

A vibrant photograph of the Singapore skyline. The Singapore Flyer, a massive Ferris wheel, dominates the right side of the frame. In the background, several modern skyscrapers, including Marina Bay Sands, are visible under a clear blue sky with light clouds. The foreground features a body of water and lush greenery with bright pink and orange flowers.

# The Healthy City

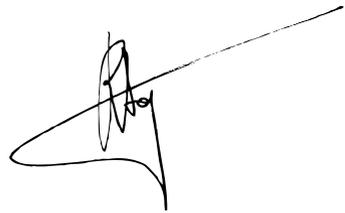
# The Healthy City

Making Singapore a  
worldwide precedent  
for The Healthy City



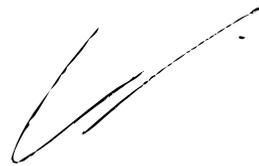
### This booklet

The team consisting of ZJA, OKRA and Witteveen+Bos has a large track record of reference projects that illustrates their expertise and experience. But even more important, the projects illustrate the viability of our proposed ideas. In the following chapters we proudly present you our ideas to accomplish the integrated improvements for The Healthy City.



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Singapore has become an exemplary metropolitan city for Asia and for the rest of the world. The legacy of Lee Kuan Yew to develop Singapore into a City in a Garden has led to the big success as we can see it now, being a true sustainable framework. In the context of continuous populous growth, we envision that the next step is to make Singapore the world's example of The Healthy City.

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ZJA • OKRA • Witteveen+Bos



# Singapore Challenges

Singapore Challenges	Towards The Healthy City	Creating The Healthy City	Modules	Company Profiles
5	9	15	31	43

## Singapore Challenges

Today, Singapore has become the world's leading example of a liveable city. In terms of safety, international connectivity, quality of (public) housing, public transportation, social cohesion, employment, business opportunities and medical care, Singapore has become an exemplary metropolitan city for Asia and for the rest of the world. The legacy of Lee Kuan Yew to develop Singapore into a City in a Garden has led to the big success as we can see it now, being a true sustainable framework. In the context of continuous populous growth, we envision that the next step is to make Singapore the world's example for The Healthy City. We believe urban design plays an important role in achieving The Healthy City. The current population of Singapore is nearly 5.5 million. The Singaporean government is aiming for a total population of 6.9 million by 2030 (natural growth combined with an increasing number of foreign workers). The increase in population will lead to further land scarcity, increased demand for

resources (water, energy, food), increased transport demand, and increased waste production and emission. In light of this rapid growth, the challenge for Singapore lies in enhancing the aspects that determine the city's health such as air quality, noise pollution, urban heat islands, safety, inspiration, happiness, accommodating active lifestyle and so on. Many of these aspects tie in with the liveable city concept as well.

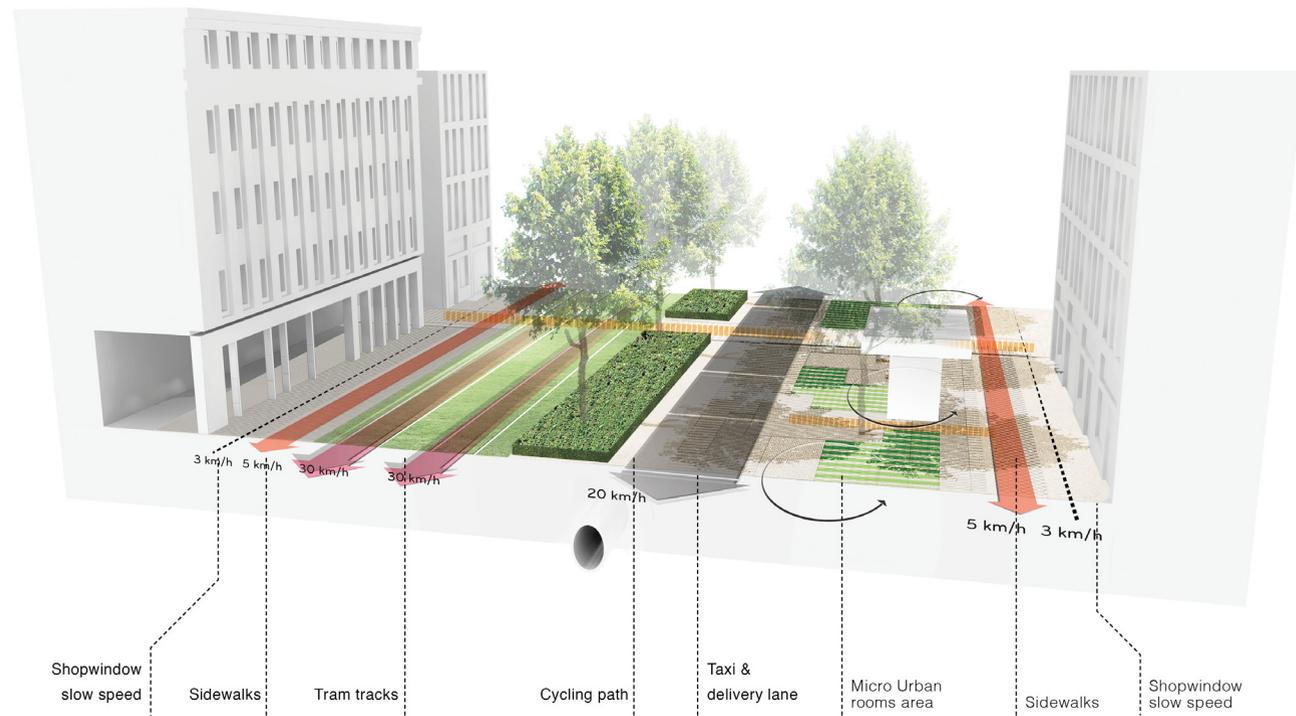
All this has to be achieved within an existing complex urban environment. Urban functionality, accessibility and efficient land use seem to be competing. However, the team of ZJA, OKRA and Witteveen+Bos is well experienced in achieving improvements on an integrated level. ZJA, OKRA and Witteveen+Bos are convinced that the engagement of these challenges provides a chance to make Singapore a worldwide precedent for The Healthy City.





## Towards The Healthy City

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Athens City Centre

## Towards The Healthy City

We envision that Singapore as the world's exponent of The Healthy City is a place where infrastructural axes have become green corridors, waste will be turned into green energy, commuting means exercising and necessary coastal defence measures have enriched the city with the most remarkable and enjoyable public spaces. Even considering Singapore's land scarcity, we truly believe this vision is a reachable goal. Furthermore, Singapore's unique position as a highly advanced and congested high-tech society will fit The Healthy City extraordinarily well.

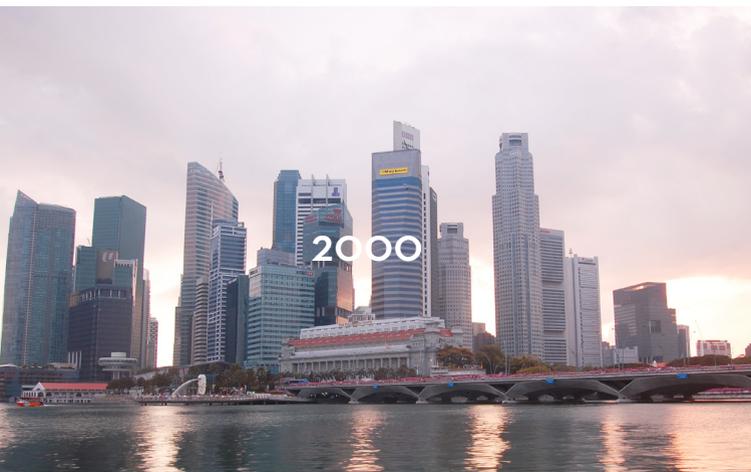
The World Health Organization defines a healthy city as follows: one that continually creates and improves its physical and social environments and expands the community resources that enable people to mutually support each other in performing all the functions of life and developing to their maximum potential. A healthy city is defined by process, and not by outcome (WHO, 2015). This means that in fact every city could be a healthy city if they are committed to changing their health, process and structure to achieve it. A healthy city is not one that has achieved a particular health status, so there is no optimum (WHO, 2015)<sup>1</sup>. A lot of planning has been done on the topic of The Healthy City, but the way in which architecture, public space and landscape should be designed to make the city healthier is not well known yet. Important lessons on how to shape a healthier city can be learned from tactile examples (such as Toronto, Copenhagen and Melbourne), where the principles (which may be used in different combinations) are as follows:

1. A city shapes the built environment to promote opportunities for active and healthy living;
2. A city has a diverse mix of land uses at the local scale with densities that support the provision of local services, retail, facilities and transit;
3. Public transit is used to extend the range of active modes of transportation;
4. The environment of The Healthy City is focused on air quality, noise pollution, vibration nuisance, natural lighting, urban heat island reduction, and etcetera.

Contemporary developments into sustainable transportation point towards experiments and demonstration projects for driverless cars, electric movement and other technological innovations. These developments all have crucial effects on city planning. Furthermore, these innovations will support continuation of the ongoing shift from 'possession' of vehicles towards 'availability' of vehicles and sharing them, as well as a plurality in transport means.

Being aware of these new trends, city planning can take advantage of combining the triangle 'mobility', 'urban programmes' and 'energy'. Integrated urban nodes will become new focal points in the urban network of public realm and infrastructure.

<sup>1</sup> See <http://www.euro.who.int/en/health-topics/environment-and-health/urban-health/activities/healthy-cities/who-european-healthy-cities-network/what-is-a-healthy-city>. See also WHO report (2014): Healthy cities. Promoting health and equity – evidence for local policy and practice. Summary evaluation of Phase V of the WHO European Healthy Cities Network



### A brief history of healthy cities

In the world of landscape architecture, liveability has always been an important aspect. Since the industrial revolution brought economic prosperity, people have become more aware of the unhealthy environment, and consequently wanted to create a better place on earth. Moreover, productivity rates increase when labour force is healthier and happier.

This awareness made urge to design healthy and green spaces such as the landscapes of Lancelot "Capability" Brown, Henry Flitcroft, William Chambers and William Kent. Ebenezer Howard who introduced the garden city movement followed them. He meant to design less dense cities with more green for health related reasons. Of course there were many others who wanted to create a healthy environment; a "healthy city" is not a new phenomenon. The urgency of healthy cities is also represented by the fact that many intergovernmental organizations such as UN Habitat, World Bank, European Union and World Health Organization have developed indicators for urban health.

Health problems have changed since people gained more welfare. They are getting older and have enough to eat. The incidence of aging-associated diseases such as cancer and Alzheimer's disease increases. In the western world, obesity is a bigger problem than hunger and poverty. Furthermore, the traditional development of cities with a strong focus on economic prosperity have brought adverse side effects for human well-being, for instance air pollution, noise and safety issues. Cities are currently recognised as an important factor of influence in local weather (Urban Heat Island) as a result of building characteristics.

These problems lead to rethinking of urban and landscape designs. Designing more exercise space, interactive space and better health stimulating space are some examples to make a city healthier. But what is actually a healthy city? And how do we design a healthy city? In the following chapters an exposition and explanation including principles to truly design a healthy city will be given.

In fact, the late prime minister of Singapore, Mr Lee Kuan Yew, already envisioned many aspects of a liveable city. He was ahead of his time in many aspects by advocating Singapore to become a City in a Garden, advocating against littering, executing the historical Singapore river clean-up project and providing good public housing with reliable utilities. Singapore's development towards a truly healthy city hasn't stopped there. Singapore has ventured - with success- on the path of becoming independent in water supply by using the city as a catchment (catch every drop) and recycling as much used water as possible, while reducing the water consumption of households and industries.

Drainage canals are transformed to blue-green infrastructure features through the Active, Beautiful and Clean Waters Programme. Huge investments have been made in infrastructure to create a reliable and dense public transport network. Lastly, Singapore has taken the first steps towards a cycling friendly tropical metropolis as well. To conclude, Singapore serves as an example of a healthy city in many aspects for Asia, but in face of the continuous rapid growth of Singapore, more needs to be done to maintain and enhance The Healthy City.



## Creating The Healthy City

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# Creating The Healthy City

## Strategy: surgical interventions to create a healthy city

To achieve improvements in active and healthy living, diversity of land use and active transportation without worsening other aspects, and most of all without demolishing existing urban values, the integrated approach is applied as if a surgical operation. After all, the liveability projects are implemented in the city's system while the city is in business. This requires full understanding of mechanic, constructive, design, planning, management, logistical and environmental aspects within a project. The planned project has to result in a solid, safe and economically viable city improvement. This results in investigation, design and engineering from a functional design perspective with use of methodologies such as Value Management and Systems Engineering, which help to focus on needs and demands, both in existing and newly implemented aspects of the city's system.

Both tools can be used to develop a full understanding of the cities functions and processes that need to be improved for creating a healthy city and are to be maintained during this surgical operation.

The strategy to create a healthy city entails new types of hybrid urban programmes interlinked to one another and the existing urban fabric. It is a dynamic approach: A small-scale intervention can be the starting point for a growing network. Rather than imposing a large (country) scale intervention, the presented scheme is based on relatively small and interconnected interventions.

Systems Engineering helps to increase insight in interconnections, requirements and functions of a complex project system. Value Management is a systematic, creative and multidisciplinary approach to improve the value of a project, product or process, with help of issue- and functional analysis. Value is defined as the optimization between functional performance and (lifecycle) costs of the project:

$$\text{Value (V)} = \frac{\text{Functional performance (Fp)}}{\text{(lifecycle) costs (C)}}$$



E-city Rotterdam



### Opportunity: Interactive coastal areas

Innovation for the next decades is also about creating good connections between the city system and its surrounding landscape. It requires rethinking the edge of the city and its relationships with the surrounding countryside. It is not just about consuming landscape, but trying to create an interactive relationship with the countryside.

Investigating connections to the landscape leads to new visions on relationships between city, ecological systems and the surrounding landscape systems. Investigating leisure activities on the larger scale offers new opportunities to connect recreational use within the city to the outer city.

In this respect it could be an opportunity to combine coastal defence and creation of a revitalized landscape offering recreational facilities. Because of the rising of the sea level, and the fact that within the densely built metropolis of Singapore the risks of flood cannot be accepted, coastal defence is imperative. At the same time due to the increase

of recreation, the pressure on the coast increases. These days a more integrated approach on coastal defence, nature and recreation is required.

Creating a coastal landscape with larger dimensions than just the technical defence has advantages in many respects. The zone along the coast becomes more interesting while taking advantage of the natural dynamics of the landscape and giving more room to the natural process taking place in this coastal region: erosion, sedimentation, tides and currents. To provide room for this coastal system, the area along the waterfront is being widened to a wide zone with a varied dune landscape with space for recreation, nature and water. That way, natural processes get more space. To offer more space to the dynamic coastal system so it can be more visible and productive, the zone will be broadened with a variable natural landscape.

Because availability of sand in Singapore is limited, and sand is expensive, it would be best to create a multilayered landscape. Building a parking garage

at grade and covering this with a thin layer of sand combines interventions for coastal defence with creating a natural landscape. The idea is to integrate coastal defence and provisions for flood protection with recreation for citizens and tourists. Moreover, layering and integrating programmes provides space for new hotels, shops and attractions.

This widened zone will thus provide opportunities for organising infrastructure and holiday facilities in a different way. Within an enlarged area it will be easy to make a distinction between calm, more natural areas and seaside resorts that are more crowded, areas that will be quiet and areas that are used more intensively.

The infrastructure system can be adjusted to the intended zoning. By creating covers on the highway the hinterland can be connected to the coast and building opportunities arise just adjacent to the covered infrastructure. By arranging accessibility in a different way, bathing areas will be reachable by

paths from a new main road while the intervening areas will not. Visitors by car are led to car parks with provisions and a good access to the beach. Covered parking with good facilities at the most favourable locations will enable concentrated parking on the desired sites. Green corridors will be created on the landside, connected to the green structures in between the larger built areas north of the highway.



#### Masterplan Beira

With its strategic location at the Indian Ocean, the coastal city of Beira is facing economic and population growth, which results in substantial demand for land and infrastructure. More suitable land and infrastructure are needed for industrial purposes, for new and improved housing and for public facilities. Our Masterplan provides the necessary climate adaptation strategy and integral planning framework. It provides the basis for the development of projects, resilience to water safety risks and liveability.

#### Masterplan Jakarta

In the masterplan for the Jakarta coastal zone, the flood protection needed to protect the city is combined with land reclamation, port development, toll road and public transport construction. These urban development components are used as economic drivers to fund the flood protection and climate change adaptation measures.

#### Katwijk Coastal Defence Seaside Resort

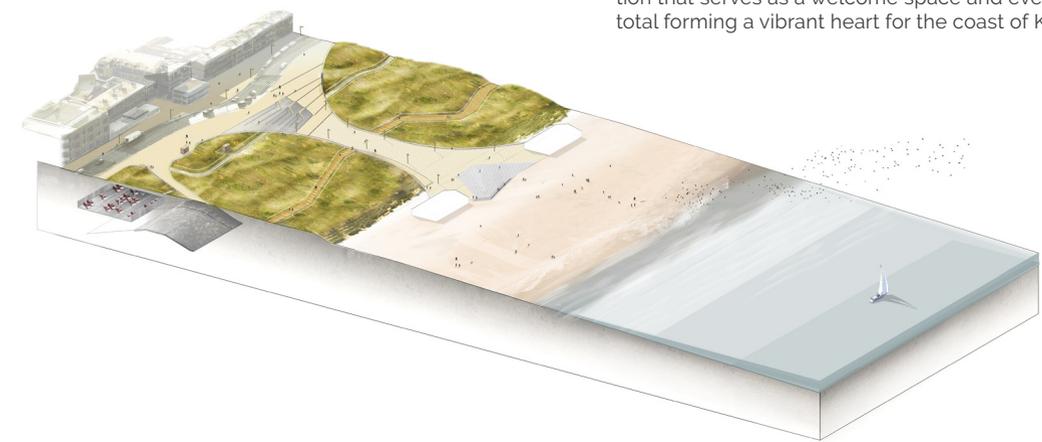
For the past ten years the Rijkswaterstaat, the Ministry of Infrastructure and the Environment, have been working to strengthen some weak links in the coast. Alongside building the required coastal defence, the coast zone investments also ensure that Katwijk remains a tourist destination and supporting the local economy of seaside towns. With the need to strengthen the Katwijk coast, care is taken to preserve the value of the existing town and, ultimately, how this can also be made stronger.

#### Relation Between Town and Beach

In an interactive planning process OKRA defined the most important values of Katwijk; namely the relationship between the village and the beach. The chosen dyke-in-dune coastal defences, a stone-lined embankment covered and reinforced by dunes, sufficient low dunes would be built with minimal disruption between town and beach. With this construction the City Katwijk could also realise an underground parking garage behind the dyke.



Natural Dune Landscape  
 The dyke and garage are completely hidden from view by natural-looking dunes. An extensive network of paths has been built to connect village and beach, offering views of the sea. The highlight of the design is a broad dune transition that serves as a welcome space and event plaza, in total forming a vibrant heart for the coast of Katwijk coast.



BIKE TUBE  
PROTECTION FROM SUN  
AIRCONDITION  
ELECTRIC BIKE TRACK  
CAN LEAD TO ELEVATED PARK TO REST UNDER TREES

FREE BIKING IN CONNECTION WITH PUBLIC TRANSPORT  
ELECTRIC BIKES  
PARKING LEADS TO ELECTRIC BIKE HIGHWAY TRACK



Bike Hub Singapore

### Interlinked urban nodes: a growing vital network

As described earlier, a healthy city enables people to support each other in performing all the functions of life and developing to their maximum potential. Cities can use the principles as a guideline in their transition to healthy environments. The team of ZJA, OKRA and Witteveen+Bos translated the definition of The Healthy City and the principles into a specific urban programme with nodes in the growing network that can be used as catalysts. The urban nodes have a number of essentials and possibilities:

1. Transport hubs;
  - E-node;
  - Floating Node

- Interconnected by:
2. Stacked corridors

In this proposal a network of urban nodes is connected to other networks and is imprinted in the existing urban fabric. Urban nodes are conceived as catalysts, further activating the existing urban networks in the metropolis. In Singapore's current multi-polarity in terms of economic hotspots and connecting urban transport, these nodes will function well beside each other, and interact economically, socially, culturally, spatially and energy-wise.



#### North/South Metro Line Amsterdam

The North/South Metro line in Amsterdam serves as an excellent example for building underground in an already built up area. Witteveen+Bos works for the Municipality of Amsterdam at their most prestigious project. The North/South metro line will connect the North of Amsterdam with the South. The total length of the current North/South metro line is about 9 km, with 9 stations in total. These stations are the catalysts in the new transport network of Amsterdam. Safety modelling is executed to ensure the safety underground (the stations are located to 26 meter below ground level. Another major part of the challenge concerns the surgical operation, limiting the nuisance and controlling the risks during the construction of the line.

#### Amfora

In its 'Action plan Healthy City 2008 - 2014', the city of Amsterdam published its strategy regarding the environmental and economic development of the city. Concentrations of particulate matter (PM 10) and nitrogen dioxide (NO2) are well above European standards. These standards have to be met in 2010. Otherwise, not only the health of the Amsterdam citizens will suffer, but also the economy and development of the city. Permits for building projects may not be granted. The city published a range of measures accompanied by the following statement: „If anyone can

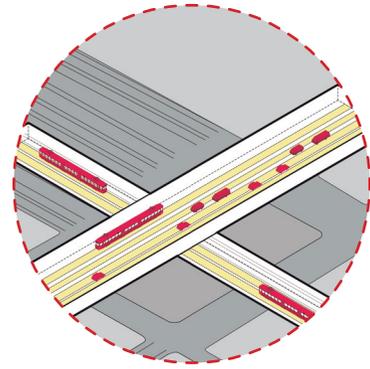
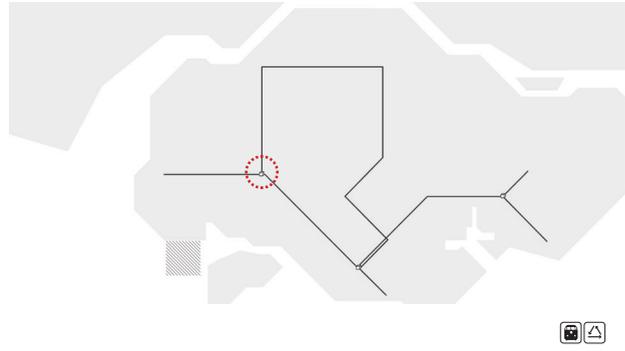
make it plausible that the objective can also be achieved in any other manner, their idea will certainly be investigated." In collaboration with Okra landschapsarchitecten, Delfttech. Winner MIPIM Future Projects Award 2010 (Big Urban Projects) for Amfora Amstel

#### Beatrixlaan

Randstadrail is a project for a new light urban rail network for the area between The Hague and Rotterdam. The network runs partly over existing tram and railway tracks and will be supplemented with new sections. In the centre of The Hague, in the Beatrixkwartier office district, a link between the tram viaduct at the Ternoot stop and the NS (Dutch Railways) railway embankment close to the Laan van NOI station was needed. To achieve this a viaduct has been built over the entire length of the Beatrixlaan, with a new station halfway.

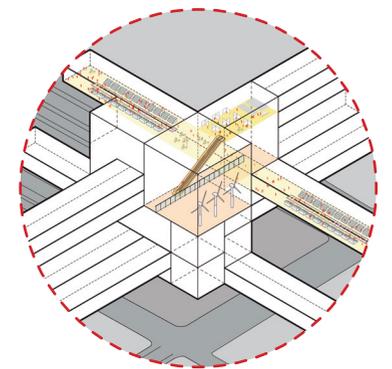
Phase

1



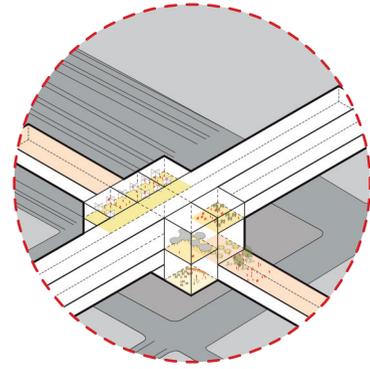
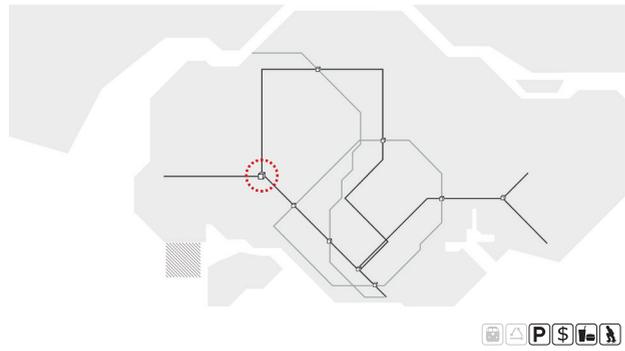
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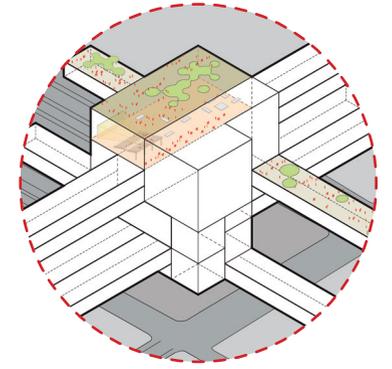
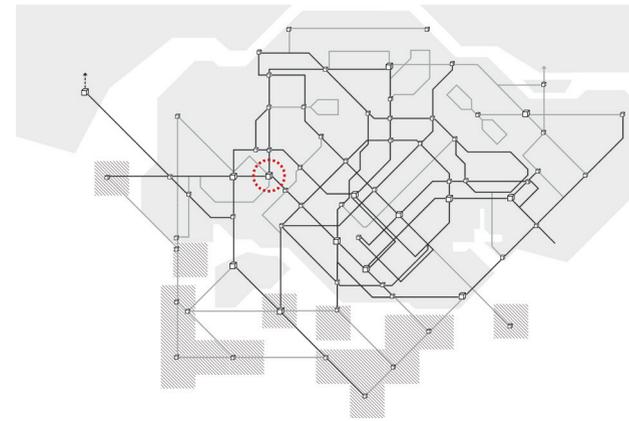
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2



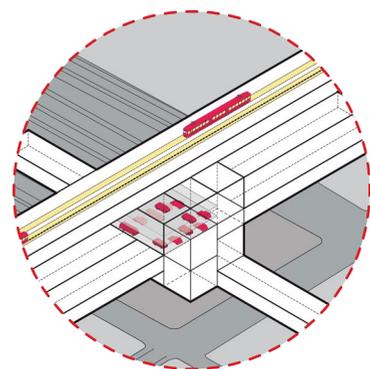
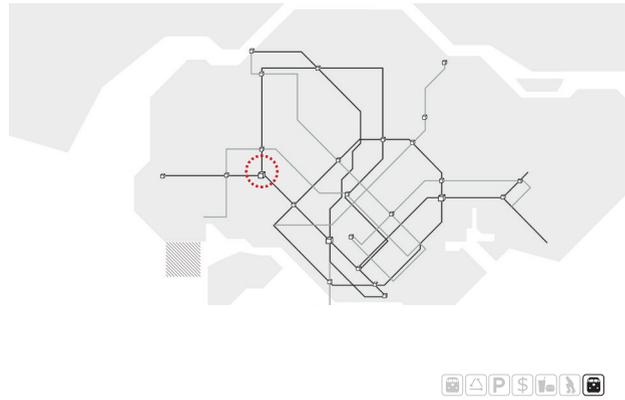
Phase

5

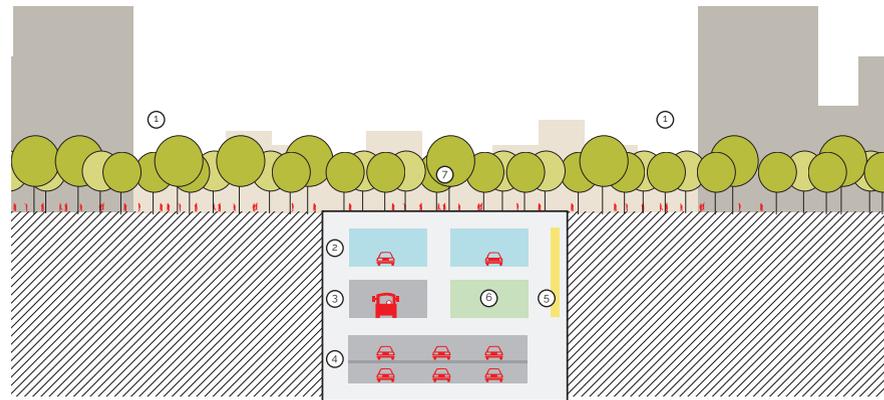


Phase

3

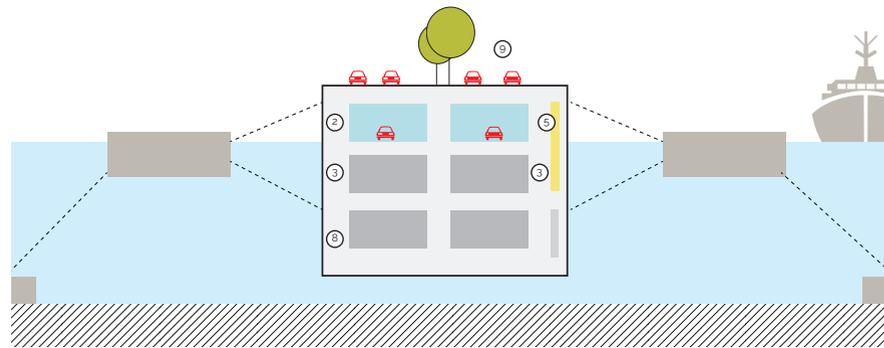


- commercial
- food & beverage
- educational
- leisure
- transportation
- energy plant
- green area
- energy transformation
- waste
- to be charged
- storage



Conceptual sketch  
basic principle stacked  
corridors

1. Open green
2. Transportation
3. Recycleable waste
4. Vertical parking
5. Utility
6. Energy plant
7. Green corridor
8. Container terminal
9. E-cars



### Opportunity: stacked corridors

E-nodes, Floating Nodes and interactive coastal areas will be interconnected and linked to the existing urban fabric by a system of stacked corridors. Above ground, attractive and pleasurable public space is created encouraging Singaporeans to spend free time, exercise, cycle and breathe fresh air. Underground, a somewhat hidden network of transport veins will be the necessary interconnecting infrastructure in The Healthy City by conveying people, goods and energy/ utilities, node modules, information and waste. This compact and condensed transportation system in which anything moves driverless is designed to be very efficient, 24/7. During the day it will mainly carry people, at night mainly goods. Energy, node modules (if

required), information and waste will be carried anytime. Moreover, these corridors are conceived as a modular, flexible and expandable system, able to grow in terms of networks size and capacity. Besides being a very compact, flexible and efficient system, it thus creates healthy space above ground for people.



#### ZuidasDok Amsterdam

Project ZuidasDok in Amsterdam aim to improve the accessibility and enable further growth of the financial hart of the Dutch capital. The initiators purpose to create a sustainable multifunctional urban centre. The first step is to bring the highway traffic underground and to redevelop the public transport station. An important aspect in this surgical operation is that the traffic tunnel is design on a very short distance from the existing buildings. Investigation reveals how the risks for settlements and vibrations can be managed during the realisation.

#### Mobility plan Riga

The metropolitan area of Riga houses more than one million people, or 47% of Latvia's total population. A diversity of traffic problems confront the city. Witteveen+Bos has executed a Mobility Plan that provides the framework for planning and management of public transport and the road and rail networks, the limited capacity of Daugava river crossings, a lack of road safety and a shortage of facilities for cyclists and pedestrians.



#### 'Cycling city of all' Oslo

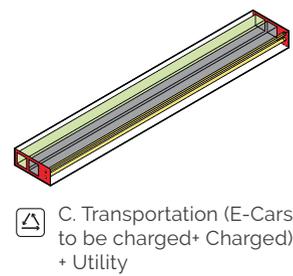
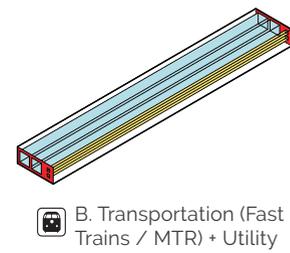
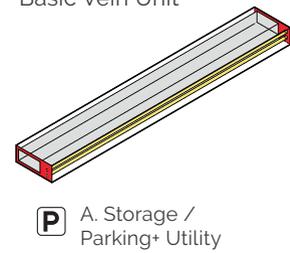
The contribution of Witteveen+Bos, OKRA and Grindaker calls for integrated planning of all traffic modalities in Oslo. In order to create safer conditions for cyclists, the plan proposes a number of solutions, including on-street parking in the city centre and a reduction of car traffic. The plan also calls for bundling public transportation routes, enlarging the 30-kilometre speed limit zone in the city centre, constructing bicycle routes that cut across the city centre, and



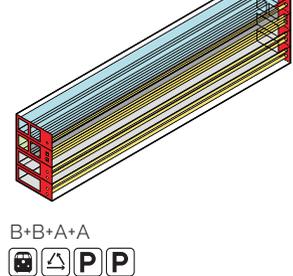
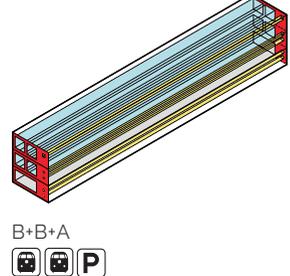
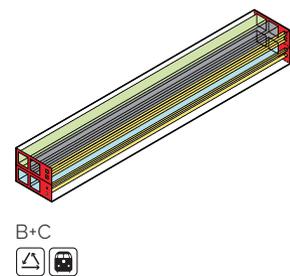
diverting motorists away from an enlarged pedestrian city centre with car parks on the perimeter. The designers also propose the construction of more bicycle parking facilities.

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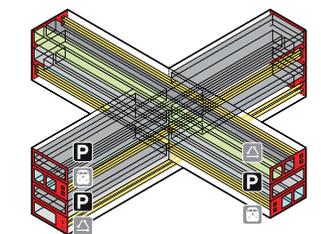
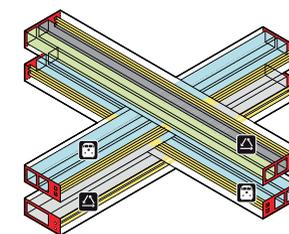
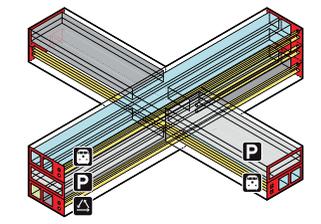
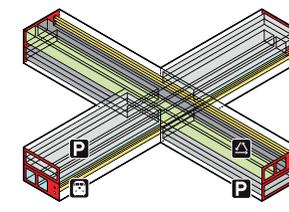
Basic Vein Unit



Unit Configuration



Interchange/Joint



**Parallelstructure A12**

Infrastructure project "Parallelstructure A12" will significantly improve the city of Gouda's connectivity. In collaboration with Heijmans, ZJA designed a highway infrastructure system that will release pressure from the infrastructure network surrounding Gouda. The largest and most complicated feature is a 500 meter long and partly moveable bridge, crossing the river Gouwe, directly adjacent an existing aqueduct.

**Athens Centre**

**Decline of the City**  
Decades of rapid growth in Athens caused infrastructural problems and a social-cultural imbalance, against a background of difficult economic circumstances. The decline of the city centre is clearly visible, low quality of life and a shortage of green in a severe environment.

**One Step Beyond**

Changing the heart of Athens into a true contemporary metropolitan city centre requires transformation of the city

triangle into a lively and attractive part of the city. OKRA puts innovative theories of climate control, reduction of vehicular movement and programming public realm into practise with one step beyond. By creating an integrated proposal to realise a resilient, accessible and vibrant city, not just limited by its project borders, but by linking this area to its adjacent areas and therefore becoming a catalyst for the whole city. A new network of public and semi-public spaces will provide new and safe routes, creating new places where people can enjoy and ultimately, encourage new developments.

**Economical Activation**

The regeneration of the city centre will strongly contribute to the change of Athens. It will improve the environment of the city plus activating the area economically.



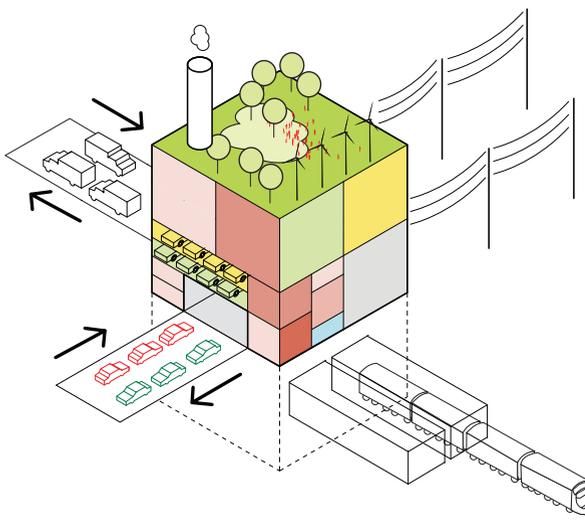
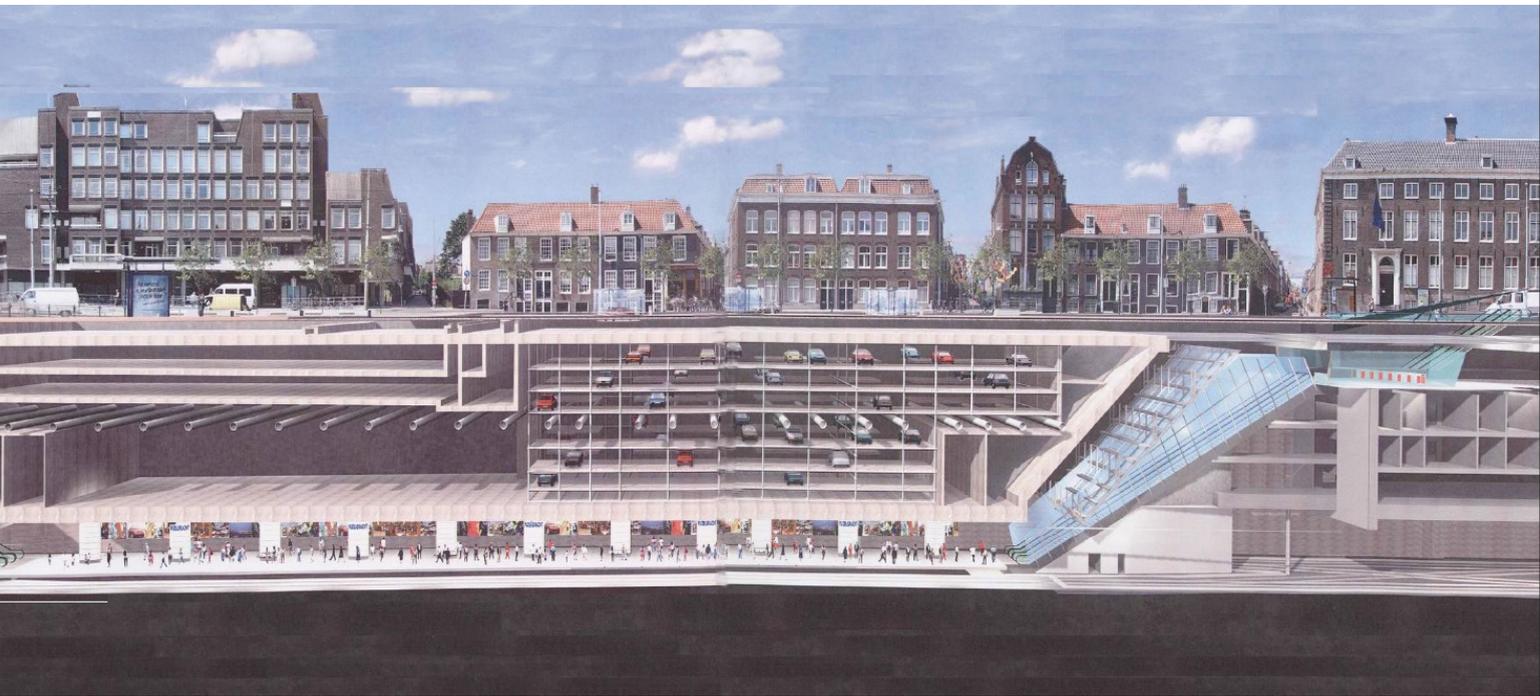
## Modules

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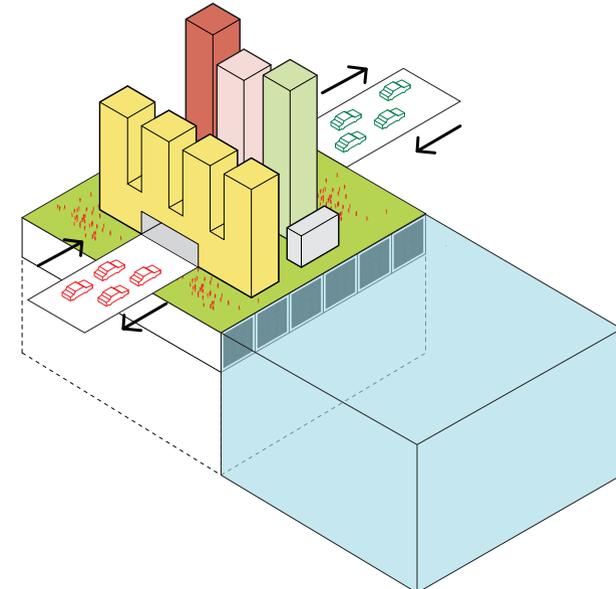
# Modules

## Transport hubs in a complex urban environment

The challenge of connecting all flows of passengers, goods, money, energy, data, etcetera is not only to facilitate a robust handling capacity. If properly designed, one can achieve synergy in terms of costs and benefits by utilising the resources that are involved with each traffic flow. The coupling of different traffic flows will then yield more than connecting these individually (1+1=3). It is important to understand the hierarchical levels of each traffic flow, enabling the hub function to support each traffic circuit from local (street) level to state level.



E-Node

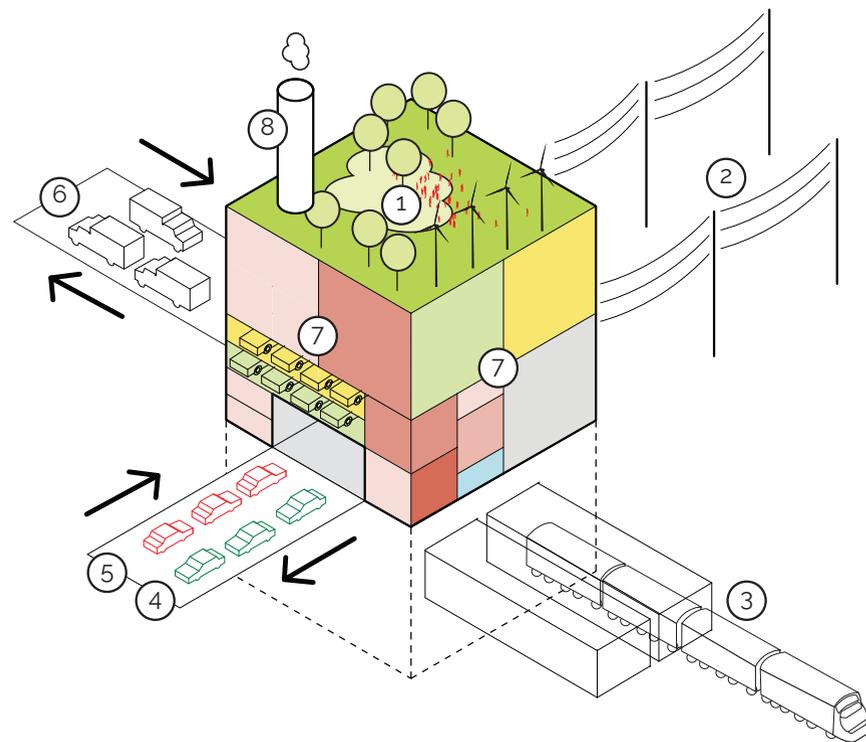


Floating Node

- commercial
- food & beverage
- educational
- leisure
- transportation
- energy plant
- green area
- energy transformation
- waste
- to be charged
- storage

Conceptual sketch basic principle E-node

1. Open green
2. Energy production
3. MRT (transport vein)
4. E-cars charged overnight (transport vein)
5. E-cars to be charged (transport vein)
6. Waste recycleable (transport vein)
7. Hybrid programme (see legend above)
8. Clean discharge



### Opportunity case: E-node for Singapore

A new type of urban node is introduced by joining electric mobility, public transport, leisure, energy production, waste incineration and education. In fact, the E-node is an enriched version of a public transportation hub (which in fact often already contains a hybrid programme), a destination and a place to be. When transportation shifts from conventional cars to e-mobility these hubs will be important places in the network.

The E-node is a dynamic concept; it is a menu from which elements of the programme can be chosen according to the specific needs and location in Singapore. It is also a modular system, which can be expanded in phases to meet the requirements of that time.

It will be interesting to link spatial conditions to state of the art sustainable energy systems. We welcome the opportunity to integrate energy centres as visible parts of the public domain and urban experience in these nodes. We envision that a completely automated waste collection

system terminates in the E-hub. A state of the art incineration plant turns the non-recyclable waste into electricity, which will be used to recharge E-cars while these are not in use. By making this entire waste – energy production process accessible, it will boost public awareness on consumption and waste. Solar panels integrated in the lighting structures and kinetic pedestrian crossings can be added too.

Normally, routes and pedestrian crossings are mainly driven from the perspective of connectivity and safety. By means of kinetic crossings these routes can contribute to energy sustainability as well. Furthermore, efficient use of shade and sun within the public realm and especially the urban rooms can mitigate the urban heat island effect on a micro scale. Careful orientation towards the sun and existing buildings and deliberate integration of the design with local light, wind, water, shadow and vegetation patterns will create delightful and deliverable public spaces.



#### Erasmus Line Station, The Hague

A new departure station is needed at The Hague Central Station for the Erasmus Line, the fast light rail link between Rotterdam and The Hague. Zwarts & Jansma Architects was asked to design the most realistic +2 level variant. Trams arrive at the station via a long viaduct. This carries the RandstadRail over the Bernhardviaduct at more than twelve meters above ground level to the departure station. The latter is situated at the edge of the bus platform and high above Anna van Buerenstraat.

#### New Station under the Kop van Zuid

The Wilheminahof was designed for the banks of the Maas, next to the abutment of the Erasmus Bridge. The project, a combination of courthouse, tax office and other offices, was meant to be a stimulus for the southern bank of the Maas, with the ambition of drawing the centre of the city out across the river. The Wilhelminaplein metro station had to be constructed beneath this complex of buildings. Immediately after the metro tunnel has passed through under the Maas, the tube is still at its deepest point, and it then rises as steeply as possible in order to attain the level of the aboveground metro line.



#### Kralingse Zoom

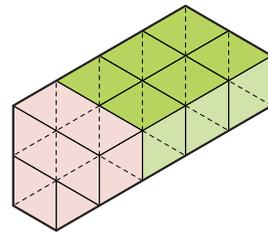
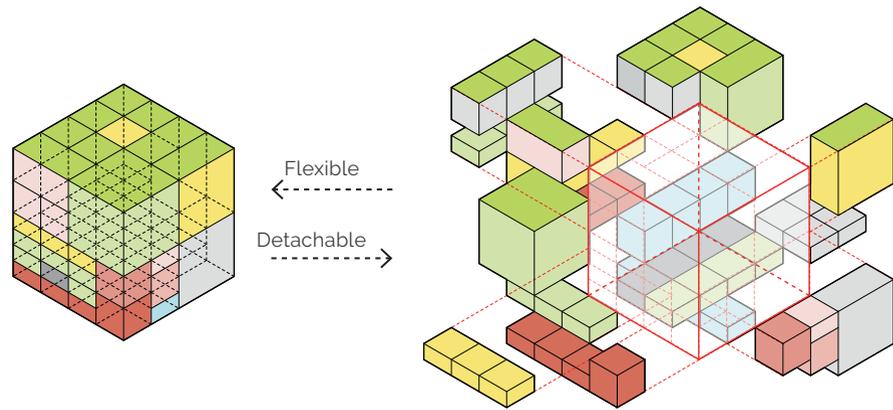
Kralingse Zoom is a public transportation hub containing 1.040 parking places, metro, bus station and a people mover in Rotterdam, the Netherlands. The 175 meter long new building is next to the Highway A16 and crossing the existing metro and bus line. The result is a striking object, marking the high level business district Brainpark in Rotterdam.



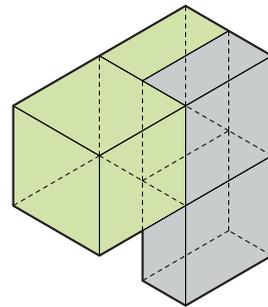
#### Bleizo

The Transport node is a node with potential for development. The location is determined by the future intersection of the Extended Oosterheemline, the A12 and the railway Gouda-The Hague and thus offers opportunities for the influx of people and real estate development. Currently the node does not exist and therefore only for few people a reason to go to this place.

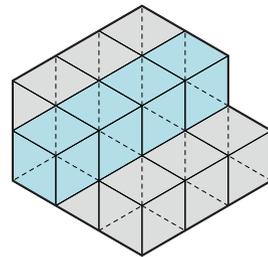
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- storage



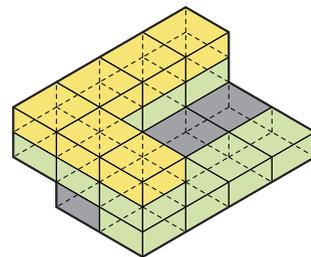
Leisure + Open Green



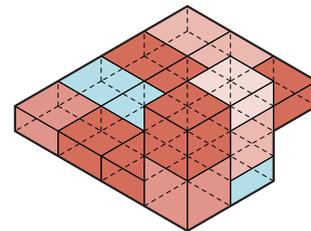
Energy Plant + Waste Storage



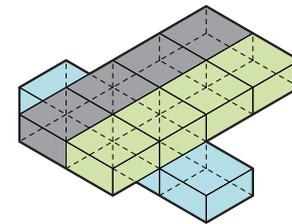
High Speed Train + Car Parking



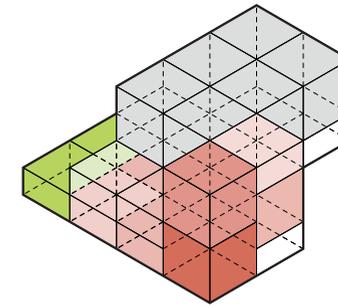
Energy Transformation + E-Cars Charging Service



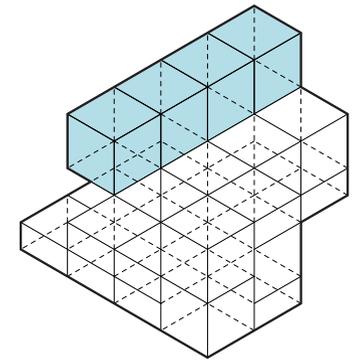
MRT + Commercial + Food & Beverage + Leisure



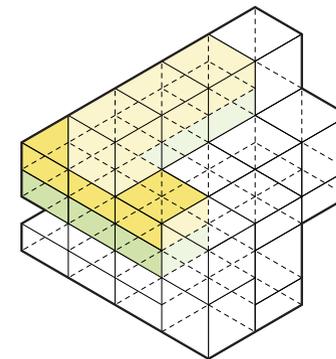
0. MTR+Recyclable Waste Storage / Reproduction



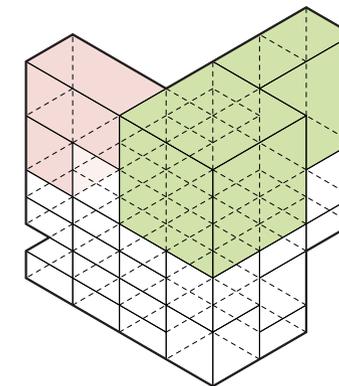
1. Add Commercial and Public function, Offer more Parking: P+R



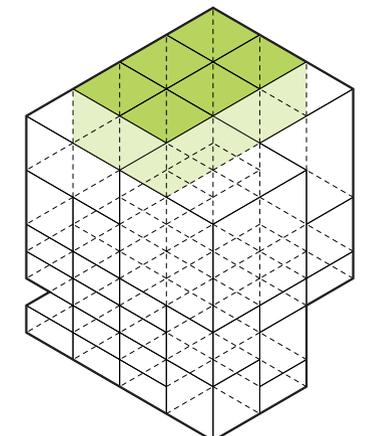
2. Fast Train line in use



3. MTR+E-Cars(charged/ to be charge)



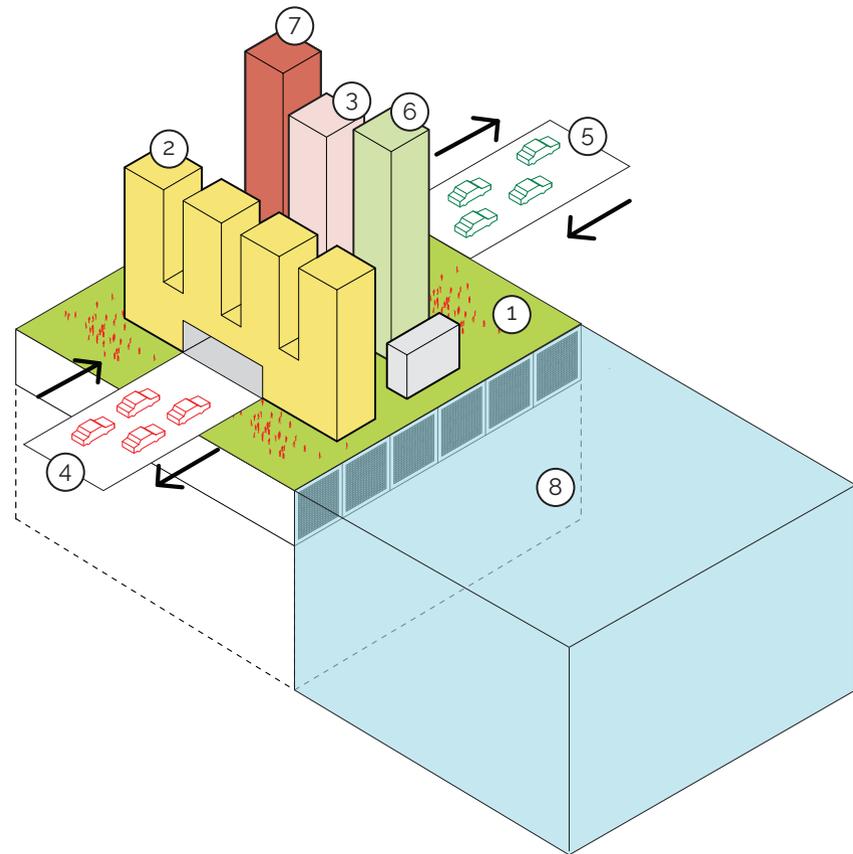
4. Educational Center for Sustainability +Energy Production



5. Provide more Open Green for city and people

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- educational
- leisure
- transportation
- energy plant
- green area
- energy transformation
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- to be charged
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- Conceptual sketch basic principle floating node:
1. Open green
  2. Energy production
  3. Education centres
  4. E-cars charged overnight (transport vein)
  5. E-cars to be charged (transport vein)
  6. Clean discharge
  7. Commercial functions
  8. Sea / ship docking

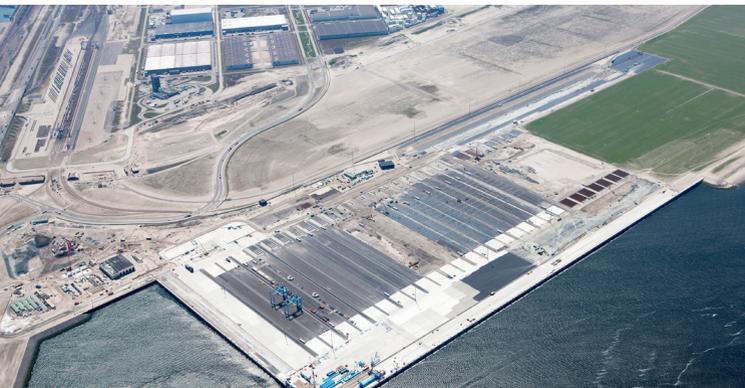


## Opportunity case 2: Floating node

The Floating Node is a layered city combined with a state of the art below sea level container terminal: a floating trade community. It is a place where people dwell, work, shop, play sports and spend their free time. However, like an iceberg, a large part of its programme is hidden below sea level. A completely automated container terminal is located under a layer of (seemingly) ordinary city.

Building new parts of Singapore completely offshore on floating islands will release pressure from a scarcely available resource, land. This creates new possibilities for the expansion of the Port of Singapore and its transshipment facilities. Also, when covering as many square meters as possible with photovoltaic cells, these islands will double as power plants and offshore power supplies for waiting ships, eliminating the need for diesel generators on-board. Moreover, the ships' batteries can be turned into a temporary and collective powerhouse where the day's power surplus is stored and delivered at night.

The Floating Node is a highly flexible system. A single island, connected to the mainland, can be the starting point of a network of islands offshore. Additionally, the modular approach creates the possibility for island expansion with more space, adding new programme. It would even be possible to add modules to accommodate temporary facilities (for example in case of large sports events and temporary needed labour). By an advanced buoyancy control system, stability of the Floating Node is maintained while containers (thus mass) are moved, loaded or unloaded from the island.



### APM Terminal Rotterdam

The APM Terminal creates new innovative, sustainable and safer possibilities for the expansion of the port of Rotterdam and its transport facilities. It runs on a zero emissions, sustainable business model using renewable energy, benefitting the people of Rotterdam and Europe. And, equally important, with 40% higher productivity – thanks to automation. BIM-techniques (Building Information Modelling) are used to refine the constructional implications with real-time connection between calculations and 3D design.

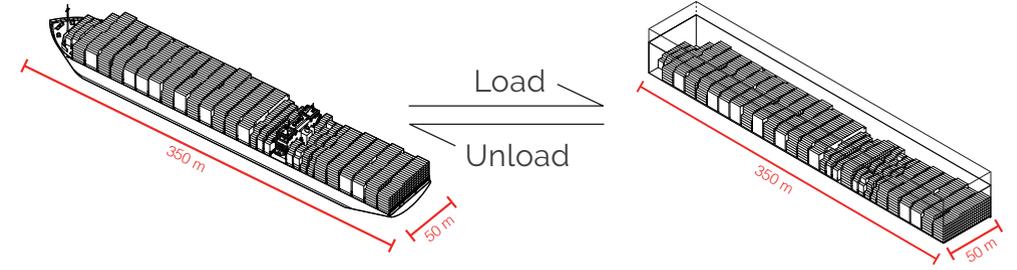
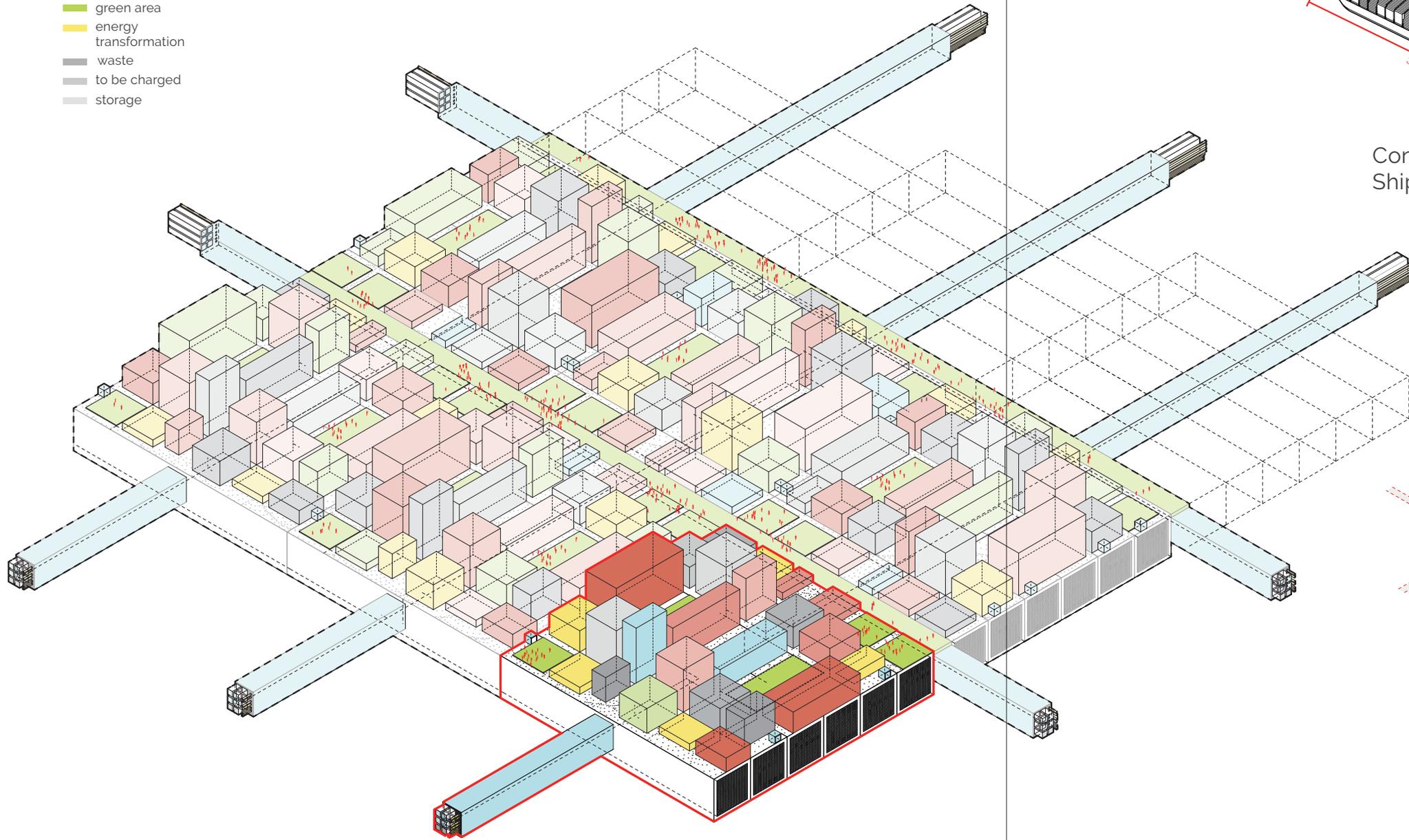
### Manmade islands Caspian Sea

Manmade islands are designed and realised to explore the oil reservoirs present in the northern part of the Caspian Sea. This off-shore project is exemplary of our expertise in tough environments. The oil reservoirs are located about 100 kilometres from shore within a climatically violent area. Average temperature varies from plus 35 to minus 35 degrees Celsius. Essential in this climate is the protection of the islands from drifting ice and waves.

### Floating cruise terminal

At the Cayman Islands, a private initiative to increase economic activities and preserve coastal ecosystem at the same time led to a design for a floating cruise terminal offshore. The main challenge is to be able to resist natural hazards.

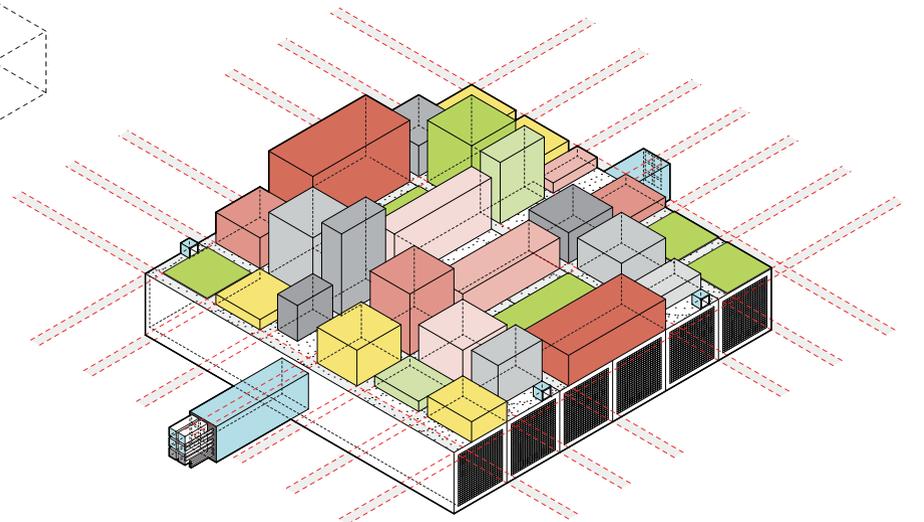
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Container Ship

Container Block

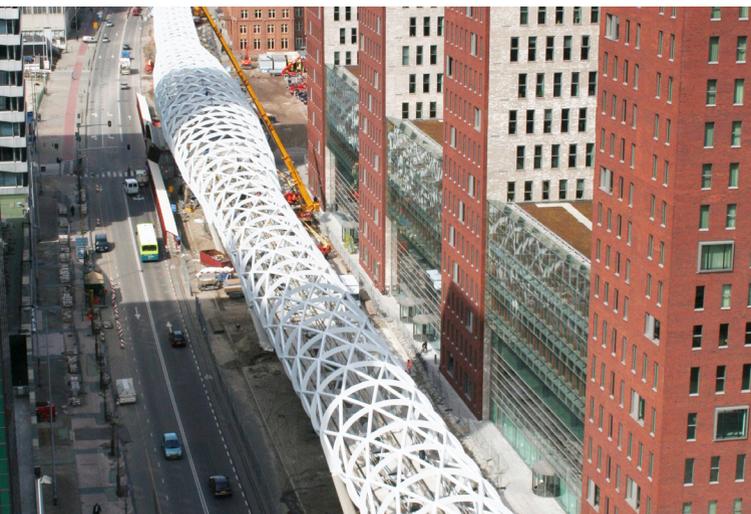
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## Company Profiles

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## Company Profiles

### Witteveen+Bos

Witteveen+Bos offers its clients valued-added consultancy and design services. We deliver reliable solutions built on the knowledge, experience, social insight and intellect of our employees. Witteveen+Bos is committed to being a first-rate consultancy and engineering firm. Performing at the very highest level is a precondition for achieving this goal. A national and international orientation towards products, markets and the labour market is essential to operating at the pinnacle of our field of work. In order to keep abreast of new challenges and developments in these different areas of expertise and to ensure an effective management and coordination of our services, we are organized in four business lines: (I) Built Environment, (II) Delta, Coasts and Rivers, (III) Energy, water and environment and (IV) Infrastructure and Mobility. These business lines consist of expert groups for the different disciplines relevant to the area of expertise.

[witteveenbos.com / witbo.nl](http://witteveenbos.com/witbo.nl)

### OKRA

OKRA is an award-winning design office for landscape architecture and urbanism. Over the last twenty years OKRA has focused on the transformation of cities and landscapes for the people who use them. OKRA has extensive experience in defining frameworks for urban development, design public space, master planning and strategies. OKRA is a multi-disciplinary team with more than 20 international professionals working enthusiastically with partners and clients to create a better environment.

We Imagine. We believe that with the understanding of tomorrow, you can solve the issues of today.

We Discover. With our eyes open and a curiosity for discovery, we get to the heart of each problem by recognising where opportunities lie.

We Build. We use our knowledge and ability to bring our vision to reality.

[okra.nl](http://okra.nl)

### ZJA Zwarts & Jansma Architects

ZJA is an internationally oriented office founded in 1990 and specialized in infrastructure, public transport, sport and leisure. We are an optimistic team that translates often complex assignments into unexpected solutions. We do this in a distinct manner, based on our many years of experience with large-scale building projects. We value our reputation as designers of stadiums, bridges, stations and motorways.

ZJA draws on state-of-the-art technical expertise thanks to amongst others its independent research & development department. In addition, our office boasts an inspiring, multinational and international network of complementary expertise, ranging from structural engineers, urban designers and acoustic engineers to interior architects, sustainability experts and software developers. Wherever we go, we look. At people, at cyclists, at queues, at building materials, at rituals, at supporters, at how people move in a park, at history, at menus, at a dune, at advertising. Everything we see finds its way back into our work.

[zja.nl](http://zja.nl)

*List of not-project related pictures*

Coverpage: Singapore skyline with iconic structures such as MBS and Singapore Flyer, Photographer: Nicolas Lannuzel (some rights reserved) / Page 4: Cyclist, trees, path, Photographer: Jnzl's Public Domain Photos (some rights reserved) / Page 7: Singapore's skyline, Daylight, Photographer: Joan Campderrós-i-Canas (some rights reserved) / Page 30: Soyuz Spacecraft docked to the ISS during Joint Operations, Photographer: NASA Goddard Space Flight Center (some rights reserved)



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