

**DESIGNING
RESILIENCE
GLOBAL
INTERNATIONAL RESEARCH NETWORK**

International Symposium
and Competition

June 20th to 24th 2022

Documentation

DESIGNING RESILIENCE GLOBAL INTERNATIONAL RESEARCH NETWORK

International Symposium and Competition



TECHNISCHE
UNIVERSITÄT
DARMSTADT

Technical University Darmstadt
Department of Architecture
Unit of Design and Urban Development



emergenCITY

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DESIGNING RESILIENCE

INTERNATIONAL RESEARCH NETWORK
VIRTUAL 20TH-24TH JUNE

A THINK TANK TOWARDS THE RESILIENCY OF CITIES
IN VIEW OF THE EFFECTS OF CLIMATE CHANGE

'DESIGNING REGENERATIVE TERRITORIES'

URBAN RESILIENCE RESPONSES
IN THE ERA OF URBANIZATION AND CLIMATE CHANGE



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FLEMMING RAFN

THIRD NATURE
Founding Partner Third Nature

DESIGN COMPETITION: 'THE SEA CITY INTERFACE'

REGENERATIVE URBAN DESIGN FOR SINGAPORE
A CARBON-NEGATIVE CITY IN ASIA-PACIFIC

REGISTRATION AND MORE INFORMATION AT

WWW.DESIGNINGRESILIENCE.COM

The international competition and symposium “Designing Resilience in Asian Cities (DRIA)” was launched in 2014 by the National University of Singapore to encourage an informed discussion of innovative ideas with the aim of strengthening resilience and sustainability in the Asia-Pacific region. This initiative, which connects international universities, seeks critical engagement with the challenges of climate change and urbanization. Over a period of seven years, forward-looking architectural and urban planning concepts as well as innovative technologies have been developed for different tasks to strengthen the resilience of urban communities. The participating universities take turns in evaluating the annual competition results, which are presented during an international symposium. After five years at NUS Singapore, the organization has been handed over in an annual rotation to the National Cheng Kung University in Tainan, followed by KMUTT Bangkok, which arranged the event digitally for the first time due to the pandemic situation. The latest international competition and the present symposium Designing Resilience Global 2022 was organised by TU Darmstadt in the frame of the emergenCITY week 2022.

PREFACE

Annette Rudolph-Cleff



Joachim Schulze



In retrospect, the collective change and collaboration provided a wealth of learning opportunities and experiences, attracting both academics and practitioners specialising in resilience through forward-looking planning concepts in a community-based approach. The exploratory design approach is proving to be effective in combining technical knowledge with cultural and social objectives. As a result, the Designing Resilience competition demonstrated that the forward-looking images of our students' design projects are tangible to local communities. What is more, all these insights have not only been relevant to our internal discussions, but have also provided valuable input to many other stakeholders, such as politicians, NGOs and local communities.

Over the three days of the symposium, we received particularly valuable input from renowned keynote speakers in the form of insights into their work or general reflections on the topic. Landscape architects Kongjian Yu, Herbert Dreiseitl and Fleming Rafn provided exciting input on international projects that combine design challenges in climate change and mitigation, flood management and water resource management with added value for local communities. We also had the opportunity to explore the possibilities of serious games in DRM with Kevin Flemming, and to hear from Juliane von Hagen about the challenges faced one year after the disastrous floods in the Ahr valley in Germany. The following is a brief reflection on the valuable insights gained from the presentations made during the symposium week.

SCHEDULE SYMPOSIUM

Monday, June 20th

9 am - 9:20 am | **Welcoming Speeches**

Matthias Hollick

Professor at Technical University of Darmstadt
Coordinator LOEWE center emergenCITY
Head of SEEMOO (Secure Mobile Networking Lab)

Jens Schneider

Vice President Technical University of Darmstadt

Annette Rudolph-Cleff

Professor at Technical University of Darmstadt
Faculty of Architecture
Head of Design and Urban Development

9:20 am - 10:50 am | **Opening Session: "Designing Urban Resilience"**

Key note: **Oscar Carracedo**

Designing Resilience Global (DRG) Director

Interview: **Pratyush Shankar**

Dean of SEDA Navrachna University, Vadodara, India

11:00 am - 12:30 noon | **Session: "Designing Infrastructures as Landscapes"**

Keynote: **Kongjian Yu**

President Turenscape
Founding Dean and Changjiang Chair Professor
Peking University College of Architecture and Landscape Architecture

Interview: **Antje Stokman**

Professor of Architecture and Landscape
HafenCity Universität Hamburg

3:00 pm - 4:30 pm | **Session: „Digital Resilience“**

Keynote: **Kevin Fleming**

Researcher & Project Manager
GFZ Helmholtz Centre Potsdam

Interview: **Matthias Hollick**

Professor at Technical University of Darmstadt
Coordinator LOEWE center emergenCITY
Head of SEEMOO (Secure Mobile Networking Lab)

Tuesday, June 21st

9:00 am - 10:30 am | **Sessions: „Capacity Building in Ahrtal “**

Keynote: **Juliane von Hagen**

Urban Planning and Development Researcher

Dr.-Ing., MSUP (USA), stadtforschen.de

Interview: **Carmen Mendoza Arroyo**

Vice dean of the School of Architecture

Director Master in International Cooperation Sustainable Emergency Architecture

Universitat Internacional de Catalunya, Barcelona

10:45 am - 12:15 noon | **Sessions: “Climate-resilient and livable Cities”**

Keynote: **Herbert Dreiseitl**

Landscape Architect & Urban Designer

DREISEITLconsulting

Havard GSD Loeb Fellow, Fellow of the Center of Liveable Cities in Singapore

Founder Atelier Dreiseitl in 1980 (today Ramboll Studio Dreiseitl)

Think-Tank “Liveable Cities Lab” at Ramboll Group International, Boston

Interview: **John Fien**

Innovation Professor of Sustainability at RMIT University in Australia

Professor of Practice in the Master of Disaster, Design and Development degree in

the School of Architecture and Urban Design at RMIT University, Australia

Consultant to UNESCO Headquarters and UNESCO-UNEVOC

on Education for Sustainable Development

Wednesday, June 22nd

6:00 pm - 7:30 pm | **Sessions: „Nature Strikes Back.**

Strategies towards the Climate responsive City“

Wednesday Evening Lectures series at the Faculty of Architecture,

Technical University of Darmstadt

Keynote: **Flemming Rafn Thomsen**

Founding Partner, Third Nature, Copenhagen

Interview: **Björn Hekmati**

Head of “Zentrum Baukultur”, Mainz

SCHEDULE COMPETITION

Thursday, June 23rd

10:00-12:00 and 14:00-14:20 | **Student Presentations**

10:00-10:20 Kyushu University (Kyudai), Japan

10:20-10:40 South China University of Technology (SCUT)

10:40-11:00 National Cheng Kung University (NCKU), Taiwan

11:00-11:20 King Mongkut's University of Technology (KMUTT), Thailand

11:20-11:40 Institut Teknologi Bandung (ITB), Indonesia

11:40-12:00 Bangladesh University of Engineering and Technology (BUET)

12:00-14:00 Break

14:00-14:20 Université de Montréal (UDM), Canada

Thursday, June 23rd

Jury Panel

From 17:00 - open end

Friday, June 24th: **Award Ceremony**

14:00-15:00



SYMPOSIUM

June 20th 2022, 9:20-10:50 hrs

**Oscar Carracedo
Barcelona, Spain**

Vita

Oscar Carracedo is an Architect, Urbanist and Educator. He is the director of the DRG-Designing Resilience Global International Research Program, and director of the InnerHoods Lab, where he researches on resilience, sustainability, integrated urban planning and informal urbanism. Oscar is also co-founder and director of CSArchitects, an urban planning, urban design and architecture firm based in Barcelona, Spain.

Designing regenerative resilience Beyond Sustainability

Two names need to be mentioned when talking about resilient city design: Ildefons Cerdà and Josep Lluís Sert. Both from Catalonia, Cerdà is referred to as the father of urbanistics and urbanization and is best known for designing the Eixample in Barcelona. With a population of app. 270,000 this is still one of the most densely populated city districts in Europe. Josep Lluís Sert was the dean of Harvard University and founded the discipline of urban design. In 1956 he stated that “urban design is the most creative phase of city planning, in which imagination and artistic capacities play the important part”. 66 years later this proves to be true more than ever.

Currently, 55% of the world's population lives in cities and projections by the United Nations estimate this proportion to reach approximately 70% by 2050. In addition, two people are added to the global urban population every second and 1,5 million will become urban every week.

Thus, we will be living in an urban world made of cities calling for the commitment and responsibility of architects and city planners to take on this challenge. After all, 60% of the places that will be urbanized by 2030 haven't been built yet. On the other hand, cities are responsible for three-fourth of the world's CO2 emissions, so we cannot build and run cities the same way we have done in the past. Global warming is already taking place and related disasters such as sea-level rise, droughts, floods, extreme rainfall, wild fires and high temperatures pose a serious threat to the population. Cities in Asia are especially affected, as data on displacements due to conflict and climate disasters are highlighting. Of app. 40 million displacements in 2020, a total of app. 30 million go back to climate disasters. Most of these are located in East Asia, the Pacific and South Asia. Furthermore, 86,4% of catastrophes are related to water such as floods or storms. Sadly, the people affected by these events are the ones least responsible and most vulnerable, leading to a new category of refugees – namely climate refugees. However, climate change has no boundaries and does not distinguish between the rich and the poor. Awareness and the need to take immediate action are therefore already on the agenda of governments of many developed and developing countries. Put into numbers, achieving climate safety would mean reducing CO2 concentration in the atmosphere by 32,3 Gigatons of CO2 every year, which equals 7 billion vehicles. However, humanity at present is consuming a lot more resources than our planet can provide and still has a long way to go when it comes to achieving the necessary reduction of CO2 emissions. As an example, country overshoot days in 2022 reveal that Germany has already used up its share of resources on May 4th 2022.



many definitions of resilience, such as by The World Bank, UN-Habitat, The Rockefeller Foundation or the United Nations. Although slightly different, these definitions use the same key terms such as “adapt”, “withstand”, “recover”, “transform” or “shocks” and “stress” in their description of the essence of resilience. Furthermore, resilience is often understood as something related to post-disaster relief. However, the Designing Resilience Global program pursues a different strategy. Instead of focusing on response, relief or remediation measures, it aims to tackle the problem at its root by anticipation and prevention.



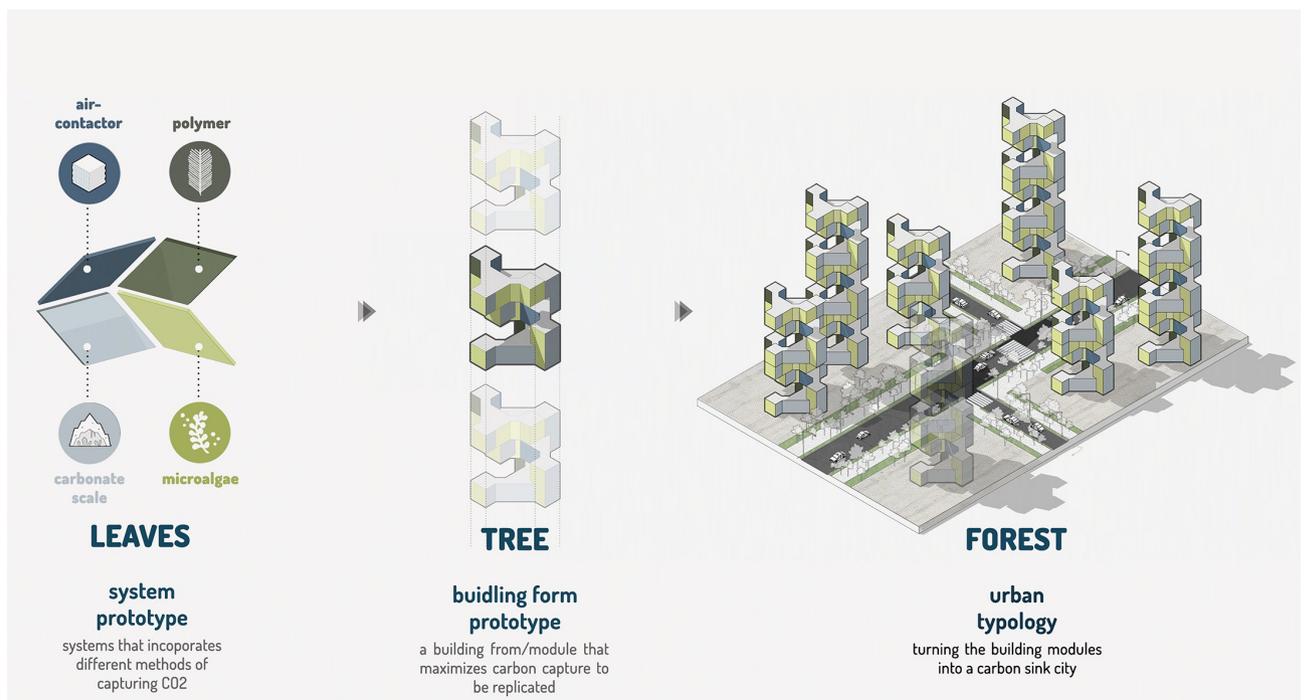
3 Hubs, 3 Regions

For almost ten years now the DRG network has been working on resilient city design and is organized in three hubs with 25 universities taking part. Through the years, the DRG network has derived eight key design principles of resilience: 1) reinstate nature, 2) decarbonize, 3) decentralize, 4) synergetic enclaves, 5) hybridized living, 6) virtual technology, 7) interdependent systems and 8) cohesive inclusivity. But what concrete measures are necessary when it comes to making cities more resilient to climate change? Essentially, these are about adaption and mitigation. Adaption makes changes to prepare for the effects of climate, reducing the vulnerability of communities and ecosystems. Mitigation prevents the causes of climate change by burning fossil fuels and working to reduce man-made effects on the climate system. Another important strategy involves the restoration of the environment rather than depleting it, thereby returning the qualities of the urban milieu. “Sustainability is not enough: we need regenerative cultures” is how Daniel C. Wahl describes this approach. Regenerative urbanism therefore involves the transition from sustainability to regenerative design, aiming to bring back the qualities of the natural and urban environments.

The project “Room for the river” is a good example how this can be implemented in an urban context. Situated in Bangkok

the project aims to increase social, green and ecological spaces alongside the river Chao Phraya. Rather than placing a wall to contain the river this nature-based solution gives space for the community as well as the river. The design strategy includes the identification of high-risk zones, the relocation of the affected population and the re-naturalization of the river Chao Phraya. Additionally, an application enables citizens to evaluate the best places to relocate. Amongst others, the project increases biodiversity, absorbs CO₂, reduces urban heat island effects and purifies the river water.

Another example is the project “Living on paragond” utilizing what is referred to as synergetic enclaves. The main idea of the design is to integrate small projects into an existing village structure on the island of Hainan that incorporate measures to foster resilience. These do not only act as shelters during flooding events but also provide social spaces for the community. The insertions adapt to the existing village structure and are constructed with local materials making them easy to build by the villagers.



The Synthetic Forest

Decarbonization is another key design principle that is addressed by a project titled “The Synthetic Forest - The regenerative City”. Different systems of carbon capturing shape the facades of lean multistorey buildings that are labelled as synthetic trees that by multiplication finally form a synthetic forest. Depending on their height, these buildings can capture up to 1,230 tons of CO₂ per year which is the equivalent of 50,000 trees. In the case of Singapore, 160,000 of these buildings would need to be constructed in order for the country to become carbon negative.

Catalan architect Josep Antoni Coderch stated in 1961 that “It is not geniuses what we need now”. When we look at the challenges we are confronted with today, the question is: what do we need? Regenerative resilience designers that actively contribute with plans, projects and solutions to regenerate the environment and recover urban ecosystems seems to be the appropriate answer. The DRG program has therefore contributed to this task by educating, encouraging and supporting students worldwide to work on regenerative design solutions that incorporate resilience strategies. This seems to be inevitable, considering that we have only one world that must be taken care of and preserved.



SYMPOSIUM

Monday, June 20th 2022

Kongjian Yu
Beijing, China

Vita

A recipient of a Doctor of Design at Harvard GSD, Yu is a Professor and founding dean of Peking University College of Architecture and Landscape, founder and design principle of Turenscape that practices globally. He is a strong advocator of “ecological security patterns” and “sponge cities” that have been adopted by the Chinese government for the nationwide ecological campaign. He was elected International Honorary Member of the American Academy of Arts and Sciences in 2016 and he also received the 2020 IFLA Sir Geoffrey Jellicoe Award — the highest honour given by the International Federation of Landscape Architects, and the 2021 Cobb Common Good Award.

Designing Infrastructures as Landscapes

Kongjian Yu initially provides a reflection on the challenges in China to climate change and urbanization. The annual flood damage costs 100 billion US\$ and at the same time, 400 of 662 cities have water shortages. 75% of the surface water and 64% of the underground water is polluted, and there is a serious habitat loss due to 50% of wetlands lost during the last 50 years. Conventional solutions would rely on grey infrastructure and increasingly more sophisticated engineered facilities, such as more damming, flood walls, channelizing or stronger sewage plants. Grey infrastructure was commonly a solution to some urgent problems, however, it destroys nature and its resilience. Therefore, grey infrastructure often accumulates a higher risk of disaster.

Designing Infrastructures as Landscapes offers an alternative. Nature-based ecological infrastructure is critical for securing

ecosystem services combined with technological solutions. Ecological infrastructure needs to be planned and build across all scales: from the national level to the regional scale up to the local infrastructure project. Water is the key to such ecological infrastructure. A city built on water-centred eco-infrastructure is called Sponge City. Its philosophy is (in opposition to conventional grey infrastructure) to retain water, to slow down water flow and adapt to water. Sponge Cities are inspired by the ancient wisdom of farming and water management that uses simple tools to transform the landscape in a sustainable way. It relies on simple concepts like terracing, islanding, diking and ponding.

For more than 20 years, Kongjian Yu and his team have been working on sustainable concepts in landscape architecture on more than 500-1000 national and international projects, mainly in areas suffering monsoon rains. The focus is mainly on flood adaptation, stormwater regulation, water cleansing/climate resilience and soil remediation. All projects are systematically designed to provide ecosystem services. In China, all urban rivers have been dammed and channelized with concrete walls. More than 20 billion US\$ is annually invested in flood control, but 100 billion US\$ is lost every year due to flood damage. Kongjian Yu points out that we finally need to deal with flood adaptation and flooding as a natural phenomenon and he explains the concept through his projects.

Yanweizhou Park, Jinhua City, Zhejiang, China gives an early example of an ecological redesign of riverbanks to adapt to monsoon floods. Former concrete walls turned into green terracing that slows down the river and provides flood plains. These ecological embankments can reduce peak flows by more than half. Only in the extreme case of the 100-year flood is the park completely flooded and can only be accessed via bridges. Normally it is a spacious park that enriches life in the city.



Yanweizhou Park, Jinhua City, Zhejiang, China

Yongning River, Taizhou City, Zhejiang, China, is a project that focuses on the natural filtration of water through the redesign of the riverbanks. The green plant occupies the same space as the former side walls of the canal. The result is a water-friendly riverbank and a people-friendly riverfront.



Yongning River, Taizhou City, Zhejiang, China

Sanya City, Hainan Island, China, is the scene of an impressive project to create a green sponge within the city through three types of traditional Chinese cultivation techniques: Terracing, Ponding and Islanding Building. Working at different scales to adapt to flooding, as a habitat in the trees above the water, and as an urban open space in a treetop walk, the ecological goals are linked to the provision of public space. The success is reflected in the tripling of the property value of the surrounding housing estates within three years of the park's completion.



Sanya City, Hainan Island, China

Fishtail Park, City of Nanchang, China shows the transformation of an abused landscape of 51 hectares into a floating forest that regulates stormwater, provides habitat for birds and wildlife, offers an array of recreational options and gives residents a new way to connect with nature. The design of the morphed landscape was made for two to five meters of water table fluctuation. The floating forest has a regulation capacity of 1. million cubic meters of water. Board walks and platforms of prefabricated concrete open the park for visitors of all ages who embrace the opportunity for a new kind of immersive natural experience.

Benjakitti Forestry, Bangkok, Thailand is a current project in the heart of the city. This brownfield development is about building a giant green sponge that combines flood adaptation, climate resilience and mitigation, biodiversity and urban open space on several vertical levels. The park will be accessible via walkways in the dry season and boardwalks in the monsoon season. The underlying concept to design constructed wetland, which can remove nutrients through biological processes nutrients, is also starting point for the following projects.

Huangpu River, Shanghai Houtan, China is designed as a living landscape on a former brownfield to treat polluted river water and to recover the degraded waterfront in an aesthetically pleasing way. The project was planned and built as a demonstration project for the EXPO 2010. The park's three hectares of constructed wetlands filter phosphorous and other nutrients from 2,400 cubic meters of water per day. The success of the project is proven in ten years of monitoring. In the city of Handan, a dump site has been transformed into a system of water purification terraces that reclaim roughly four million cubic meters of water from the local treatment plant. At the same time, the water-cleansing terraces help to restore the adjacent 50 acres wetland. The design intends to remediate the dumped materials on site and to create a nature-based water purification system. Several types of constructed wetlands are combined to form a new landscape in which the correlation between design variables and ecosystem performance can be observed and quantified, while simultaneously yielding a landscape for exploration and education. Primary data is collected to understand the natural water remediation

Sanya City, Hainan Island, China is the site of a project addressing the mitigation of storm risk by restoring mangroves. Concrete from the demolition of the former flood wall and an interlocking finger design was used to lead ocean tides into the waterways to create an ideal habitat for mangroves.

Meishe River, Haikou City, China shows emphatically, using the example of the polluted river in the heart of the city, that it is not just about the river, and about redesigning the riverbanks and improving water quality. It is about transforming the whole infrastructure. In this respect, it is important to think and develop the Sponge System across scales. From the city to the region, to the nation-state, to our planet, which we have destroyed with industrialisation. Kongjian Yu also looks at the 60 billion square metres of buildings that China has built in recent years. From his point of view, green architecture and the contribution of each individual to their environment can contribute to sustainable and resource-saving use of water and nature. "More than ever, we have to rethink the way we build our cities, the way we treat water, and even the way we define civilization"



Water Cleansing Terraces, 11 HA Handan City



SYMPOSIUM

June 20th 2022, 15:00-16:30 hrs
Kevin Fleming
Dublin, Ireland

Vita

Kevin Fleming completed a BSc Hons at the University of New England, Australia, and a MAppSc at the Western Australian School of Mines. After working as an exploration geophysicist, he undertook a MPhil at the University of Cambridge, and then worked as an environmental geophysicist in Sydney. After completing his doctoral studies at the Australian National University in 2001, he worked at the GFZ GeoForschungszentrum in Potsdam, Germany, as a postdoctoral researcher and research project manager. In 2009 he moved to Perth, Australia, as a researcher at Curtin University. He returned to GFZ in 2011 as a project manager and senior researcher, mainly in seismic hazard and risk assessment. His research interests are centred around multi-type hazard and risk assessment concepts. He is currently a senior project manager with Inlecom Commercial Pathways, Ireland.

Serious games for Disaster Risk Management information elicitation: Insights from the SENSUM and ESPREsSO projects

In the context of urban resilience, serious games are applied to understand Disaster Risk Management (DRM). This report introduces two EU-funded projects, namely SENSUM (Framework to integrate Space-based and in-situ sENSing for dynamic vULnerability and recovery Monitoring) and ESPREsSO (Enhancing Synergies for disaster PRevention in the EurOpean Union). The SENSUM project aimed to explore the application and integration of remote sensing and ground-based methods for multi-type risk

analysis. The ESPREssO project developed a strategic vision for dealing with disaster risk reduction (DRR) and climate change adaptation (CCA).

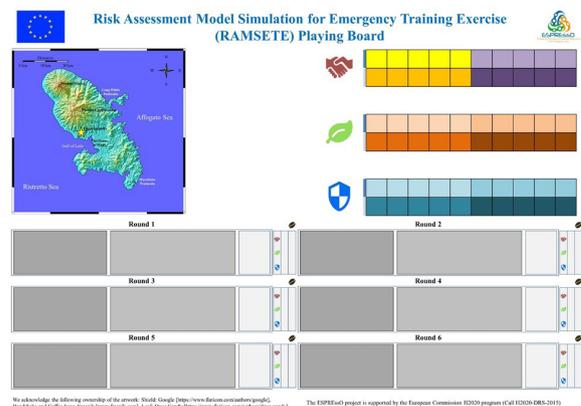
To begin with, serious games require a wide range of different expertise and numerous actors. They are defined as “a game in which education (in its various forms) is the primary goal, rather than entertainment” (Michael and Chen, 2005). The key fields are 1) assessment, 2) mitigation, 3) response, and 4) communication. The assessment identifies the hazard, the vulnerability and the exposure of all elements of concern. Mitigation refers to the question of how to deal with the situation. The response aims to point out who is responsible for what actions and in many cases who will cover the expenses. Communication is a very essential aspect. One wants to know who one should talk to, and how they should speak to each other. But how can we find the answers to these questions and improve upon a given situation? First of all, it is necessary to be aware of the different ways of thinking that are required in the course of the disaster risk cycle. Rapid, procedural, and instinctive thinking based on experience on the one hand, or slower and more deliberate thought processes on the other. This leads to another critical point in serious game development: understanding the needs, goals, and challenges of different groups and for them to understand their own. The SENSUM project applied role-playing scenario-based exercises as a type of serious game. The participating scientists found this approach to be beneficial because it is not as passive as questionnaires, since everyone must be engaged in the exercise. Serious games have the potential to allow an iterative process, where issues outside of those initially considered may arise, and last, but not least, aspects of fun also play a role.

Apart from the specifics of every individual game design, there are some general features that need to be addressed: 1) what are the overarching issues being investigated, 2) what roles are involved, 3) what actions are being considered, 4) what events are of concern, 5) how is the scenario area defined, 6) what metrics are of concern, 7) what exercise materials are needed, 8) what are the mechanics of the exercise, 9) how is the game's time frame divided, 9) what are the rules of the game, 10) who takes the role of the facilitator, 11) the continuous assessment of the game's progress and 12) a final review at the end of the game.

The serious game developed in the SENSUM project had the goal of reviewing the participants' knowledge of remote sensing and other such technologies for exposure and vulnerability assessment, disaster response and assessment and recovery moni-

toring, and to identify indicators that are most used. Timing, resolution, accuracy and cost were the specific issues being addressed. The participants, in this case civil protection managers, were divided into three groups: namely event generators, decision-makers and information providers, and had to deal with the pre-defined scenario of an earthquake. Timewise the exercises were divided into 30-to-35-minute sessions and altogether the game had a duration of two days.

By comparison, the ESPREsO exercises were less operational and rather aimed at higher-level decision-makers and planners. Rather than looking for final answers or results, the intention was to undertake the exercise itself.



The table sheet for the RAMSETE 1 serious game exercise (Abad et al., 2020)

Labelled as RAMSETE 1 (Risk Model Simulation for Emergency Training Exercise) the first exercise dealt with the better integration of DRR and CCA actions and was set on the fictional island of Espressoland. During the game, the island was subject to multiple natural hazards such as earthquakes, landslides, floods, volcanos, and storms, and was expected to be strongly affected by climate change. The overall aim of the exercise was to enhance the well-being and social cohesion of the population of Espressoland. Five different roles, such as the ministry of interior and the ministry of the environment, were assigned to the players and their communication was limited to a certain degree based on a set of cards. The game metrics included shields standing for DRR response and preparedness capacity, leaves standing for an increase in CCA resilience, handshakes for social cohesion, with beans representing the currency of Espressoland and the resources required by the participants/roles.

In the subsequent evaluations, both the SENSUM and ESPREsO exercises were perceived by the participants as being in-

teresting and fruitful. Regarding SENSUM, the transcripts revealed the interplay between the participants in a way that could not be gained from surveys or interviews. ESPREssO was appreciated for its problem-solving component. Critically perceived were the facts that information was deployed dependent on the background of the player and that it was not always possible to have players take roles comparable to their own experiences. Apart from this, cultural aspects proved to play a major role and general attitudes to hierarchy and gender participation deserve special attention. Problems occurred regarding language barriers, the exercise going off course or participants not joining in or inappropriately dominating. All of these issues therefore call for the facilitators of the game to take appropriate action. In conclusion, a few more points need to be made. First, It can also be fruitful to add an element of theatre to role one is assigned to maintain interest in the process. Then, importantly, it is very important to follow on after the exercises, in that these exercises should not be regarded simply as an interesting few hours or days of activity. This means that the facilitator debriefs the participants between and after the sessions, so that the participants are aware of the benefits gained through the exercises and are encouraged to continue the dialogue afterwards.

Abad, J., Booth, L., Bails, A., Fleming, K., Leone, M., Schueller, L. and Petrovic, B. (2020) Assessing policy preferences amongst climate change adaption and disaster risk reduction stakeholders using serious gaming, *International Journal of Disaster Risk Reduction*, vol. 51, 101782, doi: 10.1016/j.ijdr.2020.101782.



SYMPOSIUM

**Tuesday, June 21st 2022,
9:00-10.30 am
Dr.-Ing. Juliane von Hagen,
MSUP (USA)
Essen, Germany**

Vita

Juliane von Hagen holds a Diplom-Ingenieur in Architecture and a Doktor-Ingenieur in Planning from RWTH Aachen University, Germany and a Master of Science in Urban Planning from Columbia University, New York, USA. She studied and researched in New York City and taught at several universities in Germany and Australia. She is now working as Adjunct Professor at Pennsylvania State University and Texas A&M University in their Study Abroad Programs. Next to running stadtforchen.de, an office for urban research, development, and communication, she also works as a freelance journalist in Germany.

Capacity Building in the Ahr Valley A catastrophe and its consequence

One year after the dramatic flood disaster in western Germany, urban planner and urban researcher Juliane von Hagen describes the situation in the Ahr valley. She draws upon her personal perspective as person with strong ties to the region. Hence, she does not paint a complete or comprehensive picture of the flood or the disaster management. She rather presents her observations based on visits and conversations with residents.

The Ahr valley is located about 20 km south of the former capital of the Federal Republic of Germany Bonn and captures an approximately 85 km long river in the state of Rhineland-Palatinate. The Ahr rises near the Belgian border at Blankenheim and runs through a narrow valley with small, however dense villages and towns before emptying into the Rhine. The Ahr is embedded

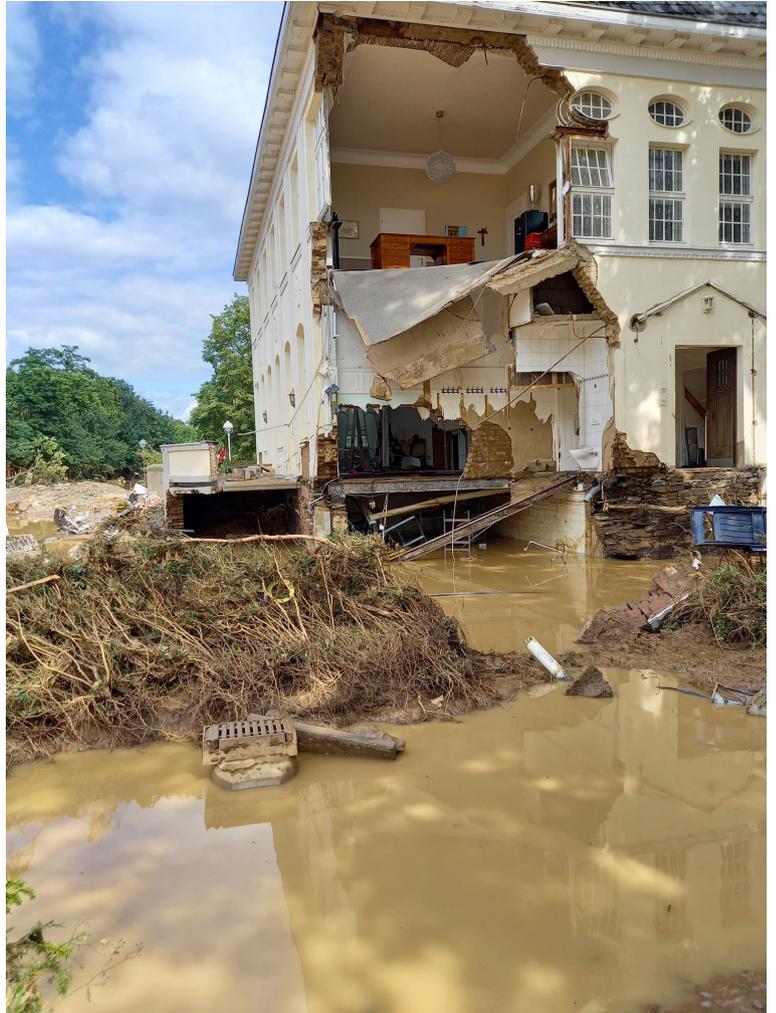
in a beautiful landscape which made the area a destination for recreation. Since the 1960s, the region has been known for winery and tourism.

Historical pictures show how urbanization grew along the Ahr valley. The first buildings were built at a respectful distance from the river. In the 1980s, when the Ahr valley became interesting as suburban region for commuters, urban structures grew denser and moved closer to the riverbed. Over the years, the riverbed was closely captured by urban and infrastructures.

The flood disaster of July, 14th and 15th 2021 was a shock to the people in the region. There had been warnings from the weather forecast several days in advance, pointing to an imminent heavy rainfall with 70-120l/sqm. Nevertheless, the extent of the flood was unexpected and the enormous masses and the speed of the water impossible to even image. The water levels rose to the highest mark at a rapid pace. In the late evening of July 14th, the system for measuring the water levels broke down completely, so that the ultimate height of the flood is unknown. The floods of that night costed in Rhineland-Palatinate and the neighbouring state North Rhine-Westphalia more than 180 lives and caused economic damage of about 30 billion Euros. This makes the catastrophe the largest natural disaster in Germany after World War II in 1945, a storm surge in Hamburg in 1962, and the Elbe flood of 2002.

The flood along the Ahr did not only move a huge amount of water through the valley, but also large amounts of mud, stone, wood and debris. Wrecked cars, containers and caravans can be found everywhere. After most of the rubble had been removed, it became visible that the entire "urban ground floor" had been washed out by the water. There are no more public spaces, squares, or parks left, and uses in ground floors of buildings vanished, too.

The flood along the Ahr hit an area equivalent to 200 German soccer fields. About 56,000 people were affected by the disaster, and approximately 17,000 people injured. Altogether, about 4,200 buildings were damaged, of which 70 percent are severely hit which makes their reconstruction very difficult or even impossible. A total of 60 bridges along the river were destroyed, and with them the connection between neighbourhoods and their residents. Today, several temporary bridges allow crossing the river again. The missing bridges had a huge social impact on the community and the people on both sides of the river.



Destruction Downtown Bad Neuenahr

Looking back into history, it becomes clear that this flood is not an isolated case in the region. There had been two major floods; one in 1804 and another one in 1910. Historic documents show that damages were big in the past, too. Water experts estimate that the amounts of water flooding the valley were in 1910 almost as big as in 2021. However, the increasing urbanization, densification and sealing of surfaces over decades let a similar amount of water rise up to much higher levels now.

Severe damage to infrastructure is hampering reconstruction. Even five months after the flood, most households only had emergency measures in place to provide electricity and heating. Although many volunteers and first responders have helped on the ground, reconstruction is proceeding slowly. Even one year after the event, the reconstruction of basic infrastructure is far from complete.



Downtown Rech

An important event for and in the region, the State's Horticultural Show 2022, was first postponed by one year due to the Covid pandemic. After the flood in 2021, the show had to be cancelled completely. There are too many urgent reconstruction tasks that have priority. Nevertheless, several ideas of the Horticultural Show, especially for upgrading and renovating public spaces, are still present. Among them is an intergenerational playground which was just completed. Here, the municipality of Bad Neuenahr wanted to set a sign. They rapidly wanted to reconstruct recreational and gathering spaces for the residents, and not only focus on renovating infrastructure.



Downtown Bad Neuenahr, temporary bridge

The future of large parks in the town of Bad Neuenahr, like the Kurpark or Joseph-Lenné Park, is however still open. They have been cleaned and made accessible as green spaces. It gives hope to the residents, it offers distraction, and locaionts of pleasant atmosphere in a town resembling a huge construction site. But the final redesign of the large public parks, and their new function as retention spaces, still has to be defined. While many residents, and also professional planners and landscape architects had hoped for a quick redevelopment, or at least an overall plan for reconstructing the Ahr valley, a long term vision is put on hold. There were first signs of developing a comprehensive concept; with a Future Conference in autumn 2021 and a Scientific Conference in June 2022. However, the implementation of innovative ideas still seemed to be blocked by urgent tasks, by daily challenges, and time consuming procedures of bureaucracy. Many questions about reconstruction and flood protection have not yet been resolved. A lot of people are also still waiting for financial aid by the government or insurances to cover their losses, and to provide resources for reconstructing their homes.

About 80 percent of the applications for public funding had been approved, but only five applications have been fully disbursed. Difficult and extensive bureaucratic procedures block a lot. Hence, the announcement of politicians to provide fast and unbureaucratic help seem to fail. What remains is self-organization and small glimmers of hope in community reconstruction. But there is still a long way to go in the Ahr valley. And one can doubt that the region can hold another Horticultural Show in ten years from now. Then, they want to invite into a region which is a model for sustainable development, climate adaptation, and disaster management.



Downtown Bad Neuenahr, "We continue" is written on the facade



SYMPOSIUM

**Tuesday, June 21th 2022,
10:45-12:15 am
Herbert Dreiseitl
Überlingen, Germany**

Vita

Herbert Dreiseitl is an urban designer, landscape architect, water artist, interdisciplinary planner and Professor in Praxis. His focus is on creating liveable cities around the world, where Herbert is an internationally highly respected expert with a special hallmark on the inspiring and innovative use of water to solve urban environmental challenges, connecting technology with aesthetics, encouraging people to take care and ownership for places. Herbert initiated and influenced several important movements like the WSUD, the ABC Water Guidelines for Singapore, Cloudburst projects in Copenhagen, New York City and Washington DC in cooperation with the Ramboll team; he also led research projects, e.g. with MIT, Harvard GSD, NUS and Zeppelin University, for a successful implementation of Blue/Green Infrastructure in dense cities worldwide. He founded DREISEITLconsulting GmbH and is currently giving advice to many initiatives and cities around the world to improve their projects towards resiliency and strive for regenerative frame conditions.

Climate resilient and liveable Cities

In his lecture, Herbert Dreiseitl explores the question of how we can respond to the challenges of climate change and climate adaptation in our cities with blue-green infrastructures. Blue-green infrastructure can support the quality of water by biological absorption, filtration, sedimentation, infiltration and biocycle, as well as the quantity of water by exploration, conveyance, detention, retention and storage. The need to create new space for nature in our cities and to transform our cities with water-sensitive urban design meets competing demands for space in urban areas. Herbert

Dreiseitl emphasizes that we need to bring multifunctional systems into our cities, if we want to advance climate adaptation. Today, 30-40% of the surface area in our cities is covered with asphalt for car parking and roads. Every transformation in urban space triggers long discussions, which is why positive examples of climate-adaptive design and liveable urban spaces are so important.

Blue Green Infrastructure Toolkit



Dreiseitl H., Wanschura B. (2014): Strengthening blue-green infrastructures in our cities. Ramboll, Liveable Cities Lab

Blue Green Infrastructure Toolkit

An interesting project mentioned during the lecture is the regeneration of the Pearl District in the city of Portland, Oregon. The industrial area was transformed with the involvement of more than 300 citizens in the planning process. The people were in favour of creating a park that can collect the water from the surrounding areas and serves as a retention basin, a sponge, a buffer and even a filter for the water before the purified water is released into the river. In such a participatory process, it is important to involve all stakeholders and to include all generations, because the future of young people is at stake. In this way, the support of the citizens can be won, and can help to make money available. Successful implementation is proved to be possible only with public support. In addition, even the maintenance costs are very low, and there is hardly any vandalism in this multifunctional park, which testifies that the citizens well understood the importance of the park.

The Potsdamer Platz project in Berlin dates back a long time and was part of the planning for a new city centre in Berlin after the reunification. Here, the idea of sustainable water management in an urban context was realized. Stormwater is collected via green roofs in cisterns and intermediate storage tanks, then recycled and used as service water for flushing toilets. The remaining water flows into an open lagoon that can accommodate different water levels.



Potsdamer Platz, Berlin, Germany

This green lagoon has purifying biotopes and keeps the water quality at a high level by using nature-based solution. There is extensive scientific research behind this project focusing on how to implement nature-based solutions. However, this example is not easily transferable to other climates. There are even fish populations in this lagoon today and it is a very popular place to enjoy the urban waterscape. Finally, the water is celebrated and thus favourably changes the image of the city.

A current exciting project is the Kampung Admiralty, a multifunctional building block by WOHA Architects in Singapore. It is a public building that integrates many different functions, such as an MRT station, a shopping mall, a medical care centre for young people as well as a centre for the elderly. This complex was built by the housing authority in Singapore. Here, every drop of water is collected, filtered, recycled and reused. Rainwater harvesting is an integral part of the archival design of the building block. The architectural design brings together the idea of public facilities and services under one green roof. This is also where the interface with Singapore's large-scale goals is laid out: The Waters ABC program in Singapore focuses on the integration of blue-green infrastructures in the dense urban context. The famous Bishan-Ang Mo Kio Park, which embeds a former canal in a reconfigured landscape and serves as a floodplain, is a spacious district park with a small river in dry weather. However, in monsoon rains, the valley can also serve as a floodplain. The realization raised many concerns about safety issues, but there are still good reasons to prefer a nature-based solution to a concrete canal. The expectation of being able to eliminate risk will no longer be fulfilled. Herbert Dreiseitl emphasizes that we must learn to deal responsibly with risk and respect nature.



Vertical ABC Water Design Integration

Bishan-Ang Mo Kio Park is just one example of more than a hundred projects in Singapore's strategic planning for sustainable water management. Thereby, Singapore develops a holistic understanding of the water catchment areas to change its water management. A river is more than just flowing water on a surface, it's a highly complex system embedded in its environment. The so-called natural capital of blue-green infrastructures in urban open spaces is seen in the management of water, the quality of soil and air and the contribution to biodiversity. Our aim is to create places that are vibrant, healthy and full of socio-cultural vitality. Urban open spaces should open the possibilities for a healthy environment, active physical activities and inclusive spaces. Reflecting on the fact that Singapore is an island with more than 5,3 million people, it is surprising that this intense urban society with beautiful natural environments still depends on water from neighbouring Malaysia. Therefore, it is central for Singapore to collect and store rainwater, thus building up its resources to have clean water at its disposal. Singapore is a pioneer in water management, however, it seems that other cities will have to follow this example, when considering that water being essential for our lives and our quality of life is becoming an extremely limited resource.



Health and Wellness

The example of Lake Constance in Germany shows the challenges in Central Europe. The Lake supplies 4 million people with water and is an important location for freshwater research. The growing urbanization accelerates runoff, erosion and flood risk. Settlement structures increase rainfall runoff and largely contribute to pollution. Sewage treatment plants are overloaded and outdated, causing combined sewer overflows. After heavy rain events, contaminated water flows into the rivers, now up to 44 times a year. The polluted water is carried by rivers into the lake and sediments settle in estuaries. Hence, it is not just about changing technology, because the whole catchment needs to be looked at. Besides the urbanization, agriculture and forestry also contribute to the current problems. There are already many good examples of rainwater management in our cities, such as Scharnhäuser Park in Osterfildern near Stuttgart. 140,000 sqm of residential area and 21,000 sqm of retention areas stage the rainwater as a visible element in the open space and in the architecture.

The Solar City Linz in Austria also uses every drop of water and stages the collection of rainwater via the roof surfaces. The inner harbour in Offenbach shows the attractiveness of water areas for public space after its transformation into a residential neighbourhood. Major challenges lie ahead in the regeneration of industrially used landscapes such as the Garzweiler Brownfield Industrial Landscape. The big challenge will only be met with transdisciplinary cooperation and the courage to innovate.



Scharnhäuser Park, Osterfeldern, Germany

The complexity of water topics needs fluid thinking, and mere technological knowledge is not enough. Therefore, it is crucial to overcome traditional silos and to integrate all stakeholders in the decision-making process and all disciplines in the planning process. Finally, our positive project examples also emphasize the cultural significance of planning processes for the development of sustainable societies.



SYMPOSIUM

**Wednesday, June 22th 2022,
18:00-19:30 hrs
Flemming Rafn Thomsen
Copenhagen, Denmark**

Vita

Flemming Rafn is co-founder and partner of architecture studio THIRD NATURE. The Danish studio have for the last decade spearheaded some of the largest and most innovative climate projects in Denmark. Flemming's key concepts are driven by the notion that a coherent and optimized design creates the most powerful impact and sustainable solutions for the city as a whole, but also adds to the sensitivity to individual spaces, places and the people. A sensitivity that invites the users to a more aware, joyful and resilient everyday life.

Nature strikes back Strategies towards the climate responsive city

The office THIRD NATURE was founded in 2011 and is currently run with a staff of 25 employees in Copenhagen, Denmark. An initial point of discussion is often the name THIRD NATURE, which refers to the term second nature, describing in its essence cities and mass globalization and having the ambition to come up with visionary strategies for a more agreeable combination of man and nature. In addition, in the founding year of THIRD NATURE, Danish people were benchmarked the happiest in the world based on a set of indicators such as equality, life expectancy or average wages introduced by the United Nations. At the same time, the Happy Planet Index came to a remarkably different result placing Denmark last on number 111 of 111 nations. The ecological footprint assessed by the Happy Planet Index made the difference which is probably unaware to the majority of the Danish population. THIRD NATURE is thriving to bridge the gap between both assessments maintaining happiness without the mass ecological footprint, reminding that the excessive consumption of resour-

ces is a worldwide problem. Establishing consciousness for this, the climate and the responsibility for our planet in general is an important aspect of the work of THIRD NATURE. When it comes to cities THIRD NATURE covers all scales such as huge plans, climate scapes, life buildings and scalable solutions.

Crisis is interconnected with cities and climate change. In 2011 Copenhagen was struck by a very intense storm event which led to major flooding throughout the city. One important perception gained through this event and its consequences was the transformation of urban space. And comparably rainfalls took place almost every three years in 2014, 2017 and 2022. In this context THIRD NATURE set up a mapping of Copenhagen defining water catchment areas. And the question of assessing space in urban environments for resiliency can be illustrated when becoming aware of the distribution of traffic in Copenhagen. Cars are moved approximately one hour per day, seat one person, and are parked for 23 hours but take up 80% of the real estate in cities.



Project Climate District, Copenhagen

The project Climate District made an effort to change this by designing a completely car-free district. In this case, vehicles are parked in the basin with buildings and open spaces arranged on top. In its appearance, the district corresponds with the neighbouring buildings but on the inside, a hybrid corridor is established working with row houses and a mix of density. One of the key design elements of the inner corridor are the so-called edge zones where residents spend most of their free time in the city. The blend of private and public space characterizes this space and the enhancement of biodiversity is an important aspect of the design approach. This way, a hybrid of biodiversity and social interaction is established. Until the summer of 2022, 30% of the project has been realized.

Related to the project Climate District is the project Climate Street. The initial idea of the project was to design a scalable element with general applicability. The main problem of city streets is the fact that they are sealed and water is led into the sewer and cannot be stored. The solution is a tile named Climate Tile that can be put on top of the existing street. It captures water in the case of a heavy storm event preventing flooding but also retains it. This way, water is available for times of drought. Planting trees and watering them is very expensive in Copenhagen. With Climate Tile these costs can be reduced to a large degree. Altogether, water permeability of streets can be increased from 0% to 30%.

Looking at streets in Copenhagen many are the opposite of what a liveable city would need. The location of the office of THIRD NATURE is such an example. There is no green at all and the edge zone is reserved for parking only. THIRD NATURE had the opportunity to redesign 20% of the edge zone because many parking lots were removed. The Climate Tile system was applied in combination with planting a group of trees at the corner. Almost immediately residents sat down and occupied the space. In 2018 the Climate Tile system received the grand award in the engineering category by popular science.

Blue destinations is the title of another project situated in the north harbour area of Copenhagen. The real estate development is destined for office use but 50% of the ground floor of the building has to be accessible to the public. The municipality intended to obligate the investor to give added value back to the community. THIRD NATURE designed the two lowest floors to be completely open and grant access to a large winter garden that is characterized by mix-use and greenery. This way, a very exquisite office is combined with a public destination in the city.

Adaptation is a fundamental aspect when working on resiliency. This was applied in the transformation of a mixed-use site just outside of the historical core of Copenhagen that is especially affected by noise pollution from a nearby street. The task was to design a structure providing quality liveable space under these adverse circumstances. The design proposes three-story rowhouses with a parking lot situated on the ground floor creating an elevated open space between the houses. Through modularized timber construction, the carbon footprint could be reduced by 40% of comparably concrete construction. Momentarily, the project is on hold and it is not certain if it will be executed in the future.



Project Climate Park

The Climate Park is a park in central Copenhagen located in one of the hippest and most densely populated districts. As a historical site, over one million people visit the park every year. Additionally, it marks a depression in the city topography leading to frequent flooding events. The main challenge of the project was to preserve the cultural heritage, maintain the accessibility for visitors and simultaneously retend an estimated amount of 23,000 m³ of stormwater. This water would add up to a level of 70 cm throughout the whole park. At first, this task seemed to be impossible to solve. Taking down the surface and lowering the entire area did not seem to be a viable solution because this would mean cutting down all the greenery in the park. In close collaboration with the engineers, an alternative approach was developed. A border was constructed around a defined area of the park creating a catchment basin for the stormwater. The soil was excavated and relocated to achieve the necessary volume of 23,000 m³. Since such an extreme stormwater event only takes place every 50 or 100 years a great deal of effort was taken to design the park for all the average non-extreme stormwater events. To maintain accessibility through the barrier a shutter was integrated that is normally open but closes automatically when the catchment area is flooded. This shutter is triggered through a simple gravity-based drive and does not require any technology.



Project Climate Island

Another forward-looking project is entitled Climate Island. This involves the largest land reclamation project in Denmark. It has three tasks namely 1) flood protection, 2) soil depot, 3) urban development and 4) infrastructure. Waterfront design in Copenhagen has evolved from fortification through industrial to post-industrial. In this case, THIRD NATURE proposes a nature-based and climate-proof solution. The basic idea is reconnection with and transformation through the sea rather than taking efforts in holding it back. A coastal park is supposed to fulfil this claim. The images of the project that were published showing cattle grazing on a natural coastline led to very controversial debates among the citizens of Copenhagen. But the cattle are not merely symbolic but accelerate the naturalization of the soil thereby increasing the biological capacity. In addition, the project has a strong focus on establishing underwater habitats in the form of zone reefs. Due to the increasing lack of sand, these are projected to be made of stone material.

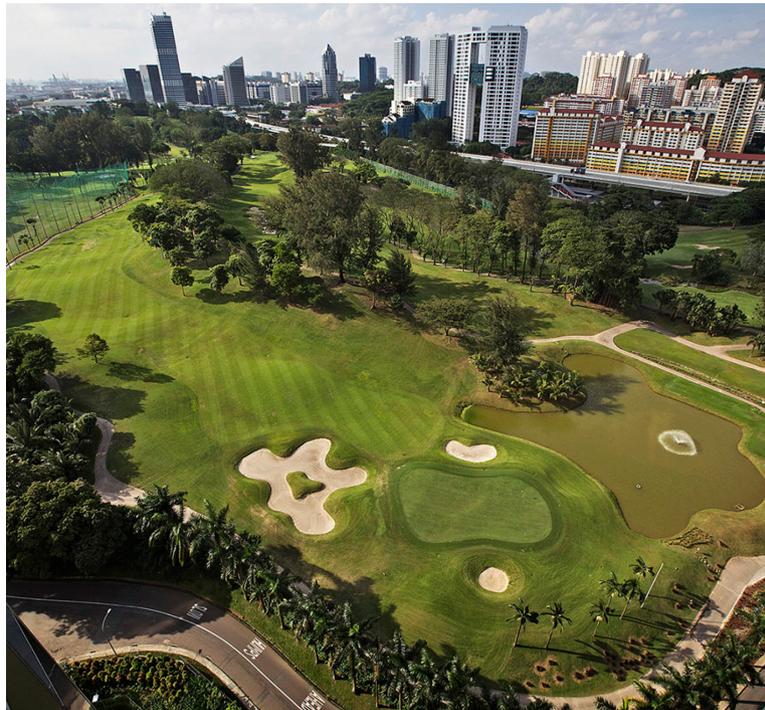


Project Street Labs

Street Labs are another type of project that provides a good possibility to raise awareness and acceptance for the difficult changes THIRD NATURE is aiming to apply in the city. In this case, THIRD NATURE worked with the medieval core of Copenhagen and had the opportunity to transform three kilometres of the street. THIRD NATURE removed all the elements usually found on the left and the right of the city streets and replaced these with trees. Alongside the spatial transformation observed it was interesting to monitor the change in temperature achieved. It dropped from 51°C to 32,4°C. Based on the results of this project the city of Copenhagen has launched an initiative to reduce the number of parking lots from over 1,050 to 300. Park Labs was another Lab of THIRD NATURE located in the city of Aarhus. It involved a completely circular park on a pier in the harbour that was constructed with the sand available on-site with a minimum of investment. An artificial topography aims to mitigate wind and creates an identity for a place that had no identity at all. The opening of this experimental park was very well received by the mayor and the citizens.

COMPETITION BRIEF

The topic of the 2022 Designing Resilience Global competition was „The sea-city interface - Regenerative Urban Design for Singapore. A carbon negative city in Asia Pacific.“ The 2022 DRG competition focuses on urban design and the city as drivers of resilient change. This requires the resetting of methods and intervention tools, and the development of new paradigms to meet the challenges of global development and contemporary urbanism. Working with a site located at the greater Southern Waterfront in Singapore, the design competition also aims to discuss the design of the city-region understanding that the environmental consequences and implications of rapid urbanization and climate change go beyond administrative boundaries. The objective of the competition is to promote anticipatory, preventive, and holistic design paradigms that engender the physical, urban, environmental, cultural and social resilience of Asian cities/communities in front of the effects of climate change.



The sea-city interface

JURY MEMBERS



Oscar Carracedo

Director, Designing Resilience Global



Jean Christophe Dissart

Professor And Director of the Institute of Urban Planning
and Alpine Geography

Member of the Laboratory Pacte
University Grenoble-Alpes



Inge Roecker

Associate Professor and Founder of Asir Architects
School of Architecture and Landscape Architecture
University of British Columbia



Daphne Frank

Project Manager Cities fit for Climate Change

Deutsche Gesellschaft für Internationale Zusammenarbeit (Giz) GmbH



Nebojsa Camprag

Guest Professor of International Urbanism,
Faculty of Architecture, TU Darmstadt

Principal Researcher, Urban Morphosis Lab, TU Darmstadt

COMPETITION ENTREES

Kyushu

Embracing City

Jessica Andrade

Keisuke Hattori

Tan Jianliang

Yuki Yanagi

Honorable Mention Award

Singapore industries consume a bunch of energy and emit many gases. The primary energy production is from thermal power which emits tons of carbon dioxide. The city also imports an expressive amount of water and food, generating a big impact on carbon emissions in terms of transportation and making the city dependent on other countries, suffering due to price change and financial aspects. Another concern in the city is the rising level of the ocean and, consequently, flooding of a considerable part of the city due to the flat topography, which can happen more quickly due to rising temperatures on the planet caused by global warming. Therefore, Embracing City is a project that utilizes different design strategies to create an auto-sufficient ecosystem. It aims to embrace each aspect and connect them in a strong relationship able to provide for all needs of living beings, reduce carbon emissions, and be an example for both the rest of Singapore and the world.

The connection between all the parts will concede the creation of a living and functional area, which will allow all the strategies to work together.

The driving force is formed by the association of water and buildings. The water shapes the landscape, looking like an extension of the sea and in symbiosis with the building, which mimics a tree, creating a dynamic and functional environment.

To create the water spaces, wet ponds are filled with sea and rainwater. This strategy is important in case of flood, to cool the buildings and to store water for the industries. Buildings are made of concrete called SUICOM that stores carbon, they form a type of prototype that shapes change to create movement.

The buildings also use the water to cool the space and are covered by vegetation to create an agreeable microclimate. They include functions such as residence, offices, museums, schools, and also factories. The factories are water (desalination and NEWater), SUICOM concrete, biomass, solar energy, wind energy, and artificial photosynthesis, firstly providing supplies for the area but aiming to spread the ideas, energy, and solutions for the whole of Singapore. The Pasir Panjang Power Station will be transformed into an indoor farm to provide food for the area and decrease food imports. Additionally it is proposed a public transport covering all the area and the use of bicycles and walking for commuting.

Combining all strategies, the number of carbon emissions will be reduced by capture and transformation in the industries and also by the trees along the area. The space will be pleasant and joyful, full of activities where people can communicate, learn, work, have fun, and so forth. Lastly, the project aims to be an example to the rest of Singapore in terms of renewable energy and regenerative strategies and spread the energy to supply the whole city. It also seeks to be an example for other cities in the world, disseminating ideas, reducing human impact in the world, and principally helping to create a better Earth for all the species.

Embracing City

Embrace means to include something in a group to surround everything, to highlight to support actively. Correspondingly, Embracing City is a project that utilizes different design strategies to create an auto-sufficient ecosystem. It aims to embrace each aspect and connect them in a strong relationship able to provide the needs of all living beings, reduce carbon emissions, and be an example for the rest of Singapore and the World.

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- 8000 people
- 20 buildings
- 2400 apartments
- no cars
- bicycle & walking
- regional trees



Global Warming

Water Crisis

Singapore Climate

Water

Energy

Carbon Emissions

Singapore Thermal

Singapore Reservoir

How to make Buildings & Ponds

How to get energy

CO2-SUICOM

Material	Composition
Concrete materials	Water + cement + aggregate + special admixture + coal ash
Curing method	Curing by CO2 contained in gas emitted from thermal power station
Hardening reaction	Carbonation reaction of CO2 and special admixture in addition to hydration reaction between water and cement

Relationship design

Water System

Water Factory

Module Architecture

Household use

Food Farming (FP)

Jury Report



The "Embracing city" urban design entry by the KYUDAI is based on a highly comprehensive analysis of the location that resulted with an innovative concept. The jury particularly appreciated the strong focus on the important local/global aspects of water scarcity. Through the use of innovative and climate friendly materials the problems of air-pollution and the objectives of microclimate regulation are also considered. Besides from recognizing the qualities behind the innovative design, the jury also emphasized the slightly uniform character on a larger, urban scale. This further raised the questions of appropriateness of the suggested design solution regarding the qualities that would promote the sense of place, as well as the capacity of the suggested innovative solution to offer an adequate functioning of public urban spaces—in particular regarding the qualities of orientation points, urban identity, and social life. The jury explicitly praises the proposal as the design is very innovative and creative, especially due to the unusual and multifunctional room structures.

COMPETITION ENTREES

SCUT

Weaving with Nature

Liu Yuyang
 Hu Yaowen
 Hong Yue
 Huang Zhanhui
 Liang Yueyi
 Chen Kefan
 Yang Xinyao
 Tan Zhixian
 Gao Yaqing
 Peng Jiaxin
 Liu Yue
 Ye Miaoyang
 Wang Haozhe
 Liang Tingyao

Environmental Design Excellence Award

Based on Singapore's vision for the development of the Greater Southern Waterfront and the severe situation of the ecological conservation, we purpose to replan and design Keppel club and Pasir Panjang Power Station to protect the natural ecosystem environment and balance them with human activities as well.

Inevitably, sea level rise will pose new challenges for Singapore in the foreseeable future, and we have concluded consideration on this question in our design. Plus, currently the Keppel Club and the Labrador Park don't correlate organically. To improve the connectivity of plots on both sides of Berlayer Creek and settle possible future environmental issues, we have designed a unique embankment system for the mangrove areas, which not only protects the mangroves, but also responds to the rise of sea level.

Concerning to the community, firstly, water system inside the community and the green vein connecting north and South constitute the base of the community, forming in an ecological way with the elements of blue and green. And, a large area of green space is set on the ground-as a benefit of the space left by first floor elevation-to return it to nature. Also, the house reflects our scenarios of the future elastic community, with modular units meeting a variety of requirements. In order to maintain the accessibility of space, an efficiently shared transportation system runs through buildings to form a three-dimensional elastic community.

As for the other spot, the industrial heritage of Pasir Panjang Power Station is designed as a flexible park, utilizing green space to replace the original large area of hard land, so as to achieve the goal of restoring ecological benefits and enhancing carbon absorption. For buildings, the new energy system provides water and renewable power for surrounding communities and port settlements. What is more, the agricultural complex also distributes fresh vegetables and creates public leisure space for refreshments such as sports and gatherings.

Finally, we explore a stronger adaptability of the design and provide new ideas for the transformation and design of surrounding countries and regions.

Notably, this pavilion will participate in a larger production system to mainly provide for the hawker's consumption but will also have the processing and packaging facilities to be able to provide for the larger consumer market of Bukit Merah, the adjacent residential district to the Keppel Club site.

Taking into consideration the immediate local context can provide regenerative measures and ways of thinking. Reducing Singapore's carbon footprint by reducing the distance from greenhouse to plate can contribute to the city-state's resilience, continue to foster growing change, and BEND THE CURRENT way of things.

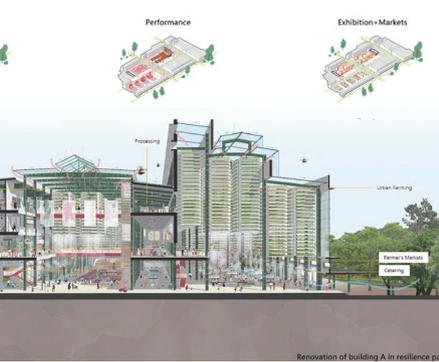
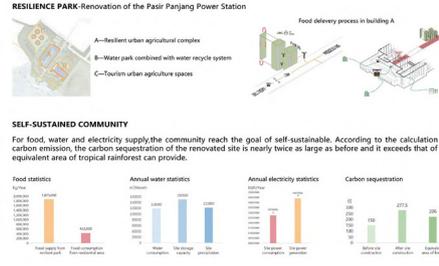
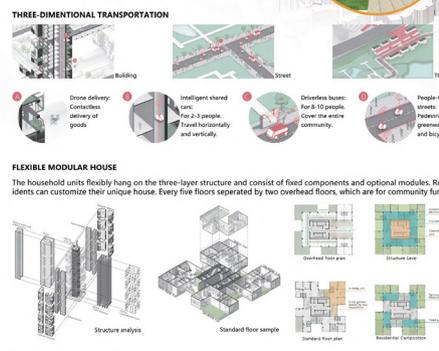
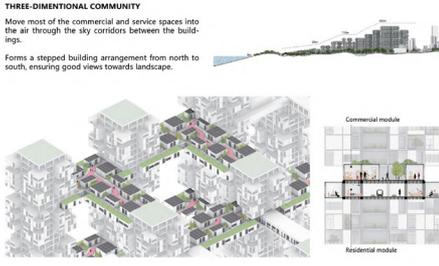
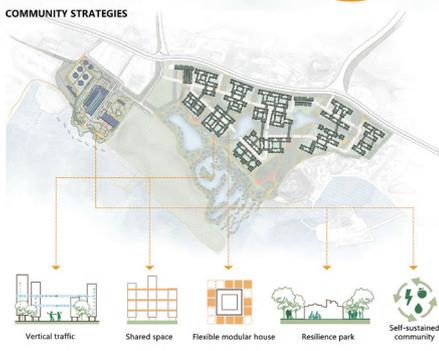
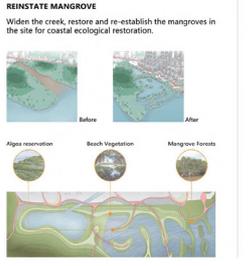
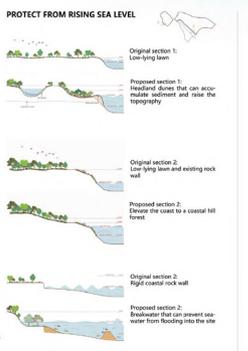
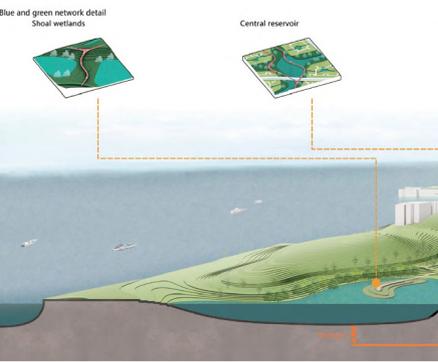
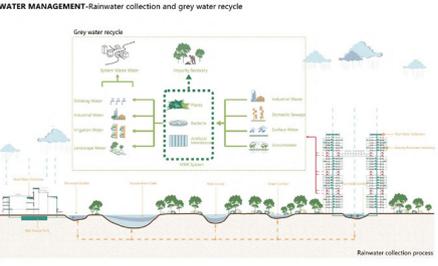
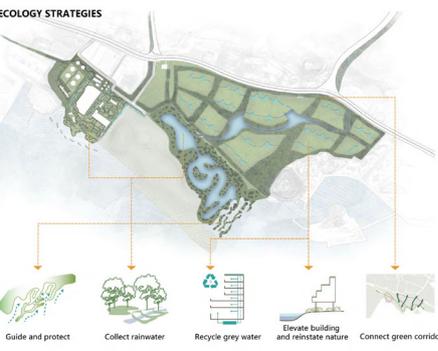
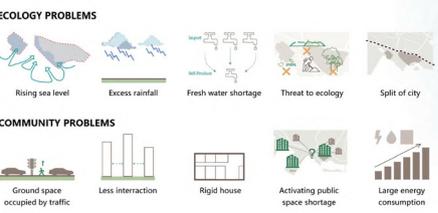
Weaving with Nature

A future adaptable community

South China University of Technology, China
 Team members: Liu Yuyang, Hu Yaowen, Hong Yule, Huang Zhanhui, Liang Yueyi, Chen Weifan, Yang Xinyao, Tan Zhiqian, Gao Yeqing, Peng Jixin, Liu Yue, Ye Miaoyang, Wang Haozhe, Liang Tingyao
 Instructor: Prof. Xiao Yiqiang, Prof. Wang Jing

Based on Singapore's vision for the development of the GSW and the severe situation of the ecological conservation, we purpose to repair and design Koppal club and Pasir Panjang Power Station to re-nature the natural environment and balance them with human activities as well.

Global climate change and rapid urbanization have raised many problems. In GSW, we focus on two aspects of problems: ecology and community. In order to deal with the problems, we develop several strategies and they leads to the solution—— return nature to the ground and build a three-dimensional resilient community.



Overview section of the ecology network and community | Renovation of building A in resilience park

Jury Report



The "Weaving with Nature - A Future Adaptable Community" urban design entry by the SCUT is based on comprehensive analysis, with a strong focus on the current local and global challenges. The proposal is also characterized by a high level of elaboration, which is also present in consideration of diverse aspects of environmentally friendly design. The special quality of the design entry promotes far-sighted approach in terms of resident's changing structure and the customization element in the design and usage of housing units. The jury equally approves consideration of many other various local sustainability challenges, including food supply. On the other hand, although highly detailed, the overall design solution leaves the impression of a slight uniformity and high density, which further underlines the questions of interaction and connections on various levels. The highly detailed considerations on the integration of infrastructures into a blue-green environment distinguish the design to a great extent.

COMPETITION ENTREES

NCKU

The City - Water Mosaic

Tuz-I Wang

Yu-Kuan Wu

Chia-Hua Lai

Cheng-Yun Tsai

Hao Huang

In the whole design proposal, we put forward a design strategy with water as the main concept, re-design the collection of water resources in the site and divide the use and discharge of water into different levels, combined with the original water pipe and DTSS system, to form ecology, sports entertainment and water Resource utilization of island-wide water cycle relationships to address water scarcity in Singapore.

We built the first phase of drainage pipes, rainwater recycling towers and filtration systems in the site, so that the site can have more water resources for the residents to recycle and use, and the excess water can also be transported back to the DTSS system in Singapore for use. It is responsible for the recycling of wastewater in the port area back to the DTSS system for use.

We re-planned the old landscape with the grid system, and divided the site into three main areas with different sizes: Keppel club, cleaning space, power station, and connected in series with a green belt park system, combined with Singapore's island-wide park connector network. We use green belt ecology, sports and leisure methods to blur the West between the Keppel residential area and the northern HDB residential area. Coast Highway, and through the design of an ecological corridor combining water and green belts with water education at the edge of Keppel residential area, will provide a recreational trail close to mangroves and oceans for the Alexandra Garden Trail corridor, as well as a Labrador Park MRT Station. With better functions, people can get closer to Labrador Park and Pasir Panjang Power Station.

Redesign the water filtration system in the site, and design rainwater towers and catchment areas with different functions, extending to three main areas with a grid system, and divided into four parts:

1. Keppel club, as a landscape filler water function, passes rainwater and sewage through filters, residents can do living, educational, agricultural and recreational uses, while filtered water is transported to parks and power stations.

2. The cleaning area, as a wetland park, is connected to the laborador park, allowing residents to experience wetland education and sports here. Finally, the water is sent to the power station.

3. The power station serves as a place to use filtered water to filter the land, generate electricity from biogas, and to provide public activities for community residents and demonstrate the use of filtered water.

4. Finally the remaining filtered water will be transported back to the new water factory in Singapore through the DTSS system to give back to the society.

THE CITY - WATER MOSAIC

Resilience Grid System of Singapore

Designing Resilience in Asia
National Central University (NCKU), Taiwan

Team: Tzu-I Wang, Yu-Kuan Wu, Chia-Hua Lai, Cheng-Yun Tsai, Hsi-Chuang

Advisor: Chen-Luen Hsieh, He-Ling Chang

In the whole design process, we put forward a design strategy with water as the main concept, redesign the collection of water resources in the site, and plan the use and discharge of water into different levels, combined with the original water pipe and DTSS system, to form ecology, sports, entertainment and water Resource utilization of island-wide water cycle relationships to address water scarcity in Singapore.

We built the first phase of drainage pipes, rainwater recycling towers and filtration systems in the site, so that the site can have more water resources for the residents to recycle and use, and the excess water can also be transported back to the DTSS system in Singapore for use. It is responsible for the recycling of wastewater in the port area back to the DTSS system for use.

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Deep Tunnel Sewerage System (DTSS)

Through underground water pipe, designed by Linear Park, the filtered and excess water from Keppel residential area can be sent back to the DTSS system for use in the port area, which is the island-wide water cycle relationships. The DTSS system mainly collects the water from Garden of the Bay, Keppel Club, and other areas in the island. The water is then sent to the port area for use. The DTSS system is designed to be a sustainable water resource for the island. The DTSS system is designed to be a sustainable water resource for the island. The DTSS system is designed to be a sustainable water resource for the island.



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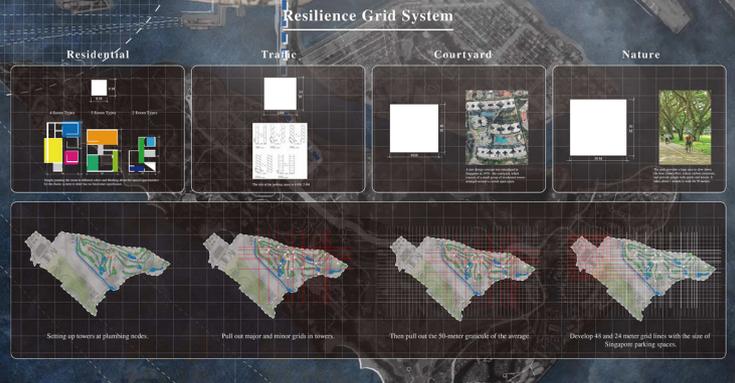


Site Plan



Water System

1. Keppel Club, as a landscape filter water function, passes rainwater and sewage through filtered, residents can do living, educational, agricultural and recreational park, while filtered water is transported to parks and power station.
2. The cleaning area, as a wetland park, is connected to the Labrador park, allowing residents to experience wetland education and sports here. Finally, the water is sent to the power station.
3. The power station serves as a place to use filtered water to filter the land, generate electricity from biogas, and to provide public activities for community residents and to demonstrate the use of filtered water.
4. Finally, the remaining filtered water will be transported back to the new water factory in Singapore through the DTSS system to give back to the society.



Jury Report



The "The City-Water Mosaic" urban design entry by the NCKU is based on a highly analytical and people-centered approach. The entry considers the local issues and elements of achieving urban resilience on various levels. The jury particularly praises the qualities of thinking on a large-scale that was reactive to the geography and morphology of the terrain, successfully to be translated to the planning area. Although the suggested concept is highly critical towards the element of boundaries as a local specificity of Singapore, the appropriateness of the suggested grid system seems to be a challenging approach to achieving the previously set objectives. The design is highly elaborate and very technical in its nature. The jury discussed the challenges posed by social issues and goals to achieve the social component of resilience. The highly elaborated proposal with innovative elements highly distinguishes the forward-looking design project.

COMPETITION ENTREES

KMUTT
On the Green

With climate change in full swing, like any other coastal urban metropolis, Singapore faces the challenge of managing the sea level rise impact on its coastlines and subsequent land areas. Moreover, the city's future is further threatened by the predicted increase of extreme weather conditions such as storm surges with persistent heavy rain or prolonged dry periods with extreme heatwaves. Thus, putting existing measures for disaster response, recovery, and associated regenerative approaches under regular stress.

When coupled with the city's limited self-sufficiency in natural resources such as water, energy, and food, its resilience is further threatened by its heavy reliance on import-oriented supplies. As the pandemic has successfully shown, disrupted logistical supply chains can further weaken existing resilience measures to inoperability. Such is underscored by the continuing demographic change of retiring older generations, which leaves increasing gaps in social and service-oriented areas.

Therefore, Singapore's challenge is to ensure its current progress in daily life and urban growth, which needs a plan for the development of a more self-sufficient system to create proactive conditions for the enormous changes ahead. Furthermore, the ever-growing demand for expansion of the built environment and changing demographics require more strategic development to meet future challenges. Such goes hand in hand with the need for more disaster-resistant living space, combined with sustainable mobility, energy, water, and food transition. While Singapore is clearly at the forefront of such urban planning and architecture trends in Southeast Asia, it may be better prepared than others. However, the city's belief in perpetual progress can backfire when simple urban functions such as self-sufficiency, self-reliance, and awareness become obsolete.

Our concept of coping with all those factors is to release the stress pressing on the city organization's responsibility by strengthening city districts' more self-sufficient, community-supported development. The former Kepler Golf Court area and its surrounding land areas have a high potential for demonstrating such understanding. The creation of midrise community blocks aims to allow local communities to take care of most of their demand, making them self-sufficient and more disaster-resistant. Therefore, our approach to addressing all these factors is to relieve the responsibility of the city government by encouraging more self-sufficient, community-led neighborhood development. The former Kepler golf course area and the surrounding property have great potential to demonstrate such an understanding of a self-sufficient urban quarter. The creation of medium-sized development sectors that allow local communities to meet their needs and foster opportunities for community-oriented development

also allows them to become more disaster-resistant. This is also underpinned by green and water areas' planning measures, which are also dedicated to integrating extreme, seasonal conditions, regenerative aspects, and biodiversity conservation.

Therefore, this project investigates the design of sustainable urban neighborhoods that work together in a system of communities to share knowledge, experiences, and support to thrive under climate change conditions. A neighborhood that stimulates long-term mobility and social cohesion and a diverse range of regular activities within. Implementing a regenerative program for water, land, ecology, and community connection improve human and animal well-being while still promoting a thoughtful lifestyle of togetherness in the self-sufficient community.

Urban planning "in the green" thus demonstrates the design of facilities, housing, business, community activities, sustainable use of resources, and urban agriculture. In turn, this will also help reduce the causes of climate change. For example, reducing the daily commute as people live within the communities and less transport of goods from external suppliers reduces the number of emissions generated. Reusing and producing your resources also helps stop the depletion of natural resources.

For this reason, we propose to develop a community of residents responding to climate change and demographic change while strengthening the ecosystem and comfort of residents. A solution that combines innovation and sustainable ideas for Singapore's urban future.

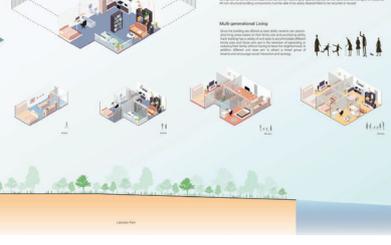
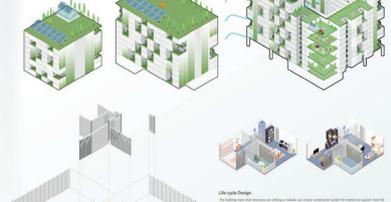
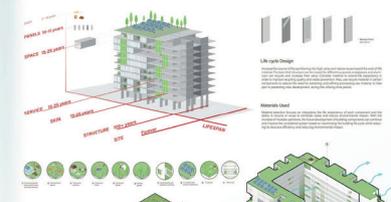
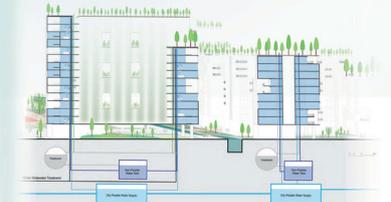
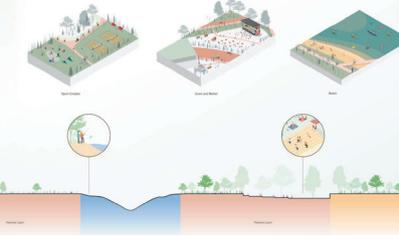
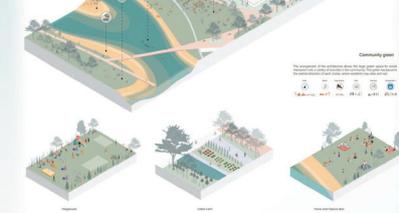
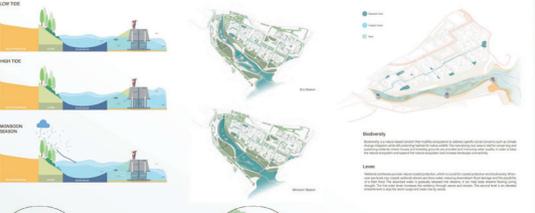
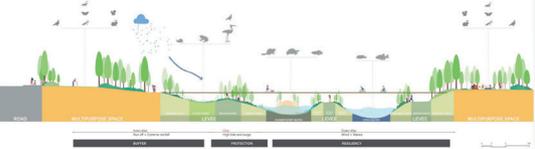
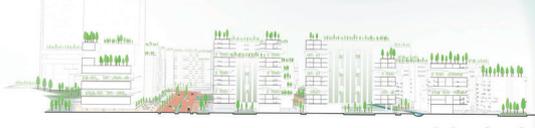
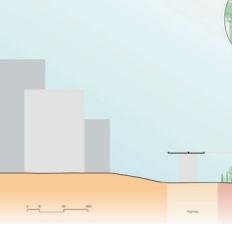
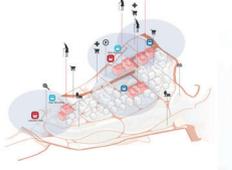
On the Green

A self-sustaining neighborhood which stimulates long-term mobility and social cohesion with diverse range of regular activities going place in the neighborhood.

With limited land resources, largely characterized by coastal exposure, Singapore has emerged as a densely populated city-state challenged by climate change from rising sea levels and subsequent coastal erosion. In addition, specific demographic shifts are growing challenging as Singapore faces increasing retirements of older people and a limited increase in its young population, leading to find ways to protect its citizens in their daily challenge of balancing work, family, stability, and self-fulfillment.

Our design proposal for the former Keppel golf course development aims for a largely autonomous neighborhood by creating and engaging daily activities within the community, enhanced by a cohesive social and functional mix. A community built around a set of ideas determined by the community of residents responding to climate change by providing renewable energy, full water cycle management, sustainable mobility, space for food cultivation, and accessible through city public services and are self-sufficient.

Our mission focuses on regenerative programs for water, land, and ecosystem and community connections. These are important approaches to improve the well-being of humans and animals and to introduce a considerate lifestyle of togetherness in the self-sufficient community.



Jury Report

“ The “On the green” urban design entry by the KMUTT is based on a highly comprehensive analysis of the location that resulted with an appropriate concept. The suggested design promotes harmonization with the surrounding urban fabric, while at the same time suggesting the creation of an attractive and functional new urban neighborhood. The jury praised the consideration of social interactions through diversification of spaces that actively promote mix of the social strata. The entry also reacts to the local environmental circumstances, reflected in the consideration of the conditions during the dry and monsoon seasons. Few critical elements are the lack of landmarks or orientation points in space, possible conflicts between different user groups, and some elements of dealing with diverse aspects of achieving urban resilience. Overall, the design represents a very compelling contribution to the future development of the Sea-City Interface in Singapore.

COMPETITION ENTREES

ITB

infiNature

Kevin Mochamad Oktafarel
Muhammad Agramansyah
Nathania Andiani
Nudia Aufia
Roiswahid Dimas Pangestu
Yosephine Rania Angelia

Urban Design

Excellence Award

Its strategic location in an interregional route makes Singapore a country in Southeast Asia with a productive and economical coastal fringe, despite being a principal area of CO₂ emissions. Population and industrial growth in Singapore encourage the expansion of built environment through reclamation and urban sprawl due to land limitations. The decline of natural area due to rapid urban development reduces Singapore's green area and biodiversity, increases the carbon footprint and emissions, and accelerates the impacts of climate change, such as sea level rise and temperature change. The evolution towards a more resilient and sensitive development is needed by Singapore to tackle climate change and reduce its carbon emissions through regenerative approach by increasing the regenerative area and creating a regional carbon sink.

infiNATURE, learning from mother nature, promotes the increase of regenerative spaces by stretching the surface to provide 50% more green areas as a solution to climate and resources issues. infiNATURE managed to reunite the living space of human being with the natural habitat of the other living creatures by connecting and maximizing their interaction. Regenerative space provided by infiNATURE, such as green corridor, nature-connected living space, biodiversity conservation area, resource-producing area, and economic spaces, can not only keep nature away from deterioration, but also improve the quality of human life and restore nature along with its biodiversity.

infiNATURE aims to address the challenges of limited land related to housing needs, resources scarcity, and climate change by becoming a part of innovative sustainable development, in accordance with Singapore's development vision, City in Nature. Housing needs fulfillment, nature conservation, and rejuvenation of cultural heritage will be the main objectives of the development plan for certain sites: Keppel club, Pasir Panjang Power Station, and Labrador Park on the Greater Southern Waterfront area. The site development is directed towards a concept of 15-minutes-walk by deploying public amenities throughout the site to improve connectivity and suppress mobility to reduce carbon emissions. Residential area will be connected to public transport station and the spaces are interconnected as well with pedestrian pathway on the ground and roadways underground. Renewable energy resources are used for self-producing energy while developing agriculture and aquaculture area to achieve a food self-sufficiency.

Natural tourist attractions are designed with elevated pathways for pedestrian to be more adaptive to sea level rise and sudden flood. Wastewater and solid waste are processed with reusable and recycled management systems. Pasir Panjang Power Station are redesigned to be commercial and temporary events

area while developing Labrador Park to be a tracking and hiking area with historical experiences.

We believe that the design concept and development of infiNATURE will bring a more regenerative and sustainable living space for people and nature. By multiplying infiNATURE across the country, we hope that Singapore can be improved environmentally, economically, and socially, and become the carbon negative city in Asia-Pacific that they hoped to be.

COMPETITION ENTREES

BUET

Sea-City Interchange

Humayra Anan

Ahmad Abdul Wasi

Md. Mashuk Ul Alam

Fouzia Masud Mouri

Singapore had always been a small island nation with big dreams and with even bigger challenges. In spite of this perpetual affray between the land scarcity with a limited supply of resources and sky-high aspirations fueled by hunger or development, Singapore has always overcome the odds and stood out from the rest because of her positive energy and welcoming attitude toward innovative solutions. After the golden jubilee of her birth, Singapore is now faced with an even more critical condition caused by the global effect of climate change and sea level rise. This has resulted in an existential crisis for the island state. This project intends to seek a solution for this grim situation to not only save the country from drowning in its own lifeline but also seek a new identity of living with the rising sea and increased climate endurance of the city.

The Sea-City Interchange is a nature-driven intervention for the city to acclimatize to the changing climate and rising sea. The concept tries to reinstate the natural and geological system to create a regenerative outcome that will mitigate the climatic stresses to be followed by Singapore in the next hundred years through an extensive landscape adaptation. It tries to recreate the lost exchange of natural elements among various players in the environment to replicate the natural phenomena of spontaneous, simultaneous, and systematic erosion and reclamation of land to be used as a protective layer for the future while vertical reclamation shelters its growing population. The concept also welcomes the sea and make room for various landscape alteration emerging into a new coastal lifestyle on the shores of Singapore inspired by the past, while it also protects the growing nature and natural system inside the city. The regeneration and adaptation of blue green network backed up by extensive infrastructural works set up a vision for the next hundred years of Singapore, emerging as the Forest City of South Asia. The study starts with the new development plan for the Greater Southern Waterfront showing intensive site-specific interventions to be designed as the blueprint for a new ecological Singapore in the face of climate change and sea level rise.

Keywords: Geological configuration, Nature-based approach, Sea-city interface, Rising Sea-level

SEA CITY INTERCHANGE

Vision for A Centennial Forest City

Bangladesh University of Engineering and Technology (BUET)
 Team Members: Humayra Anan, Ahmad Abdul Wasi, Md. Mashuk Ullah, Fouzia Masud Moon
 Faculty Supervisor: Dr. Apurba Kumar Poddar

As the preparation for the centenary of our island nation we the Singaporeans have taken a new endeavor not only to protect our city but also shape our way of life by the sea creating a transcending identity of never Singapore. Sea-City Interchange is the new adaptation measures for Singapore to fight against the global rising sea. Sea-City Interchange proposes to adapt the sea level rise by welcoming the sea rather than fighting with it which costs more to the natural setting of the region. Sea-City concept consists of various eco-engineering solution to secure the coast more naturally while the rising sea and higher waves enter the mainland. At the same time it allows the mainland to occupy additional land from the sea occurring using the natural silt at the bottom of the sea, stratified by fabricated coral reefs. The concept is to create a systematic, systematic and simultaneous reclamation and creation of land that creates various regenerative landscapes that restate the natural phenomena against climatic conditions that not only mitigate the effects of sea level rise but also adapt the many climatic vulnerabilities which will be faced by Singapore in coming years.



1. Keppel Club, Housing Development Board
2. Swamp Islands, Housing Development Board
3. New Keppel Bay
4. Keppel Club Beach
5. Old Keppel Club Heritage Building
6. Keppel Bay View Desalination Swamp
7. Telok Blangah Desalination Swamp
8. Mount Faber Freshwater Reservoir
9. Henderson Freshwater Reservoir
10. Telok Blangah Green Freshwater Reservoir
11. Berlayer Channel
12. Labrador Bay Desalination Swamp
13. New Berlayer Creek
14. Labrador Park Reserve Forest
15. Labrador Nature Research Centre
16. Pasir Panjang Clean Energy District
17. Climate Science Research Lab
18. Carbon Sequestration Forest
19. Incubators
20. International Platform of Climate Awareness, Singapore
21. Pasir Panjang Advanced Agriculture Lab
22. Climate Watchers View Point
23. Pasir Panjang Desalination Swamp
24. Terminal 5 Desalination Swamp
25. Terminal 5 Creek
26. Keppel Island
27. Naturally Reclaimed Land for Development
28. Reflections at Keppel Bay
29. Reflections Beach
30. Keppel Bay View
31. Bay View Beach
32. Carribbeans at Keppel
33. Carribbeans Beach
34. Corals at Keppel Bay
35. Coral Swamp
36. West Coast Highway
37. Greater Southern Waterfront Community Hubs

PASIR PANJANG CLEAN ENERGY DISTRICT



Existing Site Condition at Pasir Panjang Power District. The former power station is now a deserted building with industrial infrastructures declared as a reserved site for new Public Space Development.

At Phase 1 the climatic stress on the site is reduced through intervention. Throughout the open areas and over existing building shells, the urban natural landscape will be reinstated. The ecosystem's functional diversity will be regenerated in order to promote carbon sequestration.

Phase by phase the property will be developed into a climate awareness platform and natural innovation lab.

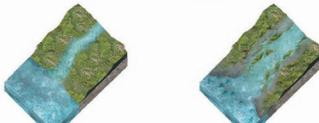


Next the site and the existing building renovations will be allocated into various functional, institutional and cultural landscape and ultimately turning it into a global landmark in the field of Climatic Awareness. Also the Site will work as a carbon sink for the city as well as an influential landmark and trademark in the field of climatic safeguard and net zero carbon emission.



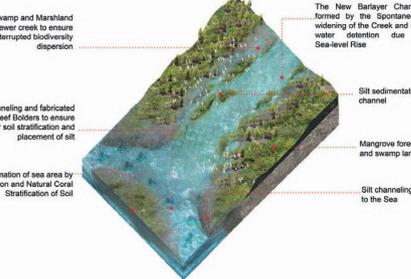
View from Keppel Club towards Berlayer Park and Bay

THE NEW BERLAYER CHANNEL



Mudflat, eco engineered soil, mangrove culture media, soil collection, and stratification methods have been reinstated to help to regenerate mangrove habitation and to adapt to create a suitable natural environment by Phase 1.

During phase 2 of the development, risk of saline water intrusion will be mitigated to protect the island biodiversity. Mangrove-based eco-engineered solution for soil/silt stratification will raise the immediate sea wall creating a barrier from the rising sea.

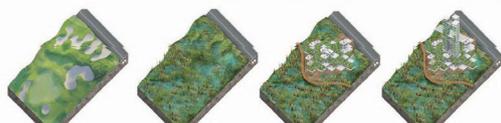


Phase 3 will be faced with the challenges of sea level rise and storm surges. Design strategies have been taken to mitigate the impending doom. Added land elevation, natural bend to allow silt deposit, and full mangrove protective layer will perform to the maximum for preventing unpredictable climatic stress as well as new land reclamation from the sea will be carried out by Green erosion and stratification of soil by modified fabricated coral belt.



Walkway by the Berlayer Channel

WORK.PLAY.LIVE.PLAY MORE AT KEPPEL CLUB



Existing site of Keppel Club as Golf Course Site with Uncluttering grounds and discontinued waterbodies

In the Phase 1, the Natural Vegetation and the biodiversity is allowed and accelerated to grow freely to take over the discontinued Landscape.

Phase 2 includes the elevated ground floors to allow the nature to flow underneath, the added grounds work as the podium of the living towers with shared terraces allow more greenery to grow.

In Phase 3 the bio-climatic towers are added to house the residents. The sky plaza connects the high rise apartments allowing more vertical vegetation and to scale down the effects of tower



The risk of drowning in the water will be minimized as a result of the additional terrain. The biophilic utopian forest city concept will be reinstated, with additional grounds providing 500 percent more green areas. Layers of bay, beach, mangrove, and rocky shore will regenerate in the new landscape. In a regenerative ecosystem, residents and biodiversity will adapt to the coastal lifestyle. All the Communities are connected by the Great Southern Waterfront Community Hubs.



The New Berlayer Bay with Reclamation Project Inside

Jury Report



The "Sea-City Interchange: Vision for A Centennial Forest City" by the BUET is an urban design entry that brings highly inspiring urban design solution and suggestive spatial visualizations, with functional, attractive and at the same time protective park as its central core. The jury particularly praised its adaptive and flexible qualities, such as suggested phases of implementation, architecturally multi-dimensionality and adaptive reuse principles. The design is nature-based, with well elaborated future vision and a large-scale thinking that brings a projection to the future development. Thereby the element of replicability is also well considered. Some of the critical elements are reflected in the general focus on the challenge of sea-level rise, while some other aspects of resiliency would require the same level of attention. The overall design reflects a brave and innovative approach for the sea-city interface in Singapore.

COMPETITION ENTREES

UdeM

Bending the Current

Ariane Bérubé

Daniel Santos Castela

Miroslava Herrera Rivero

Jade Swai

Architectural Design

Excellence Award

In face of climate change, Singapore's coastline grows more and more vulnerable to rising sea levels, which is a major concern for the completely urbanized city-state. 30% of the city is found at less than 5 metres above the current sea-level and limited space means the population relies on importation for 90% of its nutritional needs. How will Singapore continue to grow and prosper as it loses physical space, and its food security is threatened? Bending the Current is a coastal proposal in urban and architectural strategies that aim to contribute to Singapore's efforts in mitigating the effects of climate change on its social, economic, and environmental landscapes. The coastline, as delicate as it may seem, has the capacity to contribute to Singapore's future stability, growth, and resilience - even with the presence of water.

By using agriculture as a framework for future coastal developments, we can reduce Singapore's reliance on food importations and improve self-sufficiency. This strategy aims to optimize the space available along Singapore's coastline to contribute to the city-state's resiliency in the face of rising sea-levels. This agricultural framework manifests itself as a belt that embraces the coastline. Pairing this belt with a regenerative water-welcoming design and a new eco-responsible residential zone will further contribute to coastal resilience. By harnessing the existing social, economic, and environmental challenges of the neighbouring communities, our proposal aims to BEND THE CURRENT way of things by BENDING our mindset.

Through more resilient and sustainable approaches to contemporary design, these coastal strategies can be adapted to different contexts along the Singaporean coast for different needs.

To directly contribute to Singapore's agricultural self-sufficiency, Bending the Current's first intervention is a series of agricultural pavilions that will produce about 5% of the city-state's '30 by 30' objective. The detailed architectural component of this proposal is a communal agricultural pavilion that will contribute to the societal consciousness of the practice and reduce the ecological footprint of food consumption. This main pavilion incorporates a hawker market, community centre, community gardens, and an aquaponics system for production to integrate and contribute to multiple spheres of Singaporean life.

Notably, this pavilion will participate in a larger production system to mainly provide for the hawker's consumption but will also have the processing and packaging facilities to be able to provide for the larger consumer market of Bukit Merah, the adjacent residential district to the Keppel Club site.

Taking into consideration the immediate local context can provide regenerative measures and ways of thinking. Reducing Singapore's carbon footprint by reducing the distance from greenhouse to plate can contribute to the city-state's resilience, continue to foster growing change, and BEND THE CURRENT way of things.

BENDING THE CURRENT

When new waves bring new ways

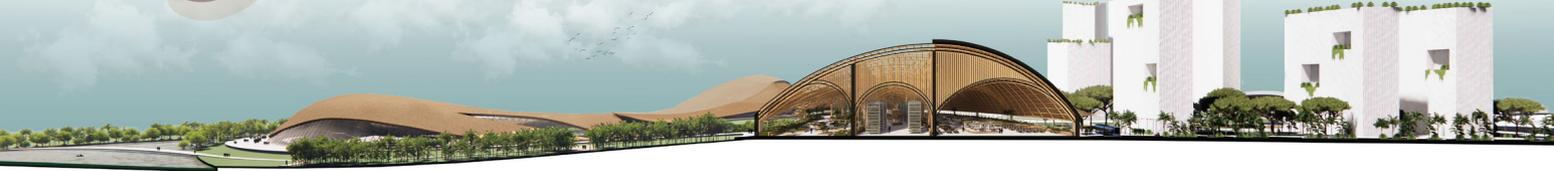
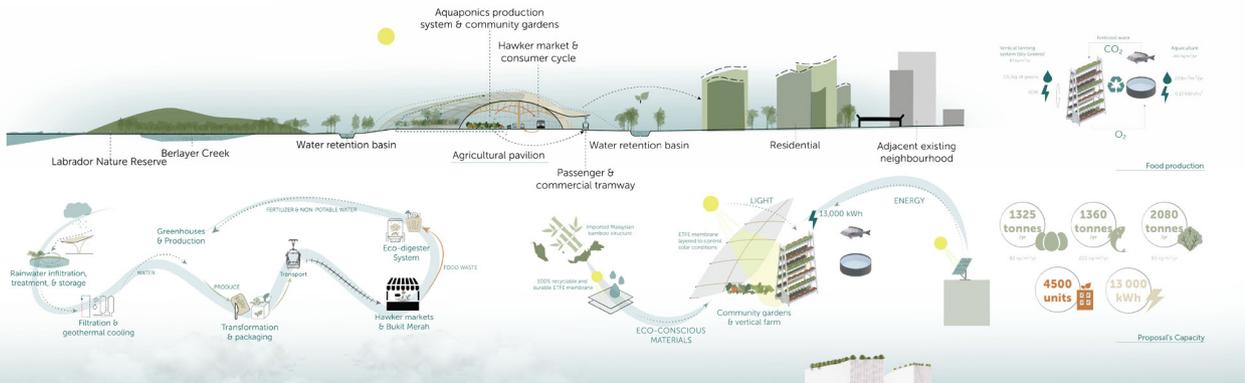
In face of climate change, Singapore's coastline grows more and more valuable for using sea levels, which is a major concern for the country. Located at the tip of the island, 5 metres above the current sea level and limited space means the population relies on imported food for 95% of its nutritional needs. How will Singapore continue to grow and prosper as it loses physical space, and its food security is threatened? Bending the Current is a coastal proposal in urban and architectural strategies that aim to contribute to Singapore's efforts in mitigating the effects of climate change on its social, economic, and environmental landscapes. The coastal, as defined in this team, has the capacity to contribute to Singapore's future stability, growth, and resilience - even with the presence of water.

By using agriculture as a framework for future coastal developments, we can reduce Singapore's reliance on food importation and improve self-sufficiency. This strategy aims to optimize the space available along Singapore's coastline to contribute to the city-state's resiliency in the face of rising sea-levels. The agricultural framework markets itself as a belt that embraces the coastline. Pairing this belt with a regenerative water-resourcing design and a sea-level-resilient residential zone will further contribute to coastal resilience. By harnessing the existing social, economic, and environmental challenges of the neighbouring communities, our proposal aims to BEND THE CURRENT way of things by BENDING our

mindset. Through more resilient and sustainable approaches to contemporary design, these coastal strategies can be applied to different contexts along the island available for strategic spaces.

to directly contribute to Singapore's agricultural self-sufficiency. Bending the Current's first intervention is a series of agricultural pavilions (initially cost-estimated at \$20 million) to be developed. The design and architectural components of this proposal include agricultural pavilions that will contribute to the social consequences of the practice and reduce the ecological footprint of food consumption. The intervention incorporates a hawker market, community centres, community gardens, and an aquaponics system for production and packaging to multiple layers of engagement. In parallel, this pavilion will participate in a larger production system to market produce for the hawker consumption, but will also have the processing and packaging facilities to be able to provide for the larger commercial market of Bukit Merah, the adjacent residential zones to the Keppel Club site.

Taking into consideration the immediate social context can provide regenerative measures and space of thinking. Reducing Singapore's carbon footprint by reducing the distance from greenhouse facilities can contribute to the city-state's resilience, continue to meet growing change, and BEND THE CURRENT way of things.



Overview of the Hawker Market



Hawker Market



Community Centre



Community Garden



Approaching the Pavilion

Bending the Current / A. Barabji, M. Herrera Rivera, D. Santos-Castillo, J. Swail, Owen Rose / Université de Montréal, Canada / Designing Resilience Global 2022 / Singapore

Jury Report



The "Bending the Current" urban design entry by the UDM is based on a highly analytical and comprehensive approach. The design concept is strongly based on the aspects of food sustainability, as an element that gains on attention globally. It therefore promotes urban agriculture with central agricultural belt that additionally emphasizes the qualities of multifunctional urban space, which is central for the suggested concept of self-sufficiency and integrated in the "changing the mindset" of the local population. The jury particularly praised the exceptional architectural design, the reliance on renewable and local materials, and suggested development in phases. Regarding some critical elements, there is a general lack of attention to designing urban structures surrounding the central agricultural belt. Although the connection to the adjacent neighbourhood is not defined, the adaptive design is integrated in an amazing proposal for the sea city interface and a stunning translation of local culture."

RESUMEE

Annette Rudolph-Cleff
Joachim Schulze

The 2023 DRG Symposium was a great success for our department, the Faculty of Architecture and the LOEWE Centre emergenCITY. We are very pleased that we were able to bring together such renowned keynote speakers and welcome such a large audience to the symposium. Over the three days of the event, we were able to attract up to 130 listeners to the digital lecture series and over 200 guests to the lecture in the presence of the Faculty of Architecture.

The event was opened by Oscar Carracedo, who has been involved with the NUS initiative's Designing Resilience programme since its inception. Oscar Carracedo is passionate about the challenges cities and communities face in making their development inclusive and safe, resilient and sustainable. He showed many examples that illustrate the potential of design-based approaches. Many of the examples are projects from previous Designing Resilience in Asia (DRIA) competitions from 2015-2022. Reinstating nature is an important focus of nature-based solutions, new technologies provide a glimpse into the future, and capacity building is a constant theme for communities. Almost all of the design project examples have in common that they address the issue of flood management in a specific place-based way.

One focus of the symposium was on water sensitive urban design. Flood protection and water supply are among the greatest challenges facing cities worldwide. 90% of all natural disasters are water-related. With Kongjian Yu, we were able to present a pioneer who has realised the theme of the sponge city in China in a variety of projects and made it prominent. He uses the landscape as infrastructure and sets new standards with his experimental projects of river restoration, wetland rehabilitation or brown field conversion, both in terms of the scale of the strategies implemented and the objective of nature-based approaches.

Flemming Rafn of Third Nature presented European showcase projects from Copenhagen that address issues of climate adaptation in dense residential neighbourhoods. The design solutions for flood protection in Copenhagen demonstrate the urban scale of water-sensitive urban development in the existing building stock. At the same time, the planning processes spanning different levels of government and the participation of citizens down to private projects underline that the urban context in Europe requires a special culture of integration and embedding.

Herbert Dreiseitl bridges the gap between the speakers with his worldwide activities in project development and teaching. He showed examples of blue-green projects involving the public and the added value of water sensitive urban design for the qua-

lity of life. Success and sustainability can only be ensured if the community is involved in the development of a project. Examples from his teaching and work with simulations and models illustrate the issues we need to emphasise. Whether one is involved in planning, implementing or teaching, collaborative learning is the way to success.

Kevin Fleming's presentation of his research projects involving serious gaming moved away from the design perspective and highlighted the important contribution of research to disaster risk management. The interface between analysis and scenario development is, in our view, an important element when it comes to cities and communities and their decisions about what tasks to tackle and what risks to take.

The disastrous floods in the Ahr valley were the subject of Juliane von Hagen's work. At the time of the symposium, the event had taken place a year earlier, and the images shown by Juliane von Hagen depicted a region that was far from having returned to normal. The Ahr valley represented past failures in dealing with the consequences of urbanisation, agriculture and forestry. It was a powerful reminder that Germany not only needs to catch up with the challenges of water-sensitive urban development, but also needs to rethink its approach to cultural landscapes.

It was clear from the presentations that urban resilience is a mammoth task for communities and cities worldwide. Our living and production conditions have left deep traces in the urban environment. Dependency, displacement and deep cuts between city and countryside become visible, but also opportunities to respond to the challenges of climate change and urbanisation. Environmental degradation, depletion of soils and natural resources, and the food crisis highlight the importance of environmental resilience and the integration of landscape as infrastructure. Competing interests for resources and growing inequalities in living conditions between urban, suburban and rural areas perpetuate this development and show the vulnerability of our living spaces. Environmental protection cannot go hand in hand with environmental degradation. Climate change and natural disasters, persistent droughts and floods, as in the Ahr valley, make it clear that behind false self-confidence lies our true fragility.

The selection of keynote speakers focuses on the sustainable design of urban landscapes and blue-green infrastructures. The potential of nature-based solutions and ecological design is the starting point for meeting the challenges of climate change and urbanisation. As the title of Flemming Rafn's keynote "Nature

strikes back" suggests, we have no choice but to respect the forces of nature. Despite modern technology, as part of nature and the ecosystem, we are still embedded in bonds and relationships, dependent on environmental conditions, systemic cycles, energy balance and social behaviour.

The international student competition "Designing Resilience Global 2022" was a highlight for the participating universities at this conference. The presentation of the design projects shows how the different student teams understand the local challenges and the strategies they apply in their site-specific design projects. Each of the seven entries presents individual solutions that provide a contextual approach to resilient and sustainable urban development. These include dense mixed-use neighbourhoods, vibrant landscapes and integrated and inclusive multi-functional megastructures. Nature-based solutions, revitalised waterfronts and integrated stormwater retention capacity strengthen resilience to rising sea levels and the associated adverse effects of climate change. In addition, culturally embedded functions such as community spaces, urban open spaces, playgrounds and community services ensure that the qualities of urban life are equally addressed. This makes the underlying concepts visible, tangible and therefore open to informed discussion. The design strategies present anticipatory scenarios based on forward-looking concepts and concrete ideas for implementation. In this way, the architectural and urban design concepts encourage the discussion of innovative ideas for strengthening resilience and sustainability within our academic community, with stakeholders, political representatives, NGOs and, last but not least, within local communities. Undoubtedly, the design contributions of the international student teams have a very high value, which may be at a different level than academic research or practical planning experience, but is an equally important contribution to our discourse on resilience.

Finally, we would like to express our sincere thanks to everyone who contributed to the success of the 2022 Designing Resilience Global Symposium and Competition. This includes our keynote speakers, interviewers, the competition jury, the emergent-CITY team and last but not least the international student participants. Without your commitment and dedication, DRG 2022 would not have been possible. Let us all look forward to the next edition of Designing Resilience Global in 2023.



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