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The spatial impact of train stations on small and medium-sized European cities and their contemporary urban design challenges

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Important note
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The spatial impact of train stations on small and medium-sized European cities and their contemporary urban design challenges.

After a decade marked by the renewal of grand European high-speed railway stations, today, a second wave of station renewal is at hand. This paper argues the importance of the train station in the historical development of smaller cities. Based on comparative research of recent best practices, the contemporary urban design challenges of smaller and medium-sized stations are explored. The paper concludes that the station is no longer shaped as a monolithic, architectural cathedral, as for the grand stations, but interweaves the world of the passer-by with that of the local inhabitant as a system of public infrastructure and facilities.

1. Introduction

Train stations perform as a magnet for all kinds of socio-economic activities and the public space around the station often represents one of the main gateways to the city or village. However, the quality of the surroundings of these stations resides in many cities under pressure due to various factors such as poor accessibility, vacancy, obsolete patrimony, insufficient economic activity, a lack of greenery, noise hindrance or an uncertain real estate market. Due to several factors such as increasing traffic jams, more sustainable transport policies, new transport modes, and increasing real estate pressure, the societal pressure to improve and renovate stations is rapidly increasing in urban areas, and there are rising expectations on their spatial development potential. The urban development of station areas has significant potential as a sustainable way to enhance public transport use, accommodate cities' long-term growth – generating many social and environmental benefits, as well as potentially cross subsidizing improvements to stations and infrastructure. Nevertheless, smaller cities struggle in implementing these sustainable policies and to deliver high-quality public spaces around stations.

After the past decade marked by the renewal of several grand European high-speed railway (HSR) stations in cities like Antwerp, Liege, Rotterdam or Lille (van den Berg and Pol 1998; Pol 2002), today stations renewal in smaller cities need more *integrated approach* and a spatial vision, different from the ambitious metropolitan HSR stations' redevelopment plans (Bertolini 1999, 2005, 2012; Smets 2000, 2002; Triggianese et al. 2018). Backed by a European Interreg project, this paper analyses eleven smaller cities in the Belgian-Dutch border region, which collaborated to redesign their station areas: Aarschot, Bergen op Zoom, Diest, Hasselt, Heerlen, Herentals, Roosendaal, Sint-Truiden, Tienen, Tongeren and Turnhout.

2. Methodology

The structure of the paper follows the methodology of analysis of train stations' cases at different scale levels, ranging from the rail network to the station building, including their impact on the surrounding urban tissue and the *urban design challenges* associated with that. The analysis considers the main features of station design and development as follow: 1. the understating of the strategic position of the smaller stations within the larger transport network, their capacity of gaining commuters' interest (not only local inhabitants), which confronts the designers of the station area with correlated design problems (*inter-modality* as design challenge); 2. the role of the station functioning as the engine of urbanization, where the train tracks represent barriers for potential extensions and urban developments (*morphological barrier* as design challenge); 3. the station area as catalyst of urban programs and opportunity for enhancing local economy. The smaller cities need to develop a more local and specific program (*programming* as design challenge). 4. The re-interpretation of the traditional notion of public space. The railway station area becomes a new center with a distinct character (*public space* as design challenge). 5 the typological transformation of the

station building, which is no longer a pompous railway cathedral but an urban living room (*typo-morphological character* as design challenge).

This research was based on a combination of historical literature study, comparative case study and cartographical mapping. The morphological impact of the stations on the urban tissue of the eleven Belgian and Dutch cities was combined with literature study with a cartographical methodology. Historical maps and technical drawings were combined with contemporary G.I.S. data, via CAD programs and other visualization tools. This resulted in eleven sets of five maps: five maps for every analysed city. Each map depicts the morphology and the impact of the train station at a certain moment in history. The second part of the research was based on the comparison of the urban design projects for station renewal at the eleven cities. The designs were analysed on recurring problem statements and the strategies and design concepts dealing with it. This literature study was complemented with interviews with the main stakeholders of every station project. Interviews were conducted with the local project managers, responsible politicians, project developers, train company, urban designers, representatives of the user groups, real estate developers, local and national planning departments. Finally, based on an extensive literature review, best practices in urban design of smaller European stations were analysed in the recurring design challenges and concepts. (Fig.1)

3. The network evolution

Once a dense network, the Dutch-Belgian border region lost its density after the Second World War. However, today, a renewed interest in the local train stations in this region is emerging.

3.1 Tracing tracks between Belgium and the Netherlands

The railway network developed in Belgium and the Netherlands at various speeds and took on

different constellations in both nations (Duffhues 2013). Belgium implemented in the early 19th century, immediately after its independence from the Netherlands, the new railway technology in order to forge the young State together. The network was drawn according to the concept of the so-called Iron Cross and connected the largest cities with the most important industrial regions at that time (Van der Herten et al. 2001). In the Netherlands, the rail network would be rolled out later. The Netherlands at that time could be called rather a 'Waterland', which transported a significant part of its goods through its dense network of canals and waterways (van der Woud 2006). But by the end of the 19th century, also the Netherlands traced a dense railroad network and the country industrialized in quick succession (Chorus 2012). (Fig. 2)

Against the background of the rapid development of the network in Belgium and the progressive development of the Netherlands in the 19th century, the stations and station areas emerged as we know them today. At the time that the railways reached the city limits for the first time, the largest city of the eleven cities analysed in this paper (Turnhout, 15.000 inhabitants) had about four times as many inhabitants as the smallest (Aarschot, 4.000). These cities represented regional centers - often no more than walled villages - and remained in the shadow of cities such as Antwerp (100.000), Rotterdam (90.000) and Brussels (120.000). Anno 2012 similar proportions can be detected: the largest of the eleven cities (Heerlen, 89.000) counts almost four times as many inhabitants as the city with the smallest population (Diest, 23.000). Then as now, we can consider these as small to medium-sized cities.

During the Interwar period the mazes of Belgian-Dutch railway network began to lose their density. Under the pressure of road transport, the least profitable lines were systematically eliminated. Out of the nine rail links, which connected Belgium and the Netherlands through halfway the 20th century, only two are left today. Moreover, the recent Fyra debacle proves that such cross-border interconnections increasingly come to be under pressure of HSR lines

and that the small border stations systematically lose their function (Gerrits and Marks 2016).

3.2 Havens of intermodality

However, the train station was not only the hub of the railway network. In the 19th century, the train station represented also a new junction in an expanding extensive road network. After all, at that moment, in Belgium, 90% of all traffic would pass through a station (Duffhues 2013). In each of the investigated cities, the train station would also represent a hub for tramways or local and industrial railways (Van Acker 2014). This lighter form of railway was considered a relatively cheap solution to the problem of connecting the villages, agricultural developments and local industrial resources that lacked a proper train connection with the larger cities, their markets and the national harbors (Graux 1882).

For example, in the cities of Hasselt and Herentals, by the end of the 19th century, the railway network expanded with local industrial tracks, servicing the intermodal connection between the station and the nearby canal. These local links conducted the traffic between the main rail and water network for the jenever industry in Hasselt, and the steel and shoe manufacturing in Herentals. In and around the city of Tienen an impressive amount of local railway lines was built around the turn of the century. Two lines cut through the city center and there was also a loop drawn for sugar transport between the increasing refineries and the station. From 1886 until the Second World War, even an air track for beet and coal ran between the sugar plants and a freight station nearby. (Fig. 3)

These local railways would not therefore form a new autarkic public transport network, but just as rivers have streams, and main roads branch into local roads, they would function as secondary feeder lines into the national train network (De Burlet 1907). In the investigated cities, most of the local lines started at the train station, or reached it fairly quickly along the trajectory. At these junctions, new emplacements were developed (Keutgens 1985). Multiple

train and tram tracks were interwoven into transhipment points where cargo could be exchanged.

3.3 Small stations gain commuters interest

After the decline over the past half-century, the train seems ready for a revival today. However, today in Belgium the small stations gain renewed importance (De Block and Blondia 2011). More and more travellers recognize the strategic position of the small stations in the transport network. Commuters drive their car to the smaller station, and rather than to queue with their colleagues in traffic towards the big city, they ride the train to work. These smaller stations serve a larger hinterland: these stations not merely function as transport hubs for the city, but they serve the wider region (NMBS mobility 2018).

The primary users of those train station are therefore not merely inhabitants of the city. This confronts the designers of the station area with a major challenge and correlated design problem: how can a larger commuter parking be integrated into the station area? For the city of Aarschot for example, the urban designers proposed the concept of the 'park-parking'. The depot where the car is parked in between the alignment of trees, should also serve as a new green link between the local park and downtown. In Hasselt, the urban design office shaped the parking lot to a so-called Esplanade: a semi-underground car park, tucked under a sloping park. (Fig. 4)

Of course, the commuters do not just arrive by car to the new stations. Today the call for the station to be yet again an intermodal haven sounds louder than ever. The designer of the new station should also systematically provide more space for bicycle parking and the bus. The designs often include wider bus platforms, but in some cases, such as Hasselt and Turnhout, also additional space for a larger bus buffer. A station like Hasselt even prepares to receive

commuters via light rail. In most of the cases, these different transport modes compete one another for more space within the limits of the project site.

A second recurring problem statement is how the new train station could be embedded in the city, while the majority of users are not a resident of that city? How can the train station entice those thousands of travellers each week to also frequent the city, and not only its station and car park? Certain cities aim to turn their station into something more than merely a transportation device and to restore the station in its function of gateway to the city. The city of Tongeren for example wants to make also its downtown as a destination for the train passengers. The station is being developed as a pole of attraction on the city's cultural and commercial axis. The new station near Tongeren could be conceived as the crown jewel of the city's modernization process of the past decade. Also, in the city of Sint-Truiden the local government and designers recognize that the station could be more than just a transit zone. The designers consider the station as a starting point, not to explore the city, but rather its wider, natural surroundings. In their plans, the design company PLANNERS crosslink the new residential developments around the station with a recreational network, oriented towards the regional landscape.

3.3 Reweaving the station: intermodality as an international design challenge

Also internationally the spatial and mobility reconciliation of the design or renovation projects of (light) rail stations with other transportation modes represents a returning design challenge. In Straatsburg-Hoenheim (FR) for example, the terminus station and parking of the tram network was conceived as a new gateway to the city. The design for the station combines tramways, a motorway, bus stop, 800 parking lots and a direct connection to the train station, in an artificial landscape of concrete, steel and TL-light. In Le Mans (France), this urge for a better intermodal spatial coordination was integrated with a renovation project

of the existing train station. The historical building was paired with a new, linear passage. The architectural intervention of the glass passage functions as a new spine for the station surroundings, guiding the public fluxes between train, bus, tram, car and bicycle park. Near the station the passage functions as a waiting room. Outside, it functions as a covered path, conducting the travellers to the bus, parking and tram stop. In the near future, the passage will also connect the station with a new hotel and conference center. (Fig. 5 & 6)

4. The train station and urban development: engine or barrier?

4.1 The emergence of the bipolar city

In the early 19th century, most cities were still surrounded by a wall or other military defence systems. The city gates connected to the main access roads. This was true for all Belgian cities in this paper, with the exception of Turnhout, and on the Dutch side, for Bergen op Zoom. Additionally, all the Belgian cities and the Dutch city of Bergen op Zoom had a grand market place at the center of their morphology, the so-called 'Grote Markt', which was often unchallenged for centuries as the socio-cultural and economic center of the city.

It was therefore no coincidence that, where the existing urban structure permitted, the train stations, in each of the eleven analysed cities, were built as close as possible to the historic market place. Therefore, the original marketplace continued to represent in the 19th century, the center of the economic activities of the city. Even though the motive for the construction of the railway was not directly linked to the local economy, but rather part of a territorial or transportation plan, also the small cities or villages along a new railway line, were often granted a proper train station. This way also the local economic activity was stimulated to thrive. At the level of the city, the railway station was perhaps situated at an eccentric location, but on the scale of the network, the existing market places in those cities were the

most important places to trace the new network along. (Fig. 7)

When traveling, the city was exited and entered by one of its gates, by which it was immediately clear in what direction the traveller was heading. The transport revolution in the 19th century, and the arrival of the railways in particular, would change these centripetal and centrifugal patterns of transportation. The outdated military function of the city walls and moats, paved the way to break down portions of the walls and transform them into a proper railway space. The station as the new city gate became the primary access point for traders, travelers and visitors. The station was connected to the historical center by the so-called Station street (in Dutch: 'Stationsstraat' or 'Statiestraat'), often until today still called this way (De Block and Polasky 2011).

4.2 Bridging the morphological barrier

With the station functioning as the engine of urbanization, in the late 19th century, the train tracks get to lie deeper and deeper in the urban tissue. Therefore, besides a development pole, the rail infrastructure generates paradoxically also a morphological barrier, one that is difficult to overcome by horse and cart, and later by car.

How the morphological fraction of rail beds and embankments can be overcome, is also today a recurring design problem in the analysed projects. The design office WEST8 realized a multiple bridge over the tracks in the city of Aarschot. (Fig. 8) The construction not only represents a pedestrian bridge to cross the tracks between the two divided neighbourhoods. It simultaneously grants access to the train platforms. In addition, in the base of the bridge, bicycle parking was incorporated. For the same station area Studio SK and Omgeving redesigned the bleak, draughty railway underpass. Instead of the dark and narrow tunnel, the team presents two lowered squares on both sides of the tracks. The squares gently slope down

to a floor height, so a clearly legible and pleasant railway underpass emerges. In Heerlen, a drastic different approach was applied to bridge the morphological gap. For this project studio SK and Michel Huisman promptly put on top of the tracks a large-scale, post-modern building, and called it an 'inter-neighbourhood connection'.

Other designers try to manipulate the rail trajectory in order to break the morphological barrier. Bureau B+B and B-architects research in several scenarios the possibility to move the tracks below ground level for the new station environment of Turnhout. This way the station could be granted a new, large station square, covering the tracks. Finally, decreasing the train traffic can reduce the barrier effect as well. Therefore, traffic engineering office Vectris proposed a second train station at the urban verge of Turnhout. This train station would be strategically located near a large-scale industrial zone and a highway junction. This complementary station could intercept a large part of the passenger and freight traffic outside the inner city. This way, the waiting period for the city traffic at the railroad crossings could be reduced considerably.

4.3 Re-embedding the train station

Internationally, also in the case of Alboraya in Valencia (SP), the redevelopment of the train station was grasped as an opportunity to mend the historical morphological barrier caused by the railways. (Fig. 9) The design of RStudio situates a new park at street level, situated on top of an underground parking garage. In the second phase also, the train tracks and station move to the underground levels. The park welcomes the travellers before they enter the station. The former station building is transformed into a café.

In Mikkeli (FI), the new train station is conceived as a missing piece in the urban tissue between the city and the Saimaa-lake. A new glass bridge for pedestrians and cyclists

connects both verges of the rail yard, but also gives access to the train platforms. Moreover, the bridge is linked to the new office buildings, a new travel center, a freight station with courier-services and the bus station. (Fig. 10)

5. Programming the station area

5.1 Industrial catalyst

Undeniably in the 19th century the train station represented the urban catalyst of economic development and industrialization (Van der Herten et al. 2001; van der Woud 2006). Railways were considered essential for the competitiveness of the city and the region. Thanks to the railway, the cities could expand their markets and the cost of transport was reduced to cities equipped with a train station or some sort of rail connection. Without a connection to the rail network, economic decline was feared in the 19th century. In the Netherlands, the fear of losing competitiveness to Antwerp, which early on had established a rail link to Germany, has been for decades a driving force behind the elaboration of the Dutch railway network and the normalization of its rivers.

The railways in the 19th century dominated the territorial concepts, aspired by the governments of both countries and the cities (Picon 2002; De Block 2011). The railways were initially constructed where most economic and political activities already were located, and therefore there was a proven market for transport. However, the opposite was also true: without railways, no economic or urban development. The belief was that without railroads, there would be no economic success for the city, neither for the region, nor the nation. Existing economic structures and the construction of the railway influenced each other in a perpetuous positive way.

The city of Heerlen for example represented at the beginning of the 19th century merely a

small town in Dutch Province of Limburg, isolated in the border region. When black coal was

discovered in this region at the end of the 19th century, private mining companies settled

nearby the village. (Fig. 11) The government took the initiative in the development of the

mining concessions and Heerlen's urbanization grew explosively (Geest 2003). Industrial

railways connected the mines with the new working-class districts. The logistic scheme of

mine organization determined the structure of the urban sprawl. The city was built up in

various centers around the mines and along the tracks and developed a proper network type of

urbanization pattern (Oswald and Baccini 2003).

5.2 In search of a tailored urban program

However, as soon as the role of the railways is taken over by the modern road, after the

Second World War, also the industry relocates towards the motorway. Most towns were thus

left behind with a neglected and abandoned industrial heritage around the station. The station

area soon became a blind spot in the urban tissue (Smets and De Meulder 2000).

The redevelopment of the investigated station areas represents therefore mostly a quest for the

right economic program to revive the local economy and abandoned industrial sites

(Departement Omgeving 2018). Some projects seek an answer in supralocal demands, a

regional program that can generate a local economic impulse. This way the city of Hasselt

realized a new Provincial court of justice (designed by J. Mayer H., Lens Ass Architects, a2o

architects), and new Flemish Administrative Centre (a design of AWG and a2o architects).

However, Hasselt represents an exception, compared to the other cases. In most of the small

to medium-sized cities, the investors are not jostling around the station areas, ready to develop

large-scale, generic programs, such as office developments or large public facilities. The

smaller cities need to develop a more specific, often more local program. The city of Sint-

Truiden for example plans on a former industrial site near the train station a complex urban

block, combining public and local amenities. Beel and Achtergael architects integrated in this block a primary school, a health campus, a youth club-room, a party room and dwellings. (Fig. 12)

Moreover, the economic crisis threw for some station development a spanner in the works. The master plan for the city of Roosendaal for example, called 'Rail Harbor', was to be found too ambitious and too expensive for the shrinking city. Therefore, the design office Palmbout proposed in 2002 to reduce a part of the rail-yard, to relocate future economic developments and to tunnel the tracks beneath ground level, in order to heal the historical fracture in the urban tissue. (Fig. 13) With the new Masterplan, called 'Rail City' in 2010, designed by KCAP, the city returns to its roots as a former border station. With ample space for distribution functions, the city aims to present itself as the logistics hotspot in this border region. The city of Aarschot rather focuses on local, but labour-intensive activity, with new forms of housing, imagined by the architects of HUB. Also, in the city of Diest, the urbanism office BUUR drew a masterplan for the new station district, consisting of residential programs and space for local economic development.

The city of Turnhout conceived its station area with a special program. The big old timber warehouses will yield to the so-called 'Living and Care Lab'. In consultation with the city, a large pharmaceutical company and the local university, Bureau B + B and B-architects designed a new type of easy-care dwellings. In these homes, the initiators examine how the gap can be bridged between the development of new products or services, and the end-users in their own home environment. This way, the city would like to support the medical-technological innovation and attract new investors to the station area.

5.3 Mediating between local and regional programming
This search for a local program but with a regional image, was managed in the Quartier

Ecoparc next to the new Neuchâtel station (SW). (Fig. 15) A railway yard of five hectares near the station was redeveloped, using a wide variety of functions such as offices, housing, a university campus and a music conservatory. The foundation of Ecoparc combined both the public and private sector, and also academics and local community groups participated. This program translated in an ecological laboratory consisting of a fine maze of public spaces, connecting the historic center with the station square. The car park, for example, is used by the office workers during daytime; in the evening the local inhabitants are welcome to park their car.

The competition brief for the new Bologna station (IT) proposed a high rise and a tabula rasa approach in between the industrial and historical environments that surround the station. (Fig. 14) Arata Isozaki and Andrea Maffei Associati, on the contrary, proposed to reconnect both parts of the city by a low-rise enclosed glass bridge, thereby serving as an alternative entrance for both the inhabitants as the visitors to the historic center. (Ábalos+Sentkiewicz 2011) The new station would house classic commercial functions such as ticket counters, restaurants, retail booths and waiting rooms. However, in order to integrate the station in the local community, it will also accommodate a theater, a congress center and a sports complex.

6. Reinventing public and open space

Together with the morphological impact of the railways, the new technology introduced new types of public space in the industrializing cities. Today, the revival of the train station area yet again represents an opportunity to revive the public domain in often very densely urbanized tissues.

6.1 Introducing new types of pubic space

With the advent of the railway infrastructure the mono-centric structure of the cities, would

change radically. A new geographical scale was introduced. As mentioned earlier, until then the Grand Place was the true center of the city, the logical beginning and end of each trip to and from the city (Duffhues 2013). (Fig. 16) Around the station emerged also a new type of public, open space with distinctive features, the so-called station square. This square took over some of the functions of the inner-city markets, especially the functions aimed at travellers and the trading of goods such as cafés, hotels, restaurants and post offices. Also completely new neighbourhoods developed around the train station, consisting of worker housing, in other cases with aristocratic dwellings. (Fig. 17) This way, at the end of the 19th century, the city was equipped with a second urban center, the railway station area, however a center with a distinct character.

6.2 Injecting the urban tissue with open and green space

When the railways where drawn to the investigated cities, most of the train stations flanked at least at one side the country side. Some cities, more particularly those of Diest, Sint-Truiden, Tongeren and Herentals maintained long into history this border position in between the urbanized area and the rural region. However today, most of the eleven stations are surrounded with urbanized tissue. Therefore, Today, several designers seize the station renovation as an opportunity to enrich the neighbourhood and the city with new types of public open space. These projects are not limited to the decoration of the existing stations; on the contrary, in some cases new full-fledged city parks are introduced in dense urbanized tissues. For the city of Tienen for example, the planning offices Omgeving and a2o designed a new, linear park along the railroad embankment as a green spine of the station revival project. (Fig. 18) This rail park conducts along its trajectory also a pedestrian and bicycle path. New dwellings, offices and companies frame the park together with the railroad tracks.

In the city of Hasselt, West8 designed 'the Esplanade' to restructure the station area. The Esplanade is an elevated, linear park along the trajectory of the tracks. The strip between the railway and the Esplanade hosts a mixed set of programs with a varied skyline. The green Esplanade connects to a second, elevated station square, which will provide a more comfortable access to the new entrance hall of the station.

6.3 Hiding the tracks, presenting the park

The introduction of a new HSR connection between Barcelona and France was the inducement to relocate the tracks between the train station of Sagrera and Sant Andreu to the

underground. West8 and RCR redesigned this way a surface of more than 22 hectares in the urbanized tissue of Barcelona could be redeveloped as a park of more than 4 kilometers. (Fig. 19) El Cami Comtal could become the green counterpart of the renowned Avinguda Diagonal, improving the city with a grand green long of biodiversity.

In Strasbourg the former grey and unpleasant station square was transformed into a public garden of 4 hectares. (Fig. 20) The park is accessible for pedestrians and cyclists. The design of Michel Desvigne is framed by the train station, the public transportation and the car traffic. The redevelopment of the train station was therefore used to grant the city a privileged green and open space, offering travellers pleasant routes to the city centre.

7. The typological transformation of the train station

7.1 From a monumental cathedral to a functionalist machine

The original typology of the train station was conceived as a new gateway to the city. The station building was designed to welcome the citizens and travellers in a worthy and impressive environment that emphasized the solidity, comfort and reliability of the rail network (Douma 1987). The station complemented, as a prestigious public facility, the traditional and ancient monuments in the city (De Bot 2006). The rail technology therefore enriched the city with a new architectural landmark, symbolizing its progress. Proudly, the new station buildings were depicted on numerous post cards. Today, the situation is quite differently in the analysed cities. Whoever visits the station neighbourhoods today, often finds the dilapidated relics of the 19th and 20th century. In some cases, this original 19th century train station is still remained. In the city of Tienen for example, the oldest train station of Belgium, is still of use.

Contrastingly, in cities such as Hasselt, Sint-Truiden, Diest, Aarschot or Herentals, the train

station of the second generation is already in need of urgent renovations or replacement. After the Second World War, the functionalist thinking, in which segregation, rationality and efficiency was manifested, articulated not only in the spatial organization of town and country, but also in the architecture of the station buildings. (Fig. 21 & 22) The railway stations, the "cathedrals of the 19th century", did not meet the adage of "form follows function". In the years of prosperity and growth after 1945, one looked down on the relics from the 19th century. Also in other countries with a rich rail history, monumental railway stations were ruthlessly demolished. The best-known examples are London Euston (1962) and New York Penn (1963).

This trend was not lost to the Netherlands and Belgium. Railway managements were beginning to realize that a traditional station building actually represented an unprofitable construction, which received little benefit from the expensive square meters of urban space (Leeuwen and Romers 1988). In the 1960s and 1970s, the station design appears to not much more than a sum of functions, structures, planning requirements, facilities and above all: profitability. The train stations in Hasselt, Bergen op Zoom and Sint-Truiden were in the 1960s and 1970 replaced with such functional buildings, sometimes barely recognizable as a train station. The stations of Herentals and Heerlen were subjected to similar drastic transformations in the early 1980s.

Since then, the railways were caught in a downward spiral. Especially in the regions outside the dense urbanized cities, the impact was noticeable in the decreasing train services and infrastructure network. However, simultaneously also the first signs of a renaissance of the railways were appearing. In several places protest arose against the demolition of historic station buildings and the shutting down of services. However, in 1973, the oil crisis led to a renewed interest in electric transportation. In 1981, the first TGV drove between Paris and Lyon. In 1979, the Centre Georges Pompidou, organized the traveling exhibition "Le temps

des gares". Initiated by several European institutions, this exhibition was an example of the renewed interest in stations, describing them as both places of historical emotional value, and as centers of a new geography.

7.2 The train station of 21st century

The question of how the station of the 21st century should look like, is difficult to answer. In our research, however, at least one tendency became clear: in small to medium-sized cities, the new railway station, is no longer a cathedral of steel and glass, as in international metropolises or as many of the contemporary HSR stations (Thorne 2001; Ferrarini 2005). Moreover, the investigated projects do not develop into any high-tech transfer machines with a large hall full of counters or large-scale public facilities.

The analysed projects reveal a different trend. The station of the 21st century is rather a public infrastructure, which is shaped along, over and between the railway tracks, with a consistent grammar of awnings, plazas, bicycle parks, local public amenities and intermodal functions. In other words, these stations represent no longer grandiloquent architectural totems, but rather intelligently designed linkages of public spaces. In the city of Sint-Truiden for example, in the plans of EIS and planners, a rather small, new station building adjoins a new square, followed by an underpass with a canopy that also unfolds to a roof above the platforms. (Fig. 23) In the city of Herentals, where the station building partially lost its function, the designers of EIS trace a new elongated public square, on which different reception facilities and other public functions are plugged. In the city of Turnhout, a new canopy makes a conciliatory gesture over the historic morphological barrier of the railway.

7.3 The station as system of infrastructures

This tendency of a train station architecture that seeks to establish local, small scale connections, rather than to translate the program into a pompous solitary building, is also

recognized internationally. In Hardbrücke (SW) the upgrade of the local station consists mainly of signalization and new connecting infrastructure. (Fig. 24) The new signalization renders visibility and orientation to the station, but it also grants a new identity to the neighbourhood. With a modest budget, the design manages to liberate the station from its isolated location, entangled between the elevated highway and the railway yard. An inclined plane and elevators link smoothly the train station on the ground level, with the bus station, which is located on the overpass.

The train station of Gotha (DU) was conceived as an urban living room, rather than a transit machine. (Fig. 25) An enormous roof of 50 by 50 meter spans the platforms and shelters the travellers. Elaborated as grid of open and closed surfaces the architectural intervention links the station with the bus services but also to a touristic tramway. The vegetation refers to the Thuringhian woods: the final stop of the tramway.

8. Conclusions

The building of several grand European HSR stations has triggered very high expectations for the development of the surrounding neighbourhoods of train stations nowadays. HSR stations became 'special' projects with national importance and with the aim to improve accessibility between city as well as to revitalize relevant portions of the European territory. The paper argues that the station in smaller and medium-sized cities is also granted such a strategic role in the network, and can function as a catalyser of urban transformation. However, it is no longer shaped as a monolithic, architectural cathedral; it interweaves the world of the passer-by with that of the local inhabitant as a system of public infrastructure and facilities. The station renewal meets new contemporary urban design challenges, such as the intermodal character of the hub. Moreover, in practice, the revitalization of the station environment represents a complex task, due to a multifaceted problem setting and a multitude of

stakeholders (municipal and higher authorities, transport operators, infrastructure managers, private owners, investors and developers). Unfortunately, smaller cities and towns do not always dispose of a comprehensive planning department or the management experience to keep such complex projects on track. The design and development principles of train stations are often consensual at the metropolitan or national level, however, when landing at the local scale, stakeholders sometimes struggle to integrate the new station and its complementary development into its surroundings. This contribution aims at enlarging the design knowledge by offering practitioners and academics an overview of the most important design challenges and a vast array of comparable cases within Europe of integrated train station developments in the historical development of smaller cities.

9. Acknowledgements

10. References

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11. Illustrations

Fig. 1 The eleven Belgian and Dutch cities of which the impact and the transformation of the train station area were analyzed in this paper. (Created by first author)

Fig. 2 The Evolution of the Belgian-Dutch railroad network since the emergence of the rail technology. (Created by first author)

Fig. 3 The air track cutting through the city of Tienen, running between the sugar refineries and a freight station nearby, conducting beets and coal, from 1886 until the Second World War. (Phot. Bertels, Brussels, SD, private collection historical postcards of the first author)

Fig. 4 The commuter parking as a returning design challenge for transformation projects of smaller train stations. Park + Parking proposal in the city of Aarschot. (Studio SK)

Fig. 5 & 6 In Le Mans (FR) A linear, glass passage restructures the traveler fluxes between train, bus and tram stations, the bicycle and car parking, a hotel and conference center. (AREP)

Fig. 7 The Morphological Impact of the Railway Network on the city of Turnhout. (Created by first author)

Fig. 8 A multiple bridge at the station of Aarschot simultaneously grants access to the train platforms and in the base of the bridge, bicycle parking was incorporated (West 8).

Fig. 9 Alboraya Valencia (SP) new underground station creates space for new urban park on top of new parking garage (RStudio)

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Fig. 20 The multimodal hub with a public garden in Strassbourgh (Michel Desvigne)

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Fig. 22 The station of Roosendaal (ca. 1930), architecturally symbolizing the belief in societal progress. (Uitg. Verdult, SD, private collection historical postcards of the author)

Fig. 23 The 21st train station represents no longer a pompous railway cathedral. The station of Sint-Truiden is rather an infrastructural system of a small reception building, a canopy, an underpass and a new square. (Planners)

Fig. 24 Hardbrücke Zürich (SW): A long slope and elevators link smoothly the train and bus station on the viaduct. Signalization renders visibility and identity. (EM2N)

Fig. 25 The station of Gotha (DU) as an urban living room with huge roof of 50 by 50m, alternating open and enclosed spaces (Exp!ander).