



journal

aE studio / NR 9 2019/2020

WE TEACHERS OF ARCHITECTURAL ENGINEERING
OF THE FACULTY OF ARCHITECTURE AT
DELFT UNIVERSITY OF TECHNOLOGY

ACT IN SOLIDARITY WITH THE THOUSANDS OF PEOPLE
MARCHING FOR THE FUTURE OF OUR PLANET AND **SUPPORT**

THE EFFORT OF THE NEW GENERATIONS TO ENSURE
THEIR OWN FUTURE AND THE ONE OF THEIR CHILDREN.

IN OUR DAILY PRACTICE, WE
DESIGN AND TECHNICAL
INNOVATION

COMBINE

BY SEEKING INNOVATIVE AND INSPIRING
ARCHITECTURAL SOLUTIONS FOR
ENVIRONMENTAL AND SOCIETAL ISSUES.

WE ARE DRIVEN BY THE NEED TO THINK DIFFERENTLY ABOUT FLOWS OF
RESOURCES, ENERGY GENERATION, EFFICIENCY AND PEOPLE PARTICIPATION

WE ENCOURAGE STUDENTS TO EXPLORE THEIR
IN DEVELOPING A FUTURE OF URGENT CHANGES BY
UNDERSTANDING EXISTING POTENTIALS AND BY COMBINING
THOSE WITH THE HOPE WHICH INNOVATION BRINGS.

**ROLE AS
ARCHITECTS**

THE BUILDING INDUSTRY LARGELY CONTRIBUTES TO GLOBAL CO2 EMISSIONS

BELIEVE THAT NEW ECONOMICAL AND INDUSTRIAL
PROCESSES ARE POSSIBLE AND NECESSARY.

CLIMATE RELATED CHALLENGES HAVE TO BE ADDRESSED IMMEDIATELY IN ORDER TO
ENSURE A PROSPEROUS FUTURE FOR OUR PLANET AND THE FUTURE GENERATIONS.

News aE in action

Introduction aE Chair / Innovating Architecture

by Thijs Asselbergs

With a little help from my friends

What would you think if I designed a new world, would you stand up and join me? Lend me your knowledge and I'll design you a place that can help to make a better world.

In 1967 the Beatles made a song in which they asked each other questions: 'with a little help from my friends'. They helped each other to find out topics about life and love.

In 1966 the architect Cedric Price made the provocative statement often used by aE: 'technology is the answer, but what is the question?' It is intended to invite everybody to search, question and reconsider the impact of technological progress on architecture. Now more than 50 years on, this question is as relevant as ever.

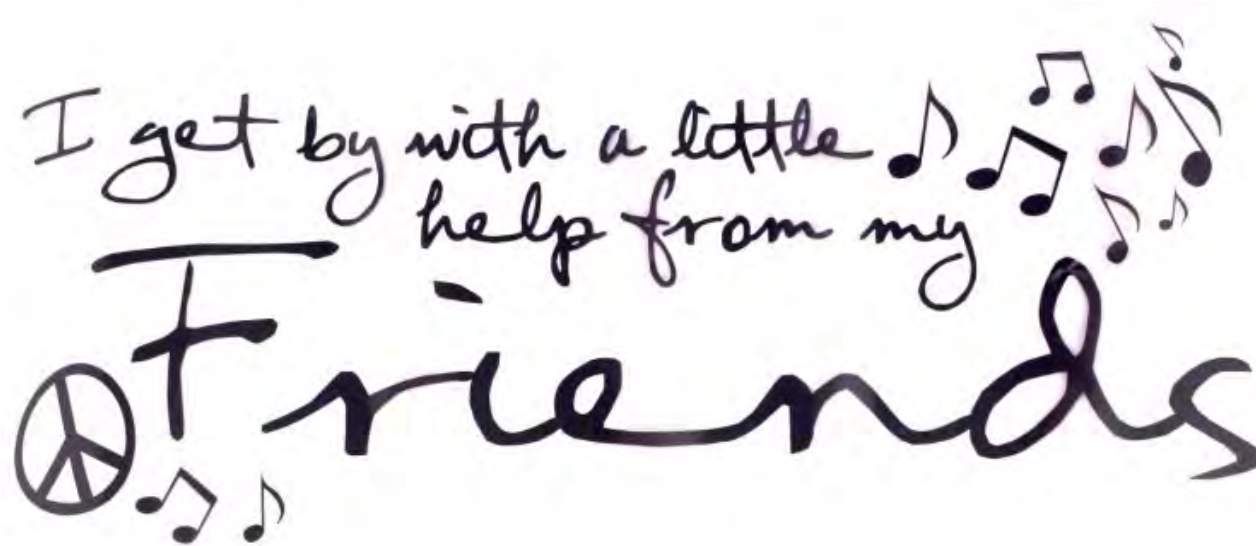
We as teachers of Architectural Engineering ask our students to think about which question they want to address. We work from the technical fascination of the student. How do you make something, what is it made of, where does the material come from, why do I want to apply it, what can be improved, does it contribute to a better climate, can it be circular and what added value do you create with the design?

We want to integrate technology optimally in architecture and the built environment.

In our aE graduation studio this philosophy works in different contexts and with different techniques and resources. We are extremely interested in how we can use robotic and CNC milling techniques to make better architecture. We focus on current environments that require innovation. These are areas where shrinkage or the high building density is the challenge. We choose areas in Amsterdam such as the Marineterrein or the renovation of the ZuidoostZuid district. On the border between the Netherlands, Germany and Belgium, we work together with the

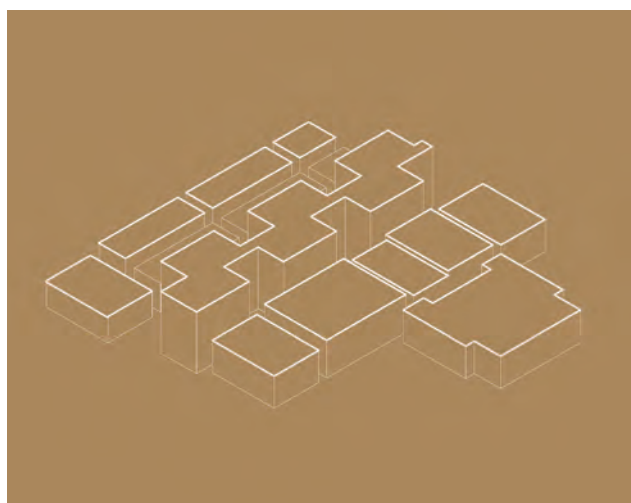
Landscape Architecture department on Harvest. Or we look at what happens in Bandung in Indonesia or on the island of Sint Maarten. We work through all scales, from component to structure, from object to the entire environment. In this way we work on designing for a new world. For this we are looking for friends who can help us to give the right answer to the design questions that we ask. In this ninth edition of aE journal, we would like to show you the results we have achieved in the recent year with our students and the goals we envisage in the coming period.

Are you a friend of Intecture?



Circular AMC

aE Big Project



As part of an actual renovation based question aE / Intecture addresses together with AMC the future of this city-building within the scope of energy transition and circularity. To work on proper answers we share this topic with the department of Product Innovation, Heritage & Architecture and Management of the Built Environment. Aim is to gain insight in do's and don'ts in order to make a set of rules as a method for further development and good architecture for current and future use.

3XN - Upcycle

aE Intecture Publication



As part of the visiting professorship of Kasper Guldager Jensen, partner at 3XN/GXN, research has been conducted on the potential for urban mining and urban upcycling in Amstel III. The results have been translated into a booklet called Upcycle Amstel and include analyses of current political frameworks regarding circularity goals, stakeholder interviews, case studies, and some key recommendations. The booklet should inform and inspire designers, developers, municipalities and others on the potential of urban upcycling in Amstel III.

NRP Master Prize

aE Intecture 3rd Place



Last October, aE student Nikki de Boer won the 3rd prize at the NRP Masterprize with her graduation project "Connecting Walkup Apartments in Local Closed Flows". According to the jury "all aspects that currently matter, certainly with the Climate Agreement in mind, were taken into account. Interventions at district, neighbourhood and building level were taken up in order to realize all high ambitions". Nikki's graduation tutors were Thaleia Konstantinou, Paddy Tomesen and Emiel Lamers, who was also present at the prize winning ceremony.

aE in action News

Ongoing aE collaborations



Shared Heritage Seminar

On the 7th of March 2019 a seminar on Shared Heritage in Indonesia has been organised by students and tutors of the Shared Heritage Lab, a collaboration with the School of Architecture, Planning & Policy Development of Institut Teknologi Bandung (ITB, Indonesia) which is set up as a cross domain graduation studio of Architectural Engineering, Heritage & Architecture and Urbanism (Landscape

Architecture). Student projects formed the ingredients to discuss the lab's central question, *how to turn the former colonial cities of Bandung and Semarang into inclusive, thriving and healthy cities for working, living and leisure*, with a wider audience of shared heritage experts, such as the RCE and the Liveable Cities platform of the Indonesian Diaspora Network. An exhibition of student projects accompanied the seminar and will form the base of a final exhibition in Bandung in 2020 during the 100th year anniversary of ITB.



IABR Harvest Lab

From last September 2018, aE / Intecture and Landscape Architecture are starting a Cross Domain studio. At a time when technical innovation plays a major role in thinking about and designing the built and unbuilt environment, aE / Intecture and Landscape Architecture are looking for innovation through all scales. From the scale of the landscape to the building, from the scale of the object to the region. We work

on inspiring examples that put the metabolic thinking on the map. How these fields of design will influence each other is part of the quest, but it will certainly lead to new types of space and materialization in both architecture and landscape architecture. This program has been selected for the International Architecture Biennale Rotterdam 2018-2020 'Missing Link' and is offered in the graduation labs of aE / Intecture (MSc track BK-Architecture) ture (MSc track BK-Landscape Architecture).

aE Alumni Day



Rethinking Architectural Craftsmanship

This year's aE Alumni day has been organised on the 20th of December 2018 around the central theme of Rethinking Architectural Craftsmanship. Nine aE Alumni from all over the world were invited to tell about their graduation projects, their professional work experience and how this relates to the architectural craftsmanship they are developing. The presentations of Tanya Tsui (TU Delft), Krzysztof Jakub Gornicki (Foster

+ Partners), Lara Smits (ABT), Maria Vera van Embden Andres (Studio Drift), Eric Geboers (CONCR3DE), Nina Kuipers (NACO), Cas van der Zanden (Witte Haai), Rushabh Chedda (Conscious Designs) and Daniele Tanzi (Superuse Studio) showed that aE graduates are very entrepreneurial and that they find work within highly innovative architectural work domains. An interview with aE Alumni Eric Geboers of CONCR3DE, a start-up company specialized in 3D printing of sustainable stone material is featured on page 15.

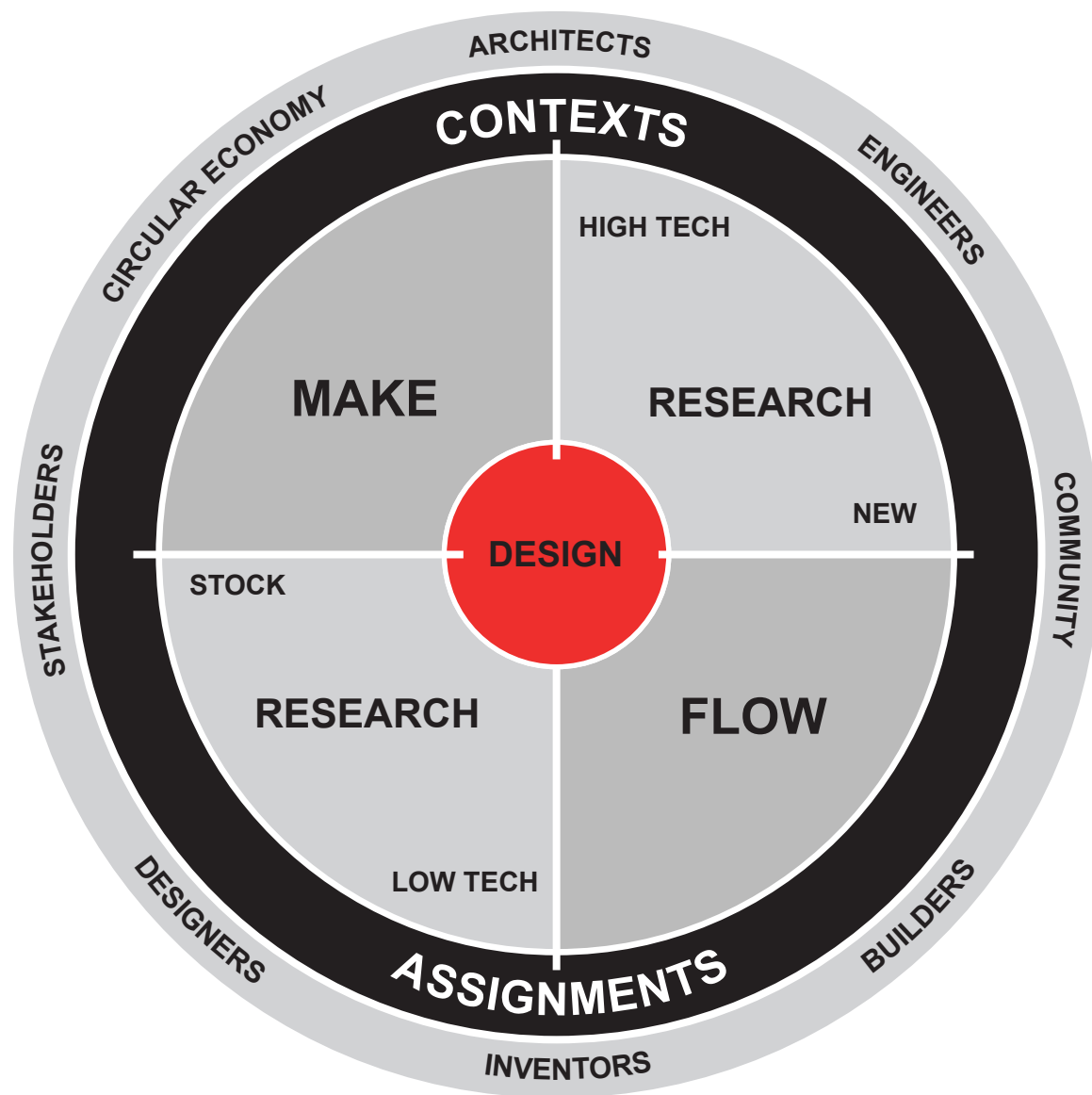
aE Studio 21 / 22

Living Lab Approach

This graduation year (2018/2019) two groups of students (aE Studio 21 & 22) launched new projects. At the start of the two semesters they kicked off with the Pavillion Pitch, through which they introduced themselves and their technically inspired design fascinations. aE Studio further developed its Living Lab Approach of working. Each assignment is connected to a real-life context and to corresponding stakeholders and communities. Students team up in solving societal issues by means of architectural engineering and creative thinking. On page 30 a summary of the Upcycle Amstel III project is included, which shows how aE students collaborated with the City of Amsterdam and a professional design firm (3XN, Kasper Jensen) to explore the possibilities for a circular economy and built environment.



Introduction aE graduation studio



FLOW

In Flow we see buildings as structures interwoven with their wider system. The sustainable performance of buildings has everything to do with flows. Well managed flows of people and resources contribute to valuable, comfortable and healthy spaces and cities.



STOCK

Stock is about the potential of the existing by looking differently to what is already there, by making use of a technical fascination, in relation to current or future needs. Ideas for intervention can vary: the upgrade of existing housing stock, office buildings or product development of interiors.

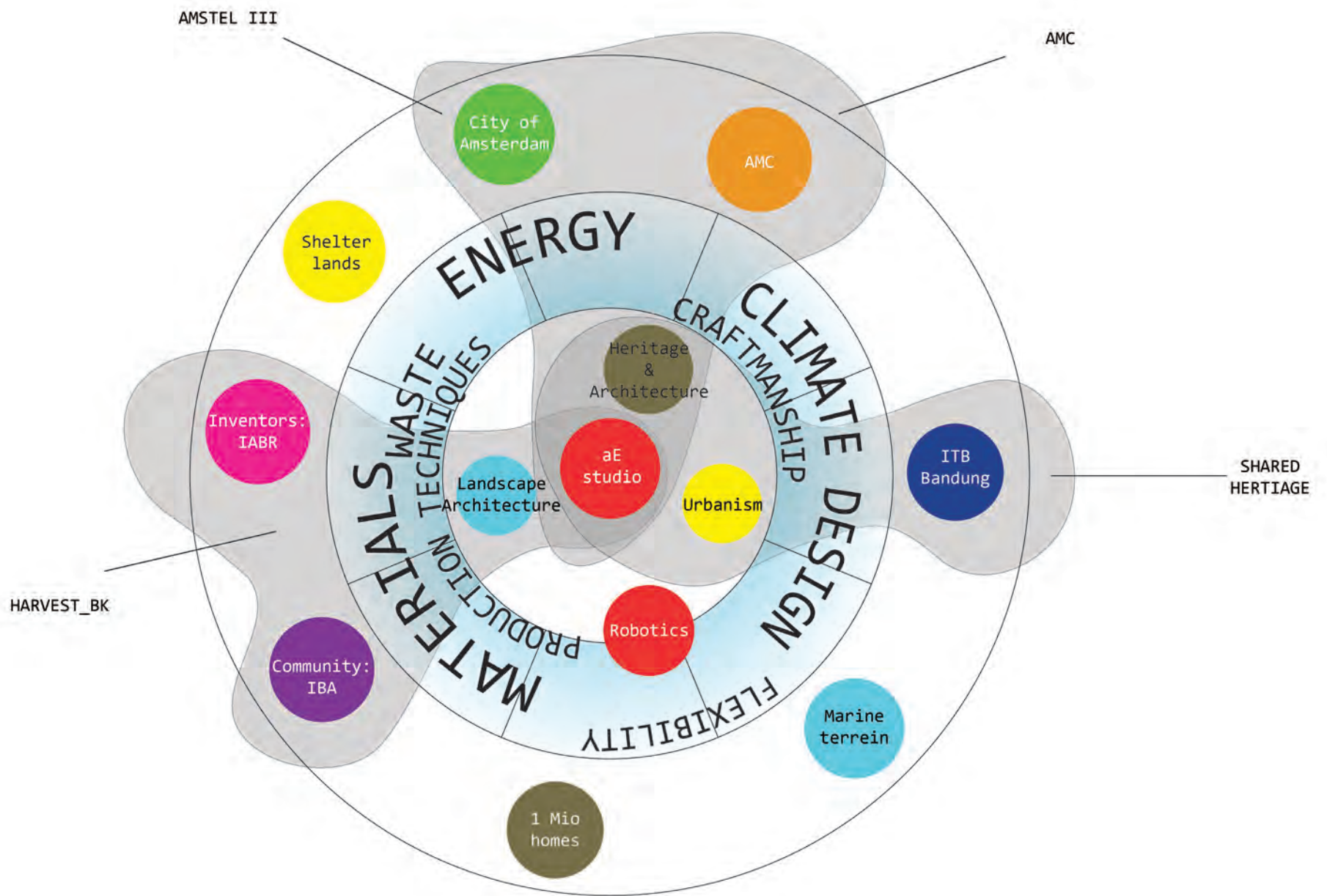


MAKE

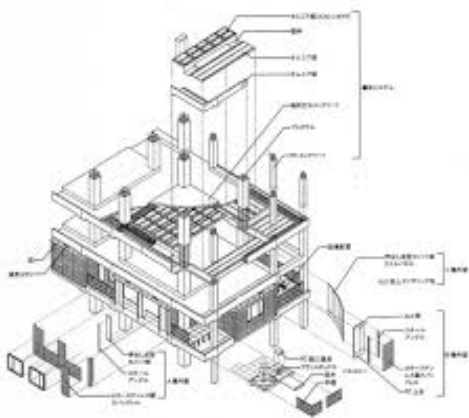
Make is about new (digital) production methods, the (re)-use and development of materials and systems for existing and new applications. How do we change the future of our environment, our homes and our cities, using a bottom up approach towards a better and more sustainable future?

Assignment Introduction

Collaboration & Knowledge Exchange



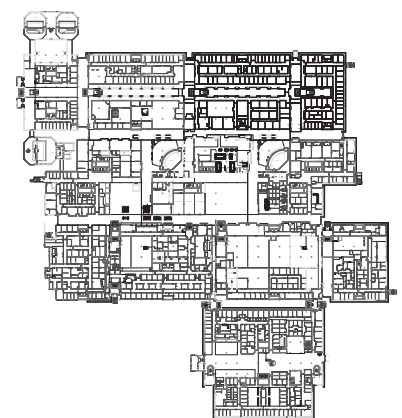
Themes & Contexts



I MILLION HOMES



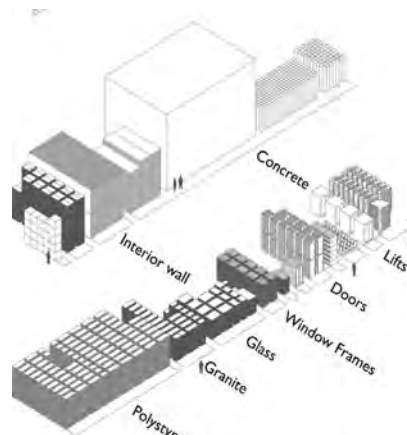
HARVEST_BK



RE-DESIGN AMC



ROBOTIC BUILDING



CIRCULAR AMSTEL III



SHARED HERITAGE @ BANDUNG

Context Marineterrein, Amsterdam

Structures for social interaction

text **Thijs Asselbergs**

Marineterrein offers an oasis of tranquility in the bustling city of Amsterdam. Though a protected enclave, it has nevertheless traditionally been a hive of business activity. The municipality would like to preserve this character. Marineterrein is to become a meeting point for the residents of Amsterdam, a place where they can enjoy the peace and quiet, the water, and the panorama over the city. Besides this, it will become a place in which researchers and entrepreneurs from many nations can collaborate as they wish.

aE/Intecture is working together with the Bureau of the Marineterrein and is looking for a new experimental approach. Students are working on different subjects: from a complete new energy system to an innovative school, from a tiny house project to temporary festival architecture. We like to discuss our proposals also with the local people who are working or living at the Marineterrein. Working on these types of experiments we like to contribute to an innovative way for new uses of the city and add value to such an enclave in the center of a metropolis in western Europe. The development of the Marineterrein Amsterdam is not running the traditional course of progression. In contrast to traditional project developments, the projects have no final goal or plan of functionality. Instead, themes have been created within which developments will take place.

The express wish of Amsterdam is to have a gradual trajectory of growth, on the basis of a gradually growing consensus. This innovative approach has been agreed upon in an administrative agreement and will be completed by Bureau Marineterrein Amsterdam. Furthermore, the prospect of cohesion and interaction is increased, as the owners and users will be working together on completing the character of the property instead of working towards the completion of a predetermined master plan.

The intention is to allow the area to grow in value. This includes economic value as well as societal values such as sustainability, integration with the city, and the improved profiling of the international identity of Amsterdam. Growth in terms of societal value is important to the owner, the Dutch government, who can then economically and socially distance itself from the property; as well as being important for the Municipality of Amsterdam, who can then decide in which direction they would like this new part of the city to develop.



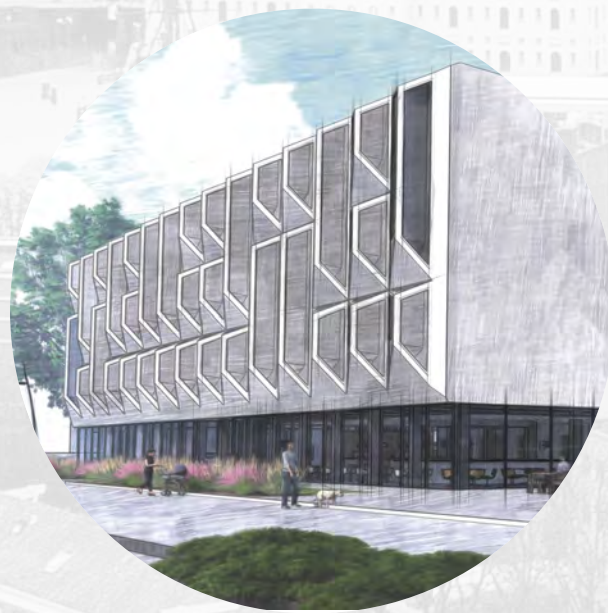
THE MARINE PASSAGE

by **Jelmer Armory**



How can the design of a temporary pavilion for the 2021 Amsterdam Biennale, at the Marineterrein, be made circular?

This pavilion design introduces inhabitants to this new part of the city and attracts tourists from the inner city to the Marineterrein. The pavilion contributes to the development of the area while becoming an innovative hotspot. The design is circular using design decisions based on circular design strategies. The thematical research focusses on the guidance towards circular building design.



ADAPTIVE FACADES

by **Martijn Aling**



This research provides a set of guidelines for systemized façade retrofitting in mixed-use buildings to become nearly energy neutral. Heating, ventilating, and air-conditioning (HVAC) are parts of the major energy consumption in buildings. Nevertheless, until recent, all effort and attention have mainly been focused on increasing and optimizing the thermal insulation. The development of dynamic building envelope technologies, which are capable of adapting to changing outdoor and indoor environments, is considered to contribute to achieving nearly energy neutral buildings



BLOOMING PAVILION

by **Jiajia Zhao**



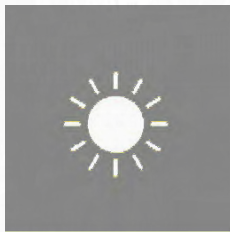
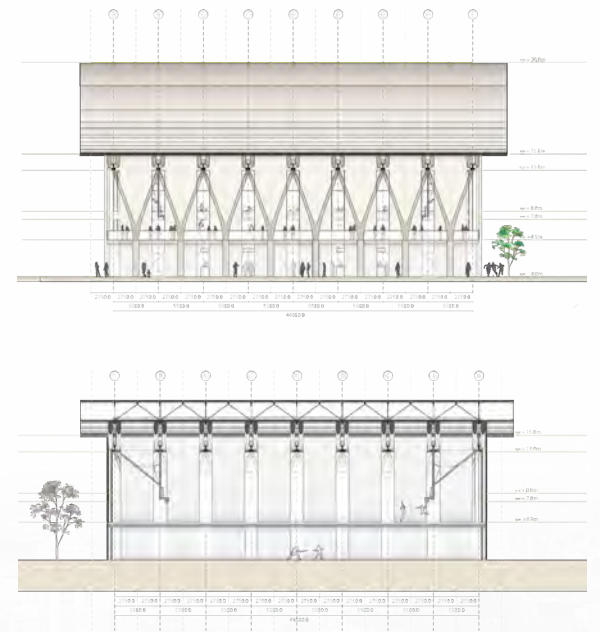
Nowadays, Marineterrein has become an incubator for the dreamers. The 'organic development' of Marineterrein indeed calls for a gradual and slow change for the pioneers to launch their dreams. However, there also needs to be a chance for the dream to be announced and to welcome the city as a part of it. The project introduces an annual Expo to Marineterrein for one month every year through an inflatable pavilion floating on the water in which the innovation companies and entrepreneurs could tell their story to the industry as well as the public.



PLAYING WITH LIGHT

by **Olly Vleugelers**

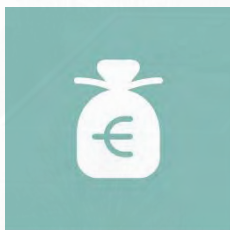
The design of traditional sports halls has tended to exclude natural light. Mostly due to problems such as glare, overheating and local cooling. Variation in light quality and quantity can be unmanageable and fenestration can lead to unwelcome distractions. However, the resulting designs are rarely compatible with attractive architecture and pleasing indoor environments. The project gives a wider use of a sports complex. It becomes a new center for urban life at the Marineterrein of Amsterdam, providing the perfect setting for large sports competitions, events and meetings.



natural light



indirect light design principles



cost efficiency



complex sports program



Context Marineterrein, Amsterdam

Shared living and working environments



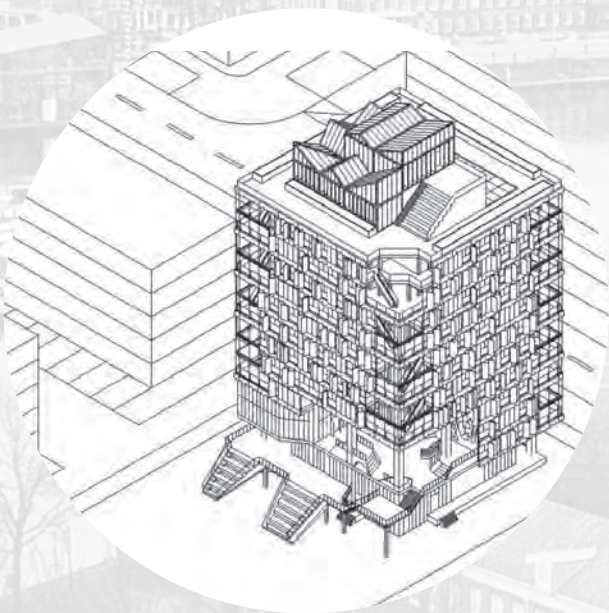
GATHERING THROUGH WATER INTEGRATION



by **Michelle Remmers**

How can water and its natural cycles be integrated in a hotel building design for the Marineterrein in Amsterdam?

The goal of the design is to minimize the impact of climate change in relation to the water system. In combination, the design strives to be an inspiration for others in how to deal with the consequences of climate change and how to raise awareness for these issues within a community through the means of design.



BOTTOM-UP VERTICAL COMMUNITY



by **Mara Wang**

Office vacancy is an ever dominant problem in the Netherlands and abroad. While there are still a lot of issues unresolved, we might be overwhelmed with ideas, concepts and suggestions on how to tackle this vacancy.

This graduation project tried to give a different perspective on this vacancy by introducing the concept of open building and link this phenomenon with the mid-income housing shortage situation. The building's location characteristics and the physical building characteristics will be assessed.



FUTURE PROOF BUILDING 028



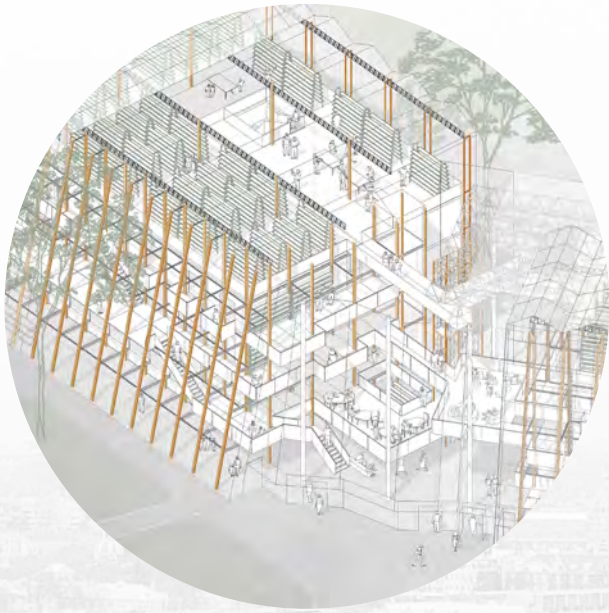
by **Thomas Van der Geest**

The intent of the design is to develop a multi re-purpose strategy whereby functional change can be accomplished with minimal technical modifications, by taking into account the changing future.

The Marineterrein in Amsterdam is an ideal place for test-casing this strategy, because of the redevelopment of the area. The design tests how existing vacant stock can be transformed into functional adaptive buildings, with a variety of functions.



Public production environments



FARMHALL

by **Ruoning Ni**



How to design a visitor welcoming vertical farm and housing complex based on an existing building at the Marineterrein to optimize the building performance as well as the resource utilization?

This design aims to create high quality accommodations for young professionals, providing an urban farm solution with high productivity, intriguing spatial experience and educational impact. The goal is to reduce the overall resource consumption of the building complex compared to the conventional dwellings and farms.

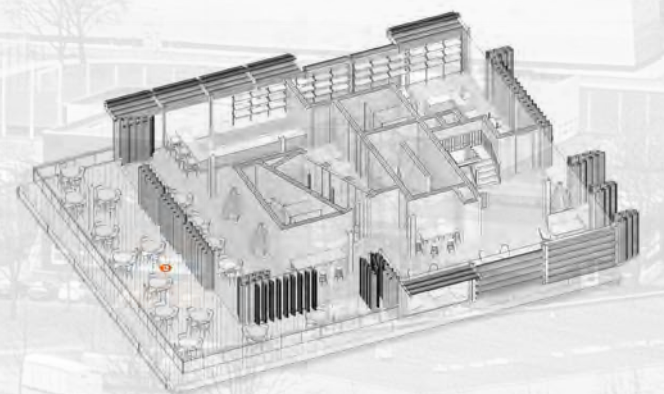


AN ADAPTIVE VISION

by **Robert Jan Pruim**



Many companies and inhabitants are interested in the Marineterrein. Economical, historical, leisure and living are important factors for the different entities. This leads to a paradox conflict of the development of the site. To get control on the area the municipality developed guidelines which are focused on vision and ambition. This project takes these different vision and ambition guidelines into account and redevelops that into a new plan: redeveloping, activating, innovating and connecting the buildings on the Marineterrein, so it becomes an attractive and futuristic neighborhood.



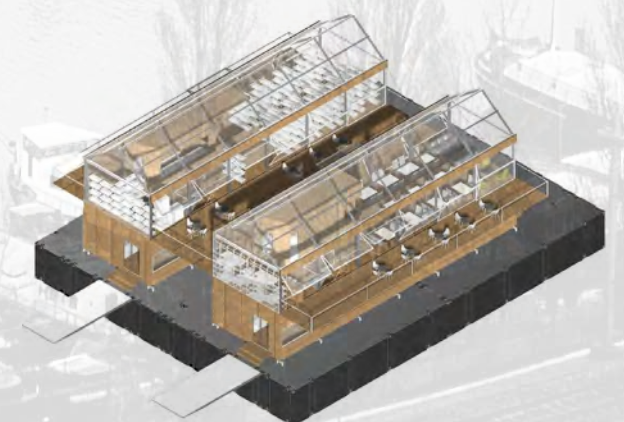
BIO LOOP PLUG-IN

by **Yuge Zhu**



One-third of the food produced is wasted while the demand for food is increasing worldwide. The food supply in the consumption phase is not only the last chain but also wastes the most. Yet the majority of residents in the Netherlands have still underestimated this number.

Therefore, the design aims at recycling and reusing the food waste on the one hand, and on the other hand potentially reducing the waste by breaking the barrier that hinders consumers to be waste-conscious.



Context Parkstad Limburg | Gardencity 2.0



Structures for productive landscapes and energy artefacts

text **Annebregje Snijders**

Parkstad, a cooperative body of 8 municipalities, covers an area of +/- 200 km². Less than 20% of this area is being considered as 'town' whereas more than 80% is 'green'. Where in the Randstad the focus is on greening and climate adaptive policy, this quality is already available in this area. But how are such common city landscapes used, what do they look like and what public value do they generate?

Parkstad is a leader in future thinking about energy transition and circularity and wants to be energy neutral in 2040 (Parkstad Limburg Energy Transition - PALET 3.0). Two third of the required energy will have to come from renewable sources in the region. The potential of wind energy and solar fields is virtually nil due to policy restrictions from the POL (provincial development plan). As a result, each municipality looks for solutions within its own borders, with the danger of further fragmentation and fragmentation of the landscape. However how we offer space for energy, water and mobility is strongly related to the way we offer space for living, working, care and recreation. "By considering transition issues in conjunction, robust, healthy and sustainable solutions are created" (Panorama-Nederland, College of Government Advisors).

aE studio works together with students and researchers on integrated architectural design solutions at this location, using the energy transition as a handle for a renewed and healthy living environment. In combination with the spatial potential from the area itself, we work on design solutions that strengthen the social activity, economy and its spatial identity.



Source: Samuel de Vries



THERME BIOMASS

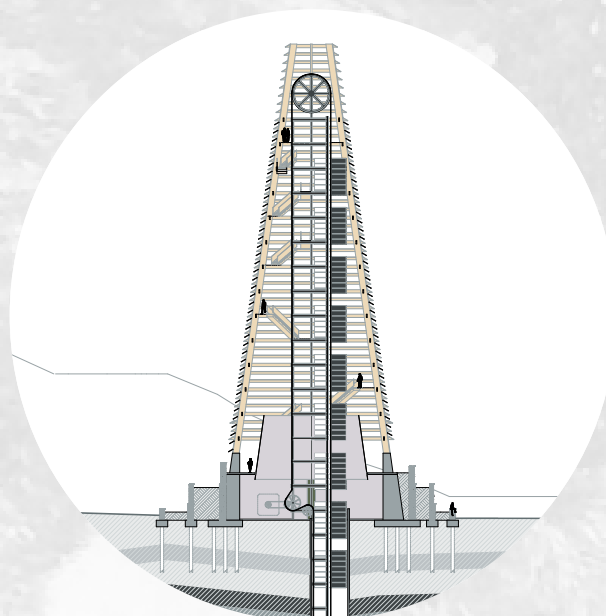


by **Yixin Lyu**

Parkstad is now facing urban shrinkage. The development of biomass probably can provide a change to this region. Therme Biomass, as a power station, will produce energy and resource to Parkstad. Integration with a bath center will attract guests to come here and learn more about this renewable energy and technologies. This project is an experiment for the future of industrial architecture.



Source: AnnA



SUBTERRANEAN ENERGY STORAGE



by **Jornt Walsmeer**

The transition from fossil fuels to renewable energy is currently happening in full swing. Energy storage is necessary to provide reliable electricity supply throughout the day. The deep mineshafts of Parkstad have potential to store excess electricity. By extending this process into accessible towers on top of the shafts, the process can be observed in the surrounding area. The visual nature of this method can aid in establishing a more conscious relation between people and energy consumption as well as making the region self-supporting.

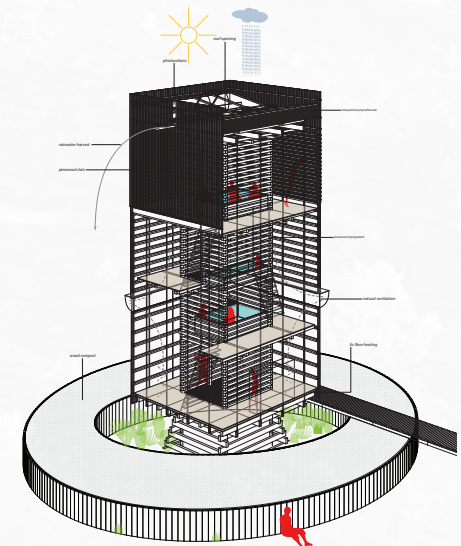
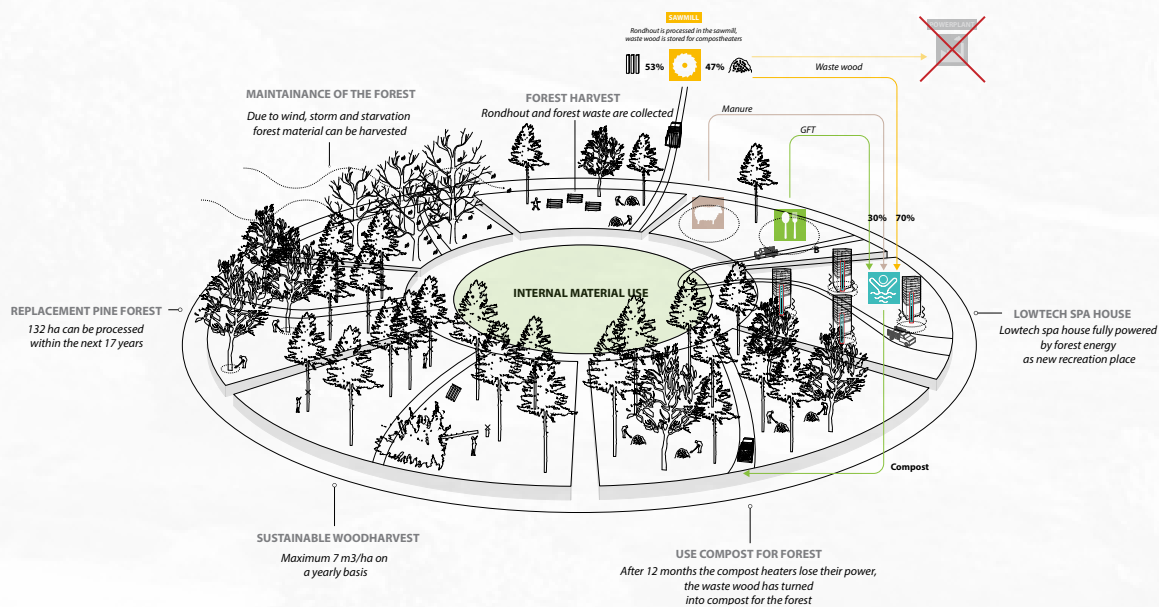
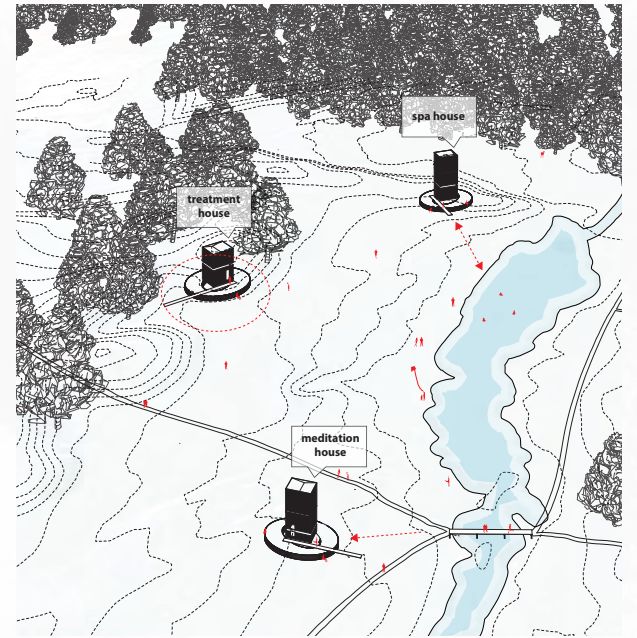


RECREATION FROM THE FOREST



by **David Kooymans**

This project explores local energy potentials from the forest around the Brunsummerheide. A nature area with a characteristic mining and extraction history. After the mines closed in the seventies different recreation places in the area disappeared, the forests lost their production function. This project demonstrates how local materials and the landscape could be used in a smart way. It reintroduces a recreation place using a lowtech approach and proposes several spa pavilions made of local wood, powered by local biomass from the forest.



Context Harvest_BK Lab, Limburg

IABR-

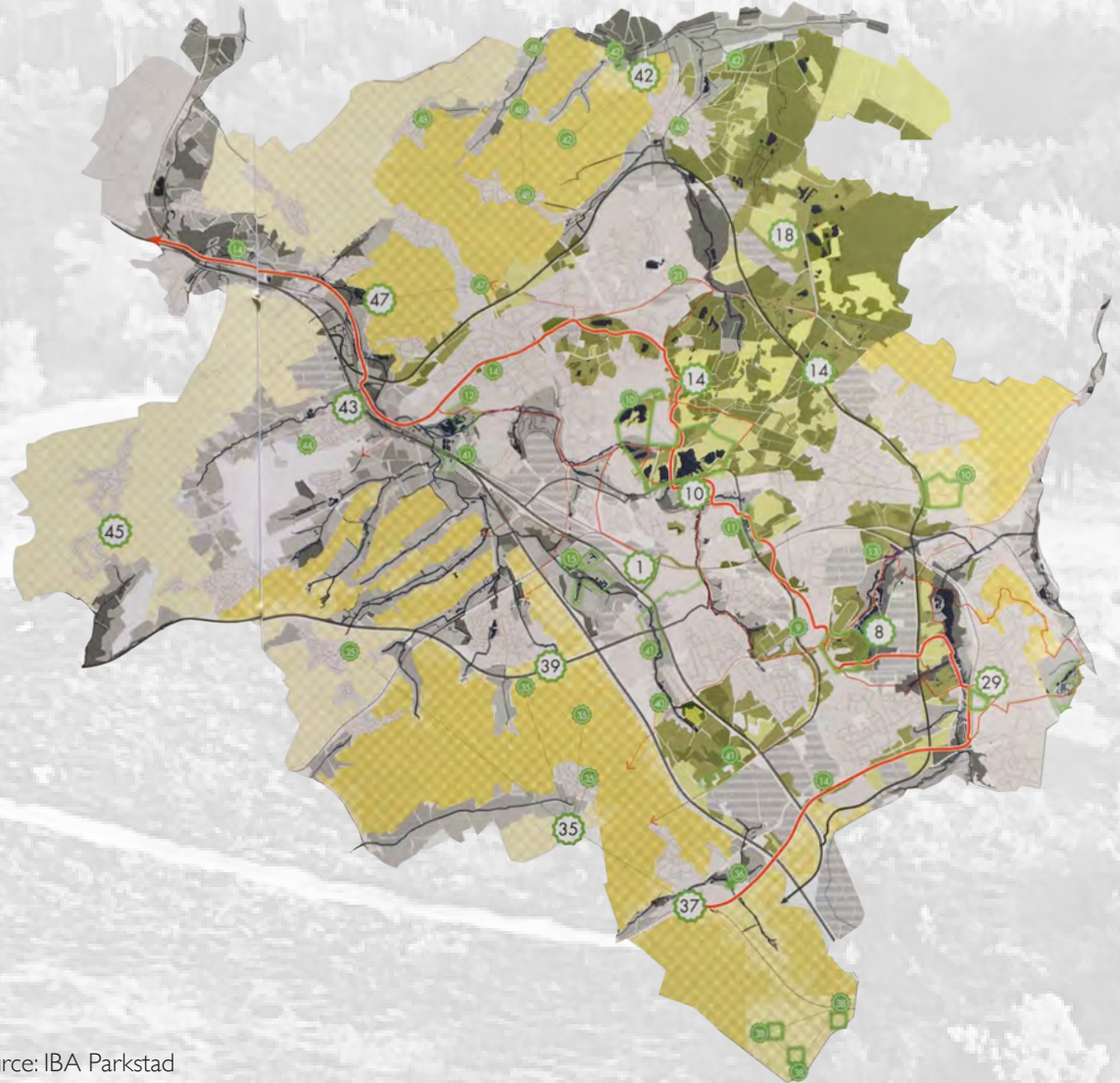


Cross domain between aE Studio and Landscape Architecture

text **Annebregje Snijders**

City Region Parkstad is the cross-border cooperation between Brunssum, Heerlen, Kerkrade, Landgraaf, Nuth, Onderbanken, Simpelveld and Voerendaal. Until the end of the 19th century, the region consists of a large number of small farming communities. Supplying the coal for the industrial energy demand of the 20th century, Parkstad becomes a prosperous mining industry landscape. Until the 70's, life in the region is formed entirely by this coal extraction, both economically and socially. Less polluting and cheaper energy sources made the government close all mines. The region turns from prosperous to poor, with high unemployment rates and no prospects. Today through creative and good governance with vision, the region has transformed from grey industry into a green city region.

After these two transformations, Parkstad Limburg is working on its third where Harvest_BK contributes to, by working on a Gardencity 2.0. This concept is based on the uniqueness of the site, providing a coherent and renewed productive urban landscape. Forests, parks and heathlands as well as agricultural and industrial landscapes are under scrutiny whereby the metabolic flows, such as energy, water and food are mapped. It examines the demand in relation to resources, nutrients and their cycle influence on the architectural landscape. The combination of initiators link scientific knowledge to social knowledge on location. As a result, the social consequences of functional spatial revolutions are included in the design process. The fields of design will influence each other and lead to new types of space and materialization in both architecture and landscape architecture.



Source: IBA Parkstad

Location:

Parkstad Limburg

Initiators: TU Delft Faculty of Architecture, Chair of Landscape Architecture & Architectural Engineering, Statistics Netherlands, World Council on City Data

Collaboration:

Internationale Bauausstellung 2020 (IBA Parkstad)

Internationale Architectuur Biennale Rotterdam 2018-2020 (IABR)



MISCANTHUS GRASS

by **Hatto Kienhuis**

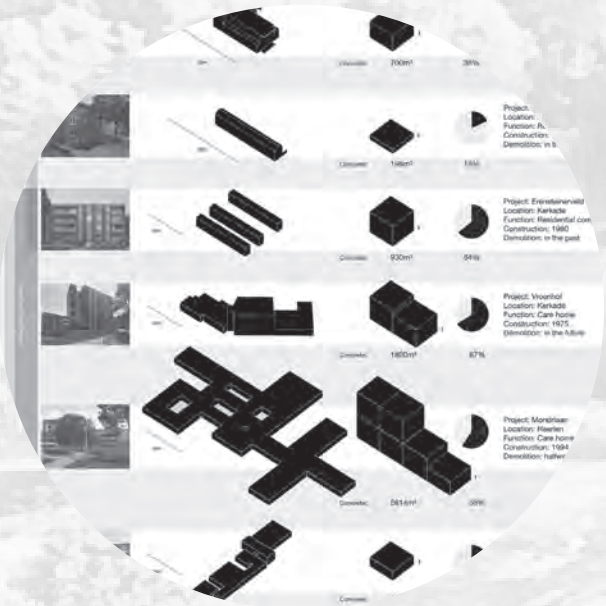
After the closing of the mines, the region Parkstad had difficulties finding new economies. A new initiative could be growing Miscanthus x Giganteus, a super grass, on the many grassplots in Parkstad, especially near infrastructure or on empty industrial plots. When harvested the dry material can be used for producing ethanol and carbon fiber.



BUILDING BLOCK FOR PARKSTAD

by **Sarah de Bruin**

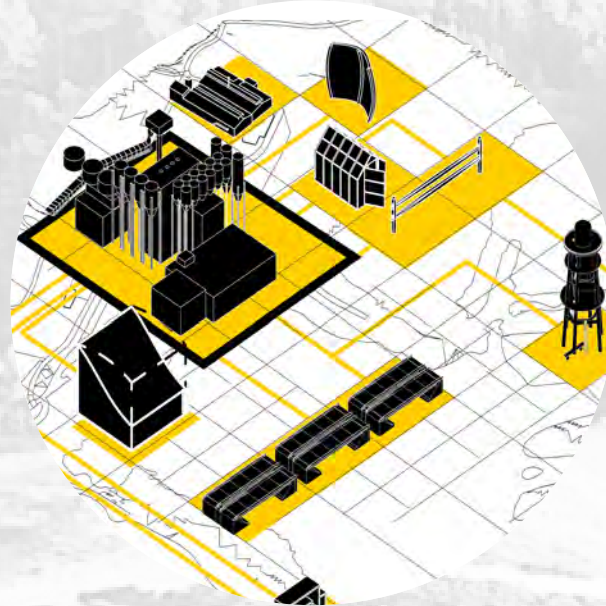
The objective is to research and design with the possibilities of applying fungi through different scales within the built environment of Parkstad. By making use of different waste streams of local industries in Parkstad, the "roots" of this living organism called mycelium, can transform this waste into valuable new building materials.



DEMOLOGY

by **Szymon Lapaj**

Demology is the story about the shift of regional identities: from Coal Mining into Urban Mining. Parkstad for centuries appeared as material landscape. Materials were mostly excavated from the ground. Today we can obtain precious construction materials from existing vacant buildings through demolition and recycling (urban mining).



SHIFTING SANDS

by **Maria Kaik**

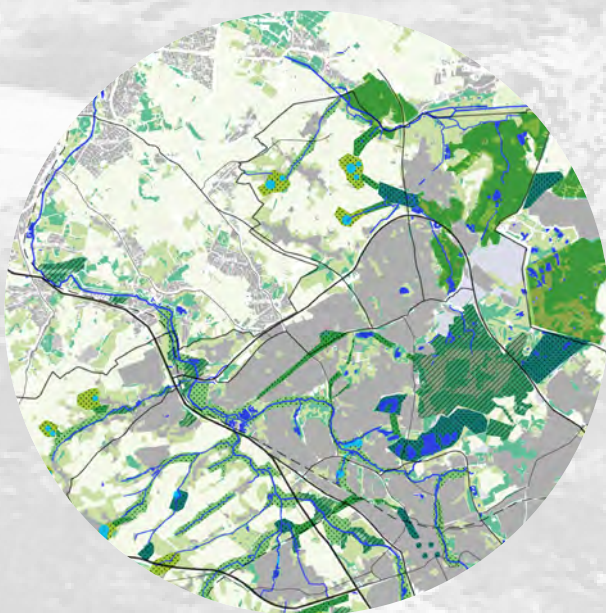
In the shrinking Parkstad Area, where the former instruments of financial accumulation are left unattended, a series of architectural interventions will form an interdependent network. It is a strategy for reassembly of the former infrastructure into devices which stimulate the ecology. Developed over time, they can react to the dynamic changes in the ecosystem.



WATER PURIFICATION COMPLEX

by **Joshua Ho**

The aim is to design a water purification complex that integrates functional processes and architectural design to reinvent the cycles of water and energy. This project explores how the pumping out excess mine water blooms into catalytic modes of function, nourishing both land- replenishing local water sources and ecosystems, and people- providing energy, food and sculpting social interaction.



RE-GREEN

by **Chang Guo (LA)**

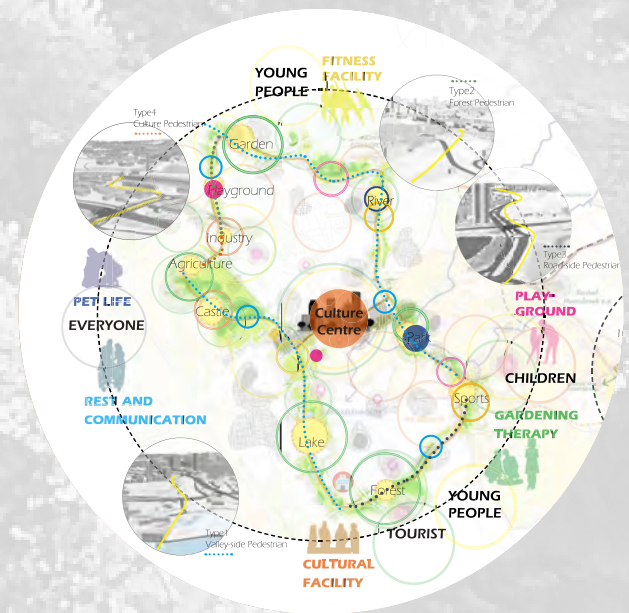
The project aims to strengthen the ecosystem value of Parkstad Limburg to prepare for an uncertain future by enhancing the biodiversity. Increase potential rather than tap and consume potential of this area. Creating a new balance between natural and urban systems, restoring nature in urban areas to provide more space and possibilities for local flora and fauna.



BLUE BATTERY

by **Shuai Shao (LA)**

The aim is to generate a landscape system, based on a series of spatial knots, combined with a new kind of underground pumped hydropower technology. It creates a new urban metabolism by re-utilizing the underground remains of the industrial heritage. It will bring new features to the metropolitan landscape, related to the history and the memory.



HEALTHY LIFE ROAD

by **Yajie Sun (LA)**

As one of the most famous mining area in the history of the Netherlands, Parkstad is facing the challenges from shrinkage and aging society now. This project aims to built the living main road system to promote a positive lifestyle for active aging and public health. Elders can experience multi-activities and communicate with people in different ages.

Context Robotic Building

Architecture in the age of Robotic Building

by **Henriette Bier**

As part of the aE Studio, Robotic Building (RB) focuses on the advancement of robotics in architecture. Robotics fundamentally changes architecture from conceptualization to production and use. Hence developing an understanding of how robotics impact building processes and buildings and applying this understanding in design and robotic prototyping is crucial part of the studio.

Robotic Building (RB) has been established 2014 as part of Hyperbody, which has ceased to exist spring 2018. Meanwhile, the integration of RB in Architectural Engineering in fall 2018 has been successfully implemented. The MSc 3 research topic links to research implemented by the RB research group and focuses in the academic year 2018-19 on the development by RB means of 100 Years Bauhaus Pavilion, which is sponsored by DIA and is supposed to be built in 2019 on the Bauhaus site.

RB looks back to a successful history of 4 years. In this period, 40 students have graduated with focus on RB. The RB group grew from 4 to 6 team members consisting of 4-5 researchers and 1 programmer. Key moments in this period were the establishment of the first robotic lab hosting a KUKA robot, the establishment of an international collaborative framework Adaptive Environments involving partners from EU and US, the successful 2 years collaboration with DIA involving student exchange, the two 4TU funded projects Scalable Porosity (image above) exhibited amongst others at Centre Pompidou and Variable Stiffness exhibited at Dutch Design Week, the publication of the first volume on Robotic Building in the Springer Book Series Adaptive Environments, and TEDx Delft Salon presentation.

As part of AE since fall 2018, RB has continued successful collaboration with DIA that takes advantage of the larger KUKA robot available in Dessau, co-initiated collaboration with University of Waterloo resulting in a joint workshop with Industrial Design Engineering at Delft Science Centre, and promoted results via media and publications in conference proceedings, journals and books. Particularly, the newly established collaboration with Chinese International Green Building Alliance, Southeast University Nanjing, Yangtze River Urban Architectural Design Co., Ltd. The Third Construction Co., Ltd. of China Construction Eighth Engineering Bureau, Nanjing International Healthcare Area Development & Construction Co., Ltd. Fondazione EMGdotART for the Next Architecture Competition and Symposium is of interest because it opens a new venue with potential for building a demonstrator in Nanjing. In addition to expanding collaboration from EU and US to China, RB developed collaborations with South America as for instance the Museum of Future and University in Rio de Janeiro thus becoming a worldwide player. The ambition for the future is consolidate established international network and expand education by reestablishing MSc 1 on robotics and offering MSc 2 as blended (on- and off-line) course.



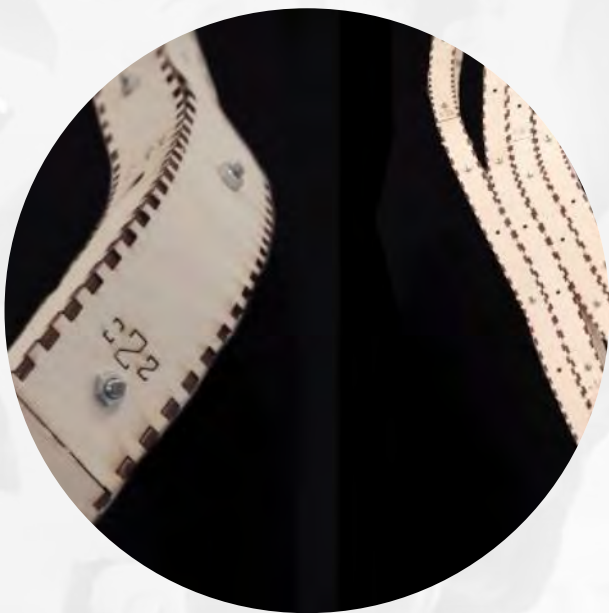
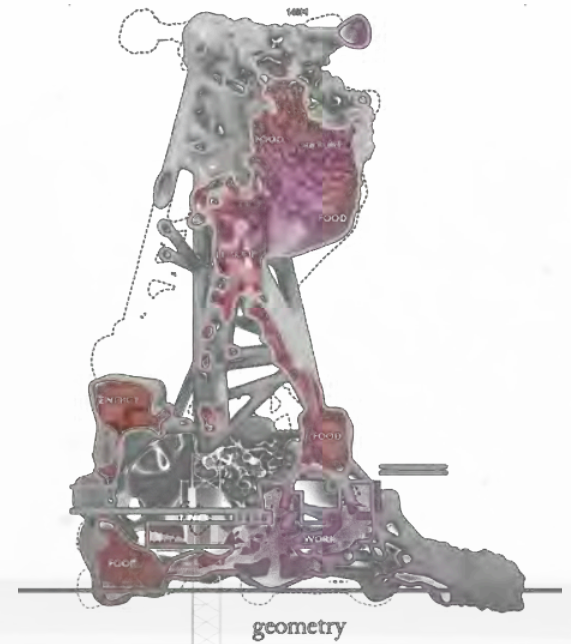


RUNNING OUT OF GAS

by **Benjamin Kemper**



Repurpose of abandoned drilling rigs in the North Sea. Our society, human behavior, and cities are changing due to the exponential progress of technology. How are we going to live in a future, and which role will architecture play in an augmented world? It might emerge as a balancing act between utopia and dystopia, between the total dependency and repression of the machines and the freedom to achieve more than we ever imagined. Society's addiction to technical devices emphasizes the urgency at hand to begin to work with new technologies instead of denying the process categorically.

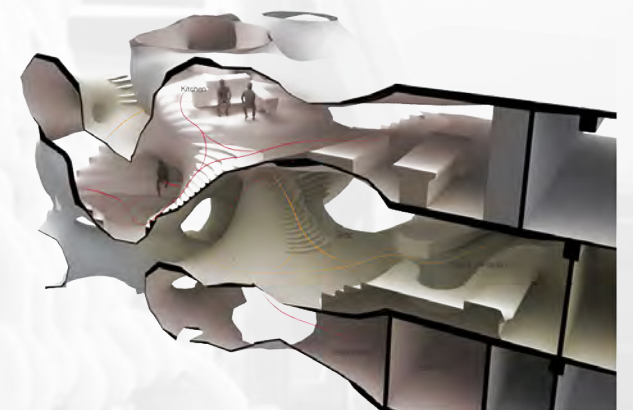


EXPERIMENTAL SOCIETY LAB

by **Erik Zanetti**



This project aims at tackling a socio-political issue, the refugee crisis, from an architectural point of view which integrates sociological aspects. In order to face the lack of housing for refugees, the project is located in an abandoned office tower block, which is becoming a widespread problem in the Netherlands. Adopting a concept of vertical city, three types of areas are defined within the building: public, semi public and private. By means of subtraction, an internal sloping street is obtained, while the residential areas equalise the remaining office tower.



ARCHITECTURE DISASTER RELIEF

by **Marco Galli**



Architecture for disaster relief explores the role of the architect, specifically focused on the aspects of digital and robotic technology for architecture solutions in disaster areas. The aim is to re-settle post natural disaster environments through digital driven design methodologies and robotic production technologies. These new technologies and research-methodologies also requires the users (inhabitants) to be involved in the design and building process, therefore re-defining the role of the architect and possibly the tectonic culture of architecture.



Context AMC, Amsterdam

Rehabilitating an existing hospital as healing environment

text **Thijs Asselbergs and Anne Sniijders**

The AMC in Amsterdam is the largest academic hospital in the Netherlands and comprises of about half a million square meters of floor space. The design dates back to the end of the seventies and is from the Dutch architects of Mourik and Duintjer. In addition to buildings, covered streets and squares, the complex also includes the medical faculty of the University of Amsterdam.

The facades of the 40-year-old AMC are due for renovation. AMC is faced with a historical choice about what to do. The renovation project, with all its possibilities and dilemmas, is a unique opportunity to explore different possible solutions. Another factor that plays a role here is that the AMC is and remains in full use during the renovation.

How to deal with a lifetime of thirty years? How to deal with circularity and how do energy requirements, indoor climate and façade renewal influence each other? Which variants are possible and how is this in balance with the sizeable investments aimed at achieving energy neutrality? Which requirements are fixed in 2050? What can we anticipate?



ARCHI-NATURE

by **Cheng Zhu**



How can we redesign the in-between space, including the atrium, roof and interior facade, of AMC to create the sense of nature experience, and to improve energy efficiency of the building? The main objective of AMC renovation is to create the sense of nature experience by structural design. Through sense of natural experience, the new healing environments contributes to patients' recovery and better performance of staff.



CITY RECOVERY GARDEN

by **Xiaoyu Wang**



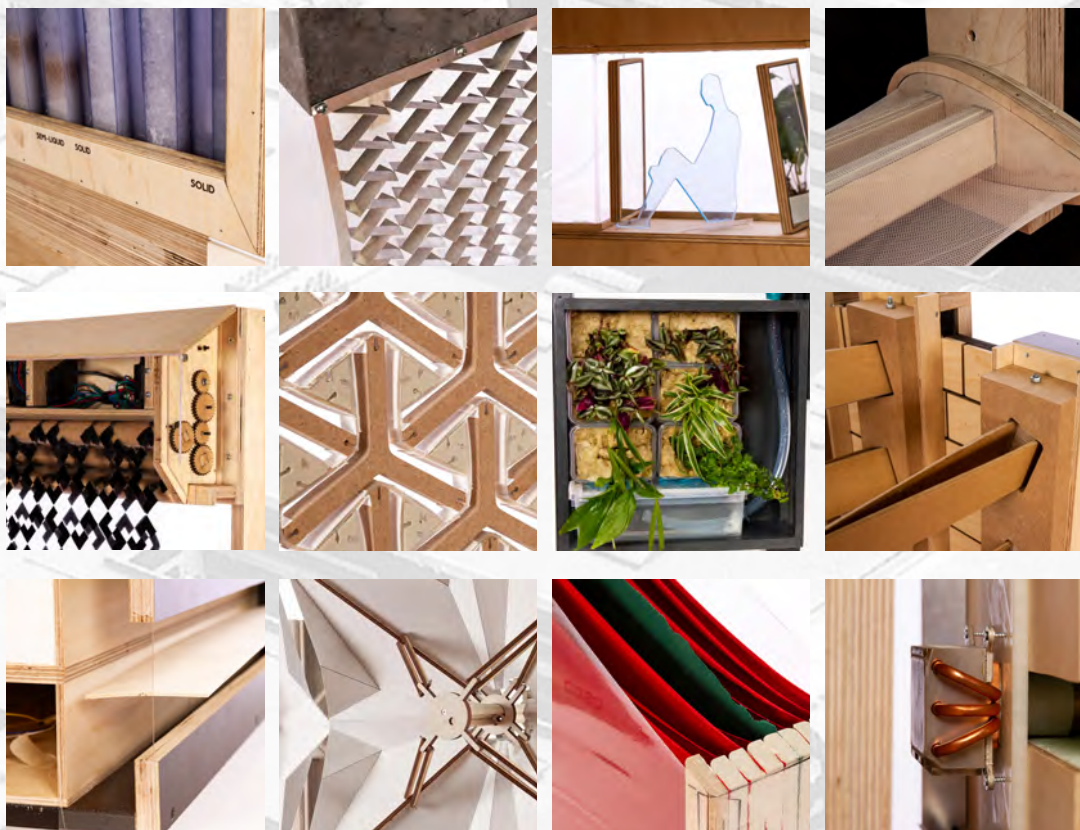
The renovation of the AMC should cope with the future transformation of healthcare system which mainly relies on prevention and decentralized treatments. Therefore, the massive complex building would act more as a public welcoming place, promoting a culture of wellness. By integrating urban farming, the new AMC could provide fresh healthy food, educate the public and encourage a healthy lifestyle.

BUCKYLAB

text **Marcel Bilow**

This semester we contributed our work to the Academic Medical Center in Amsterdam. Our students were asked to think about innovative solutions that will support a more sustainable future of the immense building complex by lowering the energy consumption, increasing the comfort or contribute to a better healing environment.

The projects and prototypes cover a wide range of solutions. You are able to see solar chimneys that support the mechanical ventilation systems of the building, we have solutions that gain more natural daylight into the depths of the room in order to reduce the amount of artificial lighting. You will also find concepts that aim to increase the comfort of the users with decentralized heating solutions as also ideas to bring the patients in closer contact to nature. The shown full-scale prototypes are made at the end of the second third of the semester and helped the students to evaluate their ideas.





BIOPHILIC ENVIRONMENT

by **Danny Cheng**

The concept of biophilia implies that humans hold a biological need for connection with nature on physical, mental and social levels and that this connection affects our personal well-being, productivity and societal relationship. The project renovates the AMC into a biophilic hospital, focusing on the internal layout and facade aspect of the nursery area. The design reduces the energy consumption of the building and with the nursery area representing the largest percentage of floor area, the most effective way to achieve energy efficiency is to begin energy reduction there.



Context Shelterlands



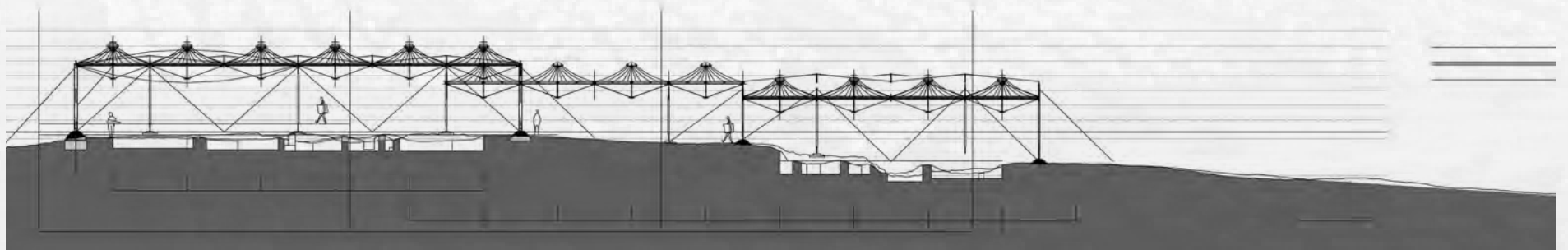
SHELTERS FOR ARCHAEOLOGY



by **Stefanos Koufopoulos**

How to create a modular, sustainable and reversible architectural-structural system as a transitional shelter which protects damaged or endangered monuments, and archaeological sites and excavations?

The main objective of the project is to create a prototype structure that responds to the specific requirements for the overall given context. The original intention is to create a modular and flexible design that can be efficiently manufactured, transferred and assembled on site, addressing not only in a case-study context but even in a broader one.



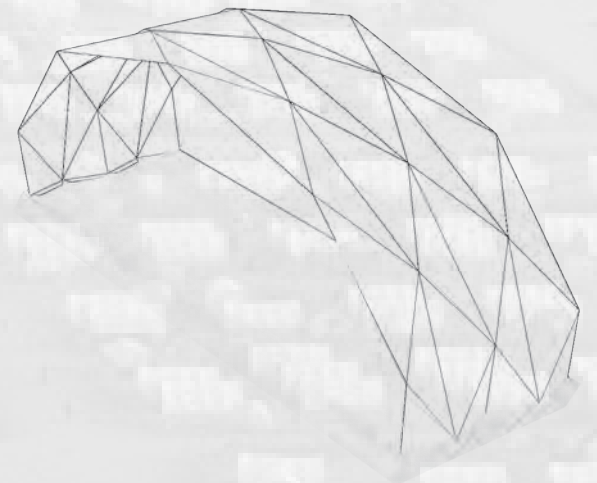
FOLDING STRUCTURES



by **Sjoerd van Greevenbroek**

How could a multipurpose, temporary and economically circular community platform be designed to stimulate participation and awareness in order to reactivate depreciated area's in the urban fabric of Rotterdam?

By developing a modular building system which is adaptable, demountable, transportable, self-sufficient and easy to assemble, this design aims to solve this issue. A new construction method for freeform foldable structures, based on the principles of origami and CNC milling, is used to create this system.





chair

Education & Research Architectural Engineering
journal 2019/2020

Education MSc I/2

EXTREME

text Job Schroën

EXTREME is a MScI and MSc2 course about integral design. We take on extreme assignments and find solutions which are architectural and technical.

EXTREME MALDIVES

After EXTREME teamed up with the United Nations Development Program in 2017 and 2018 a small group of students started the Resilient Island Foundation in order to improve agriculture on the Maldives. They are collaborating with Wageningen University, did a TEDx talk and are slowly getting closer to building a greenhouse on the Maldives. More info and the TEDx talk can be found here: <http://www.resilientisland.com>

EXTREME HYPERLOOP

Collaborating with ProRail EXTREME students have been working on the design for a Hyperloop station. Other than starting from mechanical issues, the EXTREME students took the passenger as a starting point. This resulted in many different configurations and ideas about future travel.

Several projects have been on display at the Innovation Expo, Dutch Design Week and at the ProRail offices in Utrecht and Amersfoort.

EXTREME SXM

For the semester starting in februari 2019 we're teaming up with Unicef to design sport/play/childcare/shelter facilities at hurricane-stricken Sint Maarten. We will be looking into the local conditions to see how we can offer ideas and solutions for local families and children.

If you'd like to know more you can contact Job Schroën, coordinator of EXTREME at: rschroen@tudelft.nl



EXTREME presenting their TED Talk at TED X Amsterdam



EXTREME visiting the Maldives



EXTREME at the Dutch Design Week

Bucky Lab

text Marcel Bilow

The projects from the last Bucky Lab semester were made in the RDM Campus in Rotterdam.

This was organised within the 1st semester of the Building Technology master program which is hosted by the department of Architectural Engineering and Technology. Not only 63 students put effort in the programme, but also an entire team of docents and teachers from various chairs.

Next year in spring we will offer a new set up for the Bucky Lab – especially for the Architecture students – so keep your eyes open! So in principle it's a Bucky Lab without building physics, structural mechanics and material science but we will make sure you get enough knowledge you are able to build your prototype.

Want to know more about the projects? Visit www.buckylab.nl



Research

Symposium AMC

text **Thijs Asselbergs**

Students, lecturers and researchers from BK TU Delft have been asked by AMC to develop design ideas and visions. These ideas and visions can be a unique and inspiring breeding ground for feeding the agenda of innovation.

BK TU Delft works together on the vision with AMC, AMS, the municipality of Amsterdam and Atelier Rijksbouwmeester. During the symposium 'The Circular Built Environment' the chair of Architectural Engineering offered a platform for discussion about circularity and how to approach the AMC. Speakers, amongst which Floris Alkemade, Paul Kalkhoven from Foster + Partners and Kasper Jensen from 3XN, gave their attribution to the topic.



The Circular Built Environment Symposium in the Berlage rooms at the Faculty of Architecture



Building Engineering Action For Climate

text **Elise van Dooren and Mo Smit**

The coming graduation year a new structure for the Architecture Master track will be implemented.

An important aspect of the change is the further integration of building technology education within the Architecture master studio's. The separate Delft Seminars on Building Technology course in the MScI will be replaced by the integrated Building Engineering Studio (BES) course (10 ECTS) organised by the Chair of Architectural Engineering. Professor Thijs Asselbergs and Elise van Dooren have worked on the content of the BES programme and have talked with all the coordinators of the Architecture master studio's to prepare the implementation of this new structure. An ambitious team of Building Technology tutors is ready to start working within the new BES and looks forward to collaborate with the architecture colleagues on the various studio assignments.

text **Mauro Parravicini**

Failing to agree on climate action would 'not only be immoral' but 'suicidal'.

(UN Secretary-General António Guterres at the COP24 climate change conference in Katowice, Poland. 12 December 2018.)

We, as teachers of the Architectural Engineering Chair at the Faculty of Architecture of the Technical University TU Delft, act in solidarity with the thousands of people marching for the future of our planet and we support the effort of the new generations to ensure their own future and the one of their children.

As AE/Intecture teaching team, in our daily practice, we combine design and technical innovation by seeking innovative and inspiring architectural solutions for environmental and societal issues. We are driven by the need to think differently about flows of resources, energy generation, efficiency and people participation.

We encourage students to explore their role as architects in developing a future of urgent changes by understanding existing potentials and by combining those with the hope which innovation brings. The building industry largely contributes to global CO2 emissions. We believe that new economical and industrial processes are possible and necessary. Climate related challenges have to be addressed immediately in order to ensure a prosperous future for our planet and the future generations.

Ferry Adema, Thijs Asselbergs, Henriette Bier, Marcel Bilow, Elise van Dooren, Jelke Fokkinga, Bas Gremmen, Pierre Jennen, Gilbert Koskamp, Peter Luscuere, Hubert van der Meel, Mauro Parravicini, Roel van de Pas, Job Schroën, Annebregje Snijders, Mo Smit, Pieter Stoutjesdijk, Paddy Tomesen.



From left to right: Thijs Asselbergs, Barbara de Groot, Elise van Dooren, Jelke Fokkinga, Henriette Bier, Hubert van der Meel, Vera Laszlo, Roel van de Pas, Pierre Jennen (friend), Mauro Parravicini (friend), Gilbert Koskamp (friend), Anne Snijders, Paddy Tomesen (friend), Mo Smit, Marcel Bilow (friend), Ferry Adema (friend)

Missing on this photo: Emiel Lamers, Pieter Stoutjesdijk (friend), Jos de Krieger (friend), Arwin Hidding, Job Schroën, Jan van de Voort

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COLOPHON

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Mo Smit
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December 2019



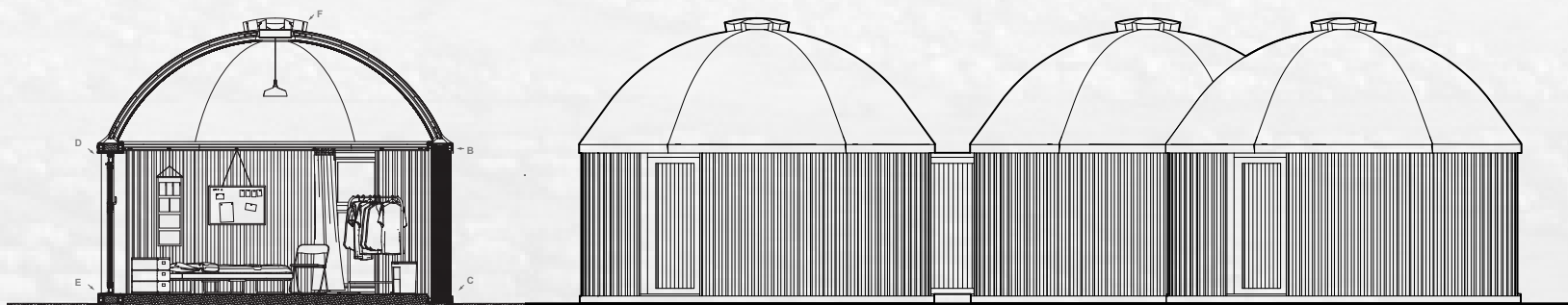
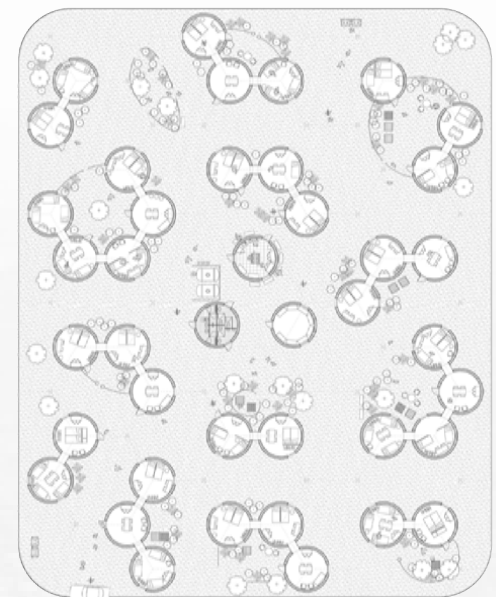


SHELL-T

by **Boyuan Zhang**



The goal of this design project is to improve the living comfort of temporary house in semi-arid climate area in aspect of thermal performance, ventilation and natural light. Meanwhile, the design should be easy to transport and to assemble. The whole process of the shelter usage should be in relatively low budget, taking into consideration the conditions in developing and poor countries.



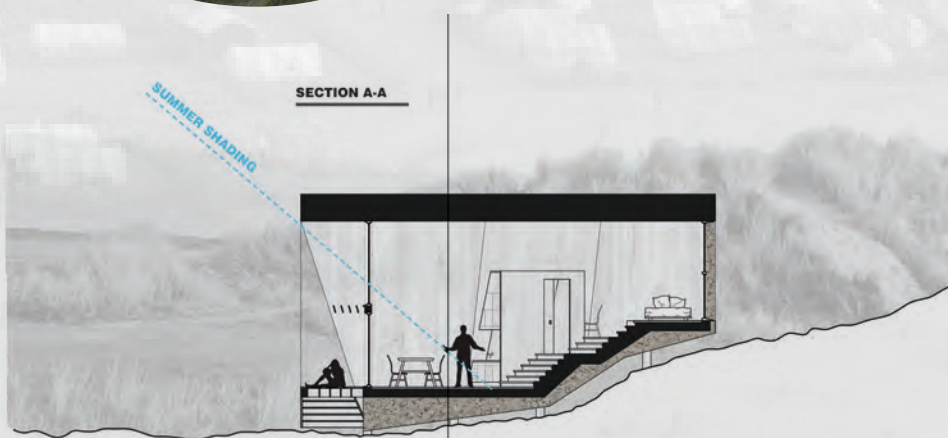
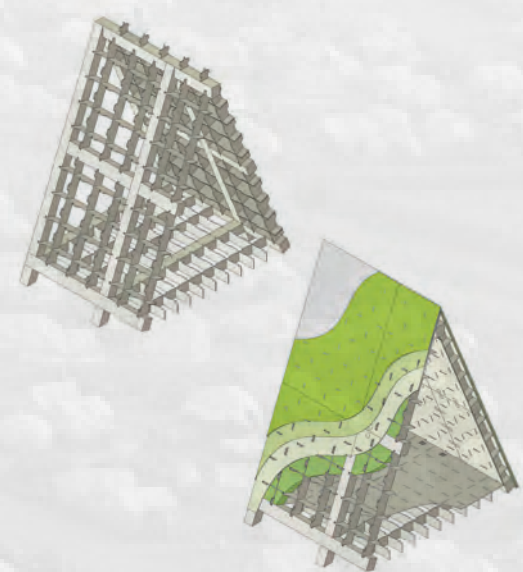
HARVESTED HOME

by **Charles Gregoire**



The design assignment consists of designing a 4-6 person holiday home on the Island of Texel in an environmentally protected area.

The design strives to answer the question 'how a fully functional home can be made at 99% from biological, harvestable materials'. The home must also minimize its energy consumption through the use of passive solutions.



Context Bandung, Home at Work

The industrial kampung as a healthy live-work environment

text **Mo Smit**

Home at Work, one of the aE Intecture design labs, focuses on the development of healthy and flourishing live-work environments within the context of the Indonesian city of Bandung. The last semesters students made plans for the heavily polluted industrial kampung of Cigondewah, a former rural settlement of farmers and fishermen at the south eastern periphery of the city which strongly urbanized under influence of the arrival of the global fashion industry in the region.

Cigondewah is also a first case-study of the Fashion Village Lab, an initiative of the Circular Community Foundation, which aims to develop the region of Bandung into a sustainable and innovative region for fashion production using a community-based approach. Student projects, such as the design of healthy housing for factory workers, safe factories & workshops or community-based waste, energy or water management facilities contribute to the overall ambition of this initiative.

Because of its rural past and agricultural remnants, its creative entrepreneurs and its intrinsic connection with the global economy, the industrial kampung of Cigondewah has a great potential to be a healthy and flourishing live-work environment for future generations. The off-the-grid character is a quality that can be embraced to make the industrial kampung not only economically self-sufficient, but also ecologically regenerative.

The main challenge of Home at Work is to develop circular design strategies which empower the local (business) community to transform their environment in a sustainable and equitable way. Instead of wasting resources they can be brought into a closed cycle on the scale of the industrial kampung. Instead of importing materials for clothing or building construction from other areas they can be locally produced within the region. The reconnection of economy and ecology enables industrial kampung communities to step out of poverty and realise a healthy and resilient live-work environment together.



FASHION FACTORY OF TOMORROW



by **Lara Smits**

Can a medium-size garment factory in Bandung meet the production-demands of today's fashion industry, while providing a healthy and comfortable indoor environment by using passive building design strategies? The innovative design is based on the re-use of an abandoned factory hall. The renewed factory consists of sustainable materials (bamboo, wood and banana fibres) and offers a healthy and comfortable work environment for fashion makers by optimising the provision of daylight, fresh air and good acoustics.



FACTORY FOR GOOD



by **Tanya Tsui**

Can a decentralized, circular system be used to provide energy and water to an industrial peri-urban neighborhood of 26,000 people? This project explores the potential to use factories as sources of water and energy for peri-urban industrial contexts in developing countries. The project is situated on the perimeter wall of a large textile factory surrounded by informal settlements. It transforms the wall into a public facility that consists of public toilets, a food market and factory worker housing. The facility produces energy in the form of biogas, and filters toilet waste water to be reused by the factory.



CIRCULAR COMMUNITIES



by **Rushabh Chheda**

Indonesia is one of the five countries in the world that contributes to around 60% of all the ocean plastics. This project deals with the informal local economies of waste recycling and the migrant housing industry. By applying circular economy principles, building elements out of plastic waste are developed in collaboration with local building and recycling entrepreneurs. These simple and long lasting elements can provide affordable and sustainable housing for the low-income population of kampungs and empower them to improve their own environment.

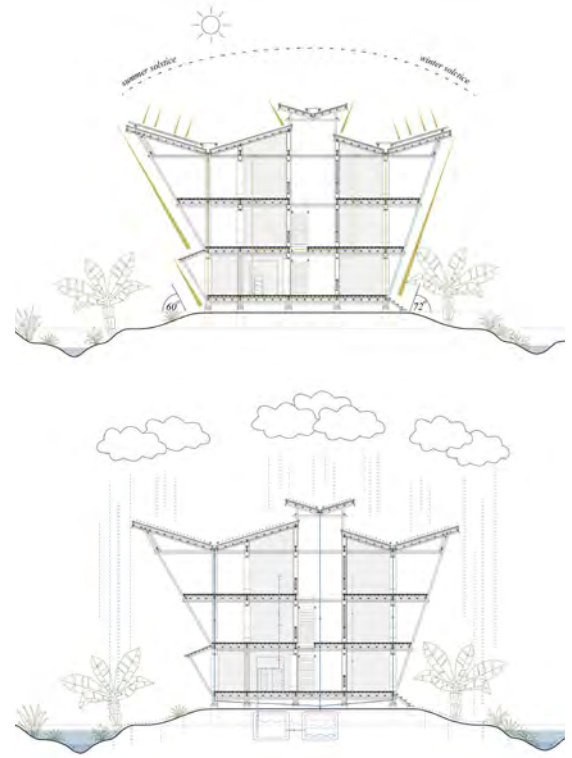


INTO THE CLIMATE

by **Wioletta Sarara**



How to create a climate resilient off-the-grid neighborhood for a peri-urban context in Bandung (Indonesia)? Buildings and people rely too much on mechanical appliances, forgetting that just small changes in the shape of buildings could change the living conditions throughout the whole lifespan. This project copes with this problem by taking the local climate as a starting point. Collective housing clusters and outdoor space are designed in symbiosis with nature, locally available low-tech building materials are applied, while the cycles of water, energy and nutrients are closed on a neighbourhood scale.



Context Bandung, Shared Heritage Lab

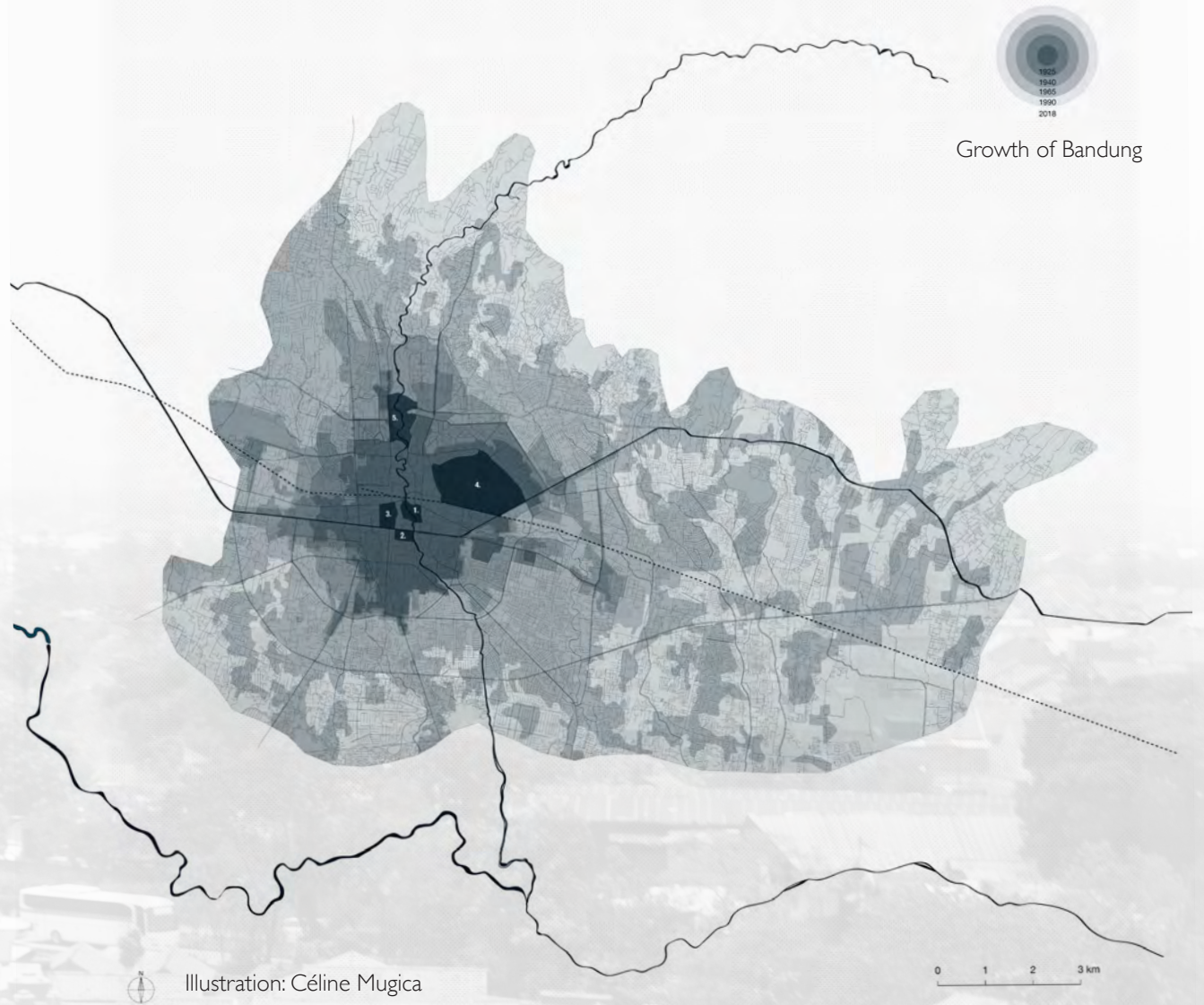
Heritage-based placemaking for healthy and inclusive cities

text **Mo Smit**

As a result of the long period of colonization by the Dutch, Indonesia has many shared heritage sites and buildings. The question for (landscape-) architects and urban planners is how these sites and buildings can contribute to the development of sustainable former colonial cities.

The cities of Bandung and Semarang serve as case studies for the programme of the Shared Heritage Lab. The historical and future development of these cities is researched and explored, taking important urban structures and areas, such as rivers, (rail-) roads and neighbourhoods into account. Ultimately, the goal of the Shared Heritage Lab is to showcase Bandung and Semarang as examples of inclusive and healthy future cities for working, living and leisure.

The Shared Heritage Lab is a collaboration between Architectural Engineering, Heritage & Architecture and Urbanism (including Landscape Architecture) and the School of Architecture, Planning & Policy Development, Institut Teknologi Bandung (ITB, Indonesia). The lab is supported by the Royal Netherlands Embassy in Jakarta (Indonesia) and the Cultural Heritage Agency of the Netherlands.



SELF-CRAFT COMMUNITY

by **Celine Mugica**

The self-craft community which grows from the existing structure of the Pasar Cikapundung is a creative educational environment where vernacular craftsmanship knowledge and skills can be taught, tested and innovated, while incrementally improving the conditions of the urban kampung in a sustainable and expressive manner.



KAMPUNG THE NEXT LEVEL

by **Ruben de Roo**

How to develop high quality public space and healthy living conditions along the Cikapundung river? By means of an elevated wooden structure the riverside is incrementally developed into a respected and healthy neighbourhood. The structure forms a safe modular backbone for affordable housing following vernacular design principles.

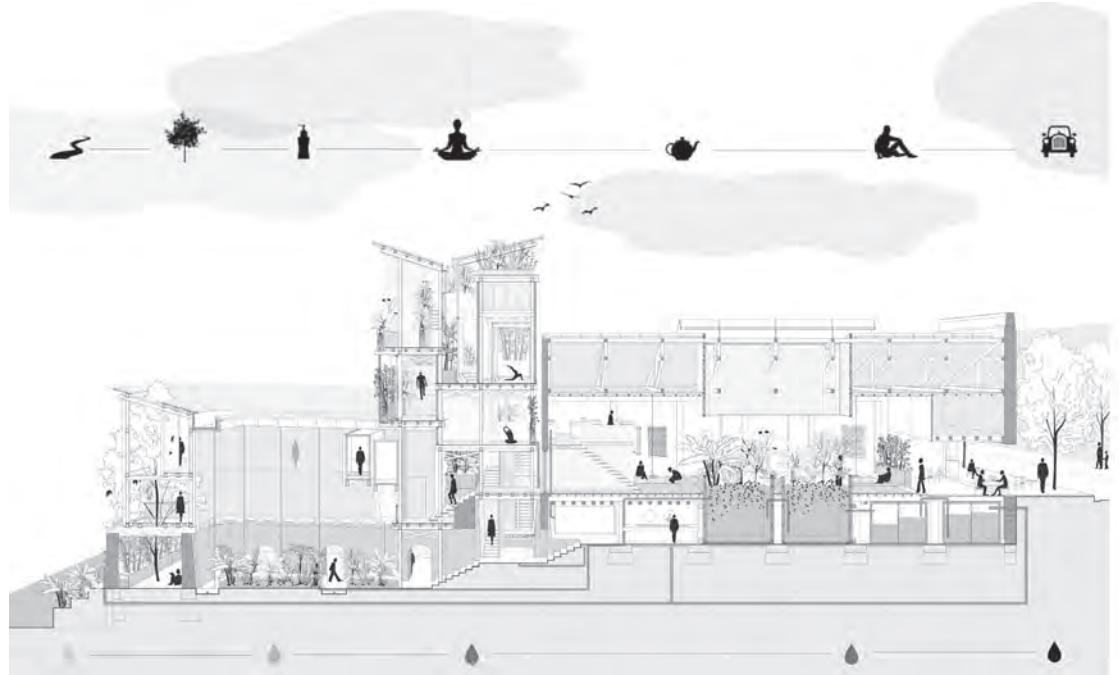


KAMPUNG CIRCULARITY

by **Tim Mechielsen**

Can the overall quality of high density kampung dwellings be increased by implementing re-use and up-cycling strategies of local waste within the construction process? To answer this question a demountable building material hub is designed, which forms a circular economy showcase regarding building materials for self-build housing within the kampung context.





WELLSPRING FOR THE FUTURE

by **Jip Colenbrander (H&A)**

The historical structures of the city can't cope with the increasing urban growth. This results in a city that has to deal with sincere water problems, such as flooding, water shortages and pollution. The proposed design for an ecologically integrated bathhouse enables people to experience the benefits of a sustainable future with clean water, while having the opportunity to escape and take a moment for cleansing both body and mind.



KAMPUNG KITCHEN

by **Amy Cotino (H&A)**

This project focuses on the informal food industry of an innercity kampung and seeks ways to provide opportunities for the local community within an abandoned colonial heritage building. This resulted in the transformation of the old Hellerman building at Braga street, including a programme of urban farming, communal kitchens and restaurants.

BRAGA PERMAI ELEVATED

by **Luuk Borremans (H&A)**

The ongoing and uncontrolled densification of cities like Bandung leads to the loss of cultural value of the urban tissue. This project aims to tackle this problem by developing and testing an approach that grows from the values of shared heritage, in order to create synergy between the colonial urban structure and the typical Indonesian kampung structure.

RISE OF THE KAMPUNG

by **Maarten Limburg (H&A)**

The heritage buildings along Braga street are very popular among tourists. Many cafés and restaurants have opened their doors here. The kampung at the backside of Braga street hardly benefits from this situation. This project aims to solve this by transforming a heritage building into a creative hub for both the kampung community and the visitors of Braga Street.

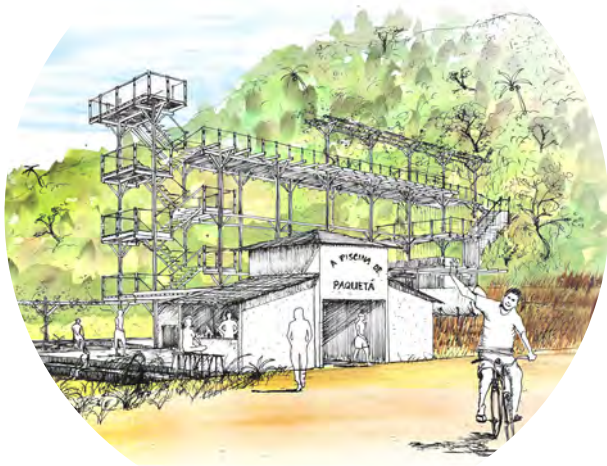
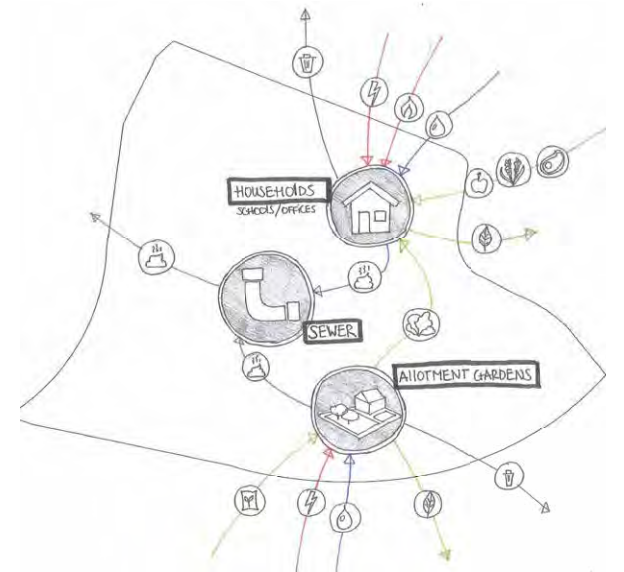
Context Broader Contexts



CONNECT WALK UP APARTMENTS

by **Nikkie de Boer**

Post-war neighbourhoods need to be prepared for the future. Different flows like, water supply, waste treatment, energy supply, food supply and transportation should be integrated to create closed cycles. This project answers the question how to redevelop the neighbourhood Carnisse, connecting the loops of different types of streams on a local level, while improving differentiation in housing and functions and the quality of the dwellings and the public space, transitioning it into a self-sustaining and resilient neighbourhood for the future?

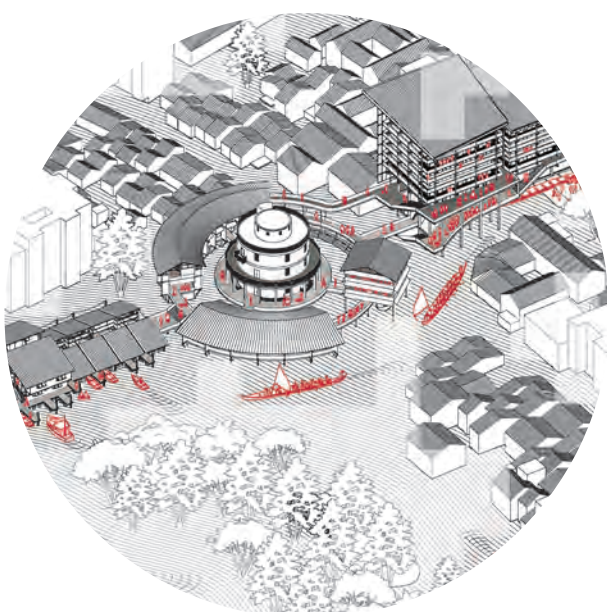
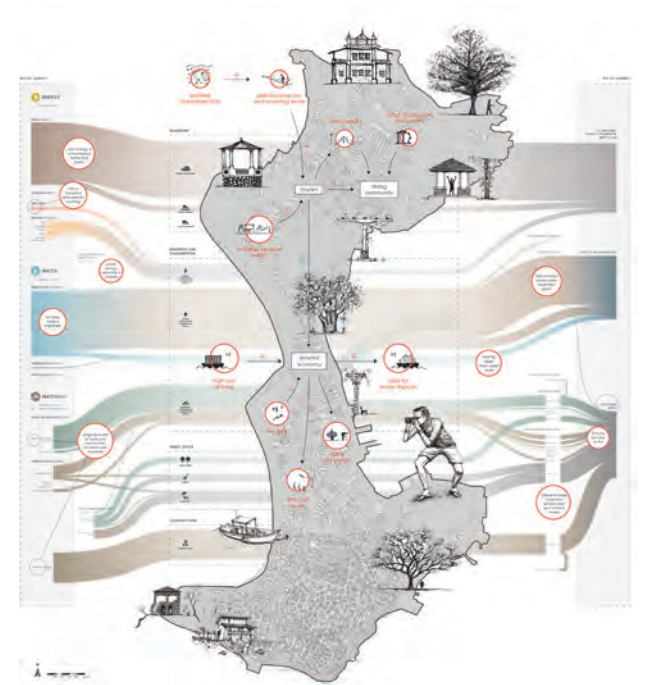


PROJECT PAQUETA

by **Lodewijk Luken**

How can architectural and urban interventions facilitate the utilization of wasted resources and generate new economic activity on Ilha de Paquetá?

The aim of the design project is to reduce the inputs and outputs of Paquetá, by reducing the demands or turning wasted resources into valuable products. The incentive for the local community to get involved are the opportunities that this new economic activity brings, while solving the environmental problems of the island at the same time.



FLOOD PROOF BUILDING

by **Mengya He**

The old port area of Xiangtan is an urban area suffering from yearly flooding, during which the local residents have no choice but to move to other safe space provided by the government.

The basic design vision is to intervene the site area with a flood-proof urban scale built environment for local people to stay during flooding, introduce several positive programmes, and let them be the triggering factor towards a prosperous future of the vernacular community at the same time.



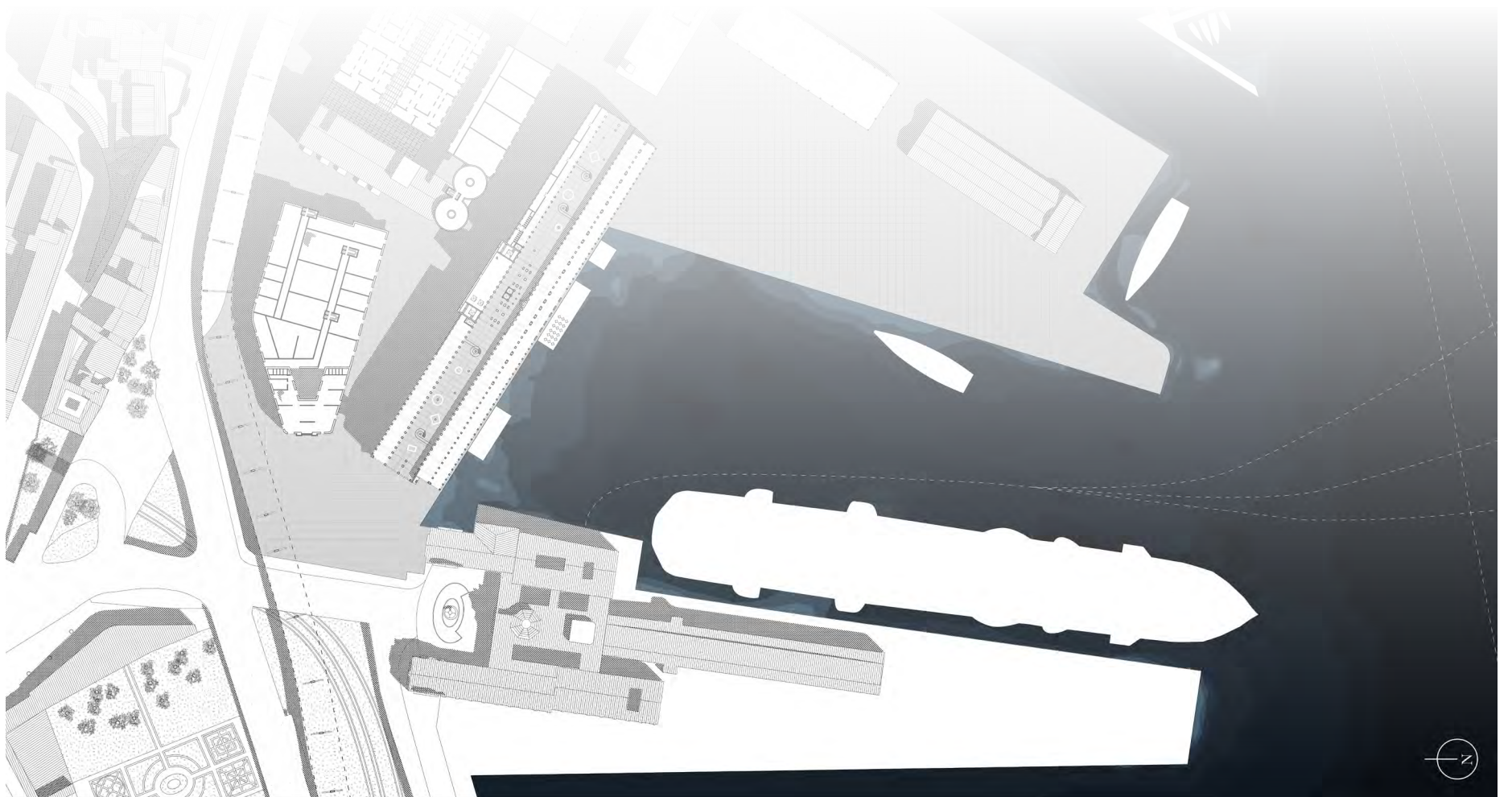
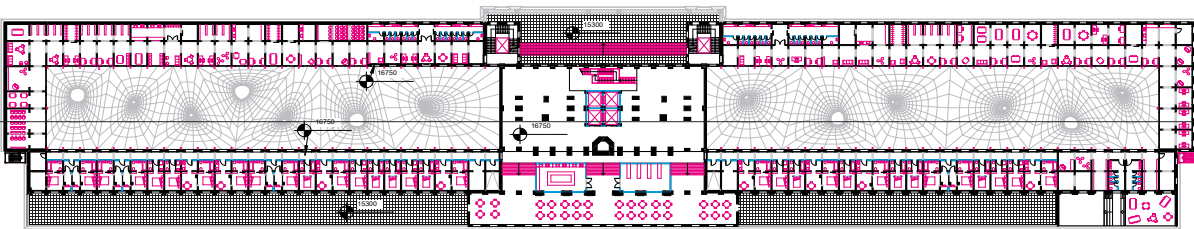
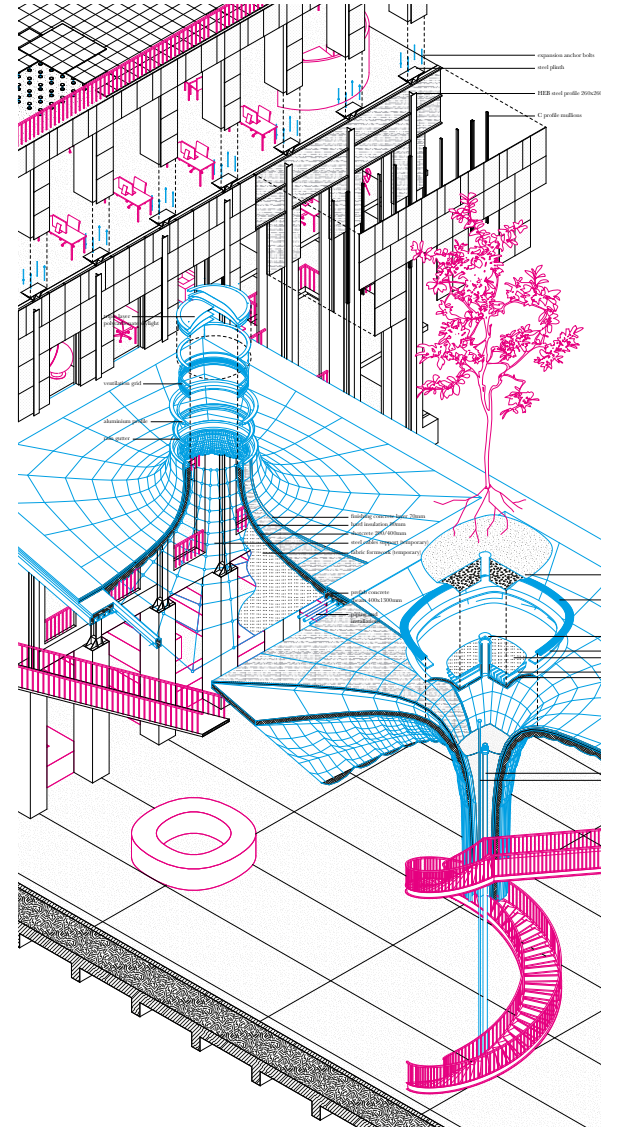


HENNEBIQUE SILOS

by **Giuseppe Campo Antico**



Tensile and membrane structures are one of the lightest of their kind and their construction logic is strongly influenced by the distribution of the forces on the surface. They can achieve big spans with less material and have a fast assembly process, resulting in a cheap alternative to traditional construction methods. They can also be used as formwork for concrete shells, by spraying a thin layer of concrete on their surface. The objective of the project is to investigate tensile structures as formwork for concrete shells as a method to renovate existing buildings.



Context Amstel III

UPCYCLE AMSTEL III

In this publication we focused on the Amstel III area to summarize top-down policies and bottom-up stakeholder value chain engagement for urban upcycling. To get familiarized with the Amstel III context we stepped out of the faculty, met some of the important stakeholders and examined building cases.

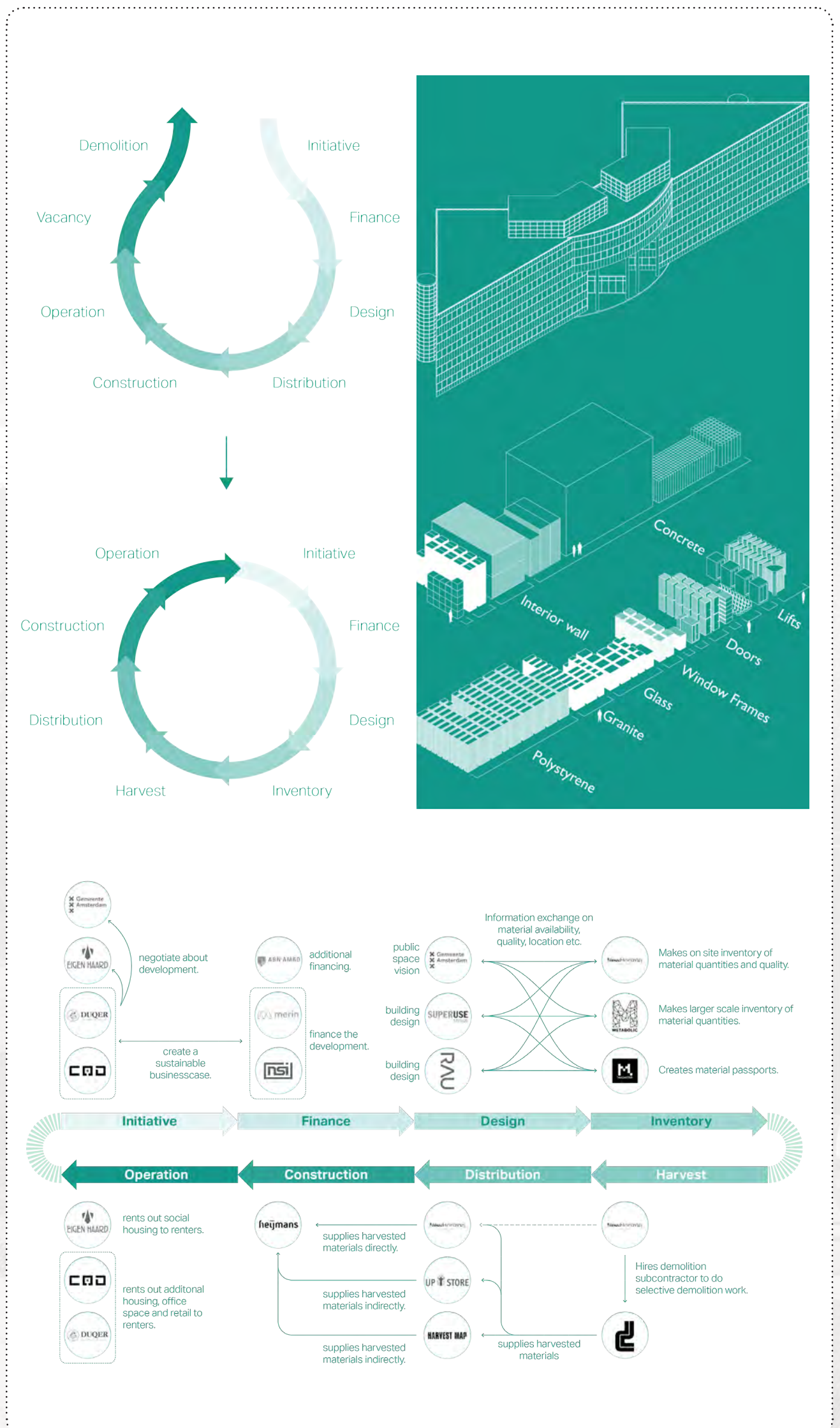
To explore the possibilities for a circular economy applied to the building sector in Amstel III, the ambitions of the governing bodies were brought together to seek for matching ambitions. A Circular Economy can be used to build economic resilience, it can provide more jobs, minimize the use of construction materials and reduce the CO2 emissions by maximizing building lifecycles. Furthermore, it has the potential to position Amsterdam as the global leader in circular economy to attract companies and start-ups in the city.

The Phenomenon of 'urban upcycling' was introduced as a way to reinterpret the current construction chain. A new construction chain is proposed into which 5 new 'phases were integrated; negotiating, making an inventory, harvesting, distribution and documenting. Additionally, the current system of stakeholders was analysed. Who are engaged in urban upcycling and in what way? A potential engagement scenario is proposed to show how these stakeholders could potentially interact in a circular construction.

To show the potential for upcycling materials in Amstel III we analysed one building by taking it apart and displaying the materials that could potentially be harvested when it gets demolished. These materials can be divided in potentially re-useable in component form or potentially recycled. These materials were then upscaled to the whole area to see the potential for Amstel III. To give an indication of the materials: this included 70.000 m³ of concrete, 7.500 m³ polystyrene and 180.000kg aluminum. Combined with the stakeholder engagement methods a total energy savings of 145,2 TJ could be realized in the current densification plan. This does require some significant changes from harvesting to making an inventory and from designing to constructing. But if done correctly a huge impact can be made.

Get your own copy!

If you are interested, the complete booklet can be found online on the website of 3XN/GXN: <https://gxn.3xn.com/project/up-cycle-amstel>



Amstel III Context

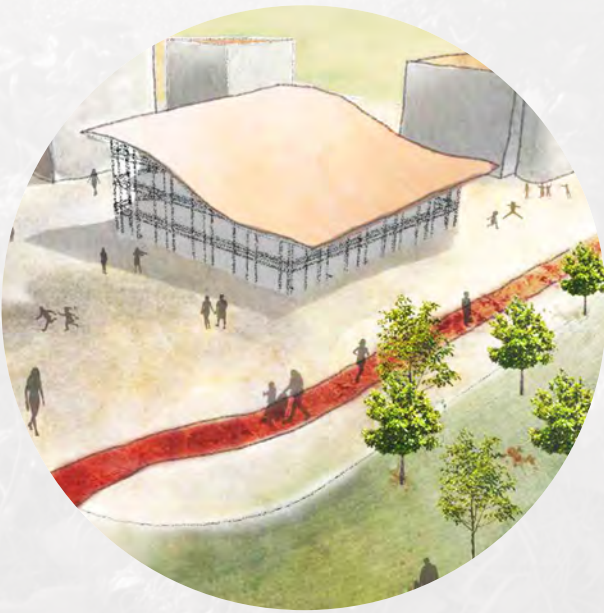
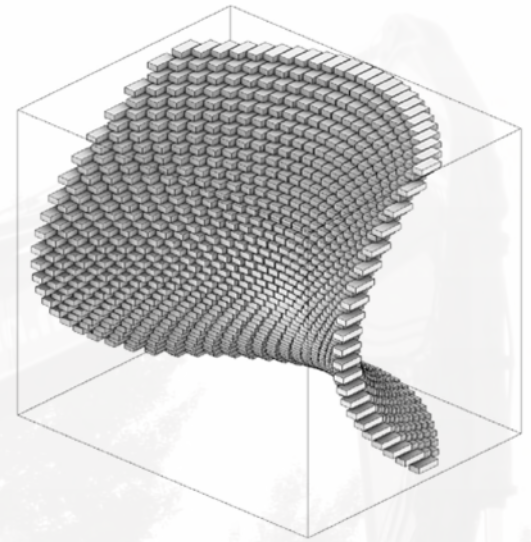


ROBOTIC REFABRICATION

by **Florian Markus**



The current use of brick in the Netherlands is an insult to its logic and circular nature. We need to minimise the material waste and energy consumption and maximise the adaptability of buildings. The solution can be found in low-tech materials applied in high-tech methods. The two main challenges of sustainable materialisation of buildings are an adaptable bearing construction and a durable facade. Using an industry robot to build prefab, solid stone, bearing masonry walls with a removable mortar joint, facilitates a new and more expressive architecture.

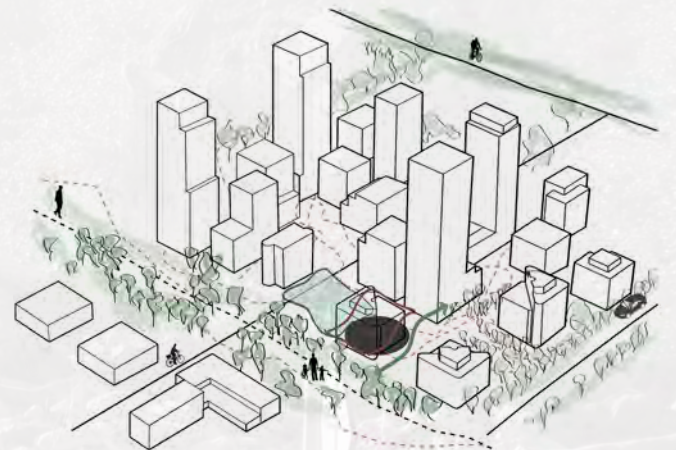


CIRCULAR ARCHITECTURE

by **Else Dekker**



As we nowadays still use raw materials to build our buildings for a sustainable future, there is a need to look at the reusability of our existing buildings to adapt them in every form to the buildings we require for the future. The users themselves also need to learn about circular economy. In order to do so this design explores the field of experiencing architecture through the reuse of these old valuable materials and make use of the building as a social circularity environment.

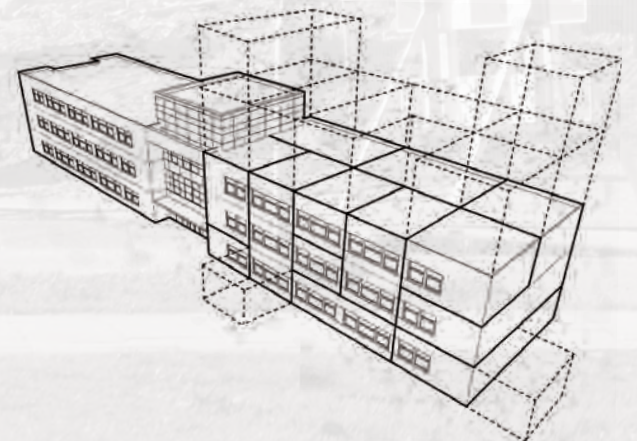


REUSE ARCHITECTURE

by **Dominik Lukkes**



Our excessive need for new building materials is causing material sources to be depleted at an alarming rate, but there is potential in reusing buildings. An existing office building is transformed and expanded, where the goal is to reuse all building components the building currently is comprised of, provided that they add to the building's aesthetic, functional and environmental value. Surrounding buildings that are up for demolition will be considered as material resources as well. Urban mining shall serve as a tool to make this possible.



Alumni

Interview with aE/Intecture alumni Eric Geboers



When did you graduate @aE Studio?

In July 2015 I graduated with the thesis “The Salt Project” within the Architectural Engineering Graduation Studio, under guidance of Tjalling Homans (main tutor), Martijn Stellingwerff (research tutor) and Engbert van der Zaag (building technology tutor). The project started off with a fascination for eco-system design. Together with my tutors I started an open exploration into this topic. By researching what this exactly means I came upon things like designing with purely local materials and harnessing the sun’s energy to grow. The idea of building with seawater came from this input. The research itself was quite broad and followed three paths: the first path was figuring out a production method for salt as a building material. The second path is logically connected to the first path and was about finding the material properties of a salt building block. Thirdly, the integration of the building material in a seawater based infrastructure in the desert was researched and developed. Ultimately one key typology was picked to be developed further: the salt building material factory, which plays a crucial role in the seawater infrastructure.

You started your own company (CONCRE3DE) specialized in 3D printing of sustainable concrete. What does this have to do with your graduation project @aE Studio?

The focus on materials and new technologies, such as 3D printing, was already there during my graduation project at aE Studio. Before I started graduation I worked in China for a while which made me want to pursue this topic. While graduating I gained knowledge from various

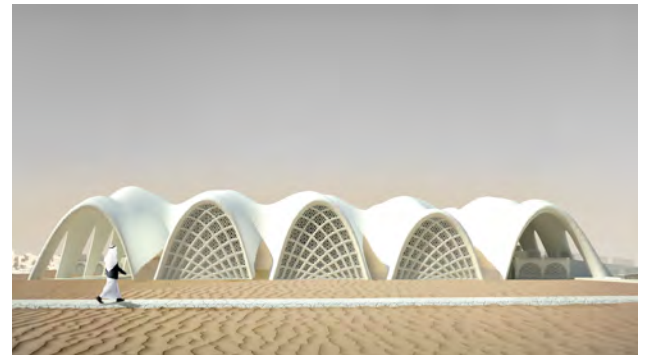
faculties of the TU Delft, such as chemical engineering and material science. I’m lucky that I got the opportunity after my graduation to further develop my ideas to use salt as a building material. I started to produce chairs out of salt. With the so-called Salt Pup I was nominated for the New Material Award in 2016. Whilst I was making the chair I met my current colleague Matteo Baldassari, who used to tutor at the Hyperbody group and was now working with robots. We discovered we had similar interests in 3D printing and materials, and out of this grew our company CONCR3DE. We focus on 3D printing of sustainable stone material, for which we use industrial waste as an aggregate. Although salt and stone are different materials, there are many similarities when it comes to 3D-printing forms with it.

How does your background as an architectural engineer influence your current role as building industry entrepreneur?

After graduation I have experienced that money is a reality when you want develop something. To be honest I’m more an entrepreneur than an architect nowadays, but my background as an architectural engineer definitely helps to speak the same language as architects who are important partners within our projects. We currently collaborate with UN Studio for example, who want to 3D-print furniture elements for the Salone di Mobile in Milano. It is a big advantage that I know what it means to make prototypes and to be able to evaluate the aesthetic quality of the products we make with our partners.

How do you see your company CONCR3DE in the future, especially in relation to the material challenge that the development of the built environment faces?

CONCR3DE is able to produce tailor made stone building elements without waste. The precision of our production method enables contractors to keep a simple and clean building site and transport less materials. Most important to us is to provide architects more design freedom than current manufacturing technologies, at an affordable price. In the future this will positively affect the aesthetic and durability performance of the buildings around us.



p o w e r e d b y i n n o v a t i o n

INTECTURE

