Resilience in the Urban Ecosystem: A Plan to Climate-proof Houston

How do we connect nature and people in such a way that urban areas become climate resilient? For her TU Delft Master thesis Nadine van den Berg researched the case study of Houston, Texas, a city that is dominated by suburbs and highways, and where there is a constant threat of flooding. An alternative approach is possible with research by design and nature-inclusive urban planning: from repairing the damage afterwards to trying to prevent flooding in advance. This is also an interesting prospect for the Dutch delta.

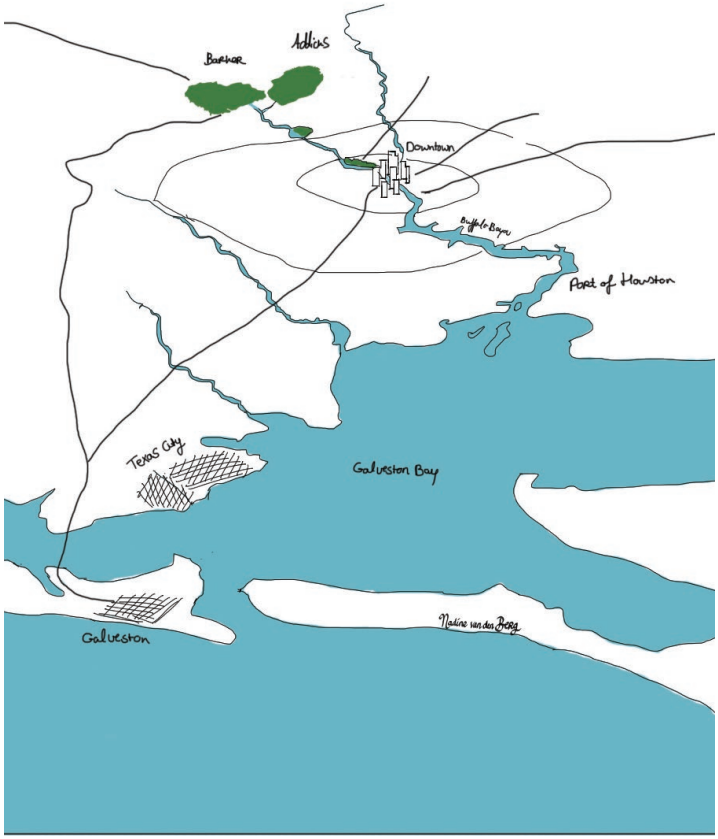

Fig. 1: Greater Houston. Nadine van den Berg (2021).

Houston is one of the largest and fastest growing cities in the US. The city is now dominated by major highways connecting the suburbs to the centers of employment. In its construction, hardly any account was taken of the natural systems underlying this region (Houston Parks Boards, 2018).

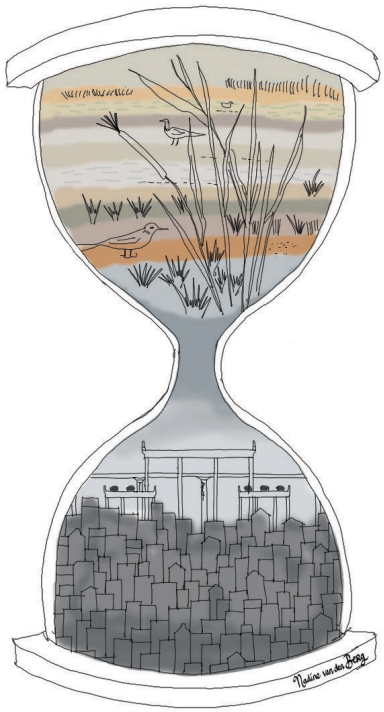

Fig. 2: Prairies vs urbanization. Nadine van den Berg (2021).

In 2022, less than 1 percent of these prairies still remain. The consequences are serious, because the original prairies had a good capacity for absorbing rainwater. In addition, the building policy in Houston has not responded to the natural subsoil of the area. There is no official zoning policy with zoning plans, which means that houses and businesses have been built, for instance, in the floodplains of the bayous: the rivers that carry Houston's natural water system. While Houston has no official zoning laws, many private properties do have legal agreements whose effects are similar to zoning laws.

Fig. 3: Prairie landscape. Nadine van den Berg (2021).

The canalization of bayous and the hardening of riverbanks nearly eliminated their biological diversity; only a few natural bayous remain, such as the Buffalo Bayou that connects Downtown Houston to the Houston Shipping Channel. Due to the large amount of paved surface, most rainwater flows directly into the bayous. A consequence of this unsustainable form of urbanization is a growing number of floods.

Fig. 4: Buffalo Bayou. Nadine van den Berg (2021).

There is now a growing awareness that Houston is extremely vulnerable to climate extremes such as peak precipitation and extreme hurricanes. The outdated drainage system further exacerbates this vulnerability. Until now, the city has dealt with this by simply repairing the damage. This approach has a lot to do with the history of Houston: a Texan oil city where freedom and material prosperity are of paramount importance, and a lot of people are skeptical about climate change and its possible consequences. Nature is often seen as an obstacle to modern developments and it is difficult to convince both residents and developers of the need to embrace climate resilient solutions.

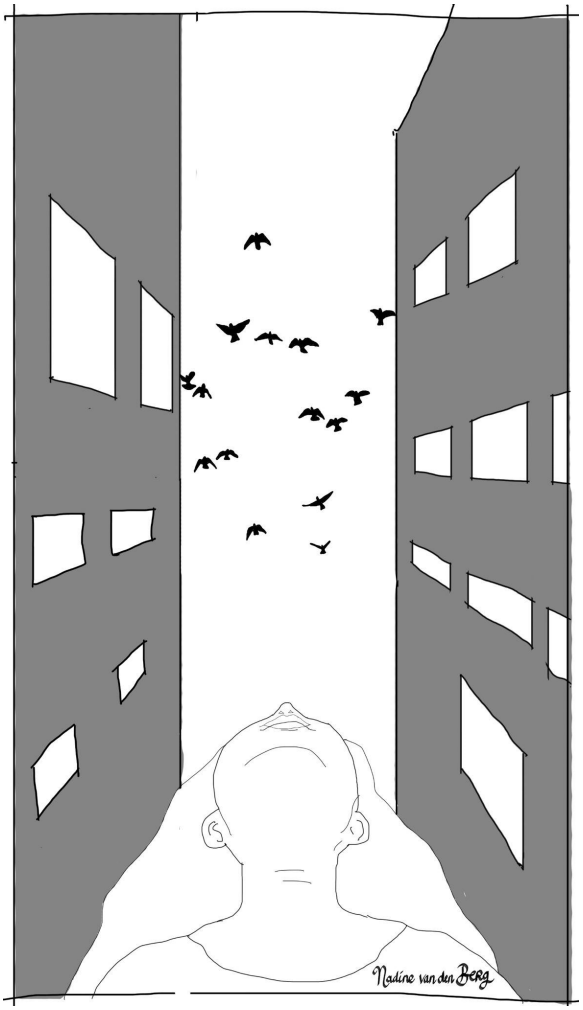

Fig. 5: Disconnected from Nature. Nadine van den Berg (2021).

The question is: how can this situation be improved? It is clear that Houston urgently needs an ecosystem-resilient approach. In other words: a strategy to make the built environment of Houston more climate and flood resistant. By integrating spatial strategies, site research and nature-inclusive urban design in the city through the method of *persuasive visual storytelling* the negative effects of flooding can be reduced.

By using visual storytelling as a part of design research, it becomes possible to project new futures. From a design perspective, the fundamental potentials and limitations of the design location are discovered, and the boundaries of reality are challenged to create out of the box ideas. From a planner perspective, the narrative systems of urban planning and design could be used as powerful tools of communication, persuasion, and education.

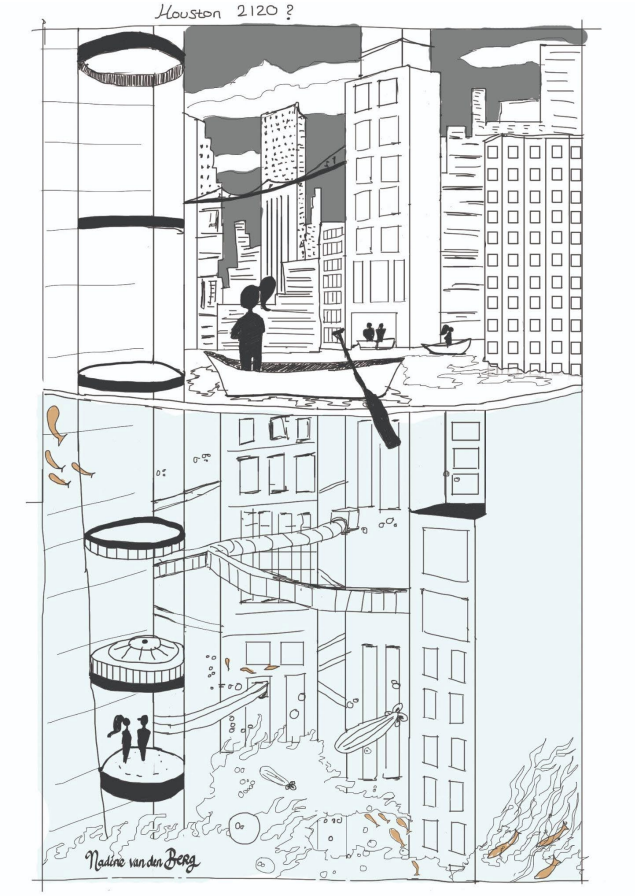

Fig. 6: Houston 2120? Nadine van den Berg (2021).

Visual storytelling has the ability to provide thoughtful content and beautiful visuals that will help in making content or messages an engaging piece that catches and holds the attention of the audience. The old saying ‘a picture is worth a thousand words’ is true: vision trumps all other senses. Being fluent in the language of images strengthens the ideas and plans, and in combination with storytelling will increase the engagement of different stakeholders, which are crucial in a successful planning process.

In my TU Delft Master thesis I propose an ecosystem resilient strategy. The bayous play a central role in this: they maintain water quality, buffer the flood risk, control erosion and support recreational activities.

My strategy is based on in-depth site research and on an overarching vision for the Buffalo Bayou corridor: 'From Islands to Archipelago'. The current unconnected parts of the urban river corridor will be reconnected. The Buffalo Bayou becomes the blue thread that connects everything, as the ecological, functional and scenic backbone of the city. By stitching the urban landscape together, the residents of Houston are brought closer to nature.

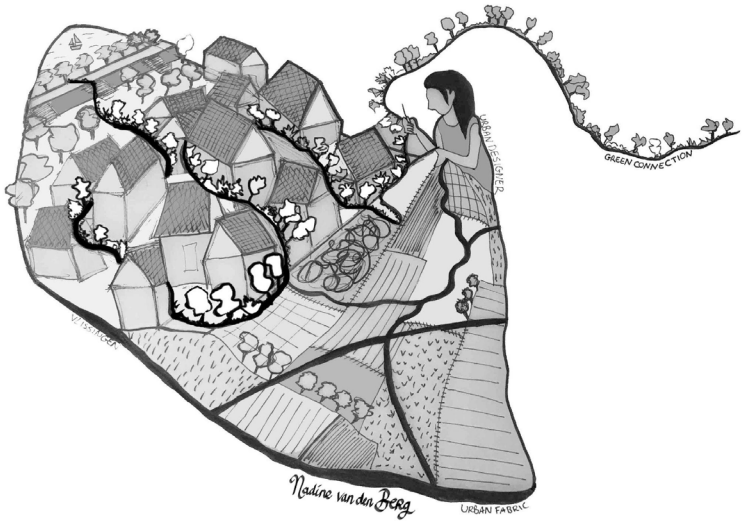

Fig. 7: Stitching together the urban landscape. Nadine van den Berg (2021).

In addition to accessible nature within walking distance, an educational nature center and park contributes to increasing awareness. The urban design that follows presents urban parks in a way that allows the visitor to follow their emergence and developments, as well as their ideological and technical aspects. This center encourages people to learn more about the native wildlife and different ecoregions of Houston and its environs. Prairies are part of Houston's history and therefore also have cultural value: Houstonians deserve to get to know their own landscape. A second important element in the vision is to create more space for the Buffalo Bayou in order to maintain natural river dynamics. Third, unused urban elements are 'recycled', such as parking lots, vacant lots and underused public space. Improving spatial quality and improving permeability go hand in hand.

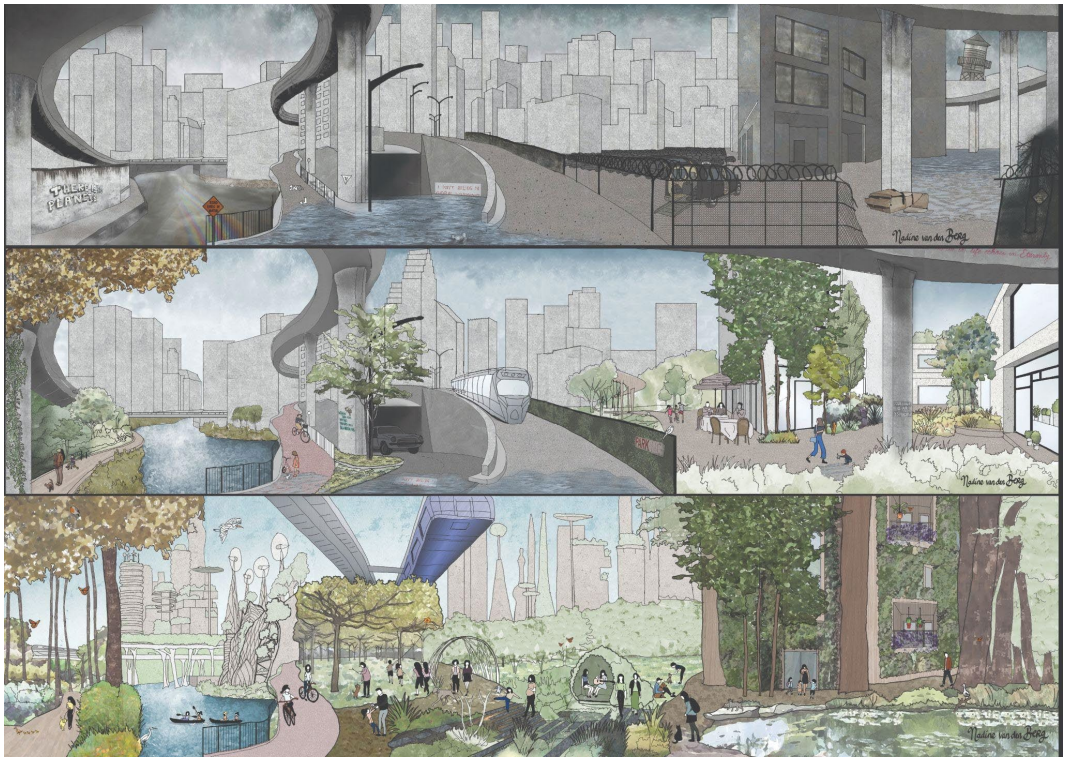

Fig. 8: Scenarios. Nadine van den Berg (2021).

I elaborated this vision in three scenarios, combined with powerful images that use creating visual storytelling techniques. They help to break through traditional normative thinking and promote communication about a city's pressing problems. The three scenarios I developed (dystopian, restorative and utopian) are not literal blueprints for a certain future, but mainly aim to broaden our way of thinking and to understand how the development of different factors interact. This way of research by design enables urban planners to discover the possibilities and limitations that are fundamental to the local situations. With this it becomes possible to envision how the boundaries of reality can be pushed, challenged and provoked, and convey this to other stakeholders.

The third part of my approach to Houston is to create a planning framework for sustainable urban development. To this end, I have developed planning guidelines for three levels of scale: stamp, block and plot. These guidelines state what is being achieved at each level, but they leave the parties involved free to determine the ways in which this is done – as long as the main objective is achieved. The guidelines are intended for the municipality to contribute and for developers to take into account. These guidelines are also translated into an urban design of an educational nature center. The development of a detailed urban design follows from a literature study on ecological urbanism, climate resilience, and nature based solutions, which is supplemented with an in-depth site analysis that focuses on spatial and technical aspects of the built environment in relation to heavy floods, spatial quality, and urbanized landscapes

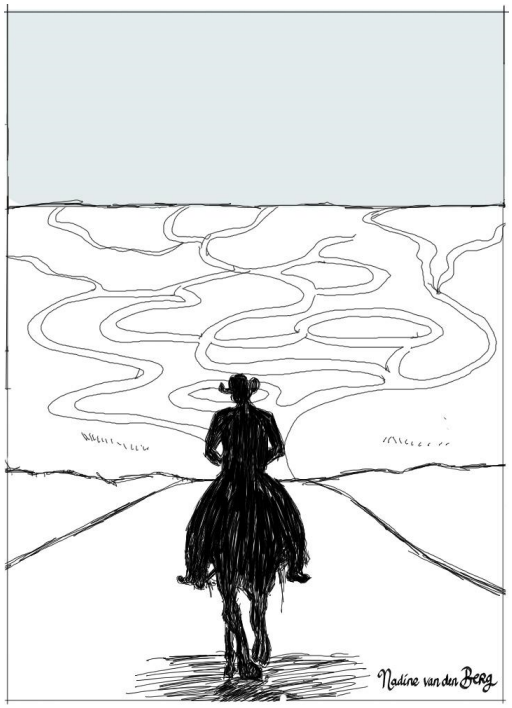

Fig. 9: What could be the way forward? Nadine van den Berg (2021).

Lessons for the Netherlands

While these planning and design suggestions are specific to the Houston context, it is the method that has great potential to create ecosystem-resilient cities elsewhere. In the Netherlands we have forgotten that we are always connected to nature and we could benefit from paying more attention to the added value of nature-inclusive construction. This is how we shape sustainable urban development. Before that happens, however, our mindset will have to change drastically. In large parts of the Western world, including the Netherlands, it is still believed that natural resources should be controlled by technical means. Technological advances over the past centuries have fueled this persistent anomaly. Rather than dominating nature, it is important to explore how our modern way of life can benefit from a stronger reconnection with nature. Visual stories, used as part of research by design, can make an important contribution to this. They are universal, easy to understand and convey the meaning and goals that allow us to find commonality with others. In this way we can project new futures in an effective way. After all, old ways will not open new doors.

Fig. 10: Planting Ideas. Nadine van den Berg (2021).

Sources:

van den Berg, N. (2021). Urban Waterbodies: Stimulating an ecosystem resilient city by integrating climate sensitivity in human-oriented urban design in Houston. http://resolver.tudelft.nl/uuid:e9d19ab3-df35-4e3b-882a-9c551a41801c

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