and provide the opportunity for energy and cost-efficient re-use of water, power and heat because of short-distribution lines. Furthermore they can provide local jobs and revenue for the community by creating a largely self-sufficient energy and water network, being less reliable on utility companies.

These utility systems however mostly work with “the economy of scale” which means they get more profitable on a larger scale. In the case of decentralization these facilities are integrated within the city and therefore need to be deployed on a smaller scale, meaning they become less profitable compared to large-scale utility systems. So why then make smaller-sized decentralized facilities? Even among experts theirs is still a debate on which direction to go, centralized large-scale systems or decentralized stems; what scale is more sustainable or more cost-efficient? In October last year I was at a symposium on decentralized water and energy solution in Amsterdam at the local drinking water company “Waternet”, where many of these question were raised.

Personally I think this depends on the situation, especially in newly developed neighbourhoods, where you have the chance to completely lay-out a new set of infrastructure, decentralized systems can be of great value, like in the case of my personal project. Even when some of these systems work more cost-efficient on a larger scale I think the extra value of such a facility placed within the neighbourhood combined with opportunities to re-use heat, energy and water more effectively could compensate for the extra costs, not even spoken about the extra value these facilities can bring to the local community when public functions are attached to it, providing place for social gathering, recreation, education, research, economic activity and both creating awareness among residents. Concluding from this you could state that these combined advantages would be able to compensate for the extra costs of operating such a facility on a smaller scale within neighbourhoods, at least in some cases, especially in new development.
The relationship between research and design.
During the first research phase I was part of the group that studied the work and living relationship within Chicago and in general American society. Although interesting to study, very little eventually came back in the urban strategy and my personal project. The fieldtrip to Chicago combined with the “industry” booklet and the atlas, gave most inspiration and useful information for the eventual design.

Especially the excursion to Chicago, being there myself and seeing the immense scale of the industrial corridors and infrastructure inspired me for later design decisions. An interview we had at a local architectural firm (Urban lab) also contributed to the design ambitions of improving the environment in Chicago and also open my eyes for the possibility to transform the industrial corridor into a multi-functional area, since they also made some inspiring plans on these topics.

Together with my proposal for a waste-to-energy plant came the need to get a better understanding of the basic principles behind waste and water-treatment. The final program and function-mix which evolved during the design process was largely determined from the research. Some functions were added along the way, such as the community gardens, swimming pool and algae-reactors.

In the first phase of the project I had to do many research in the processes that are involved in water-treatment and waste-treatment. It turned out that there are many different ways of waste and water-treatment on many different scale-levels and with a wide range of possibilities to choose from in term of treatment-methods and installations. I studied a lot of the literature and articles to understand the basic principles of water and waste-treatment and to find out what the state-of-the-art was in the industry. Because designing an installation scheme and flowcharts with fully accurate installation dimensions was far too complex for me as an architecture student I used mostly reference projects to determine the size of these installations. With some advice from (company)experts I further checked the feasibility of my findings. Many design decisions
eventually came from this research, sometimes the design process was even lacking behind because I needed more time to investigate issues like: the space requirement or safety requirements for the diverse systems.

What I learned from the research is that interviews work very well as a way to gain knowledge very quickly. For instance I visited a pilot-project on decentralized water-treatment and biogas generation in Sneek called “Waterschoon” and had an interview there with an expert, which provided me with a lot of information. Next to that I did a few more interviews by e-mail, skype and also in person. These few interviews gave me more knowledge than the research from all the case-studies combined. If I had reached out to these people right from the beginning I could have been finished sooner with the research part and could have had a more complete set of information to start the design with, where I know sometimes got stuck because I didn’t got the right information yet.

Figure 4: “Waterschoon project” in Sneek
The relationship between the methodical line of approach of the graduation lab and the method chosen by the student in this framework.

According to the philosophy of the complex project chair students must transcend different scale levels in order to embed there buildings designs in a larger urban strategy. The aim is to in the end propose a “strategic interventions” to transform the city, while taking in consideration the different interests from multiple public and private parties. This method is explicitly described by Kees Kaan in the studio’s introduction text.

“…The design becomes a communication tool where the designer takes a planner role, spokesperson or communicator, and eventually, an Architect… As a result, the approach of the Chair challenges the strict distinction between Architecture, Urbanism, Planning and their traditional, perhaps linear roles.” (Kees Kaan)

The graduation studio of complex projects therefore starts with a kind of journalistic research in the beginning to quickly acquire a broad basis of knowledge on the research topic and the location in order to use later as starting point for the urban strategy and your own proposal. This method seemed to be very useful when making the urban strategy. Although the research was sometimes very useful, I think the down-side is that in the end sometimes very little of the research was actually used in the later urban strategy or design. I therefore think the research topics were sometimes a bit too broad and could have been more focused on our urban strategy or personal project from the beginning. Although the research could have been more efficient in that way, in the end I think this kind of journalistic research was very useful to get a grounding in the research topic and the location in order get a broad understanding of the area, its history and to investigate problems and opportunities. It made the process of decision making a lot easier in some cases.

For my personal project you could say that I also had to take in many different roles in the design process, because of the distinct and somewhat innovative function of my building proposal I had to operate sometimes as a kind of scientist or (civil)engineer, investigating sometimes innovative solutions in waste and water-treatment, a field of expertise I am not educated in. I also continued the kind of journalistic research of the first semester to get an overview of the possibilities, trends and innovations in the water and waste treatment industry, which often gave inspiration for new functions to add in the building. Reflecting on the research method I think I spent too much time in investigating water and waste-treatment techniques and possibilities, I could have decided earlier on one certain system.