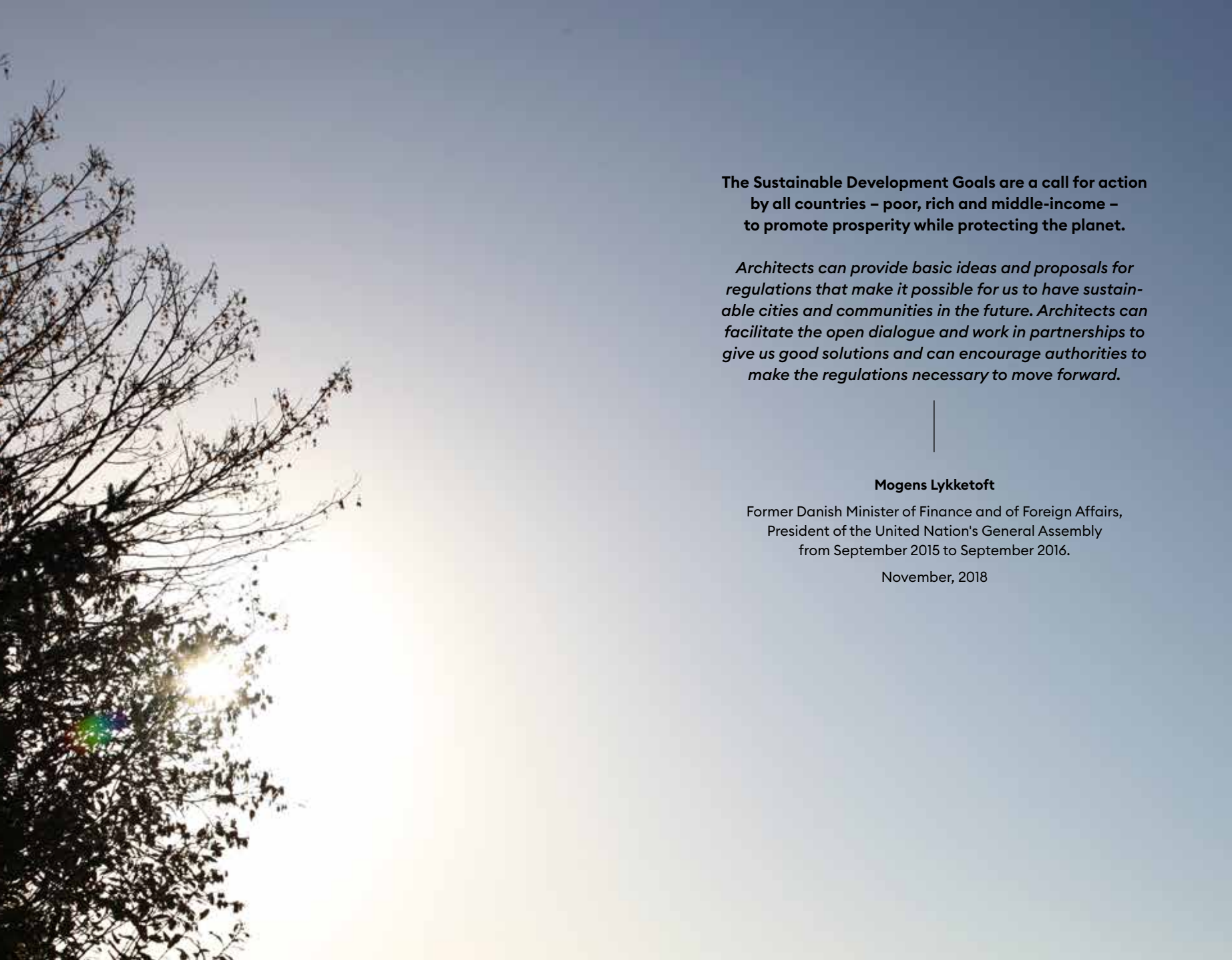


AN ARCHITECTURE GUIDE

to the UN 17 Sustainable Development Goals

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**The Sustainable Development Goals are a call for action
by all countries – poor, rich and middle-income –
to promote prosperity while protecting the planet.**

Architects can provide basic ideas and proposals for regulations that make it possible for us to have sustainable cities and communities in the future. Architects can facilitate the open dialogue and work in partnerships to give us good solutions and can encourage authorities to make the regulations necessary to move forward.

Mogens Lykketoft

Former Danish Minister of Finance and of Foreign Affairs,
President of the United Nation's General Assembly
from September 2015 to September 2016.

November, 2018

INTRO

The 17 UN Sustainable Development Goals represent the aspiration of the people of the United Nations for a more sustainable future.

The Goals define the challenges we need to address to achieve a better and more sustainable future for all. They address the global problems we face together, including those related to poverty, inequality, climate, environmental degradation, prosperity, peace and justice. The Goals are deeply interconnected, and to leave no one behind, the world must move significantly towards achieving each Goal by 2030.

The built environment, planning, architecture and design, interact with every goal. And most crucially: not just on an aspirational level or as future potential, but through realized buildings, settlements and cities all over the world. Architectural solutions are already there, everywhere, contributing to sustainable communities and quality of life. However, the built environment is also a part of the current challenges – a major consumer of energy and natural resources, and producer of waste. Furthermore, how we build can exacerbate inequalities and affect health.

That is why the Institute of Architecture and Technology at The Royal Danish Academy of Fine Arts Schools of Architecture, Design and Conservation, the Danish Association of Architects and the UIA Commission on the UN Sustainable Development

Goals have created this architecture guide to the Goals. With this guide book we hope to make it tangible how the built environment interacts with the goals and to inspire architects and stakeholders involved in the built environment to engage with the challenges. It is for each and every one of us to contribute to the realization of the goals.

The intention of this book is to provide an architecture guide to the Goals. The 17 chapters present how each Goal is defined by the UN, outlines how it interacts with the built environment and gives examples of realized projects that illustrate architectural contributions.

Many of the cases address more than one goal, but the aim here is not to explore sustainable projects in their full complexity, but to understand the Goals as they relate to architecture. All cases are realized architectural projects, planning initiatives and structures. Our hope is that the cases will form a basis on which to start a conversation about how the built environment can contribute to each Goal.

In this first edition of the guide we have 2-3 cases to illustrate each goal, many from Denmark. In future editions we would like to expand the range of projects, and we welcome suggestions of cases to be included in the second edition, planned for 2020. Cases should be realized projects that illustrate how architects

and architecture can contribute to the realization of the Goals. Each case in this guide is inspiring and noteworthy, but they are not the final answer to how the built environment can contribute to the realization of the Goals. There is no one answer to that. To move towards the realization of the Goals, we need many new solutions, adapted to local climate, culture and challenges, and we need them not as ideas, but on the ground, implemented and in use. It is through realized buildings, settlements and planning the effect is achieved; environmentally and on our quality of life.

This publication is dedicated to the architecture students who will shape the future of architecture, planning and design; to the politicians who will aid them by understanding the intersections between architecture and the Goals; and to all citizens, professionals and institutions who join in the collective challenge ahead – to address social needs while protecting the planet.

On behalf of the Editorial Committee

Natalie Mossin
Chief Editor



1

NO POVERTY

End poverty in all its forms everywhere

Poverty is more than the lack of income and resources to ensure a sustainable livelihood. Its manifestations include hunger and malnutrition, limited access to education and other basic services, social discrimination and exclusion as well as the lack of participation in decision-making.¹

Despite the fact that the global poverty rate has been halved since 2000, intensified efforts are required to boost the incomes, alleviate the suffering and build the resilience of those individuals still living in extreme poverty.²

To find out more about Goal #1, visit:
<https://www.un.org/sustainabledevelopment/poverty/>

¹ Extract from UN's Sustainability Goals, available from
<https://www.un.org/sustainabledevelopment/poverty>

² Extract from UN's SDGs Knowledge Platform, available from
<https://sustainabledevelopment.un.org/sdg1>

1 NO POVERTY



Architecture cannot lift people out of poverty, but the built environment can affect the impact of poverty on people's life through access to housing and institutions that are affordable.

Through building design and planning architects can develop buildings and settlements that are cheap, safe and healthy. Examples of this can be found in social housing schemes, co-ops and projects for urban upgrading.

The overarching principle is that buildings and services must secure the highest possible value from available funds and resources. This demands the development of new architectural solutions. As part of this, buildings must be designed using products and materials that do not compromise the environment, while maintaining the affordability of current, environmentally problematic solutions, such as the metal sheet roof. Furthermore, architecture, landscape design and planning must adapt the built environment to climatic, geographical and cultural contexts, working with the surrounding environment and not against it, to increase quality of life while helping inhabitants save on electricity and other services. As part of this, architects working on development projects must engage the local communities and help weak and poor citizens gain ownership to the built environment of which they are a part. Finally, the building process itself must take place under conditions that protect the environment as well as poor and marginalized stakeholders.

Volontariat Home for Homeless Children

Challenge

Everyone has a right to have a home. Poor people in the world has no or very little money to invest in a home, making it important for architects to design and experiment with typologies and solutions that are decent, affordable and which can be built without the use of expensive tools or materials.

Contribution

The Volontariat Home for Homeless Children in Pondicherry, India, can accommodate 15 children and 5 foster parents. It has been designed as an experiment using a rare technology developed by Ray Meeker from Golden Bridge Pottery, which consists of baking a mud house in situ, after constructing it. Keeping the cost low has been a very important element in the design, and the technique makes use of local natural resources, making it possible to spend very little money on purchased materials.

The Volontariat Home is basically a mud house built with mud bricks and mud mortar, which is baked three to four days after building, to achieve the strength of the brick. Making the house itself a kiln, is an energy efficient way of baking bricks. Furthermore while baking the house, the heat can be used to produce other mud bricks or ceramic products such as tiles. It was prioritized to up-cycle waste material for the interior and the finish, such as bicycle wheel frames for window frames or bars, glass bottles as structural units in toilet masonry, and glass chai cups to finish the openings at the top of the dome. The project is an example of radical thinking and testing new approaches to cheap housing made with local craftsmanship and materials.



Origin/team

Anupama Kundoo with technical support from Ray Meeker, Volontariat NGO, M. Vinayagam

Photo: Alka Hingorani



Photo: Sonja Winkler

Non-profit Affordable Housing on Dorteavej

Challenge

Building homes with spatial qualities on a strict budget is a constraint for all social housing associations operating in Denmark. Due to the present market conditions, this challenge is getting harder to overcome.

Contribution

The architecture office, BIG, was commissioned to design 'Dorteavej Residency' by the Danish non-profit social housing association Lejerbo in 2013. The five-storey building is located in Copenhagen, and offers 66 new homes to low-income citizens realized on a strict budget.

The characteristic winding building is based on a singular prefabricated structure, with housing modules repeating along a curve and stacked to the height of the surrounding buildings. The stacking creates additional space for each apartment to have a small terrace, providing a setting for healthy, sustainable living. The building creates space for a public plaza towards the street as well as an intimate green courtyard. On the street level, the building opens up to allow the residents and the general public to pass seamlessly into the courtyard.

All materials are kept very simple with wood and concrete in light colours dominating inside and out. Long wooden planks cover the façade on all sides, highlighting the modules and alternating to accentuate the checkered pattern.



Origin/team

Bjarke Ingels Group,
Lejerbo,
MOE



Photos: Rasmus Hjortshøj - COAST

2 ZERO HUNGER

End hunger, achieve food security and improved nutrition and promote sustainable agriculture

How do we grow, share and consume our food in more sustainable ways? If done right, agriculture, forestry and fisheries can provide nutritious food for all and generate decent incomes, while supporting people-centered rural development and protecting the environment.

However, right now, our soils, freshwater, oceans, forests and biodiversity are being rapidly degraded. Climate change is putting even more pressure on the resources we depend on, increasing risks associated with disasters, such as droughts and floods. Many rural women and men can no longer make ends meet on their land, forcing them to migrate to cities in search of opportunities.¹

To find out more about Goal #2, visit:
<https://www.un.org/sustainabledevelopment/hunger/>

¹ Extract from UN's Sustainability Goals, available from
<https://www.un.org/sustainabledevelopment/hunger/>



The built environment contributes to the securing of food supplies through planning, landscape design and building complexes that protect existing ecosystems and prioritize the preservation and expansion of areas for food production.

Creating conditions to support sustainable farming must be an integral part of development, also where fertile land is scarce, whether due to urban density, harsh climatic conditions or restricted access. Planning, landscape design and building design can contribute by developing designs that favour land use for food production in many scales. Examples of this can be found in urban farming projects, production cooperatives and regenerative landscape design. Furthermore, the built environment can help the maintenance and rebuilding of species diversity in landscape, settlements and urban areas. This requires working with local geography, climatic conditions and locally adapted crops in the design of areas for food production.

Design in areas for food production must be robust and geared to cope with climate change, such as extreme weather, drought and floods. Often, the production of building materials such as timber or bricks co-exists with food production, making it important to consider how farming interacts with the production of building materials on a local level. Finally, building and landscape design must involve end-users in a co-creation of areas for food production.

Impact Farm

Challenge

The increasing urbanization and expansion of cities into mega cities make awareness of resilience, resource efficiency and food security more and more important. Resources and time spent on transport and provision of some basic food, can be saved by local farming. Also shortage of water and energy in many places, makes it important to innovate cropping systems, making them more resource efficient. Impact Farm aims at rethinking local food supply, but in the contexts where it has been built so far (Copenhagen and New York), the emphasis has been put on community building and education.

Contribution

The greenhouse is designed as a highly efficient agricultural system, with the capacity to produce two-three tonnes of crops a year on only 50 m². This is made possible by a so-called hydroponic system, where crops are cultivated without soil, enabling cultivation to expand upwards across multiple levels. Irrigation is sourced from rainwater collection, and water is recirculated within a closed loop system. The method of hydroponic cultivation results in significant savings in the use of freshwater at 70-85% compared to more conventional methods of production.

The farms are designed for disassembly making it possible to accommodate temporary lease and shifting of site, which is a common challenge in metropolitan areas in high demand. Also the farm is designed as a social venue for community building in the ground floor. In Copenhagen the farm has raised awareness of urban farming and its advantages through educational workshops, concerts, food & cooking festivals, and a majority of the produce has been distributed to local cafés and restaurants.



Photo: Abdellah Ihadian

Origin/team

Human Habitat,
Miljøpunkt Nørrebro,
Realdania,
Københavns Professionshøjskole

Photo: Human Habitat



The Michigan Urban Farming Initiative

Challenge

A 2017 Detroit Food Metrics Report showed that nearly half of all Detroit households are lacking reliable access to a sufficient quantity of affordable, nutritious food. At the same time the shrinking city has within its limits an area of vacant lots equivalent to the area of the city of Paris. In the face of these challenges a culture of urban agriculture has emerged, which has set Detroit at the forefront of innovative urban farming.

Contribution

Located in Detroit's North End Neighborhood, the campus of Michigan Urban Farming Initiative (MUFI) covers more than 1 ha. of urban land. Within its footprint, the campus features a collection of projects, each of which is in varying stages of development. Approximately one third of the campus is dedicated to production farming, another third to interactive agriculture, and the remaining third to hardscaped space.

The all-volunteer non-profit organization seeks to engage members of the community in sustainable agriculture. According to MUFI, challenges unique to urban communities like Detroit (e.g., vacant land, food security) present a unique opportunity for community-supported agriculture. MUFI works to empower urban communities by using agriculture as a platform to promote education, sustainability, and community while simultaneously reducing socioeconomic disparity. The aim is to potentially develop a broader model for redevelopment for other urban communities; In 2017 MUFI started work on America's first sustainable urban Agrihood. An agri-hood is an alternative neighbourhood growth model, positioning agriculture as the centerpiece of a mixed-use development.

Since it began operation in 2011, MUFI has been able to grow and distribute over 22,000 kilos of produce - grown using organic methods - to over 2,000 households within 2-square miles at no cost to the recipients.

Photo: Michigan Urban Farming Initiative



Origin/team

The Michigan
Urban Farming Initiative



3 GOOD HEALTH AND WELL-BEING

Ensure healthy lives and promote well-being for all at all ages



Ensuring healthy lives and promoting well-being for all at all ages is important to building prosperous societies. Yet, despite great strides in improving people's health and well-being in recent years, inequalities in health care access still persist.¹

Many more efforts are needed to fully eradicate a wide range of diseases and address many different persistent and emerging health issues. By focusing on providing more efficient funding of health systems, improved sanitation and hygiene, increased access to physicians and more tips on ways to reduce ambient pollution, significant progress can be made in helping to save the lives of millions.²

To find out more about Goal #3, visit:
<https://www.un.org/sustainabledevelopment/health/>

¹ Extract from UN report WHY IT MATTERS – Good Health and well-being - PDF

² Extract from UN's Sustainability Goals, available from
<https://www.un.org/sustainabledevelopment/hunger/>

Most people spend the majority of their life indoors, making indoor climate an influential factor of health.

Building design must enable a healthy in-door climate concerning light, acoustics, air quality and exposure to radiation and degassing. This is important in all buildings, but especially so in buildings with vulnerable users, such as hospitals. Building design must further avoid the use of environmentally hazardous materials and substances. Furthermore, transmission of diseases and illnesses often happens within the built environment and building-design as well as the layout of settlements and urban areas are crucial to curb the spreading of diseases and exposure to bacteria.

Infrastructure, health institutions and urban areas affect citizens' access to exercise. Buildings, settlements and urban areas must therefore be planned so that they allow and encourage physical activity. Urban layout also influences the risk of accidents, for example in traffic, and this can be addressed through design.

Architecture, simply put, plays a crucial part in creating a built environment that supports good health and well-being. Examples of this span greatly and can be found in housing that reduces the risk of infection with malaria, in patient-community buildings and in the design of workout equipment for public parks.

The Magoda Project

Challenge

In sub-Saharan Africa, many infectious diseases including Malaria are acquired in and around the home. There are great demands to improve the health of local residents, specifically through improving the space, they spend the majority of their time in – the home. Low-cost houses prevalent in rural Africa usually consist of mud or brick walls with few (if any) windows. Airflow is minimal and basic facilities such as cooking areas, safe water supply and sanitation are usually absent or rudimentary. Architectural modifications used to improve the typical African home are an efficient way to target domestic issues such as health, hygiene, comfort and most importantly, diseases.

Contribution

The Magoda Project is a series of eight prototype homes constructed in a rural village in the Tanga region of Tanzania. The project explores design elements of traditional Asian and African homes to generate a variety of new and improved housing designs to minimize diseases.

The eight houses integrate Asian architectural features (to optimize airflow) with traditional African building methods familiar in the local area. Alongside collaboration with local engineers, labourers, doctors and sociologists, the final designs were materialised through research and observations of the local climate, to maximize indoor comfort. The building types are single or double storey houses clad in timber, bamboo or shade-net, with semi-outdoor kitchens, water-harvesting tanks and sanitation facilities. In addition, the project was used as an investigative tool to evaluate the reduction in disease transmission as it relates to indoor climate of different housing designs, modifications and building materials. The project engages with local community leaders and stakeholders to improve the acceptance of the new housing designs. In average the houses are 2.3 °C cooler and have 86% fewer mosquitoes than traditional homes, and thereby constitute architectural examples of ways to target domestic issues such as health, hygiene, comfort and diseases such as malaria.



Origin/team

Architects: Ingvarsen Arkitekter.
Project Team: Jakob Knudsen, Lorenz von Seidlein,
William N. Kisinza, Konstantin Ikonomidis, Emi Bryan,
Salum Mshamu and Kiondo Mgumi



Photos: Konstantin Ikonomidis

Konditaget Lüders – the fitness roof Lüders

Challenge

Two-thirds of all persons with diabetes live in cities making it important to design urban spaces that support good health and well-being by focusing and enabling physical exercise. Public urban space is scarce and shall accommodate multiple functions such as infrastructure, parking of cars and bicycles and street furniture like benches and signs. The challenge is to find the additional space for recreation and exercise in all large cities.

Contribution

The combination of a green facade, an activity landscape and a parking house, Konditaget Lüders has resulted in a 'park and play' hybrid, optimizing urban space into public amenity. A staircase and a red handrail guide people from street level to the 2,400 m² rooftop 24 meters above ground level. Here swings, trampolines, jungle gyms, crossfit equipment, monkey bars and benches offer a view of the Copenhagen skyline, and an opportunity to exercise for people defying the altitude. The building offers 485 of urban parking spaces on seven floors, limited footprint for parking purposes. Moreover, the facade and roof offer opportunity to increase health and well-being of the residents in the neighbourhood by adding and activating additional public space, and a living green facade.

Origin/team

JAJA Architects,
Totalentreprenør 5e Byg,
Søren Jensen Ingeniører,
LOA, DGI, Rama Studio,
By og Havn



Photo: Rasmus Hjortshøj – COAST for Lokale og Anlægsfonden



Maggie's at the Robert Parfett Building

Challenge

The ability to recover from serious illness can be positively influenced by architecture. Refuges have throughout history been used as a sanctuary for diseased, based on the belief that silence and clean air could cure. Modern research supports the belief that certain design can optimize the effect of treatment, such as daylight, atmosphere affected by colours and sounds, and spatial conditions that promote safety and comfort.

Contribution

Maggie's Centre offers free practical, emotional and social support to people with cancer and their families in Britain. The concept of the centres is inspired by Maggie Keswick Jencks, who began to look to architecture to lift the spirits and help in the process of recovery.

The design of the centre in Manchester is arranged over a single storey, keeping its profile low and reflecting the residential scale of the surrounding neighbourhood. Throughout the centre, there is a focus on natural light, greenery and garden views with the aim at providing a welcoming 'home away from home'. The centre combines a variety of spaces, from intimate private niches to a library, exercise rooms and places to gather and share a cup of tea. The heart of the building is the kitchen, which is centered on a large, communal table. Institutional references, such as corridors and hospital signs have been banished in favour of home-like spaces.

The south end of the building, extends to a greenhouse, which is thought as a celebration of light and nature, and which provides a garden retreat, a space for people to gather, to work with their hands and enjoy the therapeutic qualities of nature and the outdoors. It will be a space to grow flowers and other produce that can be used at the centre giving the patients a sense of purpose at a time when they may feel at their most vulnerable.



Origin/team

Foster + Partners,
HE Simm, Gardiner & Theobald,
Dan Pearson Studio,
Maggie's

Photos: Nigel Young-Foster + Partners



4 QUALITY EDUCATION

Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

Obtaining quality education is the foundation to creating sustainable development. In addition to improving quality of life, access to inclusive education can help equip locals with the tools required to develop innovative solutions to the world's greatest problems.

The reasons for lack of quality education are due to lack of adequately trained teachers, poor conditions of schools and equity issues related to opportunities provided to rural children. For quality education to be provided to the children of impoverished families, investment is needed in educational scholarships, teacher training workshops, school building and improvement of water and electricity access in schools.¹

To find out more about Goal #4, visit:
<https://www.un.org/sustainabledevelopment/education/>

¹ Extract from UN's Sustainability Goals, available from
<https://www.un.org/sustainabledevelopment/hunger/>



Schools and educational spaces are a crucial part of our investment in the future.

Whether in a refugee camp, in the slums or in Silicon Valley, access to schools and to education is defining the future of our children. Schools, universities and other educational institutions all require an architecture that enables a productive learning environment, but architecture also has a role to play in creating affordable, accessible and inclusive educational solutions for communities with limited resources for conventional buildings or limited access to an existing school system. Examples of this can be found in designs that enable study at night, such as solar-powered reading lamps for off-grid rural areas, in movable classrooms for the children of migrant workers and in school facilities for minorities.

Furthermore, the built environment can provide training opportunities regarding the sustainable performance of buildings, settlements and urban areas for both users and craftsmen. In development, as well as in use, buildings and communal facilities can interact with and promote a sustainable culture of usage.

On the level of primary education, an increased focus on knowledge regarding sustainable design and crafts will be key in building the future sustainable development.

Avasara Academy

Challenge

Half of all girls in India never make it to higher secondary education, and nearly half are married before the age of 18. Even when women receive an education, it is common that marriage leads to household and childcare, instead of employment.

Contribution

With the Avasara Academy founder Roopa Purushothaman aims at changing the mindset and value of girls in India, giving them education, role models and confidence, which can empower them to create positive change in the communities surrounding them.

Located in the outskirts of Pune, India, Avasara is a full-time residential academy focusing on developing the leadership potential of India's brightest young women. The framework of the indoor and outdoor campus area enables space for teaching along with intimacy, safety and familiarity for the women living and studying there. The spaces have been carefully designed to facilitate development of relationships between the students, and the learning environment is both fostering room for individuality, concentration and a social life, making it possible for the young women to develop who they are as individuals. Enabling the academy to be a sanctuary and a safe space of learning, the team has worked with the materiality of the campus, incorporating warm textured materials, traditional furniture pieces and a site specific colour palette softening the concrete walls with local pigments traditionally used throughout India.

Origin/team

Avasara Academy,
Case Design,
Malene Bach,
Pratik Raval of Transsolar
KlimaEngineering



Photo: Case Design



Photos: Ariel Huber



Frederiksbjerg School

Challenge

Physical exercise is beneficial for the learning ability of children, and research proves that high-intensity physical exercise just after class is beneficial for long-term memory. Still learning environments in many schools foster inactivity or uninspiring in- and outdoor spaces, making it difficult to engage everyone in the short breaks between classes. Also capacity of space can be limited, making it important to activate the potential of 'in between spaces' and to design with an eye for multifunctional use and diverse learning situations.

Contribution

Frederiksbjerg School is a public primary and lower secondary school in Aarhus, Denmark, which is designed to promote physical activity. It is one of the first schools designed to meet a Danish law requiring that children should get more exercise during the school day.

The team has incorporated physical challenges in the journey from A to B by rethinking the walking areas, the roofs, the classrooms, the halls and the outdoor spaces. In this way the school allows children to get through the day in more than 100 different ways. Also class rooms have been redesigned, and a staircase for teaching has been introduced instead of traditional tables and chairs, ensuring that the pupils do not sit for too long. Niches and group rooms facilitate space for immersion and collaboration. In order to optimize every sqm of the school for movement, the roof has been designed as a fenced playing field, the terraces function as playgrounds, the teaching areas and roofed outdoor areas are used as workshop space. Customized zones for presentations, group work, and individual studies support the educational and didactic principles making physical activity inevitable. The results are better learning and higher test scores.



Origin/team

Henning Larsen, Hoffmann,
GPP Architects, Niras
Møller og Grønborg,
City of Aarhus



Photos: Hufton+Crow

The Community Dome

Challenge

A great number of adults and children who have been displaced from Syria are now living informally within refugee camps. Often they do not have access to social security, sanitation and educational facilities. 2/3 of refugee children are not attending school.

Contribution

The goal of the EAHR campaign “100 classrooms for refugee children” is to provide schools and tools to democratize construction with easily transferable techniques. The projects train refugees in the Middle East in sustainable construction techniques and offer workshops in co-creative and participatory approaches on the field.

Za'atari Village in Jordan is currently home to 15,000 Syrians and 13,000 Jordanians. In collaboration with the local community and a local NGO, Acting for Change Jordan, EAHR organized an extension of an informal existing school so that it could be used according to the need for a common space/playing area/classroom. The room is a 25 sqm dome built with the super-adobe technique. The construction is inspired by the vernacular beehive house structures of Syria originating from Aleppo and Homs, where many of the refugees come from. During the construction, EAHR trained local workers in super-adobe construction methods which can also increase livelihoods and strengthen the resilience of the local community. Hopefully, this method allows these skills to be re-adopted to build more sustainable, low-cost and energy efficient buildings in the surrounding informal settlements and during Syria's future reconstruction.



Origin/team

Emergency Architecture
& Human Rights (EAHR),
Acting for Change Jordan,
Social Science advisor:
Jawhara Hammuh

Photos: Martina Bo Rubino





5

GENDER EQUALITY

Achieve gender equality and empower all women and girls

Gender equality is not only a fundamental human right, but a necessary foundation for a peaceful, prosperous and sustainable world.¹

Yet, gender inequality persists worldwide, depriving women and girls of their basic rights and opportunities. Achieving gender equality and the empowerment of women and girls will require more vigorous efforts, including legal frameworks, to counter deeply rooted gender-based discrimination that often results from patriarchal attitudes and related social norms.²

To find out more about Goal #5, visit:
<https://www.un.org/sustainabledevelopment/gender-equality/>

¹ Extract from UN's Sustainability Goals, available from
<https://www.un.org/sustainabledevelopment/gender-equality/>

² Extract from UN's SDGs Knowledge Platform, available from
<https://sustainabledevelopment.un.org/sdg5>



To support a movement towards gender equality, the design of buildings, settlements and urban areas must be inclusive to all citizens regardless of gender.

The organization of public spaces, institutions and services must prioritize the security of girls, women and LGBT+ citizens and help minimize the risk of abuse. The ability to move safely in public spaces, in public institutions and at the workplace is key to the inclusion of women and girls in civil society and to women being able to hold a job outside of their home, which is key to being self-supporting. Also needed are affordable and secure buildings to provide health services, basic sanitary services and meeting places for women and LGBT+ citizens. Examples of this can be maternity clinics, safe houses or secure public bathrooms.

Design of playgrounds, public parks and sports facilities must offer girls and women equal access to leisure and physical activities and create conditions that encourage use by all.

The building industry itself must work towards equal pay, promote diversity and work to oppose sexual harassment. As part of this, the industry must support women's ability to handle heavy construction processes that are otherwise reserved for men, for example by the introduction of lifting technologies. From design through construction, the industry must avoid a narrowly gendered work culture in order to promote diversity and co-ownership so that more women will be able to join the industry at all levels.

Kachumbala Maternity Unit

Challenge

Located in eastern rural Uganda, Kachumbala and the surrounding Bukedea District is home to 160,000 people, an impoverished region with limited access to healthcare. It has a high maternal death rate and a high infant mortality rate, estimated at 35-40 children out of every 1,000 not living to their first birthday. Often access to medical care, hygienic facilities, electricity and water is limited, making new maternity facilities much needed in the region. Sustainable, passive features must be prioritized when power supply is not reliable and natural resources are scarce.

Contribution

A new maternity facility in Kachumbala, Uganda replaces an existing facility, which was unable to accommodate four out of every 10 women who had travelled, often long distances to seek help. The unit includes a new post-delivery 7-bed recovery ward in which new mothers and babies can stay for observation for the WHO-recommended 24-hour period. A family gathering space was incorporated into the design, because women in labour are supported by extended family who travel with them to the maternity unit to help, to cook meals etc.

About 92% of the materials used on the project were sourced locally, and only few power tools were used to build it. Hand-made bricks that form the building's structure were pressed on site, eliminating the need to fell and burn local trees, reducing the amount of cement needed for construction. Electricity and water supply is limited and unstable in the region, and therefore natural ventilation and shading have been a major design driver, featuring a mono-pitch roof design, strategic placement of operable windows, dog run openings and exterior corridors featuring terracotta screens, all contributing to creating cross-flow ventilation and shading. Solar-powered electricity is used for lighting and cooling of drugs, and rainwater catchment makes water collection possible during the rainy season for use in the unit. The design was evaluated with the assistance of UK-based health professionals, who are also providing midwife training and other support for local healthcare providers.



Origin/team

HKS Architects,
Engineers for Overseas Development,
Clyfe Building Skills,
Welsh Government



Photos: HKS Architects

Nakuru Children's home

Challenge

In Kenya, over half the female population is living below the poverty line and less than 50% of girls are educated beyond primary school level. The building sector is one of the fastest growing sectors in East Africa and it has a huge potential for education and employment of women.

Contribution

In 2013, while Orkidstudio was building a children's home near Nakuru in Kenya, Hellen, who lived nearby, asked for the opportunity to volunteer on the site and learn the skills they were teaching. A single mother, with a large family and limited education and opportunities, Hellen was given a salary on the condition that she worked just as hard and learned twice as fast as the people already there. At the end of the week, Hellen invited another 12 women to join the team, who proved to be not only hard-working and resilient, but highly skilled and overall the most valued members among the team by the end of the project. They showed that women can and should be part of creating our built environment. Since 2013 Orkidstudio employs 50/50 women and men in the company and on construction sites. With newly marketable skills, a stronger sense of self-worth, increased incomes and economic independence, these women (1,500 to date) have transformed their lives, and, very importantly, won the respect of their male counterparts.

Responding to the development challenges African cities face, especially the alarmingly low number of high-skilled artisans to meet the demand of rapid urbanization, and the persistent poverty in urban slums, Orkidstudio is launching Buildher, a programme which equips disadvantaged young women in Kenya with accredited construction skills, leading to greater financial prosperity, changing male attitudes and promoting gender equality within the construction industry.



Origin/team

Client: St Jerome's Centre
Design Team: Orkidstudio
Structural Engineer: Structuremode
Contractor: Orkidstudio

Photo: Orkidstudio



Wonder Wood – a loop of movement

Challenge

Research indicates that women and men have different preferences when it comes to physical exercise and facilities that support it. This also applies to kids, and a special effort to engage girls in exercise during school hours calls for designs that support their wishes.

Contribution

The overall aim with the design of the new schoolyard in Skørping School, Denmark was to engage a broader number of kids in physical exercise including girls. Surveys on young kids and their movement patterns reveal that boys spread out and occupy open spaces, whereas girls cluster and occupy edge zones. By weaving the schoolyard and the surrounding forest together the vision was to create a more diverse palette of exercise options for all kids. As a part of the design, the team created a wooden loop as a route to the forest and back, encompassing many different elements such as grandstand, portal, balance beam, climb ladder, hanger benches and a treetop house. The loop also has an outdoor lounge for group work, a big screen and seating for outdoor teaching. The design of the schoolyard extends the different ways of being active and contribute with zonings for 'softer' types of exercise and more edge zones and facilities infusing safety for shy and anxious kids. Research conducted after the construction of the schoolyard has shown that the wooden loop has been successful in engaging more girls in active play during breaks.



Origin/team

VEGA landskab
Rebild Municipality
Frandsen & Søndergaard
Skørping School management

Drøn på Skolegården:
Realdania,
Lokale og Anlægsfonden,
Kræftens Bekæmpelse

Photo: Leif Tuxen
for the Danish Foundation for Culture
and Sports Facilities



6 CLEAN WATER AND SANITATION

Ensure availability and sustainable management of water and sanitation for all

Access to water, sanitation and hygiene is a human right, yet billions are still faced with daily challenges accessing even the most basic of services.

Clean, accessible water for all is an essential part of the world we want to live in and there is sufficient fresh water on the planet to achieve this. However, due to bad economics or poor infrastructure, millions of people including children die every year from diseases associated with inadequate water supply, sanitation and hygiene.¹

To find out more about Goal #6, visit:
<https://www.un.org/sustainabledevelopment/water-and-sanitation/>

¹ Extract from UN's Sustainability Goals, available from
<https://www.un.org/sustainabledevelopment/water-and-sanitation/>



To take advantage of rainfall where clean water is scarce, buildings and urban areas must be designed so that rainwater can be collected, purified and used as drinking water.

In areas where rainwater needs not be collected for drinking water, buildings and urban areas must be designed so that rainwater can enter the groundwater without being mixed with wastewater or being polluted in other ways. As for sanitation, buildings, services, sewage systems and infrastructure must be planned and designed to keep bacteria and contaminated water separate from clean water and out-of-contact with citizens. A key part of this is to ensure access to toilet facilities that are designed to handle the waste produced. Building materials that do not contribute to groundwater contamination should be chosen, whether during extraction, construction or in use.

Furthermore, urban areas, settlements and buildings must be designed to withstand climate change related to water, such as more extreme precipitation, drought and floods. Landscape architecture and urban planning must protect freshwater resources through conservation projects and the design of recreational areas that protect, collect and handle water.

Examples of this are found in water-handling features at building level, in climate adaptation projects on an urban scale and communal toilets for slum areas.

Warka Tower

Challenge

In Ethiopia major health problems are caused by the spread of diseases perpetuated by the lack of clean water and sanitation systems. Often contaminated by human and animal waste, water quality is severely poor. The impact of tainted water on the health of communities is significant.

Contribution

Warka Tower is built in Dorze, Ethiopia, and is an alternative water source for rural populations that face challenges in accessing drinkable water and where infrastructure does not exist and communities are isolated. Air always contains a certain amount of water vapour, irrespective of local ambient temperatures and humidity conditions. This makes it possible to produce water from air almost anywhere in the world. Warka Tower is designed to harvest portable water from the atmosphere by collecting rain, fog and dew.

It functions through the use of gravity, condensation and evaporation and doesn't require electrical power. It is designed to be owned and operated by the villagers. The tower provides a fundamental resource for life – water – and also creates a social place for the community, where people can gather under the shade of its canopy for education and public meetings. Warka Tower is realized with biodegradable and 100% recyclable materials.

The philosophy is to use local materials and traditional techniques as much as possible. The tower is also designed to be easily built with simple tools and maintained by local villagers without the need of scaffolding or electrical tools.



Origin/team

Architecture and Vision
(Arturo Vittori), Warka Water Inc.



Photos: Warka Water Inc.



Challenge

Changing climate conditions will imply heavier rainfall in Denmark putting a growing pressure on wastewater treatment and sewer systems. Paved surfaces in urban areas prevent infiltration and instead the rainwater is led to the sewers, which have limited capacity resulting in overflow and outlet to lakes and harbours with the risk of potential water contamination of vital natural habitats. Rainwater from urban areas is not clean and must not be discharged directly into our lakes, streams and the sea. The rainwater contains large amounts of sand and nutrients, which bind to particles in the rainwater.

Contribution

The Municipality and Utility of Viborg, Denmark, created the recreational area sønæs to expand the treatment facilities of the urban area with a multifunctional wastewater treatment park. The cleaning pond is cleaning rainwater from rooftops and roads from separate sewer systems in Viborg, before the rainwater is discharged to Sønder Lake. The discharged rainwater derives from an area of 50 ha. corresponding to 100 football fields. The water surface in the cleaning pond is approximately 2.6 ha. The team combined the need for climate adaptation, wastewater treatment, recreational facilities, climate-change education and improvement of nature and environment in one. The area facilitates water related sports and playgrounds, and puts the treatment techniques, water circulation and natural resources on display. Parts of the park have a permanent water surface, while other parts are designed to be resistant to flooding. The cleaning process in the cleaning pond is carried out by sedimentation. The water in the large cleaning pond is almost stagnant, which will cause sand, particles and impurities to seek to the bottom. In this way the water is purified and can be discharged to the lake. In case of an extreme rain event, the water will flow from the treatment basin to several overflow basins ensuring that the water is always clean before reaching the lake.



Origin/team

The Municipality of Viborg,
Energi Viborg, Møller & Grønborg,
Orbicon, Svend E. Madsen,
the Danish Foundation for Culture
and Sports Facilities,
Realdania, Vandplus
The Danish Nature Agency

Photos: Carsten Ingemann

The Living Machine

Challenge

Discharge of untreated wastewater is one of the most general events threatening the local environment. Moreover, urban and rural regions are increasingly facing the challenges towards managing access to clean water supplies. Less than 1 % of the earth's freshwater supply is accessible for direct human use. The sustainable handling and recycling of water is therefore a major concern for the built environment.

Contribution

The San Francisco Public Utilities Commission's (SFPUC) LEED Platinum Certified Headquarters is one of the first buildings in the United States with onsite treatment of grey and blackwater through a 'Living Machine' system. This system reclaims and treats the building's wastewater to satisfy 100% of the water demand for the building's low-flow toilets and urinals. This innovative design was motivated by the SFPUC's mission to serve as a model for other buildings to implement onsite wastewater treatment systems. The system provides an average of 19,000 liters of recycled water for toilet and urinal flushing per weekday, or 3 million liters a year.

The process begins as all the building's wastewater makes its way to a primary tank, where solids and debris settle and get flushed to the main sewer. The remaining wastewater is treated through an engineered system that mimics natural tidal wetlands. The wastewater is pumped from a recirculation tank to tidal wetland cells, which fill from the bottom and then drain by gravity back to the recirculation tank. While submerged in wastewater, a diverse population of microorganisms thriving in the biofilm feeds on the nutrient-rich wastewater. When the tidal wetland cells are drained, air is pulled into the substrate to oxygenate the microorganisms and facilitate aerobic metabolic processes. Hereafter the partially treated wastewater is then pumped to stage 2. Here the wastewater is vertically distributed through a subsurface perforated piping network on a slight slope, which allows for the vertical flows to then be horizontally treated. Once finished, the effluent is filtered and screened to remove any remaining suspended solids, and bacteria and viruses are removed through ultraviolet light disinfection and the addition of chlorine tablets.



Origin/team

The San Francisco Public Utilities Commission (SFPUC)

Photo: Robin Scheswohl



Photo: Carmen Magana

7 AFFORDABLE AND CLEAN ENERGY

Ensure access to affordable, reliable, sustainable and modern energy for all

Our everyday lives depend on reliable and affordable energy services to function smoothly and to develop equitably. In fact, energy is central to nearly every major challenge and opportunity the world faces today. Be it for jobs, security, climate change, food production or increasing incomes, access to energy for all is essential.

Focusing on universal access to energy, increased energy efficiency and the increased use of renewable energy through new economic and job opportunities is crucial to creating more sustainable and inclusive communities and resilience to environmental issues like climate change.

However, the challenge is far from being solved and there needs to be more access to clean fuel and technology and more progress needs to be made regarding integrating renewable energy into end-use applications in buildings, transport and industry.¹

To find out more about Goal #7, visit:
<https://www.un.org/sustainabledevelopment/energy/>

¹ Extract from UN's Sustainability Goals, available from
<https://www.un.org/sustainabledevelopment/energy/>

7 AFFORDABLE AND CLEAN ENERGY



The built environment is a major source of energy consumption and a potentially crucial energy producer.

Buildings must be designed both to limit energy consumption, for example by using materials and layouts that minimize overheating, and to produce and recycle energy, for example by storing excess heat during the day and employing it at night. This means designing and constructing buildings, settlements and urban areas that employ appropriate energy technology under given geographical, climatic and cultural conditions. Examples of this can be the use of daylight, natural ventilation or a choice of materials that support heating or cooling, such as heavy exterior walls in a hot and dry climate. The built environment can also contribute through the development of solutions that employ innovative sources of renewable energy.

Furthermore, the building industry must put a focus on total energy consumption from the extraction of materials, through the construction phase to the use and disassembly of buildings and structures. As part of this, energy intensive materials and materials produced with non-clean energy, such as coal-fired bricks, must be phased out or find new forms. Buildings must also be adapted to local climatic conditions so that solutions that would consume a high level of energy in use in a given context are avoided, such as exposed all-glass facades in a hot climate.

Powerhouse Kjørbo

Challenge

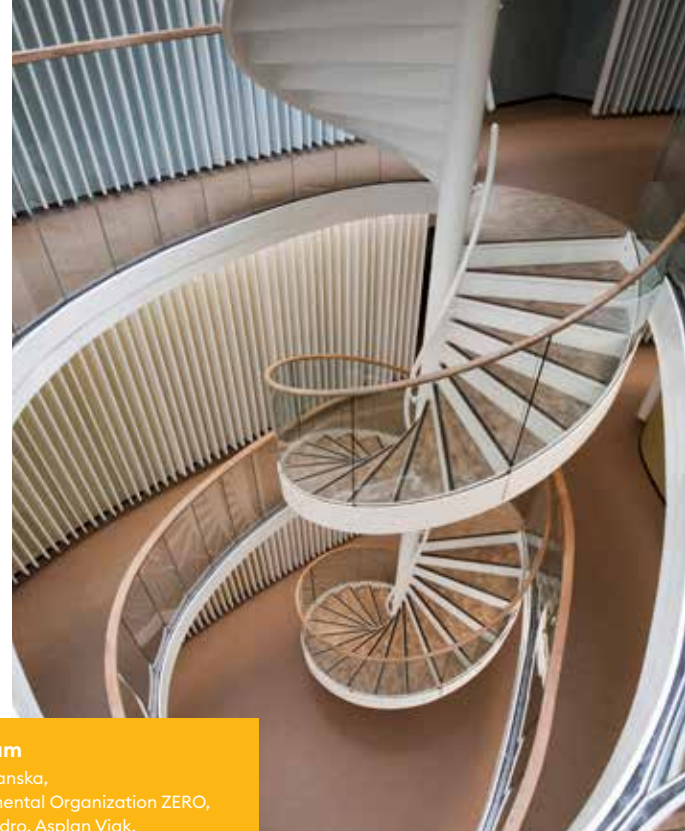
Our existing building stock holds a vast amount of embedded energy, and often old buildings use more energy to meet the current standards of ventilation and heating. This calls for renovations that bring existing buildings up to date, without wasting resources and energy by demolishing and replacing them with new buildings.

Contribution

By optimizing and combining modern technology in renovation, an ordinary office building from the 1980s now produces more renewable energy than it uses. The total refurbishment was conducted by a consortium of architects, engineers, specialists and developers, with the overall aim to construct and develop a series of buildings that produce more energy than they consume over the course of their lifetime.

Powerhouse Kjørbo, located outside Oslo, was the first to be completed, and after the renovation, the building's energy need has been reduced by more than 86 %. The building has solar panels installed on the roof and ground wells in the park outside provide heating for radiators, water and ventilation air, while a simple zoning of the plan helps reduce energy consumption and increase production of clean energy.

The design phase in this project was characterized by a close cross-disciplinary collaboration from the very early stages of the process, discovering how simple configurations and layout could support the ambitions of making the building energy positive. Drawing on specialist knowledge and collaborating intensively in the early stages is time and resource consuming, but it supports the final solution, which e.g. is utilized in a main staircase, which has a dual function as stair and ventilation channel. As the energy accounts include energy consumption related to production of building materials, construction, operation and demolition of the building, the team has made an effort in securing that all the materials brought into the project meet the highest environmental standards, while at the same time having a low embedded energy.



Origin/team

Snøhetta, Skanska,
The Environmental Organization ZERO,
Sapa and Hydro, Asplan Viak,
Entra Eiendom



Photos: Ketil Jacobsen

Øvre Forsland Hydropower Plant

Challenge

Fossil fuels continue to play a dominant role in global energy systems. Fossil energy was a fundamental driver of the Industrial Revolution, and of the technological, social and economic development which has followed. However, fossil fuels also have negative impacts, being the dominant source of local air pollution and emitter of carbon dioxide (CO²) and other greenhouse gases. The growing awareness of climate-change challenges associated with fossil fuels has triggered countries around the globe to find alternative energy resources.

Contribution

In 2015 Helgelands Kraft A/S, one of the largest producers of hydraulic power in northern Norway, decided to build a series of new power plants, which would bring attention to hydropower, to the history around it and to environmental benefits. The idea was to turn five power plants into tourist destinations and fit them into the spectacular Norwegian landscape.

In the design for Øvre Forsland Hydropower Plant, the team was inspired by the vertical and irregular shapes in the surrounding spruce forest, and through the big windows the interior of the power plant is on display. From the bridge in front of the building, visitors can experience the strong natural forces of the water flowing through the station and they can get a close look at the streaming water. The blue, green and red-light design of the interior technical parts, strengthens the experience of the power plant, also during the dark Norwegian winter. The power plant produces 30GWh which corresponds to 1,600 households.



Origin/team

Stein Hamre Arkitektkontor As,
Helgeland Kraft As,
SWECO, Stokkan Lys

Photos: Helgeland Kraft



Paramit – factory in the forest

Challenge

The building sector is considered the biggest single contributor to world energy consumption and greenhouse gas emissions. On the level of the individual building, design can have a crucial impact on the energy performance, and more broadly the ecological footprint of the building.

Contribution

The Paramit Factory in Penang Science Park, Malaysia, is a 11,600m² factory and warehouse space, and a 1,450m² office block providing engineering, manufacturing and post-manufacturing services to medical device and instrument companies.

The factory is designed as an energy efficient and climatically responsive building, measuring energy saving reductions of 45% compared to their previous factory close by. The cardinal sustainable design principles are energy efficiency, water efficiency, daylighting and Biophilia, which is the hypothesis that humans have a fundamental need to connect with nature. Energy efficiency is achieved through a merge of passive design and complex automatic systems. E.g. a canopy louver roof provides effective solar protection during the hottest part of the day, while North-facing skylights with an internal deflector panel provide soft natural daylight throughout the day supplemented with daylight responsive energy efficient ceiling-suspended LED lights. Also trees and vegetation are planted strategically to avoid direct solar heat gain. The plants add to the equation by lowering temperature through shade and evapotranspiration, and the green environment helps improving air quality by transforming CO₂ to oxygen during daytime. Water plays a key role in the design as well as vegetation to alleviate the flooding risk from the tropical rainstorms.

Photos: Lin Ho



Origin/team

Paramit Malaysia Sdn Bhd,
Design Unit Sdn Bhd,
IEN Consultants Sdn Bhd





Photo: Lin Ho

8 DECENT WORK AND ECONOMIC GROWTH

Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

This goal is about promoting inclusive and sustainable economic growth, employment and decent work for all as poverty eradication is only possible through stable and well-paid jobs.

Today, roughly half the world's population still lives on the equivalent of about US\$2 a day with global unemployment rates of 5.7%, but having a job does not guarantee the ability to escape from poverty in many places. This slow and uneven progress requires us to rethink and retool our economic and social policies aimed at eradicating poverty.¹

To find out more about Goal #8, visit:
<https://www.un.org/sustainabledevelopment/economic-growth/>

¹ Extract from UN's Sustainability Goals, available from
<https://www.un.org/sustainabledevelopment/economic-growth/>

8 DECENT WORK AND ECONOMIC GROWTH



The built environment interacts with decent work and economic growth on both a planning level and on a building level.

Safe public spaces and affordable transit routes to the workplace are crucial for finding employment. The ability to move from home to a workplace, and the time spent in transit, determine what jobs are available, making public space and transportation systems key to citizens' access to work. Cities and settlements must also be planned and designed so that poor and marginalized citizens have access to a business outlet, such as a marketplace, where local produce, handicrafts and other services can be bought and sold. Workplaces must be designed so that they support healthy and productive work environments for employees. Investing in good working conditions back a company's economic growth through higher productivity and fewer sick days.

In the building industry, focus is needed on decent working conditions and safety for workers. This entails the use of materials extracted and produced in safe and clean working environments as well as secure and controlled working conditions on building sites and in demolition processes. Furthermore, by emphasizing investment in human resources, the industry can develop towards more sustainable economic growth by using raised skills and knowledge to reduce the amount of raw materials and energy needed while raising productivity.

Examples of this can be found in planning projects for informal settlements, in state-of-the-art office-buildings and in better cover on buildings sites.

Atelier Gando

Challenge

Communities in rural desert regions of Burkina Faso face many economic challenges and the population's literacy rate of 20% calls for increased educational support in order to qualify the workforce, create growth and employment. However, the region's rich traditional craftsmanship and knowledge of construction, using local materials adapted to the local climate, is a valuable source for innovation, which can be used to enrich building practices in other parts of the world.

Contribution

Atelier Gando in Burkina Faso is a center for sustainable construction technologies and research, and aims to facilitate exchanges between local craftsmen, architects, students and visitors to study and innovate indigenous building methods for contemporary application. By providing workshop facilities, temporary lodging for students and workers, and storage for tools and materials, the project intends to support the ongoing development of regional building knowledge and practice. Moreover, the process of building the atelier is a creative exchange of tradition and contemporary building techniques, resulting in a volumetric shape inspired by native earth-built settlements.

Initiated under the organization of Francis Kéré with the Accademia di Architettura di Mendrisio in Switzerland, the atelier will facilitate architectural training for students from western institutions with a focus on architecture for rural and impoverished areas, resource conscious methods and use of building materials. The students visiting the atelier will be able to work with site specific challenges and the dynamics of collaboration across nationality and culture, creating an architectural education that addresses contemporary needs and realities.



Origin/team

Kéré Architecture, Diébédo Francis Kéré,
Accademia di Architettura di Mendrisio in
Switzerland, "Building Reality" Workshop of
the Accademia di Architettura di Mendrisio
supervised by Alberto Pottenghi,
Wéneyida Kéré, Alberto Pottenghi



Photos: Kéré Architecture

SiteCover

Challenge

Construction sites are exposed to the vagaries of the weather, and can be dangerous workplaces when surfaces are wet and slippery. Therefore Scandinavian construction sites can be closed down several weeks during wintertime due to frost and rain, which prolong the construction time. In addition to that, wet conditions can damage building materials, which is a challenge in rainy regions.

Contribution

SiteCover is a combined cover and crane for construction sites that allows the construction of new buildings to become an indoor activity. SiteCover is storm and snow proof according to Danish standards, and ensures good and dry working conditions for the workforce. This significantly improves working conditions and safety and ensures a stable construction process with no weather related interruptions. The structure provides weather protection, cranes and factorygrade facilities that include gates, lighting and ventilation, and can be used in the building industry.

Using SiteCover enables the use of sustainable organic building materials, and it reduces the construction period significantly, because the cover makes it possible to work 365 days a year. The structure is also designed to become a frame for future 3D printing of buildings.



Origin/team
SiteCover

Photo: Dragør Luftfoto ApS



Photographer:
Jacob Maintz, Sitecover

Moving Schools

Challenge

The seasonal migrant labour population of India is estimated by some migration scholars to be as high as 100 million. While migration can open new economic possibilities for families, it also comes with high risks. These risks are disproportionately felt by the children of migrants as they are often compelled to travel to worksites with their parents. Some have estimated that around six million school-aged children in India participate in family-based labour migration every year.

Contribution

Moving School addresses one of the challenges to India's migrant workforce – that of education. Moving School is a series of mobile classrooms that are designed to float, roll and unfold where they are needed.

The project started on the riverbank of the Tiracol River in Goa, India, as an initiative to provide education for the neglected children of the moving labour groups from Karnataka, who work with extracting sand from the river. The first school opened in March 2001. In 2005 the 4th school opened on a floating platform in the river. Since the labour groups are moving to different locations on the river to extract the sand, it made sense to have the school as a floating unit, which can move along with the communities. In 2007 the project was developed further into an on-land version of the Moving School.

The 'rolling school' is built on a frame like a farmer's trailer and they are designed to move with the workers who build roads or work on construction sites. It is collapsible, the floor and sides can unfold so the space inside increases to the double and creates a classroom for 25 pupils. The rolling school was completed in June 2008.

The third iteration of Moving School is a tent version designed for communities in Gujarat's coastal areas. The tents can be quickly deployed and they come with facilities needed to teach classes. There are now several of these classroom tents as well as semi-permanent structures in the Moving Schools project as well as a hostel for boys and girls which opened in 2012.



Origin/team

Mette Lange Architects,
Anders Linnet



Photos: Mette Lange



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

This goal addresses the need to build resilient infrastructure, promote sustainable industrialization and foster innovation.

Economic growth, social development and climate action are heavily dependent on investments in infrastructure, sustainable industrial development and technological progress. In the face of a rapidly changing global economic landscape and increasing inequalities, sustained growth must therefore include industrialization that first of all, makes opportunities accessible to all people, and secondly, is supported by innovation and resilient infrastructure¹

To find out more about Goal #9, visit:
<https://www.un.org/sustainabledevelopment/infrastructure-industrialization/>

¹ Extract from UN report WHY IT MATTERS – INDUSTRY, INNOVATION AND INFRASTRUCTURE - PDF.



The building industry is producing massive amounts of waste and is consuming large amounts of natural resources and energy.

Advancing sustainability in the built environment requires a development of industry and industrial infrastructure away from current practice towards new ways of producing and assembling. We must develop our industry, its services, products and transportation systems, to pollute less, tie up less energy, produce less waste, and provide solutions that are safer and healthier than current standards.

The building industry is by nature site-specific, and we must aim at utilizing local industries and advance the development of sustainable products locally, in all countries. This requires the development of both physical and digital infrastructures to promote more sustainable trade and coexistence, including much more focus on the industry's use of local materials and resources. Where advanced industry is available, the focus is on the development of products that improve existing standards and raise the level on sustainability, for example by moving from a focus on no waste in production to a focus on no waste in a lifecycle perspective. This requires training and the development of new competences at all levels in the building industry, as well as research and prototypes to test the potential of new tools, processes and solutions. The resulting innovations in industry must continuously be measured against a culturally and climatically site-specific impact on sustainability.

Soft Cells by Kvadrat

Challenge

A comfortable environment is influenced by architecture and its materiality, and how it affects all our senses. However, building materials with hard surfaces do not always support the sense of hearing, which calls for interiors with acoustic support. In order to produce sustainable building components on an industrial scale, you have to take the whole chain of production, disassembly and biodegradability into account.

Contribution

Soft Cells is an acoustic wall and ceiling panel system that delivers sound absorption and creates a comfortable acoustic environment in modern architecture with hard surfaces such as glass and concrete. The panels can be customized in shape and colour and can be integrated in various design schemes. Due to a patented textile-tensioning mechanism, they are also resistant to humidity and temperature. The panels consist of two layers of tensioned textile and acoustic padding which absorb sound in the low and mid-range frequencies. Its modular design makes it easy to reuse in other settings, and the visible front textile can be easily reupholstered for adaptation prolonging the life span.

The panels are designed for disassembly and most components and materials can easily go into recycling streams. The extruded frames constituting the main component are produced with high amounts of recycled content and are cut to size while the waste from manufacturing is recycled.

Current focus is on reducing textile waste through both reuse and recycling, and Soft Cells is working closely together with Really – a company reusing textile fibres for both construction boards and acoustic products – to develop closed material loops.



Origin/team
Soft Cells by Kvadrat

Photo: Kvadrat



Photo: Ed Reeve

Plastic: recycled and hand-crafted

Challenge

Since 1950 around 9 billion tons of plastic has been produced. Of that, close to 7 billion tons have become waste. Less than 10% of the discarded plastic has been recycled. No one knows for sure how long plastic takes to biodegrade completely, but estimates range from 450 years to never.

Contribution

Smile Plastics is a materials design and manufacturing house with a mission to change people's perceptions around waste via innovation – to use art and technology to unlock the hidden potential in recycling, and open our eyes to the unexpected beauty of scrap. In doing so, they hope to inspire more people about sustainability and recycling.

The focus of Smile Plastics' product line is a range of materials that have very similar functional properties but vary in visual expression depending on the composition of the original materials. All the materials are hand-made and made of 100% recycled and recyclable non-toxic plastics. The materials can be used for a wide range of applications – from interior finishes to furniture and facade cladding.

Smile Plastics offers a standard range of materials that are made from waste sources such as yoghurt pots, plastic bottles and food trays, but they also work with clients to create completely bespoke materials and have experimented with using sea plastic, refrigerator plastics, WEEE, plant pots and coffee grounds to name a few. In fact, the designers frequently combine different waste streams into a single material. Most of the time the combinations of waste streams are of the same type of plastic but they have also found a way of combining different types of material such as coffee grounds with plastic.

Developing a new material can take several months, though it sometimes takes significantly longer.



Origin/team

Smile Plastics,
Adam Fairweather
and Rosalie McMillan

Architecture:
Clifton Park project by
Marsh Grochowski Architects



Photo: Smile Plastics

10 REDUCED INEQUALITIES

Reduce inequality within and among countries

Inequalities based on income, sex, age, disability, sexual orientation, race, class, ethnicity, religion and opportunity continue to persist across the world, within and among countries. Inequality threatens long-term social and economic development, harms poverty reduction and destroys people's sense of fulfilment and self-worth. This, in turn, can breed crime, disease and environmental degradation.

Most importantly, we cannot achieve sustainable development and make the planet better for all if people are excluded from opportunities, services, and the chance of having a better life. To reduce inequality within and among countries is therefore a key issue.¹

To find out more about Goal #10, visit:
<https://www.un.org/sustainabledevelopment/inequality/>

¹ Extract from UN report WHY IT MATTERS – REDUCED INEQUALITIES - PDF



The built environment can act as an amplifier and enforcer of inequalities.

Disabled citizens risk being confined in their homes or unable to hold a job because stairs, steps and other design features can make streets, transportation systems and institutions inaccessible. Religious and ethnic minorities, LGBT+ citizens and women experience being confined to designated areas or secluded from educational institutions and leisure facilities. Landscape qualities like a beach or a view can be closed to the public through design and planning that make them accessible only to owners or customers.

To reduce inequalities, architecture must be designed and executed so that it is socially responsible, inclusive and take into consideration the needs of all members of society, leaving no one behind. Buildings, settlements and urban areas must be designed with accessibility as a core functionality, from ensuring even surfaces, lifts and ramps and way-finding features to giving attention to doorways and the height of utilities. It also means that social responsibility and inclusiveness must guide programming, planning and design of buildings and urban areas so that they support and allow use by all, with respect to local culture and needs. Examples span from state-of-the art office buildings adhering to universal design, over places of worship open to all religions to services and institutions open to all, like public parks.

Kamppi Chapel of Silence

Challenge

Regardless of your political or religious belief, challenging life circumstances or a busy everyday life sometimes require a moment of reflection in silence. Traditionally, spaces of refuge and spirituality have been linked to specific beliefs, each with a different set of rituals and spatial concepts. Rarely have these spaces been designed to facilitate inclusion and the interaction between different audiences. A new type of building challenges this tradition by welcoming all people – regardless of belief – in a solemn space that is designed to both contemplation and conversation.

Contribution

The Chapel of Silence introduces a place for silence and peace irrespective of religion, faith and origin. It is located in the lively commercial center of Helsinki and built in Finnish wood as a sculptural volume.

The chapel's free floating massive inner wall is made of thick oiled alder planks, and the furniture is made of solid wood, which makes the atmosphere warm and the acoustics comfortable. In the lobby anyone can meet and speak with clerical or social workers without an appointment. The rounded shape of the building and the light shining down on the curved surface provides a sanctuary from the vibrant urban surroundings.

Origin/team

K2S Architects LTD
Helsingin seurakuntayhtymä
Insinööritoimisto Vahanen Oy
Pakrak Oy



Photo: Tuomas Uusheimo



Photo: Marko Huttunen

Small-scale neighbourhoods in Chongqing

Challenge

Over the next 30 years, 300 million people will move to the cities in China. The streets, which have always been the nerve of interaction and social life, have been replaced with motorways in many places as a result of rapid urbanization and motorization. This implementation of modernist urban planning has drained social life at the street level, and new high-rise neighbourhoods have been designed entirely with a view to cars – in a country where 85% of the population do not own a car, yet. According to critics, the result is megacities full of large-scale monofunctional zones devoid of human life.

Contribution

The local government of Chongqing, China, and Gehl Architects have improved the quality of urban public space in the city, by revitalizing street life for local residents and people without cars, and by extending and improving the macro network of public transport with a micro network of interconnected streets and public spaces.

Based on survey findings, the team made recommendations and designed pilot projects in selected sites to showcase the effect of human scale planning and design on urban life. It revealed that 150% more people were spending time in the old, small streets than in the new, commercial public spaces, and 640% more people were spending time in traditional Chinese neighbourhoods with active, open facades than in streets with closed building fronts. This resulted in the political backing of implementing human scale in the streets. A new Public Space Plan was created for the entire inner city focusing, for the first time in a Chinese city, on the street quality of a public space and not only on car-capacity. As a result, public spaces are now being permanently implemented by local planning and design teams.

Sustainable design is about understanding who you design for (the majority), and where they prefer to be. Therefore the 'people-centered' future strategy of Chongqing is also about reintroducing the many positive and humanly sustainable aspects of traditional Chinese city culture.



Origin/team

Gehl Architects,
Energy Foundation,
CSTC (China Sustainable
Transportation Center),
Chongqing Planning and Design Institute



Photos: Gehl Architects

The House of the Disabled People's Organization

Challenge

Article 9, 'Accessibility', of the United Nation's Convention on the Rights of Persons with Disabilities, states that: "all parties shall take appropriate measures to ensure that people with disabilities are treated equally to others". In the built environment, the idea of Universal Design addresses equality as the design of buildings, products or environments that are accessible to all people, regardless of age, disability or other factors.

Contribution

With the ambition to create the most accessible office building in the world, The Disabled People's Organization Denmark has developed and built a headquarter in Taastrup, Denmark, which succeeds in shedding light on the need of universal design in the future.

Besides bringing the different disabled people's organizations in Denmark together in a welcoming setting, the building sets an example of integrated accessible design.

Creating a working environment which is equal for all regardless of disabilities, the team focused on promoting integrated low-tech solutions rather than add-on design. The wayfinding system addresses multiple senses with sound and tactile detailing, and simple recognizable guiding features make it easier for visually or cognitively impaired to find their way.

The team has worked with the detailing from the beginning of the design phase, making e.g. the tactical guiding paths a beautiful and integrated part of for instance the staircase design.



Origin/team

Danske Handicaporganisationer,
Cubo, Force4, Niras A/S



Photos: Martin Schubert

11

SUSTAINABLE CITIES AND COMMUNITIES

Make cities and human settlements inclusive, safe, resilient and sustainable

Half of humanity – 3.5 billion people – live in cities today, and this number will continue to grow. Because the future will be urban for a majority of people, the solutions to some of the greatest issues facing humanity like poverty, climate change, healthcare, education must be found in city life.¹

Cities are hubs for ideas, commerce, culture, science, productivity, social development and much more. At their best, cities have enabled people to advance socially and economically. With the number of people living within cities projected to rise to 5 billion people by 2030, it is important that efficient urban planning and management practices are in place to deal with the challenges brought by urbanization²

To find out more about Goal #11, visit:
<https://www.un.org/sustainabledevelopment/cities/>

¹ Extract from UN report WHY IT MATTERS – SUSTAINABLE CITIES - PDF

² Extract from UN's Sustainability Goals, available from
<https://www.un.org/sustainabledevelopment/cities/>

11 SUSTAINABLE CITIES AND COMMUNITIES



The built environment is crucial to the development of sustainable cities and communities.

Architecture, design and planning contribute in multiple ways to make cities and settlements inclusive, safe, robust, resilient and environmentally sustainable. Among key contributions are design and planning that secure affordable, accessible and healthy housing, as well as infrastructure which through design help reduce pollution from transportation, by enabling walking, biking and commuting by public transport. Furthermore, infrastructure can enhance mobility and accessibility between parts of a city, as well as between city, suburbia and rural areas.

Urban design can contribute to include all citizens and reduce the risk of exclusion and assault. As part of this, consideration of the needs of marginalized and disenfranchised citizens should be included from the early stages of planning, and all levels of stakeholders should be involved in the process. Urban design should also help reduce and counteract the environmental impacts of overuse, traffic, waste, noise and light pollution in urban areas. Individual buildings as well as building complexes and settlements must be developed to increase resilience and robustness in the face of climate change and include vegetation and green areas to help counteract the loss of vegetation and biodiversity caused by urban growth. Examples of this span broadly and can be found in housing renewal projects, in climate adaptation plans, in collective reuse stations, in pocket parks and in bike path expansions.

Low Impact Living Affordable Community

Challenge

Design can make our cities more inclusive, safe and resilient, and architecture can contribute to promote more sustainable ways of dwelling, to share the common resources, to reduce the use of space and energy, and can also support unity.

Contribution

LILAC stands for Low Impact Living Affordable Community, and is located in Leeds, Great Britain. The community is shaped around the idea of co-housing, mixing people's needs for their own space in private homes with shared facilities. This sharing approach encourages social interaction in green spaces and in a common house, including communal cooking and eating facilities, guest rooms and household facilities including a shared laundry.

The houses are made using a low-carbon, prefabricated method of construction using locally sourced straw and timber to create super-insulated walls and roofs. A typical 80m² home built in this way using straw bale can store 34 tonnes of CO². The energy consumed in the community is harvested from solar hot water and photovoltaic panels on the roofs and, according to LILAC the insulating materials and layout of the buildings enable storage of solar heat in the winter and rejection of solar heat in the summer, thus reducing the need to add heating energy. Heating, when needed is provided by individual gas condensing boilers and Heat Recovery Ventilation. The community is based on a principle of sharing e.g cars, the pooling of equipment and tools, sharing of meals twice a week and growing food on allotments. A Mutual Home Ownership Society (MHOS) model, keeps the housing affordable through a single bank loan from Triodos Bank and members of LILAC owning shares in the Society that reflect the size of their home, which give them the right to democratically control the housing community they live in.



Photo: White Design

Origin/team

The Architecture and Landscape was Co-Designed by LILAC and White Design. Lindum, ModCell, Integral Engineering Design, Progetic, BWA, coho-ltd

Taasinge Square in the Climate Resilient Neighbourhood

Challenge

In July 2011, a cloud burst hit Copenhagen with 15 centimeters of rain in less than three hours, flooding cellars, streets, and key roads. The event is estimated to have cost 6 billion Danish Kroner in damages. Copenhagen's sewer system is old, and it will be both too expensive and too difficult to expand the capacity of the existing system. Therefore the City of Copenhagen will now invest in new solutions, which will at the same time make the city's urban spaces greener and better places to spend time.

Contribution

Taasinge Square is an urban space in Copenhagen's first climate resilient neighbourhood. The square is a green oasis, which both handles large volumes of rainwater and creates a place for the neighbourhood's residents to meet.

Climate resilience in Taasinge Square is about controlling and retaining as much as possible of the rainwater falling around the square. Diverting, evaporating and retaining rainwater from roofs and streets locally, delay the water flow to the sewers, and in this way ensures that there is capacity in the sewer to cope with the torrential downpours of the future. Altogether, Taasinge Square can delay and percolate rainwater from a surrounding area of 4,300 m².

In Taasinge Square terrain as well as vegetation is part of the resilience design and is placed in an urban framework that provides space for local nature to grow willfully without appearing untamed. Rain, wind and sun are part of the rhythm of the city, and are seen and noted. Through an involvement process with the local neighbourhood, Taasinge Square has become a living part of the urban environment, and has helped in strengthening familiarity, community and a sense of ownership among the local residents. This engagement provides an ideal basis for the transformation of the whole neighbourhood of Skt. Kjelds, which is to become The Climatic Quarter in Copenhagen involving resilient landscape design of more streets and squares in the future.



Photo: Charlotte Brøndum

Origin/team

GHB Landskabsarkitekter,
Malmos Anlægsgartnere, Orbicon,
Feld, studio for digital crafts & ViaTrafik.
Klimakvarter,
Teknik- og Miljøforvaltningen;
Byens Fysik



Photo: Steven Achiam, GHB Landskabsarkitekter

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

Ensure sustainable consumption and production patterns

Sustainable consumption and production is about promoting resource and energy efficiency, sustainable infrastructure, and providing access to basic services, green and decent jobs and a better quality of life for all. Its implementation helps to achieve overall development plans, reduce future economic, environmental and social costs, strengthen economic competitiveness and reduce poverty....

....Since sustainable consumption and production aims at “doing more and better with less,” net welfare gains from economic activities can increase by reducing resource use, degradation and pollution along the whole life cycle, while increasing quality of life¹

To find out more about Goal #12, visit:
<https://www.un.org/sustainabledevelopment/sustainable-consumption-production/>

¹ Extract from UN's Sustainability Goals, available from
<https://www.un.org/sustainabledevelopment/sustainable-consumption-production/>



The building industry is a major contributor to waste.

When buildings are demolished most of the value of the existing materials and components is lost. The same applies to renovations, which transform vast amounts of materials to waste. Even the process of constructing new buildings is producing waste, from cut-off bits of gypsum board over discarded formwork and the wrapping, components are delivered in, to materials damaged by weather or mistreatment.

Designing for long lifetime, steady maintenance and careful adaptation of existing buildings are keys to sustainable consumption in the built environment. Design considerations for durability and life cycles can reduce the value loss and waste production in the building industry, in individual components, buildings and structures. Ideally, the design of buildings allows them to transform into different uses over time, so that the materials and other resources invested in the structure retain their value also when a given use changes or becomes obsolete. Additionally, individual components and materials should be designed and employed so that they can be recycled and upcycled.

Design and construction of new buildings must give priority to reducing the amount of material resources employed and waste produced. Finally, we need new components and solutions that reduce the use of non-renewable natural resources and emphasize local materials.

DESI Training Center

Challenge

For many poor people, especially in developing countries, living conditions are traditionally dependent on household production and self-sufficiency. But with increased living standards come a change of life style towards a higher level of consumption, and dependency on imported goods. For architecture and the building sector, this trend is reflected most of all in an increased use of imported building materials, which often result in buildings with a large carbon footprint. Instead of continuing building with locally sourced materials, steel and concrete are used, and indoor-climate is regulated by air condition instead of by passive measures.

Contribution

In a rural area in Rudrapur, Bangladesh, a vocational school for electrical training has been built, combining traditional building methods with modern building techniques, and alternative energy power systems. The building is passively heated and cooled, and optimized for natural inflow of light. A solar thermal heating system provides all of the power that the building requires, as well as warm water, and electricity to pump water from a well into the water tank. Toilets have their own two-chamber septic tank. Typically, in rural Bangladesh all of the various household functions – eating, sleeping, washing, etc. – are performed in separate structures that are built around a central courtyard. The DESI building, however, attempts to incorporate all of the functions of working and living into a single structure. The design is geared towards a lifestyle that is no longer linked with agriculture, but still linked to the rural context and culture. Traditional craftsmanship is embedded in the building construction and in the ornamentation. A woven bamboo wall constitutes a beautiful ornamentation and encourage pride of local building traditions and supports a sense of belonging.

The DESI building is built with an approach to architecture that – irrespective of the social and financial status – motivates a technical development of traditional building methods, instead of advertising the consumption of expensive and imported materials. Construction workers and craftsmen were all coming from Rudrapur.

Photo: Kurt Hoerbst – Alexandra Grill



Origin/team

Anna Heringer, Shanti-Partnerschaft Bangladesh e.V.,
Shanti Schweiz, Dipshikha (Non-formal Education Training
and Research Society for Village Development),
Bangladesh for DESI (Dipshikha Electrical Skill Improvement)

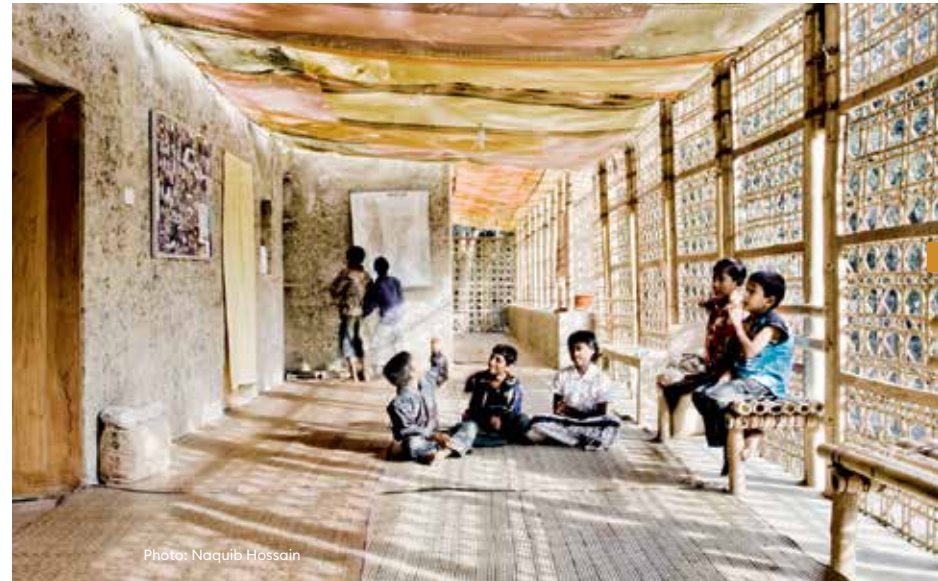


Photo: Naquib Hossain



Upcycle Studios

Challenge

Urbanization is taking place all over the world, increasing the demand for housing. This means that an estimated 60 % of the new urban areas needed in 2030 have not yet been built. Also waste from the building industry represents a huge untapped resource, and upcycling and retrofitting of building materials are a much needed approach to building, when aiming for reducing CO2 emissions.

Contribution

Upcycle Studios has been designed with the mission to construct a residential area built by upcycled and local waste materials without compromising on aesthetics, quality or price. The vision was to minimize the total carbon footprint of housing by reusing waste such as residual wood, crushed concrete and windows from old buildings. Upcycle Studios is a sustainable Scandinavian townhouse solution, located in Ørestad, in the periphery of Copenhagen, Denmark. The houses are constructed of upcycled concrete, glass and wood, and are built on market conditions and designed for scalability.

When buildings are renovated the healthy windows either end up as landfill or the glass is crushed and melted for new purposes using a lot of energy. The team therefore decided to use old windows, with wooden and not aluminum frames, which according to the team saved them up to 95% CO2 in the production process. To meet the modern isolation standards, the huge windows in the building consist of two-layer recycled double-glazing. Also the wooden floors, walls and facades are produced from offcuts and surplus wood from the Danish wooden flooring company Dinesen. The homes have been created with a large degree of flexibility, making them suitable for a diverse group of potential residents, and robust in changing markets – and social life conditions.

The interdisciplinary team has succeeded in developing upcycled, aesthetic materials from the early idea and all the way to commercial implementation, and the project has potential to change the perception of reuse and upcycling in the building industry, and among consumers.

Origin/team

Lendager Architects,
NREP A/S,
Arkitektgruppen A/S,
MOE A/S, Norrecco A/S



Photo: Arkitekt Gruppen



Photo: Mikkel Strange

Mjøstårnet

Challenge

Over the next 40 years, it is expected that more than 230 billion sqm will be built in the world. The production of building materials such as steel and concrete accounts for massive carbon emissions, making it urgently needed to introduce new and more sustainable materials to construction. Wood is an obvious choice for green building construction, as it has a lower carbon footprint, uses less energy and water, and is 100% renewable if it comes from sustainably managed forests. This sets timber apart from other building materials, such as concrete and steel.

Contribution

In Brumunddal, Norway, the structure of the world's tallest building made of wood is completed and the tower will open in 2019. Inspired by stave churches built in the 1100s, which still stand, the team decided to push the limits of using wood as a construction material to new heights. The timber used in the construction of Mjøstårnet is locally sourced in the area, which is known for its forestry and its wood processing industry. Building in wood has an advantage in areas with a high occurrence of trees, because tree binds large amounts of CO₂, and seals it in the building. Even though we do not know the long-term consequences of intense forestry, wood is to some extent self-generative, and appears to be more climate friendly and resource efficient than concrete, and thereby constitutes a more sustainable building material. Also, wooden surfaces add an organic and warm atmosphere to the environment compared to steel and concrete surfaces.

The building of the 18 storey structure has consumed 11,000 trees, but the team had to add some concrete to the bearing construction to avoid uncomfortable sway, because of the light nature of the wooden construction. The official height of the building is 85,4 meters, and the footprint is only 17m in width and 37,5m in length.

Origin/team

AB invest AS, Hent AS,
Voll Arkitekter AS,
Moelven Limtre AS, SWECO



Photo: Moelven webcam 16.11.2018



13 CLIMATE ACTION

Take urgent action to combat climate change and its impacts

Climate change is now affecting every country on every continent. It is disrupting national economies and affecting lives, costing people, communities and countries dearly today and even more tomorrow. Weather patterns are changing, sea levels are rising, weather events are becoming more extreme and greenhouse gas emissions are now at their highest levels in history. Without action, the world's average surface temperature is likely to surpass 3 degrees centigrade this century. The poorest and most vulnerable people are being affected the most.

Affordable, scalable solutions are now available to enable countries to leapfrog to cleaner, more resilient economies. ... Climate change, however, is a global challenge that does not respect national borders. It is an issue that requires solutions that need to be coordinated at the international level to help developing countries move toward a low-carbon economy.¹

To find out more about Goal #13, visit:
<https://www.un.org/sustainabledevelopment/climate-change-2/>

¹ Extract from UN's Sustainability Goals, available from
<https://www.un.org/sustainabledevelopment/climate-change-2/>

13 CLIMATE ACTION



The CO2 footprint of the built environment must be reduced, and buildings and settlements must be adapted to the changing climate.

The CO2 impact of buildings, settlements and cities must be reduced fast. We can achieve reductions through energy renovations, by integrating renewable energy production in buildings, by expanding sustainable transportation infrastructures, by reducing transport of building materials, and by emphasizing the use of local and renewable materials. Furthermore, the design of new buildings can optimize climatic comfort with a minimum of energy consumption for heating, cooling and lighting. This requires consideration of the local climate, and design with natural light, natural ventilation and the thermal properties of building structures.

At the same time, climate change is already happening, and existing buildings and settlements must be adapted to the changing conditions, including more extreme rainfalls, floods, hurricanes, drought and heat-waves. This requires new design solutions that are resilient to the changing conditions. Solutions that are sensitive to local culture as well as local topographic and climatic conditions. The amount of adaptations and new infrastructure needed is huge and costly and will affect settlements and cities significantly over the coming years. Architecture, planning and design have a special responsibility in developing climate adaptation solutions with co-benefits, such as overflow basins for extreme rainfall doubling as a recreational area between rainfalls.

Qunli Stormwater Park

Challenge

A city should be like a sponge the Chinese president Xi Jinping said back in 2013 supporting a new movement in Chinese urban planning called 'Sponge Cities'. Based on the idea of turning paved impermeable surfaces of the city into green and wet resilient urban areas, the movement reintroduces ancient Chinese flood management into its large cities, which have been expanded rapidly using concrete and steel during the last 20 years.

Contribution

Inspired by ancient Chinese water systems and knowledge from traditional farming, Turenscape has created a number of climate adaptive landscapes in urban areas, under the so-called Sponge City movement. Facing both periods of drought, sea level rising and increased rainfall in China, the aim is to 'retain, adapt, slow down and reuse' water in the urban areas in various ways. Qunli Stormwater Park in a new district of Harbin City, China, was designed to reintroduce a former wetland in a new massive 32 million sqm urban neighbourhood hosting one third of a million new residents. With an annual rainfall of 567mm concentrated in June and August, the area is exposed to flooding, and with only 16.4% of the land zoned as permeable green space, something had to be done to prevent flooding.

The wetland was designed as a storm water park being able to retain and clean the water from the new neighbourhood, meanwhile giving its residents a green urban park. The team left a major core of the wetland untouched for natural evolution and transformation, and designed a simple ring of ponds and mounds for storm water filtrating and as a cleansing buffer zone, to prevent the wetland from being contaminated. Storm water from the urban area is collected into a pipe surrounding the stormwater park, and is thereby evenly distributed into the cleansing ponds. Native wetland grasses and meadow are grown in various depths and help the cleaning process. A network of paths leads visitors through the landscape, and platforms and viewing towers facilitate an overview of both the wetland and the surrounding urban setting.



Origin/team

Kongjian Yu, Turenscape,
The Municipal Government
of Harbin City



Photos: Kongjian Yu, Turenscape

Lindevangs Park

Challenge

Global warming will result in more extreme weather phenomena, and during summer and autumn in Denmark, the tendency is that we will experience more heavy rainfalls, and cloudbursts will become even heavier. In many places, the sewer system does not have the capacity to handle cloudbursts, which call for sustainable urban drainage solutions to handle the water elsewhere and avoid flooding. Also in spring and summer time an increased risk of drought makes local water retention and collection for e.g. irrigation valuable.

Contribution

Lindevangs Park is a green urban space in Frederiksberg, Denmark, which merges climate adaptation with new facilities for social activities and meeting places for a diverse group of users. Lindevangs Park explores ways of using climate adaptation to renew and at the same time fulfill the expectations to the classic city park in a densely built neighbourhood. In the park, the collection of 3,000 m³ water is made possible through various different measures.

By the Southern entrance to the park, terrain and landscape design for the retention of water replaces a parking lot. A fountain and a 90m visible water channel shaped like a Fibonacci spiral, enables and displays the fluctuating nature of water, adding a relaxing atmosphere to the urban environment. A central grass area is formed into a large oval bowl, with the bottom creating a new stage. To the East, a long garden planted with black currents, apple trees and wild meadow flowers serves as a dike for collection of large amounts of water. The landscape design of Lindevangs Park combines cloudburst solutions with a new activity programme for the park, and succeeds in making water an integrated design feature, and in displaying the story of the water's journey through the park even when it rains heavily.



Origin/team

Marianne Levinsen Landskab,
Frederiksberg Council, Frederiksberg
Water Supplier, Niras A/S

Photo: Torben Petersen



Photo: Carsten Ingeman

Portland Green Streets Programme

Challenge

Extreme precipitation events have produced more rain and become more common since the 1950s in many regions of the world. The most immediate impact of heavy rainfall is the prospect of flooding. This risk can be heightened in urban areas where impervious pavements force water to quickly run off into inadequate sewer systems.

Contribution

Portland is a leader in using strategies that manage stormwater runoff, enhance community and neighbourhood livability, and strengthen the local economy. A street that uses planted facilities to manage stormwater runoff at its source is referred to as a Green Street. A Green Street is a sustainable stormwater strategy that meets regulatory compliance and resource protection goals by using a natural systems approach to manage stormwater, reduce flows, improve water quality and enhance watershed health.

One of Portland's first Green Streets – the NE Siskiyou Green Street Project – was built in 2003 as a stormwater retrofit to an existing residential street. The project reduced stormwater flows entering the combined sewer by slowing and infiltrating the street runoff. The project is a Green Street curb extension retrofit, and it features low evergreen plantings that blend with landscape areas on the adjacent residential properties. Neighbours have even played a major role in maintaining the two facilities by providing seasonal watering and weeding as part of the Green Street Stewards Program.

Portland's Green Street pilot projects required the coordination of multiple city bureaus, aided by the city's Sustainable Infrastructure Committee formed in 2001. The committee, consisting of representatives from Portland's three infrastructure management bureaus, documented the city's ongoing efforts toward sustainable infrastructure, gathered research on green infrastructure projects from around the country, and identified opportunities for local pilots. Since the first installations, the City of Portland has added more than 2,000 Green Streets.



Origin/team
City of Portland,
Bureau of Environmental Services



Photo: Bureau of Environmental Services

14 LIFE BELOW WATER

Conserve and use the oceans, seas and marine resources for sustainable development

The world's oceans – their temperature, chemistry, currents and life – drive global systems that make the Earth habitable for humankind. Our rainwater, drinking water, weather, climate, coastlines, much of our food, and even the oxygen in the air we breathe, are all ultimately provided and regulated by the sea. Throughout history, oceans and seas have been vital conduits for trade and transportation.

Careful management of this essential global resource is a key feature of a sustainable future. However, at the current time, there is a continuous deterioration of coastal waters owing to pollution and ocean acidification is having an adversarial effect on the functioning of ecosystems and biodiversity. This is also negatively impacting small-scale fisheries.¹

To find out more about Goal #14, visit:
<https://www.un.org/sustainabledevelopment/oceans/>

¹ Extract from UN's Sustainability Goals, available from
<https://www.un.org/sustainabledevelopment/oceans/>



Most of the built environment is situated on land, but its activities affect the oceans

The building industry affects the oceans through transport of building materials at sea, while existing settlements and cities discharge wastewater and other waste to the oceans. To help preserve life under water, we must reduce transport of building materials and components over long distances by sea through the development of local industries and production facilities. Furthermore, we must abolish plastic wrapping of materials and components to reduce the sources of non-degradable waste that ends up in the oceans.

Landscape design and urban planning must ensure that pollutants like pesticides, nitrogen and human waste are handled on site and do not reach the groundwater or the oceans. This means that sewer systems, overflow basins and wastewater treatment facilities are central parts of the built environment's relationship to the oceans. Through architecture, planning and design, we can develop solutions that reduce cost and add co-benefits to water-managing infrastructure. Furthermore, landscape design can ensure regenerative processes on polluted land close to the sea.

Caution must be exercised when buildings or settlements are placed on the coast or in fragile coastal ecosystems; on the other hand, architecturally significant and carefully placed research and learning facilities in fragile coastal ecosystems can generate new knowledge and help increase public awareness.

The Wadden Sea Centre

Challenge

Located in the southern part of Jutland, Denmark, The Wadden Sea is Denmark's largest national park and appointed World Heritage by UNESCO. The mudflats of the sea banks cover a stretch of 500 km along the coast of Denmark, Germany and the Netherlands. The landscape, the biological richness and the many migratory birds make the area unique, and also a favoured tourist destination that attracts many visitors every year. The dynamics of the tide enriches the wild life habitats in the region, but is also an unpredictable and dangerous landscape to tour in, and has to be treated with respect.

Contribution

The Wadden Sea Centre is the gate to the national park and is an interpretation of the local building tradition and the rural farmhouse typology significant in the area. The thatched roof and facades underline the tactile qualities and robustness that can be found in traditional crafts and materials of the region.

One of the main goals of the Wadden Sea Centre is to create awareness and understanding of the marshland and the sea, and the architecture accentuates this goal by being in harmony with the vast, horizontal landscape of the marsh. With an exhibition space, teaching and research facilities, cafe and a shop, the centre promotes the natural wildlife of the park for visitors from all over the world. Also the centre is the entry point for guided tours to the Wadden Sea, with careful information on wildlife and tide dynamics. The idea behind the teaching environment is that knowledge is gained through experience, and college classes, schools and kindergartens learn about the fauna, flora and the geomorphologic features of the landscape through biology and geography exercises.



Origin/team

Dorte Mandrup Architects,
Steensen & Varming,
Anders Christensen,
Marianne Levinsen Landskab,
JAC studios + Jason Bruges & No Parking

Photos: Adam Merik





Photo: Adam Mørk

Fischer Family 'August'

Challenge

To create sustainable architecture, we must pay attention to all components of the building, the materials it is made of, the process of production, decomposability and its aesthetic performance. 20 % of all plastic produced is used in construction. This presents a challenge, but also a great potential for using recycled plastic in buildings.

Contribution

Fischer Lighting has created a new range of high-quality LED downlights designed to be installed into the existing fixtures of energy intensive lamps. In this way, the conversion to low-energy quality lighting can be done without spending energy and materials on an expensive ceiling replacement. In the design of the new downlight, careful attention was paid to circular economy principles, and the possibility to reuse and recycle all components. All the lamps supplied are recouped at the end of their life-cycle and metabolized into components or materials which are recycled to make more lamps.

The first lamp, August, is made from disused fishing nets from the fishing industry which are upcycled into high-quality lighting products. Abandoned, lost or otherwise discarded fishing nets are damaging fish stocks worldwide. According to the UN, the so-called “ghost nets” in the oceans account for around 10% of all marine litter, and cause problems such as “ghost fishing”, where animals such as turtles, seabirds, and marine mammals die. One of the solutions is to improve collection, disposal and recycling schemes of all damaged and retrieved fishing gear. The downlights are installed in the National Aquarium Denmark, which has the declared purpose of disseminating knowledge about aquatic life and is deeply committed to the fight against plastic pollution in our oceans.



Origin/team
Fischer Lighting,
3XN/GXN, Plastix

Photo: Adam KR



Photo: Fischer Lighting

15 LIFE ON LAND

Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss

The goal is to sustainably manage forests, combat desertification, halt and reverse land degradation and to halt biodiversity loss.

Forests cover 30.7 per cent of the Earth's surface and, in addition to providing food security and shelter, they are key to combating climate change, protecting biodiversity and the homes of the indigenous population. By protecting forests, we will also be able to strengthen natural resource management and increase land productivity.

At the current time, thirteen million hectares of forests are being lost every year while the persistent degradation of drylands has led to the desertification of 3.6 billion hectares. Even though up to 15% of land is currently under protection, biodiversity is still at risk.¹

To find out more about Goal #15, visit:
<https://www.un.org/sustainabledevelopment/biodiversity/>

¹ Extract from UN's Sustainability Goals, available from <https://www.un.org/sustainabledevelopment/biodiversity/>



The amount of buildings, settlements and cities taking up land is rapidly growing.

Ecosystems and biodiversity are under intense pressure due to growing cities and settlements, farming, mining and the changing climate. To protect, restore and support ecosystems and biodiversity, buildings and settlements must include habitats for plants, insects and animals. This means that green-field developments should be kept to a minimum and that planning and development of all new settlements must ensure sustainable conditions for local ecosystems, flora and fauna. Nature networks that allow plant life should be developed in existing settlements and urban areas, so that insects and animals can co-exist with the built environment. Examples are found at all scales, from pocket parks and insect hotels to large-scale planning projects to establish nature networks in big cities.

Furthermore, the building industry can help promote sustainable forestry and combat deforestation by using wood only from sustainable sources and by generally using materials that are renewable and sustainably produced and which do not compromise biodiversity and natural habitats for flora and fauna. Local flora and fauna must form the basis of landscape design in buildings and settlements, including lawns and interior greenery, so that the plants will interact with and support local ecosystems. Finally, buildings placed carefully in vulnerable ecosystems or in wild-life-parks can add to their preservation through sustainable tourism and raised public awareness.

Red Ribbon Park

Challenge

Supporting natural wild life while creating access to green and lush areas in densely populated regions is a balance between intervention and preservation. Architecture mediates between the two; it allows us to experience and appreciate, but it also allows us to interfere and degrade. In this project, the design carefully manages human presence in the natural environment, to support both the experience and the wild life.

Contribution

The river park of Tangher River, China, is a landscape architecture project, which uses a minimum of intervention to create a recreational landscape which at the same time respects and supports natural wildlife habitats and which enhance the fluctuating nature of the river and ever-changing riverbanks. A red ribbon twists and turns along the riverbank, and leads people through dense plantings and open spaces, integrating boardwalk, lighting, seating, environmental information and orientation through a diverse wetland. Four pavilions provide shade and meeting opportunities, and also they function as visual focal points for way finding in the densely vegetated site. Boardwalks and paths provide access to the river and wetlands for residents of the urbanized Qinhuangdao City and display ecological processes and natural qualities meanwhile strengthening the natural habitats of the river and riverbanks. Instead of gaining control of the river dynamics with pipe channeling and concrete, as it has been done along other parts of the river, the project strengthens the natural river corridor and its habitats.

Photos: Kongjian Yu, Turenscape



Origin/team

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Yang Lina, The Landscape Bureau,
Qinhuangdao City, Hebei Province,
and Peking University Graduate
School of Landscape Architecture
in Beijing





Novo Nordisk Nature Park

Challenge

Industrial zones and business parks are often associated with large-scale uniform buildings and vast asphalt surfaces, facilitating parking and infrastructure. Today these urban typologies, with their roots in modernist urban planning, are ubiquitous and line the periphery of most cities. The mono-functionality of these areas often apply to landscape as well as buildings, and as a result natural wildlife can easily be suppressed by lack of access to suitable habitats.

Contribution

The landscape design for the headquarters of pharmaceutical company Novo Nordisk is inspired by the Scandinavian forests and hilly dead-ice topography, supporting a wide variation of natural biotopes in various ways. The planting plan shows a wide palette of native plants and has more than 1,000 new trees which over time will grow into clearly defined small 'forests' and self-regulating biotopes. The park promotes vegetation, which evolves with natural succession and seasons, and dead trees are integrated parts of the landscape design, with the purpose of increasing the biodiversity and strengthen the park's natural ecosystem, creating new habitats for bugs, fungi and larger animals. They also provide the park with the smell of natural decay and thereby a direct confrontation with the aesthetics of nature and its ecosystem.

The trees were hand-picked by the designers in specially selected nurseries before composed in relation to their natural habitat, their shape, their volume and in relation to the local microclimate to maximize shelter for the users of the park and for the office buildings. The trees also help to absorb all rainwater that falls on site. Depressions are planted with alder trees and other water tolerant species in order to contribute to the park's ambitious climate adaption design. The landscape holds a 100% water balance, which means that all rainwater falling in the area and on the buildings is collected and reused for irrigation of the park's many large trees and diverse vegetation. The biodiversity of the park is being monitored and new species has been found there. Also the park has become a recreational destination for employees, visitors and local residents.



Origin/team

SLA Architects,
Henning Larsen Architects,
Orbicon, Alectia,
Skælskør Anlægsgartnere, Urban
Green

Photo: Torben Petersen



Photos: Torben Petersen & SLA Architects

The Norwegian Wild Reindeer Centre Pavilion

Challenge

As cities across the globe continue to grow, natural environments are put under stress; natural habitats are transformed into farmland or paved with streets. The result is a decline in biodiversity and an undermining of future generations' possibilities to enjoy and utilize the realm of benefits that natural environments can offer; from 'ecosystem services' to aesthetic experiences. How can architecture instill respect for nature, and contribute to preserving and strengthening its presence in the future?

Contribution

On Hjerkin in the outskirts of Dovrefjell National Park, Norway, at around 1,250 meters above sea level, a pavilion is overlooking the mountain. It serves as an observation pavilion for the Wild Reindeer Foundation educational programmes, and the site is home to wild reindeer herds, musk oxen, arctic foxes and a variety of endemic botanical species. To get there you must take a 1.5 km hiking trail, which tourists and researchers do to visit the spectacular site. Facilitating access to national parks, giving people the opportunity to enjoy the landscape and its wildlife without notable disturbance, is a way to empower the national parks and their importance to people. Natural, cultural and mythical landscapes form the basis of the architectural idea, where a rigid outer shell meets a soft, organic inner core. The core is shaped like rock or ice that has been eroded by natural forces like wind and running water, and it creates a protected and warm gathering place, while still preserving visitors' access to spectacular views. The team has focused on the quality and durability of materials so that the building can withstand the harsh climate while being an integrated part of the landscape. Natural building materials make reference to local building traditions, while modern techniques have enabled the shape of the wood core using a large-scale robot-controlled milling machine based on digital 3D models.

Photo: Diephotodesigner.de



Origin/team

Snøhetta,
Norwegian Wild Reindeer Centre,
Prebygg AS, Lonbakken AS,
Skandinaviska Glassystem AB,
Djupevaag Ship Builders AS



Photo: Roger Brennhagen

Photo: Diephotodesigner.de



16 PEACE, JUSTICE AND STRONG INSTITUTIONS

Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

Peaceful, just and inclusive societies are necessary to achieve the Sustainable Development Goals (SDGs). People everywhere need to be free of fear of all forms of violence and feel safe as they go about their lives whatever their ethnicity, faith or sexual orientation.

In order to advance the SDGs we need effective and inclusive public institutions that can deliver quality education and healthcare, fair economic policies and inclusive environmental protection.¹

To find out more about Goal #16, visit:
<https://www.un.org/sustainabledevelopment/peace-justice/>

¹ Extract from UN report WHY IT MATTERS – PEACE; JUSTICE AND STRONG INSTITUTIONS - PDF



Parliaments, courthouses and public libraries are cornerstones in a just and peaceful society, while local community centers, places of worship and safehouses can represent citizens' commitment to an inclusive and compassionate society.

Architecture does not make an institution just, but the effort and values put into a building can represent society's commitment to justice, democracy and inclusiveness. Examples of this span from prestigious buildings for ministries or town halls to the establishment of UN emergency architecture in disaster zones.

To support society's expression of its values through buildings and public space, architecture and planning must ensure that public spaces and institutions are inclusive, welcoming, secure and non-discriminatory. As part of this, terror protection measures should be developed that are inclusive and inviting to citizens and users. The design of libraries, community centers, safehouses and places of worship must ensure safety, inclusiveness and affordability.

The building industry itself must pay close attention to procurement and construction processes in order to discourage theft, corruption, bribery and all other forms of organized crime. The building industry must also ensure that the extraction, production and handling of building materials do not rely on abuse, exploitation, human trafficking or child labour.

The International Criminal Court in Hague

Challenge

The International Criminal Court (ICC) investigates and, where warranted, tries individuals charged with the gravest crimes of concern to the international community: genocide, war crimes, crimes against humanity and the crime of aggression. This core activity can make them a target for people or organizations with hostile intentions. Keeping the institution as a public domain with the needed transparency and inclusion, while keeping it safe, is a dilemma that ICC and many other institutions are dealing with. Anti-terror architecture is a concept that is being debated and explored in various ways all over the world. As a measure of protection, architecture has the potential to ensure security but also to undermine inclusion and equal access to public space.

Contribution

The landscape surrounding the ICC in Hague, Netherlands, has been designed as a modern landscape with attractive public spaces and green recreational spots, while also containing important natural security measures. The design team has dealt with issues so diverse as terrorism prevention, identity making, climate adaption, storm water management and safety for visitors, workers and affiliated people at the ICC.

Instead of barricading the buildings behind high walls, the ICC opens up to the public through a sophisticated but gentle processing of the landscape. Dunes, a plaza, and the parterre gardens become the court's public face as an inclusive, open and meaningful institution, while attempting to protect the court against hostile intentions. To emphasize the global significance of the institution the parterre gardens in the inner courtyards have been designed to represent different regions of the world, giving each member country the possibility to experience familiarity. The vegetation and layout are inspired by Africa, Western Europe, Asia, Eastern Europe and Latin America/Caribbean, and they are supposed to provide employees and guests of the ICC with a calm and inclusive break during a busy day.



Photo: SLA Architects

Origin/team

ICC, SLA Architects, Schmidt Hammer Lassen Architects, Royal Haskoning Nederland B.V. and Esbensen - Consulting Engineers AS, Brink Groep, Courty's



Photo: Torben Petersen

Bogotá – policies of change

Challenge

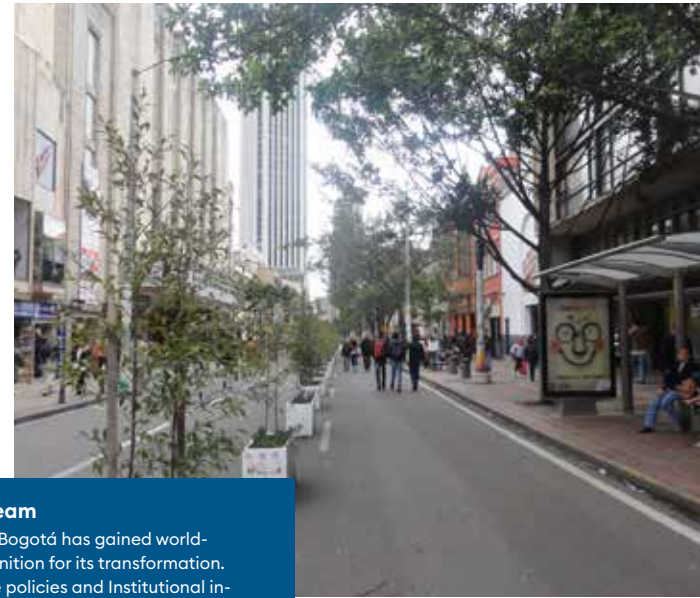
In the mid-1990s the city of Bogotá reached a low point. Mass migration to the city deteriorated living conditions which were already critical, and overcrowding and poverty generated a rapid increase in pollution. A drug war was raging, and crime rates soared. These challenges sent the city to the bottom of the statistics; homicide rates were the highest in history and Bogotá was considered the least livable city in Latin America.

Contribution

The 1990s saw a major turnaround from notoriety to pride as the city grew aspirations to not only become more livable and sustainable, but also become a source of inspiration for other cities. The key was a commitment to sustainable urban development at the city's leadership-level.

Two distinct political figures are credited for instigating the urban transformation that the city is undergoing; mayor Antanas Mockus (first term 1995-1997) and mayor Enrique Peñalosa (first term 1998-2000). Massive developments of public infrastructure; transportation, water, bicycle lanes, libraries, parks, affordable housing etc. as well as a series of unconventional campaigns launched under Mockus, to develop stronger citizenship and participation, has brought Bogotá to the world's attention as a forerunner of sustainable urban development.

While the city's rebirth started in the 1990s, the policies towards a sustainable future are still being developed. An important stakeholder in the development is The Colombia Green Building Council (Colombia GBC, or Consejo Colombiano de Construcción Sostenible) a non-profit organization with a seat in World Green Building Council and an advisor to the city government on questions of sustainable urban development. The CCCS works to advance better urban planning and sustainable construction practices, as well as linking local and national developments to achieve environmental, economic and social goals on a larger, global scale.



Origin/team

The city of Bogotá has gained world-wide recognition for its transformation. Progressive policies and Institutional innovations within city management and public service delivery, have set the city on a path towards a sustainable future.

Photo: Vladimix



Photo: Carlos Felipe Pardo

Tingbjerg Library and Culture House

Challenge

Tingbjerg is a neighbourhood in Copenhagen, Denmark, which is characterized by social housing built in the 1950-1970s, and by a large proportion of socially disadvantaged residents. From time to time, the neighbourhood has been marked by crime, and for various reasons, also relating to the physical layout of the area, the neighbourhood appears isolated from society in general, and has earned a mixed reputation.

Contribution

The neighbourhood of Tingbjerg is surrounded by green areas, and was designed as a model city, with its own church, school and shopping area. The layout of the housing project consists of blocks with three floors, row houses and a single high rise.

The Municipality of Copenhagen decided to extend the school with a new library and culture house, which architecturally respects the existing framework, and at the same time adding something completely new. Using the same basic materials found in the area such as yellow brick cladding, the new building has a clear link to the existing uniqueness of Tingbjerg. As a funnel shaped volume pointing towards the school, the roof of the culture house spans from 4 floors and slopes down to one floor towards the entrance to the school. With the open and transparent façade facing the street, the building shows its many activities to its surroundings, welcoming residents and inviting newcomers to engage.

The library and culture house is intended to support community-based activities with a great variety of institutions under the same roof. Apart from being a library, the building also hosts a pedagogic teaching centre, meeting facilities, a café, a concert and theater hall; all institutions that support the community building of the area.



Origin/team

COBE, Rune Fjord Studio,
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Rambøll Arkitektur

Photo: Rasmus Hjortshøj - COAST



Photo: Rasmus Hjortshøj - COAST



17 PARTNERSHIPS FOR THE GOALS

*Strengthen the means of implementation
and revitalize the global partnership for
sustainable development*

A successful sustainable development agenda requires partnerships between governments, the private sector and civil society. These inclusive partnerships built upon principles and values, a shared vision, and shared goals that place people and the planet at the centre, are needed at the global, regional, national and local level.

Urgent action is needed to mobilize, redirect and unlock the transformative power of trillions of dollars of private resources to deliver on sustainable development objectives. Long-term investments, including foreign direct investment, are needed in critical sectors, especially in developing countries.¹

To find out more about Goal #17, visit:
<https://www.un.org/sustainabledevelopment/peace-justice/>

¹ Extract from UN's Sustainability Goals, available from
<https://www.un.org/sustainabledevelopment/partnerships/>

17 PARTNERSHIPS FOR THE GOALS



Every city is built by many hands, and similarly we need to work together to reach the 17 sustainable development goals, as no single stakeholder can reach them alone.

The challenge of achieving the goals requires the involvement of all; from governments and institutional actors to researchers, businesses and citizens. Architects, designers and planners can contribute by sharing knowledge, promoting sustainable solutions and engage in collaboration with research and institutional partners, to develop and implement sustainable solutions. Examples span from non-profit partnerships to provide homes for the homeless to commercial partnerships to develop new sustainable products and services to the building industry. Key to the partnerships is a willingness to include new knowledge, test new practices, engage with local climate, culture and resources and work with end-users to ensure commitment and ownership in a life-cycle perspective.

Partnerships for the goals also include associations and networks of professionals who have committed to working for the goals. From the International Union of Architects (UIA) which brings together architectural associations from all over the world and represent architects in 124 countries to local study groups sharing know-how of green roofing systems. The challenges addressed by the goals are global; to achieve them we must work together across professional fields and national borders.

TECHO – a youth led non-profit organization

Challenge

104 million people live in slums in Latin America. Families lack a proper home and have no access to basic services, such as clean water, electricity or sewerage. They are exposed to cold, rain, dirt and pollution which generate many health problems. Adults are often unemployed and their children have to work from an early age to help support their family.

Contribution

TECHO is a youth led non-profit organization present in Latin America and the Caribbean. Through the collaborative work of families living in extreme poverty with young volunteers, TECHO seeks to overcome poverty in slums. TECHO is convinced that poverty can be permanently eradicated if society as a whole recognizes poverty as a priority and actively works towards overcoming it. Mission-driven relationships are a key part of TECHO's strategy, and TECHO is engaged in corporate partnerships with major international businesses who bring funding, sponsorships, knowledge, even manpower into the organization's projects.

TECHO pursues three strategic objectives

The promotion of community development in slums, through a process of community strengthening that promotes representative and validated leadership, and drives the organization and participation of thousands of families living in slums to generate solutions to their own problems.

Fostering social awareness and action, with special emphasis on generating critical and determined volunteers working with the families living in slums while involving different social entities.

Political advocacy that promotes necessary structural changes to ensure that poverty does not continue reproducing, and that it begins to decrease rapidly.

Since its beginnings in Chile, TECHO has undertaken a great expansion, and after 15 years has maintained operations in 19 countries across Latin America.



Origin/team

TECHO is based in Miami, Florida and New York, NY.

Photos: TECHO



The Climate Tile

Challenge

Water flows across municipal borders and traditional division in the building industry demand a change in the way we plan and build our cities, and the way we work together to adapt to increased rainfall and extreme weather events. Climate adaptation is a big challenge to overcome today, but also an opportunity to innovate and collaborate across fields and interests.

Contribution

Based on a cross disciplinary partnership and collaboration between architects, drainage technicians, technical researchers, a philanthropic associations and consultants, a new scalable tile system and climate adaptation solution aimed at densely populated cities has been developed. The shape of the tile mimics the traditional tile as found on Copenhagen sidewalks, making it possible to fit it in the existing framework. But at the same time the tile introduces a set of additional capabilities such as treating water in a purely technical manner and celebrate water as a valuable resource.

The Climate Tile supports the natural water circuit by a simple process that manages the rainwater from roofs and sidewalks and ensures that the water runs to the right place e.g. to plant holes and water tanks. It can catch and redirect 30% of the projected extra rainwater falling due to climate change, and thereby prevent overloads within the existing drainage infrastructure. The project is seen largely as an inclusive solution in synergy with both roads, bike paths, signage, urban furniture and town squares, and it contributes to the growth of an urban nature and improved microclimate, which generates added value for the urban residents.

The partnership has been crucial to the development of this tile system, contributing to climate action by innovating existing infrastructural elements and making them climate-change resilient by handling wastewater in a more sustainable way for e.g. irrigation systems and other needs.



Origin/team

THIRD NATURE,
IBF and ACO Nordic,
City of Copenhagen,
Malmos A/S, Technological Institute,
Orbicon, Kollision, Smith Innovation,
Realdania,
The Market Development Fund

Photos: Third Nature



Architecture without borders, Magburaka Education and Computer Center

Challenge

Many of the world's problems relating to inequality are embedded in the built environment, and to be able to combat this inequality we have to collaborate across borders to mobilize equitable architecture, urban planning and construction methods, which are socially responsible and respect diverse human cultures, while preserving the historical heritage of people.

Contribution

Architecture Sans Frontières International (ASF-Int) is a network of independent non-profit organizations, which enable vulnerable communities to access architectural services, research and educational resources. It was founded in France in 1979 and has member organizations all over the world. Members run building and planning projects in countries on all five continents together with local partners. Collaboration involves organizational, political and practical levels, and includes a wide range of professional fields.

An example created by ASF, Denmark, is an Education and Computer Centre in Magburaka, Sierra Leone. The aim of the project is to promote IT-related education and provide access to information through learning facilities. The centre includes an internet cafe and a community centre, and during the construction phase it involved capacity building of local labour through collaborations with local entrepreneurs and craftsmen. Apart from members of ASF, the partnership behind this project also includes an NGO, a university and an engineering company, and it has received several public and private donations.



Origin/team

Client: React, now a part of YDC
(Youth dream Centre)

Design and construction: Architecture Without
Borders Denmark, MECC-team

Fundings: Non-profit Café Retro,
Statens Kunstfond, Paula's Fond, Merkur Bank,
Rambøll, private donations and fundraising
by the AWB-DK-Mecc team



Photos: Carina Refsing Nissen

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The Royal Danish Academy of Fine Arts Schools of Architecture, Design and Conservation (KADK), is an architecture school in Copenhagen dating back to 1754. In 2015 KADK committed to working with the UNs 17 Sustainable Development Goals, making it mandatory for all graduates to engage with the goals in their thesis.

For more information visit www.kadk.dk

The UIA Commission on the 17 UN Sustainable Development Goals was established in 2017 by the International Union of Architects. The commission brings together architects from all over the world with the purpose of collecting, analyzing and disseminating knowledge of how architecture and architects can and will contribute to the fulfilment of the Goals.

For more information:
www.uia-architectes.org/webApi/en/working-bodies/sdg

The Danish Association of Architects was founded in 1879 in order to support and promote the conditions of architects whilst ensuring architectural quality in our cities, buildings, landscape and environment. The associations of architects in the Nordic countries which form the Nordic Section in the UIA will host the UIA World Congress in Copenhagen in 2023 with the theme "Sustainable Futures". The Congress will focus on the 17 UN Sustainable Development Goals.

For more information: www.arkitektforeningen.dk

For more information, contact: uia-sdg@arkitektforeningen.dk



REFERENCES AND CREDITS

1) No poverty

<https://www.anupamakundoo.com/volontariat-home-for-homeless-children/>
<https://big.dk/#projects-dong>

2) Zero Hunger

Detroit Food Policy Council and Detroit Health Department, 2017
<http://www.miufi.org/about>
Hill, Alex B. and Amy Kuras. Detroit Food Metrics Report, 2017
<http://www.humanhabitat.dk/portfolio/the-impact-farm/>

3) Good Health and wellbeing

<http://ingvartsen.dk/the-magoda-project/>
<https://www.ja-ja.dk/project/konditaget-luders/>
<https://www.loa-fonden.dk/projekter/2016/konditaget-i-nordhavn-i-koebenhavn/>
<http://www.citieschangingdiabetes.com/about/overview.html>
Region Hovedstadens anbefalinger for Helende Arkitektur, Region Hovedstaden, 2010
<https://www.fosterandpartners.com/projects/maggie-s-manchester/>

4) Quality Education

<http://casedesign.in/projects/architecture/Avasara%20Academy>
<http://malenebach.dk/node/97>
Donnelly, Ellen E., Case Design - A School in the Making, Archizoom, 2018
<https://henninglarsen.com/en/projects/featured/1246-frederiksbjerg-skole/>
<http://ea-hr.org/100-classrooms-for-refugee-children/>

5) Gender equality

<http://www.hksinc.com/places/kachumbala-maternity-unit/>
<https://orkidstudio.org/projects/women/>
<https://www.loa-fonden.dk/aktuelt/2018/vigtige-kvaliteter-naar-vi-taler-piger-og-idraetsfaciliteter/>
<https://vegalandskab.dk/projekter/droen-paa-skolegaarden/>
Munch, Laura, Mogensen, Mette og Roessler, Kirsten Kaya, 'Arkitektur Kvinder og Idræt', Lokale og Anlægsfondens Skriftrække 13, 2007

6) Clean water and sanitation

<https://www.warkawater.org/>
Application of wastewater treatment in sustainable design of green built environments: A review
Hamidreza Rashidi a, Ali GhaffarianHoseini b,n, Amirhosein GhaffarianHoseini c, Nik Meriam Nik Sulaiman a, John Tookey b, Nur Awanis Hashim a
a Department of Chemical Engineering, Faculty of Engineering, University of Malaya (UM), Malaysia
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<http://mgarkitektur.dk/index.php/projekter/62-sonaes-klimatilpasning-og-parkstrategi>
CSR.dk
<https://sfwater.org/index.aspx?page=1156>
Research interview with Marina Bergen Jensen, Professor mso in Design and Construction of Urban Landscapes Adapted to Climate Change, University of Copenhagen
Research interview with Helle Munk Ravnborg, Senior Researcher Natural resources and development, DIIS

7) Clean and affordable energy

<https://snohetta.com/projects/40-powerhouse-kjorbo>
<https://www.powerhouse.no/en/>
Energy consumption and efficiency in buildings: current status and future trends
Author links open overlay panelA.AllouhiY.El FouihaT.KousksoubA.JamilaY.ZeraouliB.Mourada
<http://www.vakkervannkraft.no/ovre-forsland>
Hannah Ritchie and Max Roser (2018) - "Fossil Fuels". Published online at OurWorldInDa-ta.org.
Retrieved from: '<https://ourworldindata.org/fossil-fuels>' [Online Resource]
<http://ien.com.my/projects/paramit.html>
<https://blog.interface.com/paramit-factory-in-a-forest/>

8) Decent work and economic growth

<http://www.kere-architecture.com/projects/atelier-gando/>
<https://www.sitecover.com/>
<https://mettelange.com/Moving-School-India>
Ensuring Education for the Children of India's Migrants, Reed, Megan June 30, 2014. Center for the Advanced Study of India, University of Pennsylvania.

9) Industry, innovation and infrastructure

<http://soft-cells.com/>
<https://smile-plastics.com/>
Contains excerpts from a 01.12.2017 interview by Jim Biddulph for Material Lab.

10) Reduced inequalities

<http://www.k2s.fi/k2s.html>
<https://gehlpeople.com/cases/chongqing-china/>
<https://www.un.org/development/desa/disabilities/convention-on-the-rights-of-persons-with-disabilities/article-9-accessibility.html>
<https://www.handicap.dk/handicaporganisationernes-hus/>

11) Sustainable cities and communities

<https://www.lilac.coop/>
<https://www.white-design.com/architecture/all-projects/lilac/>
<http://klimakvarter.dk/presse/>
<https://www.ghb-landskab.dk/projekter/taasinge-plads>

12) Responsible consumption and production

<http://www.anna-heringer.com/index.php?id=41.html>
<https://lendager.com/arkitektur/upcycle-studios/>
<https://sbi.dk/Pages/Bygningers-indlejrede-energi-og-miljoepaavirkninger.aspx>
<https://www.maelven.com/mjostarnet/>
http://vollark.no/portfolio_page/mjostarnet/

13) Climate Action

<https://www.dmi.dk/en/climate/the-future-climate/denmark/>
<http://mariannelewinsen.dk/lindevangsparken.html>
<https://www.turenscape.com/en/project/detail/435.html>
<https://www.theguardian.com/world/2017/dec/28/chinas-sponge-cities-are-turning-streets-green-to-combat-flooding>
<https://www.portlandoregon.gov/bes/45386>
National Climate Assessment (U.S. Global Change Research Program, 2014)

Managing Wet Weather with Green Infrastructure Municipal Handbook. Robb Lukes Christopher Kloss Low Impact Development Center. December 2008.
Research interview with Mikkel Funder, Senior Researcher Natural resources and development DIIS

14) Life below water

<https://www.dortemandrup.dk/work/wadden-sea-centre>
<http://www.fao.org/news/story/en/item/19353/icode/>
<https://www.fischer-lighting.com/solution/fischer-family-august/>

15) Life on land

<https://www.turenscape.com/en/project/detail/336.html>
<https://www.sla.dk/en/projects/novo-nordisk/>
<https://snohetta.com/project/2-tverrfjellhytta-norwegian-wild-reindeer-pavilion>

16) Strong institutions

<https://www.sla.dk/en/projects/icc-international-criminal-court/>
<https://www.cccs.org.co/wp/>
<http://www.cobe.dk/project/tingbjerg-library>

17) Partnerships for the Goals

<http://us.techo.org/>
<https://www.tredjenatur.dk/portfolio/klimaflisen/>
http://archive.asfint.org/sites/default/files/IMG/pdf/ASF-Int_PPW_NS_final.pdf
<https://arkitekterudengraenser.dk/magburaka-education-and-computer-centre/>

AN ARCHITECTURE GUIDE to the UN17 Sustainable Development Goals

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Suggestions of cases for the second edition of the guide can be emailed to:
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