



Applying Education in a Complex World

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Applying Education in a Complex World: Teaching and Learning

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INTRODUCTION

Applying Education in a Complex World: Teaching and Learning

Complexity theory, complex systems, complex strategies and a complex world. The range of concepts, practices, scenarios and metaphors through which we consider intricate, interconnected and changing phenomena is vast. The impact of this world view on how we operate is equally large. The education sector, like all those that make up the tapestry of contemporary societies and economies is not – and cannot be – immune.

The argument that the world in which today's students will eventually work, will be different and more complicated than the one they currently know, has become a truism. It guides our thinking in multiple ways. In this scenario, education is becoming equally fluid. We not only prepare students to face the changes we see occurring today, but shifts and developments no one expects, or predicts. We are obliged to think outside disciplinary boundaries. We adapt constantly to changing methods of teaching. We address new and emerging professions. We negotiate the demands of learners, parents, industries and business.

While this scenario may be contested by some, it is also welcomed by others. These proceedings, and the conference from which they come, reflect on its implications from various disciplinary standpoints.

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TEACHING CLIMATE RESPONSIVE ARCHITECTURE AND URBANISM

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INTRODUCTION

Climate change is no longer a future scenario that is going to happen in forthcoming years: It has already happened. Climate change in the form of flooding affects millions of people and urban infrastructures across the world, especially in densely populated coastal, riverside, and low-lying areas. It is affecting the environment, economy, and social and political relations. And the worst affected are the urban poor and neglected communities. Countering climate change is imperative for flooding cities. In order to instigate positive change, cities have to be developed more coherently by including all inhabitants in a shared conversation where all stakeholders participate. We put forth that one-way to achieve this is through design teaching and practice with speculative means. It is practiced through course lectures, design workshops. This course showcases the speculative design; which takes a bottom-up and collective approach in University of Innsbruck, Institute of Experimental Architecture, Hochbau.

UN scientists delivered a stark warning about the impact of climate change on people and the planet, saying that ecosystem collapse, species extinction, deadly heat waves and floods are among the "dangerous and widespread disruptions" the world will face over the next two decades due to global warming.¹

METHODOLOGY

Course suggests that communities and institutions need to collectively reflect on flooding scenarios to counter climate change in the long run. *Collective Approach* follows a bottom-up approach to study, think, build, evaluate, and negotiate the communicative formats of *Speculative Design* teaching, course workshops and exhibitions; starting small and thinking long-term through building social cohesion– as illustrated in Figure 1.

Collective Approach

The work of the Thinking Hand NGO has largely been inspired by Mathur and da Cunha's imaginative speculative design practice, as a way forward in counteracting climate change and dealing with flooding cities. In six years, the organisation, which consists of NGO members and volunteers, and the author team, all of whom have experience in both architectural practice and architectural education, have developed a bottom-up approach which we call a collective speculative design approach. The name (Thinking Hand) is associated with the idea of thinking and building

simultaneously, and emphasizes a hands-on and careful approach to the built environment. It is an effort to create awareness about environmental issues through design and its processes by collaborating with local communities and organizations, and building in the scale 1:1. We claim that doing such collective speculative design workshops and exchanging experiences and launching competitions to encourage original thinking, while creating exhibitions to share ideas with a wider public, can advance a new way of thinking about, and building, cities as an innovative way of dealing with crises and challenges (Thinking Hand/ Ketham's Atelier 2015).²

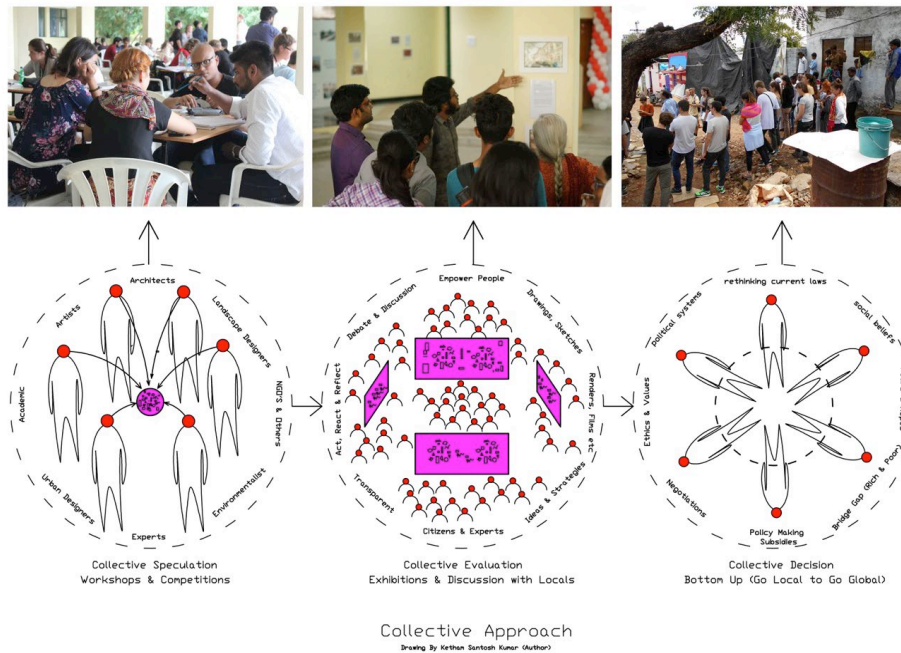


Figure 1. Collective Approach, Speculative Design: Drawing by Author (Santosh Kumar Ketham).

Our collective participatory format aims to bring actors from various sectors, disciplines, and communities together, including students, professionals, and experts, who are rarely able to meet to discuss the issues and problems neighborhoods and cities are facing. It addresses these through speculating, thinking, constructing, narrating, and ideating future possibilities and probable solutions which contemplate and adapt to the local culture, material, climate, context, community needs, and socio-economic realities, together.³

Speculative Design

Speculative design, a concept which is often attributed to the British designers, Fiona Raby and Anthony Dunne, encourages designers to think further ahead and widen the possibility of design by going beyond merely finding solutions to problems and asking different questions (Dunne/Raby 2013).⁴ In Dunne and Raby's terms, speculative design combines Design-thinking methods with storytelling and future-world-building techniques from speculative fiction to produce prototypes and experiences. These may take the form of a physical or digital product, video, documentary, book, manual, website, sculptures or other form of art. Their purpose is to generate discussion, debate, and awareness beyond projected or plausible futures so that designers, companies, and the public are not only aware of how their actions contribute to manifesting certain futures, but that they can also begin to imagine and articulate preferable futures (Lutz 2020).⁵ Futures are stories we create to analyze, plan and build consensus», according to design researcher Elliott P. Montgomery. His »narrative

futures cones» represent the subjective limits of our capacity to envision probable stories; they are often just one alternative to earlier representations that suggest a singular present, linear past, and infinitely expanding futures (Montgomery 2020).⁶ In speculative design thinking, however, ideas of possible futures can be used as tools to better understand the present and discuss the kind of futures we need to create for our survival.

“The best way to predict the future is to create it.”

— Abraham Lincoln.⁷

CLIMATE RESPONSIVE ARCHITECTURE FOR FLOODING CITIES COURSE

The course is a timely and important part of architecture, urbanism, landscape, environment, conservation and more. And it's high time to rethink our cities collectively in combating climate issues. This course was inspired by the ongoing doctoral thesis project of author (Santosh Kumar Ketham) and his design practice (studio, ‘Ketham’s Atelier Architects’ with the NGO ‘Thinking Hand’). Currently, he is teaching the course with the support of University of Innsbruck and Prof. Marjan Colletti, Institute of Experimental Architecture, Hochbau and Thinking Hand NGO. Students have an opportunity to learn, explore, study other urban cities, which are complex, messy, flooding crises and challenges cities are facing. It’s an opportunity to understand other cultures, climate, people, and places and also to build international relations between Europe and India.



Figure 2. Course lectures and collective discussions with master students at Institute of Experimental Architecture Hochbau, University of Innsbruck, Austria 2022-2023.

AIM AND OBJECTIVE

The importance of design as a profession and inculcates sensitivity towards nature and people thus making students understand the flooding crises, context, culture. Thereby allowing them to create speculative design strategies accordingly. The course is more informal in nature fostering discussion, entertaining the views of all the creative individuals coming out of their ingenuity and labour to solve the challenge. Emphasis would be on harnessing collaborative learning and positive innovations. The aim and objective of this course is to speculate how the needs of flooded cities are addressed using the method of speculative design. This technique involves students in brainstorming and generating scenarios, discussion, and reflection. It is practiced through course lectures, design workshops. This course showcases the speculative design; which takes a bottom-up and collective approach in the Institute of Experimental Architecture, Hochbau. (Exparch, Innsbruck University)⁸

As Frank Lloyd Wright once said, “The architect must be a prophet... a prophet in the true sense of the term... if he can’t see at least ten years ahead don’t call him an architect.”⁹

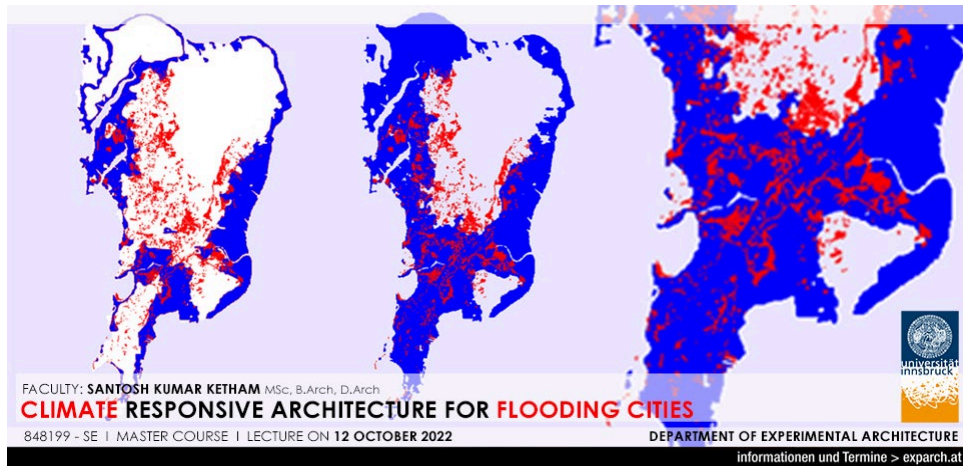


Figure 3. Poster, Master Course, Climate Responsive Architecture at Department of Experimental Architecture, Exparch, Innsbruck University.

COLLECTIVE STUDIES

As part of the course students had collectively studied various countries on climate change and flooding scenarios, problems, effects. Further the site Mumbai, India, which is author's PhD research and part of the research methodology on flooding city and speculative design. Students had opportunity to see and understand author's researcher work and experience in understanding of place, culture, climate, people and crisis.

Mumbai is one city from all the cities in India, which has enchanted everybody with its charm and liveliness. No matter your caste, creed, financial status or which part of India you come from, once you set foot in Mumbai, it accepts you with open arms. Mumbai is all about art, history, culture, food, theatre, cinema, nightlife and a lot more. This has raised the level of real estate sector in Mumbai and costs of properties are skyrocketing. Mumbai is the second-most populous city in India after Delhi and the eighth-most populous city in the world with a population of roughly 2 crore (20 million). A new analysis on the impact of sea level rise on coastal Indian cities has revealed that some critical properties and road networks in Mumbai, Kochi, Mangalore, Chennai, Vishakhapatnam, and Thiruvananthapuram will be submerged by 2050.¹⁰ RMSI's experts created a high-resolution Digital Terrain Model (topography) for the coastline of the identified cities. They then used a coastal flood model to map the cities' inundation levels based on various sea-level rise forecasts.¹¹ Mumbai City Urban plan is complex and irregular growth with lead to 55% of Mumbai's population lives in slums, and is routinely excluded from urban planning.

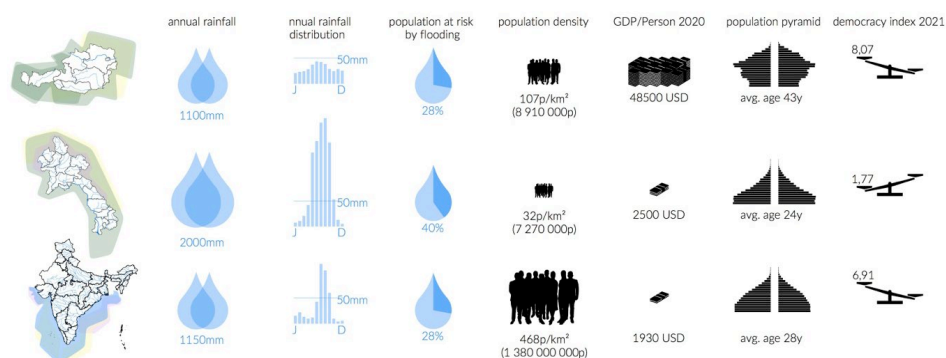


Figure 4. Showing analysis of three countries (Austria, Laos, India) its rainfall, population risk, flooding etc. Drawing by Institute of Experimental Architecture, Hochschule student Luis Navarro Preuss.

COLLECTIVE DISCUSSION AND TALK WITH EXPERTS

The Embassy of India, Vienna in partnership with the Institute of Experimental Architecture, University of Innsbruck, and Thinking Hand NGO hosted a Webinar on the topic ‘Climate Change, Flooding and Infrastructure Resilience’. Through this Webinar, the issue of climate change with focus on flooding in urban areas and the importance of infrastructure resilience is highlighted. The programme was held on 12 December 2022 from 0900 – 1100 hrs (CET) [1330 – 1530 hrs IST].

The aim and objective of Webinar is to raise awareness about the issue of flooding of cities due to climate change, ways to empower people and suggestive actions to combat the crisis. The talk had participation by experts and students from various disciplines from Austria and India. The Webinar will not only enhance knowledge and expertise of the participants but also explore avenues of future cooperation relations between India and Austria in the field.

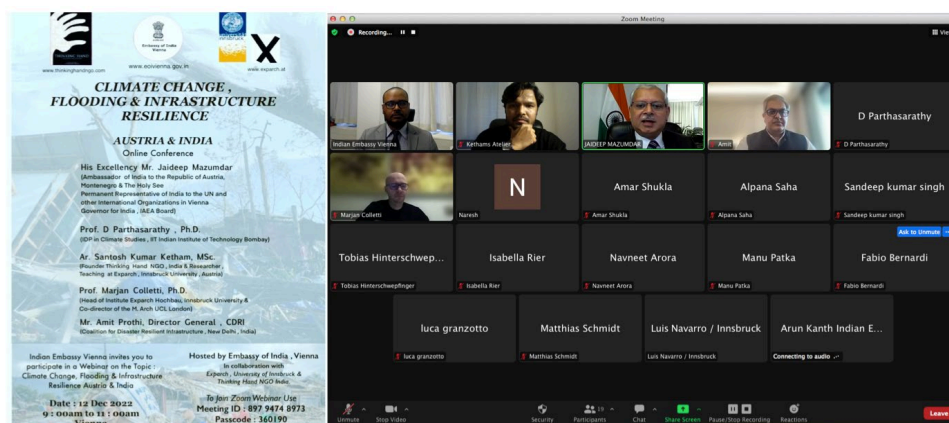


Figure 5. Climate Change, Flooding & Infrastructure Resilience Conference poster and screenshot showing experts collective discussion and talk. (Poster by Indian Embassy Vienna and Screenshot by Thinking Hand NGO)

The programme included remarks by the Ambassador and 20 minutes talk each by other panelists. The other panelists include i) Mr. Amit Prothi, Architect and Director General, Coalition for Disaster Resilient Infrastructure, CDRI; (ii) Univ.-Prof. Dipl.-Ing Marjan Colletti, Ph.D, Austria, Head of Institute Exparch Hochbau, Innsbruck University; (iii) Dr Parthasarathy, PhD. IDP in Climate Studies, IIT Indian Institute of Technology Bombay and (iv) (Author)Mr. Santosh Kumar Ketham, Architect and Educator, & Researcher at Institute of Experimental Architecture, Hochbau. The conference highlighted the challenges of urban planning and the architectural solutions for creating flood resilient infrastructure. Students and audience had an insight view of flooding problems along with example solutions, ideas to combat crises (Indian Embassy Vienna and Thinking Hand NGO).¹²

SPECULATIVE DESIGN BY STUDENTS

Research and Speculative designs for Mumbai by my master students from climate responsive architecture for flooding cities course at Exparch, Innsbruck University 2022-2023. Projects/ speculative design thinking varies from small Product, Architecture, and Landscape to Urban design.

Speculative design by student Mr. Matthias Schmidt Underground Structures

The Idea of the Speculative Design is to create a contemporary structure, which is able to store a lot of rainwater and guarantee a safe place in case of heavy flooding. As the Density of the city of Mumbai is extremely high, the structure is located in certain areas, where flooding is a major problem and

where it can rise in the high. In case of no rain or flooding, the structure should have the characteristic to disappear under the ground and does not take away area or space from the city. With the amount of water, the structure raises slightly as it is able to float. Under the ground a huge amount of rainwater can be stored and prevents flooding in the area. The aim is to locate on strategic important points for flooding a lot of these structures, to store and collect all the rainwater from the surrounding, keep the city safe from flooding and guarantee people a safe place in case of flooding.

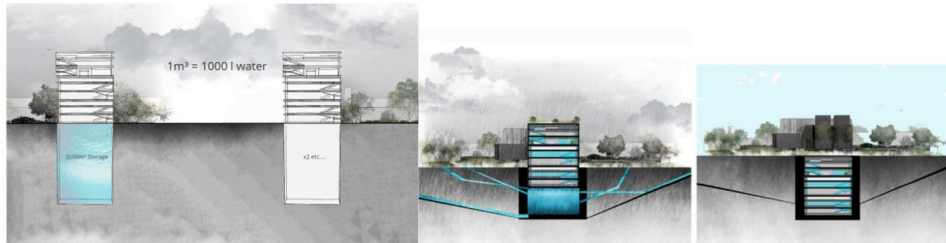


Figure 6. Underground structure for collecting, absorbing rainwater to prevent flooding in city and similar structures can be implement around city. Drawing by Matthias Schmidt.

Speculative design by student Ms. Maja Link Dharavi Clean & Green Towers

A landscape over an already existing structure. This image inspired me to add another layer over the Dharavi slum. Furthermore, I took the idea of the water tank network, and then added more helpful elements to the supply towers. The Cyclone Shelters were planned to accommodate about 1,500 people and numbers of valuable livestock during cyclones occurring within a 1.5-kilometer radius. For regular activities each center was planned to serve as a health clinic with a medicine dispensing area; as a seed/grain store; as a focus for education, training and community information; and as a communication center and office. The requirements included water and sanitation facilities within the main structure. Both the upper floors have toilets. In evolving the design brief special consideration was given to the use of the shelter in normal times; to disaster preparedness; to capacity; to livestock protection; and to maintenance and construction details.

The design is the result of a synthesis of a number of factors: the program requirements; the adoption of a logical structural system; the construction budget and the architect's understanding of the interaction among space, form and milieu. The heights of the different floors were dictated either by external forces or by practical considerations regarding their planned use. Although function and context were decisive factors in the design of floor heights, ramp, structural elements and finishes, these elements have been brought together and presented as a cohesive architectural expression within a rural environment.

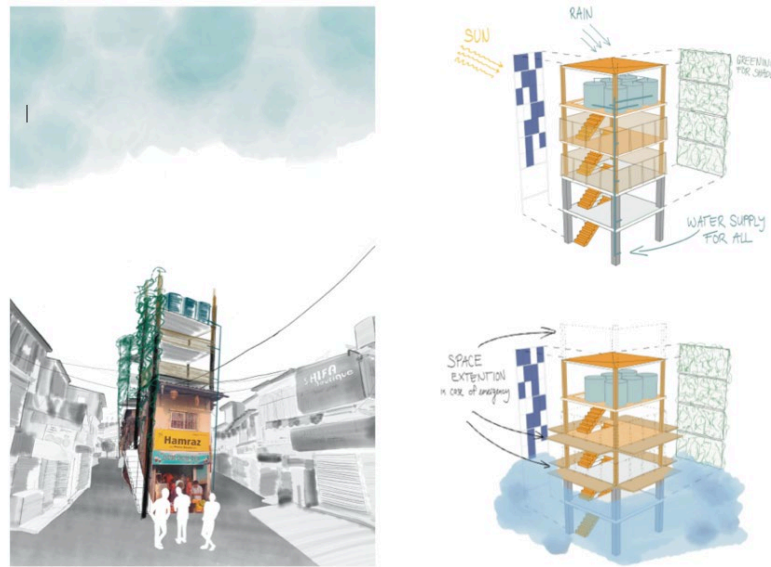


Figure 7. The Cyclone Shelters were planned to accommodate about 1,500 people within a 1.5-kilometer radius. Drawing by Maja Link.

Speculative design by student Mr. Luis Navarro Preuss Dharavi Lift

In the project DHARAVI LIFT the qualities of the reference project Quinta Monroy in Chile were integrated with the qualities of traditional architecture in Laos to design a solution against the flood endangered slum structure in Mumbai. Considering the usual apartment sizes in the slum, an axial grid was designed which allows a very large variation in apartment sizes around the 60 square meters of usual floor space. The axial dimension of three meters in floor plan is quite narrow by European standards. The reason for this, however, is that the smaller spans make it easier to carry out the finishing work oneself. In addition, many materials can be reused, which also has a sustainability value. The lighter weight compared to concrete and the ease of processing by the residents speaks in favor of it. The local building culture, however, tends to build with concrete, so the concept may have to be modified in this respect.

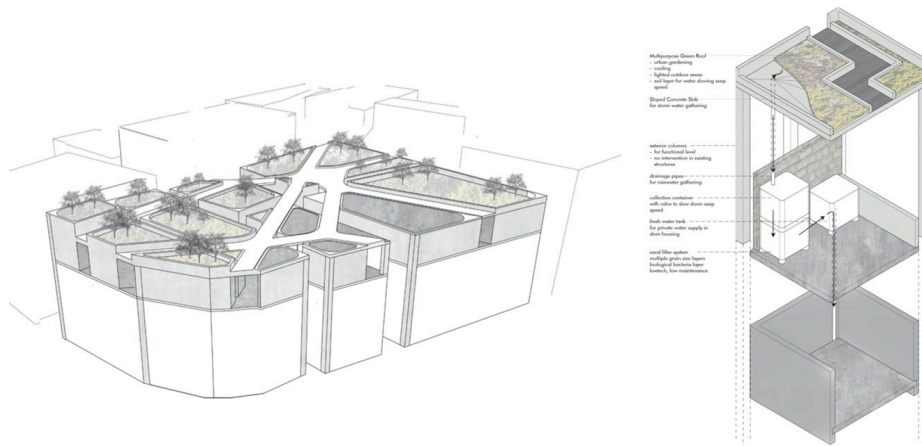
The doubling of walls between houses should be avoided; the neighbor may use the outer wall of the neighbor's house. Steel cables stretched diagonally will brace the structure. Concrete foundations protruding from the ground ensure that the wood does not rot. In order to protect the established structures in the slum, a master plan is deliberately not designed. Neighborhoods will organize themselves and exciting typologies will develop. In principle, these typologies do not differ from the ones we are familiar with, but in a slum the density will require many specific solutions and transitions and intermediate forms between these typologies.



*Figure 8. Dharavi lift, minimal buildup with grid construction.
Drawing by Mr. Luis Navarro Preuss.*

Speculative design by student Mr. Tobias Hinterschwepfinger The Sponge Roof

The Sponge Roof tries to guarantee the usability and storage of rainwater to decelerate water income on the ground and the therefore arising problem of destruction, sickness and usability of the Dharavi slum. The project develops a city scale design to ensure the connection and enhance the living quality of neighborhoods in India. Due to high floor sealing percentage, possibilities of drainage in the slum area are low. The sponge roof is trying to face that problem by slowing down incoming water volume and giving time to the floor and inhabitants to deal with it. Rainwater within monsoon season is enough to supply private household.



*Figure 9. The sponge roof and block, connecting community with green roofs.
Drawing by Tobias Hinterschwepfinger.*

Therefore the Sponge Roof implements another layer on households. Multipurpose Green Areas on the top layer create possibilities of urban gardening cooling as well as much needed lighted outdoor areas. A second soil layer also creates the first barrier for water to come in. The second slowing step happens with in the collection containers, where a valve regulates water speed in order to ensure the biological filter is still working. The last container stores the incoming water and makes it usable for private households. The Sponge Block connects multiple households within a neighborhood by adding a rooftop layer and connecting them on the same heights. Therefore, a large recreational area is created, which can be multiuser in emergency situations. It is a space to meet, relax, grow food, be fueled with sunlight.

Speculative design by student Ms. Claudia Handler Wetland Architecture

For the second approach, a new area has been chosen. It is located at the coast of Mahim Bay. This concept introduces an approach of generating a universal and modular wetland architecture that can be applied in slum areas. The chosen site is a possible example. The idea is based on generating different housing typologies, using squares in various sizes ranging from 3 to 24m, which are distributed on a grid, based on variable parameters such as existing road networks. The pattern though, is not entirely controlled; it still holds a certain amount of randomness. By including more and more parameters in combination with randomness, a complex pattern evolves, that mimics the complexity of a slum structure. Looking at the pattern on site reveals some interesting moments. The built structure adapts to its ground conditions, closer to the sea it can even be fully floating. This designed transition from sea, river and land mass acts as a relief for flood scenarios and further should support a co-existing with future environmental changes, caused by global warming.



Figure 10. Above image shows rethinking wetland areas and below image shows wetland architecture. Drawing by Claudia Handler.

CONCLUSION

I argue it's high time to think on flooding crises and which needs to start in our schools and universities. One way is speculative design method i.e. collective approach to reform cities with What-if scenarios for probable, plausible and possible for present and future flooding cities. This can act as a catalyst and also collectively redefine our relationship to reality. Courses, workshops and seminars on this topic can bring creative and non-conformist ideas to the table, and provide an opportunity to test the possibilities and limits of what architecture can do for society. I believe that such courses and studios in universities can play a crucial and important role in redefining our cities and involving various actors and experts in making speculative designs based on place, context, culture, people, climate and problems. Further show these designs to local people inform of exhibitions for discussions, negotiations with local government in reforming cities and communities. Additionally, taking feedback from community exhibitions, especially what community locals want, interests them or key important areas which further need to be reworked on. I argue that speculative design can bring transparency to issues and act as catalysts in negotiations. Furthermore, the studio courses, seminars and workshops can bring a sense of responsibility to students, various communities and building professions. They are an attempt to make

sense of deeply interconnected and interdependent problems through developing probable and possible scenarios; both theoretical and practical that envision change. I argue that the collective approach is time consuming, messy and challenging but on the positive side it can create an impact on rethinking current laws, political systems, social beliefs, ethics, values, fears and hopes. I believe if every university and school can start a studio subject, course, seminar or even workshops on this timely important topic can make a lot of difference and it's a great way to change, reform and recreate our cities with thinking hands.

ACKNOWLEDGEMENT

The course Climate Responsive Architecture for Flooding cities was only possible by wonderful work of my master students: Fabio Bernardi, Luca Granzotto, Claudia Handler, Tobias Hinterschwepfinger, Maja Link, Manuela Patka, Luis Navarro Preuß, Isabelle Rier, Matthias Schmidt. And special thanks to prof. Marjan Colletti (Head of the Institute of Experimental Architecture, Hochbau, University of Innsbruck) for making this course happen. Additional thanks to the Indian embassy Vienna for hosting a conference on Climate Change, Flooding and Infrastructure Resilience in collaboration with Exparch UIBK, Thinking Hand NGO, India for knowledge and awareness. And our special guest Alberto Fernandez from Bartlett School of Architecture UCL, London for discussion and Architect Markus Malin for final review. Special thanks to Thinking Hand NGO and Ketham's Atelier Architects support for book printing.

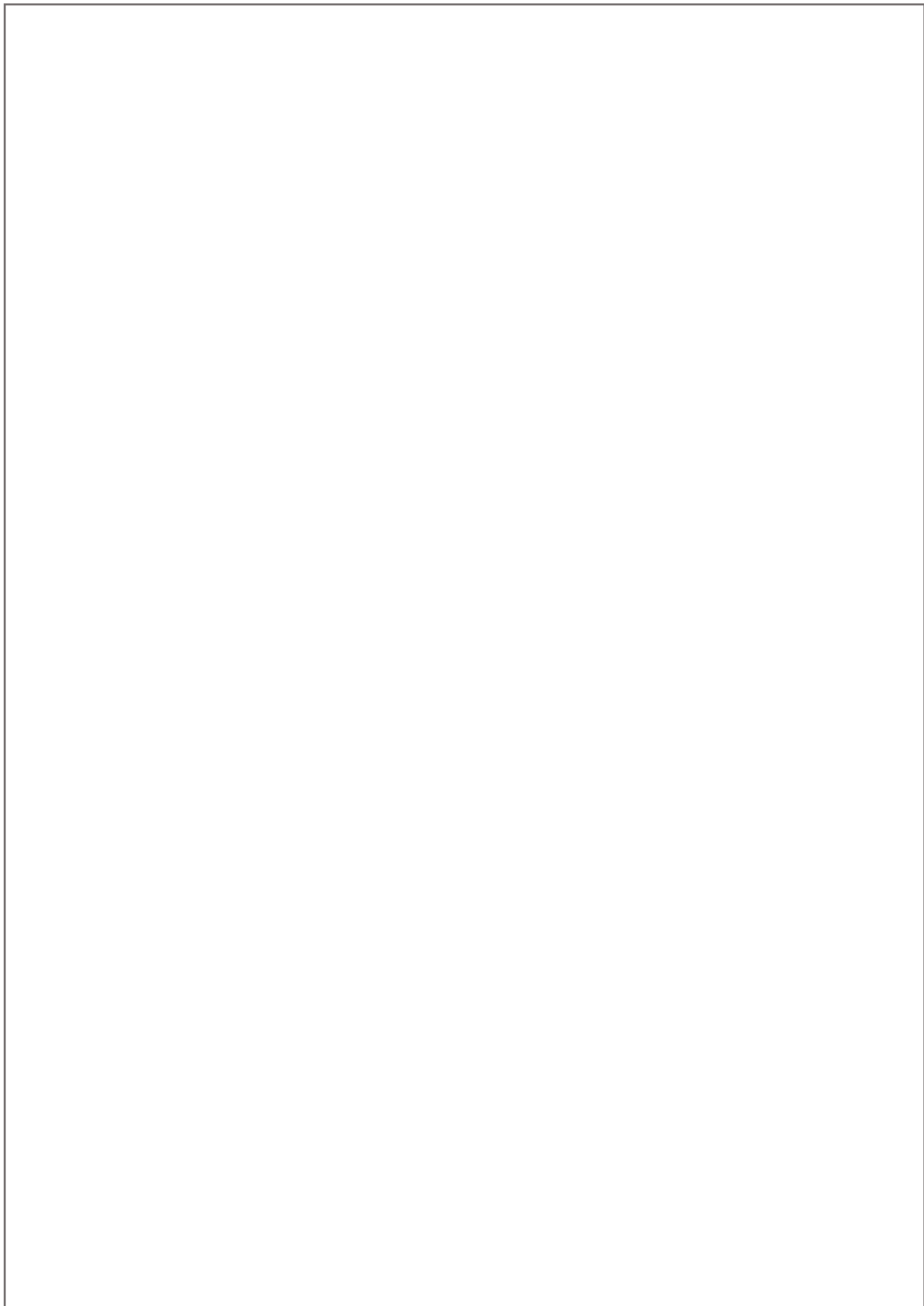
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