PAT MASTER PLAN

Competition Entry:: Prof. Spiro N. Pollalis & Prof. Wooyoung Kimm :: January 5, 2007

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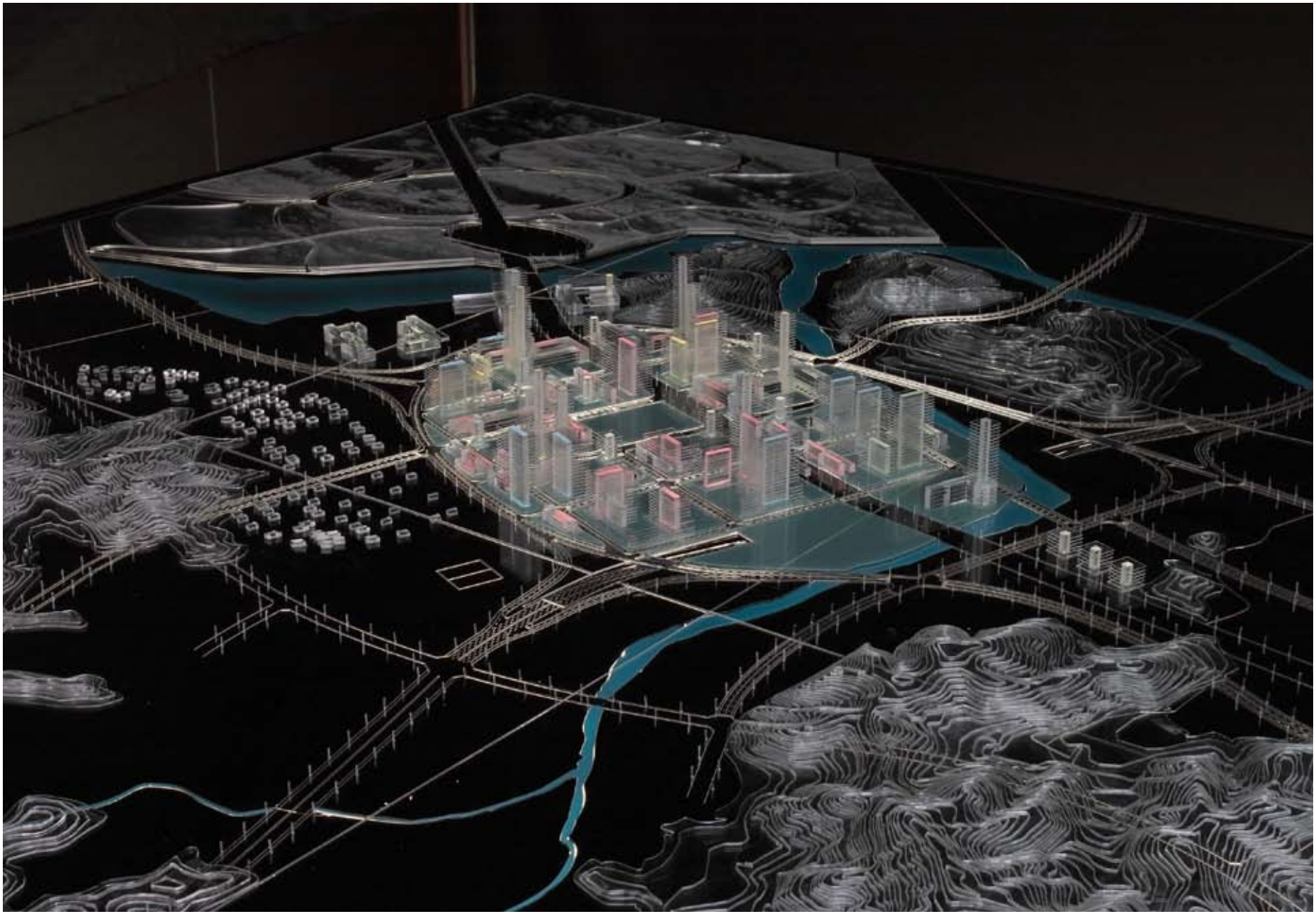
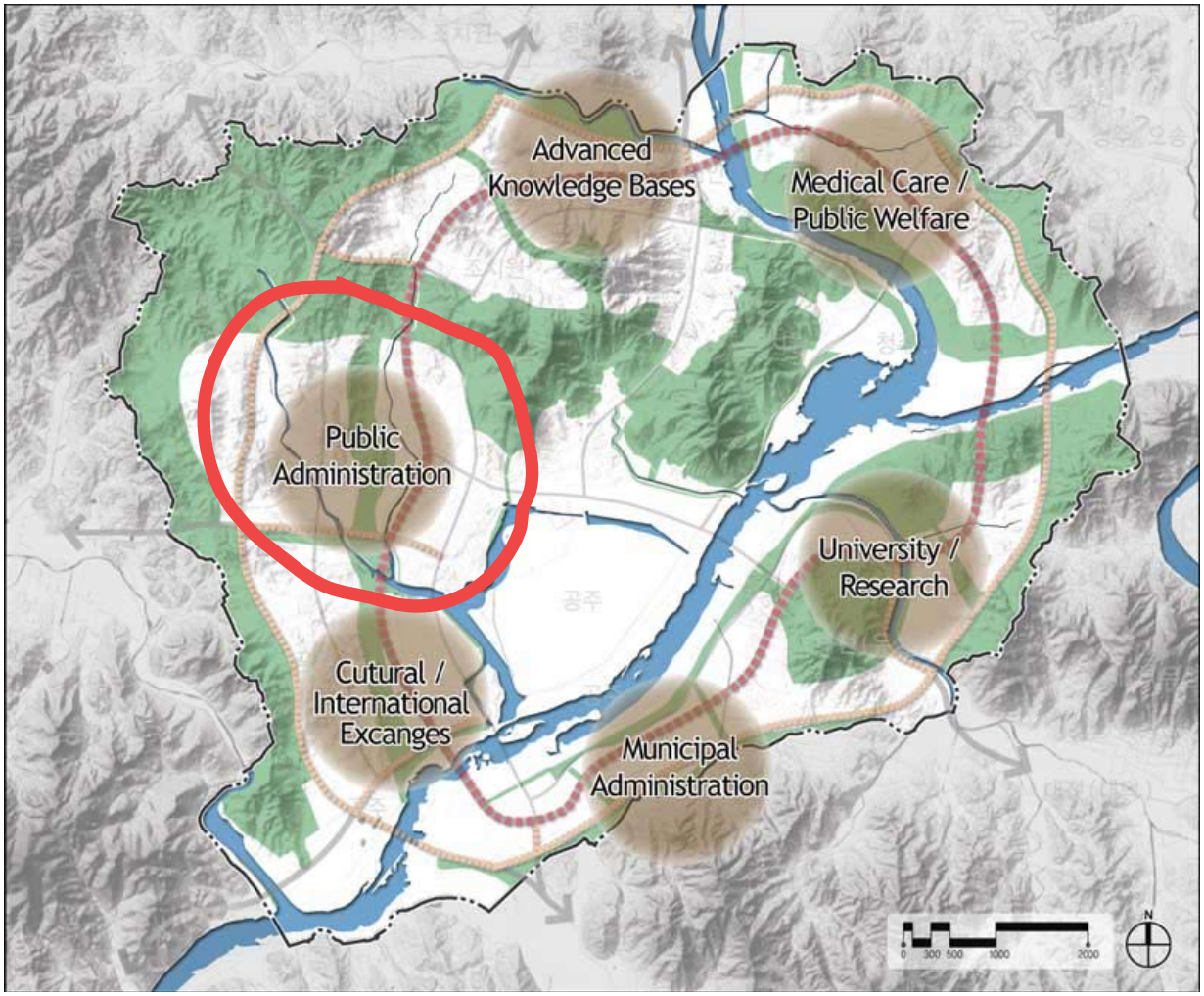


MAC is not like any new town. It is a government-based town with its own life, its own businesses and activities. It is a perfect setting for developing a model town for the 21st century, to incorporate the best in city planning and urban design.



project and site description

The project is the planning and urban design of the Public Administration part (PAT) of the new Mulit-Purpose Administrative City (MAC) in Korea.

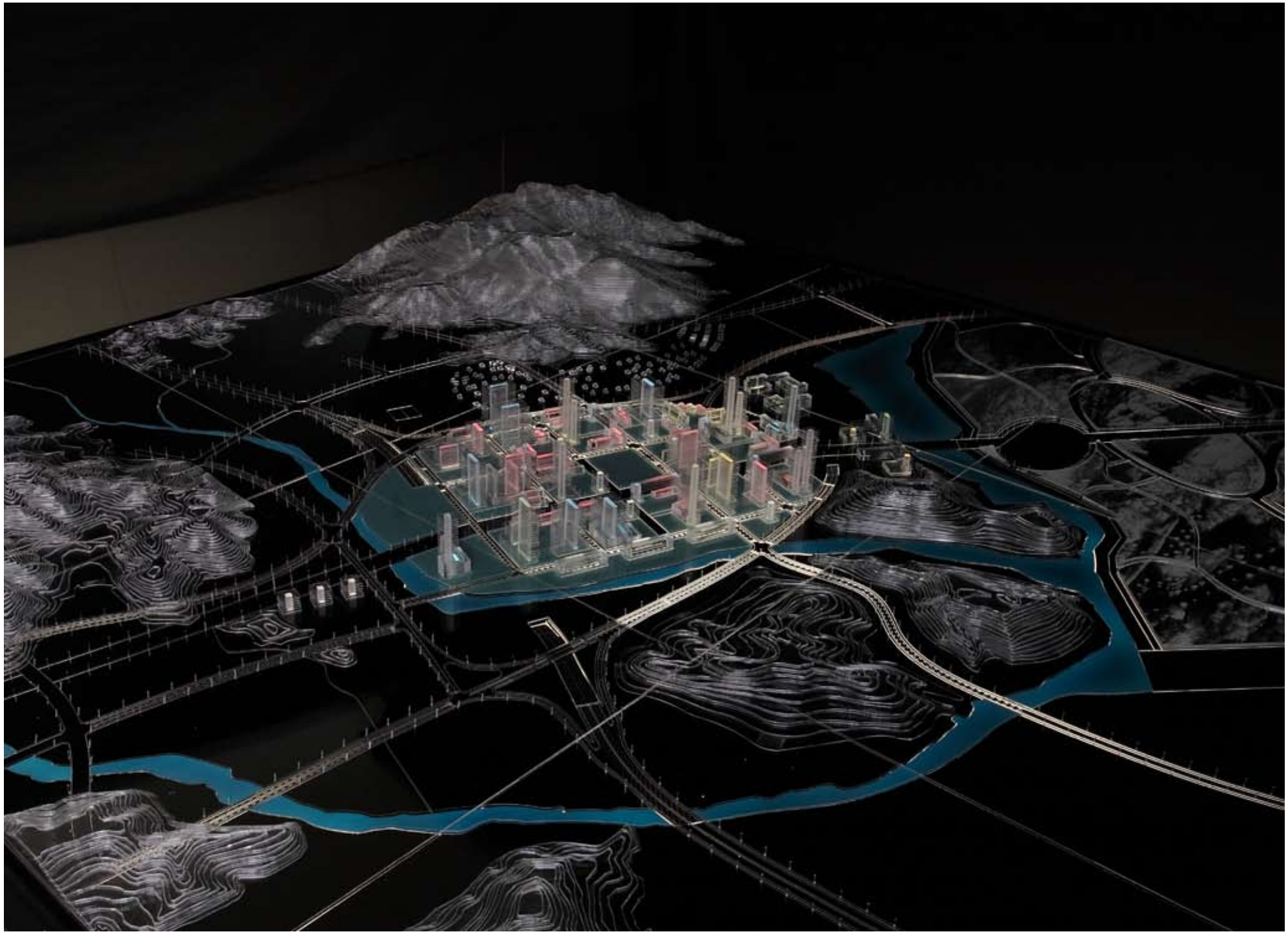
The site is in the middle of the Korean peninsula, a little more than 100 km from Seoul. It is a greenfield, with a few dwellings not to be preserved, and rice fields. It is a pristine setting with hills and low mountains, and a river crossing the site. It is near an airport and it is a node on the highway and train networks, to be further improved in the near future.

MAC will be developed in stages, with the first stage to be completed in 2012. Initially, it aims to have 200,000 people, and eventually reach 500,000.

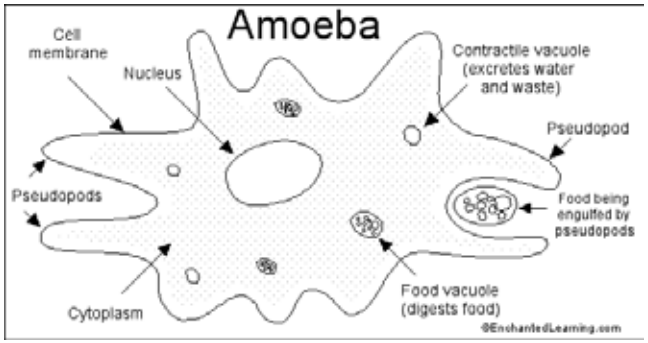
The overall planning of MAC was selected in June 2006. It proposes a city in the form of a circle, with the various towns along the circle and an open space, to be used for recreation, in the middle. The main transportation among the various towns is provided on a ring road with a Rapid Bus system. An environmentally and socially sustainable city is a requirement for the designers.

In addition, MAC should be a ubiquitous city. The planning of the technology infrastructure has already been awarded and will have a “digital architecture” component, i.e., the technology will be present on the streets and in specialized buildings that will serve as interfaces.

Korea is known for the development of new towns, usually for 30-50,000 people. What makes MAC different is that it is a government-based town and the objective is to have it stand alone, with its own businesses, activities, and daily life. Thus, it is a perfect setting for developing a “utopian” town, to incorporate the best understanding of city planning and urban design of today.



the Design

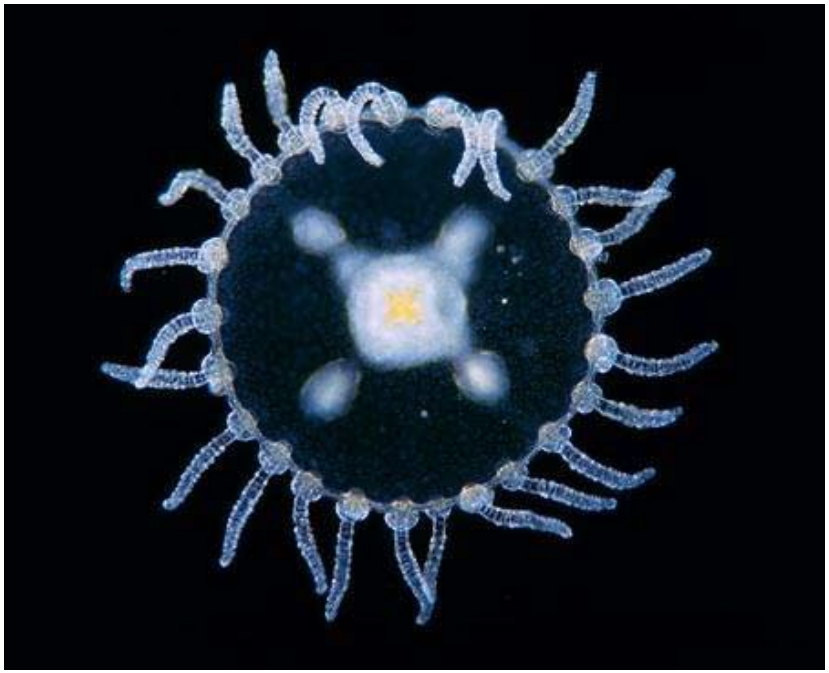


Amoeba: an inspiration

The design inspiration came from amoeba, a tiny, one-celled organism. The name amoeba comes from the Greek word “amoibe,” which means change. An amoeba consists of a single blobby cell surrounded by a porous cell membrane. The amoeba “breathes” using this membrane - oxygen gas from the water passes in to the amoeba through the cell membrane and carbon dioxide gas leaves through it. Amoebas reproduce by binary fission. A parent cell divides and produces two smaller copies of itself (http://www.enchantedlearning.com/subjects/protists/amoeba.shtml).

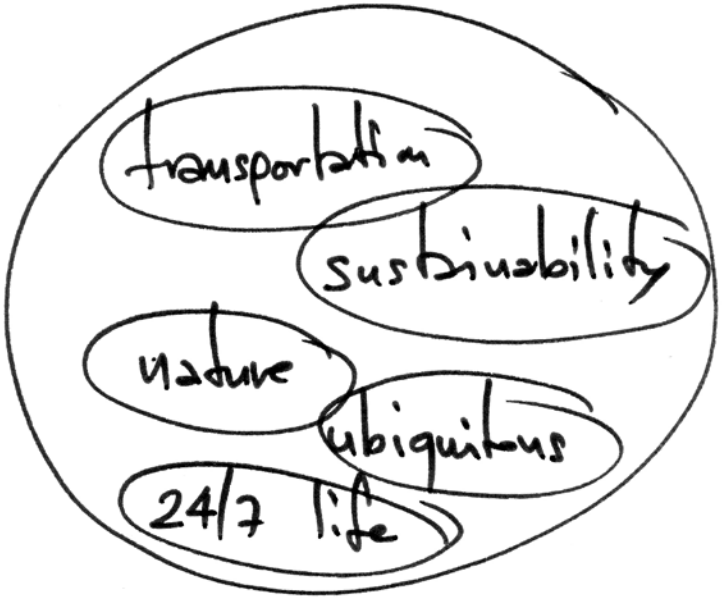
Our design behaves like an amoeba. It consists of a unified single cell, it will communicate through its boundaries with the surrounding towns, and has been reproduced through a sequential binary fission of the original MAC amoeba.

PAT addresses the everyday needs of its inhabitants and its visitors, PAT provides quality of life.



Objectives of the design

1. create a city at a human scale, with sustainable social and energy features, desirable for people to move in and visit.
2. make it consistent with the concept of the MAC planners.
3. give it an identity.
4. allow for expandability and transformation, both of the transportation system and the built fabric.



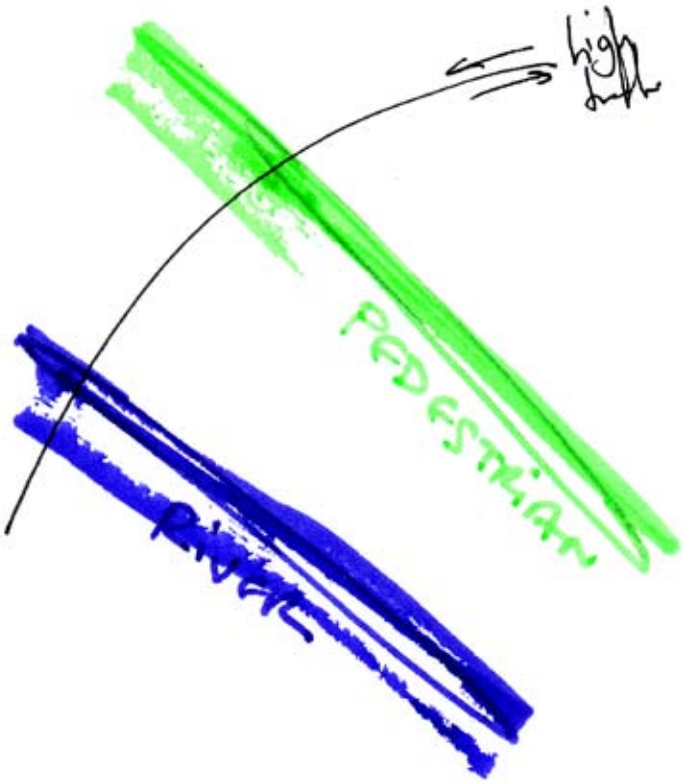
The design process

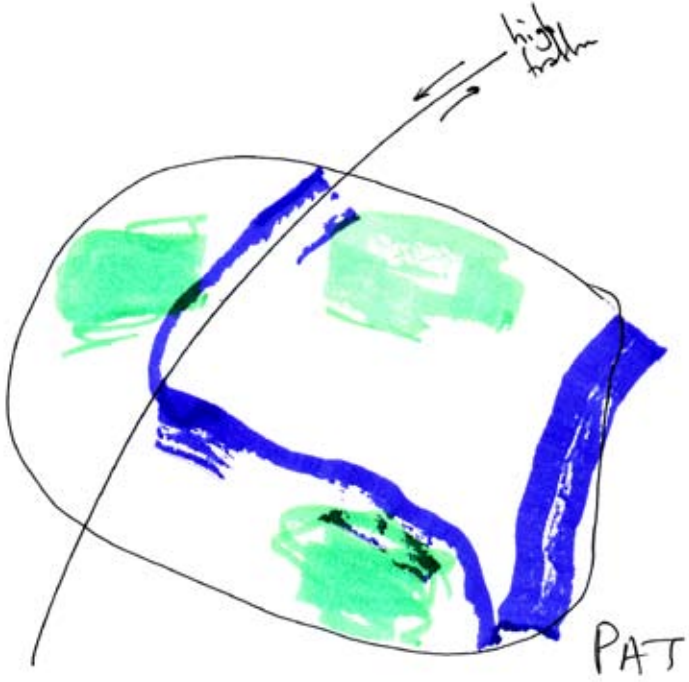
The design departed with:

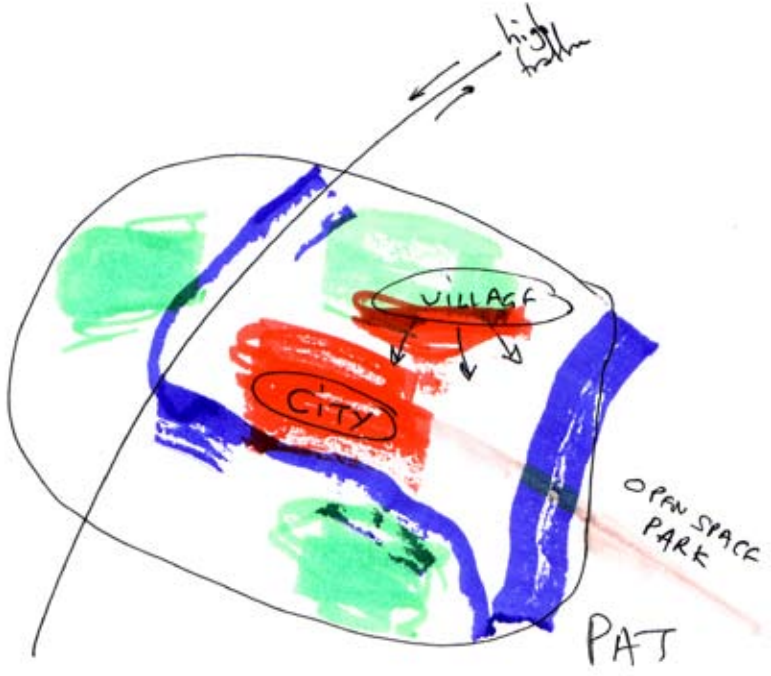
1. a desire to preserve a large portion of the hills within the boundaries of PAT
2. the establishment of water basins to enhance recreation and the feeling of nature as well as the reintroduction of rice fields in the city
3. the creation of mixed use developments to create a 24/7 life.
4. the introduction of an efficient transportation system
5. a determination to create a true ubiquitous city

All the above were considered simultaneously, being equal in priority. Often, the design followed an iterative process to meet all the above milestones.

PROGRAM m(2)	
Governmental	317,000
Business	353,392
Commercial	115,389
Residential	321,918
Educational	57,324
Community Complex	40,600
Hotels & Conference	99,120
Cultural	52,967
Government Convention Center	24,448
TOTAL	**1,382,158**

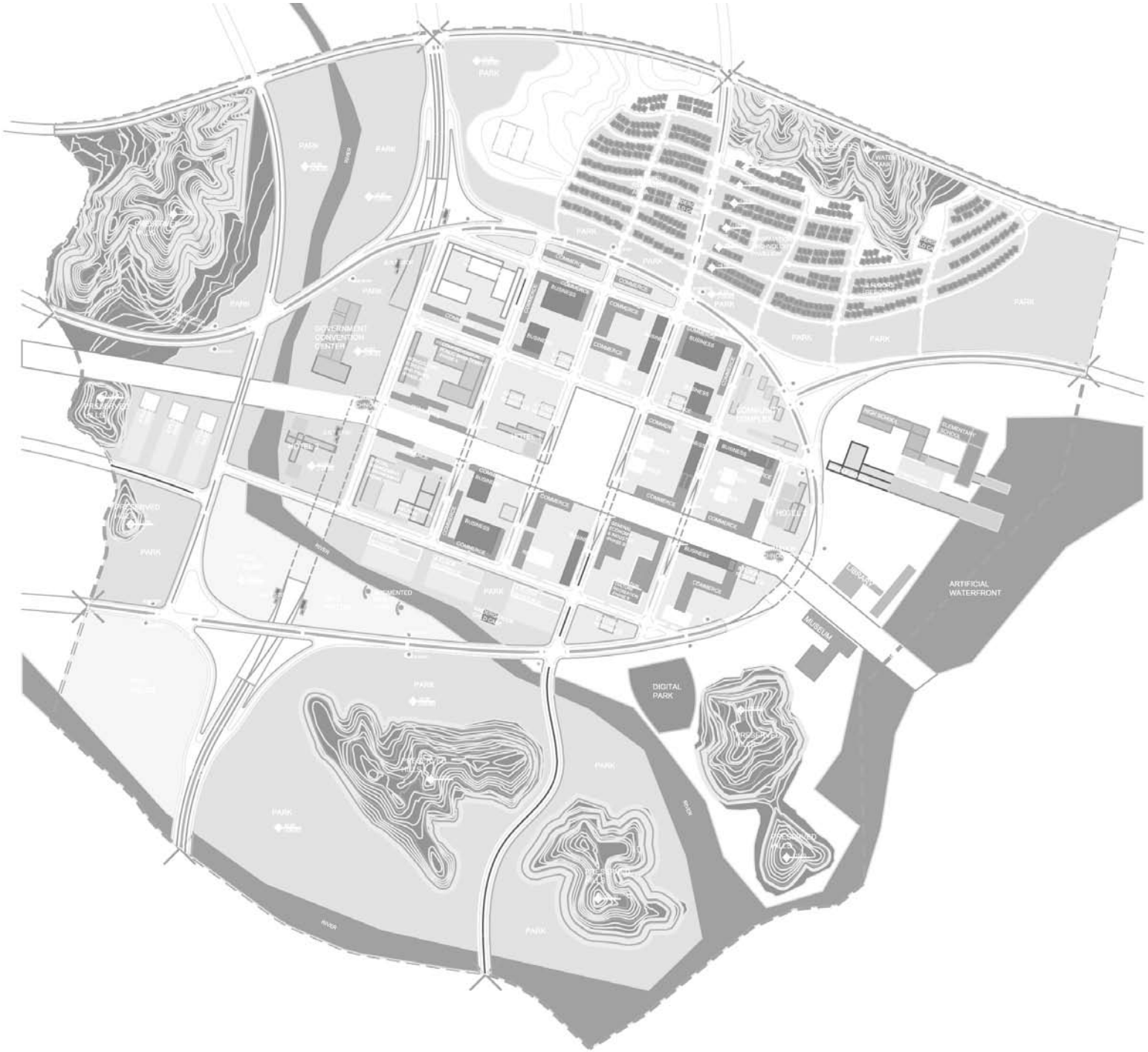






The first steps

To balance the dominant direction of the MAC ring road that connects all the towns, we decided to emphasize the perpendicular direction creating two main axes: a pedestrian walkway and an artificial river. These axes will define the design of PAT and will allow a soft connection to the central open space.
The next step was to maintain the hills at the north, south and west. The hills provide orientation, make the landscaping more interesting and create opportunities for architectural and urban design incidences that can make the design of PAT quite unique. Complementing the hills, we decided to shape the rivers in such a way to provide boundaries and also be near the center of the city, to provide the opportunity for reaching nature casually and without much effort.
Then, we placed the center of the city in the middle space, as defined by the hills and the rivers, while the northern hill provided an ideal setting to place a village on its southern slopes.



Relation to MAC

The design of the ring road makes PAT a “circular city,” reminiscent and compatible with the overall MAC design, although at a smaller scale. However, PAT, unlike MAC has the best of both worlds: the perfection of the circle, the zero, the “egg,” while it maintains a rectangular grid.

The circular implications of the ring road serve PAT well. First, they address the transportation issues in the axis perpendicular to the ring road of MAC. Second, there is a similarly open space in the middle of PAT: a large open square of 2 blocks.

An architectural approach

The design followed an architectural approach at the large, urban scale, to create spaces and forms in balance with each other. The final product is the design of the city as a whole, the land use, the transportation system, the particularities of the individual spaces for the inhabitants and visitors. The design does not focus on the individual buildings, their design will be the work of the architects to follow. Thus, we used basic organic schema for the buildings, to represent our concepts and the working relationships, as opposed to propose forms and materials. The “architectural elements” of the city as a whole are:

1. looking at elevation, the city’s gradual edges with a transition from the flat to the high-rise. We have paid an effort to avoid a carpet of uniform mid-rise buildings that kill orientation and depend on their architectural features for differentiation.
2. the irregular lots of land along the ring road that present opportunities for something different
3. the inhabitable city within the ring road, where the taller buildings are the residential towers in the mixed use developments
4. the idyllic village at the southern slopes of the northern hill, overlooking the “busy” city
5. the accessible nature, spread everywhere, penetrating the ring road, and reaching all the way to the central square.
6. the arrangement of the building blocks in each block, so that the high rise buildings dominate at the macro level, while 3-story buildings dominate the street level, offering a microcosm of proximity and comfort.

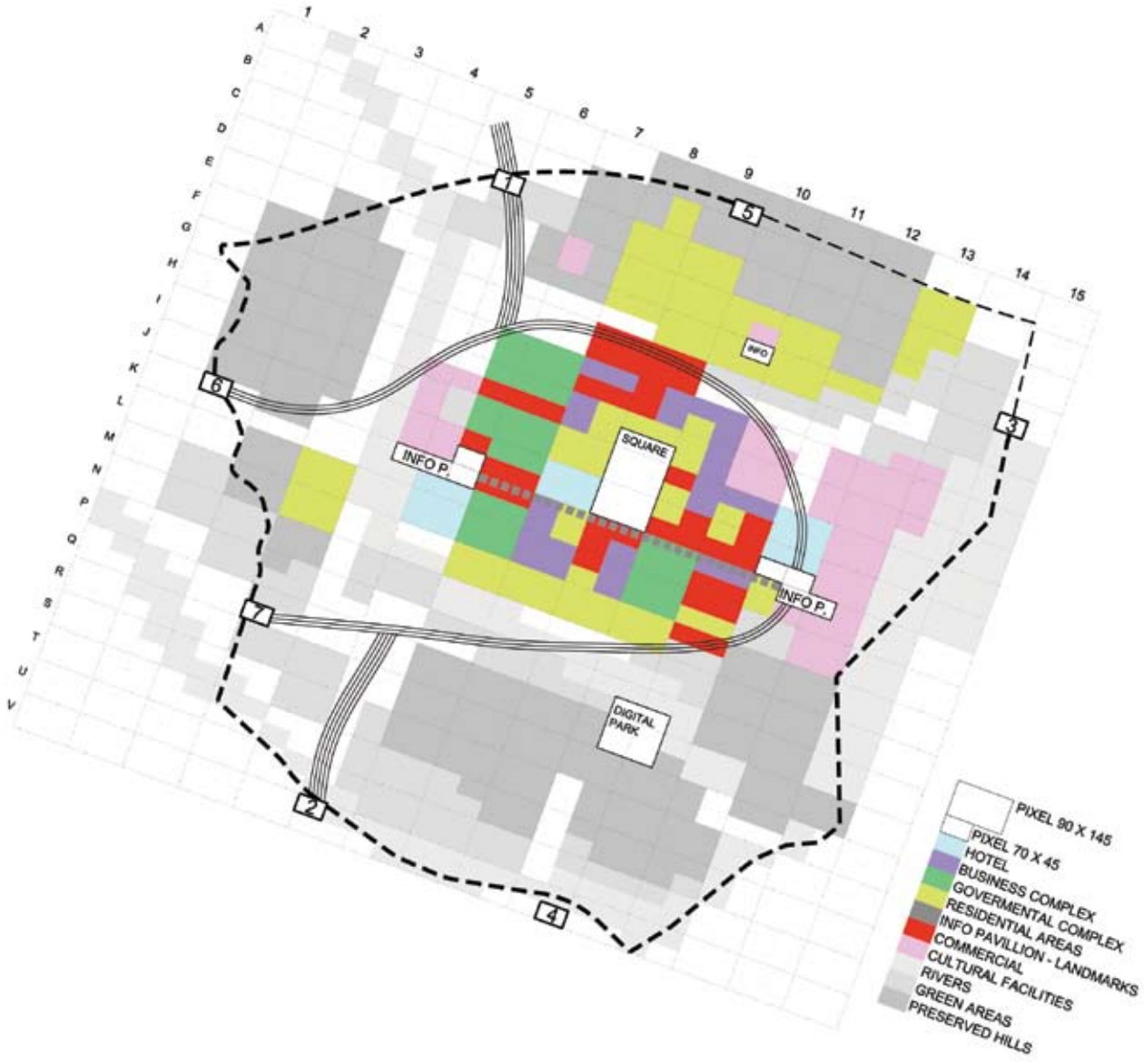

school of
administration
village
city center
community
center
schools
cultural
centers
ARTIFICIAL
WATERFRONT
DIGITAL
PARK
PARK
RIVER

Relation of spaces

The predominant part of PAT is the city center (red), geographically defined by the surrounding hills and the river and practically by the ring road.
The village (yellow) is at the north of the city center, having a desirable southern orientation, and is located on a low sloped hill. The residences of PAT are equally split in terms of square meters between the city center and the village. It is expected that young single and newly married professionals will reside in the high rise residential towers of the mixed used developments, families with small children will reside in the village, and the residential buildings in the periphery of the city center but within the ring road will be occupied by couples with older children or no children at all.
The elementary and high schools (blue) are placed in the open field, surrounded by parks, water and the cultural facilities. The schools are at an equal proximity from the city center and the village. The School of Administration on the other hand is on the west side of the hill of the village, overlooking the city and the government buildings, reminiscent of its function to educate future and current government employees.
The community center (magenta) is at a strategic location next at the intersection of the city center, the village and the schools, with a preferred access to the road system.
The pedestrian walkway provides a link with the open central space of the U-Happy City. The cultural facilities (green) create a visual gate to the park and invite visitors to combine a visit to the museums and the library with a visit to nature.

The Grid

The grid in PAT has been designed to be rectangular and rigorous to give a sense of orientation, cleanliness and order. However,, at the same time, we looked at opportunities to violate the strict order, to make the city more playful and particular. The introduction of a circular road, the ring road, provided the first option. When the rectangular grid meets the ring road, the lots of land take quite irregular shapes. The juxtaposition of the fluidity of the ring road and the rectangular grid is a distinct design feature of the city planning.
The second occasion for operating on the austere grid was at the village. The village grid could be irregular, following the natural slopes of the hill. However. a free flow grid at the village looked too different than the city center grid, so we decided to apply the rectangular grid on the hill but allow it to morphed by the slope. This transformation was achieved using a rigorous process: define contours that their smallest horizontal distance was the minimum accepted for a lot of land. Thus, the grid of the village looks similar and different to the grid of the city center, although it does not leave any doubts that it is the process of a well-defined process.
The third occasion was the double skewing of the pedestrian axis when it meets the rapid transportation axis on the west and when it meets the ring road on the east. In both occasions, the pivots are the information pavilions, located on the pedestrian walkway. There are no grids beyond the turning points, as there is no need for dense building in these areas at the present time. However, there are a few buildings, which follow an imaginary grid that turns with the pedestrian walkway creating unexpected conditions, like the positioning of the cultural facilities, the conference center and the schools, all situated outside the city center.



The Various Buildings

The government buildings will be located along the axis 1-2 for easy access. Functions within the city center will be commercial, mixed use, etc. It is expected that most city life will be in the city center, within the ring road. Two information pavilions are located along the pedestrian walkway, celebrating the importance of IT.
The hotels are spread: one in the center of the city next to the main square, the second on the west, near the ministries and parks created by the artificial creek and the third one on the east, near the residences and the cultural institutions.
The cultural centers are at the east side of the pedestrian walkway, near the bus stops and near the large body of water and the open space/park.
The convention center is just west of axis 1-2, as convention centers generate a lot of traffic and their buildings are imposing to the urban fabric. The school of administration is east of axis 1-2, having spectacular views and having the form of a campus.
The low rise residences are split in 3 villages, surrounding the city, always near amenities and open park spaces. They all have a part on a flat topography and a larger part on the slopes of the hills. They are all connected with the ring road and the community center is on the east, near the cultural facilities, in an area that is quite prominent in the city.
The rice fields along the water creek allow an immediate contact with nature while they offer areas for expansion in the future.


PARK
PARK
PRESERVED HILLS
PARK
PARK
PARK
PARK
PARK
PARK
GOVERNMENT CONVENTION CENTER
PEDESTRIAN STREET
CENTRAL SQUARE
PEDESTRIAN STREET
RICE FIELDS
RICE FIELDS
AUGMENTED REALITY HUBS
PARK
PARK
LIBRARY
ARTIFICIAL WATERFRONT
MUSEUM
PEDESTRIAN BRIDGE
SCALE 1/ 1 000
PARK
PRESERVED HILLS

24/7 Life

A main concern in the design of PAT was the convenience of having easy access to the government buildings and the risk of having a typical government city, dead after working hours and in the weekends. We believe we have achieved in addressing both issues by locating the government buildings very centrally in PAT and at the edge of the commercial center at the same time. The government buildings are along the main transportation axis of MAC, at the west side of the city center. However, low-rise commercial buildings are planned to be built in front of the government buildings along the main pedestrian walkway. This combination allows a more vibrant community after working hours and a friendlier edge of the pedestrian walkway, as residents walk across the west-east corridor.

A superposition of the design of PAT on the Cheong-Gye stream area, Seoul.
At a first glance, it becomes obvious that the center city of PAT is relatively small and everything is at a walking distance. The Cheong-Gye stream can be compared to the main pedestrian walkway, having almost the same width. The pedestrian walkway, like the stream, is expected to be the main walking attraction of the new city center. The size of the two stadia in the Dongdaemun area allow a comparison with the scale of the hills in PAT and of the cultural centers.

A superposition of the design of PAT on downtown Zurich, Switzerland.
It is a very welcomed coincidence that Banhofstrasse, Quaibruecke and Raemistrasse provide a very similar ring road to the ring road that defines the city center in PAT. The pedestrian nature of downtown Zurich and especially in the area enclosed by these streets offers a guarantee of a confined, pedestrian-friendly city center. Also, the dense surface transportation system in Zurich by trams running every few minutes, offers a good analogy to the electric-based transportation system within PAT. Furthermore, the southern facing residential community on Zurichberg, among the most expensive and desirable locations in the world, is reminiscent to the southern facing PAT village, overlooking the PAT city center.

The design of PAT proves to be at a human scale, while it assimilates elements of a megalopolis.

A superposition of the design of PAT on mid-town Manhattan, New York City.

The city blocks of PAT compare favorably in size to the city blocks of Manhattan. Also the continuation of the city fabric of PAT to the open space in the middle of the MAC city is reminiscent to the transition in Manhattan from the 5th Avenue to the central park. A fundamental difference is that the central axis in PAT is a pedestrian walkway, unlike the 5th and 6th Avenues in Manhattan but similar to the 16th street in Denver, Colorado, part of the recent development of the "downtown mall," to revitalize downtown Denver. The 16th street is dedicated to pedestrians and a slow moving, free-of-charge electric bus.

Scale

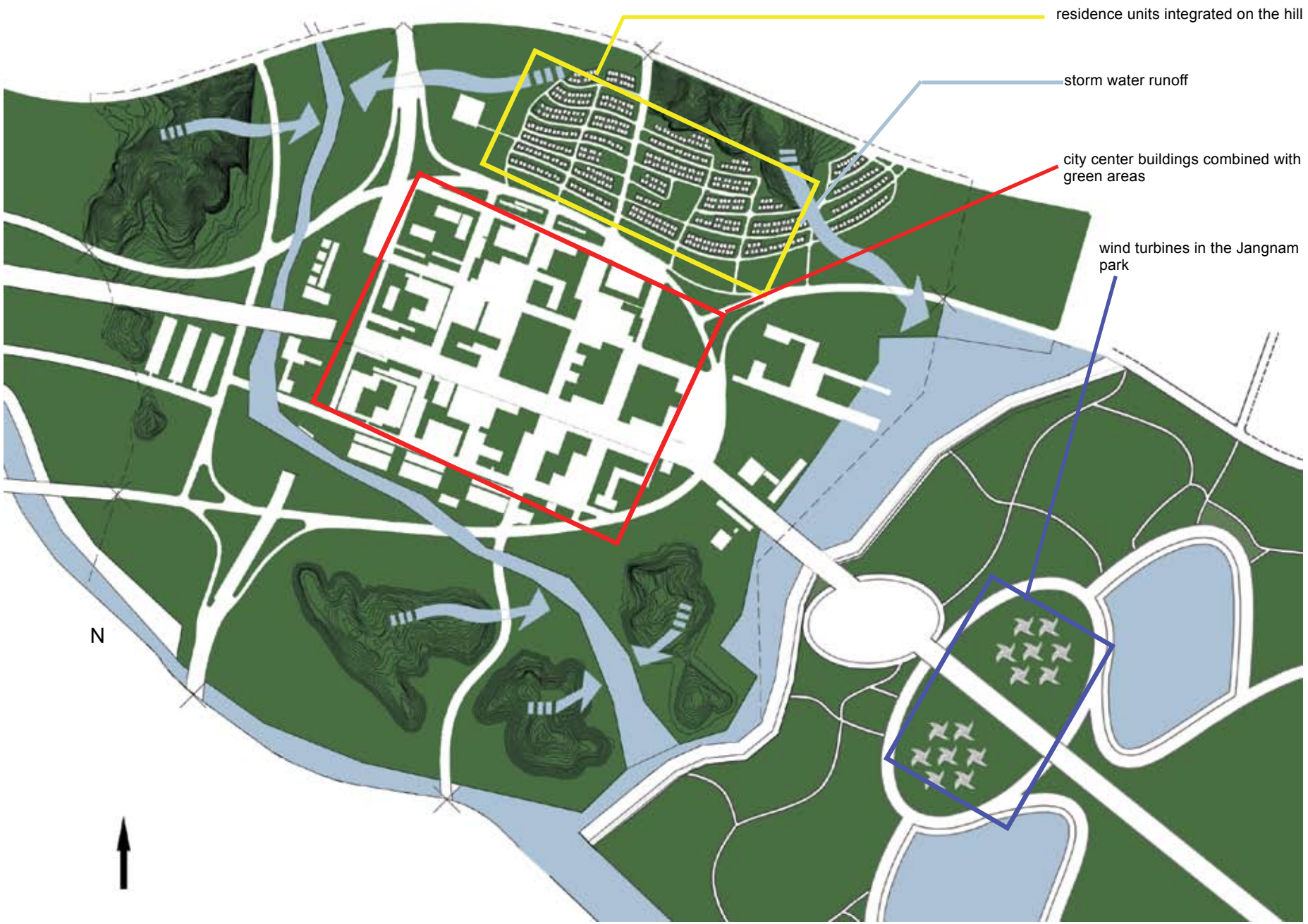
The design of PAT is compared to three cities, to assess the size, density, and human scale. Although, one could compare it with many cities, we chose the Cheong-Gye stream in downtown Seoul, the center of Zurich, and the edge of Manhattan with the Central Park.

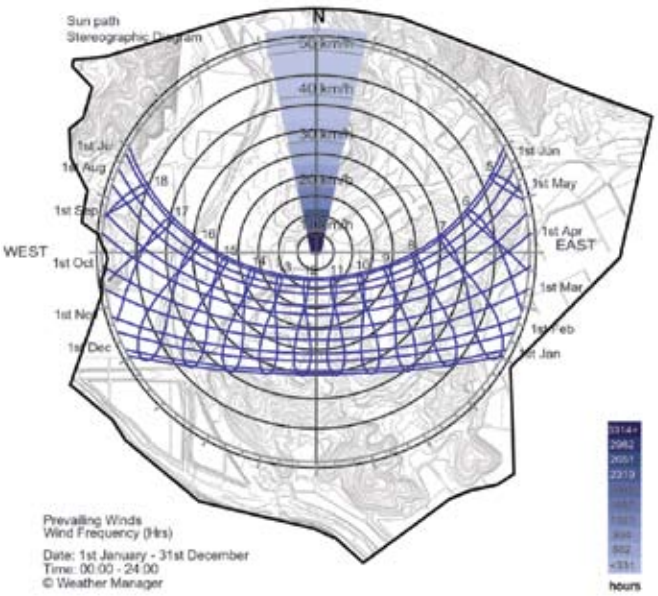
Cheong-Gye has been a successful transformation of a busy downtown to an inner city recreation, attracting residents and visitors.

Zurich is among the most livable cities in the world, with an efficient surface transportation system and its size is comparable to PAT.

Manhattan is always the reference for its high rise buildings and its size of city blocks. Especially, the edge with the central park will be similar to the edge between the PAT and the central open space, in the middle of MAC.

General Environmental Planning





Wind speed and direction diagram and sun path diagram overlayed at the PAT area
(source meteonorm, weather tool software)

sustainability

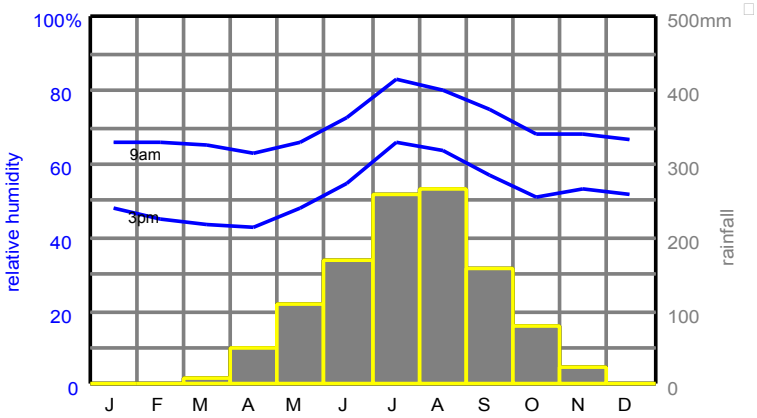
Climate Analysis

The site is located in South Korea at latitude 37° north and longitude 127° 3' east of Greenwich. The climate is considered temperate with four distinct seasons. Winters are usually long, cold, and dry, whereas summers are short, hot, and humid. Spring and autumn are pleasant but short in duration.

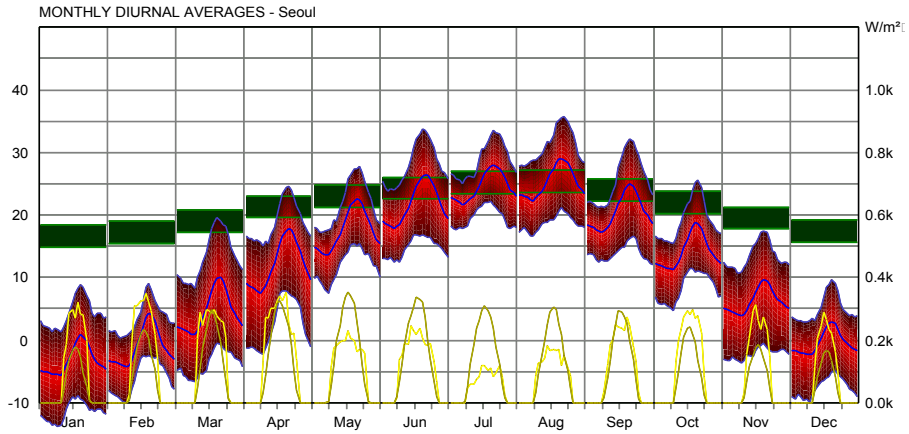
The coldest month of the year is January, with average temperatures ranging from –5 to 2°C, and the warmest is August, respectively with temperatures 24-29°C. The average daily air temperature fluctuation across the seasons shows that increasing the thermal inertia of spaces could be beneficial if combined with techniques such as night time ventilation in summer and passive solar features in winter. The solar radiation on a horizontal plane in winter may reach 600 W/m² indicating the applicability of passive solar design. In summer a significant portion of heat gains can be avoided by adequate shading.

The prevailing wind direction is from north to south. The average wind speed is 15Km/h, with stronger winds during winter.

The climate is generally humid, average relative humidity values at 3pm range from 45% in winter to 60% in summer. The high humidity levels in summer highlight the need to create air movement through the spaces to enhance thermal comfort.

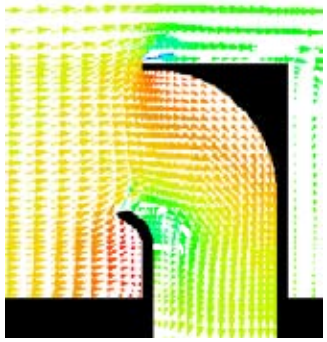


Graph showing annual relative humidity and rainfall (source: meteonorm, weather tool software)



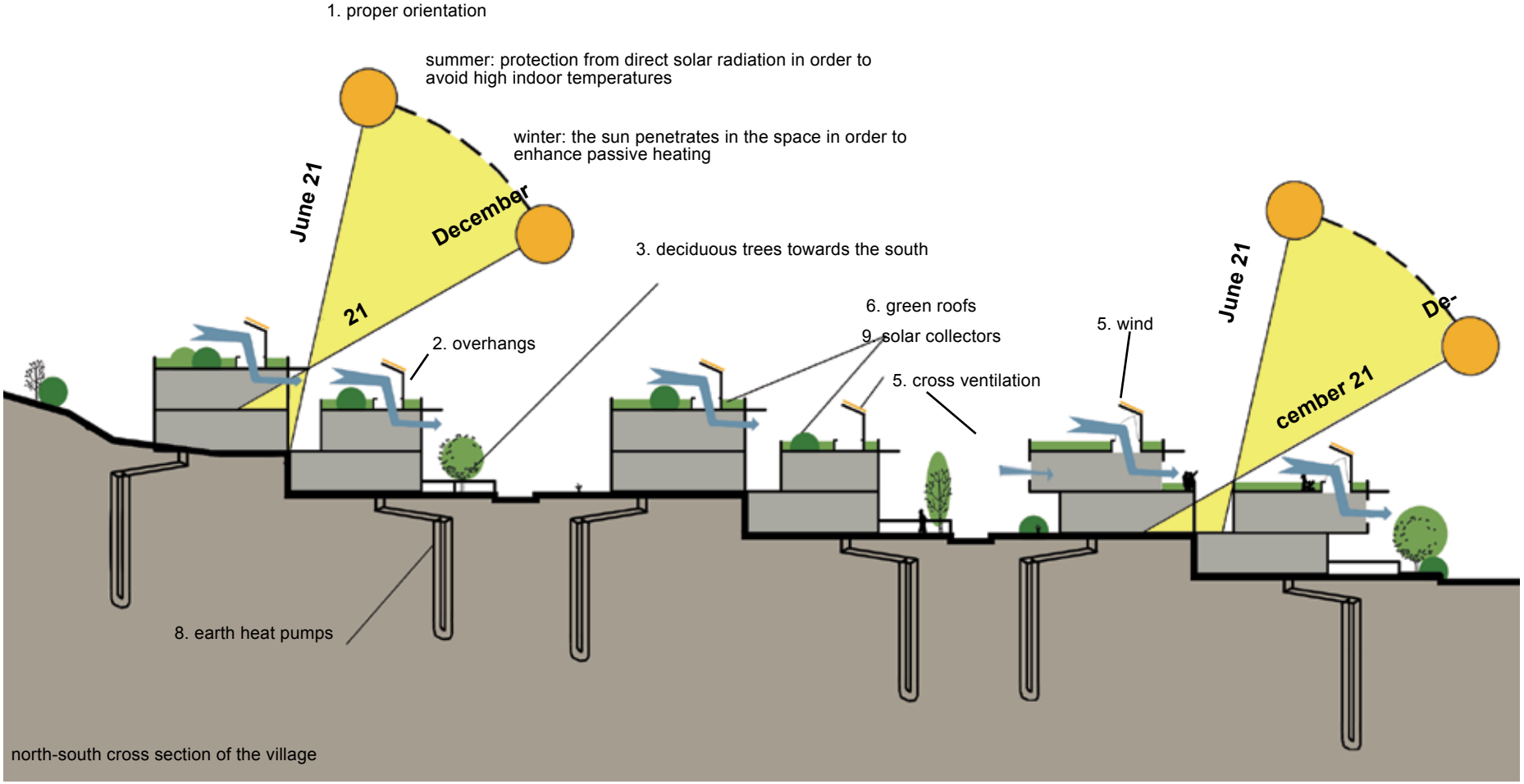
Monthly diurnal average temperatures (source meteonorm, weather tool software)

Housing Units in the Village



Wind scoop function
source:www.battlemccarthy.de-mon.co.uk/disciplines/cfd.html

Wind turbines
source:/www.quietrevolution.co.uk/qr5.htm



north-south cross section of the village

General Environmental Planning

1. long dimension of city grid oriented towards north south
2. village on the northern hill, protected from northern prevailing winter winds
3. preserve hills surrounding the city
4. volume of excavations equilibrates the infill
5. green roofs on top of most residences in village and buildings in the city center
6. wind turbines at the Jangnam plain covering part of the PAT's energy needs
7. layer of extensive green areas penetrates in the city grid to reduce the heat island effect.
8. reconstruction of rice fields
9. storm water runoff
10. large bodies of water are introduced in the PAT absorbing a large amount of the incident solar radiation and operating as a solar control device for their immediate surroundings

Environmental strategies in the buildings of the city center: business, commerce, administration functions, residences

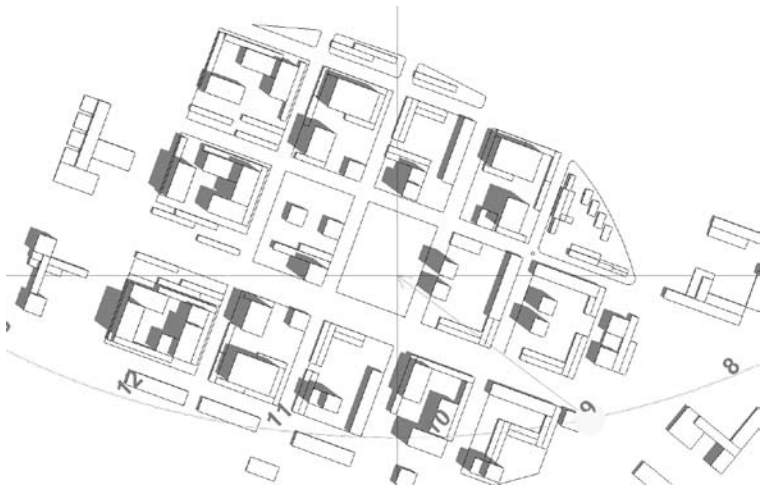
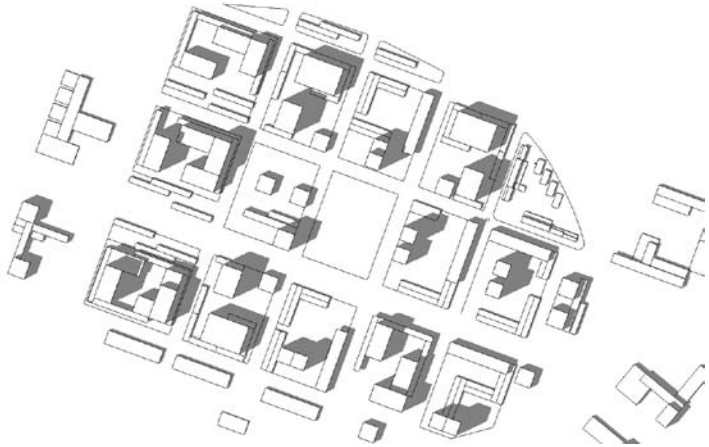
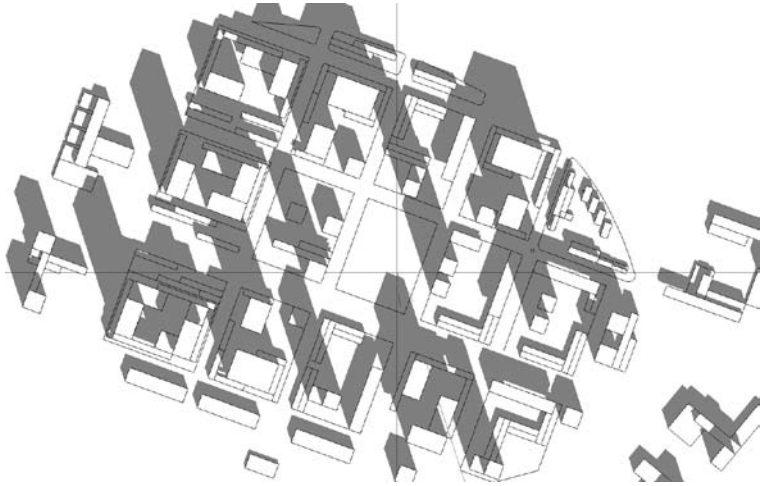
1. egg crated brise-soleil on the facades to protect from excess solar gains in summer
2. renewable energy sources: photovoltaic panels located on parts of the south facades
3. courtyard-shaped blocks: The central urban blocks are formed in combination with green areas that function as green pockets in the city grid. The quality of the urban environment is improved whilst the open spaces in the blocks become vivid and useful for leisure activities.
4. free-standing design allows for cross-ventilation
5. green roofs to reduce the heat island effect and the impact of solar radiation on the roof in summer. In addition the surfaces of green roofs filter and bind dust and other harmful materials out of the city's air and they absorb noise instead of reflecting it.

Environmental strategies in housing units

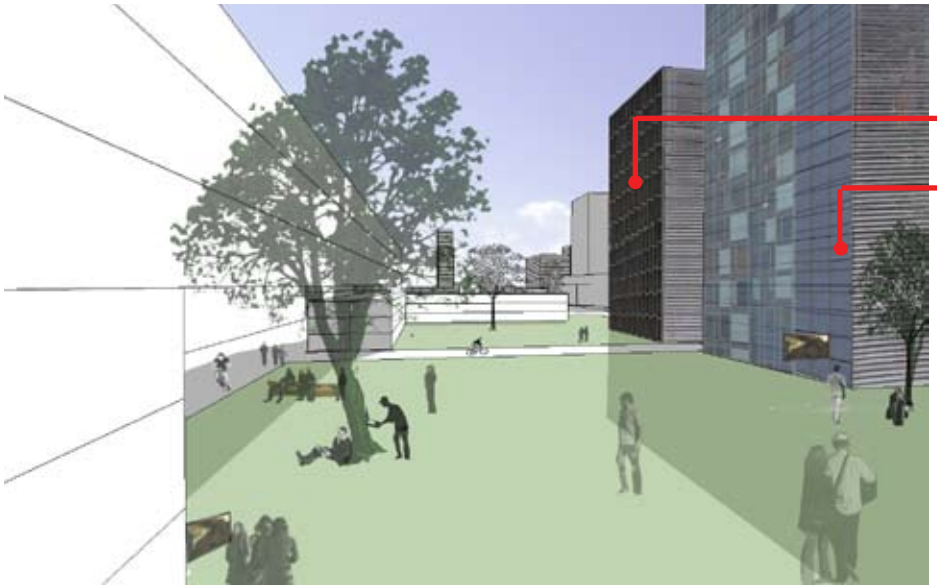
1. proper orientation of units to take advantage of solar gains in winter and prevailing winds in summer
2. overhangs towards south to block direct solar radiation in summer but allow winter sun into the spaces
3. deciduous trees towards south to block diffuse solar radiation in summer but allow winter sun into the spaces
4. free-standing design in the north-south direction allows for cross-ventilation
5. wind scoops located on the roof to enhance the cross-ventilation of spaces
6. green roofs to reduce the heat island effect and the impact of solar radiation on the roof in summer. In addition the surfaces of green roofs filter and bind dust and other harmful materials out of the city's air and they absorb noise instead of reflecting it.
7. heavyweight construction to increase the thermal mass
8. geothermal energy: earth heat pumps to provide heating and cooling throughout the year with minimal consumption of electricity and therefore reduced CO_2 emissions.
9. renewable energy sources: solar collectors for hot water and heating located on the roof.

The design of PAT follows an integrated environmental design, at multiple levels for energy conservation, water management, and human comfort.

SHADOW ANALYSIS AT THE CITY CENTER

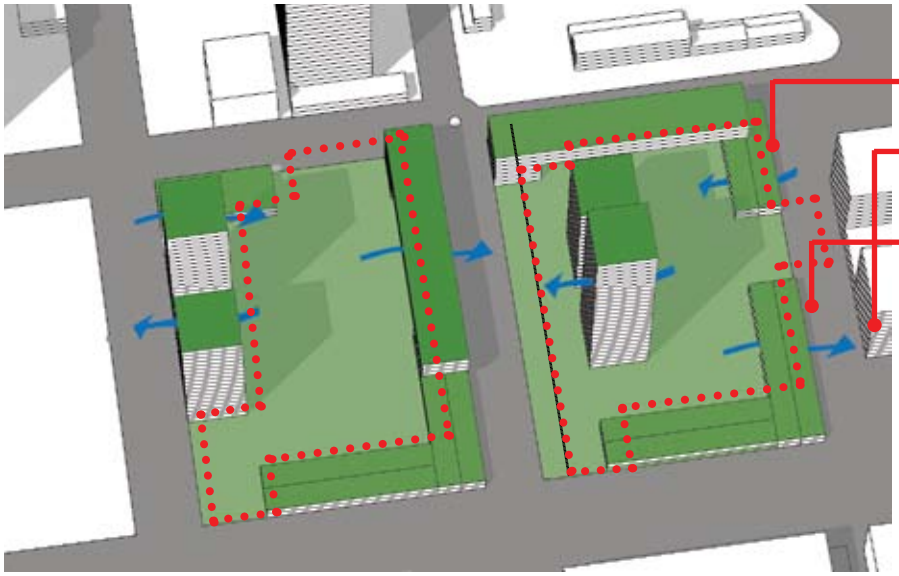
	09:00	12:00
summer		
winter		

Shadow analysis of the PAT: in the summer there are adequate shaded areas for outdoors leisure activities.
In the winter the biggest percentage of the southern facades can take advantage of the sun's radiation for passive heating
source: simulations from ecotect software



3D view of a typical urban block

Buildings in the City Center

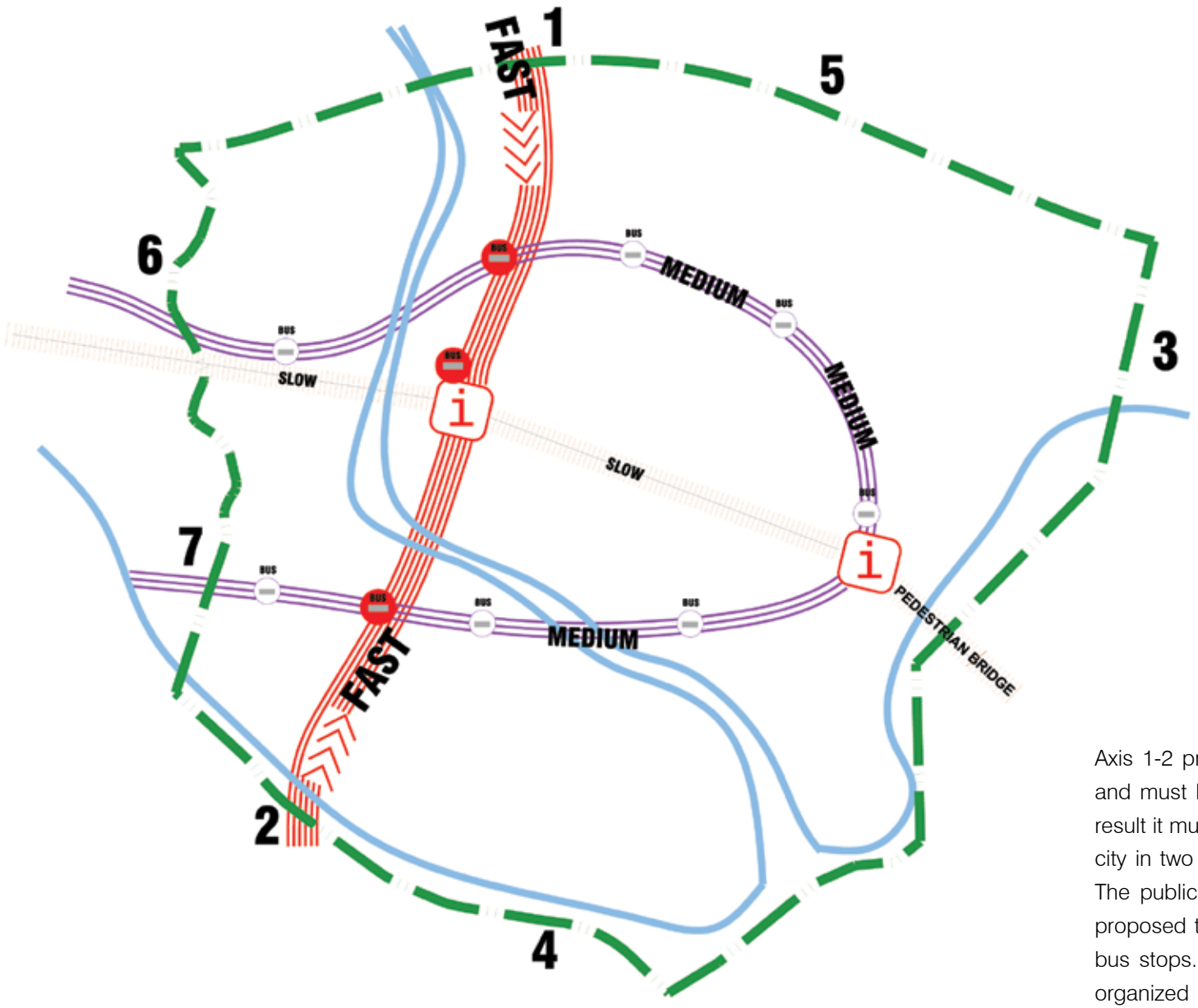


Plan of mixed used urban block: commerce, business, residences

Vegetation

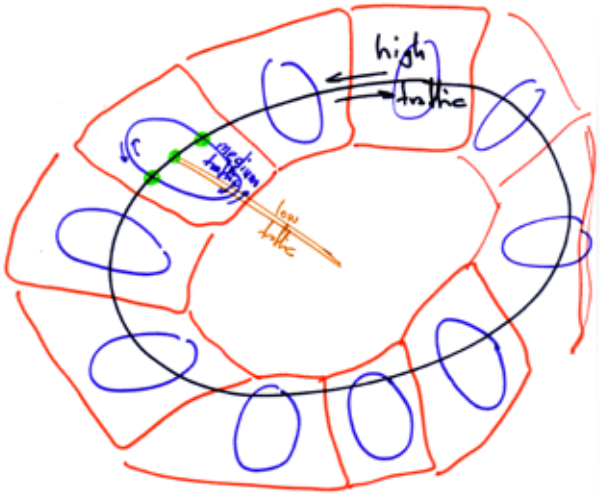
-A layer of green areas and vegetation penetrates in the city green in order to improve the urban environment. More specifically it reduces air temperature by evapotranspiration. It limits the emittance of thermal radiation thus creating more comfortable living spaces both indoors and outdoors. It also helps in the retention of dust and pollutants from the air. When the green areas are placed in considerable surface areas they affect large parts of the urban environment, functioning as natural “oasis.” In addition the high solar absorbance of vegetation relieves occupants from additional radiant loads in summer enhancing outdoor thermal comfort. The plants can also reduce air temperature by evapotranspiration.

Everything possible must be electrically powered,
PAT must have almost zero emissions in situ.



Axis 1-2 provides the main transportation of the MAC and must have no intersections so it is fast and as a result it must be depressed, so that does not divide the city in two parts. There will be 3 stops along axis 1-2. The public transportation perpendicular to axis 1-2 is proposed to be provided by a ring road, with frequent bus stops. The width and treatment of axis 1-2, with organized underground utilities, will allow to construct a subway along this axis in the future, should it be considered necessary. The location of the information pavilions is shown with the symbol (i).

transportation



Starting Principles

Our fundamental design principle was to create a pedestrian community and eliminate cars by design. Urban density and mixed use with residences blended in the city fabric have been used to the limits allowed by the competition brief to reduce the demand for transporation and promote walking.

Then, we looked at the vehicular transporation. In a city of the 21st century, non-polluting public transportation should be adequate to meet the needs of the city's inhabitants. Multiple stops and frequent service are necessary components for a functioning public transporation system.

A second element is to regulate the use of private cars. Addressing parking is a non-intrusive but effective way towards regulating the use of cars. 40% of car emissions in Los Angeles is from cars looking for parking! Thus, we started the design of PAT so that after its three phases of development, cars will not be allowed to park anywhere on the surface of the city center for more than 15 minutes and adequate parking will be provided in undergraound parking. This rule may be modified during earlier phases, since there will be plenty of parking and less congestion.

A third element is to provide shared bicycles and cars on demand. Linked to the city's ubiquitous network, citizens can use these public vehicles, to be located near the public transporation nodes. MIT's city car has been considered since the beginning of PAT's design.

The Transporation Design

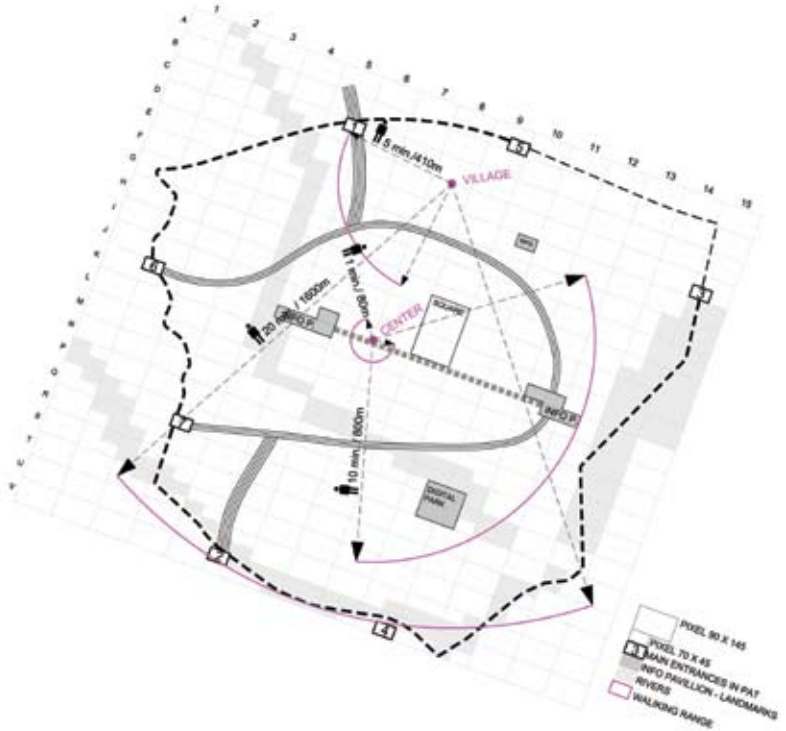
The beauty and simplicity of Ortega's design depends on the ring road for connecting the "thousand cities." However, Ortega's design offers 2 challenges. Frst, there is a need for organized transporation perpendicular to the main ring road.Second, the main ring road must be a high speed throughway, to achive its objective of linking teh various parts of MAC in no more than 20 minutes. Since a subway system has not been adopted, our first fundamental decision was to lower the main ring road in a tunnel with open and closed sections for a significant portion as it crosses PAT. Bus stops will be located below level and passengers will come to the city center level using elevators, escalators and stairs. By lowering the main ring road we have eliminated artificial discontinuities of PAT.

Addressing the fisrt issue of perpendicular transortation, we propose secondary ring roads in each segment of MAC, as shown on the sketch. These secondary roads will be of medium speed. Then, a linear segment will link each segment of MAC to the central open space. The linear segment will be a low-speed, mild traffic axis, mainly for pedestrians and slow moving public transporation.

Parking

Adequate underground parking will be available in each block of the city center. Thus, in order to eliminate congestion, surface parking will not be permitted for more than 15 minutes anywhere after phase three of development. The parking at the village is integrated with the residences and is either individual surface or covered parking. There will be multiple locations for parking the MIT city cars. These cars, in a stacked mode, require 12% of the parking area of mid-size cars.

Modern cities suffer in inner-city transportation. In PAT, we started from addressing the basics: circulation, walking distances, parking, shared vehicles



Pedestrians

A network of dedicated pedestrian walkways, shared only with bicycles, and short distances are the design elements that promote walking in PAT. The dense and relatively small city center and the proximity of the village to the city center invite for walking to be the only real alternative.

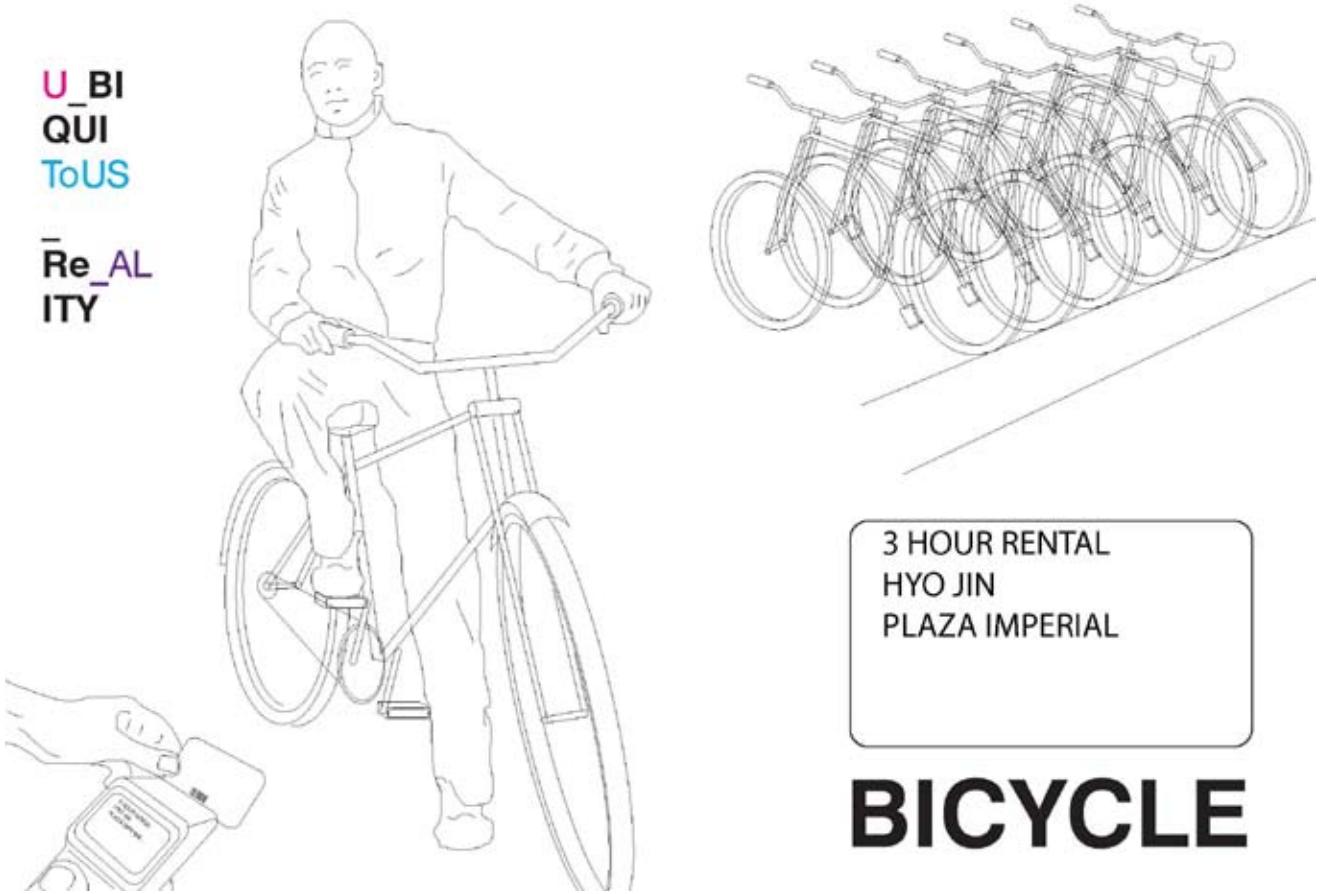
The location of schools at the green park zone and next to the waterfront, on a dedicated area and near the cultural centers, requires a walk of 5-15 minutes from the village and the city center. The crossing is provided by overpasses, so students never cross roads that carry public transportation.

	Scenaria for citizens			
	lives	works/visits	min-walk	max-walk
1	village	center of PAT	5	10
2	village	outside PAT	bus/drive	bus/drive
3	center of PAT	center of PAT	1	5
4	center of PAT	outside PAT	bus/drive	bus/drive
5	outside of PAT	center of PAT	bus/drive	bus/drive

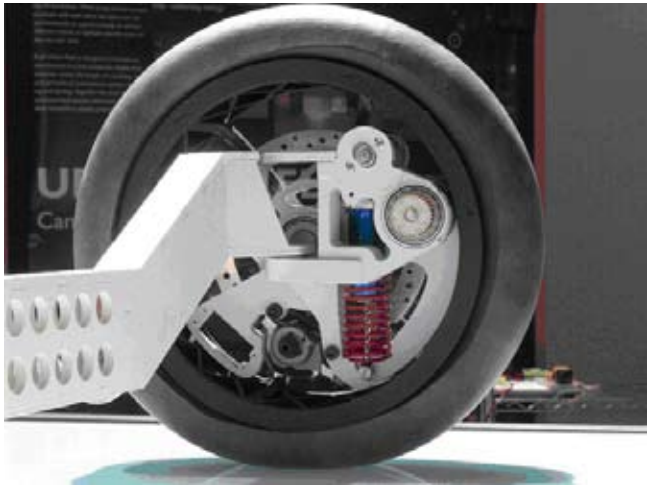
Alternative Transportation

The design of PAT promotes the use of bicycles. It is flat, has open spaces, and has many instances of proximity to the nature. Even the village has very moderate slopes. Furthermore, there are dedicated bicycle paths and the traffic is expected to be slow moving by design everywhere in PAT.

In addition to privately owned bicycles, public bicycles will be available for shared use at the bus stops and other parts of the city. Controlled by sensors, the users will be able to take them for as long as they need them and return them to designated bicycle parking areas. The bicycles offer a less expensive alternative to the city cars addressing the younger generation.



"If you combine the economy of car sharing with the environmental friendliness of an electric vehicle—and then add a really cool design that allows the car to fold and stack like supermarket shopping carts at convenient locations—you have the innovative City Car, now being developed at the MIT Media Lab," http://cities.media.mit.edu

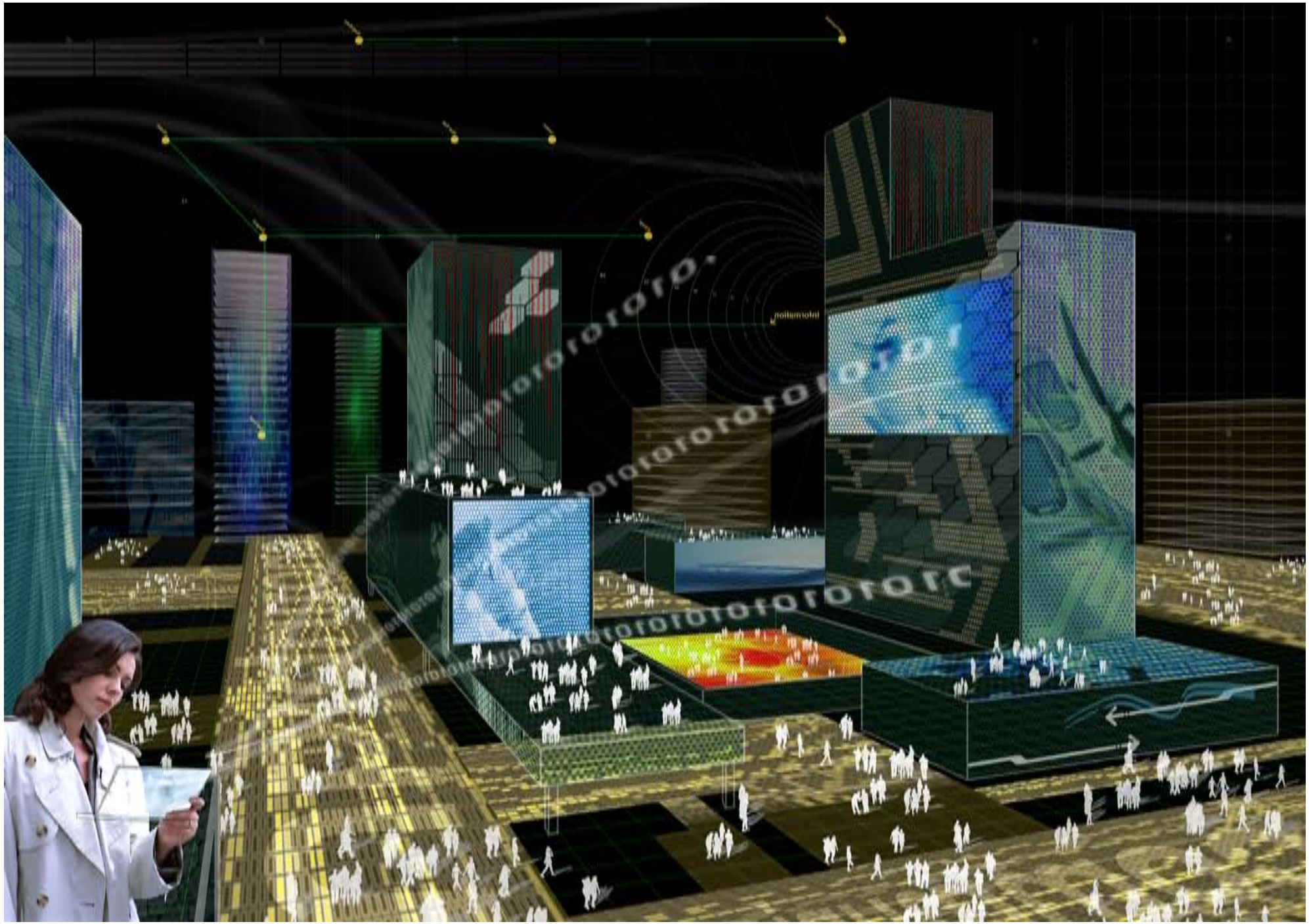


A shared city car

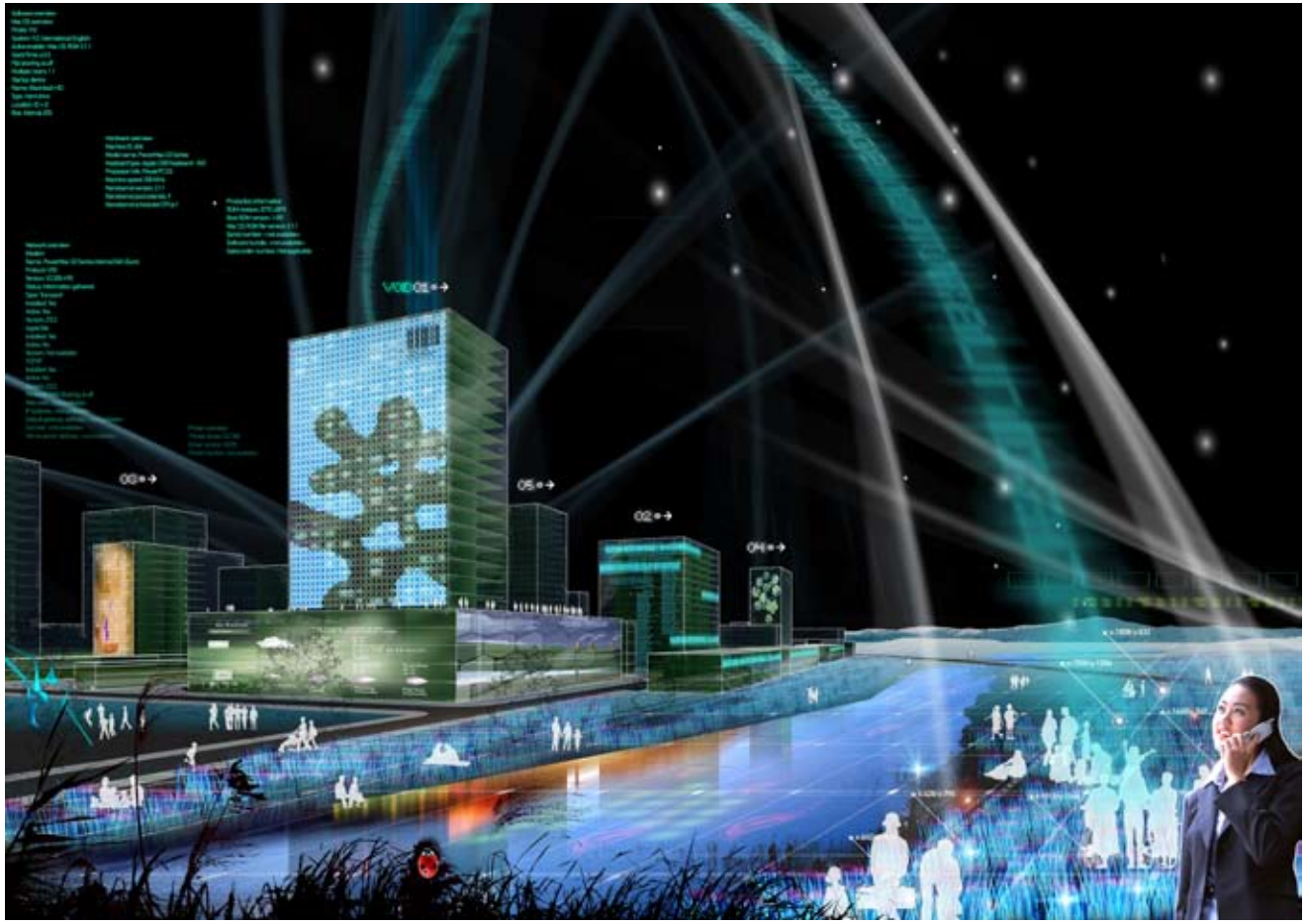
The design of private passenger cars, optimized for long distances, take much space both on the road and for parking. This is a major problem for the optimal design of cities where, literally, there is no space to park them, while they define the city's life and character.

An alternative is suggested by MIT's media lab, the city car. Based on very different design principles, like independent powering each wheel with electric motors and having a folding frame, the city car takes 12% of the parking space when stacked, is battery operated, and is a shared vehicle. People take them, use them, and return them to predefined locations. The business model is based on pay per use, as opposed to owning the vehicle.

By introducing the city car in PAT and making it a design feature of the new city, we bridge the pedestrian and the vehicular traffic with an innovative in-between solution.



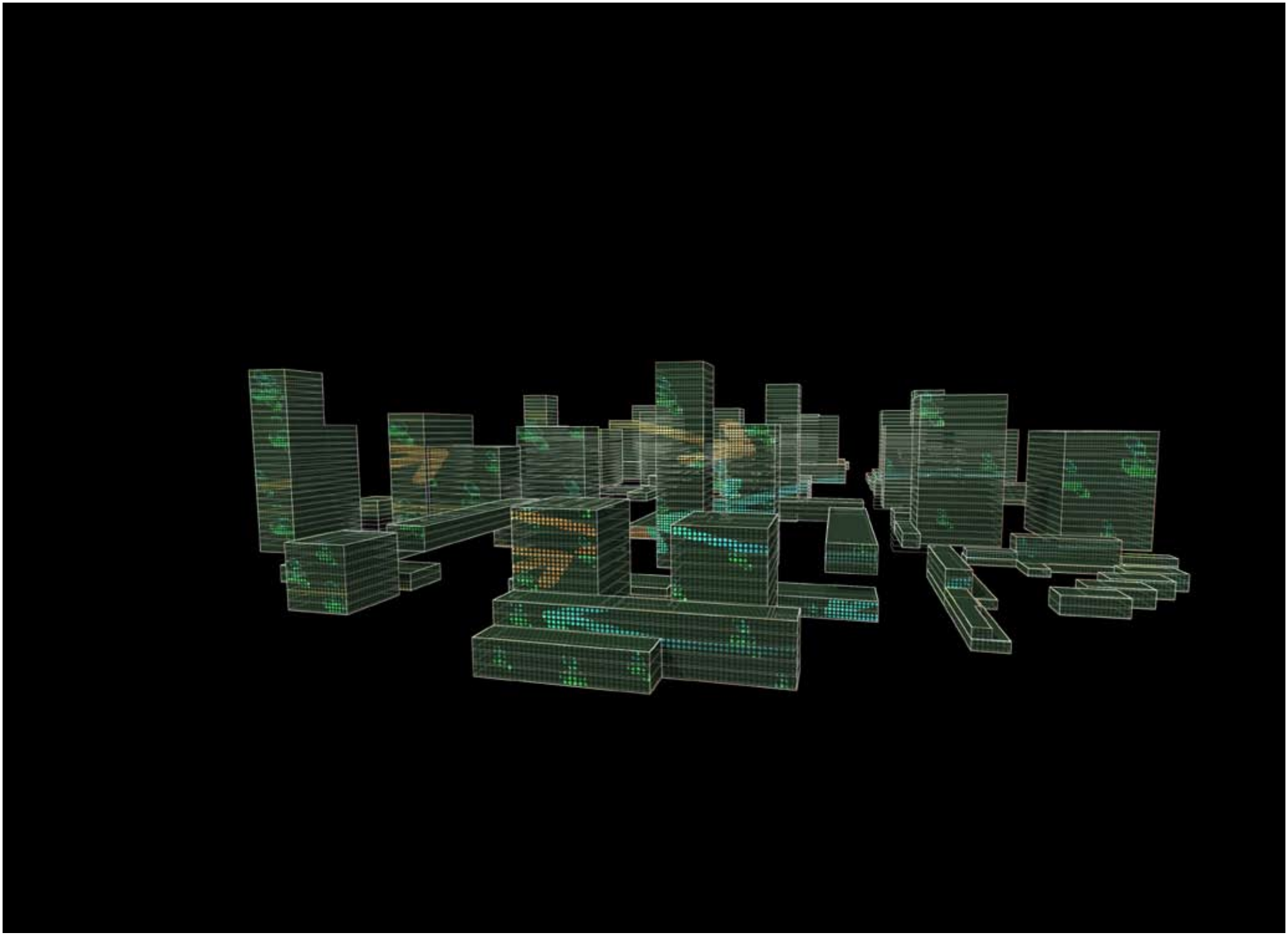
a ubiquitous city

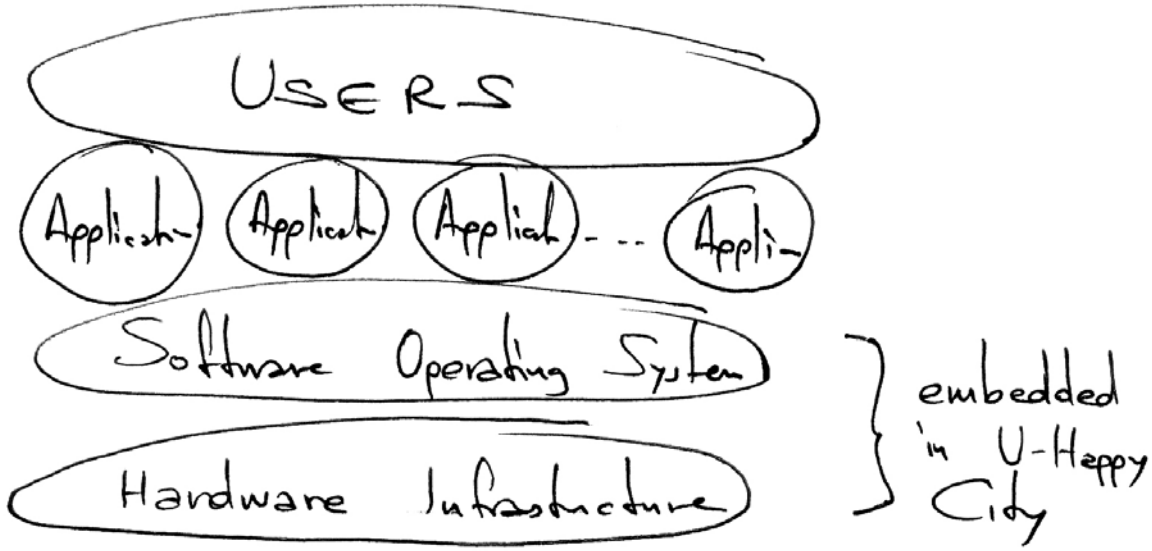


A Ubiquitous City

We envision that PAT will have a virtual overlay over its physical entity. The virtual overlay will enhance the services and functionality of the city in a transparent way, making technology invisible, powerful, and present everywhere. The virtual overlay, manifested in the form of both hard-wired and wireless devices, will contribute to a more comfortable life, enhancing and augmenting the physical space. Access to information and services, elimination of unnecessary transportation, and more efficient usage of physical space are some of the benefits of the ubiquitous city.

Being fully ubiquitous is essential for PAT. The base of the government itself, it will allow the government to be more efficient and also portray to the citizens what the government can do.

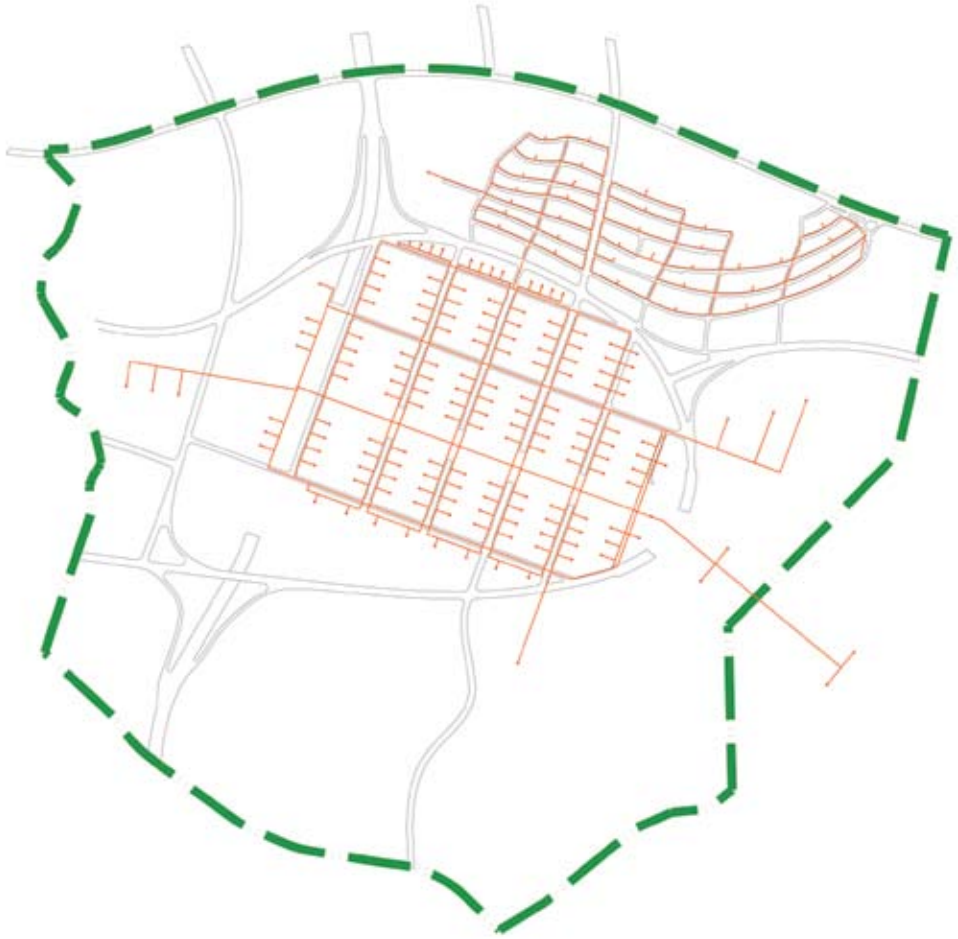


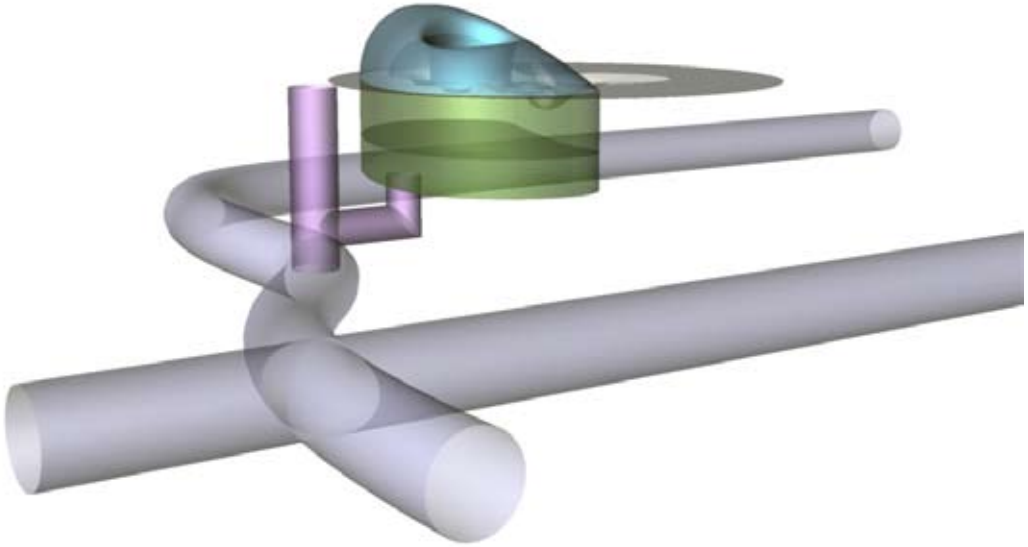


The Multi-functional Administrative City must be the example of ubiquitous computing in Korea and the world.

The Computing Implementation

The new city should be seen as a gigantic machine-computer, where people live, work, learn, play, entertain. Following that approach, the hardware/network infrastructure and the software "operating system" should be centrally provided, while the system architecture is provided to the private sector to develop applications. Then, the users access the applications by accessing the centrally planned hardware/network. The continuous development and improvement of the applications is guaranteed, driven by competition and innovation. The use of mobile wireless devices, enhanced with sensors and displays throughout the city, becomes a key success to the ubiquitous concept. Privacy issues are handled at different levels, based on the wishes of the users who decide their own tradeoff between increased functionality versus increased privacy.





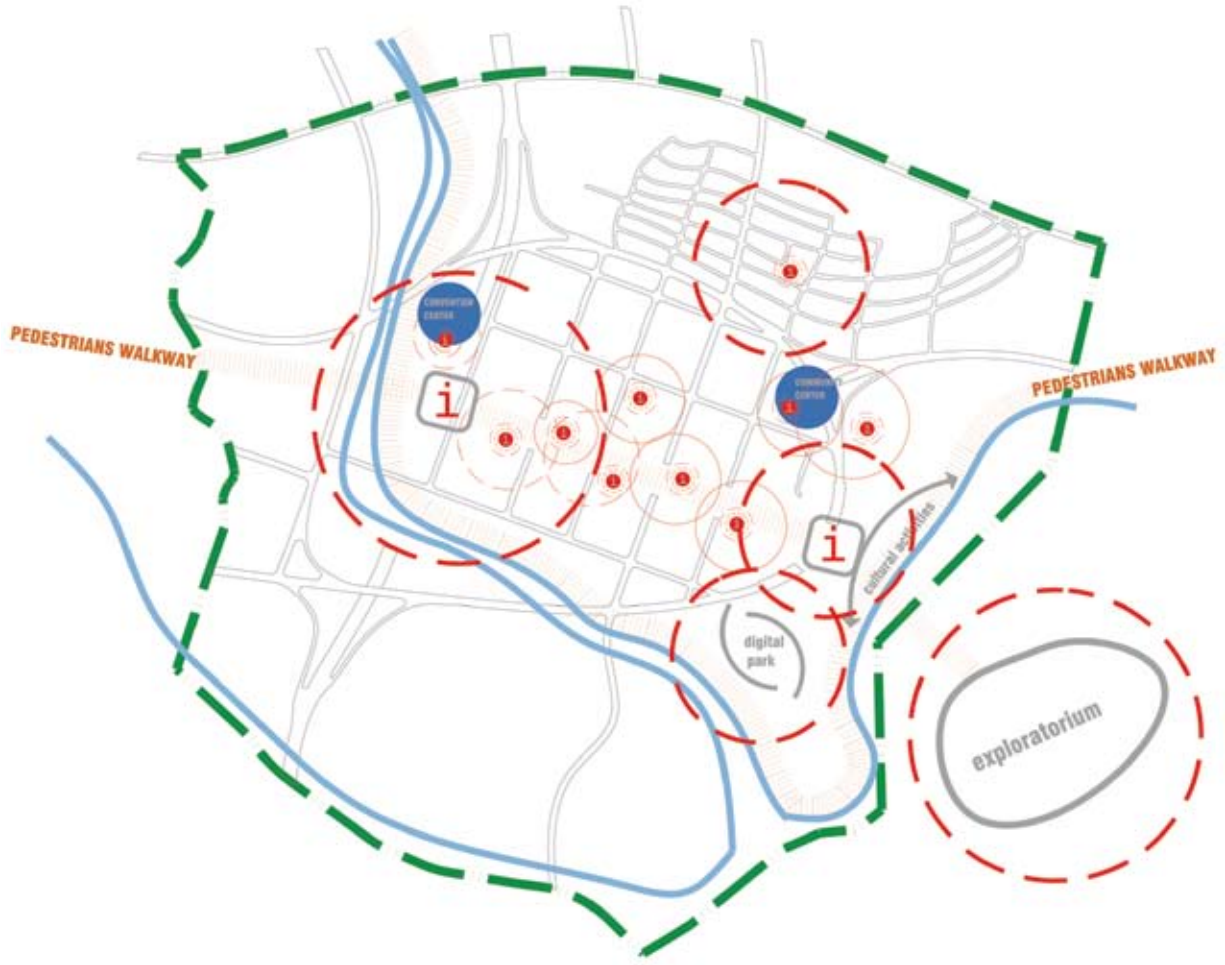
The underground network of large diameter conduits reaches every single building block and carries all utilities. Sewage is pumped as needed. While there can be several access points, the basements of the information pavilions are the routine access points for people and robots inspecting the conduits and repairing/upgrading the utilities.

Digital Architecture

As presented in Seoul on November 16, 2006, in the "u-Happy City International Conference" sponsored by MACC (Multifunctional Administrative City Construction) and KLC (Korea Land Corporation), the ubiquitous city should have dedicated multi-functional spaces to serve as the modern temples of information technology (http://www.macc.go.kr/english/). Spaces that citizens can visit to be informed, update their equipment, access newly released services, gather to explore frontier technology and enjoy art related to information technology.

There are 5 levels of spaces that we have adopted in the design of PAT.

1. the construction of an underground network of large diameter pipes spanning in the entire city and accessing each block. This network with pipes to be visited by robots and people, will carry all the utilities of the city, including traditional utilities like electricity, gas, water, sewage, but also fiber-optics and other technology conduits. The same network of underground network of pipes will have underground spaces to host servers, routers, and other computing equipment, protected by natural or man-caused disasters. While the cost is relatively manageable for a new city on a greenfield, the lifecycle savings will be enormous, as the networks will be properly maintained, upgraded and replaced without requiring excavation.

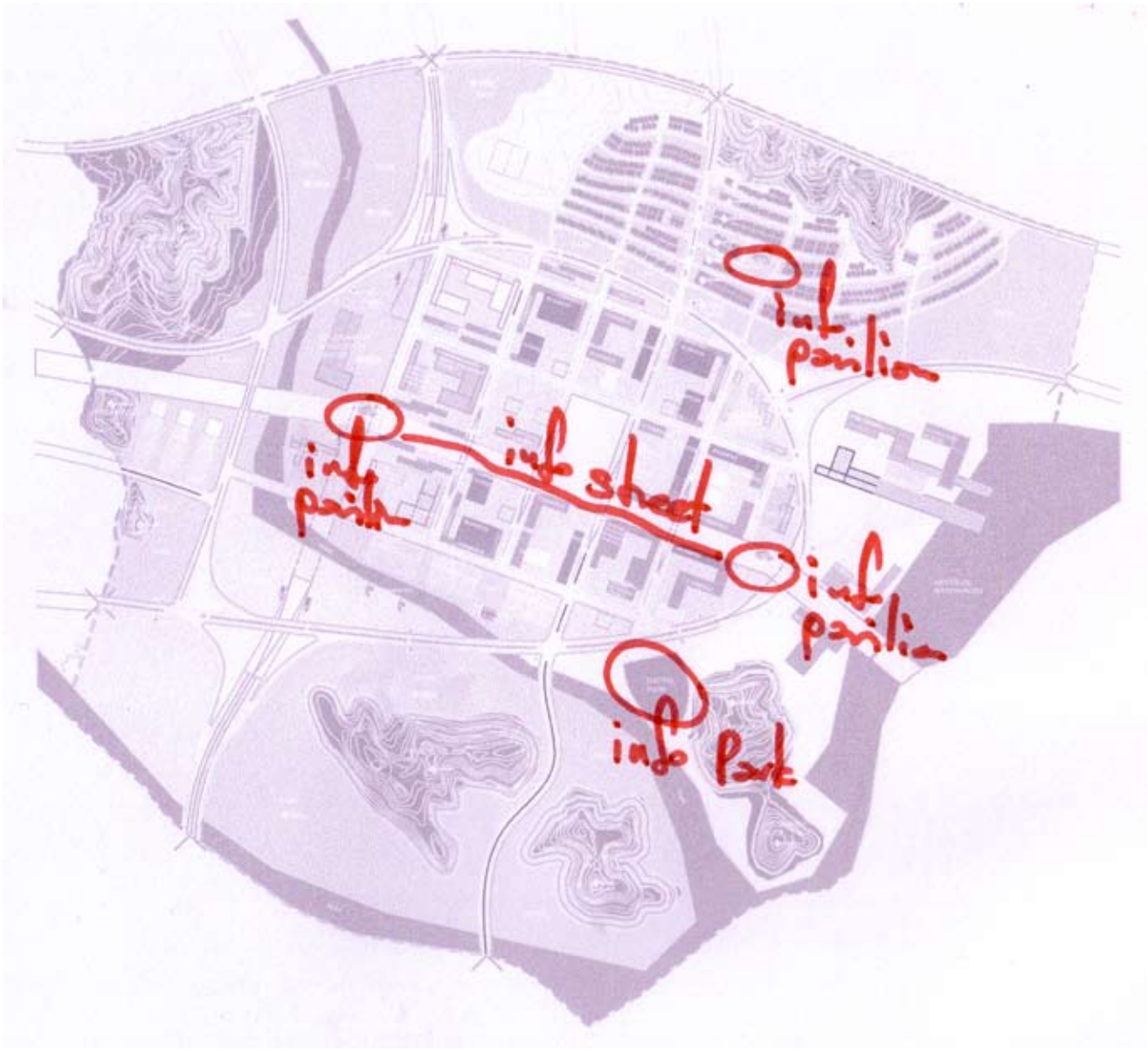


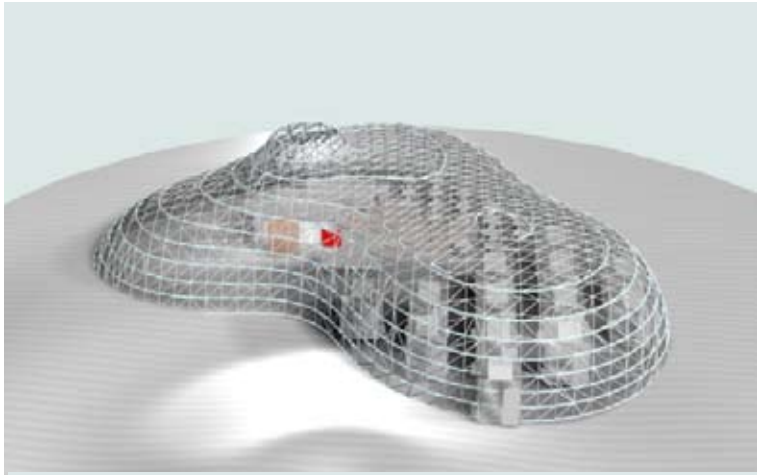

QUIZ EVENTs
how to play

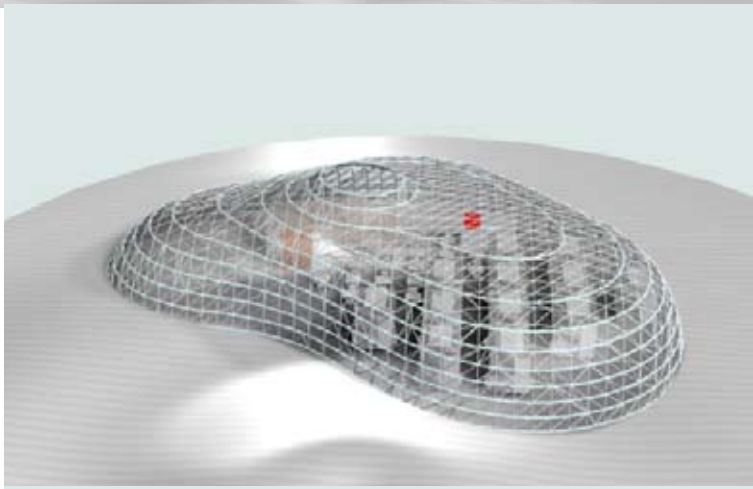
Furthermore, excavation for new buildings, parking structures, or even a subway will be much facilitated.

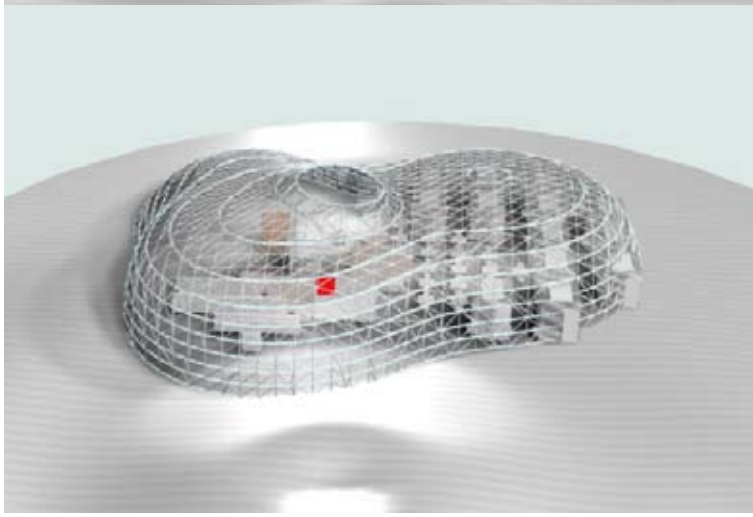
2. Displays and sensors placed on public spaces, indoors or outdoors, so people can voluntarily or involuntarily interact with the ubiquitous network. These spaces are everywhere on PAT, with a higher concentration on the pedestrian walkway and the central square that is proposed to be designed based on walking patterns, including leisure, to integrate the visual displays.

3. Three information pavilions, strategically located on PAT. Two pavilions are on the pedestrian walkway and the third in the middle of the village. The information pavilions have multiple roles: they serve as the modern day community libraries, information centers, outlets for information technology services, demonstrations for new technologies, exhibition spaces, and neighborhood cafes. While these services can be dispersed throughout the city, it is important to be







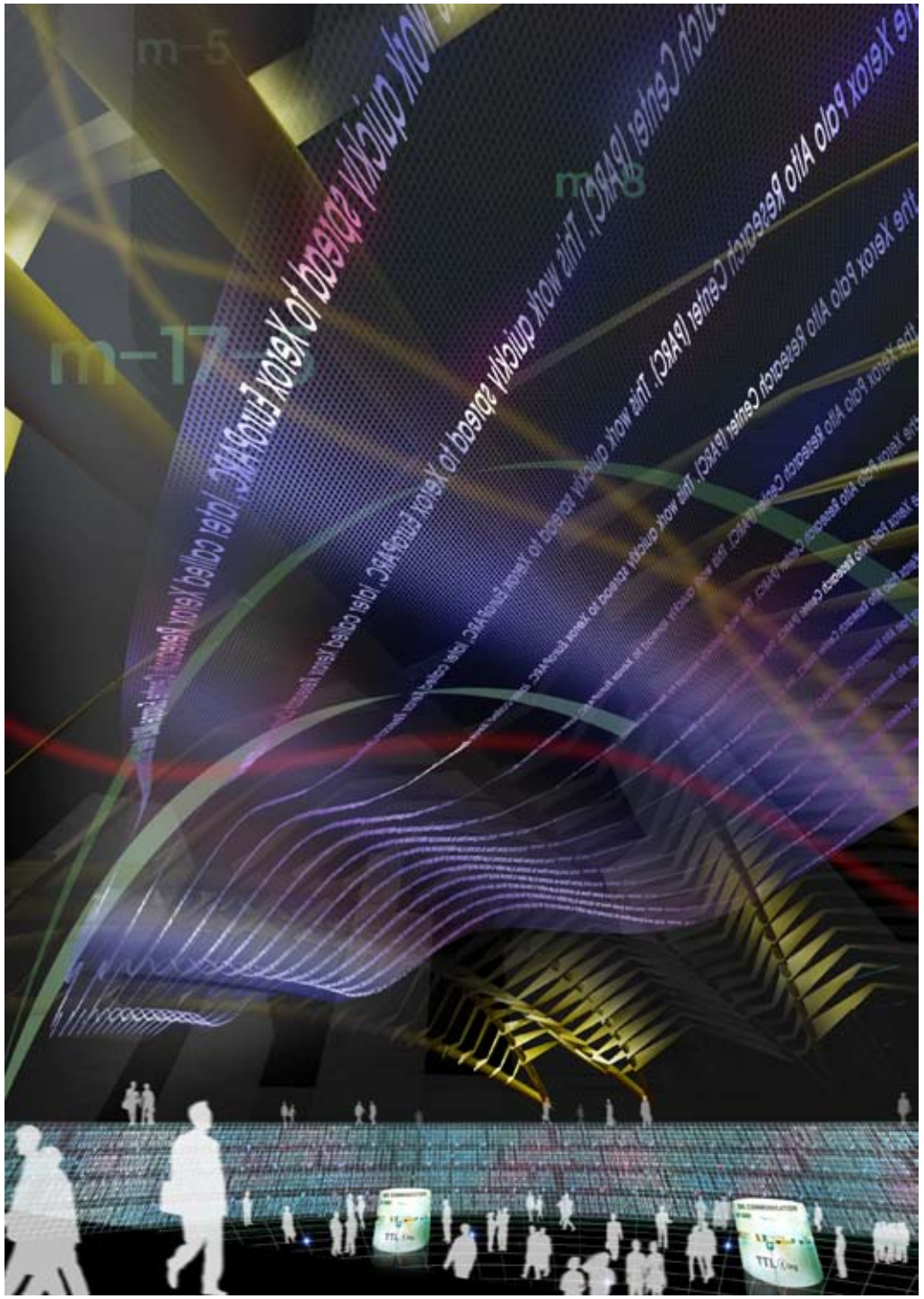


The network of the information pavilions, the information street and the information park provide a wide coverage to PAT.

housed in a specialized building, with an architecture reminiscent of ubiquity, and with real people to help all users, of all generations and all levels of expertise. In addition, the information pavilions serve as the entry points for the network of the underground conduits, while their lower basements host servers and computer hardware. The three information pavilions will be parametric variations of the same design.

4. An information technology park, blending information technology with nature, in a covered space to enjoy in the winter, has been proposed south-east of the city center, near the southern hill and the river.
5. Finally, we propose an Exploratorium/Museum to be located in the central open park, outside and east of PAT, connected with the pedestrian walkway and the low-speed electric bus running on the walkway. We believe that such location is more suitable since there will be just one Exploratorium/Museum in the entire MAC and it should be in a common territory.

Furthermore, the facades of the buildings will be illuminated at night and will become gigantic displays, transforming the entire city to a visual beacon.



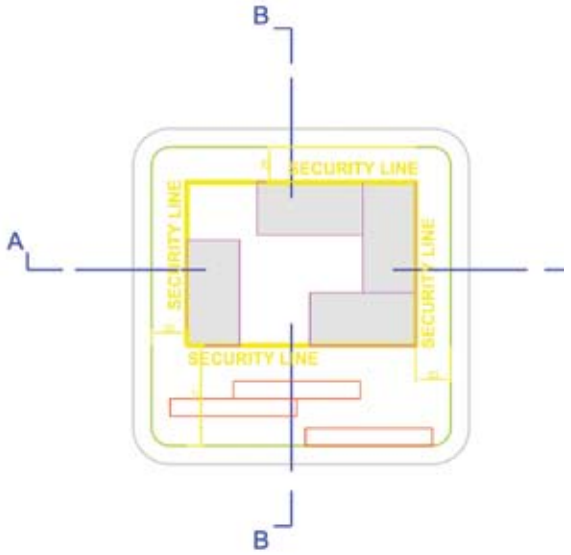
security

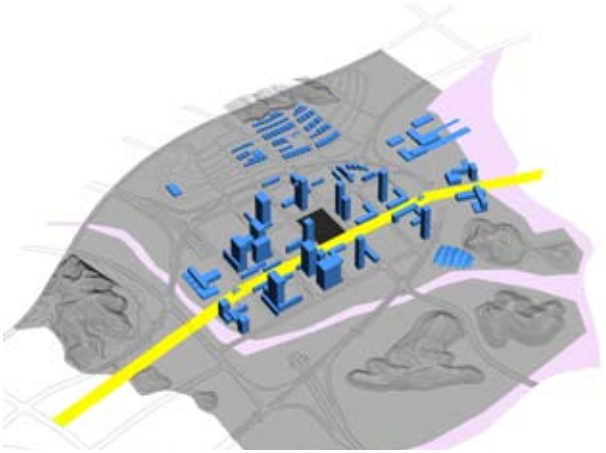
For the security of the government buildings, we propose to follow the design guidelines specified by the US Government's General Services Administration (GSA). These guidelines include:

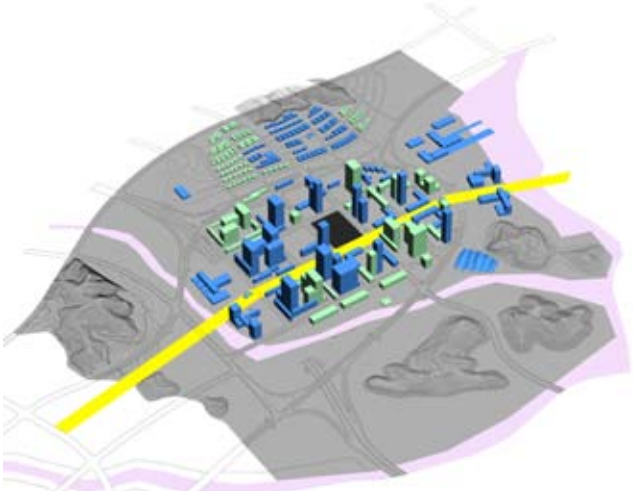
1. a setback of 15-30 m from the curbside, depending on the urbanity of the location. The security line is at the shape of a circle (see figure) and does not include commercial space, as along as there is a blast protection between the commercial and government space. Given the "downtown" nature of the city center, we propose to use a setback of 20 m from the curbside. Balustrades should protect the buildings from cars getting any closer than 20 m.
2. The facades of the government buildings should be designed to be blast resistant.
3. The buildings should be designed for progressive collapse.
4. Air intakes should be protected and separate systems should be used in the different zones of security of a building.

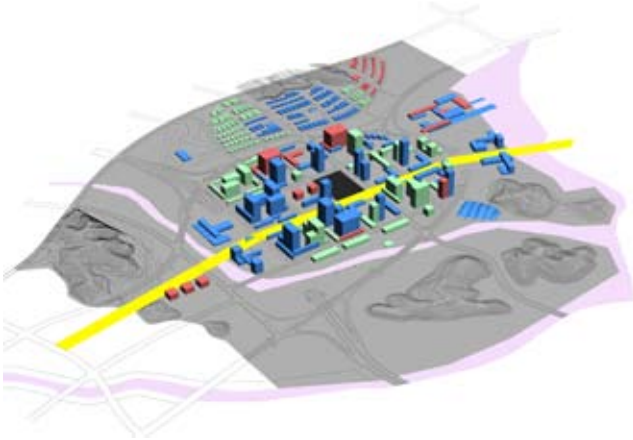
In addition, the computer infrastructure should be well protected and we propose to be placed underground, as part of the underground network for the infrastructure, as presented in the overall concept for the ubiquitous city.

Security of government buildings and the ubiquitous infrastructure should start with proper design decisions.









phases of development

The government buildings in PAT will be developed in phases. Based on the program requirements for the government buildings, we propose a phased development of the entire PAT. This proposed development is not proportional. The underground and surface infrastructure and key facilities should be developed in the first phase. The figures show the three phases of development.

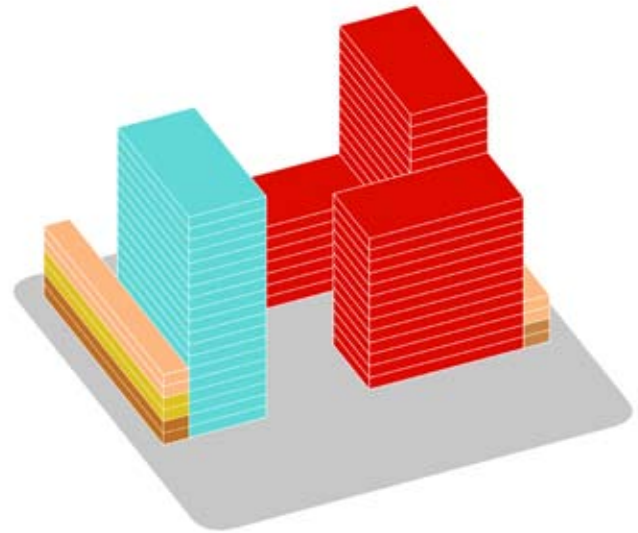
The first phase (blue) includes the required government buildings, part of the commercial and mixed use development in the city center, and part of the village. It also includes the cultural centers, the school of public administration and part of the elementary and high school. The ubiquitous infrastructure should be completed in the first phase, including the information pavilions and the information PARK. The development of these facilities will serve as a magnet to the further development of PAT.

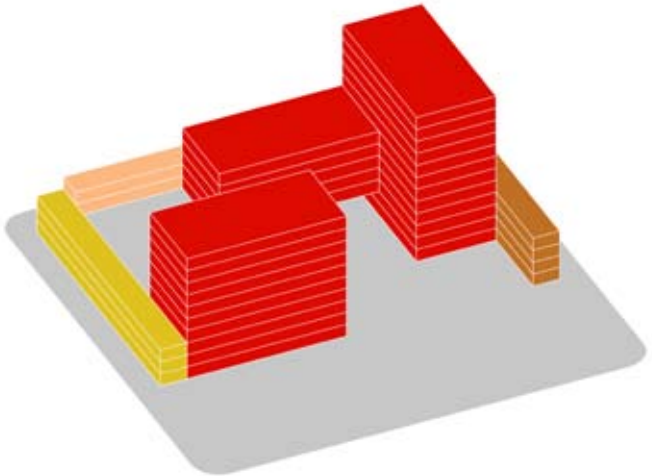
The second phase (green), includes the required government buildings, additional buildings in the city center, the large housing units on the south side of the city center and a large part of the village.

The third phase (red), includes the remaining required government buildings, a few more buildings in the city center, the large housing units on the west side of the city center, the remaining part of the village, and the final extension of the schools.

PROGRAM (m^2)	PHASE A	PHASE B	PHASE C	TOTAL
Governmental	148,800	119,800	48,400	317,000
Business	155,804	145,181	52,407	353,392
Commercial	50,873	47,404	17,112	115,389
Residential	141,928	132,251	47,739	321,918
Educational	48,726		8,598	57,324
Community Complex	40,600			40,600
Hotels & Conference	59,472	39,648		99,120
Cultural	52,967			52,967
Convention Center	24,448			24,448
TOTAL	723,618	484,284	174,256	1,382,158

The phased development of PAT stimulates growth





Block 1

Comprehensive Public Management (2,602 persons/177,300m2)			Block 1					
Institution / Function	Persons	Floors m²	Area (m²)	Shared Facilities (m²)	Percentage % of Total Shared Facilities	Total (m²)	Constructed area (m²) +/- 10%	Phase
The Office fro Government Policy Coordination	227	9 (1,800)	7,900	8,060 (61,400)	13	15,960	16,200	A
Prim Minister's Secretariat	82	2 (1,800)	1,900	1,937 (61,400)	3	3,837	3,600	A
Ministry of Finance and Budget	728	12 (1,800)	12,800	13,055 (61,400)	21	25,855	21,600	A
Ministry of Planning and Budget	339	6 (1,800)	7,600	7,751 (61,400)	13	15,351	10,800	A
Fair Trade Commission	371	6 (1,800)	5,400	5,507 (61,400)	9	10,907	10,800	A
Assembly & viewing		2 (1,000)	1,950 (from 4,300)		45		2,000	A
Welfare and benefits		3(1,000)	3,250 (from 7,200)		45		3,000	A
Maintenance		2 (1,000)	1,500 (from 3,300)		45		2,000	A
PARKING AREA		1 (18,564)	40,900		45	18,405		A
Agriculture,Forestry and Fisheries (1,033 persons 52,400m2)								
Institution / Function	Persons	Floors m²	Area (m²)	Shared Facilities (m²)	Percentage % of Total Shared Facilities	Total (m²)	Total (m²) +/- 10%	Phase
Ministry of Health and Welfare	514	6 (1,800)	7,200	7655 (18600)	2	14,855	10,800	A
Prim Minister's Secretariat	519	10 (1,800)	10,200	10844 (18600)	58	21,688	18,000	A
Assembly & viewing		2 (1,000)	1,500		100		2,000	A
Welfare and benefits		2 (1,000)	2,500		100		2,000	A
Maintenance		2 (1,000)	1,200		100		2,000	A
PARKING AREA		1 (18564)	12,300		45	12,300		A
LOT AREA			18,564					
TOTAL BUILT AREA							104,800	A
FAR			6					
TOTAL PARKING AREA		2 (18564)					37,128	A

Block 2

Comprehensive Public Management (2,602 persons/177,300m²)			Block 2					
Institution / Function	Persons	Floors	Area (m²)	Shared Facilities (m²)	Percentage % of Total Shared Facilities	Total (m²)	Conmstructed Area (m²) +/- 10%	Phase
Ministry of Government Legislation	165	4 (1,800)	5,000	5,099 (61,400)	8.3	10,100	7,200	C
Gonernment Information Agency	196	5 (1,800)	5,400	5,507 (61,400)	8.96	10,907	9,000	C
Civi Service Comission	245	4 (1,800)	3,800	3,875 (61,400)	6.31	7,675	7,200	C
The Obmudsman of Korea	92	5 (1,800)	5,400	5,570 (61,400)	9.07	10,907	9,000	C
Emergency Planning Commission	100	3 (1,800)	2,900	2,960 (61,400)	4.38	5,860	5,400	C
National Youth Comission	55	2 (1,800)	2,100	2,140 (61,400)	3.48	4,240	3,600	C
Assembly & viewing		2 (1,000)	3,265(from 4,300)		55		2,000	C
Welfare and benefits		3(1,000)	3,960 (from 7200)		55		3,000	C
Maintenance		2 (1,000)	1,815 (from 3300)		55		2,000	C
PARKING AREA		1 (18564)	40,900		55	22,405		C
LOT AREA			18,564					
TOTAL BUILT AREA							48,400	C
FAR			2.6					
TOTAL PARKING AREA							18,564	C

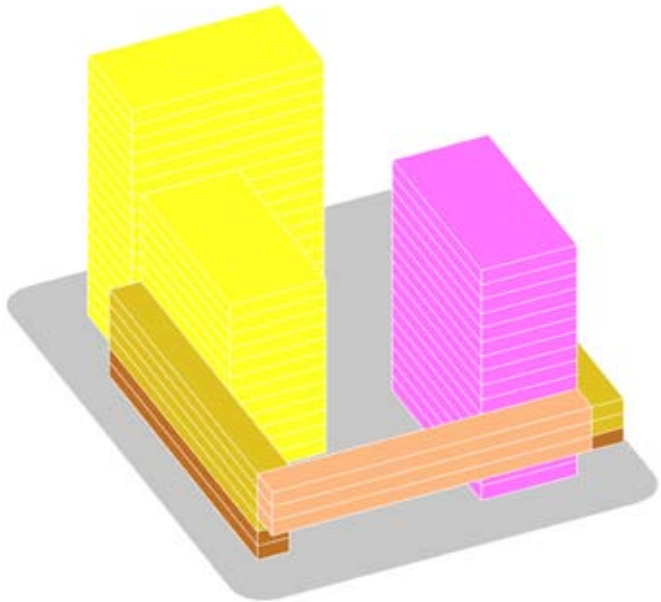
Block 3

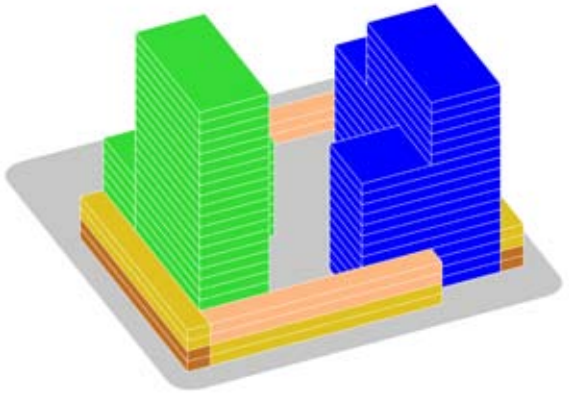
General Economic and Industrial Affairs (1,680 persons / 83200m²)			Block 3					
Institution / Function	Persons	Floors m²	Area (m²)	Shared Facilities (m²)	Percentage % of Total Shared Facilities	Total (m²)	Total (m²) +/- 10%	Phase
Ministry of Science and Technology	370	4 (1,800)	5,400	5,635 (2,8800)	19,56	11,035	7,200	B
Ministry of Commerce Industry and Energy	760	10 (1,800)	10,500	10,955 (28,800)	38,01	21,455	18,000	B
Ministry of Information and Communication	513	8 (1,800)	10,800	11,270 (28,800)	39,13	22,070	14,400	B
Presidential Commisison on Small and Medium Enterprises	37	1 (1,800)	900	940 (28,800)	3,26	1,840	1,800	B
Assembly & viewing		2 (1,000)	2,200				2,000	B
Welfare and benefits		4(1,000)	3,700				4,000	B
Maintenance		2 (1,000)	1,700				2,000	B
PARKING AREA		1 (18,564)	19,200			19,200		B
Education Culture and Recreation (978 persons 45,900 m²)								
Institution / Function	Persons	Floors m²	Area (m²)	Shared Facilities (m²)	Percentage % of Total Shared Facilities	Total (m²)	Total (m²) +/- 10%	Phase
Ministry of Education and Human Resource Development	514	6 (1,800)	7,800	8,324 (15,900)	52,35	15,924	10,800	B
Prim Minister's Secretariat	464	5 (1,800)	7,100	7,576 (15,900)	47,64	14,676	9,000	B
Assembly & viewing		1 (1,000)	1,300				1,000	B
Welfare and benefits		2 (1,000)	2,200				2,000	B
Maintenance		1 (1,000)	1,000				1,000	B
PARKING AREA		1 (18,564)	10,600			10,600		B
LOT AREA			18,564					
TOTAL BUILT AREA							73,200	B
FAR			3.9					
TOTAL PARKING AREA		2 (18,564)					37,128	B

Block 4

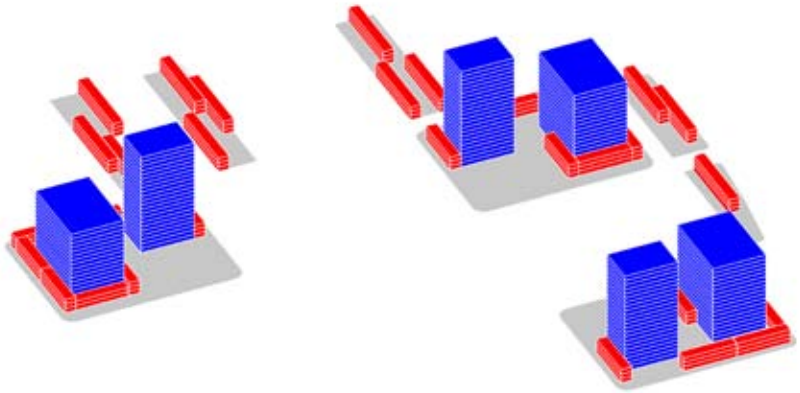
Spatial Management and Enviroment (1,472 persons / 84600m²)			Block 4					
Institution / Function	Persons	Floors m²	Area (m²)	Shared Facilities (m²)	Percentage % of Total Shared Facilities	Total (m²)	Constructed Area (m²) +/- 10%	Phase
Ministry of Enviroment	462	5 (1800)	8,100	8,300 (29,300)		16,400	9,000	A
Ministry of Construction and Tmasportation	1,010	15 (1,800)	20,500	21,000 (29,300)		41,500	27,000	A
Assembly & viewing		2 (1,000)	2,100				2,000	A
Welfare and benefits		4(1,000)	3,500				4,000	A
Maintenance		2 (1,000)	1,600				2,000	A
PARKING AREA		1 (18,564)	19,500			19,500		A
Health and Social Welfare (1,234 persons / 80,600 m²)								
Institution / Function	Persons	Floors m²	Area (m²)	Shared Facilities (m²)	% of Total Shared Facilities	Total (m²)	Total (m²) +/- 10%	Phase
Ministry of Health and Welfare	478	10 (1,800)	10,900	11,432 (27,900)		22,332	10,800	B
Ministry of Labor	480	9 (1,800)	10,500	11,013 (27,900)		21,613	16,200	B
Minstry of Patriots and Vegetereians	277	7 (1,800)	5,200	5,454 (27,900)		10,654	12,600	B
Assembly & viewing		2 (1,000)	2,200				2,000	B
Welfare and benefits		3 (1,000)	3,600				3,000	B
Maintenance		2(1,000)	1,700				2,000	B
PARKING AREA		1 (18,564)	18,600			18,600		B
LOT AREA			18,564					
TOTAL BUILT AREA							90,600	A+B
FAR			4.9					
TOTAL PARKING AREA		2 (18564)					37,128	B

building typologies





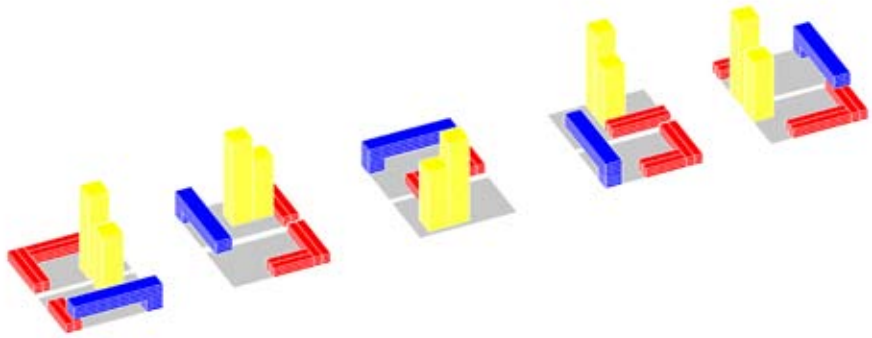
MIXED USE (commercial and business)



Commrecial & business (use 350,000)								
per block								
Institution / Function	% of 350000m²	FAR	builfing type	Floors per building m²	number of buildings	Constructed area (m²) +/- 10% / per building type	lot types	Total Constructed area (m²) +/- 10% / per use
Commerce	8.8%	0.77	A (10 X 50)	3 x 500	7 X 1,500	10,500	A (13,500)	10,500
	7.2%	1.13	B (10 X 72)	3 x 720	3 x 2,160	6,480	B (5,730)	6,480
Business	84 %	7.5	A (50 X 72)	28 x 3,600	1 X 100,800	100,800	A (13,500)	100,800
TOTAL PARKING AREA							3 X A (18,564)	40,500

Commercial & business (use 350,000)			
total built area PAT			359,820
Institution / Function	number of blocks	lot types	Total Constructed area (m²) +/- 10%
Commerce	3	A	31,500
	4	B	25,920
Business	3	A	302,400

MIXED USE (commercial - business- residence)

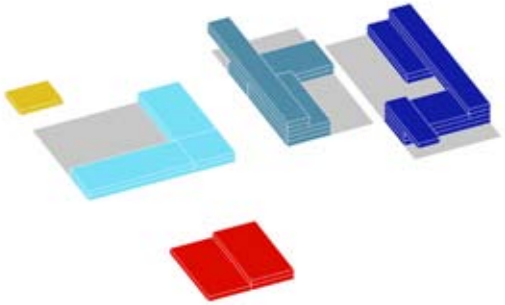


Mixed use 3- business residential - commerce (250,000 m²)								
per block								
Institution / Function	FAR (demanded)	building type	Floors per building (m²)	number of buildings	Constructed area (m²) +/- 10% / per building type	Total Constructed area (m²) +/- 10% / per use	units / appartments	Lot per funcion
Commerce	2.6	A (10 X 50)	3 x 500	2 x 1,500	3,000			
		B (10 X 72)	3 x 720	4 x 2160	8,640			
						11,640		
Business	2.6	A (20 X 109)	4 x 2180	1 X 8,720 m2	8,720			
		B (20 X 20)	4 x 400	1 X 1,600 m2	1,600			
						10,320		8,564
Residence	3.0	A (25 X 25)	20 x 625	1 X 12,500 m2	12,500			
		B (25 X 25)	28 x 625	1 X 17,500 m2	17,500			
						30,000	500	10,000
Total lot area								18,564
TOTAL BUILT AREA						51,960		
TOTAL PARKING AREA						18,564		

Mixed use 3- business residential - commerce (250,000 m²)		
total built area PAT		259,800
Institution / Function	number of blocks	Total Constructed area (m²) +/- 10%
Commerce	5	58,200
Business	5	51,600
Residence	5	150,000

EDUCATIONAL FACILITY

Educational Facility (52,400 m² ±10%)										
Institution / Function	% of 52,400m²	max. FAR	building type	Floors per building m²	number of buildings	Constructed area (m²) +/- 10% / per building type	lot (m²)	Number of Blocks	Total Constructed area (m²) +/- 10% / per use	Parking Area m²
Kindergarten Child Day Care Center	13.74	0.50	A (25 X 32)	1 X 800	3	2,400	4,800	3	7,200	500
Elementary School		1.50	A (31 X 92)	2 X 2,852	1	5,704	10,120	1		500
			B (30 X 110)	2 X 3300		6,600			12,304	
Middle School	28.10	2.00	A (33 X 65)	2 X 2,145	1	4,290	8,125	1		2,000
			B (33 X 65)	3 X 2,145		6,435				
			C (16 X 125)	2 X 2,000		4,000			14,725	
High School	15.97	2.00	A (33 X 65)	2 X 2,145	1	4,290	9,620	1		
			B (33 X 65)	3 X 3, 145		9,435				2,000
			C (17 X 133)	2 X 2,261		4,522				
			D (17 X 48)	1 X 816		816			19,063	
Graduate School of Public Administration	7.70	1.00	A (32 X 63)	2 X 2016	1	4,032	4,032	1	4,032	4,000
TOTAL BUILT AREA									57,324	
TOTAL PARKING AREA										9,000

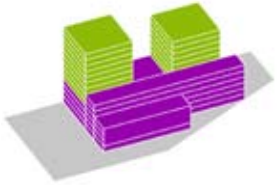


HOTELS & CONFERENCE HALL

Hotels & Conference Hall (100,000 m² ±10%)								
HOTEL 1								
Institution / Function	% of 100,000m²	max. FAR	building type	Floors per building m²	number of buildings	Constructed area (m²) +/- 10% / per building type	lot (m²)	Total Constructed area (m²) +/- 10% / per use
Hotels	25.2	4.00	A (30 X 30)	28 X 900	1 X 25,200	25,200	9,100	25,200
Conference	8.52		A (12 X 55)	6 X 660	1 X 3,960	3,960		
			B (12 X 95)	4 X 1,140	1 X 4,560	4,560		8,520
TOTAL BUILT AREA								33,720
TOTAL PARKING AREA								15,000
HOTEL 2								
Institution / Function	% of 100,000m²	max. FAR	building type	Floors per building m²	number of buildings	Constructed area (m²) +/- 10% / per building type	lot	Total Constructed area (m²) +/- 10% / per use
Hotels	22.50	3.50	A (30 X 30)	13 X 900	1 X 11,700	11,700	9,300	
			B (30 X 30)	12 X 900	1 X 10,800	10,800		22,500
Conference	11.40		A (55 X 55)	4 X 1,140	1 X 4,560	4,560		
			B (12 X 95)	6 X 1,140	1 X 6,840	6,840		11,400
TOTAL BUILT AREA								33,900
TOTAL PARKING AREA								15,000
HOTEL 3								
Institution / Function	% of 100,000m²	max. FAR	building type	Floors per building m²	number of buildings	Constructed area (m²) +/- 10% / per building type	lot	Total Constructed area (m²) +/- 10% / per use
Hotels	22.50	3.00	A (30 X 30)	13 X 900	1 X 11,700	11,700	10,400	
			B (30 X 30)	12 X 900	1 X 10,800	10,800		22,500
Conference	9		A (12 X 95)	5 X 1,140	1 X 5,700	5,700		
			B (12 X 55)	3 X 660	1 X 1,980	1,980		
			C (12 X 55)	2 X 660	1 X 1,320	1,320		9,000
TOTAL BUILT AREA								31,500
TOTAL PARKING AREA								15,000

Hotels & Conference Hall (use 100,000 m²)			
total built area PAT			99,120
Institution / Function	number of blocks		Total Constructed area (m²) +/- 10%
Hotels	3		70,200
Conference	3		28,920

1



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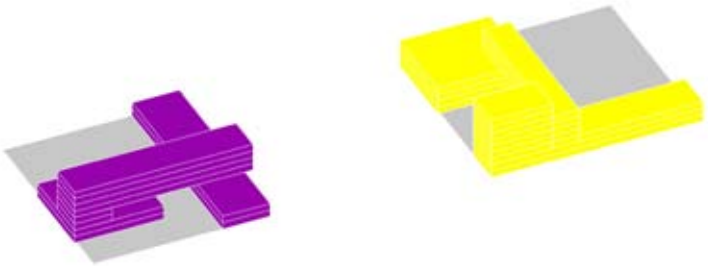
CULTURAL AMENITY

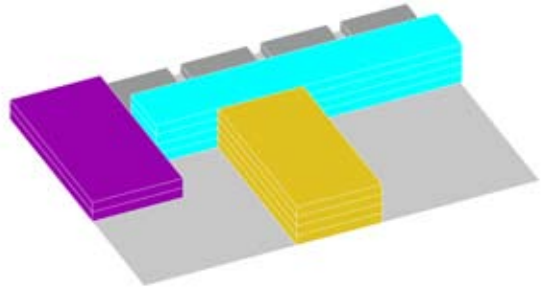


Cultural Amenity (50,000 m² ±10%)								
Institution / Function	% of 50,000m²	max. FAR	building type	Floors per building m²	number of buildings	Constructed area (m²) +/- 10% / per building type	TOTAL lot (m²)	Total Constructed area (m²) +/- 10% / per use
Public Library	64.29	2.50	A (23 X 121)	3 X 2,783	1	8,349	13,794	
			B (15 X 87)	5 X 1,307	1	6,535		
			C (50 X 50)	4 X 2,500	1	10,000		
			D (23 X 35)	9 X 805	1	7,245		32,129
Art Gallery / Museum	41.68	2.0	A (21 X 101)	2 X 2,121	1	4,242	11,312	
			B (27 X 112)	4 X 3,024	1	12,096		
			C (45 X 50)	2 X 2250	1	4,500		20,838
TOTAL BUILT AREA								52,967
TOTAL PARKING AREA								30,000

RESIDENTIAL USE

Residential Use (170,000 m² ±10%)									
Institution / Function	% of 170,000m²	max. FAR	building type	Floors per building m²	number of buildings	Constructed area (m²) +/- 10% / per building type	lot (m²)	Total Constructed area (m²) +/- 10% / per use	Parking Area m²
6 floor Residence	11.53	1.50	A (33 X 33)	6 X 1089	3	6,534	4,422	19,602	4,422
4 floor Residence	16.94	1.50	A (24 X 100)	4 X 2400	3	9,600	6,400	28,800	6,400
8 floor residence	22.14	1.50	A (28 X 28)	8 X 784	6	6,272	4,256	37,632	4,256
2 store residence (not residences)	50.90	1.00	A (8.5 X 10)	2 X 85	509	170	150	86,530	
TOTAL BUILT AREA								172,564	
TOTAL PARKING AREA									15,078

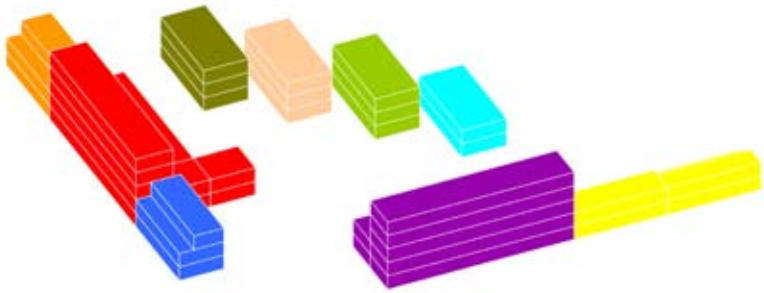
GOVERNMENT CONVENTION CENTER



Government Convention Center (34,800 m² ±10%)								
Institution / Function	% of 34,800 m²	max. FAR	building type	Floors per building m²	number of buildings	Constructed area (m²) +/- 10% / per building type	TOTAL lot (m²)	Total Constructed area (m²) +/- 10% / per use
Government Library	13.10		A (67 X 34)	2 X 2278	1	4,556		4,556
Shared facilities	26.44		A (20 X 115)	4 X 2300	1	9,200		9,200
Support and convenience facilities	7.18		A (25 X 25)	1 X 625	4	2,500		2,500
Convention and PR facilities	23.54		A (32 X 64)	4 X 2048	1	8,192		8,192
		1.50					16,187	
TOTAL BUILT AREA								24,448
TOTAL PARKING AREA								10,800

COMMUNITY COMPLEX

Community Complex (50,000 m² ±10%)								
Institution / Function	% of 50,000m²	max. FAR	building type	Floors per building m²	number of buildings	Constructed area (m²) +/- 10% / per building type	TOTAL lot (m²)	Total Constructed area (m²) +/- 10% / per use
Welfare Facility for the Elderly and Children	1.80		A (12 X 25)	3 X 300	1	900		900
Post Office	1.80		A (12 X 25)	3 X 300	1	900		900
Town Office	1.80		A (12 X 25)	3 X 300	1	900		900
Patrol Office	1.80		A (12 X 25)	3 X 300	1	900		900
119 Emergency Center	1.80		A (12 X 25)	3 X 300	1	900		900
Public Health Clinic	1.20		A (12 X 25)	2 X 300	1	600		600
Local Library	1.20		A (12 X 25)	2 X 300	1	600		600
House of Arts and Culture	1.20		A (12 X 25)	2 X 300	1	600		600
Retails & Other Support Facilities	4.00		A (10 X 50)	5 X 500	2	1,000		2,000
	4.00		B (10 X 50)	2 X 500	2	1,000		2,000
	0.40		C (10 X 20)	1 X 200	1	200		200
Gymnasium	7.20		A (40 X 90)	1 X 3600	1	3,600		3,600
Outdoor Recreational Center								26,500
		2.0					22,000	
TOTAL BUILT AREA								40,600
TOTAL PARKING AREA								20,000

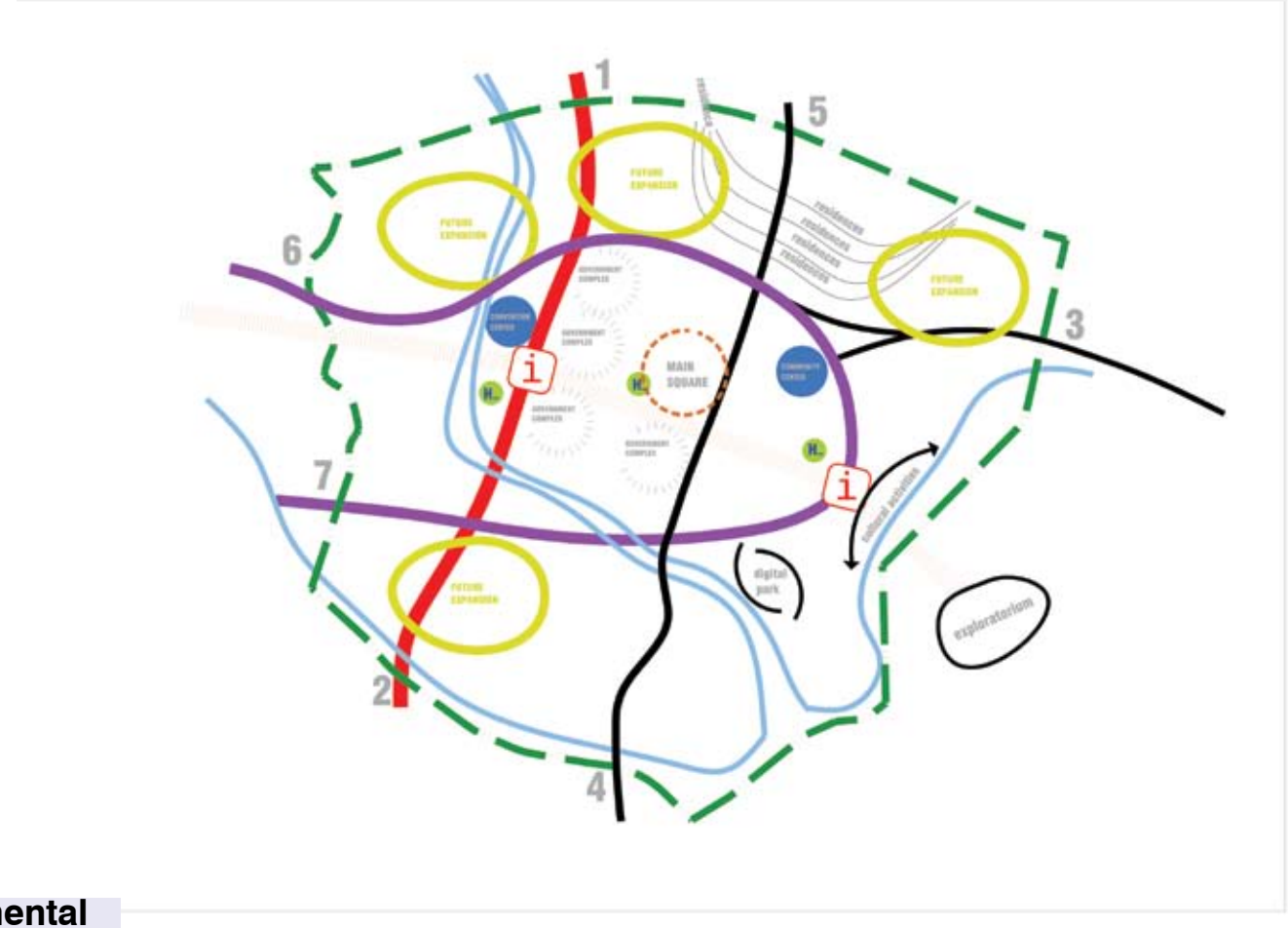


The building typologies are just sketches that include basic information. Architects should shape these buildings for a successful PAT

future expansion

Expandability has been integral to the design of PAT.
The high density of the city center with only 28% covered by buildings and 22% by roads within the ring road, together with the strategic distribution of the open spaces, allows an even higher density in the future, should it be necessary. The city center can also expand to the west, where we have left open space, as well as cross-over the ring road in selected locations.
The creation of only one village, with 22% covered by buildings and 29% by paved roads, allows both an increased density in the village, its expansion to the west and east along the same hill slope, as well as the creation of 2 more villages on the slopes of the west and south hills.
With a total of 9% covered by buildings and 12% by paved roads, the opportunities for expansion are well integrated in the design. Expansions can be incremental to meet the needs of the new town in additional space.

Possible expansion areas of the design scheme



Future expansion had been a fundamental issue for the design of PAT since day one