Building the highway system. Planning & mass motorization in Belgium since 1945

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Introduction

"The problem of the modernization of the road network ... aims to adapt the roads to answer the needs of their twofold role:

1) *to assure traffic of vehicles and pedestrians*
2) *to assure access and rights for the adjoining landowners"*[a]

This quote by Belgian highway engineer Henri Hondermarcq is the first sentence of his seminal 1951 article that laid the basis for a new network of high speed limited access highways in Belgium. The identification of the double role of roads, as an efficient traffic connection, as well as a means to give access to adjoining activities, is a relatively surprising position for a highway engineer. Highway engineering tends to focus on the function of traffic, and conceives networks and road profiles primarily from the point of view of fluidity and safety of traffic. This position of Henri Hondermarcq, who is unequivocally recognized as the 'father' of the Belgian highway network,[b] will serve as the leitmotiv for the establishment of a highway system in Belgium in the decades following the Second World War. Indeed, the intricate relationship between infrastructure on the one hand, and urban development on the other, is one of the most defining characteristics of the Belgian highways, from the conception of the network to the design of highway profiles, as this article will argue.

In order to underpin this argument on the relation between urbanization and infrastructure with respect to the highway network, the context for the planning of the highway system will be addressed briefly. We will analyze the financing mechanisms and the various highway design models applied, relating them to international discussions.

The article focuses on the period of the second half of the 1950s through the 1960s. 1955 marks the starting point of a true highway network policy when the construction of a highway network was laid down in an act of law. After an initial stage of national highway construction, the initiative devolves to inter-municipal agencies, marking an absolute high point in the rate of highway construction during the 1960s and early 1970s. The present article focuses in the first place on these formative decades, and sketches out the contours of the ulterior developments.

Reconstruction, economic recovery and the position of spatial and highway planning

After the Second World War, Belgian roads were not in a good shape. This was not exclusively due to destruction because of the war. The interwar period had not produced a thorough modernization or adaptation of the road network to the automobile. Cobble stones remained the primary road surface and paving technique,(ref weber) making the Belgian roads a famous testing ground for car designers among whom 'the Belgian road test' and the 'Belgian blocks' remained a point of reference in evaluating the suspensions of their cars.(ref hondermarcq). Given the specific position of Belgium in the final stages of the war as an important bridgehead to support the allied advance into Germany, road and other infrastructure repairs were carried out urgently. This supported a swift economic recovery, termed 'the Belgian miracle'. The downside of

this urgent reconstruction was the postponement of a thorough modernization of the infrastructure networks and industrial equipment.[c] As such, this early advance would soon become a handicap.

An example of the early economic recovery is the car industry. Belgium was particularly successful in attracting foreign car companies to Belgium. Even if domestic car production folded in the interwar period, the motor car industry remained very important through a policy of attracting assemblage activities from foreign, mainly US companies. This was the result of a policy established in the 1930s. While the import of foreign cars was highly taxed, the Belgian government concluded a customs treaty with the US that drastically lowered import tariffs on detached car parts.[d] This created favorable opportunities for US car assembly facilities in Belgium, with notable facilities established by both Ford and GMC in the port of Antwerp. This assured that jobs and knowledge in this industry were safeguarded, laying a basis for the remarkable expansion of the industry in the post war years. Volvo, Renault, Citroen, Ford, Volkswagen, Daf and Opel (as a GMC branch) all established or expanded production facilities in Belgium during the 1960s.

Planning played a very limited role in this early, ad hoc reconstruction. In other countries such as the Netherlands wartime planning efforts had laid the basis for post-war policies.[e] This was not the case in Belgium, even if spatial planning occupied a prominent place within the Nazi-controlled administration.[f] One of the initiatives of this administration was the design of a national highway system and connected to the German *autobahnen* system. With the end of the war support for spatial planning or thorough urbanistic measures was comprised by its association with National Socialism and Communism. Many of the Belgium's most prominent planners and urbanists of modernist inspiration were forced to leave office, continuing their planning work only in local administrations or the then-Belgian colony of the Congo. This rejection of planning became very apparent in the position of the new post war planning administration, as a subordinate branch of the Ministry of public works. Or as one contemporary commentator put it 'The central Planning administration is attached to the Ministry of Public Works which produces the paradoxical situation of the designer placed under the authority of the builder.'[g] This public works administration included highway and waterway branches and was manned by road engineers with backgrounds as mining or construction engineers. Traffic engineering was absent as a discipline.[h] This particular institutional set up, with a weak spatial planning discipline and a road administration dominated by engineers concerned with economic development (as was the case with mining engineers) is a crucial context element in understanding the specific agenda's of urban and regional development surrounding the construction of the Belgium highway system.

The 1955 Road Fund. The kick off for the Belgian high way network

By the mid-1950s, when reconstruction in neighboring countries was well advanced and their economies recovered, the early post-war economic advance of Belgium disappeared, resulting in an economic slump and rising unemployment. This was a challenge of the new socialist-liberalist government that came into power in 1954. In a classical example of Keynesianism, this government engaged in program of public works to stimulate demand. Given the outdated nature the infrastructure, this was not merely a spending policy, but also a much needed impulse for the modernization of the country.

The office of public works was held by Minister Omer Vanaudenhove for seven consecutive years under two governments. Vanaudenhove's efforts initially concentrated on finding a coherent and lasting financing mechanism for the ambitious program of public works aimed at the modernization of roads, waterways and ports.[i] Traditionally, infrastructure investments were programmed within the ordinary government budget. Systems where a separate budget for road construction was provided by taxes on the transport sector itself or motorists for that matter, were not established.[j] Heavy taxation of fuel, automobile possession and use, primarily served to shore up the general government budget.[k] Despite pleas from motoring organizations, these funds were not systematically devoted to road construction, as opposed to the situation in other countries.[l]

Vanaudenhove argued that the existing financing mechanism resulted in an ineffective infrastructure policy, where works that were initiated in one place were very often not finished due to changing priorities in the next annual budget or under a new Minister of Public Works, while other work was initiated in other areas simultaneously. Vanaudenhove used the failure of a first Ten-Year Plan established in 1947 to underpin this argument.[m]

Sector	Proposed investments in the 1947 Ten-year Plan	Amounts invested by the end of 1957 (at fixed prices)	Delays or progress for the period 1948-1957
Roads	8 550	13 160	+ 4 610
Waterways	25 872	11 671	- 14 201
Buildings	12 310	8 994	- 3 316
Ports of Antwerp and Ghent	9 500	2 285	- 7 215
Subsidies to local authorities (public works)	27 400	47 751	+ 20 351

Table 1. Amounts invested between 1948 and 1957 in million Belgian francs.
Source: Vanaudenhove, *Twee noodzakelijke wetten*, 30

The financial data on the amounts invested under this program between 1948 and 1957 reveal a long delay in the investments for the ports of Ghent and Antwerp, waterways, and public buildings (see Table 1). While road investments and subsidies to local authorities appear to be ahead of schedule, Vanaudenhove argued that the amounts needed were under-estimated in the 1947 plan. The estimate of 8.5 billion francs was largely insufficient, as the real need was 36 billion francs, as argued by Vanaudenhove.

Rising auto mobility and the need for a highway network

A first element in this respect was the underestimate of traffic increase. The increase in traffic forecast in this plan for 1964 was already reached in 1957 (Table 2). Data about car-ownership in Belgium reveals that the penetration of cars in the post war era rose quickly in comparison with the pre-war situation, reflecting the trend in neighboring countries.

1949	100
1952	137
1955	206
1960	278
1965	398
1968	494

Table 2: Index of traffic intensity.
Source: Fernand Baudhuin, *Histoire économique de la Belgique 1957-1968* (Bruxelles: Bruylant, 1970), 186

	Cars	Transport sector (trucks, vans, busses)
1939	156.000	*80.000*
1950	275.000	*145.000*
1956	500.000	200.000

Table 3: Motor vehicles in Belgium. Source: Fernand Baudhuin, *Histoire économique de la Belgique 1945-1956* (Bruxelles: Bruylant, 1958), 380
(numbers in italics: Weber, *Automobilisering en de overheid in België voor 1940. Besluitvormingsprocessen bij de ontwikkeling van een conflictbeheersingssysteem*, 323)

The second element in the underestimation was the discussion on the need for a highway network in Belgium. In 1947 there was surprisingly no consensus on such a requirement.[n] Since the 1930s a number of Belgian road engineers had put forward the idea of limited access highways. In 1937, a program was defined for a total of 237 km for five stretches of highway, but this was merely an updating of an earlier program of 'major highways.' As a result, only a few stretches of the projected Ostend–Brussels highway were built in the Bruges region, where the engineers of the local branch of the Roads Administration were fervent supporters of highways with a fascination for the German *Autobahnen*-system. Even if the five highways of the 1937 program were incorporated in the 1947 Ten-Year plan, the General Director of the Road Administration, Devallée, was not in favor of limited access highways, proposing instead to upgrade existing roads into three-lane roads for 'large traffic volumes' and 'high speeds':

> The enclosed (i.e. limited access) road (...) is no longer a true life line, but merely a connecting road reserved for very limited uses. (...) This type of connecting road (i.e. limited access highway) does not answer the problem we are faced with today.[o]

The latter quotes reveal that Devallée chose to side with the opponents to a limited access concept for new roads in a discussion that was also taking place internationally. In the U.S. for example, proponents of by-pass freeways were opposed to those in favor of new highways leading directly into the cities, with the possibility of business activities, shops and so on developing along them. In France, the *boulevard periphérique* around Paris was constructed as a road with grade separated intersections,

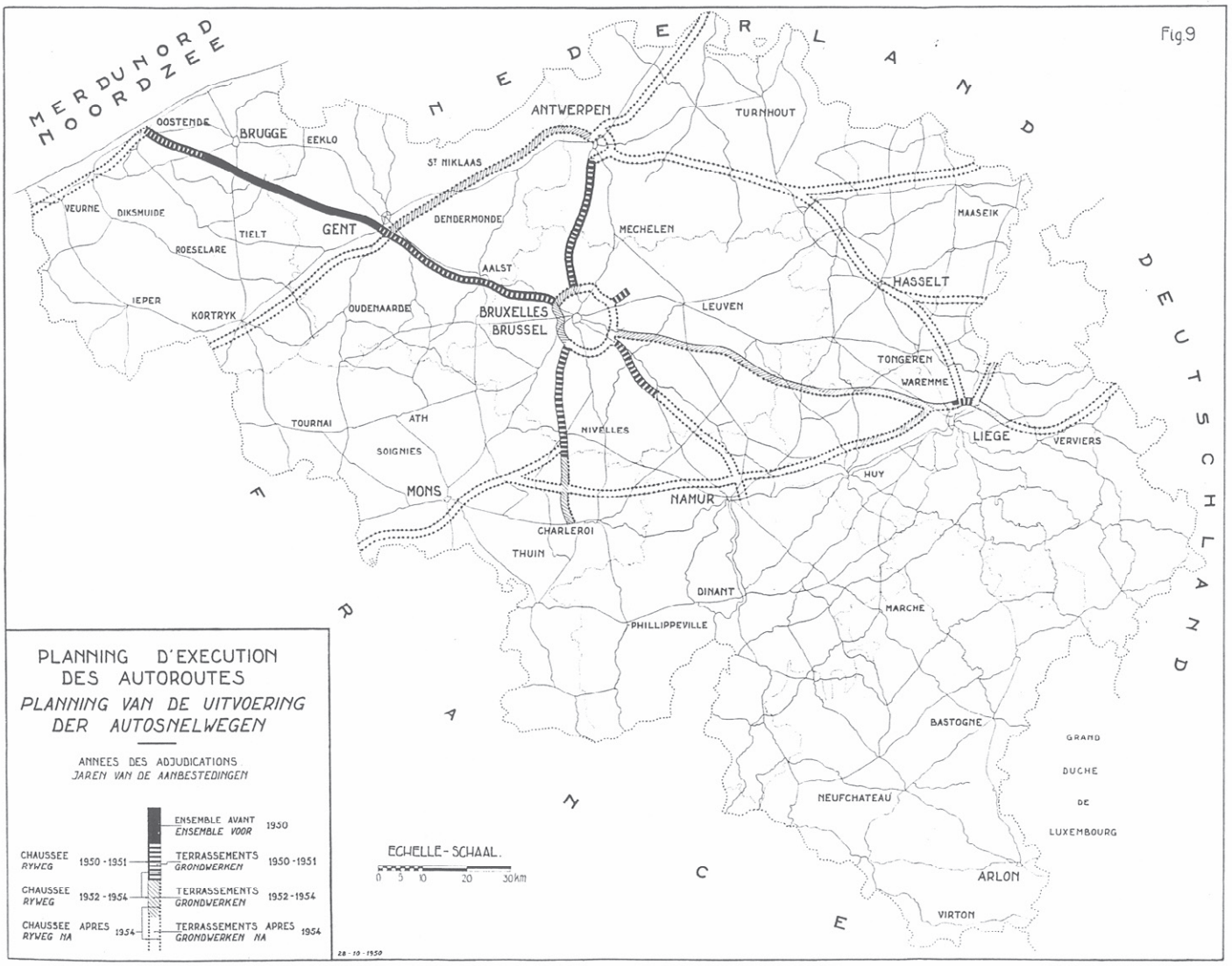

Figure 1: high way network by Hondermarcq. Source: Hondermarcq, "De modernisatie van het Belgisch wegennet"

but construction along its perimeter was allowed. It was only when Devallée was succeeded by Henri Hondermarq in 1949 that the idea of a completely new highway network with its own route for Belgium was finally established. The increasing cooperation between European countries provided an additional argument for the promoters of highway construction. In 1950, the European Economic Board of the United Nations had agreed on a Trans-European highway network, with Belgium at the strategic crossroads for various long distance connections.

Hondermarcq published the design for a national network with 930 km of high ways in 1951 (fig. 1).[p] Although the government agreed on Hondermarcq's plan, highway construction advanced at a snail's pace for many years.

A first attempt to step up road investments was made with the Road Fund of 1952. The concept of the fund destined for public works deemed of national importance had been used earlier for road construction (1886), military purposes (1897, 1906), and again for roads (1928 and 1933). Even if these funds targeted specific programs, they did not always achieve their aims.[q] Moreover, these programs were limited in scope and time. Vanaudenhove identified several problems with the 1952 Road Fund, especially the fact that it did not have any real autonomy, and in terms of results only 50 km of the entire 900 km network was built. The Road Fund of 1955, therefore, had a much broader scope. Like the earlier fund it was able to issue loans to which the general public could subscribe, but it was also set up as a separate independent government agency, with a proper legal status. Through this independence, the agency had the power to issue loans, coordinate and issue tenders for studies and construction work, and hire personnel. The head of the Road Administration, in this case, Henri Hondermarcq, was also the head of the Road Fund. The agency was supervised by the Minister of Public Works and a council consisting of the head of the public works administration, the head of the road administration, and several officers from the departments of public works, finance, economic affairs and the department of transport and communications.

The economic argument. Profitability, industrial connections and infrastructure improvements for EXPO '58

The Bill provided funding over a 15-year period (1955-1969), with 30 billion francs funded through public loans, and the remainder through an annual contribution from the government budget together and the inclusion of the remaining funds of the 1952 Road Fund.[r] Sixty percent of these funds were to be spent on the construction of the highway network agreed upon in the 1952 Act. The program was justified to Parliament and the general public as a response to the explosive growth of car ownership and motor traffic during the 1950s. There was a constantly widening mismatch between traffic intensity and the actual condition of the road network.

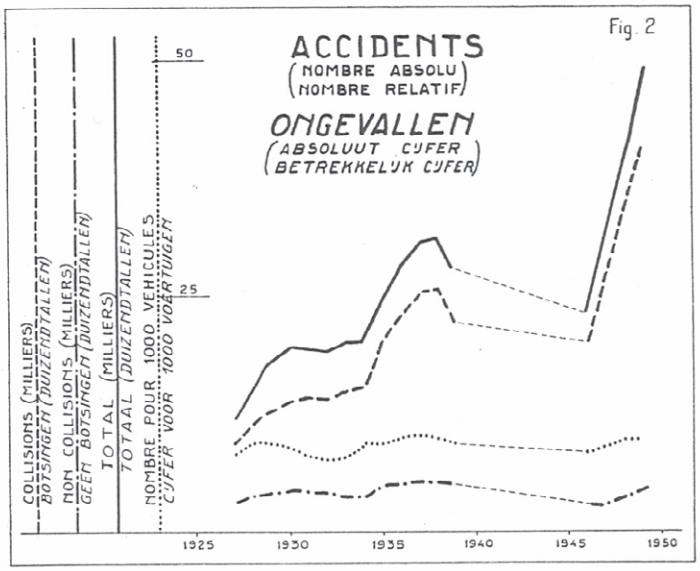

Figure 2: Traffic accidents. Source: Hondermarcq, "De modernisatie van het Belgisch wegennet", 49.

A second element was the tragic increase in traffic accidents, a hot topic in the press at the time (fig. 2).[s] In the Explanatory Memorandum, it was further stated that the loans by the Road Fund would appeal directly to the growing group of motorists who could be certain that by subscribing to Road Fund loans, their savings would benefit the road network, whereas the ultimate purpose of general government loans was unclear. The government appealed directly to road users, as well as to those who had a stake in an expanding automobile market, such as car manufacturers.

The third effect of the mismatch between traffic intensity and road conditions was the negative impact of poor transport facilities on the economy. A 'Note on the profitability of road works' annexed to the Explanatory Memorandum further justified the profitability of the Road Fund. The note calculated the substantial returns for the state budget that could be expected from investments in road infrastructure. In addition to these direct benefits for the state budget, the memo also stressed the more general benefits for the community through lower transport costs, the rapid transportation of persons and goods between different industrial and business areas, reductions in maintenance and amortization costs, in fuel consumption, in wages for drivers and chauffeurs, and in costs related to traffic accidents.

Finally, the impact on the economy was also present in the priorities set forth for the program. Priority was given to the completion of the Ostend-Brussels highway (since some stretches had already been built), to the construction of the Antwerp–Liège–Achen highway linking the Port of Antwerp with the coal basin in the Campine, the industrial basin of Liège and the German Ruhr, as a key economic axis, and also to the Brussels agglomeration in preparation of the World Expo in 1958. The latter priority fitted within a general policy to promote and develop the Brussels area into a true capital region. The international world exhibition Expo 58 coincided with Brussels' candidacy to become the European capital and was conceived to promote the city and the country as a favorable location for businesses.

The promulgation of the Road Fund Act in August 1955 was accompanied by a deliberate and broad publicity campaign since its success depended on the willingness of the public to subscribe to the issued loans. The first loan of 2.5 billion francs issued in October of the same year was an overwhelming success, the loan being fully subscribed by 11 o'clock on the morning of issue.[t]

Building the highway network. First results of the 1955 Road Fund

The early results of the Road Fund program highlight the intricate relationship between transport and an urbanization policy. The focus on economic motives was translated into an economic location policy where infrastructure projects served as the primary instrument of urbanization, i.e. as a mechanism to open up land for economic purposes. This is illustrated by the results of the investment program in the wider Brussels region as well as the Antwerp-Liège highway.

The conceptual lay out of the highway network was determined by three characteristics. First, the highway network incorporated the proposed Belgian sections of the Trans European Highway network.[u] Second, the Explanatory Memorandum for the Road Fund Act[v] explicitly designated a number of road links as industrial highways, such as the Antwerp–Liège connection and *Autoroute de Wallonie* interconneting the Walloon industrial regions. Other highways fulfilled the role of connecting tourist destinations such as the Brussels – Ostend highway. A third distinguishing characteristic of the highway plan was the literally central role of Brussels. The city served as the crossroads between many connections, and the general layout of the network adopted the pattern of a spider's web of radial and circumferential highways, with Brussels at its center. In order to fulfill its role as a crossroads for several highways, Hondermarcq included a circumferential highway around Brussels in his highway network design of 1951.[w] Next to the Ostend-Brussels highway, it is here that construction on the Belgian high way network started, driven by the urgency of the upcoming Expo 58.

The design for the Brussels circumferential highway

The design of the circumferential highway *Ring* reflects the high way design discussions as epitomized by Devallée and Hodnermarcq's opposing visions. The relationship between highway construction and urbanization was also addressed in post-war highway engineering and planning circles in the U.S.,[x] a debate Hondermarcq was undoubtedly well aware of.[y] The first issue was whether to build a highway linked directly to urban activities, as opposed to building only limited-access highways. The second was whether large interstate links carrying rapid transit traffic should penetrate right into the very core of the city, or rather by-pass urban agglomerations. [z]

This relationship was at the heart of the discussion on Boston's route 128.[aa] Originally nicknamed 'the road to nowhere' through the intervention of developer Blakely of Cabot, Cabot & Forbes, it became a primary location for advanced industrial and technological businesses.[ab] In Brussels some had raised the fear that that the construction of a limited-access road without any construction along its borders would hamper the urbanization and development of the agglomeration. Hondermarcq firmly opposed this view, pointing out that such a conception would work against the advantages of a free flow of traffic on the highway. He argued that enough bridges, flyovers (94 in total) and highway access points (27) would be built to assure the continuity of traffic between the suburbs and the city for all types of transportation.

> There is no doubt that these well-designed access points will rapidly develop into commercial centers that favor the development of the agglomeration. The American study of bypass freeways I cited earlier [...] concludes […] that both commercial activity and land value increase as a result of easier access and improved traffic conditions.[ac]

Hondermarcq referred to the Paris *boulevard péripherique,* conceived not as a limited-access highway but as a boulevard with grade-separated junctions, and its problems of traffic congestion. Although its intersections were grade-separated, 'the regulations against constructions fronting the road was ignored, and the consequences of such neglect appeared very quickly. Buildings arose haphazardly along this circumferential boulevard and very soon large-scale transit traffic was superimposed on traffic circulating locally from door-to-door, hence stripping the military boulevard almost entirely of its character as a rapid transit route.'[ad]

Hondermarcq expressed his concern for the relationship between infrastructure and urban activities in yet another way. His design for the Brussels *Ring* is not a perfect example of the by-pass principle. In addition to its role as a solution for through traffic on international connections by-passing Brussels , Hondermarcq defined two additional functions for the circumferential highway. It was designed to distribute traffic coming into the city from the radial roads and highways, and it had to provide a link between the city's suburbs. Linking the suburbs together was not generally accepted as a role for a by-pass highway; urban boulevards were expected to perform this task. As a consequence of these two design criteria, the peripheral highway was to be situated close to or actually within the outskirts of the urban agglomeration.

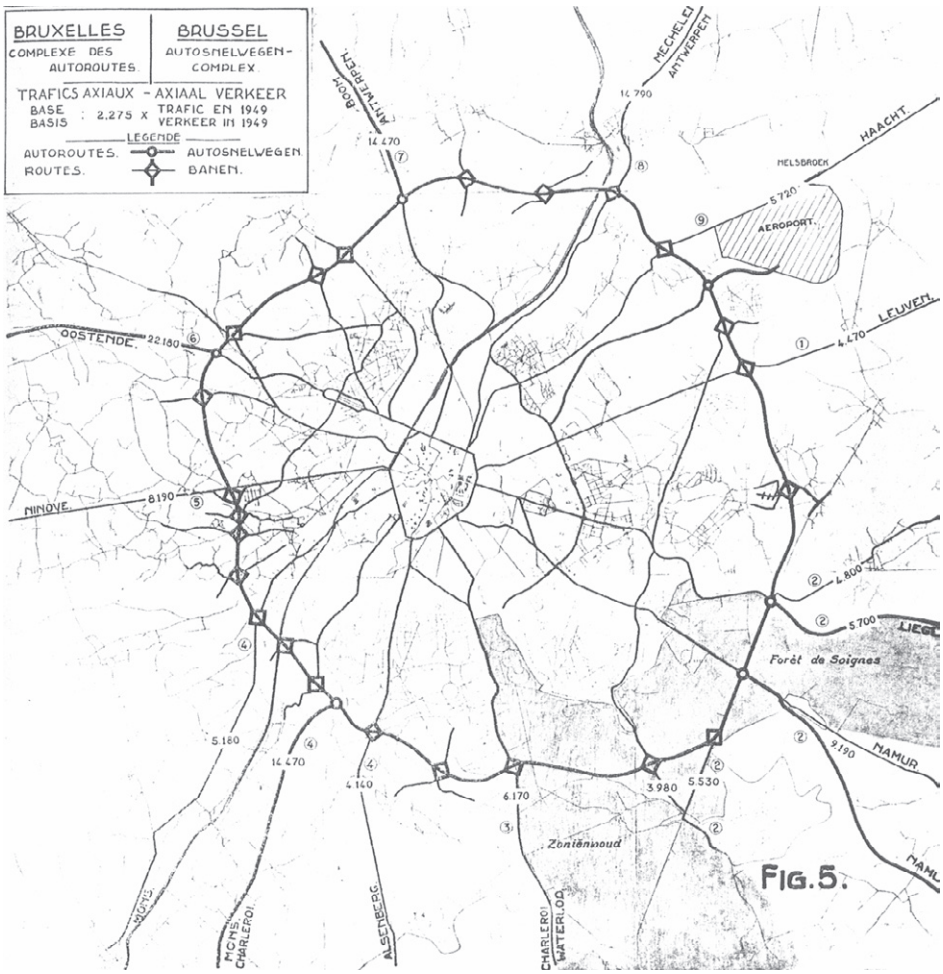

Figure 3: design of the Brussels high way ring. Source: Hondermarcq, "Le projet de ceinture de circulation de l'agglomération bruxelloise"

On the basis of these assumptions, Hondermarcq calculated the ideal radius for the Brussels Ring at 4 km. The existence of a circumferential boulevard built in the 19th century, located at the former city walls, and of a number of boulevards that were fragments of wider *Ring* designs in the 19th century[ae] allowed the radius to be expanded to approximately 7.5 km. The 'intermediary *Ring*,' as the latter boulevards are known, although partly completed, complemented the *Ring* highway's function of interconnecting the suburbs. The inner city 19th century *Ring* boulevards, on the other hand, known as the 'Pentagon,' were transformed into urban highways under the Road Fund program's priorities for 1958 through the construction of underpasses.[af] As a result, a basic scheme of three concentric *Rings* for the Brussels agglomeration came into being.

Hondermarcq wedded the dual but conflicting functions of rapid transit and local accessibility of the circumferential highway into a unique design for the highway's profile, with distinct functions for the outer and inner lanes.

> It has to be noted […] that nothing prevents the municipalities from establishing longitudinal building axes alongside the *Ring*. This would make it possible to create a large Boulevard of 4 lanes on certain stretches, whose two central lanes are reserved for through traffic, while both outer lanes meet local needs and door-to-door connections. This would therefore eliminate any interference between two different types of traffic.[ag]

In practice, the road section proposed by Hondermarcq was changed into a central double-carriageway road, with separate local service roads running parallel to the central lanes. This parallel service roads design was applied in several sections of the highways around Brussels, built in the run up to the 1958 World Expo: examples include the Antwerp-Brussels highway and the highway connecting the Brussels city center to the new airport terminal at Zaventem. But strikingly, the profile was not adopted for the first section of the *Ring* itself (between the intersections of the highways out to Antwerp and Ostend). To increase their value as critical axes of urbanization, pedestrian bridges were built over the Zaventem and Brussels-Antwerp highways where they entered the Brussels agglomeration.

The remainder of the peripheral highways around Brussels however would only be completed from 1973 onwards,[ah] yet an interconnected highway system serving Brussels' periphery was indeed established. Through traffic could use a combination of the inner, intermediary and highway *Rings* to find its way around and through the city. The utility of these basic improvements to the Brussels road infrastructure were to go much further than simply coping with the extra traffic of the '58 Worlds Fair visitors. Its conception was instrumental in shaping the economic landscape of Brussels. The transformation

of the inner ring accompanied the transformation –not to say destruction- of Brussels historic inner city into a modern administrative center, while the peripheral highways became the preferred location for international headquarters and other businesses in the advanced sectors of the emerging welfare economy. Foreign companies eagerly occupied these locations in a development pattern that is very similar to Boston's Route 128 archetypical example of the urban highway as business-location.

The Antwerp – Liège – Achen connection. An industrial high way

In the next priority of the Road Fund program, the Antwerp-Liège highway, the economic development agenda was probably even more explicit. Devised to link the port of Antwerp as main transportation hub with the Campine coal basin, the inland port of Liège, and the metallurgical and coal complex of Liège, the economic importance of the connection was evident. At a more detailed level, also the lay out and construction of the highway stressed the role of the highway as an instrument of what could be called 'industrial urbanization'.

The connection between Antwerp and Liège, between the Meuse and Scheldt basin, had always been a very crucial one in Belgian transport policy. The natural connection between these two areas was provided by the Meuse river, and as such, ran via the Netherlands where both rivers meet each other in the Rhine – Scheldt estuary. As a result, assuring this connection was the source of longtime discussions between the Netherlands and Belgium on water rights. This situation was resolved finally in the 1930s when the Albert Canal was built, assuring the connection entirely on Belgian soil. The exact trajectory of this canal was the object of a heated debate on the role of the canal in the economic geography of the country.[ai] Proposals adapted to the existing geography resulted in a trajectory connecting Liège with towns such as Aarschot, Leuven, Vilvoorde and further on to Antwerp. This allowed the expansion of existing industrial areas into sea ports in each of these towns. Opponents of this approach rather argued for the much shorter and faster connection through the less populated and less developed Campine area, and it was this trajectory that was chosen ultimately. This was the merit of mining engineer Alexandre Delmer, head of the public works administration and the 'Office de la navigation' (office of the waterways), who argued that the construction of the canal would precisely offer the opportunity to develop this 'underdeveloped' area.[aj] As the chief engineer responsible for the construction of the Albert Canal, he implemented this vision through the expropriations of additional lands along the route of the future canal, with the aim of developing these land at a later stage into industrial areas.

In the Road Fund Memorandum, it becomes clear that the trajectory chosen for the Antwerp – Liège highway is adapted to this earlier policy. The high way was designed to run as a perfect parallel to the Albert Canal over much of its route. As such, the land in between both infrastructures, an important portion of which was in the public domain through Delmer's intervention, received de facto an industrial destination.[ak] It is a perfect illustration of how infrastructure construction preceded over spatial planning in the urbanization policy. Former agricultural land was transformed into an industrial occupation without the intervention of a zoning plan. Such plans would only be implemented from the 1970s onward, on the basis of new urban planning legislation approved in 1963.

Upon completion of the high way in 1964, a string of industrial sites was already under construction at various intervals along the entire trajectory of the high way (fig. 4.).[al] As the first highway built entirely under the new road fund, the highway was named after King Baldwin who inaugurated it.

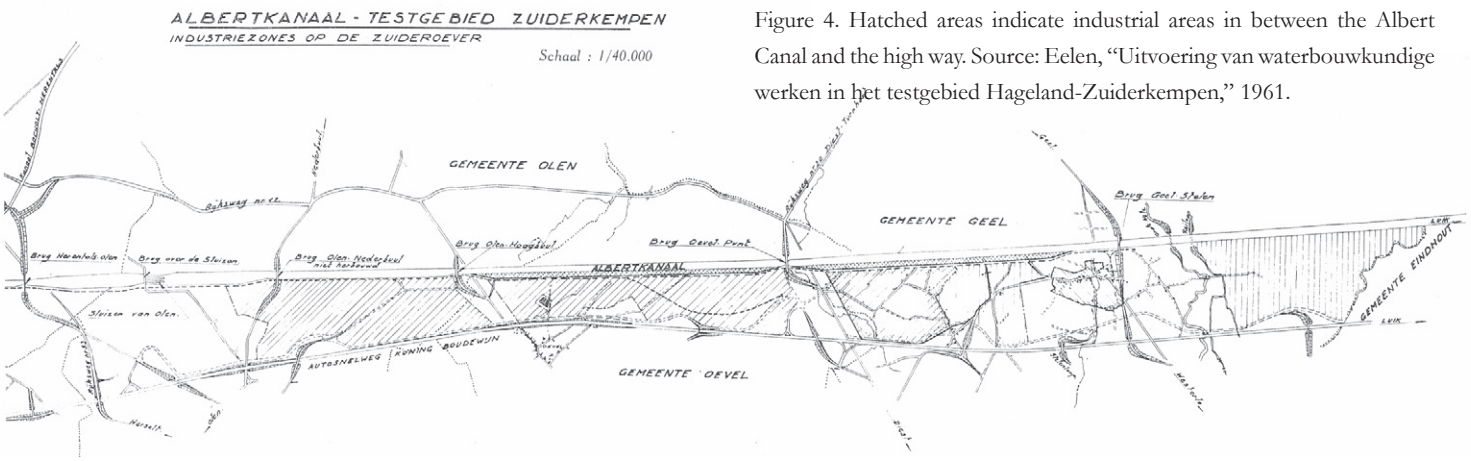

Figure 4. Hatched areas indicate industrial areas in between the Albert Canal and the high way. Source: Eelen, "Uitvoering van waterbouwkundige werken in het testgebied Hageland-Zuiderkempen," 1961.

A new financing mechanism. Inter-municipal agencies for high way construction

The 'inter-municipal agency for the E3'

After the completion of the priority program for the Brussels area, the Brussels-Ostend highway, and the Antwerp-Liège industrial highway, construction slowed down again. The construction of the connection between the north of France and the Ruhr over the Walloon industrial basins in Hainaut and Liège and the city of Namur was initiated but advanced slowly. The decision to give priority to this *Autoroute de Wallonie*, was met with criticism in Flanders, where the highway connection between Lille, Kortrijk, Ghent and Antwerp was deemed of primary importance.[am] The provision of the Road Fund proved insufficient to engage construction on both high ways. As a result, alternative financing mechanisms were necessary to complete the highway network.

Minister of public works Omer Vanaudenhove found inspiration for a new financing mechanism in Italy. Here, the *Autostrada del Sole* had been financed by a consortium of the local, regional and national governments. Vanaudenhove had carefully studied the mechanism and decided to apply a similar set up for the construction of the Kortrijk-Ghent–Antwerp high way, as part of the international Stockholm – Lissabon connection designated as the E3. A so-called 'inter-municipal agency for the E3' was established in 1963 in which the cities of Kortrijk, Ghent, Antwerp, Sint Niklaas and Turnhout participated, as well as the provinces of East and West Flanders and Antwerp and the Road Fund.[an] Three local offices were established.[ao] One problem that was overcome in this new institutional set up was the shortage of engineers the national road administration was confronted with. The 'inter-municipal agency for the E3' was not bound by the official wage scales of civil service, and higher wages could be paid to attract engineers. The very details of the financial benefits this construction yielded is the object of further research. It is clear however that the formula was certainly successful, as all highways after the initial results obtained with the Road Fund priority program, were subsequently built by similar agencies.

This new mechanism shifted the initiative from the national to the regional and even (above-)local level. A first element that illustrates how local concerns became part and parcel of the project for the construction of a national high way network of Trans European connections is the inclusion of projects for ring roads of large and medium in the programs of inter-municipal agencies. In the case of the E3 this implied the inclusion of the construction of ring roads in Kortijk, the twofold Antwerp beltway of 'Singel' and highway, among other things.

Much like the Brussels highway ring, the circumferential highway around the city of Antwerp, built between 1963 and 1968 serves as a double infrastructure, assuring international traffic and fulfilling a role as an urban highway bypass.[ap] The express highway ring was laid out in the area of the former fortifications, the wide strip of military glacis surrounding the city, in an 8-meter deep trench.[aq] This highway was doubled by the 'Singel', an urban highway running parallel to and above the express highway on the city-side of the fortification corridor. Thus a similar solution of combining by-pass and local access traffic was found for the problem posed by Hondermarcq for the Brussels ring. Whereas in Brussels these two functions were split between the intermediary and the *highway Ring*, in Antwerp both types of infrastructure were combined within the same geographical corridor. Also here new activities such as businesses, hotels, a new cultural center were attracted to the highway location, again repeating the Route 128 model.

A second element that illustrates the inclusion of local concerns in high way construction is the higher density of highway exits on high ways built by inter-municipal agencies. The average interval between exits on the Brussels-Ostend high way, built under the Road Fund, is some 8 km. On the Brussels – Liège high way, built by the *'Intercommunale voor de E5'* the interval is about 4 km.[ar]

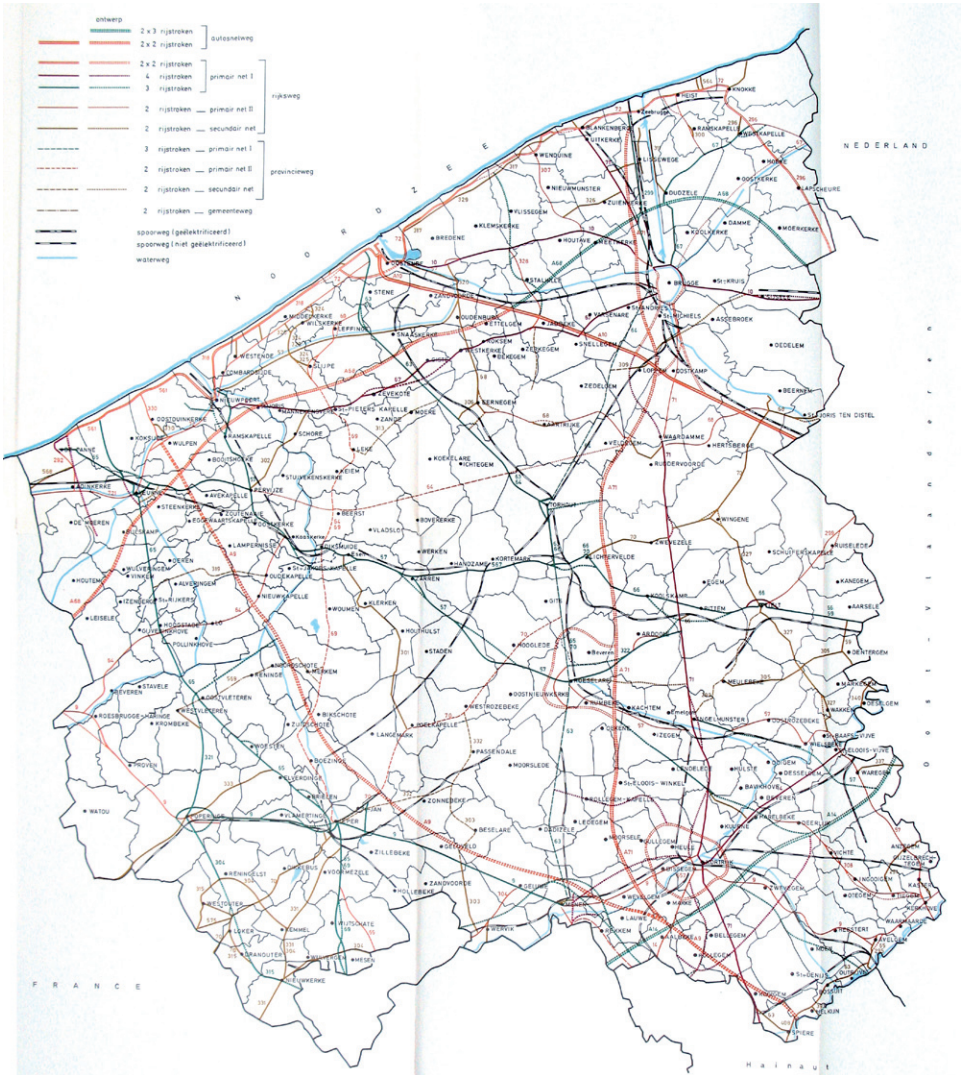

Figure 5: high way triangle in the West Flanders regional plan. Source: J.M.L. Demeyere et al., R*ichtplan voor de ruimtelijke orening en ontwikkeling van de Westvlaamse gewesten,* (Brussel: Ministerie van Openbare werken. Bestuur van de stedebouw en ruimtelijke ordening, 1968).

In 1961 the government established a powerful regional economic expansion policy.[as] Regional economic development agencies were established. These agencies also used the construction of inter-municipal bodies grouping the interests in spatial and economic development action of several municipalities. With the establishment of inter-municipal agencies for high way construction, authorities involved in the economic development agencies received high way construction as an additional instrument to pursue their development policy, as they were often also represented in the high way construction agencies.

Such initiatives resulted in the construction of additional highways added to the national network as designed by Hondermarcq. The classical example is found in the Province of West Flanders. Here an inter-municipal agency (the 'Intercommunale verenging voor de autosnelwegen van West-Vlaanderen' (IVAW)) was established in 1971 to build the 'high way triangle.'[at] The 'high way triangle' (fig. 5.) assures the connection between Kortijk and Bruges, and includes the prolongation of the Brussels – Ostend highway in a line parallel to the coast until the French border. The connection between the coastal border area and Kortrijk closes the triangle.

The construction of the 'high way triangle' was adapted to a crucial regional economic development concept - the 'Axis of Development.' This idea was voiced for the first time in a 1954 economic development study for the province of West Flanders on the interrelated development of enterprises along the Bruges–Kortrijk corridor.[au] This idea would be developed further, as an implementation of the regional economic development idea of the Growth Pole,[av] conceived in this case as an 'axis of growth' or development axis. The inclusion of the highway triangle in West Flanders supports this pattern of 'development axes.' In line with the economic development vision, the Kortrijk – Bruges axis was voted first priority. The construction of this highway was considered to serve as the '*element motrice'* as stipulated in the regional economic development

doctrine, i.e. an event (in this case a public investment) that triggers the further economic development of the region.

Similar economic development motives led to the construction of additional highways, such as the Leuven – Lummen connection, that found its motivation in the development of the Hageland towns of Aarschot and Diest.[aw] These 'regional economic development high ways' are created within the meshes of the national network. Smaller meshes were added to the clear spider's web structure of Hondermarcq's design creating a more hybrid system.

The hybridization also resulted from the inclusion of various systems of connecting cities to the new high ways. In addition to ring-systems, radial expressways or elongated ring-system complemented the high way network, each designed and developed autonomously and along the distinct visions of the various inter-municipal agencies. The importance of the financing and construction mechanism of the inter-municipal agencies gained full force in the early 1970s, when the completion of most of the national highway network was realized under Minister Jos De Saeger, with a record of 278 km of highways opened in 1972 and 103 km in 1973. While the form of the network become more hybrid, the design of the high way profiles moved in the direction of further standardization. The 'inter-municipal' high ways no longer experimented with innovative profiles to give access to adjoining business activities along their trajectory. These were now grouped in industrial parks, often situated near interchanges. The high ways became autonomous spaces, isolated from their surroundings by green buffers, planted under the 'Green Plan' program.[ax]

Adding a grid to the web. Tangential roads and north-south connections

As high way construction advanced, proponents of the by-pass idea gained the ear of government officials. In the U.S. it was argued that the focus on urban highway construction in the Federal-aid Highway Act program, was to the detriment of the interstates. Rather than connecting major cities, the Bragdon committee argued that interstates should by-pass them entirely, contrasting sharply with a radial-concentric conception of the highway network.[ay] This by-pass approach was applied in the Netherlands.[az] Similar ideas led to proposals from spatial planners for highway designs adopting this pattern (fig. 6).[ba] By the late 1960s and early 1970s, the first preliminary zoning plans were published. It appears that the new high way program of 1971 incorporated these by-pass high ways as proposed by the spatial planners.[bb]

This included an east – west connection running almost half way between Antwerp and Brussels, that would allow to by-pass the Brussels agglomeration at far greater distance. Also, a set of north – south connections was proposed, all of which would result in the superimposition of a grid-system upon the web-like pattern of the high way network. At the height of the highway construction frenzy in 1972-73, this resulted in a proposal for a 2400 km highway network. As in other countries, public

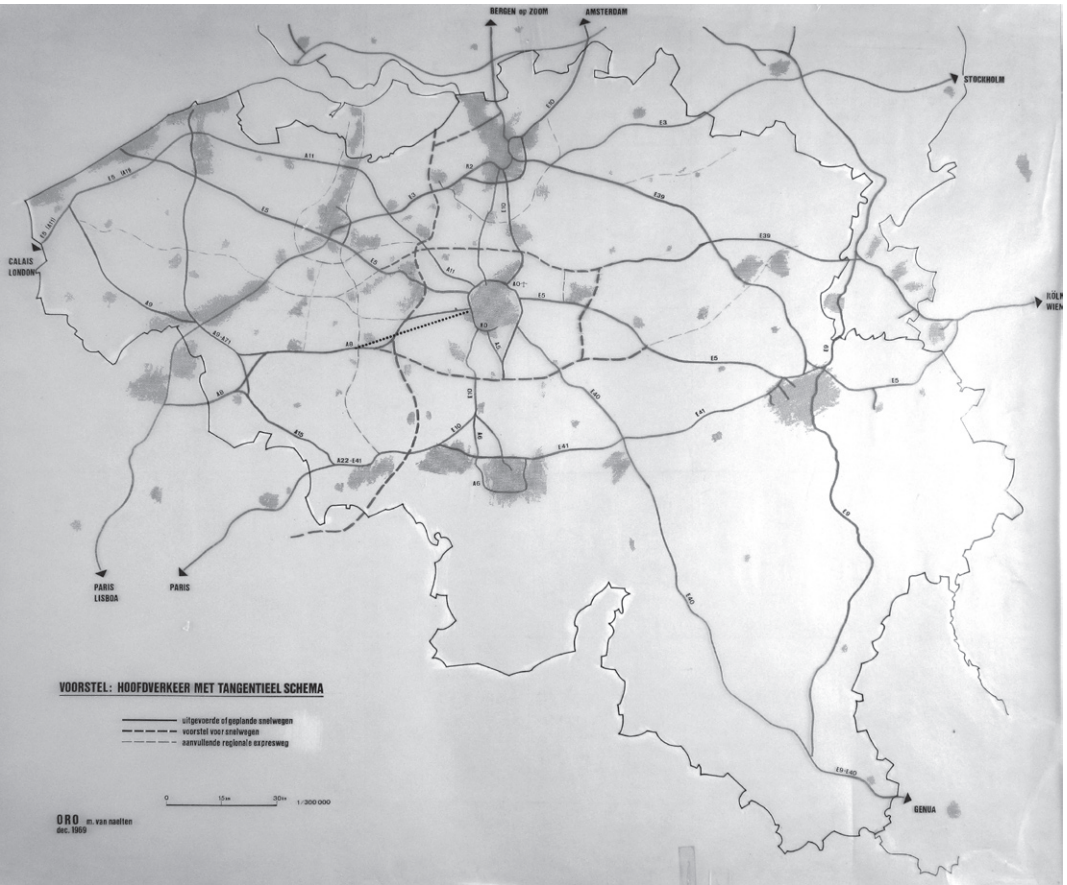

Figure 6: design for a tangential high way system around Brussels superimposed on the radio-concentric system. M. Van Naelten, 1969. Source: IISRO Archives, KULeuven

opposition against further highway construction, as well as the economic crisis, prevented these developments. Nonetheless, some of these connections were and are being implemented as upgrades of existing roads, with express-way profiles, rather than as true limited access-highways. This is the case for N16 running half way between Antwerp and Brussels, as well as forth a north – south connection in Limburg, connecting Hasselt with Eindhoven in the Netherlands.

Conclusion

In 1989 highway construction became a matter of the autonomous Flemish, Walloon and Brussels governments, the three federal regions that make up Belgium. The construction of high ways in the Ardennes in the 1980s completed the network. Even though a high way through the Ardennes was already included in the Trans European network assuring traffic to the south of Europe, these connections were seen primarily as tourist connections for vacationers passing through, and hence had received low priority. This again illustrates the 'hard economic' bias in the construction of the Belgian high way system.

Recent policies concentrate on the construction of missing links, or the expansion of the capacity of existing connections, whereas important new connections are no longer on the agenda. Today, the Belgian highway network comprises some 1750 km of highways and is the second densest in the world after the Netherlands.[bc]

The planning of the highway system in Belgium reads as a history in which the relationships between infrastructure and urban and regional (economic) development concerns are a constant element. The inclusion of local and regional concerns results in a hybridization of the highway network. International highway development paradigms, both in terms of spatial lay out and institutional set up determine highway policy at various times, leading to the adaptation of highway construction to the specific spatial as well as institutional context, primarily at the local and regional level. Whereas in other countries, the role of motor car users and their organizations played an important role in determining the 'highway system',[bd] in the Belgian case, economic development concerns seem to be of crucial importance. Nonetheless, also in Belgium high way construction started with the use of the car as a means for leisure in mind, as the interwar construction of the Brussels-Ostend highway illustrates. This motive was however eclipsed entirely in the ulterior development of the high way system and replaced by the economic motive. This is related to the financing of the high way system. Financing high way construction does not depend on the intensity of traffic, on the contributions of motorists or lobbying from motoring organizations, but rather on a national, regional or local economic development agenda. The specific institutional set up of the road administration and the position of spatial planning, explains why the network was not conceived from a traffic point of view alone. Infrastructure construction was wedded not only to economic development motives, but also to urbanization concerns. As such, the construction of the high way system was a crucial agent in the post war urbanization of Belgium.

Endnotes

a 'Het probleem van de modernisatie van het wegennet, zoals hieronder opgevat, beoogt de geschiktmaking van de wegen om te beantwoorden aan de behoeften van hun dubbele functie: 1) het verkeer verzekeren voor voertuigen en voetgangers 2) de nodige toegangen en gerechtigheden verzekeren voor de aangelanden' Henri Hondermarcq, "De modernisatie van het Belgisch wegennet," Annales des Travaux Publics de Belgique, 1 (1 February 1951): 45-73.

b J. M. Gregoire, *Autosnelwegen in België. Ontstaan en verwezenlijking* (Brussel: Simon Stevin, 1985).

c Michael Ryckewaert, *Working in the functional city. Planning the economic backbone of the Belgian welfare state 1945-1973*, Unpublished doctoral dissertation (Leuven: KULeuven, 2007), 98.

d Donald Weber, *Automobilisering en de overheid in België voor 1940. Besluitvormingsprocessen bij de ontwikkeling van een conflictbeheersingssysteem*, Unpublished doctoral dissertation (Gent: UGent, 2008), 348, A. Delacollette, Du rôle dans l'économie belge des usines Ford à Anvers (Anvers: Ford Motor Company, 1948).

e Koos Bosma and Cor Wagenaar, *Een geruisloze doorbraak. De geschiedenis van architectuur en stedebouw tijdens de bezetting en de wederopbouw van Nederland* (Rotterdam: Nai, 1995).

f Pieter Uyttenhove, "Architectuur, stedebouw en planologie tijdens de Duitse bezetting. De moderne beweging en het Commissariaat-Generaal voor 's Lands Wederopbouw (1940-1944)," Belgisch Tijdschrift voor Nieuwste Geschiedenis, 3-4 (1989): 465-509.

g 'La direction générale de l'Urbanisme est rattachée au Ministère des Travaux publics, ce qui provoque ce fait paradoxal du créateur mis sous la coupe de l'exécutant !' J.-J. Snacken, "Lettre de Belgique," Architecture d'Aujourd'hui, 7-8 (1946).

h Traffic engineering only became a seperate academic branch within Belgian universities towards the end of the 20th century.

i Embodied in three 'Program Acts': *Wet tot instelling van een Wegenfonds 1955-1969*, 9 August 1955, *Wet die de begroting van buitengewone ontvangsten en uitgaven voor het dienstjaar 1956 wijzigt, met het oog op het uitvoeren in de haven van Antwerpen van een programma van dringende investeringen en van nationaal belang,* 5 July 1956, *Wet die de planning aangeeft van de toe te kennen begrotingskredieten met het ook op het verwezenlijken van een programma van werken om zekere waterwegen bevaarbaar te maken voor schepen van 1 350 ton of meer*, 9 March 1957.

j Weber, *Automobilisering en de overheid in België voor 1940. Besluitvormingsprocessen bij de ontwikkeling van een conflictbeheersingssysteem.*

k Weber, *Automobilisering en de overheid in België voor 1940. Besluitvormingsprocessen bij de ontwikkeling van een conflictbeheersingssysteem*, 330.

l Gijs Mom, *User practices, intermediary actors, and the automobile system. Early Dutch automobilism in a North-Atlantic context*, 2008. Case 3 of the project Dutch mobility in a European context. A comparison of two centuries of mobility policy in seven countries.

m Omer Vanaudenhove, *Twee noodzakelijke wetten* (Brussel: Paul Hymanscentrum, 1961), 30.

n Hondermarcq, "De modernisatie van het Belgisch wegennet", Gregoire, *Autosnelwegen in België. Ontstaan en verwezenlijking*, 25.

o 'La route fermée longée de clôtures... ce n'est plus la route réelle artère de vie, c'est la voie de communication réservée à des usages fortement limitées.... Ce genre de voie de communication (autoroute) ne répond pas dans le cas présent au problème à résoudre.' My translation. Devallée as quoted in Gregoire, Autosnelwegen in België. Ontstaan en verwezenlijking, 25.

p Hondermarcq, "De modernisatie van het Belgisch wegennet"

q Vanaudenhove, *Twee noodzakelijke wetten.*

r Henri Liebaert, Omer Vanaudenhove, "Wetsontwerp tot instelling van een Wegenfonds 1955-1969. Memorie van

toelichting." *Parlementaire stukken van de Kamer van volksvertegenwoordigers,* session 1954-1955, n° 306, 31 May 1955.

s Liebaert, "Wetsontwerp tot instelling van een Wegenfonds 1955-1969. Memorie van toelichting."

t Vanaudenhove, *Twee noodzakelijke wetten*.

u These connections and their respective sections on Belgian soil were: London Ankara (Dunkirk – Ostend – Liège), Paris – Amsterdam (Mons – Brussels – Antwerp), Lisbon – Stockholm (Kortrijk – Ghent – Antwerp), Amsterdam – Genova (Liège – Luxemburg, not planned as a highway connection by Hondermarcq; this trajectory mainly served the Ardennes as a tourist destination). Gregoire, *Autosnelwegen in België. Ontstaan en verwezenlijking*.

v Liebaert, "Wetsontwerp tot instelling van een Wegenfonds 1955-1969. Memorie van toelichting."

w A very detailed design for this *Ring* road was presented in the Annales des Travaux Publics less than 6 months after the overall highway network design of February 1951. Henri Hondermarcq, "Le projet de ceinture de circulation de l'agglomération bruxelloise," *Annales des Travaux Publics de Belgique*, 3 (1 June 1951): 367-392.

x W. Lee Mertz, Origins and construction of the interstate system, at: http://www.fhwa.dot.gov/infrastructure/history.htm accessed on 25/08/2005 and W. Lee Mertz, The Bragdon Committee at: http://www.fhwa.dot.gov/infrastructure/bragdon.htm accessed on 25/08/2005. See also: Bruce E. Seely, Building the American Highway System. Engineers as Policy Makers (Philadelphia: Temple university press, 1987).

y Hondermarcq was fascinated by the American 'science of traffic engineering' and the results it had obtained in solving traffic problems and increasing road safety. Hondermarcq, "Le projet de ceinture de circulation de l'agglomération bruxelloise" 373.

z WM. E. WILLY, Pres. WASHO, at Salt Lake City, June 3, 1958 in The July 1958 Issue of American Highways as quoted in W. Lee Mertz, Origins and construction of the interstate system, at: http://www.fhwa.dot.gov/infrastructure/history.htm accessed on 28/05/2005.

aa Yanni Tsipis and David Kruh, Building Route 128 (Charleston SC: Arcadia, 2003), 7.

ab Tsipis, *Building Route 128*, 118. This initiative is at the basis of Route 128 as a "technopole" avant la lettre, during the arms race of the cold war years. See Manuel Castells and Peter Hall, "Boston's highway 128. High-technology reindustrialization," in Manuel Castells and Peter Hall (ed.), *technopoles of the world. the making of twenty-first-century industrial complexes*, (New York: Routledge, 1994), 29-39.

ac Hondermarcq, "Le projet de ceinture de circulation de l'agglomération bruxelloise", 379.

ad Hondermarcq, "Le projet de ceinture de circulation de l'agglomération bruxelloise", 376.

ae Victor Besme, *Plan d'ensemble pour l'extension et l'embellissement de l'agglomération Bruxelloise* (Bruxelles: Guyot, 1866) See for a small history of Brussels rings: *Intercommunale vereniging voor de autosnelwegen van de Brusselse periferie 1973* (Brussel: Ministerie van openbare werken. Dienst pers en voorlichting, 1973).

af This operation met with fierce criticism, as the old tree-lined 19th century boulevards were completely destroyed. One of the critics was the Belgian King Baldwin in person, who, from his Brussels palace was a front-line witness of the destruction taking place nearby. On his orders, the *Service du Plan Vert* (Service for the Green Plan) was established in the Public Works Department, whose primary role was to provide greenery and tree-planting in the wake of road, highway and waterway construction. *Het groenplan* (Brussel: Ministerie van Openbare Werken en Wederopbouw, 1958).

ag Hondermarcq, "Le projet de ceinture de circulation de l'agglomération bruxelloise", 391.

ah Ministerie van Openbare Werken. Dienst Pers en Voorlichting, *Intercommunale vereniging voor de autosnelwegen van de Brusselse periferie* (Brussel: Ministerie van Openbare Werken, 1973).

ai J. Van Caenegem, *Het kanalenvraagstuk in Noord-Oost-België in verband met eene Rijn-Scheldevaart en een kolenafvoerkanaal in Limburg* (Hasselt: Ceysens, 1922).

aj Alexandre Delmer, *Beteekenis van de binnenscheepvaartwegen in het totale net van verkeerswegen van een land*, Internationaal scheepvaartcongres. Mededeelingen, 16 (Brussel: Internationale permanente vereeniging voor scheepvaartcongressen, 1935), Alexandre Delmer, "L'influence des voies navigables sur la localisation de l'industrie belge," *Bulletin de la Société Belge des études*

géographiques VI, 1 (1936): 41-66.

ak Alexandre Delmer, "La valeur économique d'une grande voie navigable. Le canal Albert," *Annales des Travaux Publics de Belgique*, 5 (1952): 657-706.

al F. Eelen, "Uitvoering van waterbouwkunidge werken in het testgebeid Hageland-Zuiderkempen," *Informatieblad. Ekonomisch Komitee voor de Kempen* (November 1961): 11-15.

am Rien Van De Wall, *'Bouwen voor een onbekende toekomst.' De totstandkoming van het Belgische autosnelwegennet (1935 - 1989)*, Unpublished master's dissertation (Leuven: KULeuven, 2007)

an Gregoire, *Autosnelwegen in België. Ontstaan en verwezenlijking.*

ao Ibid.

ap *Europaweg E3* (Tielt: Lannoo, 1973), *De kleine ring te Antwerpen* (Antwerpen: Intercommunale vereniging voor de autoweg E3, 1967).

aq Gregoire, *Autosnelwegen in België. Ontstaan en verwezenlijking.*

ar Dimitri Debougnoux, *Het netwerk van autosnelwegen in België. De genese van het netwerk en de verknoping van snelwegen met het stedelijk weefsel in de Borinage*, Unpublished master's dissertation (Leuven: KULeuven, 2005), 25.

as *Wet tot invoering en ordening van maatregelen ter bevordering van de economische expansie en de oprichting van nieuwe industrieën*, 17 July 1959, *Belgisch Staatsblad*, 29 August 1959, *Wet tot invoering van bijzondere maatregelen ter bestrijding van de economische en sociale moeilijkheden in sommige gewesten*, 18 July 1959, *Belgisch Staatsblad*, 29 August 1959.

at Van De Wall, *'Bouwen voor een onbekende toekomst.' De totstandkoming van het Belgische autosnelwegennet (1935 - 1989).*

au Olivier Vanneste and Guido Declercq, *Structurele werkloosheid in West-vlaanderen. Een regionaal-economische studie* (Roeselare: Bank van Roeselare, 1954).

av Olivier Vanneste, *Het groeipoolconcept en de regionaal-economische politiek. Toepassing op de Westvlaamse economie* (Brussel: Standaard Wetenschappelijke uitgeverij, 1967).

aw Erik Buyst and Wim Peeters, "Regionaal expansiebeleid. Een slag in het water?," in Jan De Maeyer and Peter Heyrman (ed.), *geuren en kleuren. een sociale en economische geschiedenis van vlaams-brabant, 19de en 20ste eeuw*, (Leuven: Peeters, 2001), 257-273.

ax See footnote 32.

ay Mertz, *The Bragdon Committee.*

az Gijs Mom, Planning the car system in the Netherlands. Mass motorization in a North-Atlantic context, 2008. Case 6 of the project Dutch mobility in a European context. A comparison of two centuries of mobility policy in seven countries. A clear example is the Province of South Holland. The tangential system of highways in the Rotterdam–South Holland area was called De Ruit (the Diamond), a pattern that determined the entire highway network of the Netherlands. Michelle Provoost, Asfalt. Automobiliteit in de Rotterdamse stedebouw (Rotterdam: 010 Publishers, 1996) as quoted in Kees Schuyt and Ed Taverne, 1950. Welvaart in zwart wit., Nederlandse cultuur in Europese context (Den Haag: Sdu uitgevers, 2000), 165.

ba M. Van Naelten, *Voorstel. hoofdverkeer met tangentieel schema* (Leuven: Onderzoekscentrum Ruimtelijke Ordening, 1969), Archives of the Instituut voor Stedenbouw en Ruimtelijke Ordening, KULeuven, Leuven.

bb Van De Wall, *'Bouwen voor een onbekende toekomst.' De totstandkoming van het Belgische autosnelwegennet (1935 - 1989).*

bc Van De Wall, *'Bouwen voor een onbekende toekomst.' De totstandkoming van het Belgische autosnelwegennet (1935 - 1989).*

bd Mom, *User practices, intermediary actors, and the automobile system* & *Planning the car system in the Netherlands.*