

Greenprint

Examples of sustainable practice
in the urban environment



Except Integrated Sustainability

Greenprint

Examples of sustainable practice in the urban environment

v2.0

This book is dedicated to creative commoners everywhere, working to create a sustainable future, written and produced by the Except Integrated Sustainability community.



EXCEPT
Integrated Sustainability

Table of Contents

1. Energy & Materials 10

BKCity Slim Refurbishment	12
Energy-Efficient Roof System	14
Self-Healing Concrete	15
Self-Cleaning Materials	16
Biomimetic Ventilation	17
Personal Power Meter	18
Dial4Light: Cellphone Application	19
Auto-Tinted Windows	20
Lunar-Resonant Streetlights	21
Get Smart	22
The Subway Light Project	23
Biogas Digesters	24
Willow Coppicing to Create Energy	25
ETFE In Architecture	26

3. Ecology & Agriculture 40

Polydome	42
Floating Aquaculture	44
Aquaponics	45
Pioneering Urban Fish Farms	46
Mushroom Recycling	47
The Plant, Chicago	48
Vertical Greenhouses in Urban Housing	51
Food Deserts & Rainbows	52
Urban Agriculture for Entrepreneurs	53
The Eden Project	54
Seattle Urban Agriculture	56
Underground Hydroponics	68

2. Waste & Water 28

Merredin Health Industries Spirulina Plant	30
Incentive-Based Recycling	32
CHaRM: Center for Hard Recycle Materials	33
San Francisco's 3-Cart Program	34
Homes Heated by Human Waste	35
Reedbeds In Place Of Sewers	36
Efficient WCs & Controlled Taps	48

4. Typology 60

A Retrofit Facelift	62
Floating (Green)Houses	64
Greenhouse - Inspired Architecture	66
Tangram Architekten's Crystal Court	68
Toronto Towers Urban Renewal Plan	69
Innovative Facades	70
Green Roofs	71
The Geotectura 'i-rise'	72
The Hockerton Housing Project (HHP)	74

5. Transport	76	7. Neighborhoods	102
San Francisco Transbay Terminal	78	Sustainable Schiebroek-Zuid	104
Shared Space	80	EVA-Lanxmeer	108
Car Sharing	81	Housing At Nieuw Terbregge	112
Congestion Pricing	82	GWL-Terrein	116
Day of Rest, From Cars	83	Greenwich Millennium Village	120
Smart Parking System	84	Vauban	124
Automobile Abstinence	85	Hammarby Sjöstad	128
From City of Lights to City of Bikes	86	Ekostaden Augustenborg	132
Tricycles Meet the 21st Century	87		
Rapid Bus Transit	89		
6. Communities	90	8. Cities	136
The Rotterdam Collective	92	Except's Urban Green Scan	138
Like Father, Like Son	94	Curitiba - Brazil	140
Taking to the Streets	95	Portland, Oregon- U.S.A	141
By the People, For the People	96	Vancouver - Canada	142
Pint-Sized Chefs	97	Reykjavik - Iceland	143
Crowd-Sourced Recycling	98	Copenhagen - Denmark	144
Local Exchange Trading Systems	99	Seoul - South Korea	145
FlexOverschie	100		



Foreword



This book grew out of Except's belief in the importance of sharing past successes, present initiatives, and future ideas in the collective effort to create the foundations for a sustainable society. While we face some of the most pressing environmental and social concerns in our history, our increased connectivity also allows us to spread ideas and collaborate in ways never before possible. In our own work, Except continually refers to the precedents, best practices, and projects of others, while also spreading the inspiration by actively sharing our projects and research.

This compact little book has more than 150 examples of projects, products, and initiatives that could help move society towards a more sustainable future. Rather than an exhaustive survey, this book is an information and image-packed sampling of projects, culled from around the world and right next door. From energy-saving sockets to city-wide initiatives, these precedents provide inspiration for any context.

The examples represent a variety of actors, disciplines, scales, and geographies, underscoring the idea that sustainability is a collective effort which can and must be addressed in a holistic, multi-faceted way. Some of these projects are conceptual visions, some are currently in progress, and others stand as completed testaments to innovative thinking and design. Though most do not represent stand-alone solutions or fully resolved strategies, taken together they provide an excellent palette of ideas.

Except is committed to fostering the spread of ideas, using open source software and Creative Commons licensing whenever possible. All the images in this book have either kindly been donated by their owners or taken from Creative Commons sources. In the spirit of knowledge sharing, we are making this book available online, while offering printing on-demand for those who would like hard copies. We hope you enjoy the book and we would love any feedback you might have.





For you to find things easily, we have divided this book into eight thematic categories which look at distinct and inter-related aspects of sustainability. **Energy & Materials** and **Waste & Water** focus on the universal building blocks of life, describing projects and products that help creatively re-envision society's relationship to these basic resources and the by-products of their use.

Ecology looks at innovative methods of food production, both within the glass walls of a greenhouse and amidst the concrete of city streets. Feeding more people, more sustainably, is one of the most pressing concerns we face today, and these projects provide examples that will help get us there. As the world becomes increasingly urban, it is essential that we find ways of housing more people while focusing on sustainable building and retrofitting. The techniques and buildings in **Typology** point the way towards the architecture of the future.

Transport provides the physical infrastructure and means to connect ideas, people, and places. **Community** initiatives are the social glue that helps bind people together. The examples here focus in particular on bottom-up initiatives organized by and for community members. **Neighborhoods** interweaves the themes from all of the preceding sections into a larger urban fabric. Finally, **Cities** zooms out once more, with city-wide examples from around the world that demonstrate that our urban environments can be at the heart of sustainable growth.



Energy & Materials



The projects and products in this section offer new insights into energy generation and use. Innovations in materials science also show us how the physical building blocks of our environment may contribute to a smarter, cleaner energy future.

The examples included here draw inspiration from nature and look to innovative technologies in developing new forms, materials, and energy sources. Energy is often the protagonist in discussions of sustainability, but these projects help move the discussion beyond standard approaches, to a new, more dynamic understanding and interaction with the energy and materials that define our environment.

BKCity Slim Refurbishment

Sustainable Renovation of TU Delft's Architecture Faculty

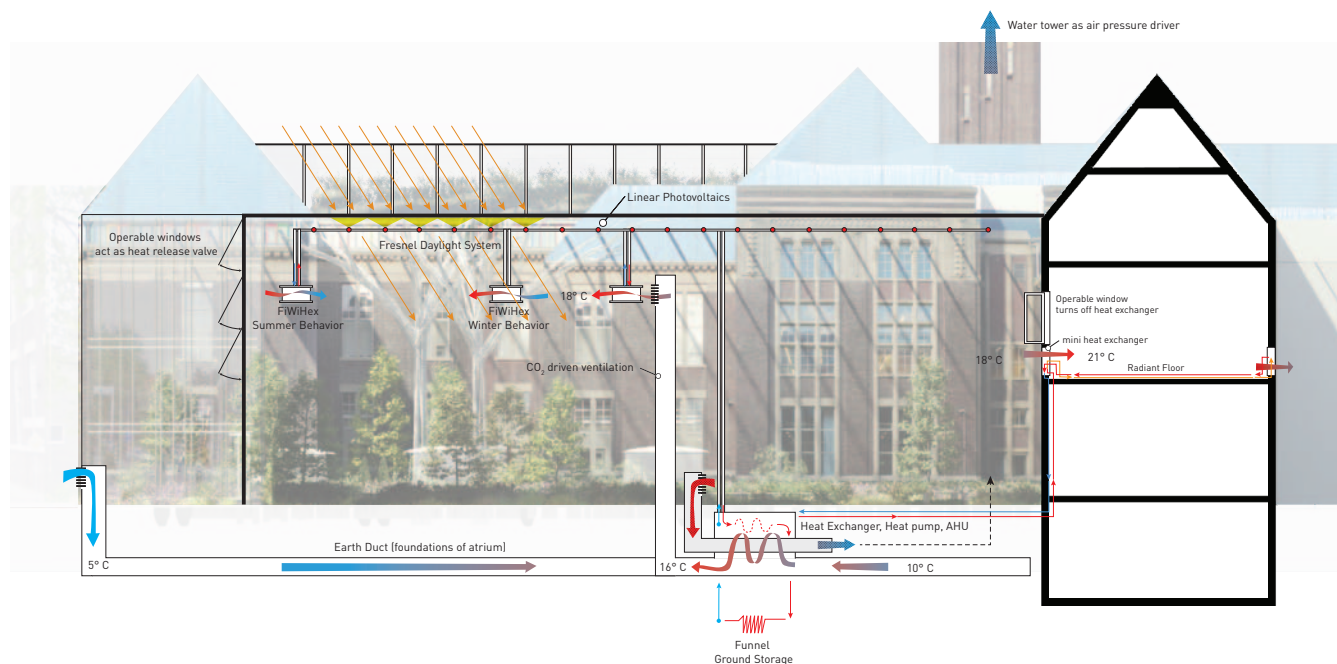
Building energy consumption accounts for 20-40% of final energy consumption, 25% of all virgin wood use, and 16% of total water withdrawals of our society. Constructing zero-energy-use buildings these days is perfectly doable, but more than 60% of both residential and non-residential buildings in Europe were built before 1975, and their resource use is often worrisome. Converting these into sustainable buildings, while treating the buildings with respect and not unnecessarily demolishing them is a major task that lies ahead of us. The BK City Slim Project provided the ideal opportunity to apply Except's integrated approach to sustainable refurbishment.

Except created a phased plan to make a historic educational building energy and carbon neutral within ten years, while converting the building into a didactic tool that puts

sustainability at the heart of education for the generations of architects that will pass through its halls. It features a unique indoor ecosystem that provides many services, including water filtration, air treatment, climate buffering and a better learning environment.

The result is a highly didactic building with exemplary environmental quality, an indoor plant ecosystem, more than 10.000 m² (1 hectare, or around 2,5 acres) of extra space, energy, and water usage that is operationally sustainable, and a plan that is both feasible and phase-able, under the requested renovation budget of 25 million euros invested over 10 years.

Further reading: www.except.nl





Energy-Efficient Roof System

Phase Change Materials Could Revolutionize Roofing

New, hi-tech materials are allowing for energy efficiency advances in roofing. According to researchers' estimates, homeowners could save 8% or more on their summer cooling bills once the latest strategies become commercially available.

Novel techniques such as active thermal mass components, reflective pigments and coatings, radiant barriers, and subventing are being developed and tested by the United States Department of Energy (DoE). Many of these techniques have been made possible by the development of proprietary phase change materials (PCMs).

Phase change materials are capable of storing and releasing large amounts of heat when they change from one state to another (e.g., from solid to liquid).

One familiar example of their use is in the heating pads used by winter sports enthusiasts to keep their hands warm. Earlier attempts to use PCMs in housing - in the 1970s and 80s - were unsuccessful because the technology was not yet mature. PCMs then were chemically unstable and not very durable in their performance.

The newest attempts at using PCMs are more promising. An inorganic phase change material sandwiched between two reflective surfaces made of aluminum foil is used as a dynamic thermal barrier between the roof and attic area in a model house. The DoE team at Oak Ridge National Laboratory has successfully tested the prototype, showing that it can reduce attic temperatures by 22 degrees on a typical summer day.

Further reading: www.pcmproducts.net



PCMs change state from solid to liquid as they are heated by the sun during the day, slowly releasing heat during the night.

Self-Healing Concrete

Safer, More Durable Infrastructure

A new concrete material developed at the University of Michigan & TU Delft can repair itself when it cracks. The repair process requires only water and carbon dioxide, which means that rainfall is all it takes to keep the material good as new.

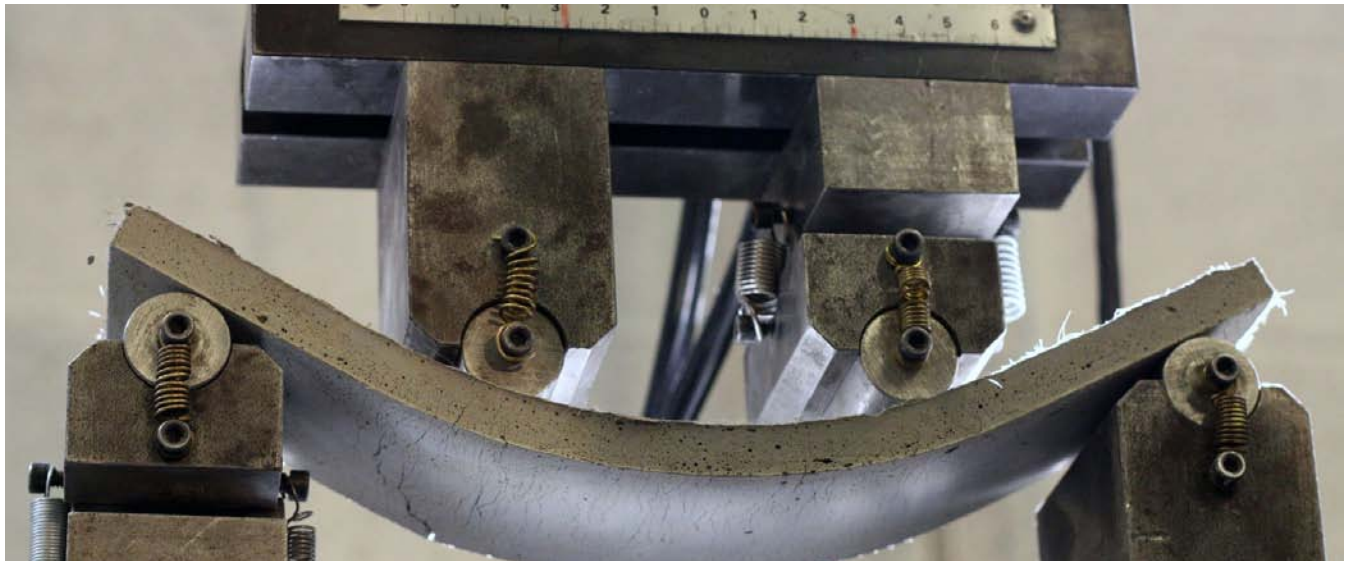
This concrete can self-heal because it has been designed to crack in a very different way from normal concrete. Traditional concrete is rigid and brittle, breaking like glass when put under stress. This new concrete material, called ECC, (developed at the University of Michigan, by Victor Li, Professor of Civil Engineering), is flexible and designed to crack in narrow hairlines, similar in behavior to metal rather than ceramics.

These tiny cracks can then seal themselves up when the material is exposed to water.

Similarly, Henk Jonkers from TU Delft University developed a self healing concrete that relies on a biological process to fix the cracks. By including water-activated bacteria in the concrete mix, cracks are sealed as the bacteria feeds off of nutrients naturally present in the concrete.

Preventing this concrete deterioration from occurring in the first place could make infrastructure safer and longer-lasting than current state of the art structures, translating into both lower costs and lower environmental impacts.

Further reading: www.umich.edu



Self-Cleaning Materials

Lotus Leaf-Inspired Nanotechnology

Lotus leaves are famous for their ability to repel dirt. This magnificent property has inspired a range of self-cleaning coatings and materials.

Water dropped onto a lotus plant immediately balls up into an almost perfect sphere, rolling off the plant's surface at the slightest disturbance. This is because the leaves are super-hydrophobic, or water repellent. It wasn't until scientists examined them on a nano scale that they understood the underlying cause of the effect: millions of nanoscale bumps, preventing the water molecules from settling anywhere. As the water rolls off, it takes dirt particles with it, leaving behind a perfectly clean surface.

Sto's Lotusan exterior paint is one of the better-known commercial applications of the "lotus effect." The paint not only

keeps buildings clean, reducing their need for maintenance, but also keeps them dry. Dry surfaces are less likely to host fungi or algae, further extending their longevity.

Further reading: www.stocorp.com



Biomimetic Ventilation

Learning from Nature How to Create Flow Without Friction

Quite a bit of the energy use for buildings is devoted to operating fans and rotational devices. Every computer has one, as do the air conditioning, water, and electrical systems throughout our buildings and cities. Surprisingly, though we have relied on rotational devices since at least 100 BC, we have never looked to nature for inspiration on how to design them - until recently.

Natural spirals and the ones that humans tend to design have striking differences in appearance. In nature, spirals almost always grow logarithmically, with each rotation from the center getting exponentially larger. This is commonly seen in seashells, the human inner ear, and the curled up tails of animals, such as the chameleon.

Simply imitating these patterns in our own rotational devices turns out to have huge benefits. PAX Scientific Inc. has now specialized in biomimetic designs for fans, propellers, mixers, turbines, and pumps.

Globally acclaimed Architect Norman Foster uses this design in his newest building in London. Through logarithmically stacking V forms throughout the structure, natural ventilation is achieved throughout all 40 floors.

By using biomimetic ventilation devices and architecture energy usage can be reduced by 10 - 85% over conventional options and cut noise by up to 75%. Why would we do it any other way?

Further reading: www.paxscientific.com



Personal Power Meter

Household Energy Monitor

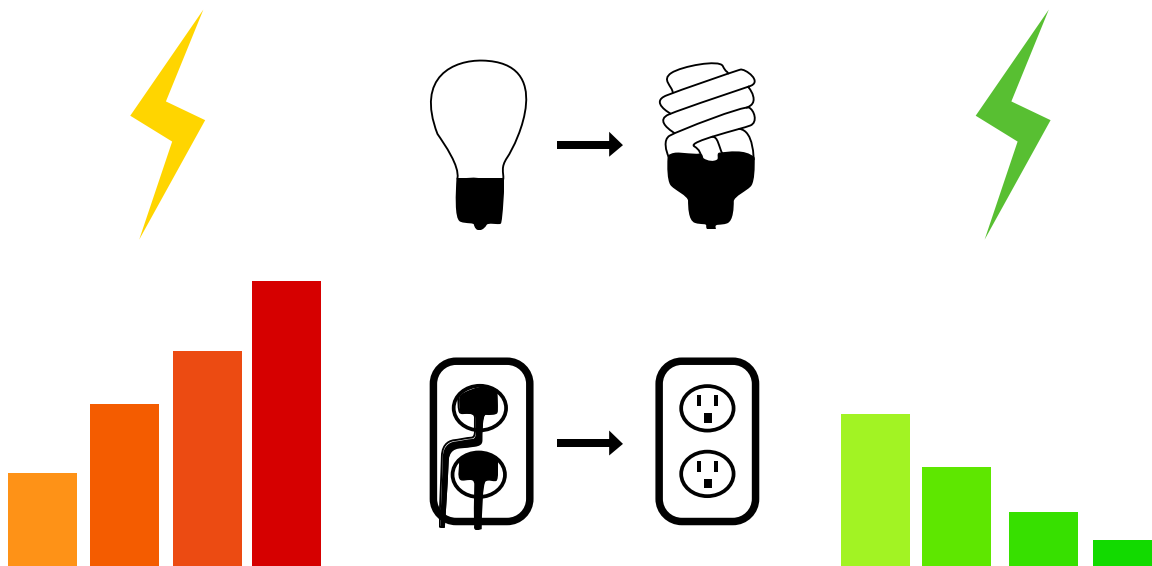
Simply telling people how much energy or water they are using through some kind of feedback metering can reduce consumption by up to 15%. Now, Google and the Dutch company Qurrent are helping people take advantage of this feedback phenomenon.

In late 2009, Google launched their Power Meter tool in the UK, allowing households to measure their individual energy use and greenhouse gas emissions via the web. The energy monitoring service, which is being offered for free, works using new smart meters or add-on clips for conventional meters. Electricity consumption is then reported on a personalized Google web page.

Qurrent provides a similar service, but takes it one step further. Not only do they provide real-time energy feedback, but they also encourage and help people to set up renewable energy facilities on their rooftops or near their homes. Priding themselves on saving and regulating energy rather than selling it, they are a one-stop shop for everything related to energy.

Using an energy modem, energy database, a user website, and software extensions, consumers can track, monitor, and regulate their energy consumption. Similarly to Google's power meter, Qurrent gives instant feedback allowing users to intelligently manage their energy usage patterns.

Further reading: www.google.com/powermeter/about
www.qurrent.com



Dial4Light: Cellphone Application

Creates On-Demand Streetlighting

In Germany, many towns have started turning off streetlights as a cost saving measure.

In response, a new cell phone application called Dial4Light was created. It allows users to dial in and turn on local streetlights for 15 minutes. The company claims that it could save cities up to 25% on their electricity bills.

Though the idea may not work perfectly, since it requires everyone to have a cell phone, the concept behind it has a lot of potential. Providing services on demand rather than all the time eliminates unnecessary waste - in this case saving energy and reducing light pollution.

Further reading: www.dial4light.de



Auto-Tinted Windows

Saving Air-Conditioning Costs

Window shading is a tried, tested, and extremely effective way of reducing indoor temperatures and saving on energy costs for cooling. Various technologies, from basic screens to high-tech gadgetry have popped up to take advantage of this simple strategy.

Denmark's PhotoSolar makes windows that block solar heat with a simple passive film inserted between two sheets of glass. A new product is under development by Sage Electrochromics that automatically tints windows from light to dark as environmental conditions change. The electrochromatic windows respond to air temperature, darkening as ambient air conditions heat up.

Though there may be some use for such high-tech options, such as for out-of-reach windows or in cases requiring attention to aesthetic detail, ordinary mechanical screens and passive design strategies may continue to win out in terms of their effectiveness and low cost in other cases. But because light is a beneficial property in many circumstances, these innovations may help us live brighter lives.

Further reading: www.sageglass.com



Lunar-Resonant Streetlights

Dancing in the Moonlight

In addition to saving energy, Civil Twilight's Lunar-Resonant streetlights also encourage an increased awareness of natural cycles. They connect one of the most prevalent features of the urban landscape to a lunar cycle which often gets eclipsed from the urban skyline.

San Francisco-based design collective Civil Twilight won Metropolis Magazine's 2007 Next Generation Design Competition with this innovative approach to street lighting. Their Lunar-Resonant Streetlights are designed to "sense and respond to ambient moonlight, dimming and brightening each month as the moon cycles through its phases."

The streetlights use sensitive photocells to detect ambient light and then electronically adjust the light emitted by high-efficiency, dimmable white LED clusters. The combination of lunar resonance and LED efficiency offers 90 - 95% energy savings over existing options.

Further reading: www.civiltwilightcollective.com



Get Smart

Smart Grids Help Cities Save

The use of embedded sensors and wireless networks has the potential to increase the efficiency of our infrastructure and resource use by astounding amounts. Smart grids, smart roads, and smart cities will be able to adjust their performance to changing conditions through the use of their own built-in sensory system.

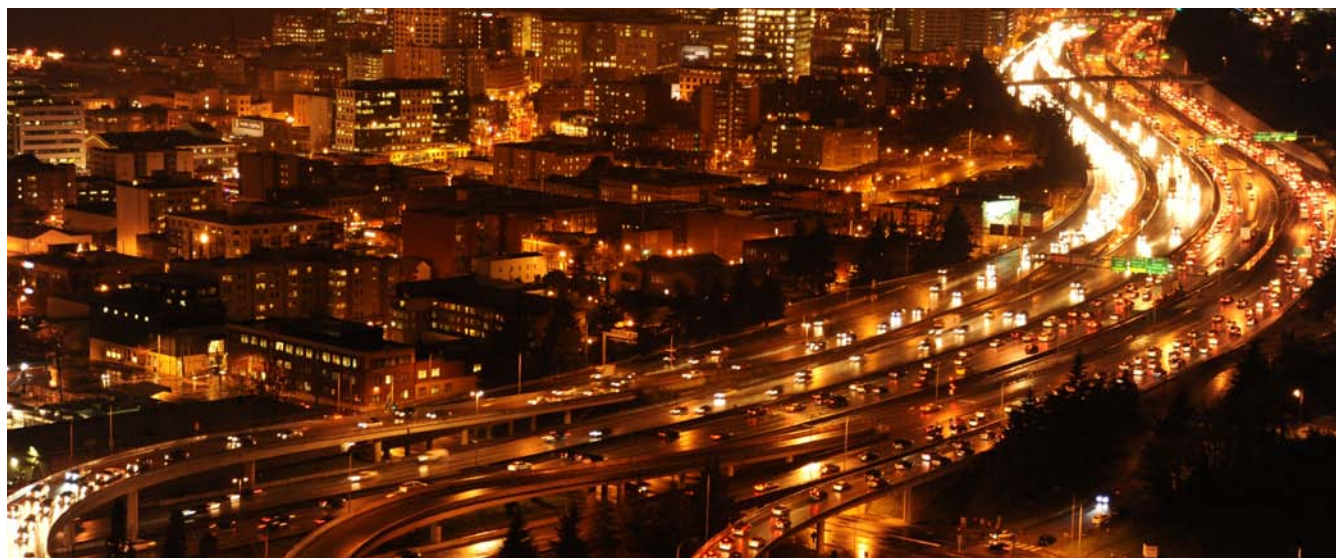
Smart grids can trim peak electricity loads by adjusting energy demand through two-way communication and control. For example, on a bright, sunny day, when solar power output is at a high, the grid can instruct certain high-demand energy processes (factory production or domestic washing machines) to turn on. At peak demand times it can reduce demand by turning certain non-critical processes off.

A demonstration smart grid project in Washington state showed that peak electricity demand could be cut by 15%. On the scale of the entire US, this would be equivalent to shutting off 30 coal-fired power plants.

Smart networks can go far beyond just controlling our energy grid. They can improve shipping logistics, reduce and redistribute traffic and boost the efficiency of water and material resource use in physical production processes by up to 30%.

What remains between us and this vision of a smarter, more efficient and responsive world is large scale implementation of these ideas. The technology is ready to go.

Further reading: www.gridpoint.com



The Subway Light Project

Bringing Daylight Underground

New advances in fiber optic technology and sun tubes are allowing us to bring sunlight indoors in new, more effective ways. This has the potential to help us save on energy costs as well as improve our exposure to high-quality, full spectrum lighting despite all the time we spend indoors.

One implementation of these technological advances is The Subway Light Project in Seattle, which incorporated a sun-light transfer system into a public art display. Designed in 2007 by Parsons student Caroline Pham, the concept uses fiber optic cables and photovoltaics to collect and channel sunlight into an underground subway corridor.

Similar techniques can be used inside of buildings, offering opportunities to save energy as well as improve mental and physical health through increased exposure to full spectrum light.

Further reading: www.scaroline-pham.com



Biogas Digesters

From Waste to Energy

Biogas digesters convert organic wastes into combustible natural gas through a process called anaerobic digestion. This gas can then be burnt for energy - either to directly produce heat, or to power turbines to produce electricity. Digester technology is rapidly evolving, increasing in efficiency and reliability.

In the anaerobic digestion process, bacteria decompose organic matter in the absence of oxygen, producing a gas mixture of 60% to 70% methane, with the remainder made up of carbon dioxide. The digester can be connected up to a local Combined Heat and Power (CHP) facility, or used with smaller scale energy generation technologies.

Small scale biogas digesters provide new opportunities for neighborhood scale energy production, and a way to locally handle organic wastes. By reducing shipping and logistics chains for waste handling, biogas digestion reduces environmental impact on a number of fronts.

As with other sources of renewable energy, excess electricity derived from biogas can be sold back to the grid through a cooperative utility agreement, also potentially providing a source of income for the neighborhood.



Further reading: www.biogas.psu.edu

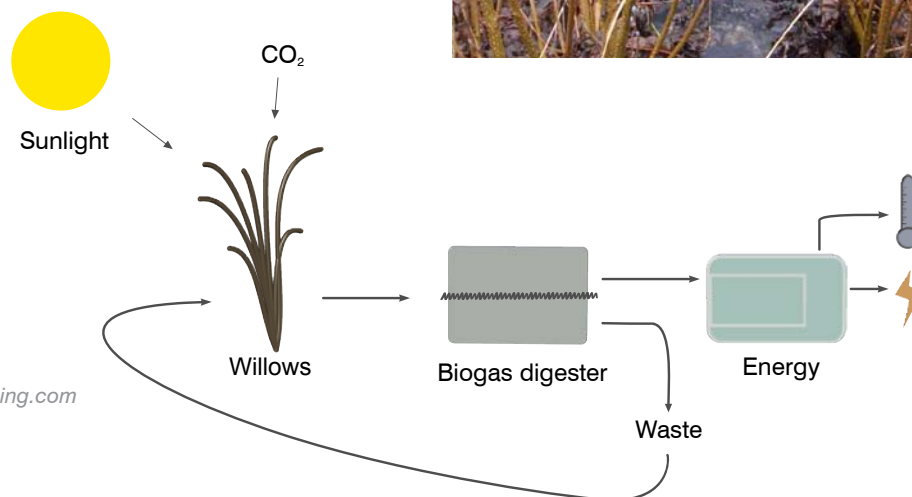
Willow Coppicing to Create Energy

The Wind in the Willows

Willows grow naturally in the moist soils and climates found in the Northern Hemisphere. While they may often simply blend in with the landscape, the cultivation technique known as willow coppicing puts them at the heart of an opportunity for dynamic and renewable energy generation.

Willow coppicing is used to produce biomass for energy, and can also be used to treat waste products, filtering pollutants from soil and water. In Sweden, the crop is commercially grown on agricultural land, and the biomass is used in combined heat and power production plants for district heating.

Sweden is also helping pioneer willow coppicing for the treatment of waste products, particularly urban wastewater, landfill leachate, industrial wastewaters, sewage sludge, and wood-ash. This process, known as phytoremediation, reduces pollutants and/or excess nutrients, making willows a promising investment throughout their life cycle.



Further reading: www.coppicing.com

ETFE In Architecture

New Materials to Create New Forms

New typologies for sustainable housing often involve greenhouse structures and atria. Such spaces can be used for many functions including: introducing food production, increasing indoor recreational spaces, and creating capacity for heat capture and storage.

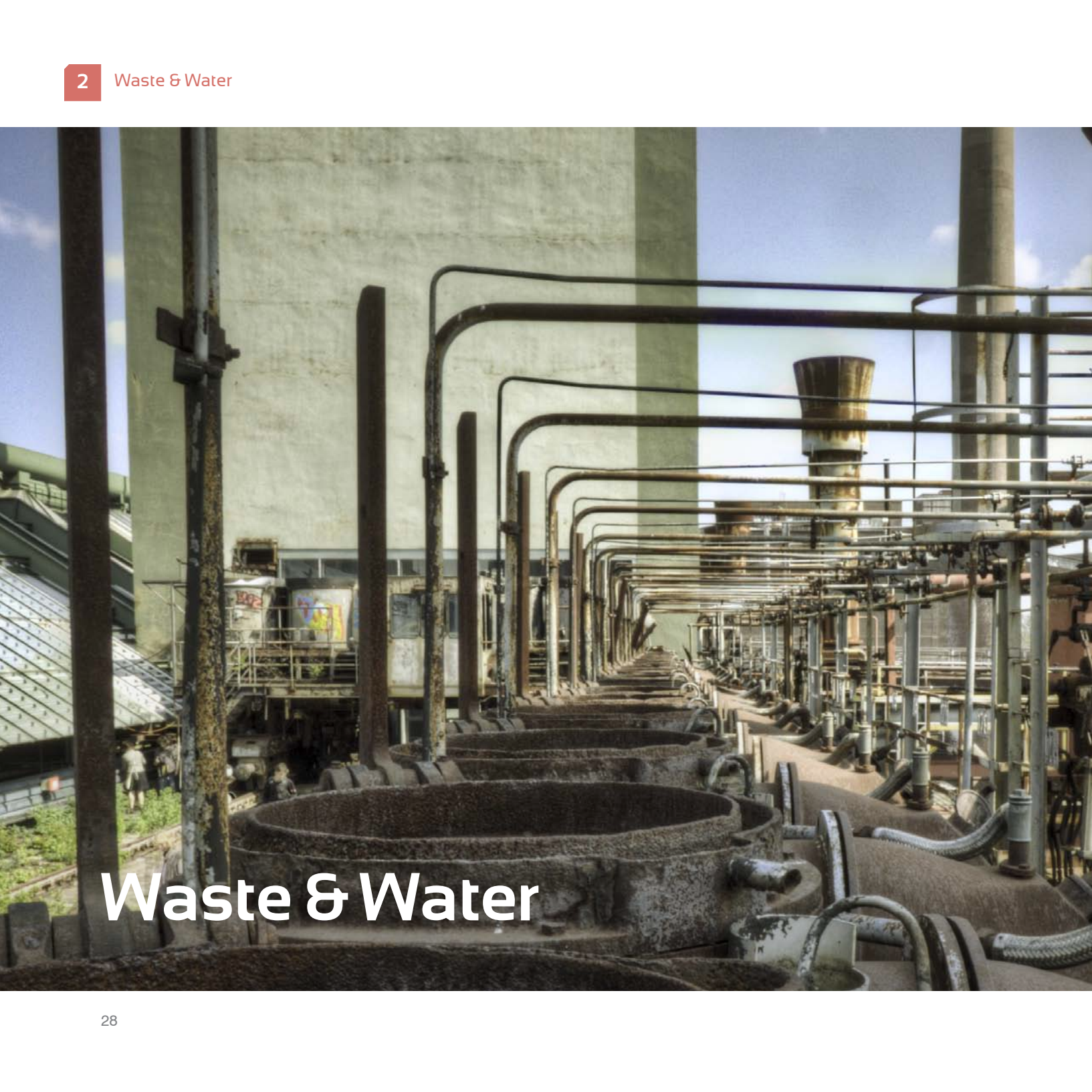
The cost of such constructions can be greatly reduced by replacing glass with a transparent polymer ETFE; (Ethylene Tetrafluoroethylene). A lighter, cheaper material to buy and install, ETFE also transmits more light and insulates much better than glass. As a result of weight reduction, the bearing structure for the building itself can also be made substantially slimmer, saving on materials, costs, and environmental impacts.

ETFE has been successfully applied in a wide range of buildings, such as Nicholas Grimshaw's Eden Project and the National Space Center in the UK.

Further reading: www.vector-foiltec.com







Waste & Water



Water, one of life's essential building blocks is becoming increasingly scarce. Waste, on the other hand, is becoming increasingly omnipresent. The need for scalable measures that increase access to, help conserve, and filter water is paramount. It is mirrored by the pressing need to decrease waste, while finding creative ways to give new uses to the waste we already have.

The innovative products and behavior-changing initiatives in this section offer forward-thinking ways to redefine our relationship to these most basic components of daily life.

Merredin Health Industries Spirulina Plant

Rural Regeneration Algae Plant, 2001

The Merredin Health Industries Spirulina Plant is a good example of a context-driven, integrated project. Set in Merredin, a West Australian desert town, the plant provides the town with economic stability, employment, and helps to better controls its surrounding saline and alkaline ground water levels.

To use algae as a perfect-fit solution was the surprising outcome of an integrated planning process which attempted to resolve multiple of the town's problems, including economic decline, unemployment and a problematic high saline ground water level. Situated in a historical pump station on the outskirts of the town, the Merredin Health Industries Spirulina Plant uses Australia's abundant sunlight and the town's high ground water levels to cultivate spirulina algae, an edible high energy super food, with globally established market potential.

The project design uses agricultural drains installed under the town to collect the water, which is then transported, processed by passive solar desalinators, and used in the spirulina plant. Merredin's alkaline groundwater is already ideally suited for Spirulina growth, requiring only a small desalination effort. The Spirulina factory is designed to be housed both outdoors, making it readily visible from the road, and inside the old pump station, revitalizing a defunct building.

Merredin's location on a trade route facilitates transportation of the Spirulina goods. The factory also provides employment and functions as a tourist attraction. Together with an incredible economic return (estimated ROI within 2 years), the project offers insight into how effective integrated sustainable development can be.

Further reading: www.except.nl

THE SYSTEM



Merredin Town Center

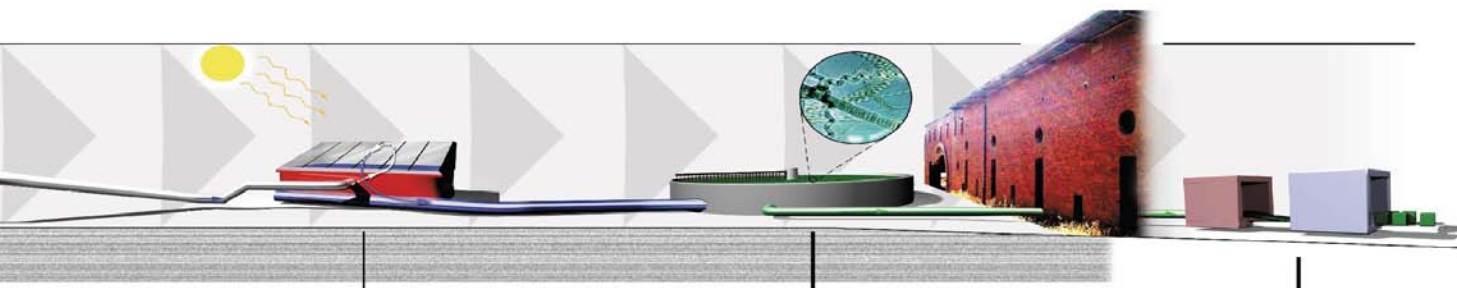
Surplus groundwater drains into standard agricultural drains under the town center. Additional water sources are located around town.

Water Pump

Provides the pressure necessary for the water to flow to the pump station. Concreek, a local man-made channel, can be used.

Uses of Spirulina

- Natural colorant
- Vitamin B-12
- Food additive
- Cosmetics ingredient
- Weight loss supplement
- In Pisciculture (to feed aquarium fish)



Solar Desalination Plant

A commercially operated solar powered vaporisation plant brings down the salt level from 160-190 g/L to 90-70 g/L and brings the alkalinity to a pH of 9.

Spirulina Pond

Using the old water agitator as a pilot and additional low profile agitators when scaling up the plant, spirulina is grown in the open air and harvested daily.

Pump Station

The large hall of the pump station will be converted into a drying and packaging unit and office. The hall's small room can be made into a visitors' center.



Incentive-Based Recycling

RecycleBank Dollars

The U.S.-based company RecycleBank offers a new approach to recycling, rewarding people based on the amount of recyclables they collect each week. Launched in two neighborhoods in Philadelphia, the company now has more than two million members in over 300 municipalities worldwide.

Using Radio Frequency Identification (RFID) chips embedded in household bins, garbage trucks scan, weigh and record how much each household recycles. Points issued for recycled objects are converted into RecycleBank Dollars that can be spent at participating stores, such as Starbucks, Home Depot, HP and Coca Cola. RecycleBank Dollars can also be earned by participating in eBay's Green Team, using a Visa Gconomy Card and through electronic recycling.

The initiative demonstrates the importance and effectiveness of motivating behavioral change, whether through monetary incentives or positive feedback. RecycleBank customers are provided with an online account number, which allows them to track their balance, determine their environmental contribution, and see how many trees and gallons of oil are being saved thanks to them.

Another key ingredient of RecycleBank's success is its joint engagement with different actors in society. The government provides recycling services and waste hauling, citizens participate in the scheme, and businesses offer product discounts and recycling coupons.

Further reading: www.recyclebank.com

The graphic features three teal chevron-shaped boxes pointing downwards, set against a background of a blue sky with clouds and a green field. The boxes contain the following text:

- Earn Points**
Take everyday green actions like recycling household goods and cutting back on your energy use.
- Get Rewards**
Take everyday green actions like recycling your household waste
- Live Green**
Learn how you and your family can tread more lightly upon the world.

To the right of these boxes, the text reads:

Big Rewards for Taking Small Actions
It's our world, let's better it together.

A white button with the text **Register** is positioned below the text. At the bottom right, there is a small illustration of a tree and three recycling symbols (a triangle, a square, and a circle).

CHaRM: The Center for Hard-to-Recycle Materials

Putting the Charm Back in Recycling

The Center for Hard-To-Recycle Materials puts the charm back into recycling. Based in Boulder, Colorado, the center is run by Eco-Cycle, one of the country's largest non-profits dedicated to recycling.

Eco-Cycle is a pioneer on the frontiers of sustainable resource management. By demonstrating and practicing zero-waste behaviour within their company, Eco-Cycle encourages individual and communal actions in moving towards a zero-waste society.

Eco-Cycle's website supplies a wealth of information for recycling almost anything, while their CHaRM center offers advice and a means for disposing of 'Hard-to-Recycle' goods. CHaRM generally charges fees of 1 to 30 U.S. dollars (0.70 - 22 euros) which are used to cover the cost of labor needed

to disassemble products (which often involves the handling of toxic substances) and for marketing and storing materials.

Eco-Cycle also offers a plethora of recycling facts and figures, making it easy for everyone to understand the necessity of responsible waste disposal.

Further Reading: www.ecocycle.org



San Francisco's 3-Cart Program

Residential Waste Separation & Collection

San Francisco is working towards becoming a zero-waste city, with the strictest mandatory recycling and composting laws in the country and a simple 3-cart collection system which has already seen 70% of the city's waste recycled or composted. The city aims to divert 100% of its waste from landfills by 2020.

The program makes recycling easier, reduces the city's carbon footprint, and preserves resources. The simple 3-cart system (green for compostable waste, blue for recyclable waste, and black for waste that cannot be reused or recycled), is designed for both homes and businesses. While the city collects the green and blue carts for free, they charge 27.55 dollars (20 euros) per month to collect the black cart.

Turning organic waste streams into compost puts waste back into useful circulation. Soil produced in the compost program is used for agricultural purposes, returning nutrients to the soil, while cans and bottles are recycled into new products and packaging.

Despite the strict fining system, the city of San Francisco assures that "the city's main goal is to remove waste from landfills, not collect fines". While some residents initially expressed reservations about the mandatory fines, which can range from 100 - 1000 dollars (72 - 720 euros), the program also offers the possibility to save money. If you reduce your weekly "landfill waste" by 20 gallons (76 liters), you receive a 23% discount off the normal cart collection price.

Further Reading: www.sfrecycling.com



Homes Heated by Human Waste

An Alternative to Ground-Sourced Gas

Over 200 homes in Oxfordshire, U.K are currently heated by human waste. After going through a stringent purifying process at a nearby sewage station, the waste is turned into an odorless gas and used to heat homes throughout the town.

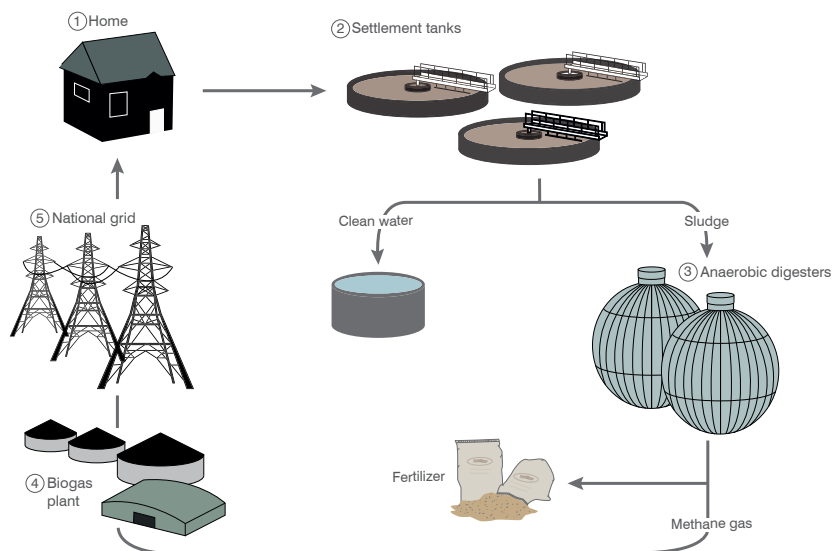
Converting human waste into gas takes around three weeks, in a process which uses anaerobic bacteria to break down the sewage and convert it into biomethane (as described on page 24 in “Biogas Digesters”).

A sustainable and renewable alternative to gas and electricity, bio-waste has now replaced several of the city’s traditional gas and electricity sources.

Initiated by British Gas (U.K’s leading gas supplier) together with Thames water (U.K’s leading water supplier) the project was also partially sponsored by government incentives, with the intention of encouraging other utility companies to follow suit. British Gas, Thames Water and Scotia Gas Networks now hope to introduce the program across the U.K.

The project represents creative energy sourcing at its best. By closing the loop of waste to energy in as little as three weeks, this project plays a big role in the move towards forward-thinking energy generation.

Further Reading: www.thameswater.co.uk



Reedbeds In Place Of Sewers

Aquatic Grasses Act As a Natural Filter

One of the oldest forms of water purification, reed beds are both aesthetically pleasing and functional. Reed beds are wildlife-friendly, all-natural systems which can be used for water or waste treatment.

Reed bed filtration is a cost-effective and increasingly popular method for the treatment of both industrial and domestic effluents. As effluents trickle through the reed beds, they are filtered by microorganisms in the roots and litter of the reeds. Successive filtration can even result in drinkable water.

Although they are complex natural systems, reed beds are low-tech and low-cost when it comes to waste and water treatment options. They require no energy and no specialized labor to operate.

Convenient for backyards, public parks, or lagoon shores, reed beds save on expensive filtration systems while benefiting surrounding ecosystems.

Further reading: www.reedbeds.com





Efficient WCs & Controlled Taps

Tinkle, Sprinkle, and Save

From unnecessary water use in flushing to overly generous taps, water usage within the home can be extremely inefficient. Smart design can help prevent water waste and optimize efficiency.

Aerated Taps

Aerated taps mix water with air, saving water without sacrificing water pressure. Aerated shower heads can use 9 liters instead of the usual 20 liters per minute (2.4 instead of 5.3 gallons). Aerated basin taps use 3.6 liters instead of 20 liters a minute (0.95 instead of 5.3 gallons).

Automatic Basin Taps

Automatic basin taps are another efficient way to reduce water flow. With integrated sensors, they automatically identify a hand under the tap, turning off when the hand is removed.

Visible Water Meters

Fitting water meters in visible places can also drastically reduce water consumption. A 2010 pilot program in California found that visible water meters resulted in an average of 17% reduction in water usage, going up to over 50% during peak hours when incentives were offered.



Dual-Flush Toilets

The average domestic toilet is used five times a day, but only one out of those five times requires a full-flush. Because you don't need a full flush every time you go to the toilet, dual-flush toilets are designed to either half-flush or full flush. The change to dual-flush can save up to 50% of the water used by conventional toilets.

Urine Separation

Urine separation toilets, or NoMix toilets, are another promising invention. The NoMix toilets separate urine from solid waste, saving on the water needed for flushing, and on waste water treatment down the road, or pipe.

The toilets could also prevent pharmaceutical residues and nutrients harmful to aquatic ecosystems from entering waterways. Urine contains 80% of the nitrogen and 50% of the phosphorus that enters sewage plants, which can cause harmful algae blooms, and is costly to process.

The toilets have been tried in seven northern European countries with 85% approval ratings. As of 2007, Sweden had around 3,000 NoMix toilets in use.





Ecology & Agriculture



Agriculture is central to human existence: to our nourishment, livelihoods, and cultures. Advances in agriculture have driven human civilizations for millennia. Nevertheless, agriculture is also currently the single greatest source of negative impact that humans have on the planet. It consumes enormous quantities of resources, displaces vast areas of natural ecosystems, and generates enough pollution to dramatically alter global nutrient and atmospheric cycles.

We must begin to think creatively about how to radically change our food production. Agricultural systems will need to efficiently produce healthy and nutritious food as well as provide economic value and satisfying employment. The initiatives here help move us closer to that goal, while also diminishing the growing disconnect between urban consumption and agricultural production.

Polydome

High Performance Greenhouse Agriculture

Except's Polydome Project is a revolutionary approach to greenhouse agriculture that offers the possibility of commercial scale, net-zero-impact food production. The Polydome system strategically interweaves a wide variety of crops and animals, taking advantage of every inch of the greenhouse while eliminating the need for synthetic fertilizers and pesticides.

With its high yields (60 – 90 kg per square meter (132 - 198 pounds per square meter)), and diverse outputs (over 50 crops, two mushroom varieties, chickens, eggs, fish, and honey), even a small Polydome system can provide a richly varied food supply for a large population. Using Polydome, even a city as dense as New York could provide the majority of its own food supply using available roof space.

Complementing advanced technologies with an innovative design, Polydome maximizes food production and variety by operating more like a self-maintaining ecosystem than an industrial farm. Plants, mushrooms, livestock, and insects interweave to connect waste, water, and energy flows between species and capture the benefits of varied space and light conditions, while beneficial insects act as natural substitutes for pesticides.

Since cities have existed, they have been dependent on outlying agricultural land to feed themselves. The Polydome system's increased variety, efficient spatial arrangements, and reduced environmental footprint mean that a compact Polydome system could sustainably and locally feed a large population. For the first time in history, cities could become producers rather than just consumers, capable of providing for many of their needs from within, and reducing the disconnect between urban life and agricultural production.

Further reading: www.except.nl





Floating Aquaculture

The Abracadabra of Growing Plants Without Soil

Hydroponics, which comes from the Greek hydro (water) and ponos (labor), is a method for growing plants without soil. Plants are grown in water enriched with nutrients or in substrates such as perlite, gravel, mineral wool, or coconut husk. This form of agriculture allows for more efficient plant spacing, recycling of water and nutrients, and up to 50% faster plant growth.

One of the first examples to garner global attention was born of necessity. Hydroponics was used on Wake Island, a rocky atoll in the Pacific Ocean, which doubled as a refueling stop for Pan American Airlines. Airlifting in fresh vegetables was exorbitantly expensive and the rocky landscape provided no arable soil. The solution: hydroponics.

Since then, NASA has also invested in hydroponics research as an option for the space program, and for future cultivation on planets such as Mars. In the present tense, hydroponics is making headway in commercial agriculture around the world.

Hydroponics also offer great opportunities for urban farming because it is lighter and more compact than soil based farming.

Further reading;

www.nasa.gov/missions/science/biofarming.html



Aquaponics

Aquaculture, Meet Hydroponics

Aquaponics is an innovative food production method that grows crops and fish together in a re-circulating system. As its name suggests, it combines traditional aquaculture, or the raising of aquatic animals such as fish and shrimp, with hydroponics, or the cultivating of plants in water.

The practice itself is in fact a centuries old technique that dates back to the Aztecs, but has recently been rediscovered and now being implemented around the world on a small scale and increasingly on an industrial scale as well.

Aquaponic systems can be scaled to a backyard or to industrial agricultural practices. Re-circulating water from the fish-raising tanks is filtered and then used to fertilize the

plants. The system also typically uses 80 - 90% less water than standard growing approaches.

One thriving example is the Future Farm Food and Fuel company based in Wisconsin, U.S.A. Their 2,500 m² (26,910 ft²) aquaponic and hydroponic system uses tilapia fish to fertilize all natural vegetables, while avoiding harmful chemicals and pesticides. The system also uses methane produced by an anaerobic digester and adjacent 1,100 cow farm to heat the aquaponic greenhouse.

Further Reading: www.afuturefa.com



Pioneering Urban Fish Farms

Save the Oceans, Use a Pool

Fishing yarns may someday become urban legends. Urban fish farming, urban agriculture's younger sibling, has recently become the talk of blogs and biologists from the West bank to the East coast, from the old to the new world. Israeli scientists pioneered the idea of desert aquaculture in the 1980s using geothermal water from aquifers to raise warm-water fish. After deconstructing the desert in the 80s and 90s, the 21st century fish farm looks to conquer what may be an even more forbidding landscape, the urban jungle.

Professor Yonathan Zohar, director of the Center of Marine Biotechnology at the University of Maryland, has built a series of high-tech fish pools in the basement of a Baltimore building, which he believes provide an innovative and practical approach to urban fish farming.

He was motivated in part by concerns with over-harvesting and declining fish populations, warning that "It is clear that the consumption of seafood and fish is on the rise, because of the great health benefits... but now we are over-harvesting. We need to change that practice and become more efficient in a way that is compatible with the Earth."

About 75% of the world's commercially fished species are either depleted, over fished or fully fished according to the FAO. Zohar's fish-farm pools use tap water, adjusted with salts and buffers to recreate a marine environment. Special microbes digest the fish's waste, while the fish swim in bio-secure, contaminant-free pools that can be installed virtually anywhere.

Further reading:

www.money.cnn.com/video/fortune/2008/07/01/fortune.bg.fresh.fish.fortune



Mushroom recycling

From Waste to Nutrients

Aware of the advantages of reusing waste and wanting to contribute to a more sustainable economy, a small Dutch company has started to close the urban material loop. GRO spoors mushrooms from coffee grounds and makes cleaning products from citrus waste.

Coffee grounds, one of the Netherlands' largest restaurant waste streams, are the perfect breeding ground for mushrooms. An otherwise difficult to deal with organic stream, coffee grounds are no challenge for the mighty mushroom. Fungi are one of nature's most powerful recycling factories, withdrawing nutrients from any kind of organic material and converting it into a nutritious food source.

GRO works with partner restaurant chains to get access to all of their coffee grounds. Once the coffee has been collected, mushroom spores are mixed in with the grounds and

left in a bag to brood. After six weeks, mushrooms begin to appear, ready to harvest and send back to the restaurants to be consumed.

Aside from some additional organic waste, no extra materials or chemicals are added during this process. The transport logistics are optimized by collecting coffee grounds just as mushrooms are delivered.

GRO demonstrates how simple it can be to cultivate a tasty and nutritious food from organic waste. For their next challenge, they are currently working towards making cleaning products from citrus waste.

With more of these examples springing up every day, we begin to see that our waste is a lot more than just.....waste.

Further reading: www.gro-holland.com



The Plant, Chicago

Industrial Regeneration & Urban Farming

Growing food in the city is one thing. Doing it on a mass scale, vertically, in a disused meat processing plant is another.

Set in the backyards of Chicago, The Plant shows how obsolete industrial structures can be used to produce food locally and eco-efficiently.

Throughout the 8,686 m² (93,500 ft²) building there are aquaponics, food-business incubators, community kitchens, and educational facilities - all providing a total of 125 full-time jobs. Using solely recycled materials and volunteered expertise, The Plant demonstrates how to create a realistic and financially viable urban farm.

The Plant has three production systems. The first contains 400 tilapia in four 473-liter (275-gallon) tanks alongside 600 basil plants growing in 31 m² (336 ft²) of bed. The Plant's managers plan to expand to a full scale aquaponic farm of 3,345 m² (36,000 ft²) over the next three years.

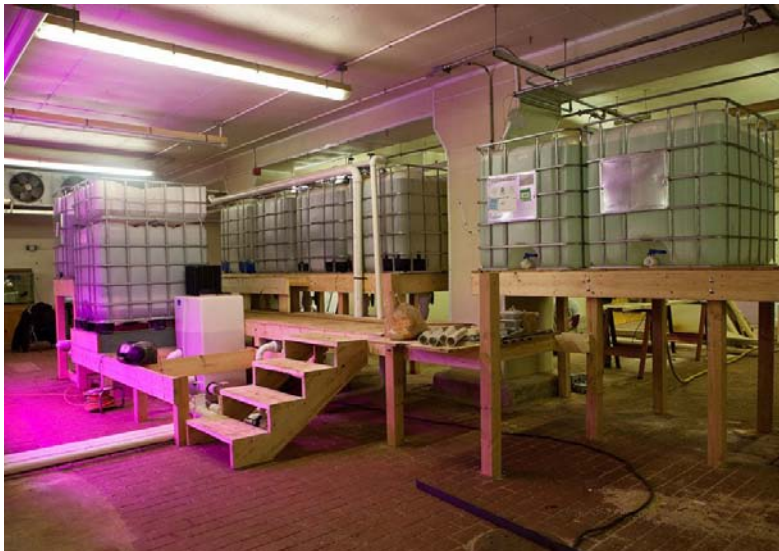
Guided by principles of sustainability and re-use, The Plant collaborates with neighboring industrial sites by recycling their waste and energy. They are committed to closing the loop on their own energy use as well. An on-site anaerobic digester converts 16.3 metric tonnes (18 short tons) of bio-mass to roughly 300 kilowatts per hour of electricity daily.

The Plant proves that vertical farming is both practical and profitable. The Plant's model can be replicated in any other urban center worldwide using a similar industrial site.

Further reading: www.plantchicago.com



The Plant is situated in a 8,686 m² (93,500 ft²) retired meatpacking facility on the outskirts of Chicago.



Tilapia tanks in The Plant, which produce ammonia-based waste that is sent through a biofilter where solids settle out and the rest broken down into nitrates.



Vertical Greenhouses in Urban Housing

The Agro House In Wuhan China

More than half the world's population currently lives in cities, and one in five of those urban dwellers is Chinese. China is one of the most rapidly urbanizing countries in the world. Massive urbanization is redefining the landscape, and many of the new urban residents come from rural agrarian lifestyles.

This Knafo Klimor Architects agro-housing project, in Wuhan, China, references the agrarian past of the country and its new urban residents, while providing a vision of what urban housing could look like in the future.

The project combines a multi-story apartment building with vertical greenhouses. The building is designed to provide organic and healthy food for residents and the surrounding community without requiring any special skill sets for greenhouse operation. While the greenhouse is designed to be as easily managed as possible, the building has elaborate internal systems to control water, air, and heat.

A majority of the buildings materials will be made of steel, aluminum, and terra-cotta, which can all be recycled at the end of the building's life cycle. The project also aims to decrease reliance on transport by bringing agricultural products to the residents. The project is slated to be completed in 2015.

Further reading: www.kkarc.com



Food Deserts & Rainbows

Los Angeles' Rainbow Apartment Complex

A food desert is any industrialized urban area where access to fresh healthy food is limited. In the United States, food deserts are prevalent in lower-income inner-city areas and suburbs. Los Angeles is no exception. Already a city notorious for its car-dependent lifestyle, lower-income areas can find themselves particularly isolated from fresh and nutritious food sources.

Los Angeles' Skid Row, with one of the largest homeless populations in the United States and with almost half of the population below the poverty line, is one such food desert.

The Skid Row social housing complex for homeless men and women, Rainbow Apartments is making small inroads. The residents of the complex, in collaboration with the non-profit Urban Farming, have created a vertical garden

with a total of 4,000 plants including cucumbers, tomatoes, strawberries, peppers, basil and other herbs that lend a new green face to the walls of the housing complex.

These small vertical farms are in part managed and operated by members of the community, and produce food year-round in California's mild climate.

Further reading: www.urbanfarming.org



Urban Agriculture for Entrepreneurs

Making Agriculture Accessible to All

Beyond the barriers of limited time and space, urban agriculture can often face an even tougher obstacle: lack of knowledge. How do you create a flourishing urban farm if you've never planted a seed before?

SPIN (Small Plot INTensive farming) is a toolkit which its developers, a couple from the United States, say "makes agriculture accessible to anyone, anywhere." The couple, Wally Satzewich and Gail Vandersteen, partnered with the Institute for Innovations in Local Farming to first develop a pilot farm called Somerton Tanks, in order to demonstrate that small-scale city farms can generate real revenue.

The 2,000 m² (21,528 ft²) farm, located in north-east Philadelphia, produced 26,100 U.S. dollars (19,110 euros) in gross sales from a nine month growing season its first

year. Two years later, gross sales had doubled. As of 2007, the farm produced 10 - 15 different crops, with high-quality organic products sold at very high-end prices, in addition to thousands of bags of salad greens, carrots, radishes, and green onions each season.

The SPIN method emphasizes fiscal discipline and planning over mechanization. The methodology has been developed into a reproducible toolkit for start-up businesses. SPIN also sells guide books on the internet, and offers email counseling and consulting. The project combines time-tested agricultural techniques with the dynamism of an internet start up.

Further reading: www.spinfarming.com



The Eden Project

Greenhouse Heaven

In a valley left over from a decommissioned clay mine in Cornwall, Southwest England, lies the Eden Project, an ecological and agricultural education center. Its 23,000 m² (247,570 ft²) of greenhouse space house two separate biomes: a rainforest and Mediterranean climate.

The greenhouses are built out of light-weight ETFE cells (see page 26, “ETFE in Architecture”) supported by steel frames. Computer controlled environmental systems regulate the biomes, ensuring that optimum temperature and moisture levels are maintained at all times. All of the water required for irrigation and humidity control comes from a rainwater collection system, which also prevents water from pooling at the bottom of the old clay mine.

Energy for the project comes from wind turbines in the local area, and will soon also come from a geothermal electricity plant which is planned to generate approximately four megawatts of power. This will provide enough energy to supply the Eden Project and roughly 5,000 local households.

Home to an array of indoor and outdoor gardens, the Eden Project's restaurants harvest all of their own fruit and vegetables. A truly didactic environment for both young and old, the Eden Project is an exciting glimpse into the potential for a sustainable future.

Further reading: www.edenproject.com





Seattle Urban Agriculture

The Coolest Building Never Built

This design competition winner has been dubbed “the coolest building never built.” The Center for Urban Agriculture (CUA), designed by Mithun, won “Best in Show” in Cascadia Region Green Building Council’s Living Building Challenge. It is designed to be an energy and water self-sufficient off-grid building which includes affordable housing, greenhouses, rooftop gardens, a chicken farm, and fields for growing vegetables and grains.

The building’s vertical design incorporates more than an acre (0.4 hectares) of native habitat and farmland on the building’s 72 acre site (29.14 hectare). 3,160 m² (34,014 ft²) of solar panels would produce nearly 100% of the building’s energy needs, much of which would be stored in underground tanks in the form of hydrogen to provide a buffer for seasonal and daily changes in demand. Grey water and rainwater would be treated and reused on site, filtered through a green lung weaving through the building’s greenhouses, planters and bio-membrane plants.

The project also emphasized connections with the surrounding community. The ground level’s public cafe would serve organic foods grown on site, and local produce would also be sold to grocers and distributed to low income groups. The CUA was also designed to serve as a community storm water and distribution site.

Though it might be difficult to actually realize due to financial and a few technological limitations, the project definitely serves up a dose of inspiration.

Further reading: www.mithun.com





Underground Hydroponics

Tokyo's Pasona O2: From Riches to Rice

Hydroponics is currently the largest growing sector of agriculture. It is in place on an industrial scale in many countries around the globe for the purpose of growing vegetables. The exploration of hydroponic rice production is still in its infancy, but it could provide a 21st century breakthrough particularly for arid countries in the developing world that need a stable staple for their diet.

In 2006, a group of Japanese farmers cultivated the world's first crop of hydroponically grown rice. This first crop was, amazingly enough, grown in an air-tight bank vault beneath the teeming streets of Tokyo's financial district. The rice grew to maturity without natural light or the paddy fields that define the landscape of many rice-dependent countries.

The team consulted with a panel of hydroponic and biotechnology experts, but after several crops failed, they brought in an elderly farmer with 40 years experience in the paddies outside Kyoto. He immediately identified the missing elements: wind and rain.

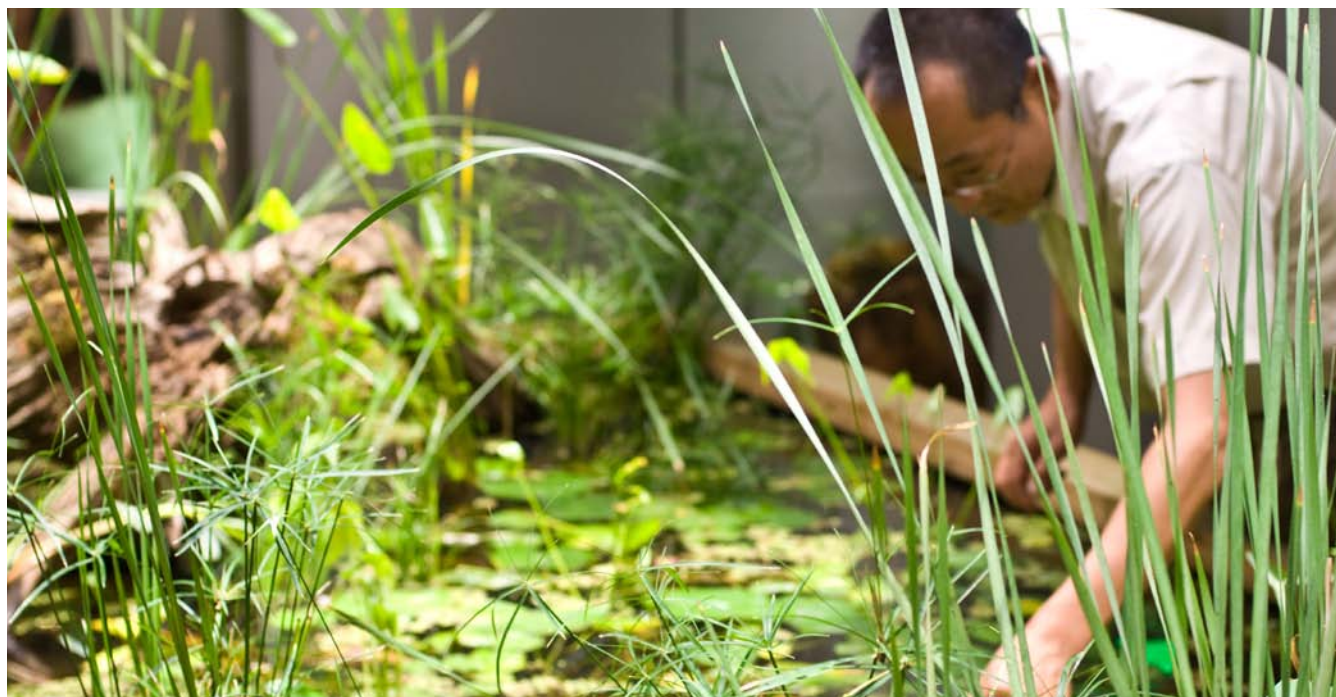
After installing large fans and raising the dissolved oxygen levels of the water to simulate rain, the first successful crop was reaped.

The bank-vault has now been developed into a fully functioning 1,000 m² (3,281 ft²) underground farm, and includes more than 100 different crops, a cafe, and an agricultural training program. The training programs allow everyone from university students to businessmen a chance to learn the basics of farming, while the underground growing chambers are also closely monitored by computers, offering a compelling combination of hands-on and high-tech growing methods.





Further reading: www.pasonagroup.co.jp/english/





Typology



Urbanization is a global phenomenon. Designing housing that will accommodate growing urban populations, while easing the transition from rural to urban environments, is increasingly pressing. More than 60% of both residential and non-residential buildings in Europe were built before 1975, in a time of different needs and concerns.

The massive energy demands and emissions of the building sector, coupled with an aging building stock, mean that sustainable retrofitting must also play a critical role in fostering a more sustainable built environment. These buildings and typologies find innovative ways to decrease the environmental impact of buildings and cities, strengthen their relationship to the natural environment, and provide more livable housing to an ever-growing urban population.

A Retrofit Facelift

Sustainable Conversion of Existing Buildings

Converting our existing building stock to a sustainable built environment is one of the most exciting challenges of this era. Building upon the old rather than opting for demolition and new construction allows us to retain the value and culture of existing stock.

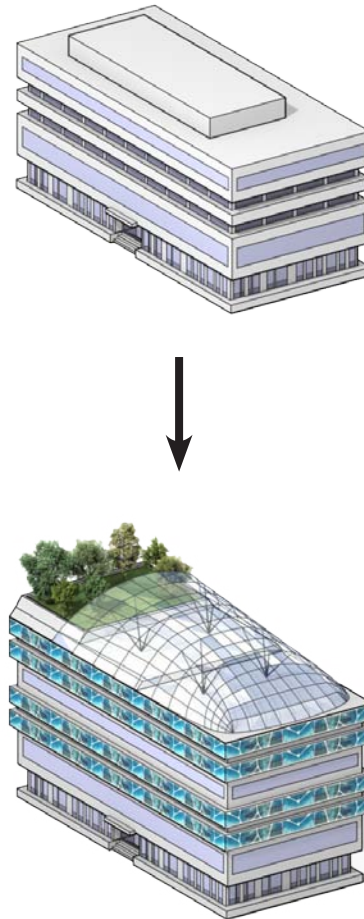
The Government Building Agency (Rijksgebouwendienst) of the Netherlands commissioned Oneplanetarchitecture institute (OPAi) in cooperation with Except to perform a study about this issue. OPAi and Except investigated 30 buildings for the first part of the study.

After a quick-scan of 30 buildings, the team selected five buildings on which to base comprehensive re-development schemes. The buildings were selected for their diverse typologies: an empty 1960s urban office block (5 stories); a large prison complex, built in various eras; a large monumental government building; a 1970s office block; and a 1970s standard typology block, renovated in the 1990s.

Some buildings were energetically optimized, while others had complete restructuring and reprogramming concepts applied. These programmatic recommendations included partial privatization, urban integration, reconfiguration, as well as zero carbon and autarkic conversion options. The team then measured the resulting performance improvements in five categories: Energy (EPBD) Performance, Flexibility, CO₂ emissions, Financing & Management, and Health & Quality.

The project demonstrates the potential for preserving the identity of existing 20th building stock while bringing performance levels up to 21st century standards.

Further reading: www.except.nl





Floating (Green)Houses

Riding the Waves with the Dutch

With land in increasingly short supply, building on water may be the next frontier. Building on water offers a constant and ready-made cooling mechanism, allows flexibility in building orientation to suit climate and seasonal conditions, and promises increased density. Floating airports, bridges, storage facilities, and wind and solar plants, often referred to as VLFSs (Very Large Floating Structures), already exist and could be the precursors to new floating worlds.

Innovative proposals are now taking the principles behind VLFSs in exciting new directions: floating housing complexes, greenhouses, and even cities.

One small-scale example in Rotterdam is the floating pavilion, an exhibition and workshop space used for demonstrating climate-, energy-, and water-related innovations as well as hosting a multitude of events.

These project designs stand, or float, as a testament to tomorrow's possibilities.

Further reading: www.drijvendpaviljoen.nl





The Dutch have centuries of experience coping with waterlogged land, and mastering the seas. They are now pioneering new floating typologies.

Floating Citadel, designed by the Dutch firm Waterstudio, will be the world's first floating apartment complex when it is completed in 2012. By drawing on ready-made water cooling techniques, the complex will use 25% less energy than a conventional structure on land.

The advantages that building on water offers to residential construction could be amplified for greenhouses. The "Floating Greenhouses," by Dutch water architect van Bueren, illustrate one vision of what that could look like. Combined with floating aquaponic growth, very lightweight ETFE structures are integrated into the water rather than simply floating on the surface.

Further reading: www.waterarchitect.nl
www.waterstudio.nl

Greenhouse-Inspired Architecture

Wageningen University, The Netherlands

Greenhouse-inspired architecture takes the principles of glass curtains and canopies one step further. The Netherlands has some of the largest and most advanced greenhouses in the world. The Dutch are also pioneers in incorporating greenhouse technology into a broader architectural vocabulary.

Wageningen University's Lumen building, in Wageningen, the Netherlands, has a glass canopy constructed directly from standard greenhouse systems. The building's greenhouse inspiration goes beyond its structural elements.

The building houses a central green lung, with balconies, terraces, and central public spaces where people can breathe in the freshly oxygenated air before returning to their class or research. The building, designed by German architect Stefan Behnisch, also has 500 m² (5,381 ft²) laboratories, 350 m² (3,768 ft²) educational facilities, and surrounding gardens.

Further reading: www.wur.nl/uk





Tangram Architekten's Crystal Court

Embracing the Glass Ceiling

Curtain walls and canopies provide outer coverings for buildings without bearing structural weight. Glass curtain walls can provide comfortable, insulated and light-filled areas that blur the boundaries between concepts such as 'interior' and 'exterior.'

The Crystal Court project of the Dutch firm Tangram Architekten demonstrates the benefits of an innovatively placed glass curtain. By enclosing an Amsterdam housing development in glass, The Crystal Court creates a continuous insulated public space amongst the 36 housing units.

Ponds nestled in the covered spaces between the houses act as a natural humidifiers. The semi-open curtain is designed to allow ducks and frogs to enter, creating an increasingly diverse habitat over time. The ponds are also

surrounded by indigenous vegetation such as large and small cattails, yellow irises, and marsh marigolds.

Further reading: www.crystal-court.nl



Toronto Towers Urban Renewal Plan

Aiming High with High-Rises

Post-war residential high-rise buildings mark the skyline of cities around the world. While seen as an efficient modern solution for quickly growing cities in the second half of the 20th century, they have since developed a reputation not only as architectural eyesores but as the antithesis of human-centered design.

The city of Toronto launched an initiative in 2009 to renew the city's thousands of post-war residential apartment towers.

The Toronto Urban Towers Renewal Plan, also known as the Mayor's Tower Renewal Plan, seeks to reinvent the hulking apartment towers and their surrounding open spaces by combining green technology and neighborhood revitalization. The program focuses on several key components:

external cladding, green retrofits, green infrastructure, new housing, community improvements, transit city, and urban agriculture.

The project began when ERA Architects, planning Alliance and the Cities Center at the University of Toronto were commissioned by the Ontario Growth Secretariat to analyze the post-war apartment towers and the neighborhoods they form, and then explore possibilities for reengaging the Towers.

ERA architects conducted their own precedent research for the project, and have since published two books - one conceptual and one technical - summarizing their findings.

Further Reading: www.towerrenewal.ca



Innovative Façades

The Alsace Case Pavilion's Green Walls & Waterfalls

Green façades can be more than just fancy wrapping paper. When done well they can convert drab and unappealing façades into a dynamic living surface that changes with the seasons, increases biodiversity, offers storm water buffering, and provides noise and thermal insulation.

The Alsace Case Pavilion, designed for the 2010 Shanghai World Expo, has a plant-covered façade which helps regulate building temperatures. The multicolored plants change with the seasons, creating a façade that literally breathes and changes as time passes.

Perhaps the building's most innovative feature is its combination of this living green wall with a solar paneled water wall. The solar panelled wall at Bouxwiller High School in Alsace served as the model for the Pavilion.

The south facing, water-skin solar wall has panels which open and close automatically depending on outdoor temperature and sunlight. The water that gently streams down the solar panels cools the building in summer. In winter, the wall is water-free, and the solar panels trap heat.

The solar panels also power a microbrewery. Visitors can tour the building, view the production process, and taste the solar-powered beer.

Further reading:

www.expo2010shanghai.com/ubpa-display-north/alsace-case-pavilion



Green Roofs

California's Rolling Hills Are Echoed In a Roof

Green roofs are a natural extension of existing roof structures that help insulate buildings, capture water, increase the life span of a roof, and bring a hint of green into urban environments. Green roofs can convert a swath of concrete into a garden, relaxation space, or habitat for wildlife, while providing an efficient way to capture and filter water.

Acting as a natural sponge when it rains, green roofs soak up rain water and slowly release it through the building's drainage system, reducing potential water damage and the need for expensive drainage systems.

Green Roofs also help reduce the heat island effect, removing heat from the air through evapotranspiration. The waterproofing membrane installed under a green roof can also virtually eliminate the solar radiation emitted from traditional roofs.

Green roofs are a positive investment for businesses and homes, and will likely play a large role in the future of sustainable cities.

One of the most innovative, and certainly one of the most visually arresting, green roofs to be erected in recent years is on top of the 2008 California Academy of Sciences, designed by Renzo Piano. The undulating hills and valleys of the green roof are designed to echo San Francisco's natural landscape. The roof's indigenous plants absorb 90-98% of the building's rainfall. Skylights dot the roof's surface, allowing museum visitors below glimpses of the green carpet rolling above their heads.

Further reading: www.rpbw.com



The Geotectura “i-rise”

Pre-Fab Meets Eco-Friendly

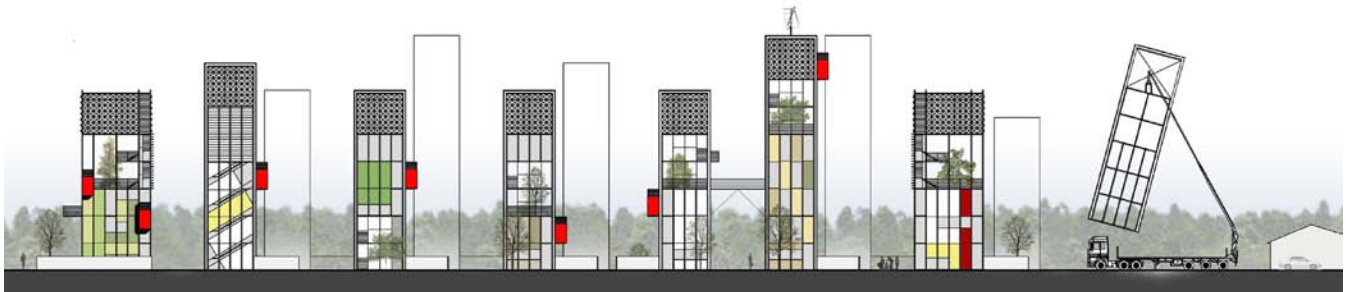
With demographics and urban boundaries shifting virtually overnight, quickly constructable and transportable buildings will be in increasingly high demand.

Geotectura, the award-winning Israeli architectural studio, has designed a structure whose pre-fab elements are not only easily transportable, but cheap and energy efficient. Geotectura has won worldwide accolades for their focus on innovative and sustainable design.

The Geotectura i-rise project is multi-story residential unit whose footprint is only 5 meters (16 feet) by 7.5 meters (25 feet). It's pre-fab structure, quick assembly, and easy transport make it cheap and flexible. The i-rise is designed to be assembled and ready to inhabit within several weeks.

The tower also contains a “brain unit” which functions as a hanging roof and contains energy-saving technologies such as a simple solar system. Inspired by zero-environmental impact technologies, the building's integrated infrastructure generates renewable energy, collects rainwater, and treats liquid and solid waste.

Further reading: www.geotectura.com





The Hockerton Housing Project (HHP)

Before Eco Was Chic

“Eco-development” is an increasingly common phrase. But when the Hockerton Housing Project was completed in 1998, it was a pioneer in wedding ecological principles and real estate development. The Hockerton Housing Project describes itself as the world’s first earth sheltered, self-sufficient ecological housing development.

The project was designed by Professor Brenda Vale and Dr Robert Vale and is located in the village of Hockerton, U.K. At the time, the development was one of the first zero-energy residential developments in the UK, and had among the most energy efficient homes in Europe.

The five houses that make up the project generate their own clean energy, harvest their own water, and recycle waste. The houses have passive solar heating, self-contained water and sewage systems, and are powered completely by wind turbines and photovoltaic systems.

The 6 meter (20 foot) by 19 meter (62 foot) south-facing conservatory runs the width of the houses, with less light-dependent rooms such as utilities and bathrooms located towards the back. The 10 hectare (25 acre) development has maintained elements of the site’s former agricultural use, with crop cultivation and small animals. It also has a large water catchment and reed-bed waste disposal system.

Further reading: www.hockertonhousingproject.org.uk



Transport



Transportation facilitates the free flow of ideas, people, and goods. It can determine the shape and growth of cities, have dramatic impacts on public health, use up massive amounts of energy, and affect air quality.

The examples here help increase mobility and connectivity while making cities more conducive to walking, cycling, and public transport. Together, these and other similar initiatives provide the literal and figurative paths to the future.

San Francisco Transbay Terminal

A Transport Hub Transformed

This completely original design boasts an integrated ecological city park that offers multi-level transport access, natural ventilation and, a counter balanced funicular.

Applying an environmental approach, Except helped Pelli Clarke Pelli Architects design the San Francisco Transbay Terminal and win the largest architectural competition of the last decade.

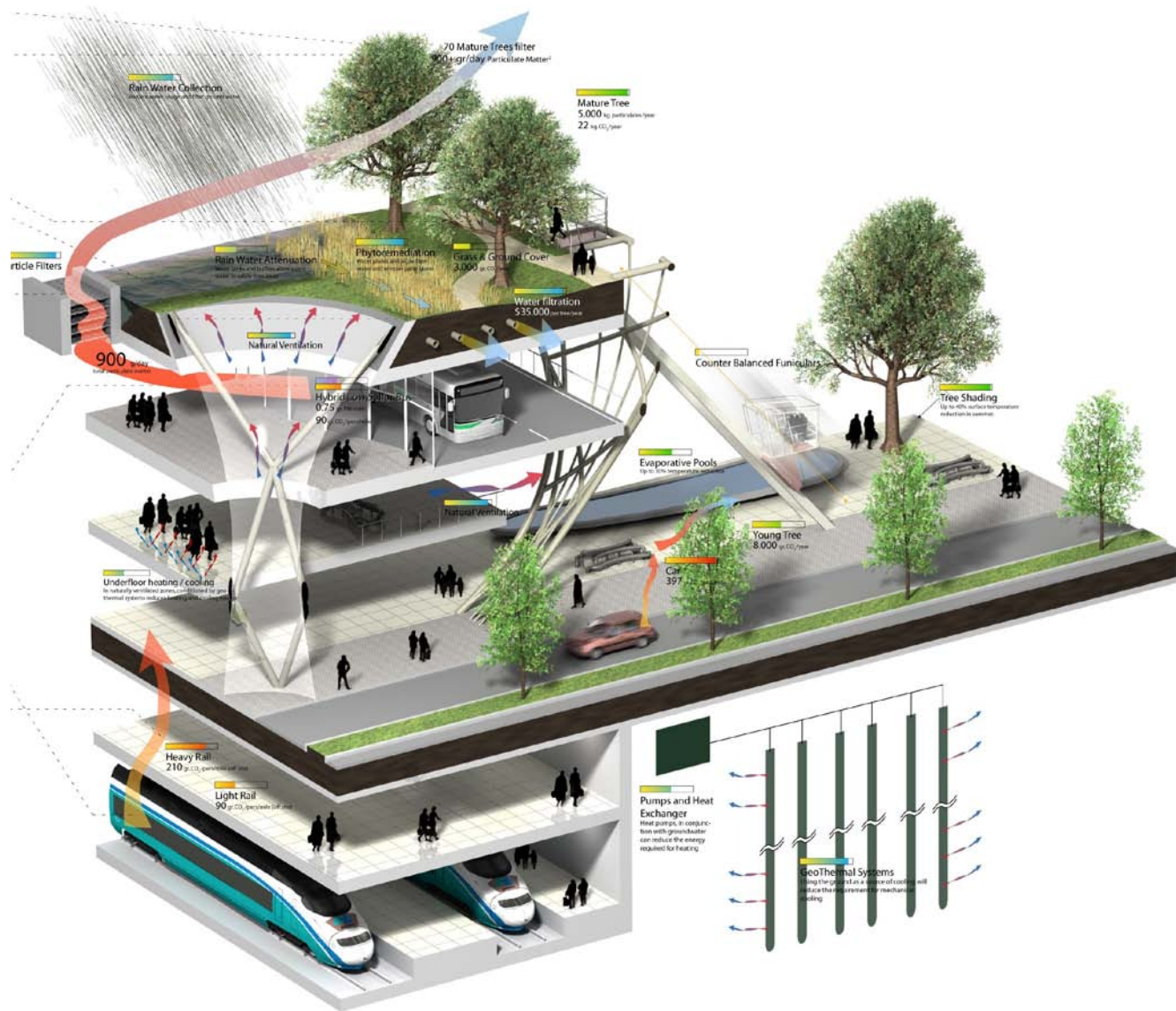
The Transbay competition revolved around the replacement of the existing Transbay transportation hub and the creation of a signature tower for the city of San Francisco. The environmental concerns were considerable, the time frame short, and the stakes high.

The project features a mature ecological landscape on top of one of the largest transportation terminals in the United States. Natural ventilation systems filter the air of fine particulates, and the landscape above helps sequester further air pollution and CO₂. The terminal functions as a beautiful city park in the heart of San Francisco.

The main diagram created by Except was subsequently used as the image for the 'Contemporary Architectural Drawing' exhibit in the New York National Academy Museum.

Further reading: www.except.nl





Shared Space

Sharing Is Caring

Shared space is an urban design concept that replaces traditional divisions and boundaries between transport modes with integrated spaces and roadways. Standard devices such as curbs, lines, lane-markers, lights, and signs are replaced with a people-centered organization of public space.

The original idea of “shared space” was pioneered by the Dutch traffic engineer Hans Monderman (1945-2008). By removing the signs and divisions between pedestrians, cyclists, and cars he placed awareness and human interaction at the heart of transport. Without signs and boundaries, drivers, cyclists and pedestrians approached intersections and overlaps with caution.

In an interview with Wired Magazine in 2004, he stated “The trouble with traffic engineers is that when there’s a problem with a road, they always try to add something. To my mind, it’s much better to remove things.”

The shared space approach has been implemented in more than 100 Dutch towns and cities. Similar approaches have since been implemented in countries around the world including Austria, Belgium, Germany, Sweden, Denmark and Switzerland, the USA, Canada, Russia, South Africa, Australia, Japan and Brazil.

Further reading: www.shared-space.org



Car Sharing

Greenwheels Promotes a Pedestrian Friendly Vision Of Urban Space

Car sharing allows people who want occasional access to a car to rent shared cars, usually by the hour. After fledgling car-share projects in the 1960s and 70s, the movement began to gain traction in the 1980s, with larger and more structured projects developing in the 1990s, principally in Northern Europe.

Greenwheels, in the Netherlands, was one of these more developed projects, and it continues to exist today. There are approximately 1000 Greenwheels cars (typically red Peugeots) at permanent parking places in 80 Dutch cities and towns.

Greenwheels is a “pay-as-you-go” plan that works with personalized chip cards. Members pay a monthly subscription

fee, an hourly rental charge, and a small fee per kilometer, while Greenwheels pays for the gas.

Greenwheels frames its company as a way to reduce the car’s impact on the urban space: “Over 100 years ago, the car was introduced into society and in cities. Over the past years, cities were adapted to cars. In historical city centers, a major part has been sacrificed to build motorways and parking lots. Through our vision we aim to reduce the degree to which people sacrifice city space in order to use cars. Instead, people adjust the way in which they are using their car to suit the city surrounding.”

Further reading: www.greenwheels.nl



Congestion Pricing

Feeling Congested? London Could Have the Cure

London's introduction of a congestion charge in 2003 has helped reduce pollution, raise revenue, and increase efficiency. One year after the program's launch, peak period congestion delays inside the zone had decreased by approximately 30%.

The 11 euro (15 dollar) daily charge applies to any vehicle traveling within the inner city (the congestion charge zone), between 7am and 6pm, Monday to Friday. Signs and symbols painted onto the road help alert drivers to zone boundaries, while a network of cameras track vehicle license plate numbers. Drivers have until midnight the following day to pay the charge, or they must pay a penalty fee of 137 euros (188 dollars).

Drivers can buy a prepaid weekly, monthly, or annual pass and save 15%, while residents are eligible for a 90% discount. The charge can be paid online, by SMS, in designated stores, or by phone and applies to foreign and national vehicles equally. All money is reinvested into the system, with about half of all revenue going to monitoring and enforcement.

Enforcement has been the program's biggest hurdle so far, particularly for foreign vehicles. Certain embassies, (such as the U.S. and Germany), have also classified the congestion charge as a tax and refused to pay.

While reducing congestion, rather than carbon, was initially the explicit aim of the initiative, in 2008 the city introduced new charges and incentives based on vehicle emissions. There is now an extra charge for "Band G" (225 grams per kilometer of CO₂) cars, discounts for alternate fuel vehicles, and zero charge for electric cars (Plug-in Hybrid Electric Vehicles PHEV).

Further reading: www.tfl.gov.uk



Day of Rest, From Cars

Bogota, Colombia's Ciclovía Car-Free Sundays

Car-free days are gaining in popularity around the world. Bogota, Colombia helped pioneer the idea in the 1970s with their car-free Sunday program, Ciclovía, which has since become an integral part of the city's culture.

The streets of Bogota are blocked to cars every Sunday and holiday, creating a temporary bike and pedestrian paradise in the heart of the city. About 2 million people (or 30% of the city's residents) regularly show up for the weekly Ciclovías, biking, walking and skating over more than 340 kilometers (211 miles) of car-free streets.

For those hoping to bike, and without their own set of wheels, free bikes are also provided. The weekly initiative is complemented by 120 kilometers (75 miles) of bicycle paths, or ciclo-rutas.

Ciclovía has inspired similar projects in other Colombian cities, including Cali and Medellin, as well as in countries around the world, including Australia, Ecuador, and the United States.

Further reading:
www.inbogota.com/transporte/ciclovía

The logo for Ciclovía, featuring the word "ciclovía" in a stylized, teal-colored script font with a wavy underline.

Smart Parking System

San Francisco Revolutionizes Parking

Wherever the car has been introduced in the city, its cement shadow, the parking space, quickly follows. As a pedestrian, planner, or resident, parking spots gobble up valuable city-center space; as a driver there never seems to be a space where and when it's needed. Parking is a hassle for urban residents, planners, and drivers around the world.

San Francisco has recently developed a new smart parking system, SFPark, which uses 21st century technology to address an issue at the heart of urban planning and living. SFPark adjusts the cost of metered parking based on real-time data. A network of sensors in parking spots across the city detect when they're occupied, and then information can be used to adjust parking prices accordingly.

The program is designed to reduce the number of cars blindly circling and looking for spots, and allow parking

prices to be more flexible and accurately represent demand. Rates range between 4-18 euros (6-25 dollars) per hour, and can change once a month. The system is expected to increase revenue from meters, while decreasing revenue from traffic tickets, particularly in light of new data from the sensors revealing that 45% of meters were unpaid.

The city has also created a free phone app, allowing people to track parking availability, view pricing information, and even pay the meter by phone. Ultimately the city also hopes to reduce the amount of real estate dedicated to parking spots, while providing one available spot at all times on every block.

Further reading: www.sfpark.org



Automobile Abstinence

Seoul Goes Car-Free Every Week

Seoul's voluntary, incentive-based program allows residents to choose one day a week to avoid driving. Participants register their selected no-driving day on a website, and receive an e-tag for their windshield.

Any non-commercial vehicle carrying fewer than 10 passengers is eligible, and the program runs from 7am – 10 pm on weekdays, excluding public holidays. Using RFID (Radio Frequency Identification), the city can then monitor participation and compliance.

One of the strengths of the program is its involvement of public and private stakeholders to incentivize participation. Public institution incentives include a 5% auto Tax reduction, 50% congestion charge discount, and 10-20% public parking fee discount. Private incentives, offered by participating

businesses, include 1-6 cents/Liter discount on gasoline, 10% discount on car maintenance costs, and free or discounted car washes.

As of 2007, 30% of eligible cars were participating in the program, reducing CO₂ emissions by approximately 243,000 tons annually. This is a 9.3% decrease in emissions, equivalent to approximately 6% of total CO₂ emissions per year in Seoul, and 20% of the transport sector's emissions.

Further reading: www.english.seoul.go.kr



From City of Lights to City of Bikes

Bike Sharing In Paris

Launched in 2007, Velib is now the world's most extensive bike sharing program, with over 20,000 bikes at stations and on streets across Paris. The initiative was born out of a public-private partnership between the city of Paris and SO-MUPI, a company led by the advertising group JC Decaux. The company covers the majority of the costs of the bicycle program, in return for control of hundreds of publicly-owned ad spaces.

Anyone 14 and over can use the system, and bicycles are available 24 hours a day, 7 days a week. People can subscribe for one day (1 euro or 1.40 U.S. dollars), one week (5 euros or 7 U.S. dollars) or one year (29 euros or 40 U.S. dollars), earning unlimited access to the bikes free of charge for up to half an hour.

The city coupled new bike paths with a high profile awareness campaign, including a 24-hour consumer helpline. A municipal commission made up of key stakeholders also helped the initiative get off the ground.

In the first three months, 1.75 million subscriptions were sold. A 2009 TNS-sofre survey found 94% of users were completely or mostly satisfied with the service, but there have been problems, including theft and vandalism.

Despite these setbacks, Paris is now expanding Velib into the suburbs and nearby cities. There are also plans to introduce a similar car-sharing program, with around 4000 small electric cars and 700 locations, meaning the Velib may soon meet Voiturelib.

Further reading: www.velib.paris.fr



Tricycles Meet the 21st Century

Electric-Trikes in Manila, the Philippines

Transport currently represents 30% of all emissions and 80% of air pollution in the Philippine's capital city of Manila. The Philippine Environment Monitor estimated in 2007 that nearly 12% of all deaths nationally are due to respiratory and cardiovascular diseases from exposure to polluted air in Manila. Tricycles are a common form of transport, and heavy polluter, throughout the country, burning nearly five billion dollars worth of imported fuel and emitting ten million tons of CO₂ each year.

In response to this, the government recently launched a new electric tricycle initiative in Manila that could be a first step in creating a greener transport network throughout the country. The program, introduced on Earth Day in 2011, is trading the gas-guzzling, emissions-heavy tricycles used throughout the Philippines for new electric trikes with one fourth the carbon footprint.

As of Spring 2011, the government had committed to 20,000 trikes for the capital, and plans to expand the program nationwide. The program will help reduce pollution, increase energy independence, potentially save tens of millions of dollars, and even generate jobs through local trike production.

The Asian Development Bank is helping fund the initiative: "Working together, we can give Manila cleaner air, bluer skies, and a more livable environment," said Kunio Senga, director general of ADB's Southeast Asia department. "The Philippines is assuming a leading role in Asia in supporting green transportation alternatives, and if e-trikes are followed by new fleets of electric buses and jeepneys, the effect could be transformative."

Further reading: www.adb.org





Rapid Bus Transit

Guadalajara, Mexico Rapid Bus Transformation

Bus Rapid Transit (BRT), also known as a busway, applies the logic of rail transit to the public bus. BRT systems frequently use dedicated lanes, high-frequency all-day service, bi-articulated buses, off-bus fare collection, enclosed stations, and a distinct image, or brand, for the bus system.

Since Curitiba's pioneering BRT program was implemented more than 30 years ago, BRT systems have been developed in countries around the world. The more accessible project costs and time-line make BRT systems ideal for cities that don't have the funds or time for an underground or light rail project. BRT also allows routes to be changed and more flexible adaptation to growing cities.

One of the success stories is in Mexico's Guadalajara. Guadalajara implemented a complete BRT system in less than two years, at a reasonable cost. The project boasts approximately 130,000 passengers per day, with 16 kilometers (10 miles) of bus routes and 27 stations installed in the first of three planned phases.

The buses arrive and depart at the same time each day, regardless of traffic, thanks to the exclusive bus lane. This has reduced average travel time by about 30%. The first phase operates along 16 kilometers (10 miles), with 27 stations and 15 routes. The hope is that by 2013 the Macrobus system will have a 79-kilometer (49-mile) network of routes, completely integrated with other modes of transport in the greater metropolitan area.

Critical components of the project's success included: involvement of civil society groups and academic institutions, coordination among state and local agencies, and acceptance of and involvement in the new project by bus operators.

Further reading: www.nbti.org





Community initiatives foster the social structures that help create vibrant, cohesive communities. They provide the framework in which people, otherwise strangers to one another, can collaborate and flourish together.

They can include many or few people. Bringing together a mix of individuals that share similar interests, they help establish social solidarity, bringing happiness and meaning to an environment. The following initiatives are locally-organized projects in communities throughout Northern Europe that provide creative ways to increase community health and happiness.

The Rotterdam Collective

A Creative Hub in the Heart of Rotterdam

The Rotterdam Collective (Ro-Co) is a new concept for interdisciplinary collaboration in the heart of Rotterdam, focused on environmentally and socially innovative projects in the local community. More than just a co-working space, it is a community of entrepreneurs working based on a shared set of principles.

Its unique structure allows Ro-Co to develop a wide variety of multidisciplinary projects. All members have their own independent entrepreneurial projects, but also have the opportunity to participate in larger projects in synergistic teams. These larger projects are actively solicited by the collective's members.

Currently the collective is made up of about 20 companies, from small and young to large and established, and 10 external members. Members' professions range from product, graphic and game design to transition management, sustainable development, and event organization.

The collective operates under a set of jointly-agreed principles that encompass some of the organization's key philosophies: a commitment to sustainability, a belief in social responsibility, the use of open source technologies and knowledge sharing, and the recognition of values beyond just profit.

These principles were also used in the renovation of the Ro-Co space, which had previously stood empty for over a decade. Only the eco-friendliest materials and techniques available were used and all labor was provided by the volunteer efforts of the Ro-Co community.

Ro-Co is a continuing effort from Except Integrated Sustainability in cooperation with Sparpweed.

Further reading: www.ro-co.nl / www.except.nl





The Rotterdam Collective hosts workshops and inspiration days, in the private conference room or in the larger space (below)



Office spaces at The Rotterdam Collective.

Like Father, Like Son

Moroccan Fathers in the Netherlands Launch The Buurtvaders Project

Moroccan fathers have taken responsibility for insuring a better quality of life within their neighborhood in Slotervaart, Amsterdam, as buurtvaders (neighborhood fathers).

Founder Al Mawadda initiated the 'buurtvader' project out of the desire to foster cultural integration in the Netherlands. Every evening 'buurtvaders' survey the streets of their neighborhood in order to provide supervision for neighborhood youth while preventing accidents and petty crimes.

The 'buurtvaders' focus on the positive aspects of social control within their neighborhood. They aim to approach youths on the street as equals. By initiating chats, 'buurtvaders' build relationships with young people, establishing trust in order to help guide behavior over time. The 'Buurtvaders' not only stroll the streets but also host various activities such as sports events and community gatherings, in order to connect, guide and supervise the young people of the neighborhood.

The 'Buurtvaders' have helped foster new relationships between neighborhood residents, improving quality of life and safety within the neighborhood, and helping residents feeling more connected to where they live. Since its launch in 1999, the concept has spread all over the Netherlands, helping other neighborhoods improve security, relationships, and youth prospects.

Further reading: www.buurtvaders-lelystad.nl



Taking to the Streets

Rotterdam's Roteb Initiative is Wiping Clean Unemployment

Unemployment and dirty streets are problems that plague cities around the world. The city council of Rotterdam has a unique program which helps simultaneously combat both.

Rotterdam's Roteb program helps reduce unemployment while creating a cleaner, more attractive city. The program provides employment for those who have difficulty finding employment elsewhere, employing more than 5,000 city residents.

Roteb employees clean and maintain Rotterdam city and its surrounding districts, including cleaning chewing gum off streets, sweeping leaves, and collecting the city's garbage.

Roteb also offers training, language classes, and guidance to help participants train for employment in other sectors. The project successfully provides a creative solution to a pressing problem, while allowing Rotterdam to pride itself on being a clean city maintained by its own residents.

Further reading; www.roteb.rotterdam.nl



By the People, For the People

Dutch Cooperative Woonbron

“Behind the front door” is a collaboration between housing corporation Woonbron, Dordrecht city council and other social welfare co-operations. A home-visit service that attends to and advises on the personal and professional struggles of Wielwijk residents, this program is there to give local people a helping hand.

As Woonbron staff visit homes to offer advice, expertise and support, they make sure to bring social or financial problems to the relevant authorities- helping residents avoid long waiting lists and bureaucracy.

Woonbron, an established cooperative promoting the idea that quality of life not only depends on the four walls of one's home, but also on its relationship to the environment and surrounding community, leads this service.

Since 2008, the project has been successfully running within Wielwijk, (one of 40 districts in the Netherlands recognized by the Dutch government as needing ‘special’ attention due to social, economic or educational fallbacks).

Dutch Cooperative Woonbron believes that ‘living should belong to the people’. Helping people find homes according to their own preferences in diverse and attractive areas. Woonbron works closely with residents to create successful residential environments throughout the Netherlands.

Further reading: www.achterdevoordeur.ncrv.nl



Pint-Sized Chefs

Amsterdam's Kindekookkafé Lets Children Do the Cooking

Cooking skills and acquired tastes are usually something people grow into with adulthood. The Kindekookkafé inverts that logic, putting kids aged 0-13 in charge of designing menus and preparing meals. This Amsterdam eatery lets children come in and prepare meals at the Help-Yourself Bar, cook together at birthday parties, or join the group of “child staff” that cook the eatery’s meals.

Adults supervise and train the kids, but it is the kids themselves that prepare the meals. The Kinderkookkafé, located in Amsterdam Vondelpark, has been around since 1981.

It emphasizes the use of seasonal ingredients, communal dining, and an awareness of the food production chain, from source to mouth. It also empowers children to take control of their own meals, gain confidence by gaining skills, and develop healthy eating habits.

Children are often an overlooked part of the social component of sustainability. When they are introduced to ideas such as healthy eating, seasonal and local ingredients, or un-processed foods, it is often in watered down lectures. Initiatives such as the Kindekookkafé however demonstrate the beauty of letting kids roll up their sleeves, dig in, and cook up their own conclusions.

Further reading: www.kinderkookkafe.nl



Crowd-Sourced Recycling

“How Can I Recycle This?”

From E-bay to Etsy, there are a wealth of websites that help people sell things they have made or no longer want. But a new wave of websites now collects crowd-sourced ideas to help people tap into the creative DIY spirit, sharing ideas to recycle basic household objects that no longer serve their original purpose.

One of the virtual pioneers is a British website called “How Can I Recycle This?”. Users can post images and descriptions of their everyday objects, from empty spray bottles to bits of yarn, and ask for suggestions on how to reinvent them.

The website has created an online community that can ask each other everything from “How can I reuse or recycle an old wrought iron gate?” to “Upcycled and recycled Valentines Day gifts” and “How to reduce wastage in the kitchen.”

Other websites offer ready-made ideas for recycling standard objects, but this is one of the first web-based initiatives that allows user to get responses tailored to their own objects, and offer advice themselves.

Further reading: www.recyclethis.co.uk



Local Exchange Trading Systems

LETS Transform Local Economies!

Local Exchange Trading Systems (LETS) are not-for-profit community enterprises that use internet-free local credit. These alternative and complementary currencies help foster local community growth.

The Brixton Pound (B£) is in use as a complementary currency system throughout the community of Brixton, the UK. Developed by volunteers from the non-profit Transition Town, the B£ is the UK's first local currency in an urban area.

In the words of the Brixton Pound's Project Manager Tim Nichols, the B£ was created as a way "to create as liquid a local economy as possible." Participants can pay local suppliers, pay employees, buy local services, and shop at independent stores with the B£.

As a complementary currency, it does not replace the pound sterling, but works alongside it to encourage local trade and production. Residents can exchange pounds sterling for Brixton pounds at local exchange points, where they can also change their Brixton pounds back into pounds sterling. Local currencies can be a dynamic way to foster community, help preserve local jobs, and support local development.

Further reading: www.brixtonpound.org



FlexOverschie

Personalized, light-weight public transportation

FlexOverschie is an energy-saving social service that provides personalized public transportation: an electric tuk-tuk taxi service for both residents and visitors. The program, based in Overschie, a city district of Rotterdam, the Netherlands, offers a free, fun, and energy-efficient way of getting around.

Bridging the gap between expensive taxi services and large-scale public transportation, tuk-tuks participating in the program drive passengers right to their front doors. There are currently 17 tuk-tuks operating in the program, transporting over 800 people each week. Because of their low energy requirements, the tuk-tuks are four times cheaper to run than small cars, at only 0.05 euros per kilometer (0.07 dollars).

The tuk-tuks are operated by Overschie residents who would otherwise be stuck in the welfare system seeking work. All FlexOverschie employees are given career development opportunities as part of the program; once they familiarize themselves with personalized public transport, they are given the option of becoming taxi drivers. Over 60 chauffeurs have successfully been promoted to the city's taxi service, RTC / RMC. RTC/RMC is very satisfied with their FlexOverschie relationship and plan to continue employing their drivers.

With talks to expand the concept to other neighborhoods, the organization plans to become subsidy-free by bringing in a small charge of 2 euros (2.7 dollars) per trip in select districts (an extremely reasonable price for a taxi journey in the Netherlands).

The performance of the system is currently being recorded and made public in order for other initiatives to start elsewhere - FlexOverschie currently has plans to expand into six more city districts.





Further reading: www.flexoverschie.nl



FlexOverschie tuk-tuks are also used for special events.

Neighborhoods



Urban planning and development lay down structures that can define the lives playing out within them.

A well developed neighborhood can increase physical and social connections between residents and surrounding areas, while decreasing energy use and environmental impact. The neighborhoods in this section provide thriving examples of how urban planning and development can help integrate multiple dimensions of sustainability – making it something to be lived on the streets and in the home.

Sustainable Schiebroek-Zuid Rotterdam, The Netherlands

Except's Sustainable Schiebroek-Zuid Project provides a template approach to converting a commonly problematic housing typology into a beautiful, equitable and resilient sustainable community.

Overview

Except developed a sustainability vision for the post-war social housing area Schiebroek-Zuid in Rotterdam. The project, commissioned by housing corporation Vestia and agricultural research network InnovatieNetwerk provides a flexible and exemplary road map for converting the neighborhood into a self-sufficient and sustainable area.

The plan combines socioeconomic programs and proven technologies to create a closed-loop urban metabolism. All energy and water are locally provided and most wastes are handled on site. Local agriculture is the “biological engine” that drives many aspects of the plan, such as energy generation, nutrition, education, recreation, social programs, and local economic activities.

Except drew on its integrated sustainable development approach, Symbiosis in Design (SiD), to develop an extensive set of measures, or ‘ingredients,’ which can be mixed and matched over time to achieve the end vision. These ingredients were designed in cooperation with stakeholders and residents. SiD facilitates and assures the integration of the many elements of sustainability in a cooperative framework.

Except hopes that this project will serve as an example for the numerous social housing areas with similar typologies worldwide.



Sustainable Schiebroek Zuid: central market & greenhouse rooftops.



Energy & Materials

Using a combination of biogas-fueled power plants, solar installations, and heat capture from rooftop greenhouses, the area can supply all of its required electricity and heat.

Waste & Water

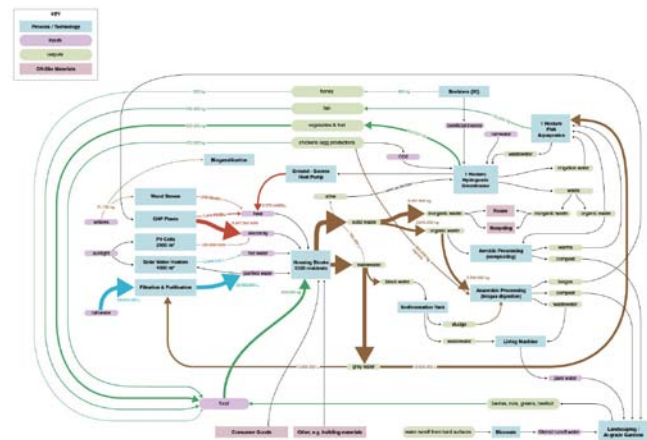
All water is locally provided and most wastes are handled on site.

Ecology

Edible landscaping throughout the neighborhood can make use of previously empty lawns while meaningfully connecting residents to their natural surroundings.

Typology

A key feature of the plan is that it renovates instead of demolishes most of the neighborhood's existing buildings, reducing both the social disruption and environmental impact typically caused by neighborhood renewals that begin with demolition.



Closed loop diagram of material flows in Scheibroek.



Sustainable Schiebroek-Zuid: communal water park.

Transport

The neighborhood revolves around a car-free center, with covered paths lit by solar panels winding through the development. This is supported by tram, bus, and subway connections to surrounding areas. The project design also incorporates charging stations to allow a shift to electric buses.

Community

The ingredients include many social programs for neighborhood target groups such as the elderly, children, teenagers, immigrants, and entrepreneurs. A marketplace and community center will serve as central hubs for the new neighborhood activities. Meanwhile, flexible ateliers provide spaces for start up companies that can be used as anything from craft workshops to offices, and kitchens to storefronts. The plan also recommends the use of a local currency as a way of encouraging local trade and as an incentive for energy saving or waste reduction efforts.

Project Team

Client: Vestia , Estrade & Innovatie Netwerk

Master Planning: Except Integrated Sustainability

Architecture & engineering: Except Integrated Sustainability, Atelier 10, POSAD

Further reading: www.except.nl



Sustainable Schiebroek Zuid: pedestrian corridor

EVA-Lanxmeer

Culemborg, The Netherlands

Ten years ago, project EVA-Lanxmeer started in Culemborg in order to contribute to an initiative aimed at developing sustainable and environmentally conscious living environments.

Overview

Since then EVA-Lanxmeer has become both a national and international example of sustainable town planning and social development. A collaborative project between the municipality of Culemborg and a foundation, EVA-Lanxmeer is situated next to a water collection area. The neighborhood is surrounded by many old trees and a populated green zone. Preserving this ecological heritage remains a key priority for urban planning and development in the neighborhood.

EVA-Lanxmeer integrates living, work, and recreational areas. This mixed-use planning offers the possibility of local employment and entertainment, resulting in less commuter traffic. The neighborhood is also situated right next to a train station for easy access to other parts of the country.

The residential area was designed with several key priorities in mind: closing as many energy and material loops as possible, working with natural cycles, sustainably managing water and energy resources, and establishing an optimum relationship between landscape and architecture. A feature of the district design process were “meeting places,” where future residents could come together to participate in the innovation, design, and management structuring of their future home.



Wooden frame houses, each fitted with solar panels.



Energy & Materials

Energy conservation and sustainable material use played a key role in the master plan. A maximum of 40 gigajoules of fossil fuels are to be used per home. 15 gigajoules are designated for central heating and warm water and 25 gigajoules for fittings and household consumption. Non-residential and office buildings have a maximum EPC value of 50% of existing building values (this is comparable with energy efficiency criteria for homes).

Air conditioning is not permitted. Instead, household grey water is used to heat and cool the community network, as well as a biogas converter which is fueled by sewage water. The houses were constructed using eco-friendly materials and methods. Wood-frame construction is the most common, with only natural dyes used for indoor paints. Green roofs have also been built on neighborhood sheds.

Waste & Water

EVA-Laxmeer uses a Living Machine system for wastewater treatment. Fed by liquid remaining from the district's biogas converter, the living machine accelerates nature's process of water purification using a cascade of biological organisms. The living machine delivers water clean enough to discharge onto surface water, use within the neighborhood as grey water, or run through an existing wetland filter.

Ecology

In EVA-Lanxmeer, architecture interacts beneficially with both people and the local environment, raising standards of living and cultivating interaction with the natural environment.

Typology

The master plan for the the district grew out of a number of workshops, ateliers, and master classes. Architects (both local and foreign), town planners, landscape architects, civil servants, and future inhabitants all played an active role in the development process. The municipality of Culemborg stated that the inhabitants of the town had to be involved in the new Lanxmeer development and be informed of its sustainable aspects. As a result, a new communications strategy was developed within the Culemborg municipality that broadened general understanding and knowledge.

Community

As much in the planning development as in the management of district, the (future) residents played a large role.

Project Team

Developer: Gemeente Culemborg & Stichting E.V.A.

Master planner: Gemeente Culemborg, Stichting E.V.A. & residents of E.V.A.Lanxmeer

Architects: Pieter van de Ree, Michael Schimmelschmidt, Pierr Bleuze

Further reading: www.eva-lanxmeer.nl



Eva Lanxmeer is filled with green-roofs and mirco-greenhouses.





Behind the houses at E.V.A. Lanxmeer, balconies overlook flourishing gardens.

Housing At Nieuw Terbregge

Rotterdam, The Netherlands

The Nieuw-Terbregge neighborhood in Rotterdam uses terraces and communal decks to help foster a sense of community.

Overview

Nieuw-Terbregge was developed with the aim of demonstrating large-scale energy efficiency and renewable energy technologies as an integrated element of an urban housing area.

Designed by the Dutch architectural practice Mecanoo, the housing at Nieuw-Terbregge is comprised of 107 'double decker' dwellings on four islands. Next to the islands, 48 waterfront houses have been designed in an 'eight under one roof' typology.

The development makes use of the numerous canals on the site, hosting boat moorings, water-decks and gardens that run down to the water. Streets and communal spaces feel safe and are well overlooked, making the development friendly and secure.

Energy & Materials

Nieuw-Terbregge is the Netherlands' contribution to the European Union's program of experimental low-energy housing known as Thermie RE-Start. The development aims to reduce energy consumption by 25-40% through a combination of measures, including eight small gas-fired combined heat-and-power plants, heat pumps connected to the ground water, solar collectors, and high levels of insulation.

Water & Waste

Rainwater from roofs and streets is guided into the canals and gardens are oriented according to prevailing rainfall.

Ecology

There are generous green spaces and communal access decks. Defined public space blends successfully into private space via the wooden decks, allowing green design to enhance the surrounding natural flora and fauna.

Picturesque canals are integrated into the neighborhood, alongside gardens and terraces offered to all residents. The close relationship between the built and natural environments is visible throughout, from the residents' boats to garden furniture.

Typology

Different architects were involved at different points in the phased development of Nieuw Terbregge. Each phase brought new variety to the neighborhood, but Mecanoo's vision makes the neighborhood cohesive. The dark wooden siding and white stucco façades helped create visual variety within the development while referencing the traditional Dutch terraced house.

Mecanoo's 'double decker' housing is an integral and unique component of the design. The 'eight under one roof' water dwellings, a concept developed by Mecanoo several years ago in Arnhem, creates a dynamic alternative to the standard terraced house typical of social housing. The water dwellings appear as large unified houses, but provide separate spaces for eight households, each with their own garden or deck.

The 'living deck' is used as a playground, terrace and a communal space. The deck's wooden slats allow branches to reach up through it, and light to play on the streets below. At the end of each deck there is a small power plant which generates heat using local waste.



Homes are spacious and close to the water, sharing terraces and parking space.



Gardens at Nieuw Terbregge are socially activated and well used.

Transport

Cars have been integrated rather subtly into the design, with 107 parking spaces for the terraced houses tucked away underneath an access deck.

The stone paved ‘under street’ and a wooden upper deck create a division between the residents’ parking area and the pedestrian area. Garages are designed for flexibility and can, if desired, be converted into studios. The maximum speed throughout the neighborhood is 30 kilometers per hour (19 miles per hour). There are also cycle and pedestrian friendly routes to the recreational area and the city center.

Community

Nieuw-Terbregge mixes upmarket housing built for sale with cheaper housing for rent or sale. The layout gives children a safe place to play where they can easily be supervised and are far removed from the cars below. The “eight under one roof” concept also uses the buildings’ unique typology to help foster community identity, uniting different households and distinct backgrounds under a shared roof.

Project Team

Developer: Proper Stok

Masterplanner: Mecanoo Architects

Architect: Multiple parties including Mecanoo

Further reading: www.nieuw-terbregge.nl



Cars are well integrated into the design of the scheme.

GWL-Terrein

Amsterdam, The Netherlands

Since the late 1990s, the Dutch government's urban renewal policy has actively sought a balance of social and market-rate housing. The GWL-terrein in Amsterdam successfully responded to this initiative by providing a compact mix of both social and market rate housing.

Overview

GWL-terrein is a large-scale community housing development built on the site of Amsterdam's former municipal water facility. The development's master plan focused on providing housing for families with children while addressing environmental concerns.

GWL-terrein incorporates several unique and innovative design features to foster a clear relationship between public and private spaces. The majority of apartments have a recognizable address and a private front door at street level.

The neighborhood consists of high-density housing and a series of linked public spaces. It is car-free in its interior and few parking spaces are provided for residents. It is located less than three kilometers from central Amsterdam and is very well connected to surrounding bus, tram, and train routes.



Energy & Materials

High quality materials were used throughout the site to increase durability. In addition to incorporating green roofs, buildings were made from eco-friendly materials and oriented to maximize solar gain. A local combined heat and power plant provides energy for the entire development.

Waste & Water

Rain water is recycled for watering gardens and flushing toilets.

Ecology

The site offers public, private and shared gardens. Divided by hedges with a maximum height of 1.4 meters (4.6 feet), outdoor spaces are well-maintained and overlooked by adjacent buildings.

Green roof technology has been incorporated throughout the development, providing highly effective natural insulation. The green roofs help maintain a constant indoor temperature by retaining heat in the winter and cool air in the summer as well as improving the air quality of the neighborhood.

Typology

The developers retained and refurbished some of the former waterworks buildings, which helped create a sense of local identity.

GWL-terrein was designed for a collective mix of families, singles and elderly, with studios, small houses, maisonettes and apartments.

The internal layout of the development is characterized by a series of public and private spaces. Public spaces wind through the development whilst private spaces are clearly demarcated with views onto public areas.



Kids play safely within the development.

Transport

One of the principal innovations of the development was the decision to be car-free. Limited car parking spaces are allocated inside the development and the few that exist are earned by lottery. All parking is on the periphery of the development, making the site accessible to pedestrians and bicycles only. The success of this policy is helped by the development's small scale (one can easily walk through it in 5 minutes), its proximity to the city center, and its excellent transport connections. A regular bus service stops at several points directly outside the development.

Community

The development is surrounded on two sides by large-scale high-rise apartment blocks that mark the end of industrial Amsterdam and the beginning of its residential districts. These boundary buildings create a sense of enclosure for the internal lanes and courtyards while remaining permeable, offering views onto the surrounding countryside.

A strong sense of community is fostered within GWL-terrein not only through communal public spaces but also by the shared retail, public, and communal aspects of the neighborhood, which encourage non-residents to visit the district, ensuring that the surrounding community is not shut out.

Project Team

Developer: Amsterdam City Council

Master Planner: KCAP

Architect: Multiple parties

Further reading: www.gwl-terrein.nl





Refitted, mixed-use buildings help create a distinctive character in the development.



Greenwich Millennium Village

London, UK

Built as part of the regeneration of the brown field site of Greenwich peninsula's former gas works, Greenwich Millennium Village is a residential development of the future that promotes and supports sustainable living.

Overview

The largest regeneration project of its kind to be undertaken in London, the Greenwich Millennium Village is designed to offer everything a community needs to grow - excellent transport links, schools, health centers, shops, and leisure facilities.

With a masterplan designed by architect Ralph Erskine, the scheme is both innovative and inspiring in its design, construction, and eco-friendly features.

Stepped housing profiles reduce wind speed and exploit solar gain. The neighborhood's custom built Ecology Park is surrounded by green corridors that encourage walking and cycling, while spaces between buildings create local micro-climates for residents.

Pre-fabricated construction techniques allowed contractors to achieve impressive reductions in pollution and energy use during construction. Innovative partnership schemes ensured full integration of the latest research and development during the design process.

Holistic definitions of sustainable development guaranteed that more than just physical aspects of the development were addressed. Community-based organizations like The Village Trust, (funded by developer subsidies) are charged with the management and maintenance of social and economic issues as well as physical ones.

Energy & Materials

Planning conditions included a range of sustainability targets over the course of the life of the project, including an 80% reduction in primary energy consumption, a 30% reduction in water use, a 50% reduction in embodied energy, a 50% reduction in construction waste, and a 25% reduction in car usage within 10 years of implementation.

Architectural designs were made to maximize solar gain and natural light and ventilation. Daylight level calculations ensured that all apartments have natural light between May and August. Light-colored external and internal walls reflect light into north-facing rooms and courtyards.

Standard materials such as concrete flag paving, pebbles, timber screens, glass balconies, and terra-cotta cladding provide a durable and contemporary public realm that will age well and require minimal maintenance.

Ecology

Street trees and ornamental shrubs articulate the residential streets and will provide shade, shelter and pollution reduction when mature.

Typology

Comprising 1,377 homes (1,079 apartments and 298 houses) and approximately 5,000 m² (53,820 ft²) of commercial space, the development offers a community center, a primary school, a health center, shops, cafes, bars, a yacht club, a 14-screen cinema, a hotel, and offices. Grouped in communities around a large village green and an artificially created lake, local amenities and residential homes are connected by quiet tree lined streets.

Two-story terraced housing and apartments in three-story blocks fit comfortably with adjacent terraced housing. Buildings no deeper than 13 meters (43 feet) maximize opportunities for natural light while creating highly adaptable structures.



Colorful façades brighten up the development.



Residents make full use of their South facing private balconies.

Transport

Small scale streets offer limited parking for the disabled. Semi-public, landscaped courtyards in the rear of the buildings have additional parking below. Strong links to surrounding areas include a riverside cycle path; a river transport pier; riverside footpaths; and good connections to buses, the tube, and mainline railway stations. This virtually car-free environment exhibits the community's commitment to reducing emissions and increasing environmentally-friendly modes of transport.

Community

The development brief required that 25% of the land and 20% of the housing units on the Peninsula be allocated to social housing; that proposals meet the highest standards of building, landscape, and urban design; and that EP's commitment to mixed use development and minimizing environmental impacts be addressed. Other requirements included energy efficiency and telecommunications measures.

All residents have access to high-speed Internet and digital services plus the potential to remotely control internal environments and appliances. These are rare features among similar housing developments. This 'e-village' also provides generous storage adjacent to each front door for shopping deliveries, a planned lifestyle solution to work in concert with the parallel virtual community at www.greenwich-village.co.uk, which will facilitate online shopping for local residents.

As part of a wider mixed-use area, a new school, health center and live-work units, are located within easy walking distance. Other amenities include restaurants, a pub, an award winning supermarket with a coffee shop, a multiplex cinema and the Millennium Dome.

Project team

Developer: Countryside Properties Pic & Taylor Wimpey

Masterplanner: Erskine Tovatt

Architect: Proctor Matthews Architects

Landscape Architect: Robert Rummey

Further reading: www.gmv.gb.com

Vauban

Freiburg, Germany

Planning for the Vauban district began in 1993 and was completed in 2006, after the completion of three distinct development phases. The primary objective of the project was to create a city district in a cooperative and participatory manner that met ecological, social, economic and cultural needs. The 38-hectare (94-acre) site is now home to more than 5,000 inhabitants and 600 new jobs.

Overview

The landowner, the City of Freiburg, was responsible for the planning and development of the Vauban community site. The city adopted a 'Learning while Planning' principle, offering flexibility in responding to development proposals in part due to the emphasis on citizen participation. The local citizen's association, which has NGO status, coordinated the participation process and was recognized as a legal body by the city in 1995.

A major achievement by the City of Freiburg has been the division of the land into small plots by preferential land allocation to private builders and Baugruppen (co-housing groups). While the development plan outlined regulations for the designs and layout of the homes, it also provided ample freedom to builders, resulting in a variety of structures.

Coherence in Vauban is achieved through the extensive use of ecological measures and the 'car-free' and 'parking-free' concepts of living.



Car-free streets make the area safe and tranquil.



Energy & Materials

The energy concept at Vauban was developed collaboratively by Forum Vauban, the City of Freiburg, and the Freiburg Energy Company (FEW). In 1992 the City Council decided that all land sold by the City should be available only for low-energy houses, meaning all houses in Vauban were built to at least 'low-energy' standards, with many exceeding this. There are over 50 passive houses and at least 100 units with 'plus energy' standards (houses which produce more energy than they need) in Vauban. It is estimated to be one of the largest 'solar districts' in Europe. Solar panels and photovoltaic cells are common on rooftops across all parts of the development. A solar power installation has also been built on the roof of the community car park.

Waste & Water

Together the solar panels, natural gas, and highly efficient cogeneration plant operating on wood chips provide hot water and 65% of the electricity for the district. An advanced water management system increases the rainwater infiltration and reduces run-off.

Forum Vauban arranged specialized and free advice at organized events to help inform self builders. They also ran practical DIY seminars for home owners and provided information on energy saving techniques.

Ecology

There are three main green spaces in Vauban: the creek and its bank, the tree and shrub population along the central spine, and the undeveloped areas to the west end. Green corridors are designed to foster social activities, including playgrounds, sun bathing areas, barbecue areas, water fountains, and seating.

Typology

Due to development plan regulations, detached houses and buildings exceeding four stories are prohibited in Vauban. This fosters a more compact urban environment, with individually designed façades adding identity within the cohesive urban fabric. A distinct market place and neighborhood center also help enhance legibility.

Transport

Vauban's ecological traffic and mobility concept emphasizes the principles of "car-free" and "parking-free" living. These principles are promoted by limiting the number of private cars, making them park at the periphery of the site, and prohibiting the building of parking spaces on private property. Nearly 50% of Vauban's households are car free.

These are supported by good public transport services and a convenient car sharing system. Car free households save the substantial cost of a parking space (in the community car park), as do development companies who put up car-free apartments for rent. Residents who join the car sharing organization have access to shared cars and receive a one year free pass for all public transport within Freiburg. Two bus routes connect Vauban to the city center and the main railway station.

Community

The joint building projects (around 30 groups of co-builders, the Genova cooperative and the self organized SUSI) together with Forum Vauban aimed to create a balance both between residential and working areas and between different social groups.

Resident participation during the development process helped form a strong community and neighborhood structure, making social interaction a key characteristic of the neighborhood. This integrity has also helped facilitate the farmers' market and cooperative food store initiatives. The co-housing model also lowers economic



Private patios open onto shared garden space.

barriers to home ownership, fostering greater socioeconomic diversity.

One of the objectives at Vauban was to be a child and family friendly district. By January 2002 more than 20% of the inhabitants were children under 10 years old. The streets and public spaces at Vauban were carefully planned to be both playgrounds for children and places for social interaction during meetings and workshops with local residents.

In line with the goal of creating a 'district of short distances,' local amenities, schools, farmer's markets, businesses, recreation areas, and food co-ops are all within walking and cycling distances from residents.

Project Team

Developer: Amsterdam City Council

Master Planner: KCAP

Architect: Multiple parties

Further reading: www.vauban.de



All houses are fitted with photovoltaic cells on their roofs.

Hammarby Sjöstad

Stockholm, Sweden

The name 'Hammarby Sjöstad' means 'city surrounding Hammarby Lake.' Hammarby Sjöstad is a new district to the south of Stockholm, which extends the inner city beyond Hammarby Lake.

Overview

Housing a population of 20,000 people within 9,000 apartments, this new 200-hectare (494-acre) city district will host 200,000 m² (2,152,782 ft²) of commercial floor space that will attract a further 10,000 people to work in the area. Approximately half the total area has been developed to date and is anticipated to be complete by 2015.

Impetus was gained for development and infrastructure in the area when plans for Stockholm's bid for the 2004 Olympic Games were being prepared. With a strong emphasis on ecology and environmental sustainability, the core area of Hammarby Sjöstad was envisaged as an Olympic Village. Although the bid was unsuccessful, development was already underway and the momentum for change had been established.

Hammarby Sjöstad is built on former industrial brown field land located on the south side of Hammarby Lake, south of the city center. This area historically formed the natural border to the inner city area of Stockholm. The project seeks specifically to expand the inner city across the water.

A politically driven and now internationally renowned sustainability program, Hammarby Sjöstad includes targets for decontamination, use of brown field land, provision of public transport (to discourage car use), energy consumption regulation, and the recycling of water and waste. Targets are monitored on information boards within the district as well as on the Hammarby Sjöstad website.



Green space and water soften the surroundings.



Energy & Materials

The main challenge for the environmental program has been establishing contact with residents in order to encourage them to assist the Council in achieving environmental goals. A number of different methods have been used in order to reach residents and businesses, including exhibitions, a website, and a newsletter.

By far the most successful form of outreach has been the website, which receives an average of 9,000 hits per day. The Glass House center also provides an educational resource for local people in adopting sustainable lifestyles.

Waste & Water

Sewage water is cleaned and purified at a large sewage plant just outside the area. The waste is recycled into natural gas and used as an energy source for the neighborhood. Heat produced through the purification process is recycled for use at a district heating unit. Hammarby Sjöstad also has its own pilot sewage treatment center, which opened in 2003. The unit recycles nutrients from sewage for use on agricultural land. Surface water is cleaned locally and biodegradable waste is composted nearby.

Ecology

The project's geographical context provided the basis for the development of the master plan. The district's borders are naturally defined by a hilly nature reserve to the south where the "blue eye," Hammarby Lake, is the most attractive public space, the district's central focus. Pedestrian boardwalks, quays, and linear parks provide a varied perimeter to the waterfront and residents have access to boat moorings in the summer.

A network of varied parks, green spaces, and walkways runs through the district. Where possible, the natural landscape has been preserved providing inspiration for the development. The original reeds and rushes remain along the waterfront, in between which secluded walkways out into the water have been built. Birch trees create the landscape for



Balconies look onto central pedestrian zones.

a beautiful waterfront park and rocky oak-woodland defines the edge of the district.

Typology

Although Hammarby Sjöstad is located outside of what is traditionally considered to be the perimeter of inner city Stockholm, the design is intentionally urban rather than suburban, and follows standards for Stockholm's inner city in terms of street width (18 meters or 59 feet), block sizes, density, and land use. This traditional city structure has been combined with a new architectural style that responds to its specific waterside context. The scale of development varies from four to five stories along Sickla canal and 6 to 8 stories along the main corridors. Hammarby Sjöstad makes the most of its waterfront setting and location. All orientation within the neighborhood is towards the water.

Transport

The spine of the new district is a 37.5 meters (123 feet) wide boulevard and a transport corridor, which connects both key transport nodes and public focal points, creating a natural focus for activity and commerce. The area is easily accessible by public transport. New roads and tram infrastructure with four stops in the heart of Hammarby Sjöstad have been central to the development. The tram connects the area directly to the underground network. Three new bus routes and one night bus also serve the area. In addition, a free ferry link across Hammarby Sjöstad has been introduced, taking five minutes to cross the lake. Residents also have access to a car-pool, in which 20 to 25 cars are available for the 270 residents who have joined the scheme.

Community

Hammarby Sjöstad has succeeded beyond expectations in attracting families with children; 16% of the current population consists of children under 16. Demand for school places is exceeding original calculations.

The Hammarby Sjöstad website is also used as a tool for consultation and lobbying. For example, residents are invited to submit views on transport provision, which can then be used as a basis for lobbying Stockholm Transport to improve services further. The strategic planner acknowledged that even with a high level of resources to support environmental sustainability, it remains a challenge to continually innovate and design sustainability measures into the later phases of development.

Project team

Developer: Skanska, Family Housing, Swedish Housing, HSB, SKB, Borätt

Masterplanner: Stockholm City Planning Bureau

Architect: Over 30 different architects including White Architects, Nyréns Architect

Further reading: www.hammarbysjostad.se



The 'spine' connects Hammarby to central Stockholm.

Ekostaden Augustenborg

Malmö, Sweden

Environmental improvements have transformed Augustenborg from a neighborhood in decline to an example of an environmentally adapted urban area.

Overview

The Augustenborg district in the city of Malmö, Sweden was built in the 1950s and initially considered highly successful, offering housing, employment and social facilities. By the 1970s the 32-hectare (79-acre) neighborhood was falling into decline. Annual flooding from an overwhelmed sewage system caused many problems for residents, disrupting and damaging vehicles and private property. The estate suffered a spiral of decline as more people moved out, flats remained unoccupied and the remaining population became marginalized, with high unemployment.

In the early 1990s the city council set out to improve the area by working with the MKB Housing Company, the housing landlord and local residents. This initial partnership led to a wide-ranging regeneration project, known as Ekostaden Augustenborg. The initial focus of the project was on innovative environmental improvements, focusing on combating flooding, waste management, and enhancing biodiversity. In the process, the project has also successfully introduced a wide range of social benefits, such as a community pool, an after-school youth club and employment opportunities for young local adults. The neighborhood is now once again an attractive and thriving place, with no long-term vacant properties.

Climate change considerations were a project priority, both in terms of mitigating its causes and adapting to its current effects. The adaptations included an open surface level storm water system, green roof-tops and improvements to green spaces. The project also introduced renewable energy sources, recycling systems, sustainable construction, and local transport initiatives.

Energy & Materials

Ekostaden Augustenborg introduced a range of measures to help reduce the amount of carbon emissions produced by

the neighborhood, mitigating the causes of climate change.

These include; 400 m² (4,306 ft²) of solar thermal panels on the roofs of the industrial estate to provide hot water, 100m² of photovoltaic panels to generate electricity, and a ground source heat pump system that stretches out under the gravel football pitch in the park and connects to the district heating system.

A façade renewal project replaced unsuccessful cladding added in the late 1970s and early 1980s with attractive cladding, contributing 10% energy savings. This has been combined with improved insulation of the underground heating pipework to reduce heat loss.

Waste & Water

The innovative water-management approach has improved resilience to flooding, proven during a major flood in 2007, in which Augustenborg coped much more successfully than nearby districts.

In the new storm water management system, (implemented by the Malmö Department of Water and Wastewater), water from rooftops and other impervious surfaces is collected from gutters and channeled through canals, ditches, ponds and wetlands before draining into a traditional closed sub-surface storm water system. The open storm water system retains 70% of all rainwater that falls onto the neighborhood. Green roofs help to manage water by absorbing rainfall, reducing the amount of water that enters into a storm water system.

The development has also introduced effective recycling and waste management programs, with the goal of recycling 90% of waste. All 1,700 households separate their waste into small bins, which they then take to one of 13 neighborhood 'resource houses' which house containers for all types of recyclable as well as large automatic composting machines. These resource houses also feature green roofs.



Open storm water management system provides a high quality landscape for residents and biodiversity.



The storm water system is an integral part of the landscape.

Ecology

A 'botanical roof garden' covers 9,500 m² (102,257 ft²) of the industrial area and is the largest green roof in Scandinavia. It was developed in partnership with several universities and private companies and has been part of a research project exploring different approaches to green roofs, receiving funding from local, national, and European sources.

All new developments in the Ekostaden also feature green roofs including some existing buildings, such as garages, which have been reused as offices and had green roofs fitted.

Studies have shown that the green roofs intercept around 50% of total runoff over the course of a year. The roofs provide a small amount of additional insulation during the winter, but have a significant cooling effect in the summer when compared with standard black bitumen roofs.

One key element of the project has been to improve Augustenborg's green spaces, offering both environmental and social benefits. The newly designed green spaces can be temporarily flooded, helping to manage water by slowing its entry into the conventional storm water system. The greening of buildings also helps regulate temperature, keeping buildings cooler in summer and warmer in winter.

Reconfiguration of public spaces between housing blocks gives residents opportunities to grow their own food in small allotments while also creating places for leisure and attractive areas for children to play.

Other 'green' improvements include planting flowering perennials and trees, establishing wetlands, providing bird and bat boxes, and improving play areas.

Transport

The development features a reduced speed limit on most local 'garden roads' in order to encourage walking and cycling. This is complemented by a community car club with electric and ethanol-powered cars. An experimental electric street train provides public transport service the heart of the development.

Community

Throughout the project, a special needs advisor and local access and mobility group worked with the design team to ensure all factors would be considered. Gardens, shared green spaces, and collective initiatives such as the recycling and car club programs also help foster a sense of community.

Project team

Developer: MKB Housing Company

Masterplanner: City of Malmö

Architect: Svenska Landskap, Mellanrum, Gisli Arkitekter, Mark och Miljö (now ISS Landscape)

Further reading: www.malmo.se



The canal is central to community activity.



Cities



Cities occupy 2% of the planet's surface, are home to more than half the world's population, and consume more than two-thirds of the world's energy.

They are the hives of innovation that drive change, and therefore must be at the heart of sustainable strategies. The following city-wide initiatives provide inspiration to cities and citizens everywhere, while demonstrating that sustainability and quality of life go hand-in-hand.

Except's Urban Green Scan Roosendaal, the Netherlands

We hear a lot about it: the integration of green spaces could change our cities from dead concrete caverns to lush green paradises, with local food production and many social and health benefits. But how to achieve this in specific cities is less clear: where exactly do these opportunities lie, what is possible, how do we communicate it, and where do we start?

Except's Urban Green Scan project addresses those questions and helps provide a guideline for cities around the world.

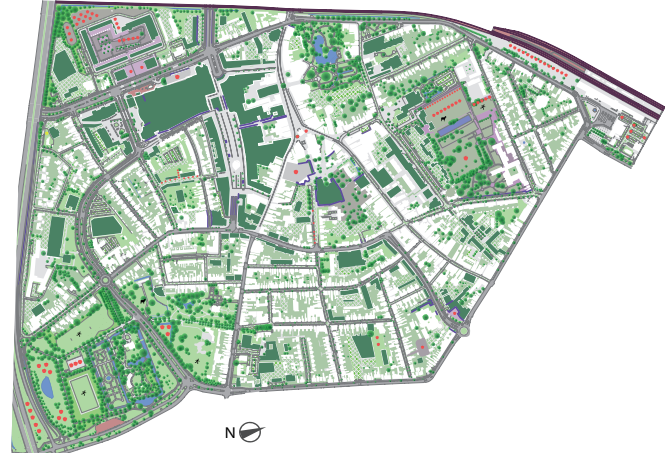
With a multidisciplinary team of ecologists, architects, urbanists, and local policy makers, Except made a map of opportunities for beneficial green interventions for the Dutch city of Roosendaal. The project analyzed the city on three scales: building, neighborhood, and the entire inner city.

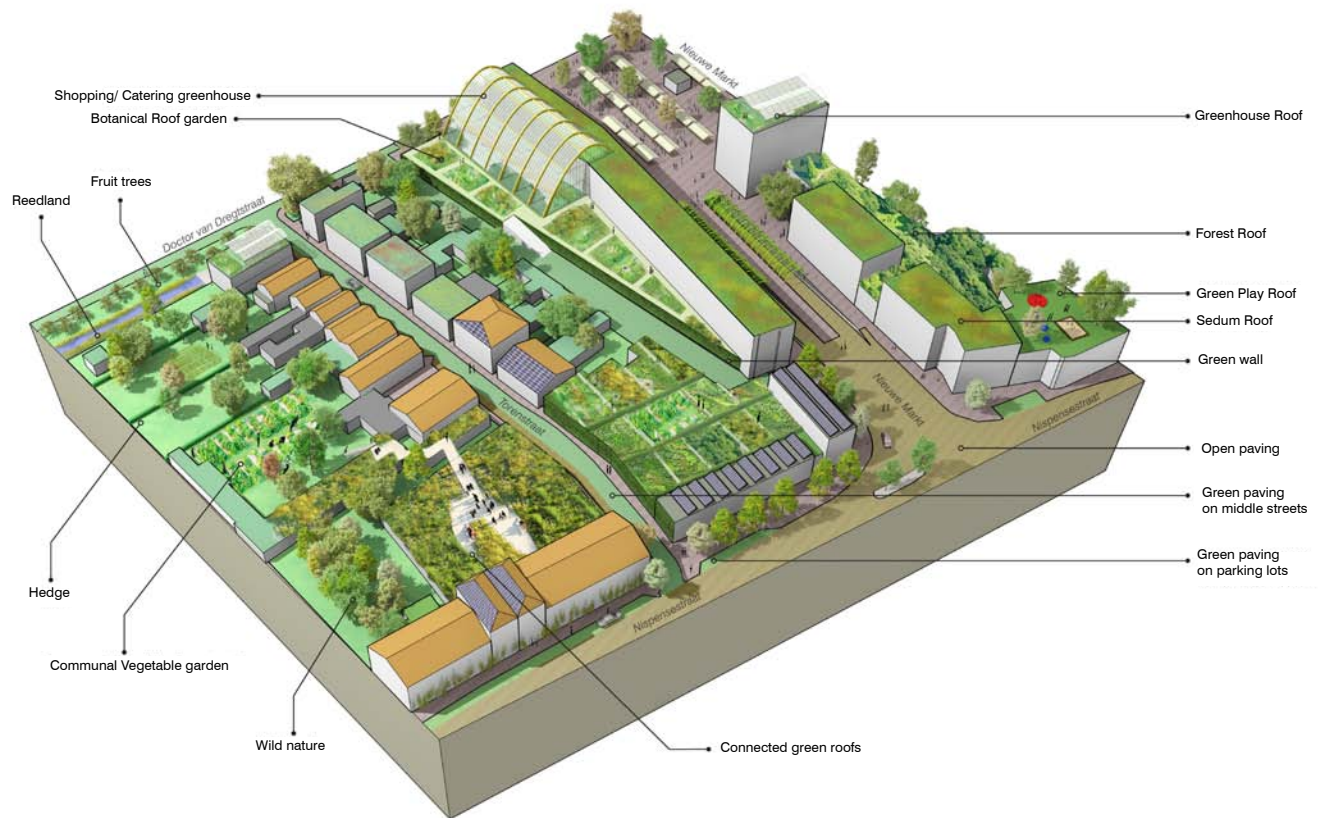
For each scale, Except identified all possible green interventions, from house plants to interconnected rooftop gardens. The team then created a comprehensive chart that shows what kind of intervention can be applied in each type of location, and what its specific benefits will be. Finally, these natural elements were placed on maps of the city at the three different scales to show where opportunities exist.

This service is now offered to other municipalities as well.

Further Reading: www.except.nl

Map showing green spaces throughout Roosendaal





Curitiba-Brazil

Integrated Planning

Brazil's Curitiba is a globally recognized example of integrated urban planning. In 1972, Curitiba's newly elected mayor Jamie Lerner transformed a car-choked, six-block area into a pedestrian zone in the course of a weekend. This lightning-fast upgrade was just the first in a series of initiatives which have helped make Curitiba Brazil's most livable city according to the American magazine Reader's Digest.

The city also created the world's first Bus Rapid Transit system, moving away from car-centered planning when many cities had the car at the heart of their master plans. Currently 75% of the city's residents rely solely on public transport.

While many Brazilian cities were welcoming any industry with open arms, Curitiba decided to only admit non-polluting companies, reserving a large swath of green space for them, which filled up with major businesses. With the population booming, Curitiba still managed to increase the green areas per inhabitant ten fold: from five to 50 m² (54 to 538 ft²).

Many of the initiatives evolved from a 1965 master plan by São Paulo architect Jorge Wilhelm. The plan encouraged local communities to become self-sufficient by providing all city districts with adequate health care, education, recreation, and park areas, connected by a consolidated public transport system.

A dynamic city designed for sustainable growth, its human-centered vision was at the vanguard of late 20th century urban planning, and still brings planners and practitioners from around the world to the streets of Curitiba to study its successes.

Further Reading: www.curitiba.pr.gov.br



Portland Oregon - USA

Urban Growth Boundaries And Green Visions

Consistently voted one of the greenest cities in the U.S., Portland is years ahead of other U.S. cities in terms of sustainable spatial development. In order to control urban growth and density the city has been adhering to strict urban growth boundary policies since the 1970's, fostering green growth while avoiding urban sprawl.

The urban growth boundary protects over 10 million hectares (25 million acres) of farmland. More than 30 years ago, while other cities were making themselves ever more amenable to the car, Portland removed a six-lane expressway and replaced it with a waterfront park. Ringed by natural beauty, Portland is now home to the largest urban wilderness in the U.S., boasting over 200 parks and green spaces.

Whether cycling or recycling, Portlanders are ahead of the curve. Twenty-five percent commute to work by bike, car-share, or public transport. The city also has the highest

recycling rate in the U.S., clocking in at 62% waste recovery. Portland was also the first U.S. city to implement a comprehensive CO₂ reduction plan, and it currently sources half of its power from renewable sources.

Further Reading: www.portlandonline.com



Vancouver - Canada

Green Visionary

Vancouver has the smallest carbon footprint of any North American city. A true leader in green thinking, the city currently sources 90% of its power from hydroelectric energy. With a dedicated team working towards becoming the greenest city in the world by 2020, the city has invested wholeheartedly in solar, wind and tidal energy and currently offers subsidies on solar and boiler panels.

Vancouver also runs a number of impact reduction initiatives, including solar powered trash compactors (that hold five times as much waste as an average trash can), theater performances that educate ecologically-responsible citizens, a city composting scheme, and campaigns that promote local foods.

Since 1996 the city has been working to increase green zones and environmental quality by introducing green centers within the city, creating more bike paths, and encouraging community gardens. Filled with parks, waterside attractions and mountain views, Vancouver is a pioneering city that looks to its surroundings in its drive to become fully sustainable.

Further Reading: www.vancouver.ca



Reykjavik - Iceland

Energy Pioneer

A city run entirely on green power, Reykjavik has often been celebrated as one of the greenest cities in the world. For more than 50 years, Iceland and its capital have been decreasing their dependence on fossil fuels and turning to the natural power provided by the country's landscape.

Waterfalls, volcanoes, geysers, and hot springs are all abundant sources of renewable energy that supply electricity and water to the country and its capital. Iceland sources nearly 80% of its energy from geothermal and hydropower, aiming to be both energy independent and the world's first hydrogen economy by 2050.

One of the few countries currently capable of producing hydrogen profitably, the country is leading the way in experimenting with hydrogen-powered public and personal transport. Hydrogen-fueled Reykjavik buses were piloted in 2003, and have been on the city's streets ever since.

Further Reading: www.curitiba.pr.gov.br



Copenhagen - Denmark

Bike-Friendly Capital

Copenhagen is internationally recognized as one of the greenest and most bike-friendly cities in the world. It topped the list of Siemens' first European Green Cities Index in 2009, shortly after winning the 2006 European Environmental Award for their "long term holistic environmental planning."

Many of the city's successes are due to forward-thinking municipal and national policies, combined with public and active transport infrastructure, or greenways. The greenways are a city-wide network of bicycle lanes that facilitate fast, safe, and pleasant cycling from one end of the city to the other.

Every day, 1.1 million kilometers (683,508 miles) are cycled by the 36% of city dwellers who commute to work and/or school by bicycle. Through the expansion of the city's greenways, the municipality aims to increase this to 50% of the population by 2015.

The city complements innovative transport infrastructure with sustainable energy and waste initiatives. In 2001 Copenhagen opened what was then the world's largest offshore windmill park, responsible for producing 10% of the city's power. Their efficient waste management system facilitates the successful recycling of nearly 70% of the city's waste. Heat from waste incineration provides 20% of district heating.

Copenhagen is also an organic food capital; one in ten purchases made within the city is organic. The city's proactive policies and planning encourage residents to take initiative in being conscious about what they eat and the lifestyles they live.

Further Reading: www.copenhagen.com



Seoul - South Korea

From Highway to Riverbank

Just ten years ago, this sprawling mega city wasn't on anyone's sustainability radar. Thanks in large part to Seoul's visionary mayor Lee Myung-Bak, the city has now been transformed. Myung-Bak pushed through widespread criticism when he began the 655-million-euro (900-million-dollar) project to transform a highway cutting through the center of the city into a river promenade in 2003.

Completed in 2005, the restoration of the Choenggyecheon stream, previously covered by the massive highway, has created a flowing corridor of open space where people can stroll, relax, and enjoy cultural events such as the annual Seoul Lantern Festival.

The city is now continuing its makeover with new transport and public space initiatives. The Banpo Hanga Park, finished in 2009, lines another of the city's restored rivers. The park has playgrounds, an inline skating track, sport fields, and bike lanes.

Seoul is also currently transitioning the city's extensive bus fleet to electricity, and has committed to making half (120,000) of the city's buses electric by 2020. In addition, the city has a state of the art Bus Rapid Transit system and the third largest subway system in the world.

All of these changes make Seoul one of the only megacities working hard to prove that bigger can sometimes be better.

Further Reading: www.english.seoul.net



Clinton Climate Initiative: C40 Cities

Heavy Hitters and Global Cities Join Forces

Cities are home to more than half the world's population, consume more than two-thirds of the world's energy, and emit more than 70% of global CO₂. Cities are both part of the problem, and part of the solution.

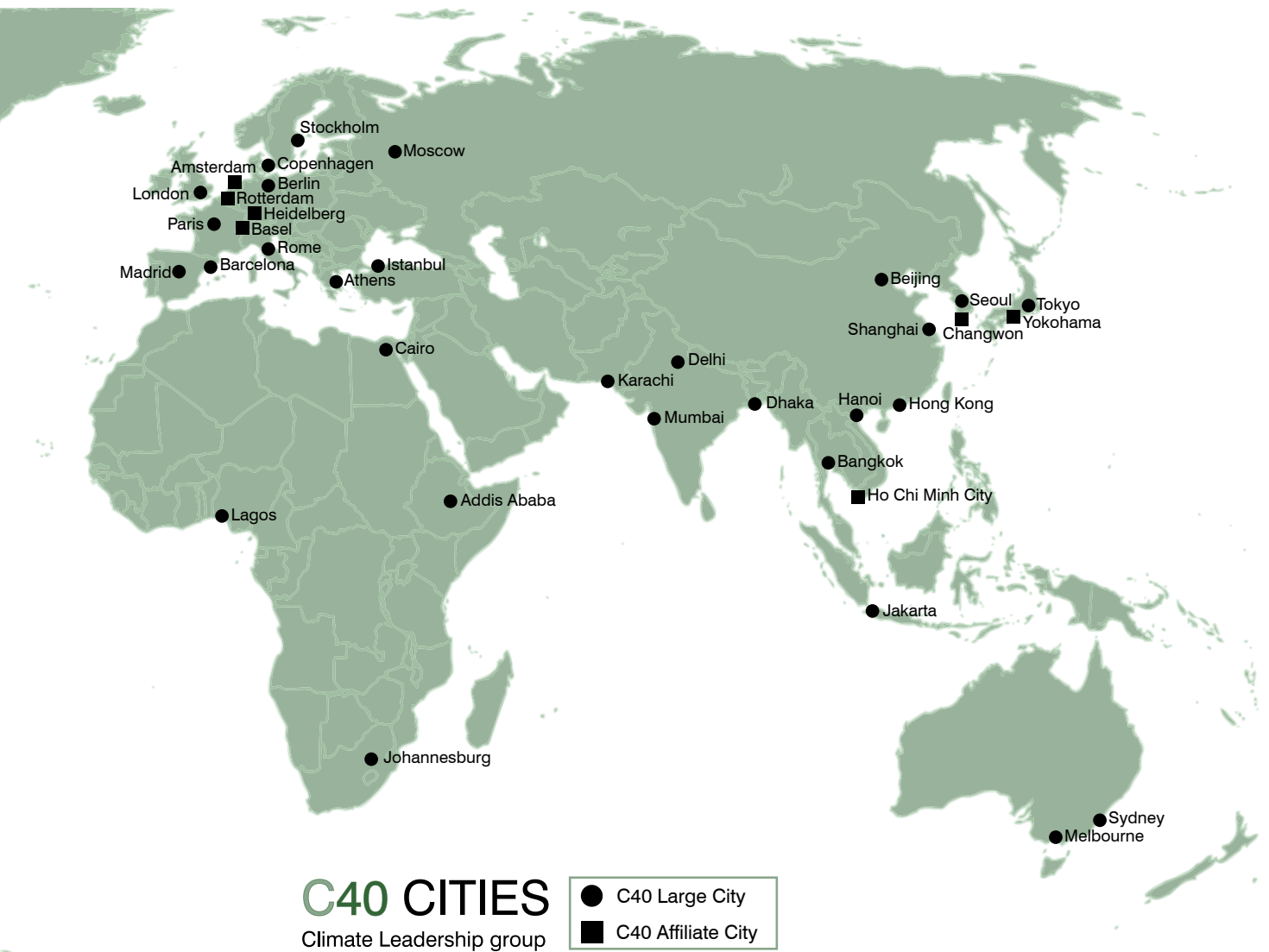
C40 is a network of large cities committed to tackling climate change, currently led by New York Mayor Michael R. Bloomberg. The network fosters knowledge transfer and collaboration, while also helping cities implement energy efficiency and clean energy programs. C40 grew out of a 2005 meeting of representatives from 18 leading world cities, galvanized by a partnership with the Clinton Climate Initiative in 2006.

The C40 website researches and shares best practices in cities around the world, and provides a forum for international cooperation. By uniting cities around the shared goal of adapting to and mitigating climate change, C40 provides a powerful platform for global urban collaboration.

In April of 2011, C40 officially merged with the Clinton Climate Initiative Cities Program (CCI), creating a new organization which will expand the number of participating cities, double the budget, and restructure the organization to help cities share best practices and address issues collectively.

Further Reading: www.c40cities.org





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16	Carly Lesser & Art Drauglis	Lens
	Brian Reynolds	Rough concrete paint
17	Ian Mutto	Gerhkin sticth London
	Sid Mosdell	Nature Patterns
19	Dial 4 Light	Dial 4 light 3
20	SAGE electrochromics	Sage tinted glass
21	LSR3	Lunar-resonant streelights
22	Wonderland Wonderlane	Wet night city: Seattle
23	Caroline Pham	Subway Light project
24	Teratornis	Hasse anaerobic digester
25	Naturenet	Coppice stool 2
26	Ned Triffle	Nicola Grimshaw's Natonal Space Center
27	Cmaaccubbin	Bubbly
28	Bas Lammers	Industrial facility
32	Recyclebank	Pdf Poster
36	Janke	Reedbeach
38	Sina Luckhardt	Intelligenter zaehler-smart meter
	Jeremy Levin design	Converted bathroom
39	Sustainable solutions	No mix toilet
40	Joi Ito	Ichigogari, Strawberry greenhouse
44	Gobalassignment files	Aquaponics
45	Burtlum	Aquaculture
47	Frankenstoen	Hypsizygus tessulatus
48	Rachel Swenie	Garden Fl ower
49	"	Fish tanks & filtration system
	"	New neighbor
50	Knafo Kilmor Architects	Agro-South west view
51	"	Agro sh-bal-06
52	Urban farming	Rainbow Apartments 1
53	Linda N	New Crops
54	Jurgen Matern	Eden Project
56	Mithun	Cua Streetview 1
57	"	Cua Streetview 3
	"	Cua Streetview 2
58	Henrik Moltke	Pasona 02.Boy w rice 2
59	"	DSC 0375
59	Henrik Moltke	Pasona 02-Daily maintenance
66	Lumen University	Panorama of greenhouse of Lumen building
68	Crystal court	Panorama 1
69	Daniels Faculty of Architecture	Wall 1 perspectie
70	Kimon Berlin	Alsace Case Pavilion
71	Monster Pete	Touched by an angel
	Michale Fraley	California Academy of sciences 81
72	Joseph Cory & Eyal Malka	i-rise 12
73	"	i-rise 06

Page	Author	Title
75	Hockerton Housing project	House in front of lake
76	Blyzz	Traffic night highway
78	Pelli Clarke Pelli Architects	Transbay Terminal Roof
80	Sharedspace.org	Noorkoping
	"	Drachten
81	Greenwheels.nl	Peugot
83	Nati Gercia	Ciclovía em Bogota
84	Junseita	Smart parking meter
	Wouter Kiel	San Francisco parking
85	David Hepworth	Walking in Seoul
	Gary Bembridge	Seoul Streets; Korea
86	Jean-Louis Zimmermann	Velib, mobilite velo
87	Asian Development Bank	E-Trike
	"	E-Trike 2
88	Jorge Lascar	Transmilneo
94	Buurtvaders Lelystad	Buurtvader groep
96	Woonbron	Achter de voordeur
97	Tim Pierce	A whisk is better then a sifter
100	Robert uit de Bosch	010612_005
101	"	Groene parkeerplaats 1
	"	Just married Paradie
110	Lamiot	Lanxmeer Greenroof
	"	Greenhouse4.2009
111	"	E.V.A Lanxmeer Child Bike 200
116	Giesbert Nijhuis	Giesbert 31
117	"	2009 DSC2452 SRGB
118	"	Giesbert 33
119	"	Giesbert 23
	"	Giesbert 9
	"	Giesbert 27
121	Martin	Greenwich Millenium Village, London 4
122	"	Greenwich Millenium Village, London 5
124	Claire Andrewglaser	Ecoquartier vauban freiburg 1
126	Adeupa de Brest	Quartier Vauban: Immeuble et espaces vertcollectifs
127	Andrew Glaser	Luft SS
128	La Ciita Vitta	Hammarby Canal view
130	"	Pedestrian accessibility
131	"	Streetcar suburb
132	City of Malmo	Urban Green
134	"	Rainwater
135	"	Waterfront
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