ETH-Singapore Month 2019 Documentation: The Future of Urban Society – STP3 Workshop: Science – Technology – (Prototyping, Policy, Practice)

Other Conference Item

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Documentation

STP^3 WORKSHOP SINGAPORE

The Future of Urban Society

STP^3 WORKSHOP

Science - Technology - (Prototyping Policy Practice)

June 2019

Contents

Introduction	7
Projects	9
Advanced Water-Storage & Anti-Flooding System	11
Industry, Innovation, Infrastructure	17
Smart Sidewalk Solutions [S^{CUBE}]	23
CO_2 Budgeting	29
"... otherwise we go to Mars"	35
cloudlines	41
Borderless Garden	47
Aqua_Hinterland	53

Introduction | Documentation STP³ Workshop
Science – Technology – (Prototyping Policy Practice)

Setting: 48 students – from 7 universities covering 16 disciplines – were asked to work in a design atelier setting in 8 multidisciplinary groups of 6 students each during a 2-week workshop.

Framework: Promoting a dialogue among disciplines and cultures, the STP3 Workshop at the Campus for Research Excellence and Technological Enterprise (CREATE) in Singapore brought together a group of graduate and doctoral students from different fields and universities to tackle contemporary societal and environmental challenges. The workshop, under the heading "The Future of Urban Society," focused on global urbanization processes in view of the United Nations Sustainable Development Goals (SDGs), the latter understood as a modern-day *contrat social* in need of implementation strategies.

Input: The didactic approach was framed by five input themes that students simultaneously addressed:
a) one of the 17 SDGs foregrounding a particular global challenge;
b) models of governance raising the question of policy and societal organization;
c) a particular theoretical text allowing to situate the work within the history of ideas;
d) a specific modelling or prototyping technique addressing the importance of ‚making' and ‚thinking' as forms of production within design;
e) a certain physical and cultural context within which to ground the work in situ – i.e., the specificity of place.

Output: Whereas the input themes aimed to bridge the alleged gaps between theory and practice, the general and the specific, as well as the abstract and the concrete, the output of the work comprised 3 straightforward components: an exhibition, a 20-minute verbal presentation, and a sketchbook documenting the process. Students were asked to present their findings to invited guests from both academia and public agencies at a final review discussion of the work.

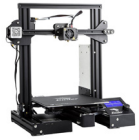
Academic institutions: Participating universities included ETH Zurich, Cambridge University, Massachusetts Institute of Technology (MIT), TU Munich, National University of Singapore (NUS), Nanyang Technological University (NTU), and Singapore University of Technology and Design (SUTD).

Marc Angélil, Aurel von Richthofen, and Frederick Kim

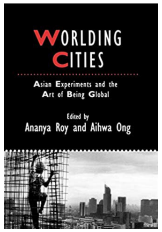
Projects

SDG 13: Climate action

Go



3D Printing



Chua Beng Huat
Worlding Cities: Asian Experiments and the Art of being Global, 2011

Site C
Punggol Waterway

Group 1 | **Advanced Water-Storage & Anti-Flooding System**

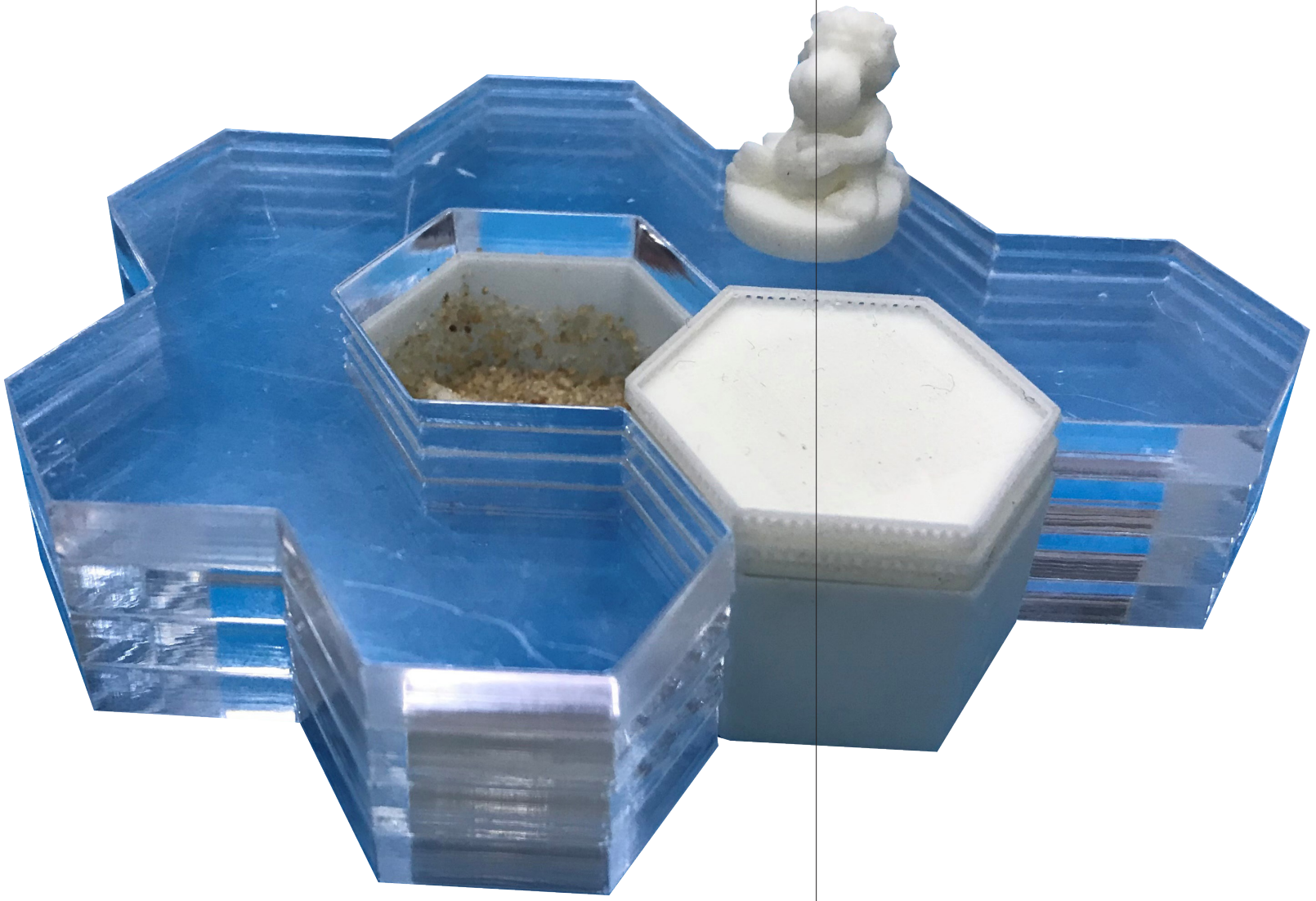
Lukas Fischer, Sandro Marcotullio, Richard Schenk, Alvin Wei Ze Chew, Yvonne Wong Yu Bing / Fabien Clavier

WITHOUT AWAS
Droughts, flooding and other severe natural desasters due to lack of water storage possibilities and sufficient runoff water canals.

WITH AWAS
The system can store water acting as a “super soil” giving two advantages: decreased flooding risk and increased accumulation of rain water to be reused.

without AWAS

with AWAS



prototyping model of AWAS

SDG 9: Industry, Innovation and Infrastructure

Tarot

Arduino

Triangulating the borderless world: geographies of power in the Indonesia–Malaysia–Singapore Growth Triangle

Matthew Sparke, James D Sidaway, Tim Bunnell, and Carl Grundy-Warr
Triangulating the Borderless World, 2004

Site B
Brani Island

Group 2 | **Industry, Innovation, Infrastructure**

Yasser Belal, Kiran Kumar, Pedro Manuel Maddens Toscano, Megan Morrow, Martin Stalder, Jolene Queck Cai Wen / Aurel von Richthofen

Through design thinking, we reshaped Brani island into a self-sustaining testing ground for innovative technologies. This is accomplished by integrating floating solar panels distributed around a water reservoir while providing fresh water and supporting the growth of floating hydroponics. Aiming to bring together AI, automation, and robotics to create intelligent machines capable of learning and self-improving, a robotics school is established. This site also serves to examine the man-machine interaction through collaborative exercises. Thanks to a developed network between policy makers and innovators we provide a place to seed new technology thereby bringing attention to arising issues in the field of ethical research, human machine interactions, and sustainable development.

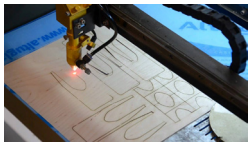
view of Brani Island from the top of Pinnacle at Duxton

model of Brani Island as a self-sustaining testing ground for innovative technologies

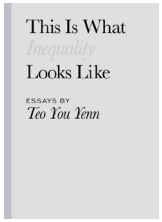
final review presentation with guests

SDG 10: Reduced inequalities

Domino



Laser cutting



Teo You Yenn
This is what Inequality Looks Like, 2018

Site E
Changi Prison

Group 3 | **Smart Sidewalk Solutions [S^{CUBE}]**

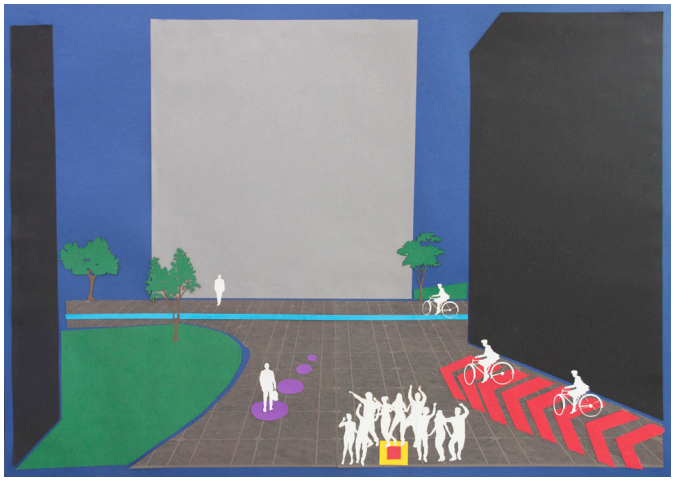
Philippe Bleuel, Alex Ng Wen Hui, Amray Schwabe, Daniel Lio Chin Shiuan, Philippe Suchsland, Peng Jia Xin / Katja Knecht

The project aims to reduce social inequalities and encourage physical activity as a response to the societal and health-related challenges faced in the aftermath of Singapore's rapid economic development. Introducing interactive floors in selected places will encourage people to engage, play and learn with and from each other, leading to a healthier and stronger community.

MORNING
Relevant information, such as the weather forecast or news, are displayed alongside morning exercises. Coloured lanes guide e-mobility users safely to their workplace.

AFTERNOON
Children can use the floor to draw and play on, while it also serves as a Karaoke screen or as navigational aides to surrounding facilities.

NOON
An active lunch break is encouraged through various interactive games, while nutritional facts are displayed. Joggers have their heartrate displayed.



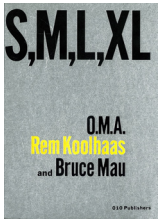
EVENING
Pedestrian and e-mobility lanes are guiding people home, while the community spirit is strengthened through games and dance activities.

student presentation on the role of public space in urban contexts

SDG 11: Sustainable cities and communities

Tarot

Point-cloud scanner

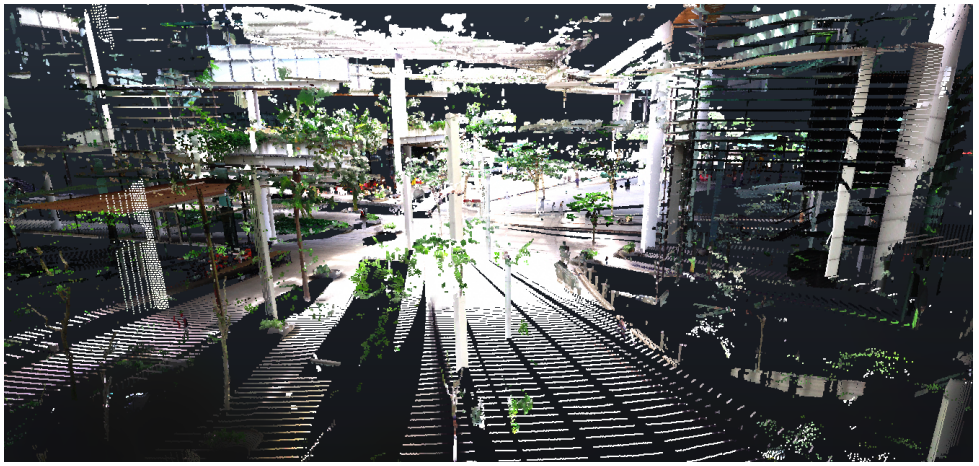


Rem Koolhaas, Bruce Mau, and OMA
"Singapore Songlines," *S, M, L, XL*, 1995

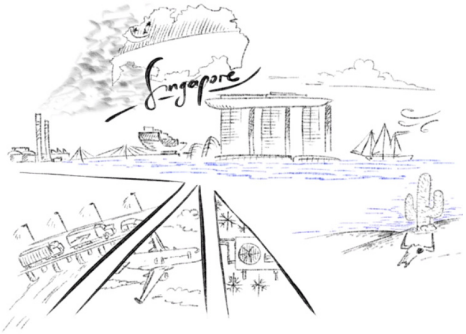
Site D
Palawan Beach

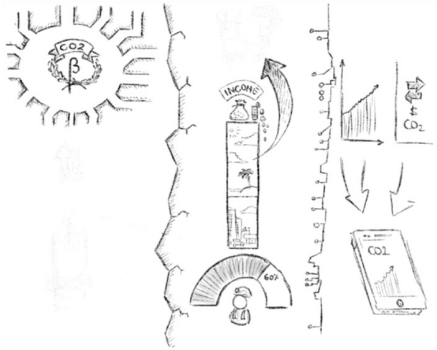
Group 4 | CO_2 Budgeting

Daryl Lee, Michael Alexander Kramer, Lau Yan Lin Adreena, Elena Pibernik, Michael Weinold, Xue Yikuan / Niklas Forchhammer



Singapore aims to reduce their carbon dioxide emission in the future to avoid further drastic climate change. To achieve this challenging goal, it is now the time for every citizen to step up and take responsibility for their own actions. We propose a new system in which every citizen is given a personal annual CO2 budget. Every action that produces CO2 will effortless be tracked by an app and deducted from the personal budget. Penalties on overuse helps to enforce the system, while trading between citizens allows certain freedom. Finally, our proposal enables Singapore's citizen to combine their efforts and realize the 11th SDG for "sustainable cities and communities".





video stils

1. Motivation

1-1)The future of Singapore will be seriously affected by climate change. Rapid urbanization has put massive stress on our fragile natural ecosystem in the past. Climate change will worsen the situation in Singapore and put its livability at risk, if no measures are taken now. The city, which was hit by flash floods in the past, will likely face a rising sea water level. Already high humidity and temperature levels are going to increase severely in a business-as-usual scenario in year twenty onehundred and make everyday life harder for our citizens and even increase the already high cooling demand.

1-2) Singapore plans to reduce the emission intensity by 36% below 2005 levels by 2030. After a decade of further increase at decreasing rates in total greenhouse gas emissions, the aim is to peak and stabilize around year 2030. Singapore is committed to do its part.
How do our citizens contribute to Singapore's emissions? Cooling our buildings requires huge amounts of electricity, mainly generated by gas plants. Transportation through both, local commutes and far holiday vacations contribute to the rise of CO2. Most of our many daily activities are related to carbon emissions. They are often embedded in the products we consume.

1-3) This sounds complex and confusing, but also gives leverage to help Singaporeans make better decisions. What if we can prevent the disaster, with the help of each Singaporean? Come on Singapore, let's all be the best we can be. Clean and green, reducing our vulnerability.

2. Mechanism

2-1) We have developed a solution for responsible citizens to meet their individual carbon goals. If you comply with your personal CO2 budget by the end of the year, everything is fine. If you see that you will exceed your budget due to your carbon intense lifestyle, you can buy rights to do so on a trading platform for emission rights. Finally, if you still fail to meet the personal requirement, you will lose a part of your annual salary.

2-3)
The carbon budget is calculated and allocated by CO2 beta, the carbon-dioxide budgeting- and emission trading agency. It is embedded into the framework of existing government agencies and draws on the data collected by them. It will be at the center of Singapore's sustainability efforts. A central entity tasked with collecting data about yourself might sounds frightening to you - almost like a lidless eye that never sleeps. But worry not, almost all the data required for this scheme is already in the hands of the government.

You might also argue that the government forcibly taking a large part of your income sounds an awful lot like communism, a radical idea. But is it not far more radical to live your luxurious life at the expense of so many others who do not have the means for climate change mitigation? This is why this is a fair carbon tax, rather than communism.

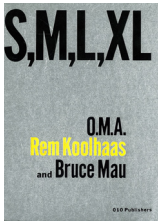
We have developed an app prototype to show how CO2 beta will enable responsible citizens to track their individual carbon goal in real-time. It displays the current usage of your annual CO2 budget, as well as calculated CO2 equivalents for consumer products. This will help you make better decisions at the mall and in the supermarket. The individualized budget is adjusted annually with respect to the total goals Singapore has agreed upon.

CO_2 Budgeting app demonstration

SDG 12: Responsible Consumption and Production

Domino

Drone



Rem Koolhaas, Bruce Mau, and OMA
"Singapore Songlines," *S, M, L, XL*, 1995

Site A
Turf Club

Group 5 | **"... otherwise we go to Mars"**

Jan Freihardt, Marco Kellhammer, Naomi Kruck, K. R. Preethi, Ashaa Preyadharishini Shunmugam, Arvind Srinivasan / Monamie Bhadra Haines

The center of this project is the Grandstand, a peculiar site in Singapore that had been opened as a horse racing club in 1933 and re-opened as a mall and sports facility in 2012. We elaborated possible futures of the Grandstand through two different approaches: A top-down "expert view" and a bottom-up "people-centered perspective".
We need to keep in mind that none of the approaches is complete in itself: A purely people-centered approach lacks long-term visions, while a purely top-down approach might design solutions that do not reflect the users' needs.

KNOWLEDGE SHARING

SHARE YOUR INFORMATION, SKILLS, OR EXPERTISE WITH FRIENDS AND OTHER PEOPLE FROM THE COMMUNITY. THE GRANDSTAND'S FACILITIES ARE SUPPORTING LIFELONG LEARNING AND CO-WORKING.

SHARING ECONOMY

ACQUIRE, PROVIDE OR SHARE ACCESS TO GOODS AND SERVICES THAT ARE FACILITATED BY A COMMUNITY BASED PLATFORM AT THE SITE OF GRANDSTAND. DON'T OWN IT, SHARE IT.

ACTIVITIES FOR ACTIVE AGEING

ENABLE ELDERLYS TO LIVE AN ACTIVE LIFE. THEY ARE VALUABLE FOR OUR SOCIETY. GRANDSTAND OFFERS UNIQUE OPPORTUNITIES WHERE ELDERLYS SHARE THEIR SKILLS WITHIN THE COMMUNITY.

PASSIVE COOLING

IMPROVING THE INDOOR THERMAL COMFORT WITH LOW OR NO ENERGY CONSUMPTION. SO YOU WON'T MISS THAT THERE IS NO AIR CONDITIONING.

ZERO PACKAGING

SHOPS WILL NO LONGER OFFER ONE WAY PACKAGING. PLEASE BRING YOUR OWN BAG OR CONTAINER AND BECOME PART OF THE „NO WASTE" MOVEMENT.

LOCAL FRESH MARKET

SUPPORT THE LOCAL BUSINESS AND CONSUME A BIG VARIETY OF FRESH FRUIT, CORPS AND VEGETABLES, GROWN AT GRANDSTAND'S URBAN FARMS.

REPAIRING FACILITIES

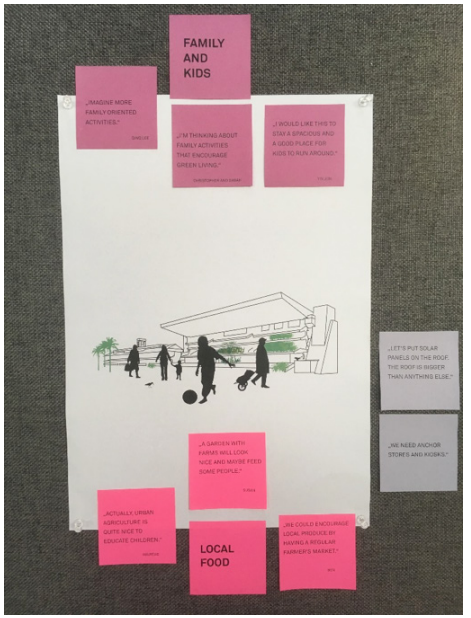
IMAGINE YOUR PRODUCTS ARE LIKE MUSIC INSTRUMENTS. THEY ARE TELLING STORIES AND GROW WITH YOU. USE THE REPAIRING FACILITIES AT THE GRANDSTAND TO KEEP YOUR PRODUCTS ALIVE.

URBAN AGRICULTURE

TAKE PART IN CULTIVATING, PROCESSING AND DISTRIBUTING FOOD IN THE RANKS OF GRANDSTAND AND AROUND.

community activities for site A

participatory process

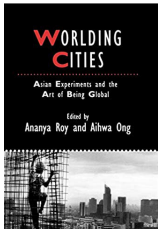


board and model for final presentation

SDG 6: Clean water and sanitation

Monopoly

Arduino

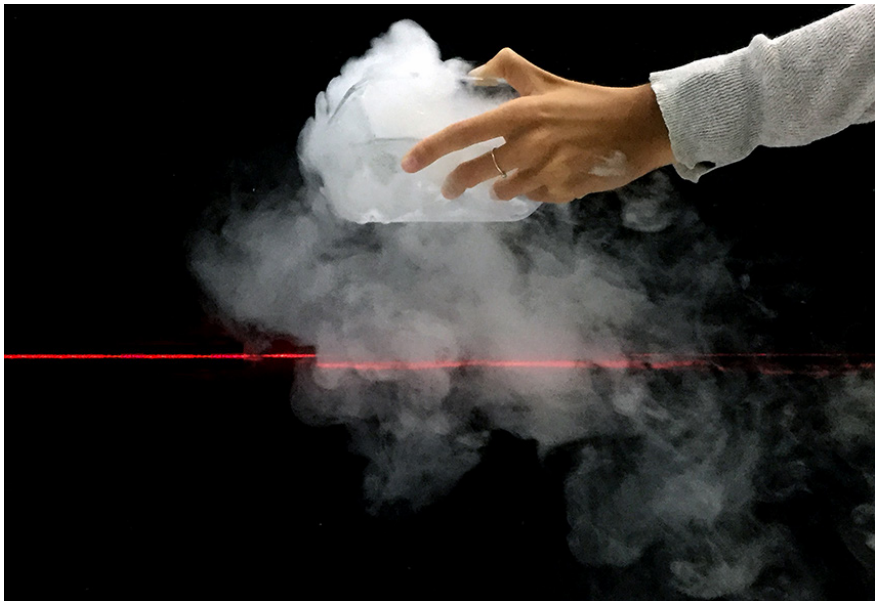


Chua Beng Huat
Worlding Cities: Asian Experiments and the Art of being Global, 2011

Site A
Turf Club

Group 6 | **cloudlines**

Hager Al Laham, Johann Krümmel, Cui Min Lim, Henning Mayer, Devesh Narayanan, Marta Tintore / Frederick Kim



Life on this planet takes place between two lines, the surface of the earth and the end of the atmosphere. This project investigates a third line demarcating the presence of water. We present our thought on how to deal with the elusive and multi-faceted nature of water in its relation to urban society by translating the depth of the line into the complexity of the cloud. Bases on this, we propose an audacious thought. Universalise the cloud! The eight images investigate the tensions, possibilities, and impossibilities of this idea. They show, how clouds interact with different environments – urban, as well as non-urban – and serve as an invitation to continue the difficult process of understanding the relation of water and the urban.

Cloudlines as Water Source

In a place devoid of water, the absence of clouds is almost a tautological assumption. Yet their movement could lead them to places even as unlikely as the desert and be a common source of water along. As climate change wreaks havoc indiscriminately and irreparably, dehydrating water distributaries. Cloudlines act as a source of water when existing ones dry out, replenishing water systems that civilizations depend on. On a land with scars of long drought visible on its surface, clouds are the future.

Cloudlines as Water Catchment

Clouds are aggregations of miniscule water droplets—like an intangible sponge saturated with water. Like reservoirs, Cloudlines act as water catchment, capturing water flows and storing them for a later time of need. This natural storage can reach up thousands of meters while maintaining its connection to the ground. Cloudlines as Living Space.

Cloudlines as Purifier

Three chimneys high above a cloud and their exhaust negligible against the white mass of the clouds covering the industry. Clouds need to clean what we emit, they cover up, neutralize by sheer volume anything put into them. Water cleans. When the air is polluted with dust and toxins, Cloudlines disperse water to clear the air of pollutants. They are climatic machines reversing the effects of our pollution.

Cloudlines as Equality

In existing cities, only the tallest of skyscrapers come into contact with clouds. They touch them and symbolically form a connection from the rough and dirty surface of the urban environment to the weightless realm of the sky. But this connection is only open to a chosen few that make it to the top of one of these towers. Yet clouds do not belong only to the chosen few who make it to the top of these towers. Here, they are accessible to everybody. Cloudlines are open to the world and open the world to the skies.

Cloudlines as a Water Poverty Line

For a long time, one dollar was the daily income line of poverty. 99cents is just below and in the industrialized worlds hardly suffices to buy anything outside the depicted store. We need to take this global perspective and make a life on 99cents a thing of the past. The clouds are the same everywhere and so much unlike the local value of money that can buy everything in some places while not being enough to drink and eat in others. The concept of a water poverty line signifies that every individual has the right to a minimum amount of water. Cloudlines ensure that water is equitably distributed to every region, so that every individual has access to water.

Cloudlines Among the People

Clouds occupy a place among the people. They mingle and connect in blurred spaces the people to the rough facades of concrete and advertisements. Undistinguishable in themselves, they portray a society as a place of difference in community. They create a place, where connection is of course and atomization impossible. The connection clouds envision is elusive and non-binding. They create the city as an open space.

Cloudlines as Leisure

In leisure activities far beyond the city, Cloudlines are needed to assist human endeavours. Every human activity requires water, and especially those of strenuous exercise. For all occasions, Cloudlines serve as shade in the outdoors and water for the parched.

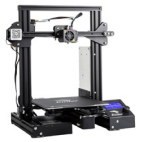
In the Cloudline

Windows are signifiers of constrained path to the world, we see, hear and feel the world behind them yet do not pass through. They stand for longing as well as access. The gaze upon a cloudy skyspace that is offered by this window stands for the potential to reach behind the urban enclosure and to immerse the life of even people living high above ground into a homogenous space of living together.

cloud demonstration with dry ice

SDG 13: Climate Action

Chess



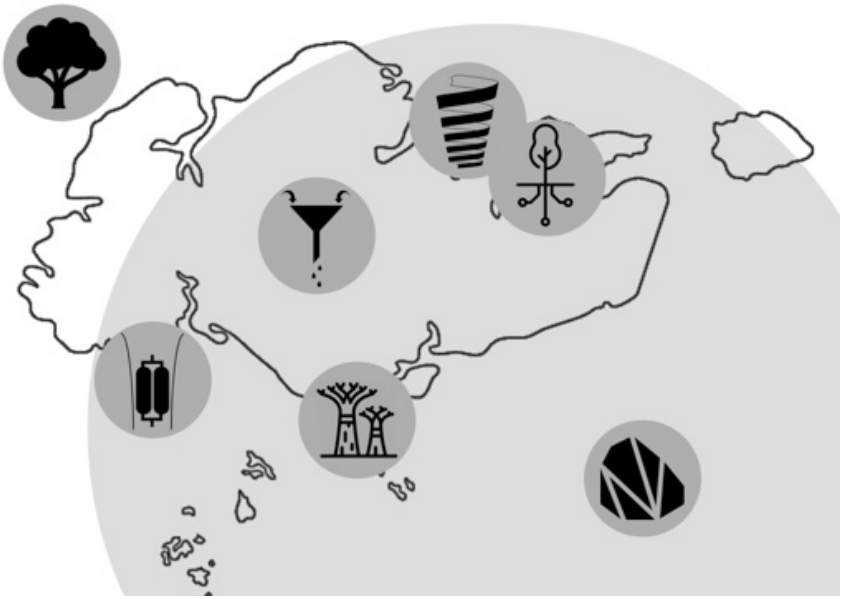
3D Printing

Matthew Sparke, James D Sidaway, Tim Bunnell, and Carl Grundy-Warr
Triangulating the Borderless World, 2004

Site C
Punggol Waterway

Group 7 | **Borderless Garden**

Lorraine Bersier, Francesco Ducci, Jacob Martin, Alli Shawal, Klara Uher, Jana Weber / Mei Qi Lim



Borderless Garden is more than an exhibition, a presentation, or a report. It's a vision. A vision of a green, clean and carbon-free Singapore, serving as an example and guideline for the future of urban society, as well as a pioneer in the field of decarbonization science and technology. The vision is achieved through a comprehensive holistic portfolio of technologies and solutions --the trees -- ranging from the mundane to the grandiose, from the trivial to the futuristic. The materialization of the vision is reached through a careful policy design, that builds upon and expands the current strategy based on carbon tax and reinvestment of the profits into truly building a borderless low carbon economy.

Natural Tree

- Placement: around the world
- Reforestation; cheap and low tech
- ¼ of Singapore needed to compensate CO2 emissions

Hydrogen Tree

- Placement: Jurong Island
- Captures carbon before it gets emitted
- Conversion of gas into hydrogen

Roots of the Tree

- Placement: south-east asia
- Storage of CO2 in caves
- Enough space to store Singapore`s CO2 until 2120

Food Tree

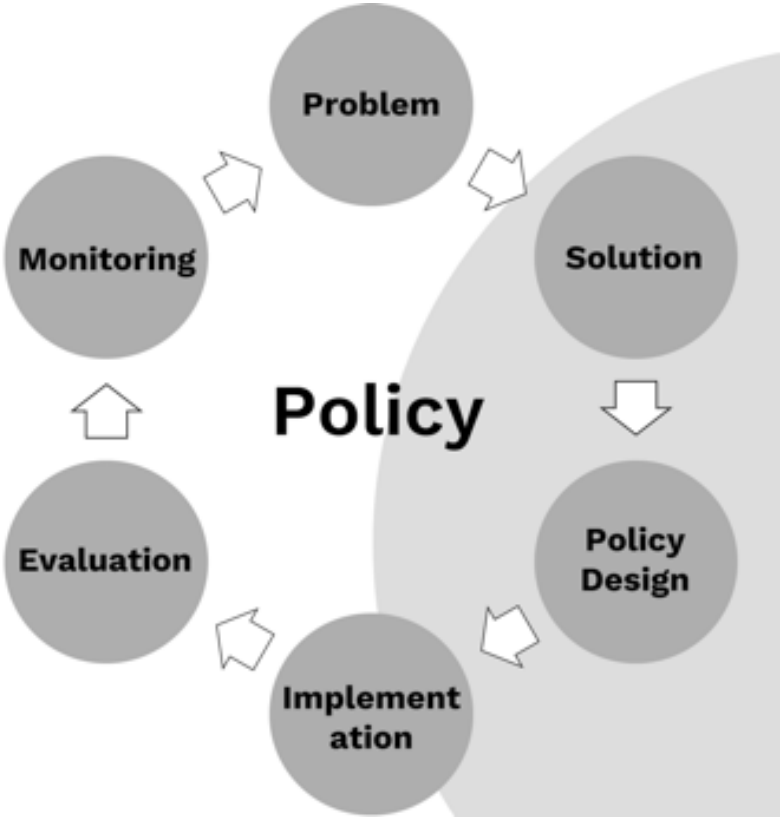
- Placement: Punggol Waterway
- Using captured CO2 to grow plants in vertical farms
- Locally produce food on less land

Air purifier Tree

- Placement: Punggol Waterway
- Absorbs soot out of the polluted air coming from Malaysia
- Can be combined with natural trees for esthetic purposes

Fuel Tree

- Placement: around Singapore
- Direct conversion of CO2 to methanol
- Most effective tech but expensive



Policy Design:
- Increase in carbon tax regardless of Industry
- Decarbonisation by reinventing profits in carbon offsetting and building a low - carbon economy

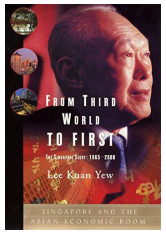
Implementation:
- Reforestation
- R&D in carbon tech via joint program with industry players
- License technology to companies for a virtuous feedback cycle

terrarium installation

SDG 14: Life below water

Go

Virtual reality



Lee Kuan Yew
From Third World to First: The Singapore Story - 1965-2000

Site D
Palawan Beach

Group 8 | **Aqua_Hinterland**

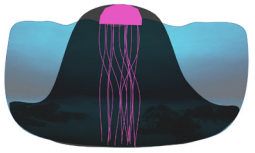
René Brieden, Xiangnan Chu, Michail Karakikes, Vasantha Raman, Irwan Soetikno, Qin Zhang / Marc Angélil

Our oceans are dying: pollution, over-fishing, decreased biodiversity, rising sea-levels, change of current patterns, increased acidification, and eutrophication. Our project proposes a series of concepts to mitigate the human-induced effects on our oceans. Moreover, we propose a representation of the oceans at the United Nations, under the heading “United Islands.”

1
Mining the Ocean

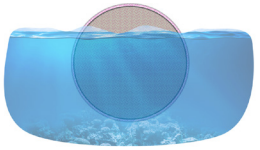
2
Coralification

3
Algae Farm

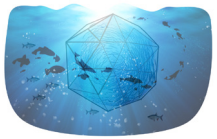


4
Carbon Capture & Storage Island

5
Turbo Island



6
Plankton Bubble



7
Aquapod

+1
Ocean Observatory

Synergies: The various concepts work in unison, acknowledging that the benefit of the whole is greater than the simple sum of its parts!

aquarium installation

The Campus for Research Excellence and Technological Enterprise (CREATE)
Singapore-ETH Center for Global Environmental Sustainability (SEC)
Future Cities Laboratory (FCL)
Future Resilient Systems (FRS)

ETH Zurich
Massachusetts Institute of Technology (MIT)
Nanyang Technological University (NTU)
National University of Singapore (NUS)
Singapore University of Technology and Design (SUTD)
Technical University Munich (TUM)
University of Cambridge, Cambridge Centre for Advanced Research
and Education in Singapore (CARES)

Acknowledgements

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Marc Angélil, Aurel von Richthofen and Frederick Kim

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