The city and its parts consist of elements created by their own logic, gathered spontaneously together within a certain confined territory, where actions and principles of operation are changing constantly over time. In such a system, symptoms of disfunction are inevitable. These disorders can be solved by planned interventions only, regarding the group of connected elements as a system that has to be brought into sustainable action. By means of very strong rectification and systematic intervention, this centrally located, vast area can be turned into a properly working system.

FOUR QUARTERS MAKE A WHOLE

The project winning the international competition for a complex to house eleven ministries of the Hungarian government applies environmentally conscious architectural and technical solutions. Moreover, it presents a combined approach to three basic problems of its urban context: the integration of the once peripheral, now central rail-tracks, the face-lifting of an adventurously developed downtown square through deconstruction, and the rehabilitation of the historic Testvár district. The 22 blocks of the latter being systematically renovated can become the urban counterweight to the planned new building on the other side of Pómacgyőr street.

The proposed design was based on the conviction that the principle of operable systems should be followed in the case of both the architecture and its environment created by the construction. The building complex of the government district is only one quarter; it will only become a whole after reviving the other three items. Compared to creating a transdenational building, it would be a much greater achievement if our design was the one to trigger the desired transformation processes. We have to think in terms of systems. There is poetry in that, too. To design a building that can support the required structural changes and initials to problems.

New scenarios

Since its success at the international competition in Budapest, Hungary, and then at Holcim Awards Europe, the project has undergone some changes which add further benefits to the proposal. In the meantime, the plot has already become a property of the state and the master-plan has been altered according to requirements of the project.

Hungarian political decision-makers saw difficulties in completing the project as planned (i.e. before the coming elections in 2010). Thus it has been decided to postpone the realization. Explicit intentions of carrying out a complex, large scale urban renewal intervention at the selected location remained (see quotes). According to official statements, there are two possible future scenarios for this:

After a short period of halt, the project will be continued as planned. The present economical conditions favor this outcome, since this way significant savings in property maintenance costs and a large income from selling the presently owned heterogeneous governmental properties can be achieved.

The government will back out of completing the project as a governmental district, and will lease the plot to developers. In this case, the building will become free from certain security issues allowing it to integrate even better into its context. The main features and virtues (energy concept, architecture, contextual approach) of the design can remain intact.
The project-flow
Our primary aim has not changed: we develop proposals for various phases of the intervention which interact, complement and thus in turn reinforce each other on very wide scales. We want to persuade participants and stakeholders of the project that it is worthwhile to conceive of a well functioning system – or, to put it more strictly, according to the present state of things it is imperative. During the year that has passed we made several improvements on our set of proposals: we considered the application of cellular interwoven structures as a primary structural element of the new building complex. This technology enables the reduction of structural weights to 10-25% of traditional brick-based structures. We have developed the hydroponic horticultural systems of the vertical green facades where the aforementioned plants English ivy (Hedera helix) and Japanese ivy (Parthenocissus tricuspidata ‘Vatchen’) can be positioned on any floor level, where feeding units are connected, supplied and monitored by a system and a central technical unit. We continued our analyses and documentation aiming at the complex rehabilitation of the adjacent Twic quarter where the strategies in development can be copied and pasted to any other parts of the downtown urban tissue. Finally, we assembled the operational and logistical matrix and methodology which supports the management and decision-making in an urban development program with many actors, aiming at high quality results and contextual interventions on this extended scale. These supplementary and partly modified proposals are our attempt to keep not only the project but also our active participation in it as designers sustainable.

<table>
<thead>
<tr>
<th>Plot area total / 40.000 sqm</th>
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<tbody>
<tr>
<td>Built-in area / 25.300 sqm</td>
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<tr>
<td>Green roof total / 8.300 sqm</td>
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<tr>
<td>Upper roofs / 19.000 sqm</td>
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<tr>
<td>Courts / 7.000 sqm</td>
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<tr>
<td>Vertical courts-walls / 2.300 sqm</td>
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<tr>
<td>Green elevations / 19.000 sqm</td>
</tr>
<tr>
<td>Vertical greens total / 12.200 sqm</td>
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<tr>
<td>Green surface total / 40.650 sqm</td>
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FLOOD AND DRAIN, RECIRCULATED

On the horizontal roof stats of the new building structure and on parts of the vertical facades plant surfaces are grown and maintained with hydroponic technology. The gardening system, just like the other parts of the building technology (HVAC and others) are operated from a central unit.
From the various hydroponic systems successfully applied in agricultural and gardening technologies, such as static solution culture, continuous flow solution culture, drip irrigation system – aka ‘run-to-waste’, flood and drain culture, we choose the latter where the feeding of individual pots is controlled by a central unit (for instance, four times a week, twice a day, for 1-5 minutes).
By applying green facades and green roofs we achieve a larger green surface on the site than the actual footprint of the buildings.

Of the possibly applicable plants two species, English ivy (Hedera helix) and Japanese ivy (Parthenocissus tricuspidata) are proposed. Both species live and creep surfaces of any material and texture using aerial roots and suck roots without additional structural support. English ivy is evergreen, providing a shiny green foliage throughout the year. As it is requires shade or partial shade, it can be applied on northern, eastern and western facades primarily. Japanese ivy needs sunlight and grows extensively. Its shiny green leaves turn to especially beautiful reddish colour by the autumn. It develops well on less sunny surfaces but its autumn hues are less intensive. Plants absorb carbon dioxide from the air and react with light and directed by chlorophyll, liberate oxygen to its free molecular state and to the environment. The fixed carbon is elevated to a higher energy level by the absorption of light energy and reacts with water to from formaldehyde, the primary building block of organic compounds. Plants are grown in an inert sterile growing medium, as clay pebbles, and fed a mixture of water and nutrients. With hydroponics, the water, nutrients and air are maintained directly to the root-balls, freeing the plant to use its available energy on its upper leaf development.

This hydroponics system is based on using a light weight granules called hydrocoals as medium for growth. Hydrocoals are expanded clay granules, about half an 1.2 cm in diameter, that have been baked at a very high temperature. The granules are often called clay pebbles and look like irregular shaped pellets. In heating the clay to a very high temperature, the granules develop extremely the pores running inside them. When immersed in water these fine holes draw up and store water in the granules using capillary action. The granules can hold up to a third of their own weight in water.
BUILDING SERVICES SYSTEM

In order to meet heating demands we plan to install a heat pump system which co-operates with the ground loops to be installed under the foundation of the building complex. Based on preliminary hydro-geologic drills, the installation depth of the loops will be between 125-150 m, in a 7 x 7 m grid. Total expected number of loops between 500-550. The output of the built-in heat pump system can cover 93% of the peak heating demand (4.8 MW) and 30% of the peak cooling demand (9.5 MW). In terms of annual operation of the building, the heat pump system can cover 100% of the heating energy consumption and 50% of the cooling energy consumption. The temperature of the produced water is 38 / 33 °C in winter mode and 13/18 °C in summer mode.

Hydroponics is a method of growing plants in water using a soilless medium.

The recirculating hydroponics system allows us to conserve water by up to 90%.

Irrigation and nutrient feeding of plants in hydroponics systems is operated through a computer controlled automated system.

For the plant to successfully adapt to its new conditions, three essentials are needed: water, oxygen and comfortable temperature of about 18 degrees C (64 degrees F).

A deep trough modular flood and drain system works off one major water tank for easy maintenance and usability.

From the main pot a central pump attached to the system delivers the hydroponic nutrient solution through hosepipe system into the growing medium on a timed cycle. Before reflooding, the medium is allowed to drain and dry slightly, drawing oxygen to the root zone.

PCM

PCM wall plaster. Plastic "plaster" applied to the wall structure, in which phase changing materials (PCMs) are used. These micro-capsules liquefy after absorbing heat when the ambient temperature rises and they solidify after losing the amount of "stored" heat when the ambient temperature falls. By using PCMs on the inner wall surfaces, cooling needs from internal heat load decrease by 10%. This way the consumption of primary energy sources and the emission of CO2 can be reduced.
CELLULAR INTERWOVEN STRUCTURE

With cellular construction, the linear, one-dimensional column is replaced by the two-dimensional wall, in the quest for elimination of all unnecessary weight from the structures. Full utilization of new building materials of high strength and uniformity has become a problem. Structural elements are now reduced to critical cross-sectional areas; and instead of strength, elastic stability (i.e., the over-all or local buckling of the members) becomes the controlling factor in design.

Main features of this technology are as follows:

Production of the load-bearing reinforced concrete structure or slab by in situ casting in the hollows of the surface panels. / A technology of stiffened concrete, where the advantage is based on the specific interaction between the plaster and the concrete. / Liquid concrete, made of aggregate with particles to a maximum 3 mm size, is stiffened by the plaster-off Paris, thus producing a concrete of vibrator-compacted quality. / Hydrostatic pressure on the permanent shuttering is relieved by stiffening. / The vibrator-free technology makes it possible to produce a reinforced concrete structure of millimetric precision.

The water extracted in stiffening provides for a continuous dampening of the concrete during maturing. / Small size concrete sections, fine graded aggregate, small steel diameters and the slab work interwoven structure result in extreme flexibility. / Volume weight of the building is one tenth of traditional, also silicate-based systems.

Concrete positive: The fabric itself is continuous, the part belonging to a negative unit is only shown here in an X-ray form. Twin negatives are used as formwork of concrete fabric. Manufactured units are small, concrete is made entirely in situ. Joints in order to arise at fully monolithic structure the in-situ made joints are rivet-like concrete units with added thin reinforcement. Internal macro-cells provide space for furniture, shelves, worktable etc. Floor cells can be used for integrated sanitary engineering elements. Engineering efficiency / Thermal comfort: The internal gypsum layer is advantageous against vapour attacks and has a very good irradiation factor. Crack-free features: Being lightweight and monolithic at the same time, and having a very sophisticated internal concrete-gypsum-insulation fabric, practically crack-free surfaces can be achieved. A lightweight structure: An extremely low weight-volume value of about 80-220 kg/m3 results from the cellular way of construction. Given its monolithic character, it is the best solution against earthquakes.

The microstructure

The concrete - lightly reinforced - is forming a lightweight, cellular fabric both in the wall and floor-ceil elements. An endless variety of internal fabric exists, depending on the possibilities of the gypsum-negative production. The fabric keeps a strict sub-modular order, connected to the production machinery, and being dividend of the modular coordination of the macrostructure.

The macro-structure

Bearing a close analogy with the microstructure, a multi-purpose monolithic cellular structure is built. The cellular walls-pillars and floors are defined by the manufactured gypsum negatives. The following main variations are at our disposal: Plate negatives, forming a roof grid with covering plates and different shaped cellular pillars or walls; Strip negatives, forming continuous fin elements both for pillars-walls and floors; cell-type negatives forming transportable manufactured volumes.

Appearance of the load-bearing structure in the inside

The structurally light cellular system can be given extra lightness through lighting, both day and night. Narrow cell stripes between the twin ribs, for example, can very simply be used for hidden lighting. For day lighting, it is a favourable arrangement to raise the covering slabs of the cellular system slightly over the cell ridge.
Building reconstruction, functional changes on the street level

Contrary to the typical practices in Budapest we propose reconstruction in this zone opposed to large scale demolition and new building. Special attention should be given to the street level zone which plays a key role in reactivating the district. Elevated ground floors and basement spaces need to be transformed to enable accommodating public functions, which require appropriate new entrances. There are no blueprint local solutions for this, it needs a paradigm shift, rethinking the structure of the Budapest urban block (i.e. shafts in the courtyards with stairs to the basements or baselayer entrances to the mezzanines).

Renewal of the street grid trend of parking cars

The street surfaces need to be changed to high quality pavement stretching from facade to facade without curbs and bicycle lanes need to be established. A basic principle for changing a pavement type is its removability and reusability in order to minimize waste and extra labour costs later infrastructure works.

Green facade systems need to be installed on facades streets, remove floating dust and for the heat protection of buildings.

Proposed specific interventions and phases

A “Multifunctional parking house-network” needs to be developed to provide the required amount of parking spaces outside street zones and public spaces. According to our research the municipality has significant ownership stakes in the area. This 21st century new infrastructure unit consists of two main parts: an automated system for parking in the back sides and a street front providing community, service and commercial facilities. This might be combined with a central heat-unit contributing to the energy supply of the blocks.

Ground floor real estate and value changes

Comparative studies suggest that after the removal of public spaces and streets the market and rental prices of ground floor spaces increase by 40-60% and continues further with time. This change contributes to the property management of the municipality as most of these spaces are in municipal ownership. Thus we propose that the municipality should absolutely not sell these after their initial很好地 but keep them as long term investments. Total sum floor area in the 22 blocks: app. 140,000 sqm. Expected value increase directly after street removal: app. 2.8 billion HUF / 90 million EUR (further increases expected with time). A stover but significant value increase is expected in the housing stock as well an estimated annual rate of 20-25% which means that the market value of apartments in the zone will double in five years.

The possible sites for multi-storey parking have been suggested by the synthesis of the research results. Parking structures can host further public functions, creating a hybrid parking-community house network.

Costs and resources

We have made preliminary a budget to prove the feasibility of the project: Rehabilitation of the street network (without infrastructure changes), 92,000 sqm road surface rehabilitation costs: 1,1 billion HUF / 36 million EUR. Multifunctional parking garages: 10,000 to 14,000 EUR per parking space – the costs of a building (street front public spaces and automated parking garage) total 2.5-4 billion HUF / 8-13 million EUR. Seven garages are needed in the first phase for which municipal investments are required. The total sum of this is 17.5-25 billion HUF / 60-90 million EUR.

TERÉZ-QUARTER REVITALIZED

We developed a detailed strategy for revitalizing the Teréz quarter passing beyond the main side road and the first row of houses, covering the entire zone of 22 blocks.

An investment at the planned magnitude in the direct vicinity of a densely built, run down slum-like urban environment causes an explosion of prices. It is indeed required to make sure that the consequences regarding financial and image changes be coordinated and directed towards specific goals in order to achieve homogenous changes in quality. We have thus researched and documented all the building standing in all the blocks and set up a four-variable matrix registering property ownership, function, building height and floor area, and the building’s conditions. According to our strategy, the rehabilitation process includes interventions that are hardware-like, only executable by the community on a planned, coordinated basis, and there are several elements of renewal that upon this coordinated basis can spontaneously develop.

The first coordinated and planned task to resolve is car parking in the zone. Furthermore, the replacement of street surfaces, planning traffic flows, phased rehabilitation of public infrastructure and creating public community spaces.

By building multi-storey parking lots we can handle multiple problems of the district simultaneously: firstly, street parking is drastically reduced, thus liberating ground floor spaces to be used as shops, restaurants and the like. These parking structures can also accommodate the growing demand for numbers likely induced by ownership changes. And finally, the district municipality has ownership registered in 80% of the houses, typically ground floor or basement sections which currently hold almost no market value. The significant rise in prices for these spaces is in the interest of the municipality and the expanding wealth the real estate stock for backing up the coordinated investments.
RAILWAY
In its present state, the initially peripheral, wide railway corridor cannot integrate into the urban tissue that grew around it. The isolating effect it causes can not only be detected in the urban connections becoming rectilinear or circumstantial, but also in the underuse of the areas directly connected to it. Only buildings turning their backs on the railway can accommodate urban functions here (see West End City Center), which further amplifies the inclusion-like character of the railroad area.

Railroad-to-crosstown to green road
Our concept is based on lowering the railroad tracks and the terminal into an underground concrete box structure covered with soil, all relocated to the outside of the old station hall designed by Gustave Eiffel's office. The hall becomes a public space liberated from train traffic, with direct access to the array of parks on top of the railroad. This green corridor with a total area of 100,000 sqm and a width varying between 50 to 150 meters reaches to the urban park Városliget, and is divided into three functional sections (park-plaza-park). This way, the downtown boulevard will be directly connected to the city's highest quality green area and leisure destinations. The ground-level sequence of public parks also establishes important cross-connections between the two districts now divided by the railway. Pedestrian traffic and limited capacity road passes will both be placed on ground level, liberating the areas which, being inclusions confined by busy roads and the railroad, have started to deteriorate badly. The value of real estate properties overlooking the parks will increase, triggering urban improvement in the neighborhood.

We examined the possibilities of integrating a system of sustainable energy sources into the structure of the railway tunnel. According to our plans, there would be air-side heat collectors beneath the foundation slabs of the lowered railroad tracks. Thus it becomes possible to pre-heat half of the input air needed (i.e., 250,000 sqm²) by 8 degrees Celsius using heat from the ground.

Effel Hall
By taking the tracks out from the station hall designed by the studio of Gustave Eiffel and completed in 1877, an exciting, three-story-high, transparent and permeable, climate-controlled public space is created. Train passengers will move at underground level, while the ground level and a newly introduced gallery will accommodate public functions.

The hall itself, not being closed by the train terminal at the rear end, becomes a genuine urban scene with a few times larger public circulation than the amount of train passengers. It can be a vivid meeting place, a gateway, departure and arrival point for urban excursions, and at the same time the most convenient pedestrian route towards the new urban complex. In the lateral naus there are dining and cultural facilities, serving both the adjacent public squares on the outside and the former station hall, which is open all year round.

The hall would be connected directly to the underground passenger level which is open in each direction, has rapid elevators and escalators at certain points. Passengers in a hurry would be transported between the train terminal and public transport facilities by means of moving walkways. By extending this underground level we can avoid the Eiffel Hall becoming merely a transit zone of the new train station.

Nyugati Square
In order to create an appropriate setting for the historic station hall in its new role as a gate to the area, four important fine-tuning interventions are needed on the square in front of it: a shift of function, the demolition of a road overpass, the covering of an open, underground level square and a replacement after for removing the planned project that we disapproved.

We can hardly use the word architecture to relocation, demolition, backfilling and a replacement project but in some cases the successful application of such techniques of deconstruction and obstruction can create the conditions of efficient operation.

SUMMARY
Substantial change and transferability
The program will entirely transform a very poorly functioning urban scene. It could prove to be paradigmatic by proposing radical, progressive solutions and introducing new qualities in a society lacking awareness and insight. Urban renewal is triggered by a type of development usually known to be amoral. The work is based on a profound analysis of the situation and a highly complex approach.

Ethical standards and social equity
Our goal was to turn a symbol of power into an exemplary model of common sense, responsibility and sustainability. Integrated concepts of energy, architecture and urbanism make the project a mind-changing example for a whole nation, providing clear, long-term benefits for the community. Publishing the project in detail on the internet gives democratic access to information and accountability.

Ecological quality and energy conservation
A sustainable energy concept is applied to the whole governmental building. Heat pumps cover 100% of heating and 50% of cooling energy needed. Hot water heating and cooling is combined with extreme thermal insulation using innovative materials. Direct heat impact is eliminated by plants on the facade and full shading of the windows, including cooling needs. Natural light drastically reduces electricity consumption. Warm water comes from solar vacuum tubes and PV panels. Rainwater gets collected, a split wastewater management and water saving appliances are used. Selective waste management is carried out on the spot. A similar concept is proposed for the connected urban area.

Economic performance and compatibility
The whole project is about cutting costs of governmental work by pulling together the offices and providing them with a better infrastructure. The relatively high cost of construction is balanced by cheap operation and sustainable economical prosperity of the adjacent urban areas. This way the intervention becomes a long-term investment which will not devalue anytime soon.

Contextual and aesthetic impact
Contextual concerns play a major role in the project. Exploiting the energy coming from the emergence of such a large and important building, an extensive urban embellishment is planned in order to get prepared for the inevitable changes coming. The governmental building introduces a new aesthetic quality in Budapest and is set into a framework of three equally radical interventions: covering the rails with a huge public park, reconstructing the square in front of the station and renewing a 25-block urban area across the street from the new building. Urban structure is regarded here as a mechanism that has to work properly and fulfill the needs of inhabitants. Hence the first three stories of the building contain public functions and are subsequently open for walk-through.