Reflection paper

E-Synergy: local collaboration in Agriport

Architectural Engineering

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The studio of Architectural Engineering, as I stated in my graduation plan at the beginning of the graduation process, is the field in between Building Technology and Architecture. Being an architect in the 21st century means more than designing beautiful buildings. In my opinion all designs should be seen as a burden to this planet and it's the task of the architect to reduce this burden as much as possible, or better: change it into a profit for the environment. With this point of view, which has grown during my studies here in Delft, it was obvious to enroll for the Architectural Engineering graduation studio.

Compared to the other students in the group, it was clearly visible that almost everyone was emphasizing on sustainability. The emphasis on the subject sustainability in my research and design was aimed especially on the natural approach of it. Although 'technical' usually doesn't let you think of a natural approach to solve problems, I think that the word 'technical' refers to the *method* of solving a problem in a sophisticated way. For example, the existence of this planet is all done by nature, and you can't tell me that nature isn't the most sophisticated thing available for us to use. So why shouldn't we do that a little more often?
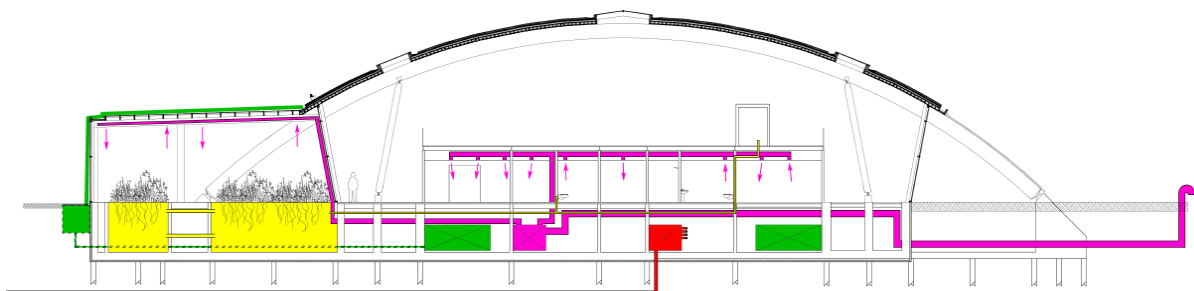
This way of thinking suits really well in the Architectural Engineering studio. Solving problems with architecture like an engineer. For current and future architects it is important to have a very open-minded approach to solve especially energy related problems.
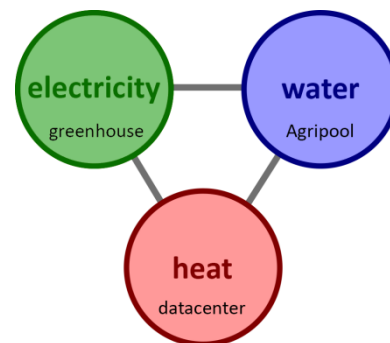
Methodical approach

At the start of the graduation process we were asked to come up with a technical fascination. Along with this technical aspect a context and program had to complement the design exercise. In the beginning, I had some struggles finding all three (context, program and technical subject) the subjects to make a clear design exercise. My method was a little bit different. It was based on a world-wide problem (the technical aspect) and a small scale solution as an answer to solve this problem (context). The problem in my case was the fact that the increasing amount of sustainable solutions, like windmills and PV panels, are causing problems for our current energy infrastructure. Near the place I grew up they've started to build a huge datacenter in a greenhouse environment (context). This place is called Agriport, where greenhouses, along with a business area, are aiming for local distribution and exchange of energy. This context example is a very interesting case for my technical fascination, but what about the program that was needed for the design exercise?

I took the gamble to start the research without taking any program in mind. In this way I was hoping the research itself would lead to a program that could be the missing puzzle piece in the sustainable energy exchange story of Agriport. The focus was solely on the problem (from small scale to world-wide future needs) and the context to see what the possibilities were in this context example, and if they could lead to a possible answer to the world-wide problem we're going to face.

This succeeded very well. Because of my analysis of the energy potentials in the context example it seemed that there were some differences between the available types and amounts of energy compared to what the media told us in the newspapers. With this information I had some options of what the program of the design could be. Combined with the enormous amount of waste heat available and the missing link in a resource exchanging Agriport (water), I decided to make a sustainable and natural swimming pool. This program was the best fit to not only use the waste energy from other functions nearby, but also provides a resource directly available for the other functions. The starting 'energy exchange' concept expanded to a 'resource exchange' concept. And on top of that, a new swimming pool could be very useful for the region.

Scheme of designed collaboration in Agriport

The downside of this approach, compared to the methodical line of approach of the studio is that it leads to a very specific solution, only suited for this location. To make a good concept, it usually sells better when it's more generic and applicable in multiple cases. But is this approach that leads to a specific solution instead of a more generic solution really a downside? Creating an energy

exchange infrastructure in a small cluster is different in every case. A generic solution could be working at one place, but fail in another. I think that for my research the specific solution is a better answer than a generic solution.

The downside of this approach for the *design stage* in the graduation process was the fact there was still no building or any sign of a design on paper. Because the program was introduced a couple of weeks, or months, later than the actual given time schedule by the studio, the design stage didn't really intertwine with the research stage. Possible design problems I encountered could've been solved more easily or earlier when these problems were encountered during the research.

Looking at my planning made in the first few weeks of the graduation process, it is indeed clearly visible that the amount of time put in the design stage is far more than expected. If decisions were made earlier about the program of the design, this time schedule would have looked less stressful in the design stage.

Research & design

The research stage of the graduation process was really an exploration of a problem yet unknown. The start of my graduation was really vague, because I wanted to solve too many problems. Narrowing down was my first priority and still the research is aimed at a world-wide problem we're going to face (the need for a change in our energy infrastructure caused by sustainable implementations).

After a while the research led to multiple solutions, following to the literature. Even Buckminster Fuller introduced a solution far before the sustainable implementations were making it a necessity.

In the end, the research led to a *program* specific for the *context* example and with a chosen *technique*: natural based. The conclusion of the research was that the sustainable implementations (which are causing the problem) tend to solve energy problems on a micro scale, instead of our conventional macro scale. This is a good in terms of self-sufficiency. The solution to the problem, on the other hand, lies in the in-between: the meso scale. This means clusters should make a balance in energy and resources (meso-scale), where buildings should try to be as self-sufficient as possible (micro-scale).

The design stage started with this interpretation of the meso scale: apart from the swimming pool function, the building will function as a missing puzzle piece in the resource exchange in Agriport. It provides clean water for other functions in exchange for huge amounts of heat. To show this collaboration in the cluster that is called Agriport, the typical architecture (greenhouses: *glass* and functional factory halls: *form*) of the other functions in Agriport is used as an ingredient for the design. The micro scale of the building (self-sufficiency) is mainly translated in the self-supporting roof structure. This brings a highly flexible building as a result. The material choice of the building (wood and the green roof) continues on the technique-subject of the research: a sophisticated, but natural way of solving problems.

The relationship between research and design is a continuous story from problem statement to the solution of the problem in a specific context example. The resource exchange is clearly visible in the design. While entering the building, you'll pass through a

greenhouse with natural water filtration. This shows the meaning of the building to the cluster, before you're entering the main function of the building itself. And even in the main function itself, the same way of filtering water is used to clean the swimming water.

The design shows its position in the collaboration in the cluster with its visible natural water treatment. What isn't visible is the ingoing energy: waste heat of the datacenter. It would've been more honest if this was visible as well. Now it looks like the building is only providing.

Project & wider social context

The graduation project has led to a solution for a specific context. For the wider social context this could be a project that raises awareness of the changes we have to undertake to prepare us for future energy problems.

A natural implementation in my design like chlorine-free swimming pool water treated by bacteria living on roots of plants is currently not allowed following to the Dutch laws. In my research I encountered many sustainable ideas that are prevented from happening due to several laws. This problem is the main issue for every sustainable innovator.

When it was known a datacenter was being built in Agriport, the media concluded that the waste heat of the datacenter would be recycled by the greenhouses. This was far from true, since the re-use of waste heat seems to make no impact on the sustainability score of a datacenter. Therefore, no investments will be done to make this recycling happen.

It might be a little bit utopian to state that collaboration in terms of energy and resources should have the upper hand instead of money. But with the stricter rules of being carbon neutral in the future, we'll have to change this way of thinking. It's very paradoxical that other laws are preventing us to make a kick start and be a leader in the world with sustainable solutions.

In this graduation project I was looking for a missing puzzle piece in the context example. But you could also see the context as our whole planet. Then this graduation project is in fact a puzzle piece to a more sustainable world. Although it's a very small one: the contribution to more awareness on a small scale is a good way to start.