

TEFLON CREDIT CARDS EPOXY POLYESTER FLEECE DIESEL KEVLAR KEROSENE LIPSTICK CAR TIRES HERBICIDES GORE-TEX SHAMPOO LUBRICANTS ASPHALT TOOTHBRUSHES NYLON GOLF BALLS FUELS ACRYLIC YOUR DAILY BREAD MOTORCYCLE HELMETS GLUE ACRYLIC PAINT PLE

GLASS PLASTIC BAGS PARACHUTES STYROFOAM ARTIFICIAL LIMBS ETHANE RAYON NAIL POLISH SPANDEX INSECT REPELLENT GASOLINE TOOTHBRUSHES NYLON GOLF BALLS EPOXY POLYESTER FLEECE DIESEL KEVLAR KEROSENE LIPSTICK TEFLON CARPETS PLASTICS FISHING LINE ASPHALT LIFE JACKETS

BEYOND OIL — WHAT’S THAT?

The catch-word of the day is Sustainability. It’s been used so much lately that it has become legitimate to preface any discussion about it by stating that the term itself has become depleted. On the other hand, if we set limitations on our future that are specific and concrete, sustainability becomes something other than a diffuse goal. Suddenly it is not just a distant *somewhere* or a *sometime* – but instead a *Something* that is generated *en passant*, in the process of attempting to solve an acute problem at hand.

The proposition that the world’s oil supply will end could be an exciting premise for a Hollywood production. Powerful men with furrowed brows and their heads in their hands, a nation under threat, a couple of young idealistic kids mustered by a wily curmudgeon that together really get to the bottom of things and not merely save their little town, but the entire future of the nation. All’s well that ends well. Yes, but the end of oil is not just a bracing plot-device. The fact that oil will end one fine day is and will continue to be the inescapable fact that will force us to soon act. It sets the framework that will inform how we will live differently than we do today. Sure, but we’re talking about the future, right? Maybe, but when will it begin?

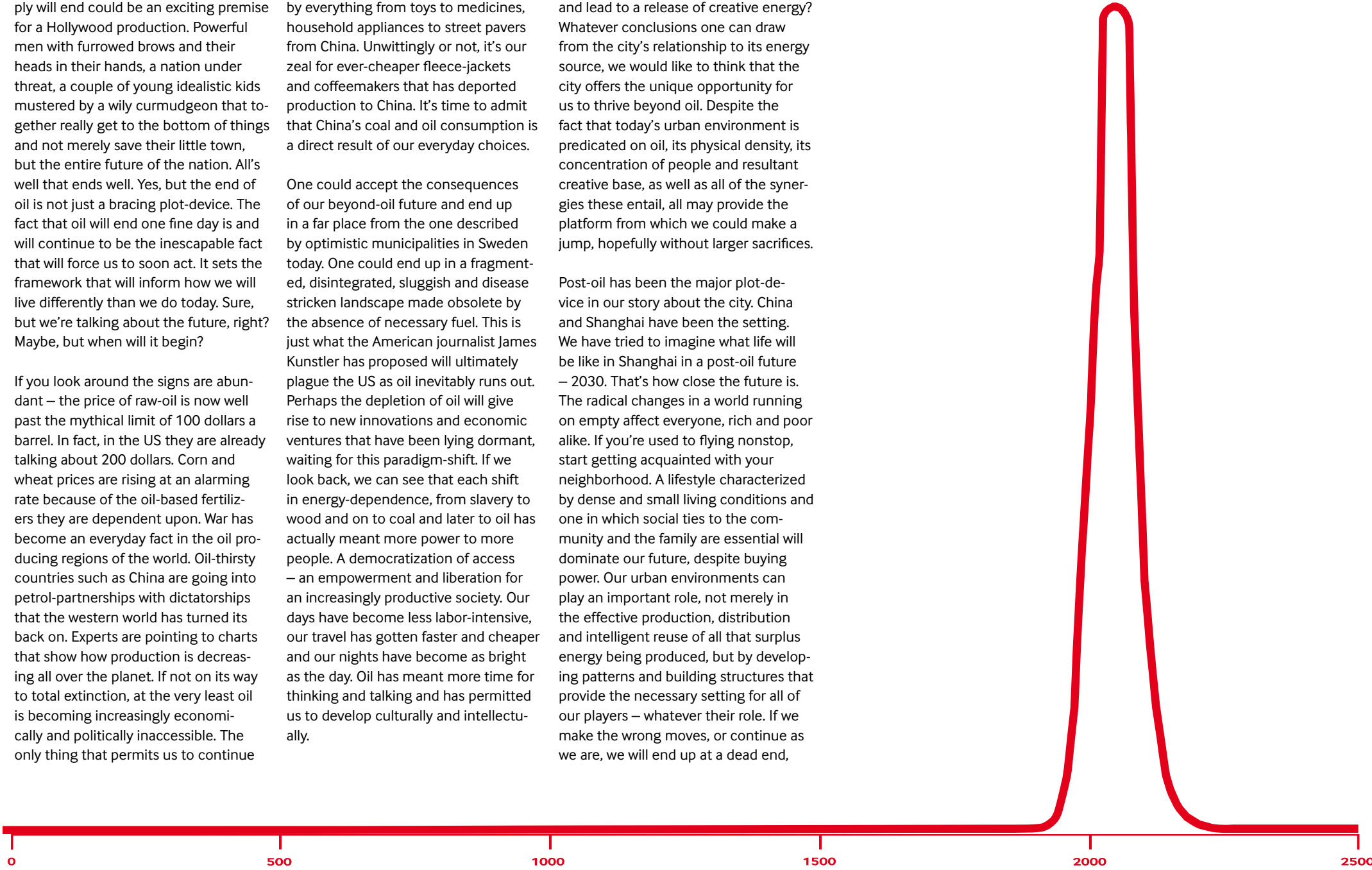
If you look around the signs are abundant – the price of raw-oil is now well past the mythical limit of 100 dollars a barrel. In fact, in the US they are already talking about 200 dollars. Corn and wheat prices are rising at an alarming rate because of the oil-based fertilizers they are dependent upon. War has become an everyday fact in the oil producing regions of the world. Oil-thirsty countries such as China are going into petrol-partnerships with dictatorships that the western world has turned its back on. Experts are pointing to charts that show how production is decreasing all over the planet. If not on its way to total extinction, at the very least oil is becoming increasingly economically and politically inaccessible. The only thing that permits us to continue

Soon enough, we will be surrounded by everything from toys to medicines, household appliances to street pavers from China. Unwittingly or not, it’s our zeal for ever-cheaper fleece-jackets and coffeemakers that has deported production to China. It’s time to admit that China’s coal and oil consumption is a direct result of our everyday choices.

One could accept the consequences of our beyond-oil future and end up in a far place from the one described by optimistic municipalities in Sweden today. One could end up in a fragmented, disintegrated, sluggish and disease stricken landscape made obsolete by the absence of necessary fuel. This is just what the American journalist James Kunstler has proposed will ultimately plague the US as oil inevitably runs out. Perhaps the depletion of oil will give rise to new innovations and economic ventures that have been lying dormant, waiting for this paradigm-shift. If we look back, we can see that each shift in energy-dependence, from slavery to wood and on to coal and later to oil has actually meant more power to more people. A democratization of access – an empowerment and liberation for an increasingly productive society. Our days have become less labor-intensive, our travel has gotten faster and cheaper and our nights have become as bright as the day. Oil has meant more time for thinking and talking and has permitted us to develop culturally and intellectually.

our oil-dependency in fact be a relief and lead to a release of creative energy? Whatever conclusions one can draw from the city’s relationship to its energy source, we would like to think that the city offers the unique opportunity for us to thrive beyond oil. Despite the fact that today’s urban environment is predicated on oil, its physical density, its concentration of people and resultant creative base, as well as all of the synergies these entail, all may provide the platform from which we could make a jump, hopefully without larger sacrifices.

Post-oil has been the major plot-device in our story about the city. China and Shanghai have been the setting. We have tried to imagine what life will be like in Shanghai in a post-oil future – 2030. That’s how close the future is. The radical changes in a world running on empty affect everyone, rich and poor alike. If you’re used to flying nonstop, start getting acquainted with your neighborhood. A lifestyle characterized by dense and small living conditions and one in which social ties to the community and the family are essential will dominate our future, despite buying power. Our urban environments can play an important role, not merely in the effective production, distribution and intelligent reuse of all that surplus energy being produced, but by developing patterns and building structures that provide the necessary setting for all of our players – whatever their role. If we make the wrong moves, or continue as we are, we will end up at a dead end,



being lulled in our gas-driven cradle is the price of air tickets to Thailand that seem to just get cheaper and cheaper. We jump onboard, intoxicated by the everyday luxury of spending a week on the other side of the globe. Why not? We can afford it.

If it weren’t for the sake of climate-change, we would just kick back. After all, we’ve got a subway system, district heating and well-insulated walls. But the fact is that we are all now affected by the consequences of a fossil-based lifestyle, just to differing degrees. Even though some scientists calculate that we can burn all of the remaining oil without sacrificing our climate goals, if coal is added to the equation, the sum becomes quite another.

China’s economy is growing at an unprecedented rate. It is also a nation built on coal. At the same time, we are all participating in this economic miracle with nearly each purchase we make.

A look at the last decades of architectural history shows a correlation between low oil prices and joyful experimentation in human habitation. Visions from the sixties of carnival-like, moving and ephemeral structures populated by scantily-clad and playful individuals seem to spring from a society awash in limitless oil. A few years later, rising prices during the oil crisis create a poignant backdrop to the works of the Italian architectural group Superstudio, whose urban allegories critically reflect on an expanding consumer society. Buckminster Fuller’s geodesic dome, built for the World Expo in 1972, became the quintessential image of a protective shell intended for an impending environmental disaster.

Will the absence of oil lead to dystopia, or will liberation from our oil dependency mean a subsequent intellectual emancipation? What mental and physical spaces are formed when energy changes shape? Could liberation from

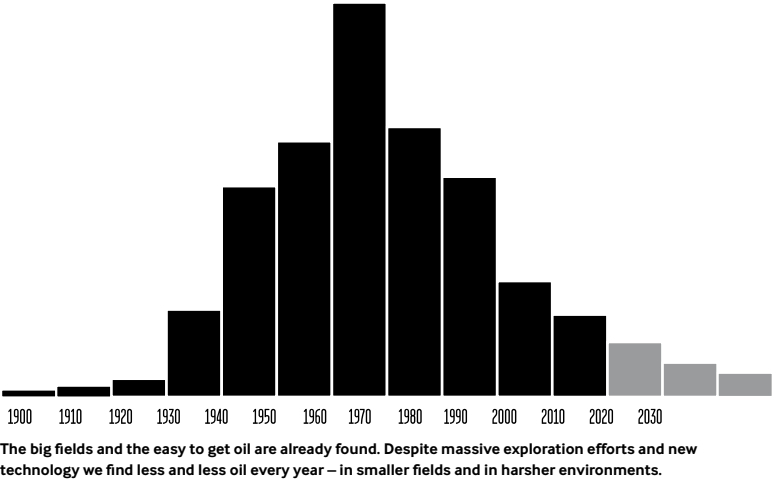
with food production and social spaces that will be guarded and only accessible to a chosen few. If we play our cards right, however, our built environment can become not only a more resource efficient, but even a more forgiving, adaptable and enabling place with the necessary preparedness for changes in production, transport, density and social spaces. Because change is negotiation and we are the negotiators. If we really want a society beyond-oil in which we all find our place, then we have to create a new space. After all, the only certainty is that change is on its way.

May 2008
Henrietta Palmer, professor of architecture and Michael Dudley, architect and teacher for Recources.07 at the Royal University College of Fine Arts Skeppsholmen, Stockholm

PEAK OIL IS NOW

There’s no guarantee that everything’s going to be OK. At the rate we’re living, it may all end within a few decades. Our modern, convenient, everyday life is leading us towards disaster, and there’s a risk that we’ll be just too lazy and irresponsible to change our habits in time.

DISCOVERIES PEAKED IN 1964



Chances are that we’ll continue driving petrol cars and airplanes, using coal- and gas-produced electricity, eating food from large-scale meat farms and wasting water until our resources become so scarce and expensive that our economic systems break down. All of this behavior resulting in the emissions of greenhouse gases that will make the world so warm that life will become very difficult if not impossible. It seems unreal, but it may actually happen.

However, this is not the grown-up thing to do. The responsible thing to do is to quickly change our ways of using energy and resources. Energy must be produced without emitting greenhouse gases. This will make energy more expensive, so it must be used more efficiently. This is equally true for material resources and food. We have to change our ways of building and using our cities, and we have to change buildings and spaces. We have to change our attitude toward how we consume our world and we have to design solutions that make it easier to live in a responsible way.

Peak oil
Oil is a finite resource. Our 130-year continuous increase in oil production will one day be followed by a decline. Peak Oil is the term used to define this turning point - a moment of maximum production that will never be reached again.

Peak oil can be predicted. In 1956, King Hubbert, the geologist who first developed the Peak oil-theory accurately predicted the peak in the United States’ oil production that occurred twenty years later. There is an increasing consensus today that the global peak is imminent, or that we have even passed it.

Oil exists all over the world, but more than 50% of all known oil comes from no more than 130 large fields. Most of them, discovered in the Middle East during the fifties and sixties, have well reached their peak. Today the world uses much more oil each year than is discovered and obviously, there is a lack of new frontiers for exploration.

Can you tell an oil-based product from one that’s not?
Today, we take the abundance of oil and other cheap resources for granted. Without oil, our everyday lives would look very different.

Transport
Basically, all transportation of goods and people involves oil - on land, sea and air. If it’s not fuel, it’s in the material of the vehicle.

Food
Production of food consumes enormous amounts of energy, particularly red meat. Even wheat and other common grains that we use in our bread are produced with artificial fertilizers, based on oil.

Clothing
Polyester is the second most used textile fibre in the world. It is oil.

Buildings
Heating and cooling of buildings is dependent on cheap energy. Oil is often used as fuel in combined heat and power plants. Numerous building components are made of plastic. Paint is often oil-based.

Fossil fuel is raising the temperature
Global warming is no longer a warning about the future. Temperatures are already rising. Current climate change is primarily due to the increase of greenhouse gases in the atmosphere as a result of mankind’s influence starting with the industrial revolution. These changes will accelerate in ways and with effects that are unforeseeable and potentially disastrous, since changes in natural systems are non-linear.

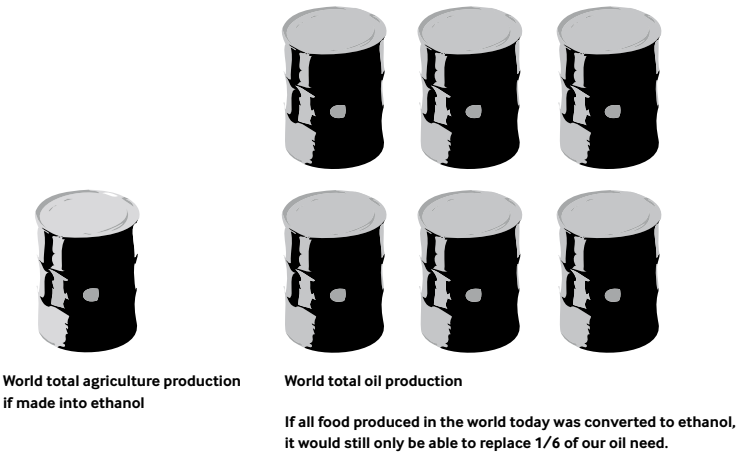
Carbon dioxide (CO₂) is presently the most essential component influencing climate change. Methane is more dangerous but its concentration is much lower, about one-fourth of carbon dioxide’s.

Fossil fuels have produced three-quarters of the increase in CO₂ over the past 20 years. The two most significant sources of CO₂ are oil and coal; each standing for a third of the total output.

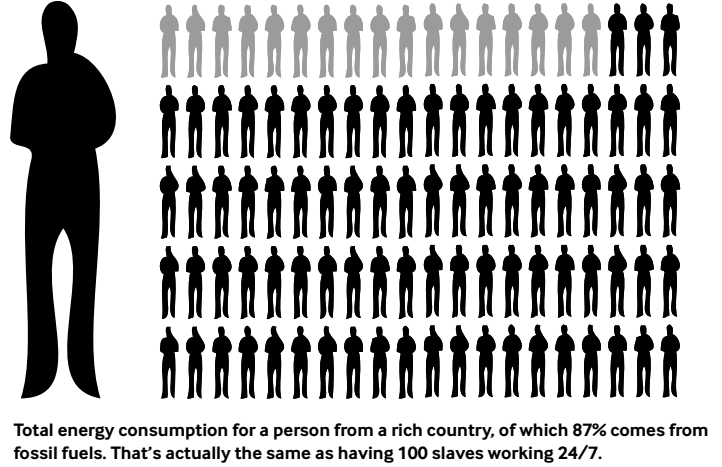
China, a world leader in both coal production and consumption, plans to open 500 new coal-fired power plants the next decade. It may well respond to a shortage of oil by increasing the use of coal even more. Considering the facts on global warming, this is not a suitable solution.

Peak oil – a threat?
Peak oil is considered a threat by the financial and political establishments of the world. However, given the greater threat posed by the continued use of fossil fuels, we should consider ourselves fortunate that oil is running out. It will force us to shift to new energy sources - preferably ones that won’t kill us. Seeing Peak oil as a threat is a logical error - symptomatic of an archaic world view and of a society living in denial. It is clinging to a self-destructive economy that will not last. If Peak Oil is a problem, it’s an attitude problem.

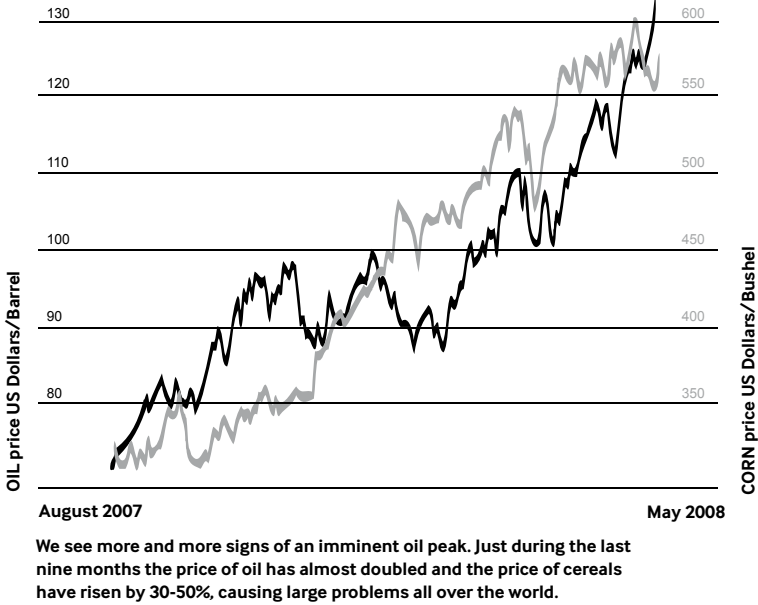
ETHANOL WON’T SAVE US



IF THERE WAS NO OIL...



FOOD FOLLOWS OIL



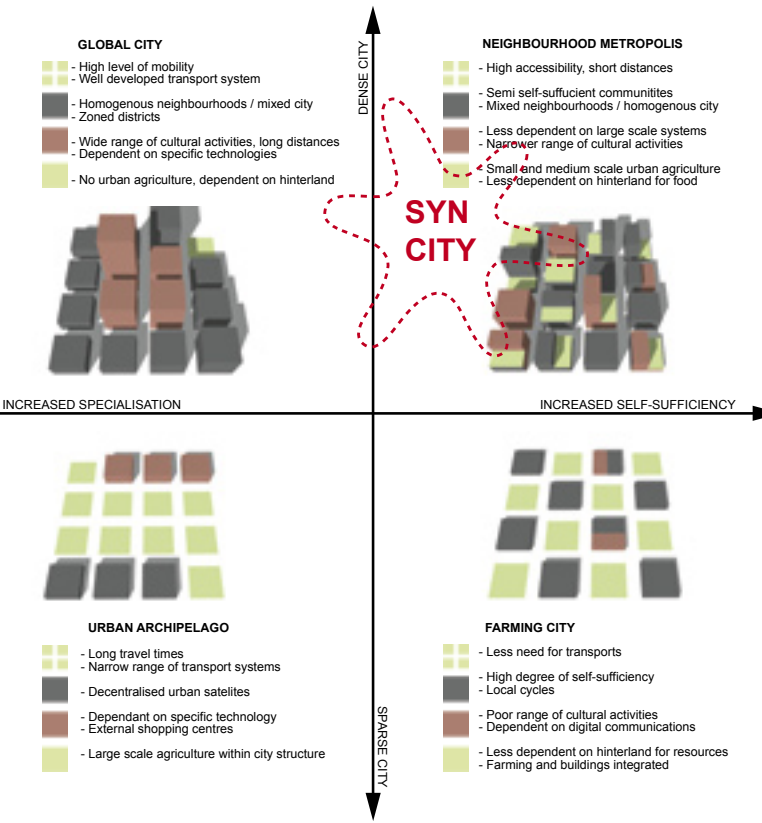
BEYOND OIL SCENARIOS

How will our cities develop beyond oil? We can assume that cheap energy will no longer be available, but what other challenges face us?

while others argue that we will cramp together in ever-tighter environments. Will we all need to become a jack-of-all-trades and increasingly self-sufficient or will we specialize even more?

Some claim that we will have to return to more rural lifestyles

What consequences does this have for the shape and organisation of the city? We have identified four possible scenarios for cities beyond oil.



SHANGHAI TOUCHDOWN

Our setting is Shanghai; the most populous city in China and one of the largest urban areas in the world with a population of ca. 20 million people. The city is located on China’s east coast at the mouth of the Yangtze River



Shanghai was settled as a small fish-ing village in the year 751 AD. The construction of a city wall in 1553 AD marked its transition to a larger urban settlement but it wasn’t until the 19th century that the city became a town of national importance. During this era, Shanghai developed into an important trading post in the East Asia Sea. When the opium wars with the British ended in 1841 the city opened up to westerners and gained the reputation of being a “sin city” for its several international settlements. Tradesmen from all over the world established businesses in the fast growing city, enjoying the wild lifestyle the city offered.

Today Shanghai is still considered China’s most important international port, with the world’s largest cargo harbour. Early western influences led the way for inter-national corporations, architecture and urban lifestyles. These influences can still be traced in the li-long blocks and the Shikumen housing typology.

Shanghai is an amazing metropolis developing at an incredible rate and is presently the eighth fastest-growing city in the world, gaining 29.4 new residents each hour. This places our proposal at the centre of the ongoing Chinese urbanization with all the consequences it brings on a global scale. To transform this energy consuming giant into an urban environment capable of surviving a future beyond fossil fuels is an immense challenge, but to paraphrase Frank Sinatra: if we can make it there, we can make it anywhere!

Luwan

The case study area of Resources.07 – Luwan – is one of 18 administrative districts in Shanghai and has 300,000 inhabitants. Its location within the urban centre makes it one of the most prosperous parts of the city. Luwan consists of a mixture of residential, commercial and office buildings. Part of Shanghai’s central business district is situated in

the north of Luwan. The riverside area, which is a former industrial site, is now a part of the Expo 2010 area.

A heterogeneous moment

The streets of Shanghai present a blended pattern of differences. The mix of diverse scales, forms, functions and livelihoods occurs on a compact urban scale. The dissimilarities can be seen between different city districts, but are even more manifest within the districts; from block to block and building to building.

This heterogenic city is foremost a result of the rapid change Shanghai has undergone the last decades. Three-story traditional li-long structures are being replaced with thirty-story towers in gated courtyards. The transformation seems to take place haphazardly and is not yet complete, leaving the city an amalgamation of building types housing habitants and activities of different kinds. One might even argue that today’s Shanghai is a heterogenic instant between two homogeneities – the past and the future, a missing link between an all-low-rise, socially uniform, one-party city and an all-high-rise, seg-regated, market economy city.



Even though the homogeneous city never was and never will be more than a chimera, the kind of blend we find in Shanghai today may soon be lost. The momentary, resilient heterogenic web may be soon replaced by a highly specialized and more uniform urban pattern that would be far more vulnerable and transportation dependent. This would likely foster a city with differences and segregation on a large urban scale and with similarities and sameness on a neighbourhood level.

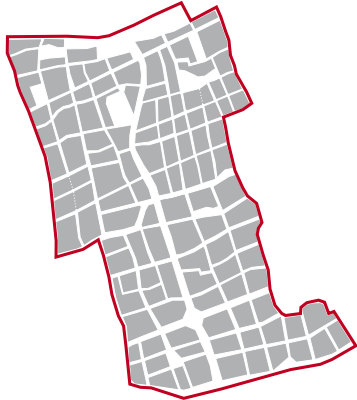
The Gated Community’s Chinese Heritage

When studying the rapid development of Shanghai one is struck by the predominance of the gated community model. Almost all new residential projects follow the same formula, consisting of around ten extruded slabs of approximately 30 stories, grouped in a common park surrounded by a wall. Although at first glance this may seem to be a concept imported from the west, this type of cellular-urbanism actually has its roots in Chinese planning.

Virtually all Shanghai’s inhabitants live in some kind of compound, weather gated or not. It originates both from the



characteristic li-long structure and the Maoist concept of the Danwei – work unit. After the revolution the entire so-ciety was divided into Danweis centred around state-owned enterprises. All inhabitants belonged to a Danwei where they lived and worked. The Danwei even controlled large parts of their social life. In recent years, state-owned enterprises have lost power to private and multi-national companies and the Danwei-model is being replaced by other forms of organisation; in many ways similar but driven by radically different forces.



Luwan – the case study area





In the Danwei system the citizen was assigned a unit that contained all necessary functions for everyday life, including laundry facilities, kindergartens, schools, clinics and meeting halls, all enclosed within a walled compound. In fact, the residents rarely had to leave its grounds.

In comparison, the new neighbourhoods – xiaoqus – are usually large-scale projects created by one company, but the residents are not restricted to one employer and have freely chosen

to live there. Security is a high priority for today's Chinese and with growing income differences and an every increasing migration to the city, people tend to cluster together with their own income group. The emergence of the xiaoqu goes hand-in-hand with the new Chinese state policy of community governance based on units of 5 000 – 15 000 inhabitants with responsibility for matters such as local rule, sanitation, welfare and education. It may seem that this would lead to increased integration but has shown to have the opposite



effect. The cellular structure of the Danwei city with few links between the cells created a particular socialist urbanism in which the city was a collection of independent communities. In contrast, the segregation of the xiaoqus based on economics and insecurity is less specific to China and rather has its precedent in the worldwide urban patterns of our time.

Chinese use of space

The use of space in the Chinese culture differs from that in the West in a number

ways. One remarkable example is the habit of establishing businesses such as shops and restaurants on the upper floors of buildings; public functions that would typically be found only on the street level in a Western city. Differing marketing strategies, informal networks and word of mouth serves to bring customers to these "invisible" commercial spaces. There is also a greater tendency to extend private space into public space; in some areas people can be seen eating, playing mahjong, or even sleeping in an armchair, on the

street outside their dwelling. This may be partly attributed to poorer economic and residential conditions - substandard living quarters - but nonetheless constitutes a significant feature. As the Li-long - traditional residential blocks in downtown Shanghai are being torn down and replaced by new skyscrapers, the former tenants (in particular the elderly) who are expelled still tend to gather to socialize outside the entrances of their new suburban high-rise homes. In general, there is a greater readiness to publicly do things which are done privately or in secluded groups in a western context. The Qi-Gong morning exercises on sidewalks and in parks are but one example. Parks are particularly important in this respect. People gather here spontaneously to exercise, dance, fly kites, and most surprisingly to westerners, sing together with strangers. The parks also offer a refuge for teenage couples who are not allowed to meet alone in their parent's homes. Some couples may wait in line for hours for a turn to sit alone together for a little while on a park bench.

The Elevated Highway – a Symbol of Modernity?

Although the percentage of car ownership in China is still very low (on par with Albania), the country is in the midst of a highway construction boom on a previously unseen, global scale. Last year China built 8,300 km of highways – which is comparable with two thirds of Germany's entire Autobahn system. Currently, the total length of Chinese highways stretches 55,000 km and will surpass the US highway system by the end of the coming decade. All this seems in preparation for a future car-based society. The number of cars in China is expected to increase with 130 million by 2015.



In Shanghai, the highways have been given a particularly dominant role in the cityscape by being elevated rather than hidden in tunnels. Raised on concrete pillars, sometimes reaching heights of 40 meters, they pierce the city as majestic symbols of the fossil-fuel based lifestyle. Surprisingly however, their effect on urban life at ground level is minimal. Below them are often streets, which are easier to cross than the massive 100-meter wide roads of Beijing and occasionally, even parks appear. The surrounding urban fabric shows a remarkable indifference to the existence of these elevated highways. While in the west they would have lead to massive consequences such as noise screens and security distances, not to mention public protests, here they are often treated almost as if they weren't there.

What will happen to this system when oil runs out? Will it stand as an anachronistic relic of a never fulfilled dream? Or can it be revitalized and given new uses?

SYN CITY

WE SEE PEAK OIL AS AN OPPORTUNITY

- to question faulty assumptions in global systems
- to reshape our living environments
- to build a future society that no longer lives above its assets

WE EMBRACE THE CITY

While cities are the great consumers of the world they also have the dynamic and density it takes to build a resource-efficient society

WE PROPOSE A CITY SIGNIFIED BY

- synergy of systems
- synchronized processes and activities
- symbiosis of people, communities and activities
- synthesis of new ideas and structures

STRATEGIES

OPTIMIZE THE USE OF SPACE AND STRUCTURES

- More buildings, more greenery, more cultivation and more public space
- Left-over spaces are recognized and developed

WASTE NOTHING

- Existing structures are renovated, retro-fitted or converted.
- Organic waste is used for energy production
- Grey water is cleaned locally
- Heat is re-used or re-distributed
- Trade with used goods is developed, integrated and valued

SYNCHRONIZE PROCESSES AND ACTIVITIES

- Access to goods and services supplements ownership
- Things, spaces and functions are increasingly shared
- Co-use and multi-functionality is promoted, both in space and in time

CO-ORDINATE TO PROMOTE SYNERGY

- Tasks are solved on the appropriate level and scale
- Different parts of the city specialize in different tasks
- The waste of one process is the resource of another

POTENTIAL

HIGHWAYS

The elevated highways of Shanghai - once a symbol of a car based utopia – are transformed into a new kind of synergetic infrastructure that connects the different parts of the city, distributes goods & energy and provides the basis for new structures.

SYN-CELLS

The large-scale superblocks that compose the city grid are turned into Syn-Cells – local cycles that can develop independently and collaborate to form a city where different solutions are allowed to co-exist.

HETEROGENEITY

The diverse structure of the city is developed and remains compact – mixing different activities, livelihoods and building typologies. This prevents sprawl and creates a density of potentials.

SYN CITY

LAYIN' THE TRACKS

Mobility is to the city what the circulatory system is to the body; essential for all life functions. In post-fossil Shanghai the city has transformed into a multi-layered city where the street level is largely accessible to people, for walking, biking, playing and meeting.



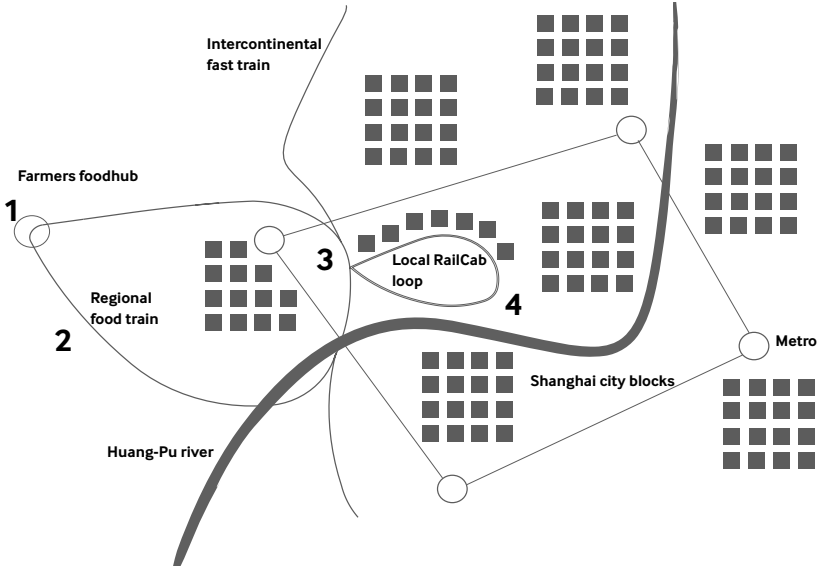
"Zhu is coming from Paris and has been travelling for almost 70 hours. She knows I'm here to pick her up, but she has no idea that I've booked a room for us, with a sauna and massage. She's going to be delighted!"
Chang Wei, boyfriend of Zhu Wenqi, CEO/Developer



1 Food is collected at country-side "foodhubs"...



2 ...and brought to the city in customized containers on the regional foodtrain.



The daily activity of transport and the public spaces associated with travelling have been radically improved, making life a bit easier and more enjoyable. Transportation is based on a circular flow of resources, where organic waste creates biogas for buses and working vehicles, which also use self-charging batteries and plug-in hybrid technique. Taxis and car-pool vehicles share the same technology.

In a future Luwan, cars still travel the streets, but use biogas and are greatly reduced in numbers. Railbound public transport is the main system for people, goods and waste – the RailCab.

Accessibility for cars and buses is regulated with different priorities given to vehicles and non-motorized movement on differing streets. This creates separated paths for motorized and non-motorized traffic flows, reinforcing the liveability on street level. New roads can never stop car-jams. Public transport can.

RailCab
RailCab is an elevated transport of people goods and waste. The same elevated infrastructure is used for all logistical

needs. Travel is made without intermediate stops, which shortens travel times radically. Vehicles are moved by electrically induced magnetism, providing a lot of movement per energy input. There are various types of vehicles, providing different types of transportation:

Public transport
Differently sized vehicles that can be linked to trains allow greater speeds. The journey can be taken without co-passengers, but at a lower fare if one is willing to ride together with others, which the computerized system offers when you order a ride via sms or at the closest RailCab stop.

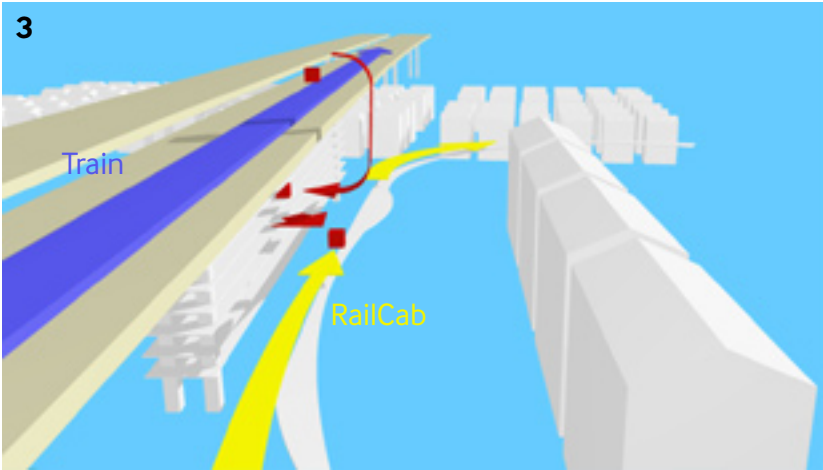
Goods and waste mover
Vehicles are customized to their specific use: for example in-built cooling to transport fresh food, low-maintenance, easily cleaned vehicles for transporting organic waste and garbage as well as platform types for container moving etc. Loading and unloading is run automatically on-demand with cargo robotics.

Dual-Mode
RailCab vehicles can be fixed on the track, or be dual-mode, meaning they can use both street and track. On street

level, they use self-charging batteries and plug-in hybrid technology like other cars, and require a driver. On the tracks they use the energy of the system and are steared automatically. The range of hybrid-powered cars is limited. The dual-mode principle avoids this disadvantage, allowing a dense transportation pattern in a local area using the regular street network and travelling on the tracks for longer distances. Supported by the system's energy while on the track, the hybrid energy lasts longer. This is beneficial to all types of travelling, both personal and service-oriented. For example: waste collection can be taken care of locally in a collector vehicle on the street, then connected to the elevated system for final transport to the power plant.

Intercontinental travel
Long-distance travel is possible by highspeed-train, linking metropolitan areas in Europe and Asia. Train stations are the airports of the 21st century. In Luwan, there is a new train station placed on the old elevated highway which connects central Shanghai to other city-centers of the world.

Travel on water
The Huang-pu river is used for transporting both goods and people, which is very popular with tourists. It allows for new movement patterns in the city and is also used regularly by commuters. Ferry stations connect to RailCab stations, so transfer is easy.



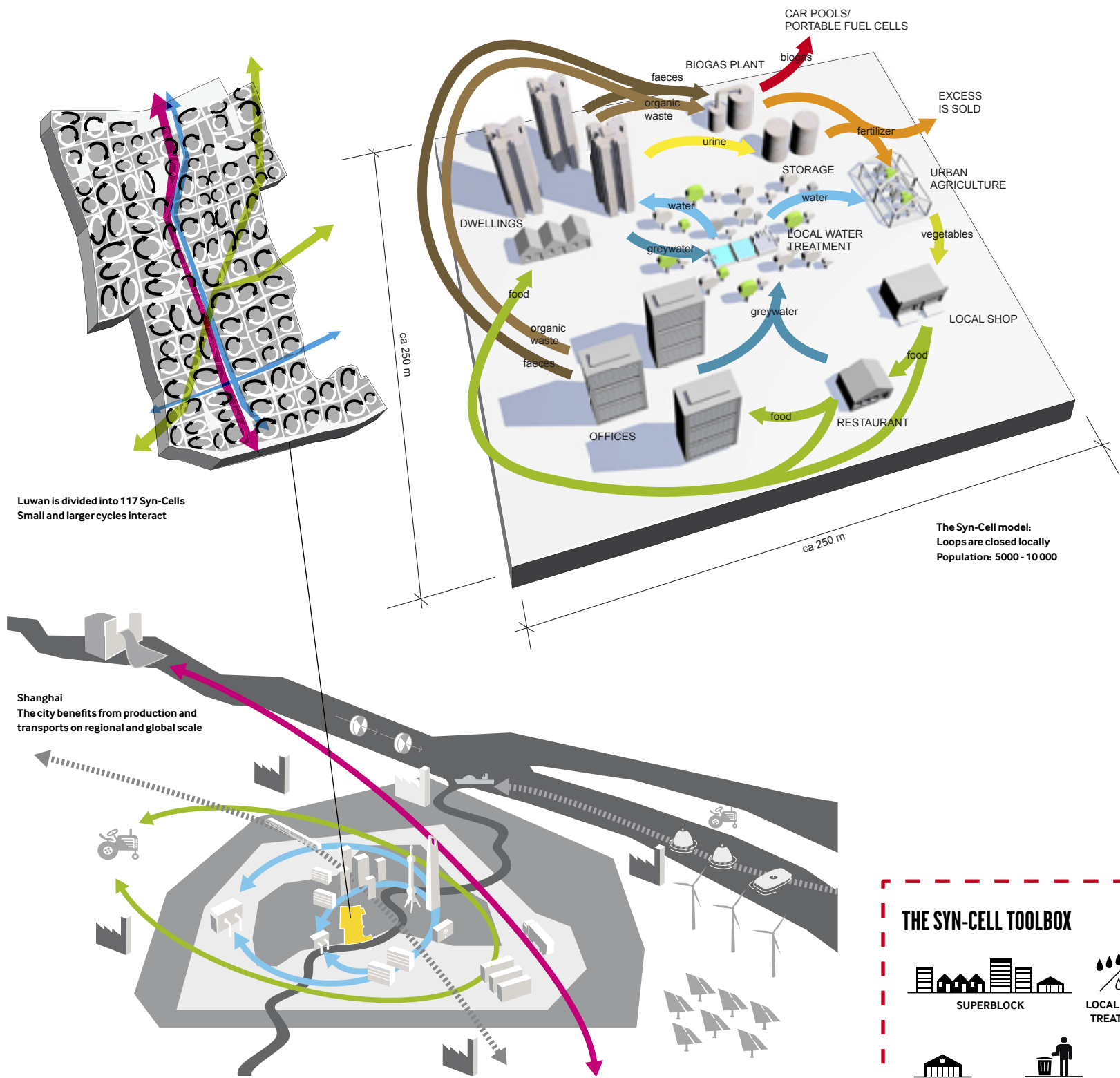
3 Reloading food transport cargo from regional train to local RailCab loop. The cargo is automatically unloaded to temporary storage under the highway, for tranfer and distribution. It is picked up on demand by a RailCab goods-mover.



4 Automatic goods delivery at local store, located at RailCab station in high-rise buildings. The RailCab network is especially connected with a new structure consisting of elevated walkways bringing public life and commerce to the upper levels of the city.

LOCALIZE IT

Better use and distribution of resources is crucial beyond oil. The city is a complex ecosystem made up of people, flows and relations that are impossible to rationalize. By dividing it into smaller units, larger than normal blocks but smaller than a whole district, different solutions can co-exist, local loops can be created and synergy effects achieved.

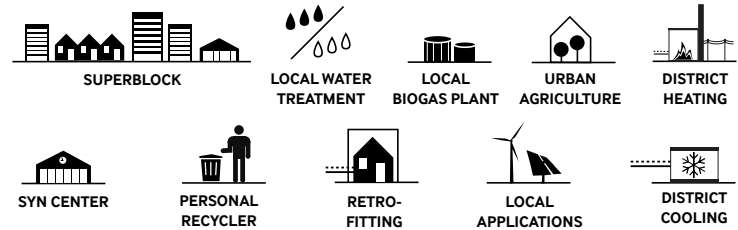


All resources don't need to be handled on the large scales they are today. By introducing a few new components, like local biogas plants and greywater cleaning, local cycles are created which minimize transports, engage the users and generate income. In keeping with the existing infrastructure, Luwan is divided into 117 Syn-Cells which take on the responsibility for these issues. They can be run by developers or the local communities and different Syn-Cells can be configured in different ways according to local conditions, desires and financial abilities. In this way new incentives and frameworks are created that encourage a multitude of solutions, initiatives and actors to co-exist and develop simultaneously.

The Syn-Cells are not completely self-sufficient, but rather connected by those systems that work better on larger scales, such as district heating and cooling. The key is that all things are solved on the appropriate level in order to minimize transport and administrative distances. A development that is driven by local actors puts more stress on the information system, and therefore a system for distributing information, resources and flows between the Syn-Cells is developed. These systems and the coordination of them is the responsibility of the authorities that also have an important role to play in the initial start-up phase. Altogether this generates a new city structure that is more adaptable and resilient to change and less restricted by top-down planning directives.

PROBLEMS ARE SOLVED ON APPROPRIATE LEVEL

THE SYN-CELL TOOLBOX



SYNERGY SELLS - A FINANCIAL MODEL



REAL ESTATE OWNER

Managing
The Syn-Cell can be implemented, owned and managed in three different ways. Providing different models for implementation is important so that local conditions are considered.



HOUSING COOPERATIVE

The Housing Cooperative
A housing cooperative is formed and with help from experts they start planning the Syn-Cell by evaluating the local conditions. Based on this analysis they build the system. The day-to-day management can be operated by the cooperative itself or be outsourced to a specialized company.



LOCAL ENTREPRENEUR

The Private Company
A privately owned investment company is contracted by the Syn-Cell. By contracting a private company they sell the right to build, operate and own the components of the Syn-Cell. The resources are then traded within the Syn-Cell and also on the Synergy Grid.



EQUITY PARTNER

The Joint Venture
A new company is created. It is owned by the housing cooperative together with an equity partner. The joint venture company is responsible for daily management. The dividends are divided between the owners. After a predetermined period of time the ownership of the joint venture is transferred to the housing cooperative. The key driver for the equity partner is price developments in resources and energy.



GOVERNMENT BANK

The Financing

The economic drivers for the introduction and operation of the Syn-Cell can be divided into two categories: market economy and governmental subsidizations and loans.

The market economy part is strongly coupled to increasing prices for resources and energy. The subsidization and loan part is based on the reduction of China's external costs related to resource instability and environmental stress.

While the introduction of the Syn-Cells vital functions and infrastructure is a massively expensive process, it is necessary, both eco-

nomically and environmentally. Some functions and components like sun-condenser coolers will have a payback time of just a few years. Others, like grey water treatment will have a lengthy payback, if at all.

However, all components are of importance in order to create a functional Synergy-Cell, and in order to design and implement a total system the Chinese authorities need to introduce new legislation and economic incentives. The economic incentives should be connected to the components' and the systems' sustainable performance - the better performance the better economic incentive.

If a joint venture between an equity investor and housing cooperative build a system with high sustainable performance they should get long-term loans with partly or fully reduced interest rates and subsidizations. The performance is evaluated continuously and the interest rate is adjusted accordingly.

Based on this principle the Chinese government needs to introduce a fund financed by carbon dioxide emission fees, the People's Fund for a better city, better life.

FEED THE CITY

Food prices have risen dramatically during the last years and the world is slowly sinking into a food crisis of unforeseen scale. Developing urban agriculture may be the key to more resilient cities.



FROM GATED COMMUNITY TO AGRICULTURE UNIT — A STORY ABOUT WANG KEBIAO



Wang Kebiao 28,
Vendor and food producer.

What is your job in this unit?
I'm a foodfactory owner. I'm engaged in production and run a shop in the block.

Production? Tell me more...
I rent space on the roofs and facades of buildings and install an aeroponic system in which I cultivate fruit and vegetables.

Doesn't that cause problems for the residents?
No, on the contrary. The plants

shade their apartments during hot summer days and my system provides all the vegetables needed to sustain our block.

How did it all start?
It began when the energy costs went up and food supplies got scarce. We realized that our block needed to do something. Some of us got help from microcredits. We started small and eventually grew larger.

Is the unit completely self-sufficient now?
No, staple articles such as rice and some fish products are still imported.

1 **15**

Urban agriculture can be 15 times more productive than rural.

50 **50** **50** **50**

1 m3 land can produce more than 50 kg green food/year. Through elevated production space is used better.



An ordinary Shanghai high-rise block retrofitted to become an agriculture unit, with ponds bamboo forests and roof gardens. Besides the functionality there is a quality of bringing nature into the city.



The block 2008; a traditional gated high-rise development with a tidy but un-productive courtyard.



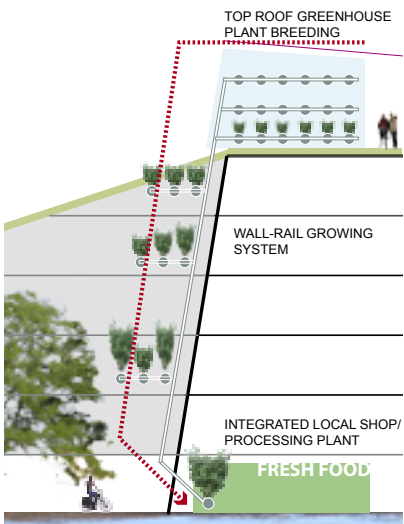
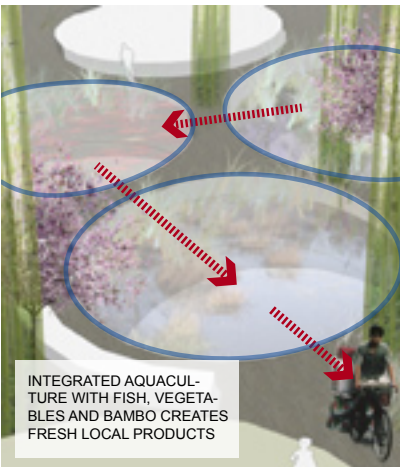
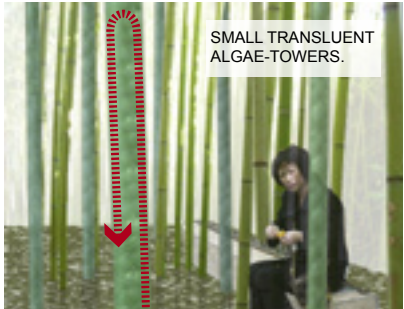
Urban Agriculture
Urban agriculture produces, processes and markets food and fuel in response to demands from the city. It applies intensive production methods by using and reusing natural resources and urban waste in order to yield a diversity of crops. Locally grown food, like vegetables and aquatic products can cut transportation needs. In order to develop large-scale urban agriculture we need to rethink production methods and develop new systems for cultivating. One example is the enormous potential for growing without soil. Plants can grow in almost anything, from Rockwool to air, as long as they are supplied with water and nutrients. The obvious advantage is resource efficiency. Urban agriculture schemes can be applied to both existing and new buildings, as well as simple structures. It can shade and green the city during the summer and can clean urban waste water.

Grow in air – aeroponics
Aeroponics is a technique whereby plants are grown in mere air. Nutrient fog is regularly injected in the root zone. The system is water and nutrient efficient and the necessary support structure can be very lightweight. Small-scale commercial units presently exist and NASA is developing the technology for use in long-distance space travel. We have invented an aeroponics system for the city in which plants are grown in mobile tubes, enabling their placement on rooftops and facades.

Integrated aquaculture
Integrated Aquaculture is a water-based method in which waste from one species is recycled to become

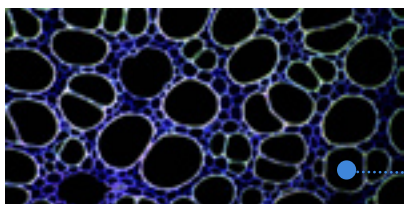
input, fertilizer and food for another. By mimicking ecosystems a synergetic food production is created. A balanced system gives environmental, economical and social advantages. Through a diversified system, risk is reduced. It can be configured through a series of ponds with differing habitats. Fish, as well as various cash crops can be grown simultaneously taking care of the cleaning and storage of water for other uses.

Algae – both food and fuel
Algaculture is a form of aquaculture involving the farming of algae. Algae can be used both as nutrient rich food, e.g. sea salad and spirulina, as well as a resource for bio-diesel production. Using algae for Bio-diesel is up to 30 times more space efficient than other production methods. Algae is best grown in sealed monocultures, due to the risk of interference from unwanted species and the need for a controlled nutrient supply. It prefers a shaded environment, but due to its fast growth, cultures on top quickly shade the cultures beneath them. We have developed a system of thin translucent algae towers combined with bamboo cultivation that together create both efficient and enchanting new city forests

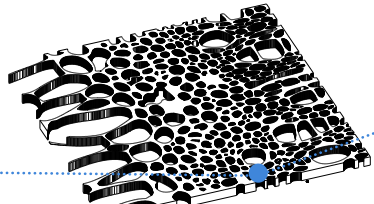


SHAPE UP

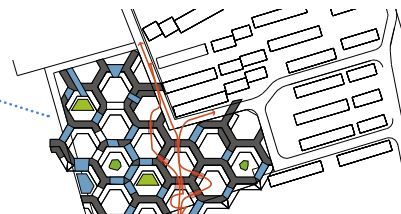
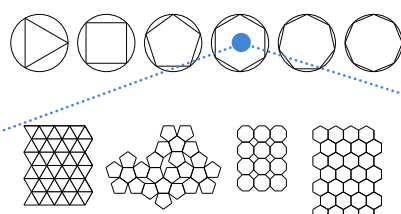
High-rise developments in gated courtyards are the routine solution to meet demands for high floor area ratio, but there are other ways of creating dense cityscapes. We need new typologies that offer effective land use while enriching the city with diverse forms and added potentials.



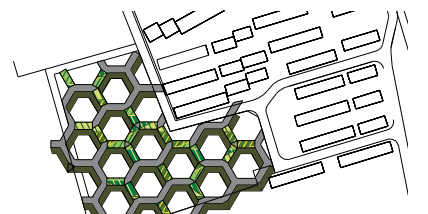
Fern-fibre



Maple-fibre



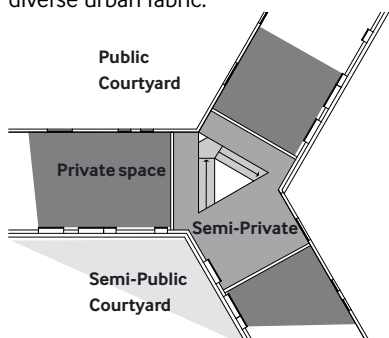
On groundlevel the homogenous building-pattern is varied between public passages and private courtyards. Water pools and a system of portals are planned so that natural ventilation can reduce the energy needed for cooling.



Plan showing two main functions on roof level, terraces and roof-gardens.

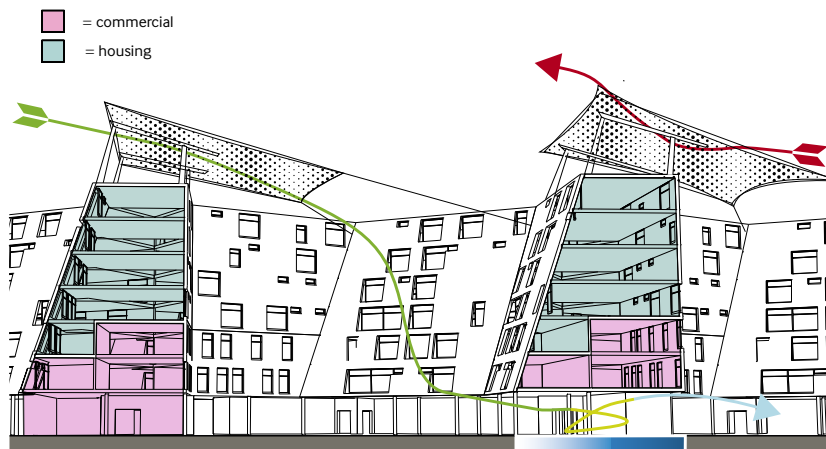
THE BUILDING AS A NETWORK

Inventing new building structures is a Shanghaiese tradition. Throughout history Shanghai has created a series of housing typologies, often as a result of combining traditions from the various nationalities that have co-existed in this cosmopolitan port-city. While these existing structures all enrich the cityscape, the city continues to develop and so should the forms we build. There is no need to invent a new definitive typology that spreads throughout the city, completely replacing the existing. Instead, we should develop strategies that can work together with the existing diverse urban fabric.



Programmatic diversity

The density for the new pattern measured in floor area/land area is comparable with standard high-rise developments (having a floor area ratio of 3). However, the fibre-typology provides social spaces of an entirely different quality, both in terms of scale and privacy. The gate surrounding the courtyard is no more. In its place a series of borders delimit the small courtyards. A gradation in scale provides a transition from public to private. This is created by demarcations on the ground level as well as in the interiors where each apartment is given a forecourt to be used as an indoor common. The fibre structure is planned for mixed-use, with diverse programs including commercial space and private housing. It has the potential to accommodate walkways and transport on the roof areas, but these spaces can even be used as a second courtyard for gardening, tai-chi or other leisure activities.



During the hot season, prevailing S.W wind is allowed to pass through the block thereby reducing the need for airconditioning. The effect is enhanced by passing over water surfaces.

During the cold season, prevailing N.E wind is deflected from the built structure, reducing the need for heating.

Inspiration for new typologies

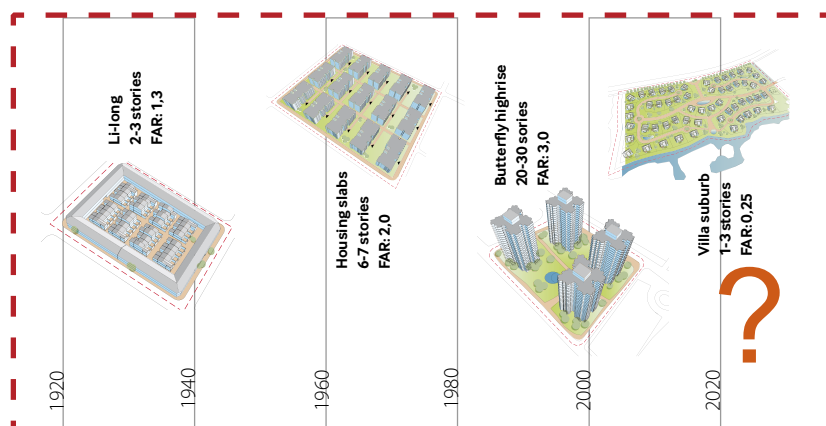
Using biomimetic methodology, a new building typology was inspired by plant fibre. Cell structures in plants create a pattern in which the built matter creates a connected web. Translating this to an urban fabric creates networks in which buildings become the connective links. The form of plant fibre has been analyzed and simplified in order to find a suitable geometry that provides a similar quality. The hexagon form was chosen since it provides an advantageous form for open space, sun angles, as well as connective points - the Honeycomb.

Building materials

Post-oil, we can't rely on energy consuming building materials such as steel, concrete or asphalt. Instead, we should utilize local resources such as wood, bamboo, brick from local clay and stone. Recycled materials, such as glass or metal may also be appropriate. When reinforced concrete or steel constructions are no longer an option, what will happen with high-rise construction?



"We were so happy to not miss out on the dance class today, even though we were tired after a morning at work in the community garden. Dancing is really a great way to get to know our neighbours" Chen Lingmei, 70, Retired



Development of Shanghaiese housing typologies



HIGHWAY TO HEAL

The elevated highways of Shanghai are majestic symbols of a lifestyle fueled by fossils. Regarded as an asset to be used creatively in the making of a resource efficient city, they are reinvented and upgraded.



The essential quality of the highway - being elevated - is utilized to separate fast and heavy traffic such as cars from the street level, thereby offering freedom and safety for bikers and pedestrians on the ground level. It's main transportation task is to carry the high-speed trains that connect Shanghai with the rest of the world and to serve the city's system for automatic block-to-block distribution of food, goods, waste and people, as well as connecting

regional trains with the local RailCab loops. It carries the distribution-systems for energy, water and sanitary drainage between the city's Syn-Cell blocks. It's concrete structure, containing a large amount of embodied energy is exploited for supporting new buildings and infrastructure. On top of the new buildings are placed elevated parks, recreation grounds and public space, all having direct contact with the sky. Elevated walkways are added, providing

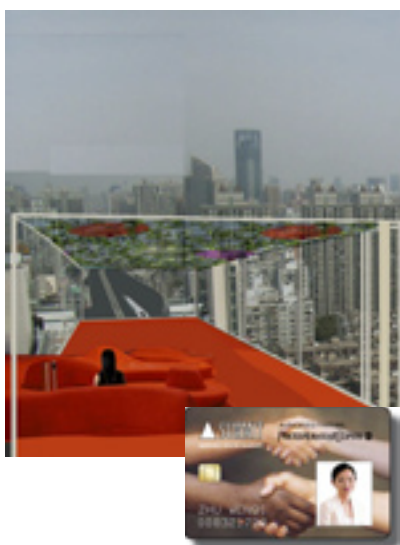
public access to the higher levels of the city. As a strong architectural element in the city, it creates grand public spaces on ground level. Weather-protected parkways for pedestrians and bikers are sheltered by the highway by means of shields, curtains and by partial glazing.



NEW JOBS FOR AN OLD GIANT — MULTILEVEL AND MULTIUSE



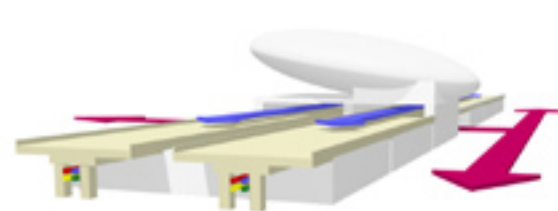
"Our youngest son was very lucky to find an apartment on the same level as the RailCab station in that house. He opened a small shop and the business is going well since there are always people coming to and from the station."
Tan Honzhang & Chen Lingmei, 70, Retired



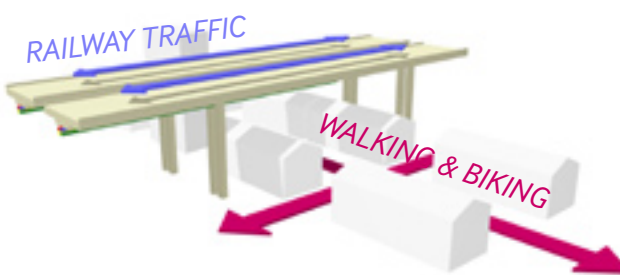
"I love coming to the VIP saloon of the Serene Sky Pavilion to watch the city and enjoy the peaceful ambience. It is a perfect place for business meetings. I always come a little early to prepare myself in this splendid environment"
Zhu Wenqui, 30, CEO/Developer



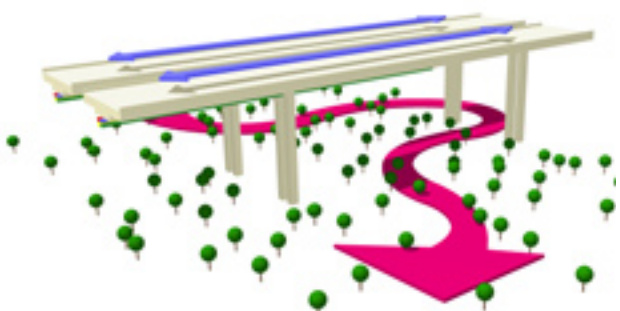
"Today it was raining all morning, so people took refuge in the sheltered highway park where we have a temporary market spot. Rain is good for our business."
Ding Xiumei, 28, Street-vendor



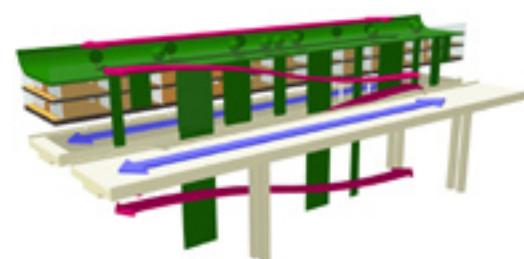
LOW HIGHWAYS constitute barriers in the cityscape, and can be regarded as buildings or blocks. Adding new infrastructure underneath and using the highway as a roof is resource and space efficient. The new infrastructure rises partly above the highway and gaps in the new construction correspond to the surrounding streets.



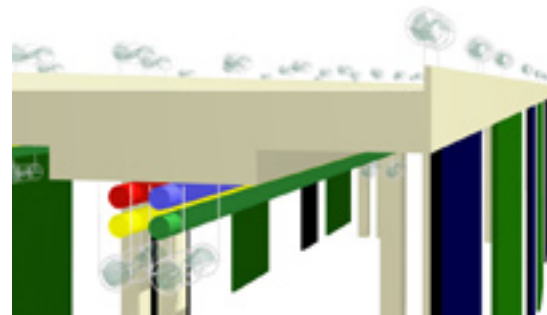
HIGH HIGHWAYS constitute no barrier and can therefore be "ignored", meaning that they don't interfere with street life. The city runs unimpeded below.



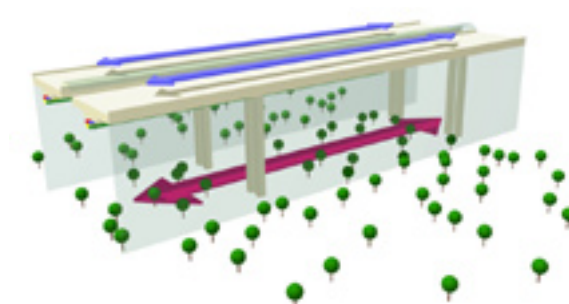
HIGH HIGHWAY with park area underneath allows free movement and adds qualitative public space. The elevated highway still serves its primary task as a structure for public transport which includes long distance rail and the city-comprehensive RailCab network.



THE TALL and robust construction is used to bring another type of large-scale architecture into the cityscape – differentiated from the typical high-rise towers. Elevated roof-garden parks provide respite.



THE HIGHWAY is consequently used as a distribution system for energy, fresh water and wastewater. With the addition of aeroturbines and photovoltaics for energy production as well as vertical cultivation surfaces, it constitutes a useful structure.



THE ELEVATED HIGHWAY creates a distinct space underneath it and is used as a roof for the public living room. Glazed sections create an elongated, climate-protected park – a semi-outdoor gallery.

4-D MOTION

We need to intensify our urban rooms by making more space in 4 dimensions: horizontally, vertically, in scale and time. We need to create new alternatives for the pedestrian that can give us new qualities. By moving on different street levels, we can create 4-D motion in the city.

The horizontal principle - to create orientation and pedestrian movement in this high-rising forest, we need new functions, nodes and uses. These spaces will require intensified human activity while demanding less energy - an axial movement that gives us a flexible city.

The vertical principle - to create different levels in the same horizontal space by using vertical space to densify and define. The densified pedestrian vertical room defines public & private spaces. An inherent Chinese principle - a vertical city.

Scale principle - to create rooms with different volumes that respond to missing needs. This can be achieved by using roofs, walls, furnishing and levels. These spaces do not need enclosure on all six sides, instead, they can be open - thereby creating a more diverse and human city.

Time principle - to create space we need to share rooms -giving them simultaneous functions in time. Shared rooms - both undefined and defined - enable us to reuse or even compact space.



QUALITIES

Semi-public spaces

The private and public spaces in a dense city require more transition and definition of the spaces between them. This is termed "semi" - semi-public and semi-private spaces. The semi-public spaces are new rooms where one shares interests such as sports or agriculture. Semi-private spaces could be a community center where one shares semi-private transport or a big semi-private party living room.



Agriculture spaces

Our large megacities require more space to grow but at the same time more space to feed themselves. At the same time we desire close contact to the natural environment. The establishment of urban agriculture in our cities is more than merely a solution or an alternative, it is our salvation.



Dark rooms

Lack of light as well as the fact that it is difficult to provide all spaces with windows gives a specific type of room. These darkrooms have other possibilities and uses, such as utility rooms for food storage, materials or goods. Music, dance, sport and other such spaces are also appropriate functions for darkrooms since they are dependent on low rental costs, high insulation, and even central locations in the city. Combined working/housing, workshops, studios, temporary housing or even hostels are other examples of spaces with short-term needs and therefore darkroom relevant.

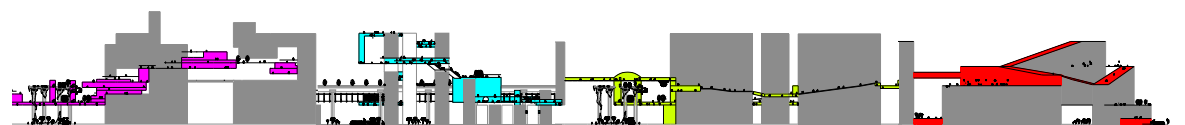


Liquid spaces

The city is compact and every single square meter has potential economic value. The creation of liquid space exists as an important component in the modern megacity, since it coexists with other spaces in a time effective manner. It exists both formally and informally, in a specific moment and is difficult to define. It often occurs in open spaces, but this is not a prerequisite for the formation of a liquid space.

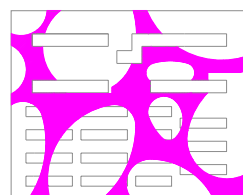
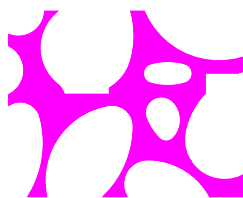


THE CREATION OF A HETEROGENEOUS 4-D CITY; EXPERIMENT & EXAMPLE



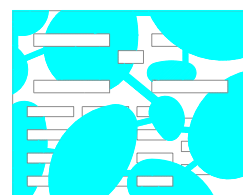
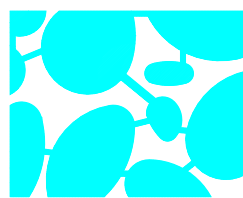
Merge

Organic structures that rise up and create new spaces both inside and outside.



Floating archipelago

Organic islands that create agriculture spaces connected by stairs, ramps, etc.



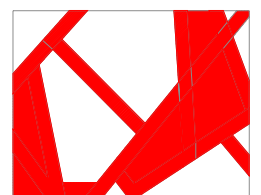
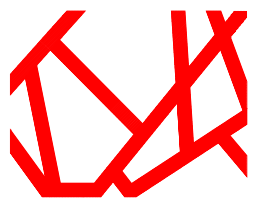
Elevated street

A regular street that rise up and create open spaces on a higher level.



The Ism

A new architectural typology providing spaces that are both indoor and outdoor at the same time.



"Today I woke up at 6:30 so that I had time to exercise up to the elevated station. It takes me about 30 minutes. I got here early so I could watch the sunrise. It's like having a huge balcony that I share with my city-mates.

feel useful for society and most of all, because it's always good with some extra cash.

Things have changed. It's not like years ago on the old town level, where traffic was so stressful. Now I have all sorts of public and private

transport alternatives to get me around. But the best thing of all is walking around the elevated city and watching the sun."

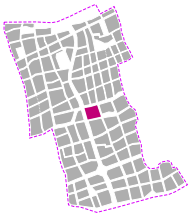
It's hard to believe it but if I close my eyes I can hear the sound of the birds singing. I sense the smell of flowers, the running of water, and for just a moment everything else disappears. It's like being a kid again and going for a trip to my grandmother's house in the countryside.

I like to do my fitness workout up here. Almost everyday my friends and I come up here to work in the agricultural fields. I like it because I



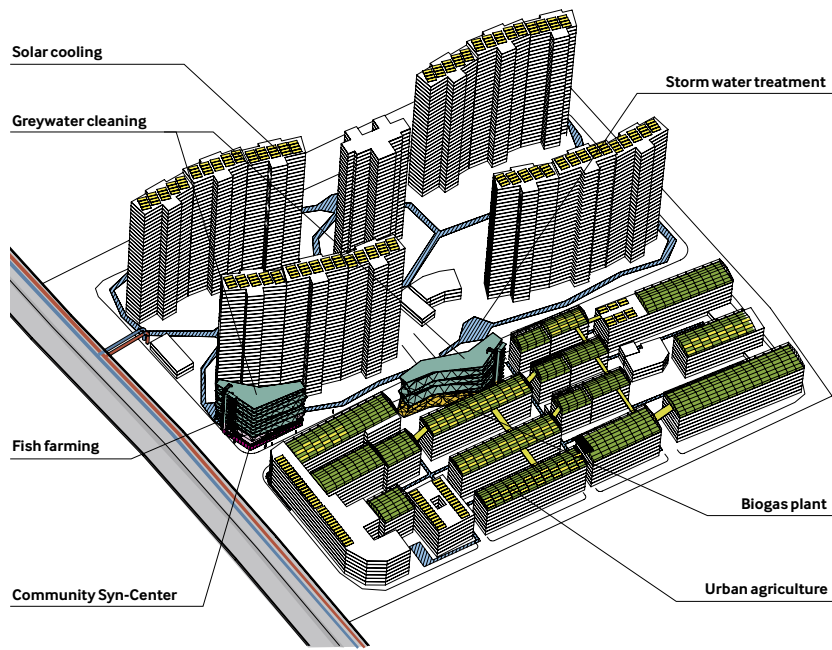
REALIZE IT

By implementing local solutions the resource systems become more evident in urban everyday life. Instead of just putting everything down the drain you can actually see how and where it is used. This also introduces new programs in the neighbourhood.



The Syn-Cell model applied to a block in Luwan

Inhabitants:	ca 5000
Grey water cleaning:	ca 10 000m ²
Biogas production:	ca 42 000 Nm ³ /year
Fertilizer from urine:	ca 2750 m ³ /year
Car pool:	330 (1/5 of the households)
Urban agriculture:	ca 7500 m ²

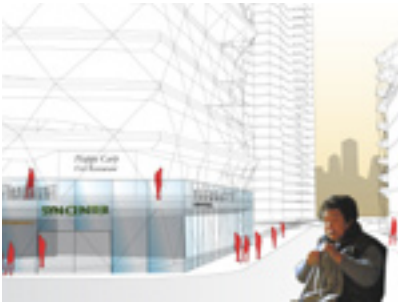


THE SYN-CELL MODEL APPLIED

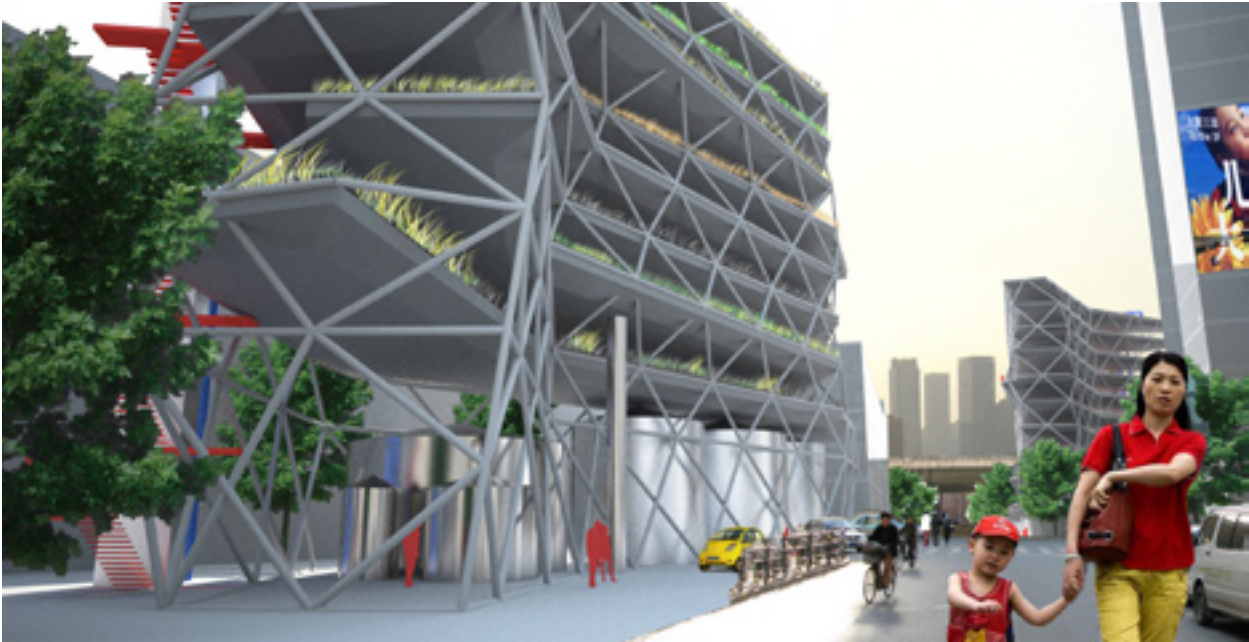
The community Syn-Center
Instead of having possessions that you only use once in a while, commodities can be used more effectively through access pools. At the local Syn-Center, residents can lend and rent things like cars, tools, bikes, books, baby carriages, holiday equipment and advanced technology like rapid prototyping machines. In that way less things are used more. Staff at the Syn-Center coordinate the Syn-Cell functions and places where you can leave goods or furniture that you don't use anymore. You can even take someone else's stuff home instead.

Biogas plant
Urine and faeces is separated and transported with vacuum piping to the local biogas plant. The urine is stored for six months while the faeces are processed together with organic waste from the households to produce biogas for the car pool. The end result is a sludge that can be used as fertilizer together with the stored urine. This is used for urban agriculture or sold to farmers within or outside the city. From the urine we can extract phosphor which can be sold separately.

Water treatment
Since excreta are separated the only water remaining to be cleaned is from kitchens and bathrooms. This is cleaned ecologically by constructed wetlands. The last steps of the process include a fish farm and vegetable cultivation. Storm water is treated in ditches which also function as flood buffers. This clean water can then be used for local agriculture or returned to the bathrooms.



RESOURCE SYSTEMS ARE MADE VISIBLE IN THE CITY



"Had to wait in line to fill up the car at the biogas plant, so I was fifteen minutes late returning it to the car pool. But I put on my best smile so it was ok."
Feng Jiangfang, 41, Self-employed

"When I was at the Syn-Center to return the hammer drill I saw this wonderful carpet in the recycle showroom. I just had to bring it home. Tan didn't like it at all but I'm keeping it!"
Chen Lingmei, 70, Retired

THE DEVELOPER'S VIEW

Zhu Wenqi, 30
CEO, Life Aquatic

- Yes, our company really started to take off after the introduction of the Syn-Cell model. We specialize in sanitation systems and water treatment solutions, on both small and large scales.

This particular project uses our vertical wetland™-technology. Only ten years ago, this kind of project would have been financial hara-kiri. But with the rising prices on land and water and the state

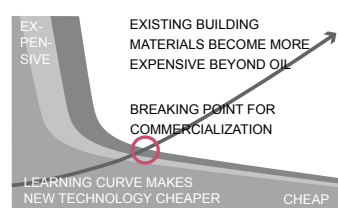
subsidies, it pays off within 5-10 years. But the real winner is the city since they don't need to invest so much in large scale piping and treatment plants anymore.

ADD & RECLAIM

Resources are getting more and more expensive, but innovation is moving on. Existing blocks need new functions and improved social spaces beyond oil. An add-on architecture is the answer.

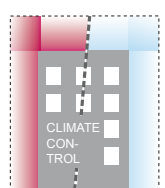
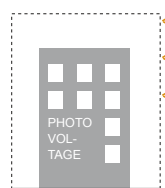
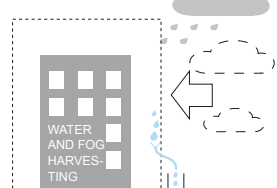
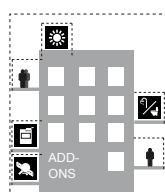


SHORTAGES AND CREATIVITY

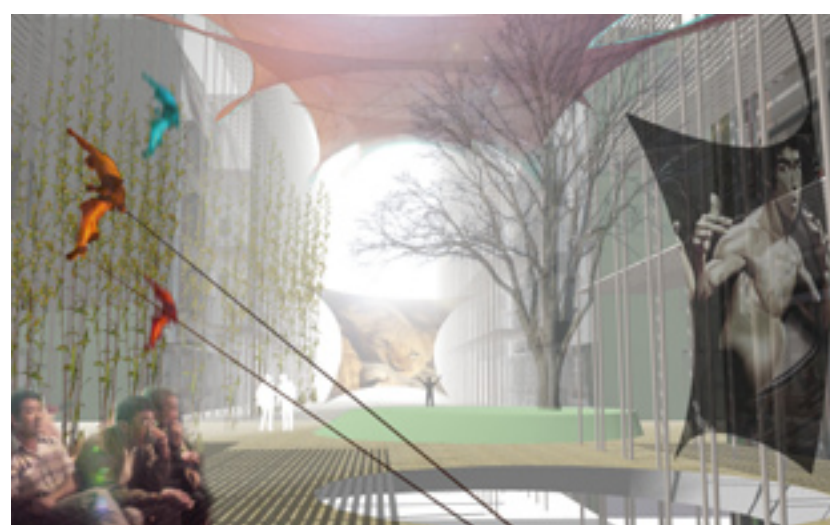


Peak oil provides challenges for the city. To meet higher energy costs, the existing building stock has to become much more energy efficient. At the same time the cost of traditional building materials, such as concrete, steel and asphalt will become increasingly expensive and shortages will likely occur.

However, harsh situations force us to innovate – we will develop new materials and systems that solve our problems. This will lead to new types of architecture; which emphasize lightweight materials and intelligent systems that can both save and collect energy and resources. An architecture that can be easily applied onto existing structures, like add-ons on facades or along streets can be initiated and owned by the inhabitants. This will provide a rich variety of expression and new forms of social life.



Light and strong
Peak-oil presents challenges for buildings in Shanghai. Problems such as insufficient insulation and inefficient air-conditioning systems are particularly acute. We can find inspiration in other industries, such as aeronautics and space technology. A new, extremely effective insulation material called aerogel is made almost entirely of air (up to 99.5%). Strong carbon-fibre structures developed for airplanes could eliminate the need for concrete and steel in buildings. Traditional materials, such as bamboo, certainly hold new possibilities. New materials inspire new architecture.



Lightweight structures that climb the walls can perform functions, such as elevators, terraces, extra guest rooms and balconies. The new add-ons will encourage heterogeneity injecting life into the existing city.

The mesh
Imagine a material, soft as textile, which could be used to shadow, collect energy, protect from wind, harvest fog, illuminate and project images.

This mesh is made of transparent solar cells, complete with fog-collecting functions for the supply of drinking water.

After work on Fridays we are few neighbours that usually sing karaoke together, lately some climbers have started to compete on the wall behind us. We think they look quite funny.

LED-lighting in the mesh can provide the effect of a starry sky at night. Equipped with Organic-LED sheets, the mesh could be used to display pictures and information in a large scale format. Organic-LEDs could also be used to light dark areas, such as under motorways. The mesh surfaces are stretched over streets and between buildings, creating a temperate half shaded environment comfortable for people.



BREAK THE GATES — RECLAIM THE SOCIAL SPACES

“When we moved here 15 years ago our block was still gated. We had a guard to protect us and our young daughter from criminals, and we liked it that way. We had only one entrance for passing in and out, and the entire neighbourhood used it. We used to notice every unknown face that entered our yard.

These days, things have changed, and I didn't expect it to be for the better, but it really is! When the ground floor was developed to incorporate service, energy

and water cleaning systems, the gate was torn down. We still have a sense of privacy though, since the ground-level is higher than the street. The difference is that we can move more freely through our block now and it's easy to reach the streets and shops in the neighbourhood.

The slopes create exciting spaces that accommodate new commercial spaces. It is so much nicer now with all the new cafés and restaurants around here. Before, we had to walk at least two

kilometres to find a good shop or something to eat.”

Feng Jiannfang, 41, Self-employed



Before



After

UTILIZE IT

The city consists of many systems. Large scale district heating and cooling is introduced as well as small scale grey waer cleaning and waste management on a neighbourhood level. All these things add to your home. Do you assume you have to compromise beyond fossils?



THE NEW LUWAN WASTES PRACTICALLY NOTHING

WHAT ARE WE PUTTING IN THE TRASH?

Organic Wste

is more precious than we used to think. The biogas plant can reuse energy in leftovers and faeces to produce biogas. When oil is depleted, traditional plastics will not be an option. Instead, bioplastic will be the right choice. Your leftovers, together with the biopackage it came in and the faeces you leave behind all make biogas production the obvious choice.



Glass

Even if the production of glass requires a lot of energy, it is possible to use several times before melting it down again to recycle it. Since oil-based plastics such as PET will no longer exist, glass becomes even more important. We miss the milkman.



Paper

is still a vital part of your everyday life, although not as much as before. If biomass is produced for use in hydrogen fuel cells, access to paper will become limited.



Solid waste

such as your old sofa, your 15 year old bike or other non-organic waste, all need to be handled differently. We propose the establishment of a personal recycler as an integral part of the Syn-Center. This way, you get help finding the right use, place or price for much of your solid waste. Remember, re-use or retrofit is still an option.



WHAT ARE WE LETTING GO DOWN THE DRAIN?

Grey water

Grey water
is another name for dish-, shower-, sink- and other wastewater types that don't go down the toilet. It's not as dirty as toilet water can be.

Greywater needs less treatment and can be used directly in agriculture. If not used directly, the water can be eco-treated at one of the garden towers or the local water treatment plant.

Faeces

Faeces
Let's face it. We all need to take a dump once in a while. As the faeces decompose, biogas is produced. The rest product still has plenty of nutrients that can be used as fertilizer in local agriculture.

Did you know that an adult produces 50 kg of faeces every year?

Urine

is the most nutrient rich product leaving our households. It is an excellent fertilizer, as long as it is free from toxics and trace substances. Several tanks must be used for storage since it takes six months before it is ready to be used in agriculture. The high nitrogen content increases amino acid synthesis in plants.

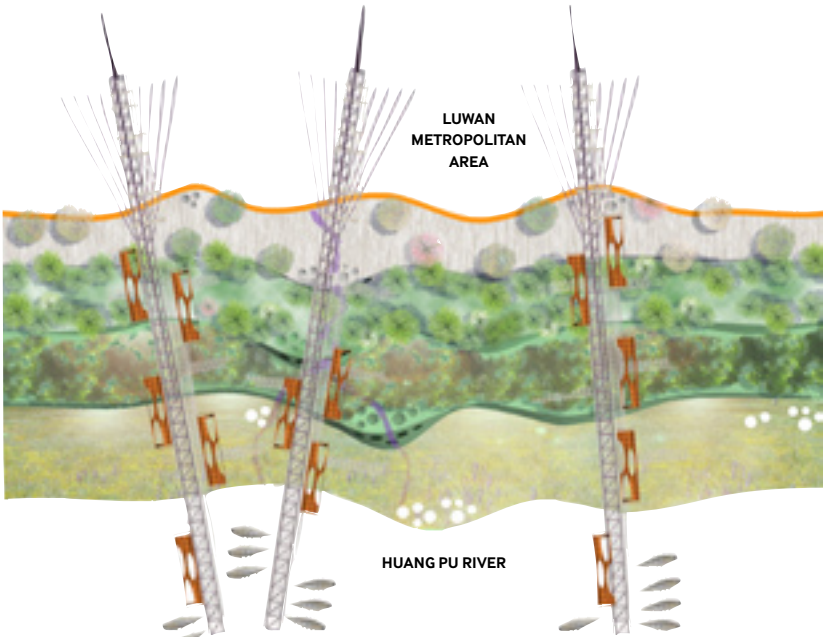
One adult produces about 500 liters of urine every year.

GET AWAY

When high energy prices and lack of fossil fuels prohibit a majority of city dwellers from long-distance travel, the riverbank could transform into a place for recreation and relaxation. The vacation will come to you instead of you travelling to the vacation.



"We decided to have lunch on the upper boardwalk so we could watch the cyclists. The new camping table was really easy to carry."
Fang Minhua & Feng Jianfang, 41, Self-employed



Johnny Chou, Developer:

"Historically, walls have been built along the rivers and streams in Shanghai to protect the city from floods and tides. The protective function of these walls is retained in our project. The riverside along the walls is the site for new spaces, becoming a man-made, elevated, landscape.

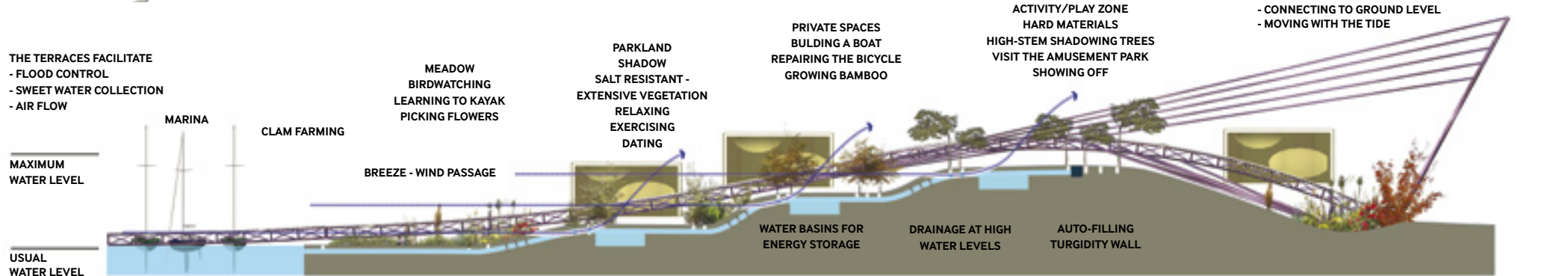
The new riverbank is flexible and adaptable. Its functions are comparable with a fair in which the activities are constantly changing over the course of the year. It is a multifunctional area providing spaces for an outdoor cinema, skating, camping, kayaking, dancing, playing football, amusement parks and much more.

The lower wooded areas in combination with the hard surfaces of the upper area create a new, recognizable urban icon. The continuous spaces follow the river and contribute to connectivity throughout the city.

A new type of floating bridge provides connection between the city, the water and the underlying terraces. The bridges move with the tide and are always accessible. At the end of the floating bridges piers are located that provide marinas and landing-platforms. Boats take you between hotspots along the rivers. The bridges are built with locally grown bam-

boo and recycled steel. Moveable cabins and houseboats are set within the new riverbank. They are integrated with the adjacent landscape and can be rented as workshops, vacation cabins or even function as hotels. This mobility creates a constantly changing outdoor scenery.

We provide these new and changeable urban rooms for the people in Shanghai to enjoy, take to their hearts and use throughout the year. We also see this concept's applicability to other coastal



Technical specs

An important factor considered in the design is the shading and cooling effect from plants and water. The lower terraces will be covered extensively with plants and biomass in order to create a more robust ecosystem. Desirable breezes and flows of air through the site are augmented through variations in height, combined drainage holes as well as wind tunnels

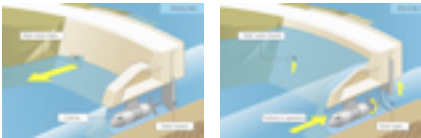
in the terraces. The venturi effect in the wind tunnels intensifies the south-easterly breezes in summertime. Wind is cooled down by contact with the water before reaching the terraces. The solitary taller trees also contribute to increased air turbulence. The height of the terrace-leveled section is calculated to meet possible sea level rise and more frequent rains.

The lower terraces will become wetlands partially flooded with tidal water. During high tides water is stored as potential energy on the upper levels, later to be released into turbines and transformed into kinetic energy. The water loop pipes that are situated under the walkways provide cooling in the summer and heat in the winter. If the water level rises to an extreme

level, the turgidity wall will protect the structures behind the highest point of the wall. Storm water can be cleaned in sedimentation dams in the slopes and used locally. Bamboo will be grown on medium level terraces to be used in the local building industry and in energy production. Seafood farming along the water's edge helps to clean the water and produce seafood.



Maximum water level



Small turbines for tidal power



Turgidity wall for flood protection. The sections fills with water and builds up the wall as the water level increase.

SYMBOLIZE IT

The prosperity of our civilizations will depend on access to clean energy. Energy is therefore celebrated in all of its forms by the establishment of an Energy Expo that not only offers space for research and education but also power production and cooling.

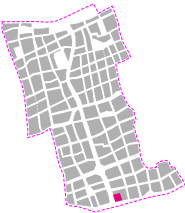


The energy campus marks the turning point for how Shanghai manifests its presence in the region.

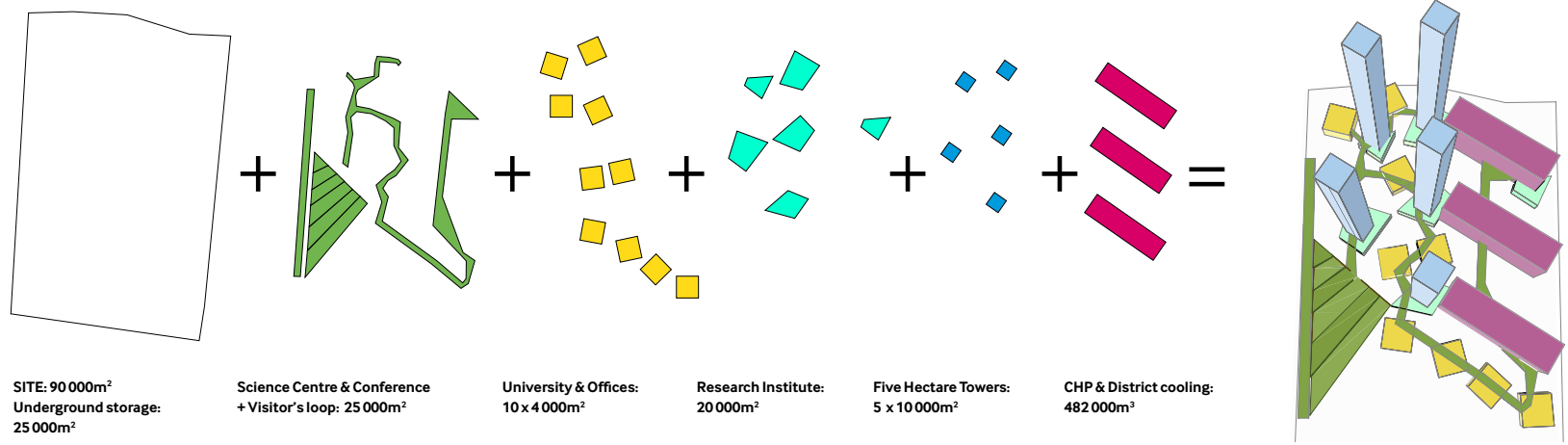
By signifying the importance of energy and synergy and by creating connections between knowledge, research and entrepreneurs the Campus positions Shanghai and Luwan as the region's main leader in future development.

Within the Campus you find a geothermal and excess heat based district cooling plant that provides Luwan with its cooling needs. It also provides electricity and district heat.

In addition there are research facilities and a university exclusively focused on energy research. Close to the research facilities many enterprises locate their offices in order to be close to experts and a skilled workforce.



By utilizing excess heat from the CHP chimneys growing conditions during the winter months are improved. In the summertime heat is vented from the greenhouse to avoid overheating. Some of the plants are used to clean exhaust fumes, while others are used for research and energy production within the campus.



Zhu Wenqi, 30
CEO Life Aquatic

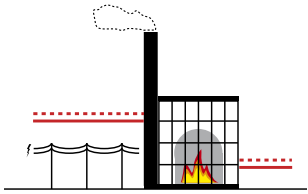
"We have our office here because we need to be close to the best research and researchers in our field. It's also important for our company to be within walking distance to our partners. The short walk to the train and subway station is really convenient for our employees, since they travel frequently throughout China."

PRODUCE EXPLORE CONNECT EXPERIENCE MANIFEST

HOW IT WORKS



On site a combined heat and power plant produces electricity and heat by incineration of bio fuels and burnable non-organic waste from the district. The fuels are incinerated in a controlled manner in order to prevent harmful particles from being released in the atmosphere. The heat produces steam that is used to drive a turbine, thereby producing electricity. During the winter months the heat generated is used for district heating, in the summertime it is used for cooling.

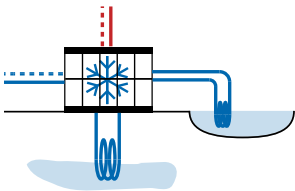


The district cooling system uses a combination of two different systems.

The first system is a so-called free cool principle, in which cool water from the river and the aquifers underneath Shanghai are utilized. The second system is an absorption cool system that runs on excess heat from the CHP.

The district cooling and heating is distributed via a closed system connected to the highway. The cool and hot water is used to temperate the air which is circulated within the buildings.

Implementation of the Syn-Cell system on the Luwan Campus ensures energy self-sufficiency.



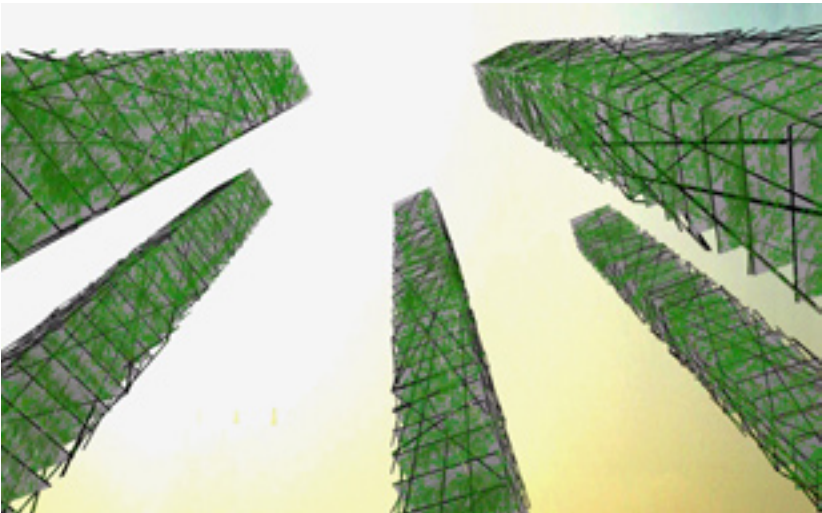
Heat production: 0,9 Twh/yr
Electricity production: 0,5 Twh/yr
Cooling power: 300 MW

Running at normal capacity, the CHP uses 2-3 train deliveries of bio-fuel per day.



"We see them from our terrace. Chen is very fond of them at sunset, but I like them best when I wake up early and see them appear out of the morning mist."

Tan Hongzhang, 70, Retired engineer





IN THE LAND OF THE CRANES

A film about Chongming Island. A visit to the largest sedimentary island in the world, located in the opening of the Yangtze River north of Shanghai, provides a glimpse of a rich habitat. What at first glance appears to be merely a natural environment reveals complex questions. Birds and ornithologists, environmentalists and developers, visionaries as well as migrant workers all co-exist. What happens when these parallel worlds meet?

30 minutes
Director Lisa Hagstrand
With ornithologists, migrant workers and residents on Chongming Island, Shanghai, China.



THE SCHOOL OF ARCHITECTURE

AT THE ROYAL UNIVERSITY COLLEGE OF FINE ARTS, STOCKHOLM

The School of Architecture at the Royal University College of Fine Arts in Stockholm is a forum for post-graduate education in architecture and urban studies. The school dates back to the end of the 18th century and is the oldest institution for architectural studies in Sweden. Today, the school concerns itself with current issues relevant for the general public and investigates how these are connected to an architectural and urban discourse. It provides one-year courses in three disciplines including Architecture, Architectural Restoration and Art and Architecture, the latter conducted in conjunction with the Fine Arts department. Each course includes an extensive lecture series, which addresses the chosen theme in a comprehensive manner. Study trips are also an integral component of each curriculum. The goal of the School of Architecture is to engage society through the generation of relevant and tangible projects, as well as the creation of working networks for all involved that continue outside the academic realm. Projects that have their inception at the school often become independent platforms that develop on their own.

RESOURCES.07 Beyond oil: Shanghai

This paper is a publication from the post-graduate course Resources.07 Beyond oil: Shanghai School of Architecture Royal University College of Fine Arts Stockholm, May 2008.



RESOURCES.08 Beyond Desire: Los Angeles

Post-graduate course in Architecture, 60p / Royal University of Fine Arts

Finding a peaceful transition from fossil to alternative energy sources is the greatest challenge we face today. We find ourselves in the midst of a decisive moment of *transit*. A transitional phase between old and new energy sources necessitates a change to other economies, cultural patterns and built structures. The American urban environment is predicated, both physically and socially, on a limitless supply of cheap oil. How will this be affected by a shift in energy systems? Are we prepared for *post-motopia*? What does Los Angeles look like beyond *Desire*?

Recourses.08 is looking for engaged individuals who are interested in investigating these issues. You should be an architect, landscape architect, urban or regional planner, or from a related design discipline such as photographer, filmmaker, designer, artist or journalist – with a specific interest in architecture and urban planning issues.

The course can also be attended as a lecture series, giving 30 academic credits.
Download program at www.kkh.se
Additional information: Michael Dudley, md@kkh.se
The application should be postmarked the 9th of June, 2008



PROJECT PARTICIPANTS

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Johan Kristiansen Designer	Anders Rinman Graphic designer	Michael Dudley Architect and teacher



