

Improving the green system of Budapest by transforming railway rust areas

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Introduction

The Industrial Revolution had a negative impact on both the city and the environment. By the second half of the 19th century the urban erosion of industrial cities cried for direct intervention and curing. The methods developed either along an urban or an anti-urban philosophy, resulted the new models of green belt systems aimed to solve all the main urban problems with restructuring the urban fabric, controlling the urban spread into the rural landscape, the lack of green areas and open spaces for recreation and social life, and the lack of green spaces for ventilation.

On the other hand in the big cities the brownfield sites are considered as reserve areas for sustainable urban development. Reusing the brownfields and rust areas is already a land-saving urban development approach, and in case of a complex and ecological urban rehabilitation it can underlie the development of an efficient urban green system and green network.

Background/Literature Review

This doctoral research is started in 2010 deal with a really current and multiple topic. In Hungary the first and mostly complex research with brownfields (Clarinet 2002) was made in MTA (Barta 2004). It contains a definition and a cadaster of the brownfield in Budapest. (Lócsei 2002) But at the beginning of this doctoral work had to be updated this cadaster work, and naturally particularized the railway sites.

The other term, the urban green system is an older topic. The first comprehensive urban green system plan in Hungary was prepared in the 1960s (MEM Green Belt Concept Plan), and then there were several new green-space development programme (e.g. Pro Verde). But the green surface rate of Budapest has been continuously decreasing. In the first part of the doctoral dissertation was collected and analysed most of historical and current maps, programs, concepts and urban plans for the green system of the capital and on the other hand the databases, maps of the vegetation intense of Budapest. (Gábor et al. 2006) It was focusing on the connection with the railway rust areas. All of them was useful and instructive the development strategy, but the

truth is that up to now was not made complex investigation and program especially in this topic - improving the green system of Budapest by transforming brownfields and railway rust areas. (Hutter 2014, 2015) (Hutter – Szilágyi 2014)

Goals and objectives

The aim of my doctoral research was to identify those rust areas that hold potentials for green surface development following the principles of sustainable and ecological urban development. The linear structural elements of the railway network can replace the missing elements of the ring-radial urban green system. Therefore among the various brownfield rehabilitation possibilities the doctoral research was focusing on the formal railway sites! It established the following hypothesis: *How can brownfield rehabilitations improve the urban green system and the green network connections?*

Method(s)

This doctoral research was based on two parallel research in two current and interesting topic: the brownfields and green system of Budapest. To answering the above-mentioned question - after review the literature and terminology – the first step was to prepare the cadaster map of the railway rust areas by comparing orthophotos with the development plans (realignment plans for the railway network, selected areas to be vacated) of the Hungarian State Railway (MÁV Zrt.). (Figure1) Having prepared the first cadaster map, it had to be compared with the current green areas of Budapest.

With analysis from an ecological perspective could be identify those rust areas that have good attributes for green surface development. (Based on the vegetation index assessment, near-infrared orthophotos and multiple ground truthing could be determine: the biologically active green surfaces proportion in the railway rust areas, and the ecological value of the established vegetation.)

With the above described criterions, finally I made suggestions for the possible land-use categories and new functions for potential railway rust areas. This schematic map demonstrate how can the rehabilitated rust areas can support a well-established ring-radial green network, the development of a well-functioning green network, and broaden the urban recreational facilities. (Figure 2)

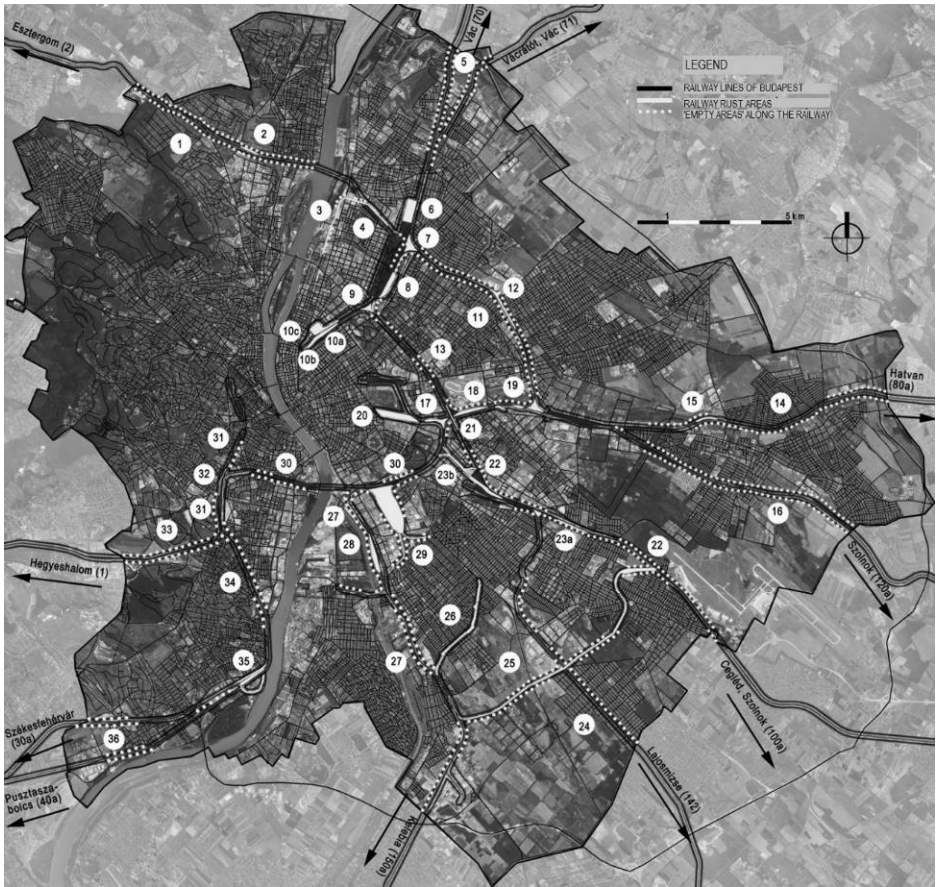


Figure 1. Cadaster map of railway rust areas; The most important areas of railway rustbelt and the 'empty areas' along the railway (source: Dóra Hutter)

Results

Transforming the abandoned sites of the railway network (making use of their original structural features) we can improve the urban green system by replacing the missing linear elements or nodes. National and international examples prove that; theme parks, institutional gardens, public parks or other linear green elements developed from brownfields draw attraction and hold increasing tourist potentials. Due to the fresh and modern design approach that exploits the unique features of such particular sites. As a new recreational area, green network element or just as a conditioning surface they can become valuable elements of the settlement's recreational green network and its complex green system.



Figure 2. Schematic concept for the green system and green network of Budapest-based of railway rust areas; proposed green axes (black),recreation axes (light green points) and focus points of green system (source: Dóra Hutter)

Discussion

The following new scientific results have been achieved during the research:

1. The railway rust areas along with the connecting industrial brownfield areas are the last resources to replace in the missing structural elements and provide the necessary connections in the green system. For the urban ecological, environmental quality, and health protection point of view therefore these areas should be favoured against other land uses.

2. Compared to the industrial rust areas, the releasable areas in the railway network and the railway rust areas - due to their settled ownership rights, areal

homogeneity, and general regulations - are more adequate to be used in the development strategy of the capital.

The industrial brownfields are very mosaic, in many cases the ownership status is not clear, or they are over-fragmented. Compared to the railway areas they are state owned, and form a connecting network.

Part of them (mainly the open lines, and those areas which are not involved in the public service) belong to the public purse, while others (the mainly traffic zones) are owned by MAV Ltd. These are all considered as transport areas land use category.

3. The safety zones of the former railway segment and the railway rust areas (abandoned rails, former industrial and service areas) in most cases resulted a development of a spontaneous vegetation. In many of these places a high vegetation intensity is recorded, thus the green areas along the railways are considered as an important part of the urban green system.

There is a connection between the vegetation index and original function, the time that has passed since the abandonment, in other words with the disturbance level. The higher - even 80% - green surface intensity is typical for the green areas of safety zones, and the railway deltas which can include valuable tree lines or larger forestall areas.

On the slowly, gradually abandoned rust areas that might been even treated by weed killers due to the railway operations mostly ruderal vegetation can be observed. These areas - from the settlement ecological point of view - may be a good starting point for the next step, but on the long-term it requires a constant maintenance and stock replacement.

4. In the technical and ecological and urban structure aspect of the linear elements - crossing various urban districts - can be well used in replacing the missing areal connections and important corridors in the axial-radial green system of Budapest and to provide new eco-friendly transport lines of the green network.

There are over 150 km long linear green areas along the railway network that can be categorised in 3 main groups:

I. The abandoned railways of the open-line areas altogether 26,3km which consist from 8 - mostly 1, 3 or 10 km long units-

II. These corridors can be increased more by using the linear line formed by the connecting nearby railway rust areas (abandoned stations and service

areas) which in many cases can add an extra 5km. These valuables can increase the total estimated value.

III. The development of the “empty” lines along the railway lines can provide areas for future developments. There is an almost 124km long area that is suitable for green corridor development, from which there are 3-7 km long sections that often run along the two sides of the railway.

To summarize it the currently (mostly proposed new green corridors provide various recreational lines, which could connect the focus points of the green network - the big city parks, thematic open spaces, natural sights, and the future_ green surface elements developed from the rust belt. These recreational lines define various connecting eco-friendly, 10 km long pathways in the urban fabric.

5. The abandoned railway stations, transfer stations, service areas, safety railway deltas can replace the valuable elements of the green system. Due to the complex rehabilitation of new green network elements can be created in the neighbourhoods now lacking public green spaces.

The potential railway rust areas of Budapest is estimated to be over 245 ha. From this:

- I. the major transport areas and service areas that add up to 146 km
- II. In between the railway deltas and junctions an average 5 ha can be designated for development.
- III. The station and the abandoned areas of each cover 2 ha on average.

We can state that even the smaller units are suitable for developing respective stock climate public parks, thematically green areas and can create various new focus points in the green system and network of Budapest.

6. The larger connecting railway rust areas - even with wider brownfield connection - can be the centres of complex neighbourhood revitalisation, or ideal sub-city centres. To achieve this it is unavoidable to increase the low biological activity - that is typical for the industrial brownfield to protect the ventilating corridor with the valuable vegetation that has been settled along the railway. In other words to provide the settlement-ecological aspects in the city-rehabilitation program.

The scheduled development and temporary use are important during the long-term plannings. In many cases - mainly in those areas where future constriction is unlikely - a preforestration could be advised and a few years later a recreational development.

7. The national inventory and strategy that would deal with the green areas from an ecological and a green network prospective is still incomplete.

The regional building regulations cannot unite the comprehensive development plans such as creating a linear green elements including new recreational transit lines.

As the railways mainly pass along the district boundaries and cross entire zones, it is highly important to create a new city-scale regulatory system regarding the green areas developed from former railway rust areas.

8. To create the linear element of the green system and network, the green promenade should be defined as a new land use category. Its own regulatory category could facilitate to define such a green area lane that:

- has a high green surface rate (50%, multilevel stock)
- can incorporate sufficient pavement for the urban uses, built up elements, (a min. 10m wide, long running section with min. 5 m multifunctional promenades and other reserve zones).
- to provide the background for the presently scanty regulation on the key linear element of the green network and the urban green area network. (Figure3.)

From a landscape aspect it is important to highlight the green promenades, trails that form the column of the green network but differ from the traditional greenways. Their target groups are citizens thus these provide opportunities for walks, short relaxation, everyday recreation. Its pavement rate is more permissive than the forests'. But it has a more levelled green surface, than the afforested public spaces. Due to its linear characteristics its functional arrangements (pedestrian and non-motorised traffic corridors, green surfaces) are considerably constant. Therefore a general cross section can be estimated and maintained. Green corridors has to be created based on open-space plan as landscape architect work, involving transportation engineer and further professionals.

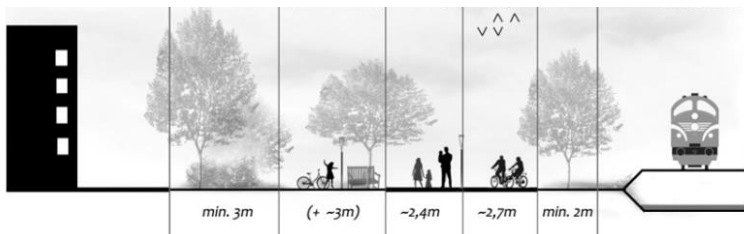


Figure 3. General section of a parkway, where the minimal wide 10m (additional functional and furniture zone 3m), the green surface rate 50% (source: Hutter)

Conclusion

The international overview also shows that the modern principles of sustainability and liveability would eventuate in land-saving, ecological means in urban development. Such a development will improve and enhance the urban green system and network. Unfortunately, the urban development concept of Budapest does not consider these aspects; it is rather influenced by economic or real estate development interests. My research hypothesis is based on the finding that the urban structural and ecological features of the railway rust areas support the development of a well-structured green network and also improve the urban green system, thus ameliorating the environmental quality and the urban ecological conditions.

This study presents the methodology of an ecologically-based assessment and investigation for rust area revitalization. I am aware of the fact that urban ecology is only one of the various development objectives. Although a successful revitalization project is based on a complex assessment (for example aspects of investment, market or economic interests). My aim of discussing merely the urban ecological aspect was to raise attention to the importance of this neglected field.

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