

The Ten-Year Plan for the port of Antwerp (1956–1965): a linear city along the river

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The Ten-Year Plan for the port of Antwerp (1956–1965) funded the expansion of the port's infrastructure over a 10-year period. Strictly, a national government-funded infrastructure programme for the construction of a set of canal docks, the programme laid the basis for a broader urbanization of the north-eastern Antwerp metropolitan region. The importance of the operation lies primarily in its role as an instrument of urbanization rather than in the improvement of the transport and transshipment capacity of the port because it opened up a large territory to industrial settlement. The linear layout of the project along the Scheldt River led planners to conceive the further urbanization of the adjacent region on a linear city model, with satellite communities attached to the industrial and infrastructural strip. Compared with the contemporary *Europoort* plan for the port of Rotterdam, where several planning agencies implemented conflicting plans for functionally distinct infrastructures and the construction of a new town, the success of the Antwerp approach resides in the flexible and strategic implementation of the project as a co-production between various authorities and private parties.

Keywords: port city; infrastructure; economic development; growth pole; linear city; satellite town; neighbourhood unit; zoning

Introduction

Vast parts of Western Europe have been subject to intense urbanization processes in the second half of the twentieth century, resulting in environments that seem to lack any consideration for an integrated urban development.¹ Social geography literature stresses the importance of sociological, political and economic motives and drivers in the production of these generic spaces of late twentieth-century urbanization.² The north-eastern part of the Antwerp metropolitan area fits within this category of spaces where business and economic development logics – in this case, port development and widespread residential sprawl – are major drivers of the urbanization process.

Authors from an urban planning and design background have argued that the physical patterns of these spaces correspond to a 'minimal rationality'.³ In various contexts across Europe, cartographic and descriptive techniques, borrowing from the morpho-typological school and the north American tradition on the phenomenology of vernacular landscapes,⁴ have been used to decipher the spatial patterns of the 'ville émergente', the 'Zwischenstadt' or the 'nevelstad' as the late twentieth-century urban reality became known in France, Germany and Belgium, respectively.⁵

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The role of urbanism and planning as a discipline in the production of these ‘generic’ spaces has received less systematic attention so far, with notable exceptions.⁶ In the case of Antwerp studied here, many references to iconic models of the modernist tradition in urbanism, such as the linear city, the satellite town, the neighbourhood unit or functional zoning, occur as we will see, but their impact is rather limited. The core of the urbanization process is a central government-led project for infrastructure construction, the Ten-Year Plan for the expansion of the port of Antwerp. Antoine Picon was one of the first to stress the role and importance of engineering, infrastructure and networks of communication in the emergence of a project of modernization in the territory since the Enlightenment era.⁷ In line with this approach, the infrastructural, technological and economic development concepts used are also considered to be part of the conceptual background guiding the urbanization process.

Not surprisingly then, the idea of the linear industrial city will appear as the most inspiring concept to conceive the urbanization process in relation to Antwerp port expansion. Jean Louis Cohen has pointed to the Russian fascination for Ford’s rational organization of production as one of the sources for the linear industrial city models of the Russian De-urbanists in the 1930s.⁸ Nikolai Milioutine was one of the first to interpret these linear industrial city proposals as the transposition of the assembly line to a territorial scale.⁹ In the 1950s, ideas on the existence of input and output relations between companies, metaphorically resembling the relations between the various production steps in the assembly line, led economists to propose a spatial clustering of businesses in ‘pôles’ or ‘axes de croissance’ (growth poles or axes) as the new guiding principle in a business location.¹⁰ In Antwerp, the spatial organization of the new production and harbour installations in a linear pattern brought architects and planning officials, through a curious case of pattern recognition, to conceive the urbanization along the lines of a linear city concept.

The economic assessment of the Ten-Year Plan, based on existing literature,¹¹ further underpins the hypothesis that its success cannot be understood from an infrastructure or transportation logic alone. The economic impact of the operation resides in the specific spatial patterns applied, going beyond the economic utility of the infrastructure project itself.

A comparative perspective on the contemporary *Europoort* plan in the port of Rotterdam stresses the competitive advantages of the particular approach used in Antwerp, showing how an operation with a similar programme, occurring in a similar geographical but rather different institutional context, yields a fundamentally different solution. Whereas the Rotterdam operation is determined by a bureaucratic approach with conflicting plans from various administrations, the Antwerp approach is a co-production between local and national authorities and private parties, in which the strategic objectives of the project are more important than the blueprint of the plan.

Shaping the conditions for a central government intervention on behalf of the port of Antwerp

Reconstruction and modernization after the Second World War within a pre-war framework

In port history, the port of Antwerp is catalogued as one of the Hanseatic ports among ports such as Le Havre (France), Rotterdam (the Netherlands) and Hamburg (Germany).¹² These ports share a common history dating back to the era of the Hanseatic League, and more importantly, they are the main competitors for port traffic towards the north-western European

hinterland. They share a similar institutional framework as ports that are administered by the municipal authorities of the cities to which their territory belongs.

The port of Antwerp was immediately challenged by the changing economic context of the post-war years and the emergence of new economic and industrial patterns. One important international trend was the shift of industrial activities towards maritime locations. Since the late 1920s, harbour authorities had encouraged industrial settlement as a means to link flow of goods more strongly to the harbour, thus protecting it from cyclical movements in the harbour economy.¹³ In Antwerp, car assembly was the pioneering industry in this respect. It was the first 'modern' industry to settle in the port as opposed to 'traditional' harbour industries such as ship repairing.¹⁴ Both Ford and General Motors used the opportunity offered by post-war reconstruction to enlarge and modernize their plants.

The second trend was the increasing importance of oil as an energy source. After car manufacturing, petroleum played an important role in the industrialization of the port. Traditionally, petroleum storage facilities had been located to the south of the city, but this area was saturated. Shortly before and immediately after the war, the city was faced with several demands from oil companies to settle in the northern port area.

Initially, Antwerp was able to respond quickly to the requests of the car and petroleum companies. In 1927, a 'Convention for the North Grounds' had annexed three northern municipalities for the city of Antwerp, with the aim of providing additional space for harbour activities.¹⁵ The plan for these 'Northern Grounds' provided for the construction of 'new industrial' and 'new residential centers'.¹⁶ A first string of new docks was built in the 'Northern Grounds' in the 1930s, but the economic crisis meant that few additional activities had settled around these new infrastructures. Despite numerous proposals for the layout of 'industrial' docks, that is the docks not destined primarily for transshipment and storage activities but for industrial occupation, the northern and western portion of the area remained vacant throughout the 1930s and the wartime years.

Upon liberation, the port of Antwerp fell in the hands of the allies almost unscathed. The hasty retreat of the Wehrmacht was not repeated in Rotterdam, where the port was thoroughly destroyed. These conditions would prove to be a crucial competitive advance for the port of Antwerp in the immediate post-war years. Shortly after the liberation, construction began on the so-called Marshall dock for the petrochemical industry¹⁷ and a new high-rise housing estate. The representative buildings of the expanded motor corporations, such as offices and showrooms as well as the new housing estate, were built along a new highway in a remarkably homogenous architectural style, a sort of moderate modernism combining traditional materials with modern construction techniques.

Entering an era of 'unfulfilled wishes'

This first post-war northern extension was a short-term economic success, and upon completion in the early 1950s, it conveyed the image of successful reconstruction and modernization through its distinct architectural approach.¹⁸ From an economic and technical point of view, however, it showed the failure of an urbanization process based on the outdated development model of the 1920s. The resulting physical constraints were a first element leading up to the Ten-Year Plan. Demand by petrochemical and other industries for industrial grounds in the port very soon exceeded supply, and the harbour was faced with an acute shortage of industrial space. The

remaining space in the harbour was reserved for shipping installations, and the harbour extension had reached its northern limit. The limited capacity of the existing pre-war infrastructure created conflicts between sea-going vessels and inland traffic.¹⁹ Moreover, the increase in ship sizes required longer berths. Although the net mooring length for general cargo in the harbour remained fixed, the absolute number of ships that could be handled decreased. In order to solve these infrastructure problems, the municipal harbour authority drew up a plan for an additional general cargo dock, and a new link to the Albert Canal, the main hinterland waterway. The municipal board accepted the plan in 1951, but there was no funding to build it.²⁰

These financial difficulties of the port provided the second element leading up to the Ten-Year Plan. The limited resources of the port authority were a direct result of the export-oriented economic policy pursued by the central government. To enhance trade and compete with Rotterdam, the government imposed low transshipment tariffs.²¹ The revenue from these port dues did not cover port operation costs, which meant that the harbour authority accumulated losses on harbour exploitation. This put a heavy burden on the Antwerp municipal budget.

Both these conditions combined provided strong elements for the Antwerp municipal authorities and the association of entrepreneurs related to the port to lobby for a national government intervention for the port of Antwerp. These parties argued that the port of Antwerp was, in fact, subsidizing the Belgian economy. The municipal authorities filed monthly reports to the Ministry of Economic Affairs, with all the requests of enterprises wanting to settle in the port that could not be met due to the lack of space.²² Except for the limited amount of funding from the Marshall plan for the construction of the petroleum dock, the central government did not intervene to solve Antwerp's problems. The period between 1951 and 1956 was an era of 'unfulfilled wishes' in which the needs of the Antwerp port community were not addressed.²³

The general economic slump of the early 1950s was the third element that shaped a favourable climate for a national government intervention on behalf of the port of Antwerp. The general economic situation prompted the socialist liberalist government that came into office in 1954 to engage in a powerful Keynesian policy of job creation by increasing demand through public infrastructure programmes. The policy relied on three acts: a 15-year investment programme for the construction of a highway network (1954), the Ten-Year Plan for the expansion of the port of Antwerp (1956) and an act aimed at the modernization of the Belgian canal network (1957).

On a more detailed level, the economic slump and related unemployment affected the port of Antwerp directly. The initial advantages of the reconstruction economy for the port of Antwerp shrivelled away as neighbouring countries repaired their infrastructure and began to compete. In 1949, the port of Rotterdam officially announced that the port had been repaired and modernized. Wharves had been widened to allow for more storage space, and the docks were also dug deeper. Not only had Rotterdam reconstructed and modernized its port, but between 1947 and 1955, it had also extended the port's surface area by 2000 ha.²⁴ At the same time, the consolidation of the market in the Benelux and the European Coal and Steel Community (1952) removed protectionist measures, putting Antwerp and Rotterdam in direct (and fierce) competition, as both ports served the same hinterland. The infrastructure constraints that hampered traffic flow in the harbour and the lack of adequate mooring and storage space put Antwerp at a competitive disadvantage.

These macro-economic difficulties led to social unrest, in particular, among dockworkers. In 1950, 25% of Antwerp dockworkers were unemployed and the figure rose to 33% by 1953,

resulting in a radicalization of workers that threatened social stability nationwide.²⁵ Antwerp mayor, Lode Craeybeckx, enhanced his lobbying campaign on behalf of the needs of the port of Antwerp. As a member of parliament, he could directly raise the issue on the national political level, and as such, he succeeded in including the needs of the port of Antwerp in the national infrastructure programme.²⁶

Conceiving a plan for the port of Antwerp

The conceptual and institutional framework of the Ten-Year Plan

The programme for the Ten-Year Plan was based on negotiations between the central government and the city, and formalized in a 'Convention between the City and the State'.²⁷ The port authorities proposed an elongated scheme, adopting the trajectory of a future canal that would link the port of Antwerp with the Rhine and the port of Rotterdam (Figure 1). A series of 'Canal Docks' on the trajectory of this future canal was the extension plan's backbone. To the east of this backbone, a secondary canal was projected to meet with the Albert Canal and a set of industrial docks.

The cost of carrying out this plan was estimated at 7 billion Belgian francs, but the central government could only agree upon an amount of 4.2 billion.²⁸ It limited the programme to the most essential and strategic elements, the construction of the Canal Docks B1 and B2. The eastern extension, the new hinterland canal and the lock connecting the new docks to the River Scheldt were cancelled from the national programme but continued to figure in the plans of the municipal authorities (Figure 1). In any case, the arrival of the Ten-Year Plan marked the end of Antwerp's era of 'unfulfilled wishes'.

A commission of city officials for the 'expansion of city and port', known as the ACUSH (Ambtenaren Commissie voor de Uitbreiding van Stad en Haven),²⁹ was established to coordinate the execution of the Ten-Year Plan as an urbanization project. The technicians and engineers responsible for the execution of the Ten-Year Plan were incorporated into the technical department of the port authority, functioning as a decentralized cell that formally belonged to the national Public Works department.

As such, the Antwerp municipality received a relative autonomy of action in implementing the Ten-Year Plan. On a number of crucial matters, however, it still had to rely on decisions from the central government. In addition to the decision to limit the scope of the Ten-Year Plan discussed above, two other strategic decisions taken by the national government played an important role in steering the urbanization process that would inevitably accompany the harbour extension.

First, during the parliamentary discussion of the Ten-Year Plan, it was decided to limit land annexation in neighbouring municipalities as much as possible: expropriations of property could only proceed at the same pace as the actual harbour extension.³⁰

Expropriation plans were restricted, and the eastern parts of the harbour extension plan remained outside the city's jurisdiction. This jurisdiction was further restricted by the route traced for the Antwerp–Rotterdam highway by the Road Administration of the Public Works department, as it effectively limited any further eastward extension. Despite protests from city officials, the central Roads Administration maintained the route's trajectory and the dock was cut short.³¹

Second, the city could not rely on the 'Convention between the City and the State' for the immediate expropriation of the annexed land. The Inspector General, Leopold Hendrickx, of

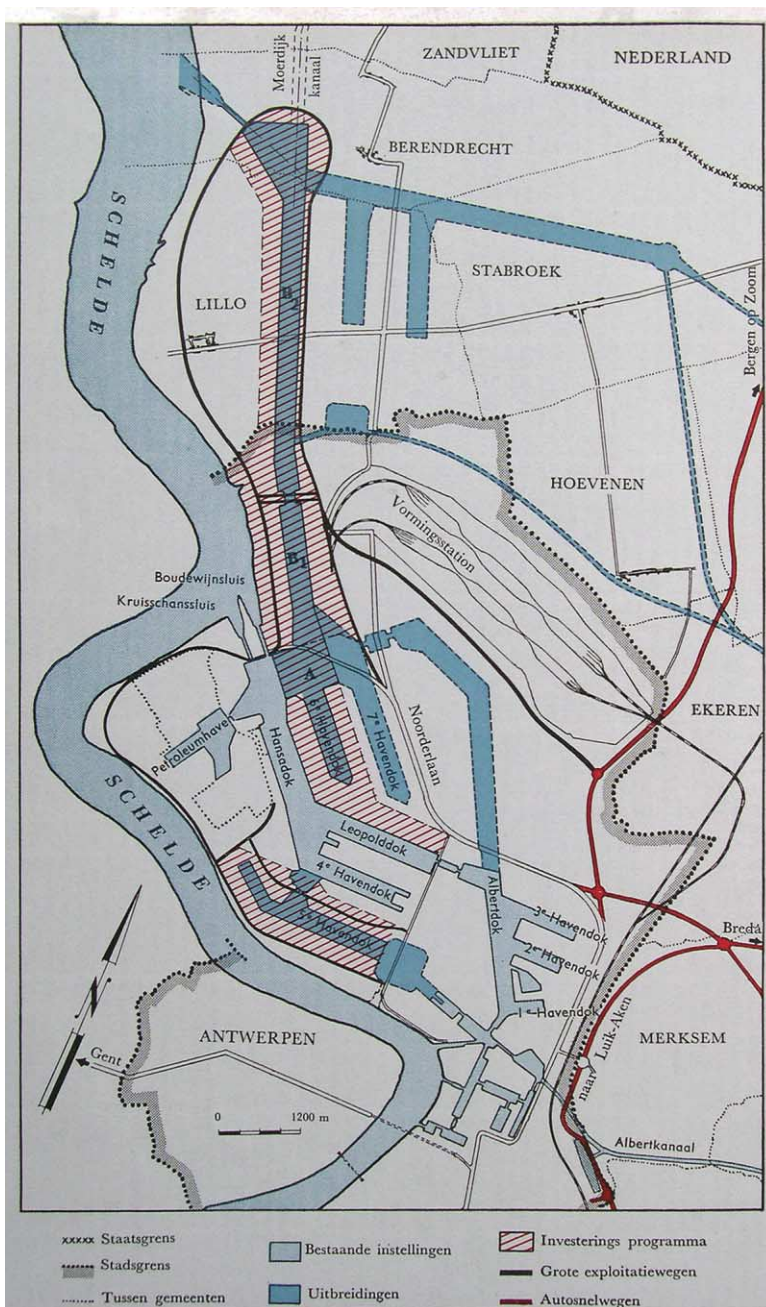


Figure 1. Ten-Year Plan for the port of Antwerp, 1956. Hatched areas were included in the central government-funded 4.2 billion Belgian francs programme. Source: De Kesel, 'Havenuitbreiding. Reden en vormgeving'.³²

the national Urban Planning Department requested that the procedure provided for in the Town Planning Act of 1946 should be followed.³³ This implied that a zoning plan for the entire area had to be authorized to be able to proceed with the expropriation. The combination of these measures would prove very effective in safeguarding the residential landscape of the polders as the harbour extension proceeded. As such, in a strange reversal of the usual hierarchy of policy-making, the national policy level defended local interests of the polder communities against the aspirations of the Antwerp authorities.

Housing the work force of the port expansion. Renaat Braem's project for the Satellite Town of Lillo and Bandstad België

How did this infrastructure programme tie in with a larger concern for the urbanization of Antwerp and spatial plans established to that effect? The previous sections show that city and harbour officials were mainly interested in the harbour extension. The city extension did not feature on their priority list, although it was strictly speaking part of the ACUSH's mission. In the General Plan for the Antwerp Agglomeration of 1960, the entire area of the territory annexed in 1958 was earmarked for industry, with the polder villages overrun by port and industrial installations (Figure 2).³⁴ This created the impression that in planning the harbour extension, the authorities had 'forgotten' to include the extension of residential areas required to house the work force, as Antwerp modernist architect and former Le Corbusier collaborator Renaat Braem noted.³⁵ Braem, the most important representative of the Modern Movement in Belgium and a prolific architect and critic, decided to design a string of satellite towns along the banks of the Scheldt River as a personal counter-project, a utopian design with a critical aim.³⁶ These satellite towns were part of an industrial *Bandstad* (Strip City) that was laid out along the main industrial corridors to cover the whole of Belgium.³⁷

The project was a further development of Braem's earlier ideas on linear cities, inspired by the examples in Miljutin's publication 'Sotsgorod' of the 1930s.³⁸ Braem's post-war proposal moved away from the interwar ideas and translates the inspiration of Le Corbusier's *Cité Linéaire Industrielle* of the 1940s.³⁹ Indeed, as opposed to the pre-war proposals of continuously built-up strips of working, housing and recreation areas, the *Cité Industrielle*, as well as Braem's *Industrial Strip City*, adopted a 'beads-on-a-string' configuration of industrial areas (laid out along the principles of the *Usine verte*) and compact dwelling satellites set in green and/or agricultural surroundings.

In Antwerp, Braem designed a detailed satellite town near the village of Lillo.⁴⁰ This project is one of the five satellite towns of 2000 dwellings (housing 8000 persons) attached to the industrial backbone of the Antwerp harbour installations, first sketched out on a piece of tracing paper affixed over an official depiction of the Ten-Year Plan (Figures 3 and 4).

The implementation of the Ten-Year Plan

The economic and infrastructure dimension of the Ten-Year Plan assessed. The Canal Docks as a hybrid infrastructure

The economic importance of the Ten-Year Plan for the port of Antwerp has been the subject of previous studies. Loyen⁴¹ has compared traffic growth figures for the port of Antwerp with

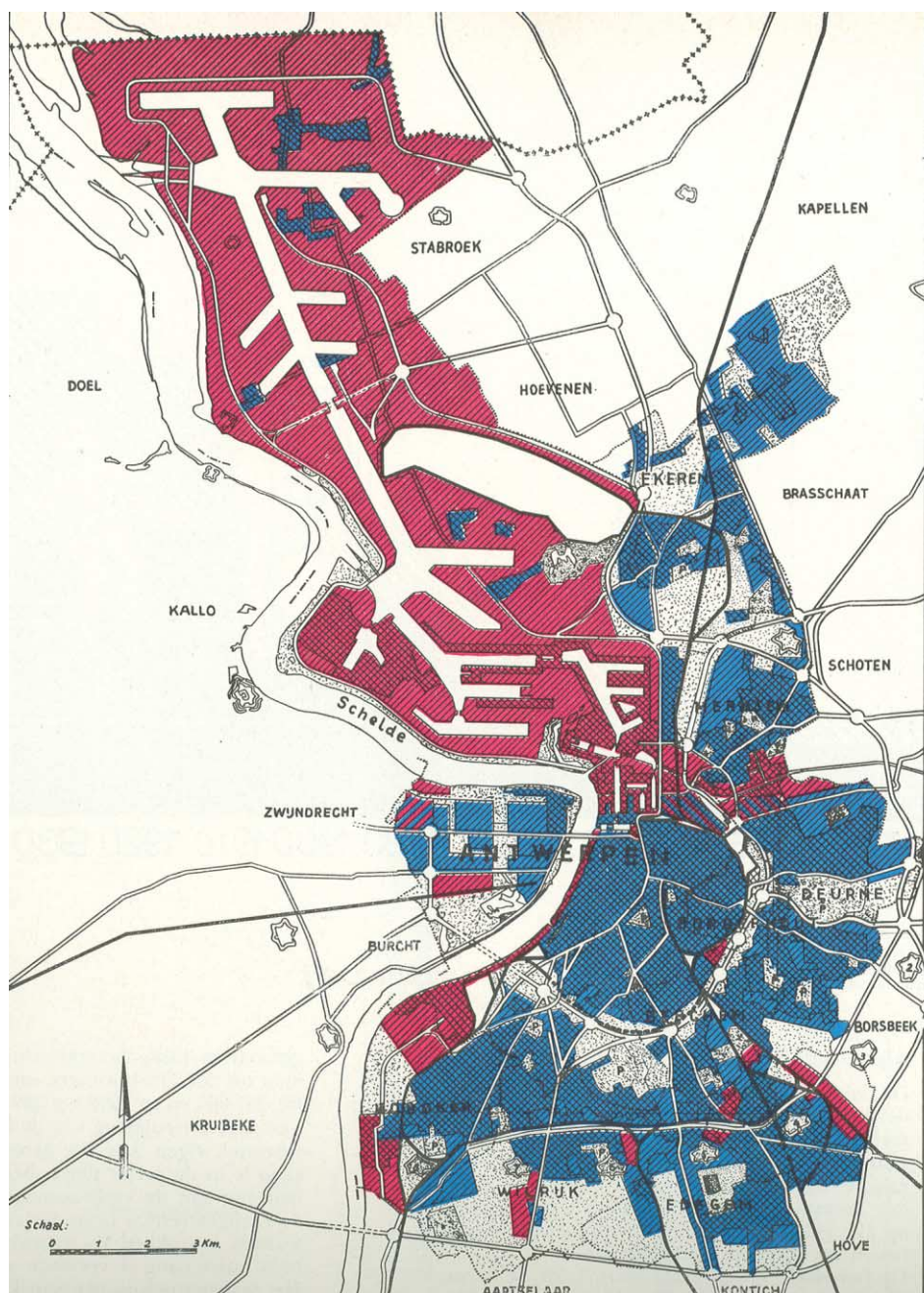


Figure 2. General plan for the Antwerp agglomeration, 1960. Zandvliet and Berendrecht polder villages overrun by port infrastructure. Source: Cooreman, 'Stedenbouwkundige problemen', 1960.

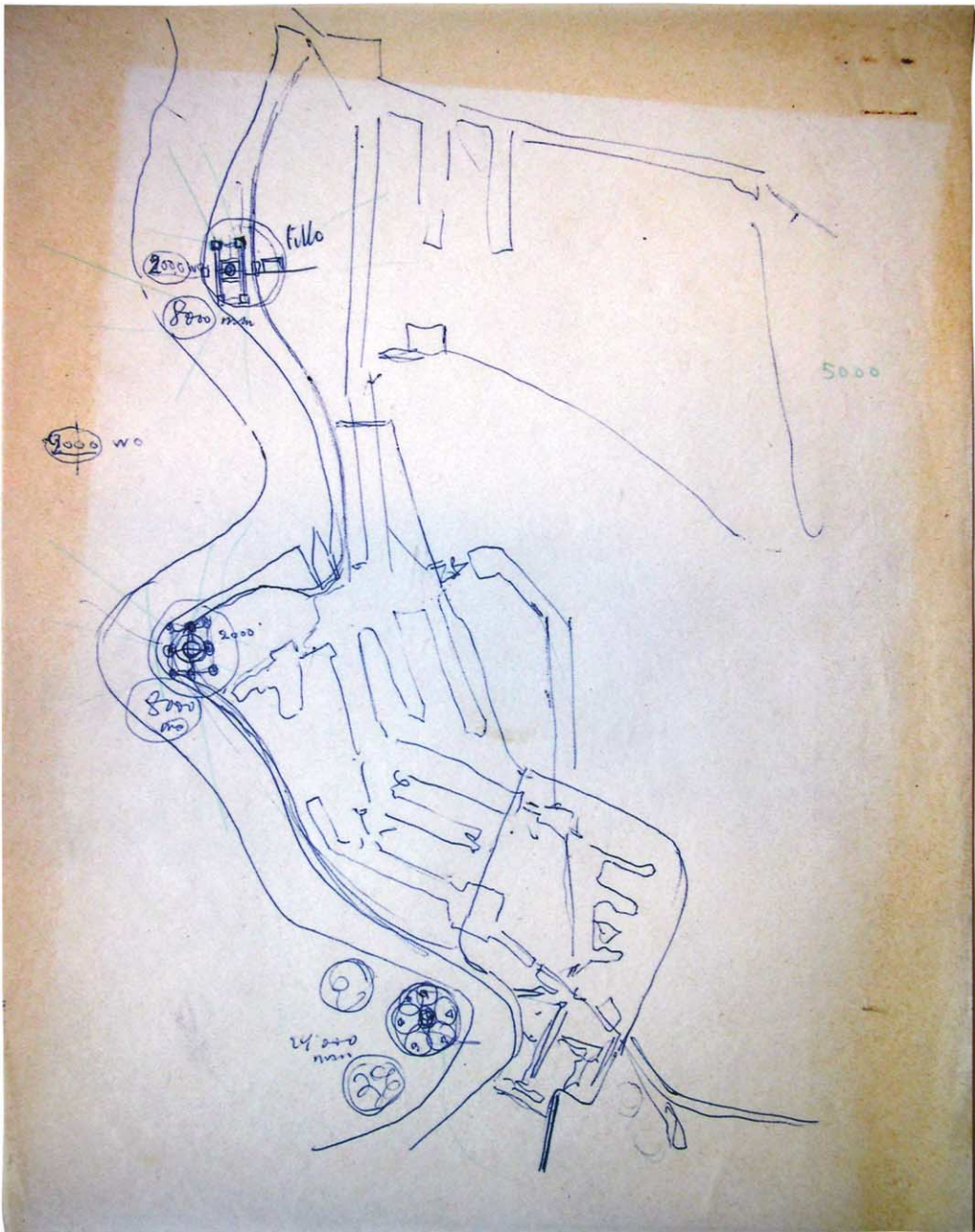


Figure 3. Renaat Braem's linear city proposal drawn on the basis of the Ten-Year Plan, with satellite towns of 8000 inhabitants each (ca. 1957–1958). Source: *Vlaams Instituut voor het Onroerend Erfgoed* in Brussels, Renaat Braem Records (henceforth VIOE Braem records), no. 114 – Lillo, Stad België, drawings A02 & A07.

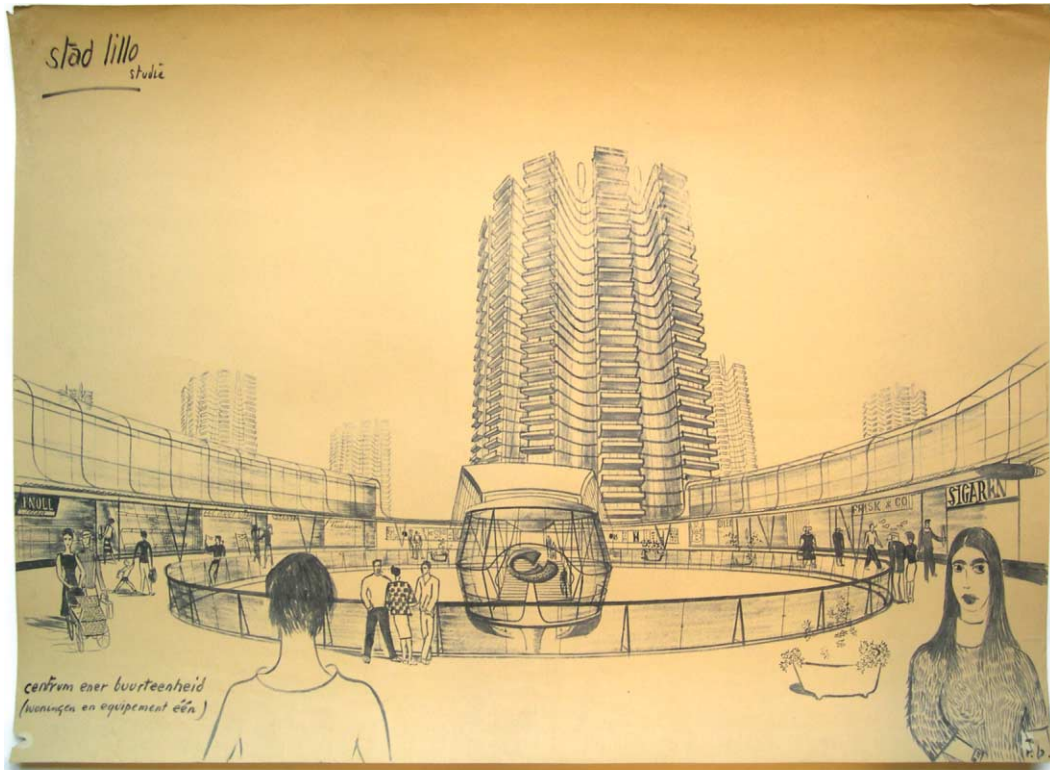


Figure 4. Rendering of the Lillo satellite town by Renaat Braem (ca. 1957–1958). Source: VIOE Braem records, no. 114 – Lillo, Stad België, drawing C05.

the other North Sea ports. This comparison shows that Antwerp grew less than its competitors between 1950 and 1970, losing part of its market share to other North Sea ports. Blomme has pointed out that the ideal pattern for investments in port infrastructure is one where investments follow growth in port traffic and throughput.⁴² The Ten-Year Plan resulted in a sharp increase in the net mooring length of the port of Antwerp. Initially, this was followed by an increase in maritime traffic, but then by a regression during the 1970s. However, since the 1970s, a further increase in maritime traffic in Antwerp has occurred with only a limited increase in mooring length. This indicates that the infrastructure built under the Ten-Year Plan was sufficient to accommodate the increase in traffic for many years. Furthermore, Loyen notes that:

The increase in welfare of the silver fifties and the golden sixties did not bring Antwerp the expansion (of port traffic) predicted in the context of the Ten-Year Plan – on the contrary. In this period Antwerp merely laid the basis for a sustained achievement after the (1973) oil crisis through the expansion of the petrochemical industry.⁴³

The petrochemical complex in Antwerp does not rely critically on maritime transport. Since the closure of the Suez Canal in 1958, tankers grew bigger to offset the longer journey

around Africa. These new tankers with a deeper draught could not call at Antwerp because of the insufficient depth of the Western Scheldt. To assure the supply of crude oil, the Rotterdam Antwerp Pipeline was built in 1970. It was this infrastructure, more than the Canal Docks built under the Ten-Year Plan, that supported Antwerp's expansion. The deepwater location of the petrochemical complex merely supported the inland shipping of semi-finished products produced by the chemical plants.

These economic analyses indicate that shipping activities were not the main beneficiary of the Ten-Year Plan. The importance of the Ten-Year Plan as a traffic infrastructure was rather limited, and the economic importance mainly resided in accommodating an expanding industrial sector. The Canal Docks built under the Ten-Year Plan were in that sense a strategic and flexible piece of infrastructure. As their name indicates, they were conceived to fulfil two roles at the same time: that of providing a means of transportation (the 'canal' dimension of the project) and that of providing a means of transshipment (the 'dock' dimension of the project). Upon construction of the Ten-Year Plan, there was no certainty whether the Rhine link would ever be built, as its construction depended on difficult negotiations between the Netherlands and Belgium. Moreover, some people in the port community feared that the Rhine link would result in a loss of traffic to Rotterdam.⁴⁴ So, the 'canal' aspect of the infrastructure was certainly problematic. Nonetheless, it was decided to construct the Canal Docks with soft sloping banks rather than wharves suited to mooring ships, except for a small part of the B1 Dock. As a result, the infrastructure was not immediately fit for transshipment or deepwater-related industries either, thereby compromising the 'dock' dimension of the infrastructure.

In reality, this conception reveals the hybrid nature of the infrastructure. As a result of this, the economic importance of the Canal Dock investment cannot be assessed from a strict infrastructure perspective. Its importance is only revealed when its dimension as an instrument of urbanization is also taken into account.

Available space as a competitive advantage: Rotterdam's Europoort plan as a comparative perspective

This can be illustrated most clearly when the Ten-Year Plan is compared to contemporary developments in the port of Rotterdam under the *Europoort* plan. This comparison, moreover, sheds light on the distinct institutional approach of the Netherlands, an approach that, as opposed to the Belgian case, relied on a well-developed 'planning machinery'.⁴⁵

Next to the local Rotterdam authorities, the central and regional governments played a direct role in the spatial planning of the port. Constraints introduced by the various regional and national administrations largely compromised the design of the *Europoort* plan. The *Rijksplanologische dienst* (National Spatial Planning Service) conceived of the New Waterway (Rotterdam's link to the sea built in 1870) as a highway for sea traffic. The *Rijksplanologische dienst* argued that it was necessary to construct a separate sea canal (*Caland* canal) within the limited space of the narrow Rozenburg Island for the purpose of housing industries with berths for both sea-going and inland shipping vessels.⁴⁶ Next to this, a separate inland traffic canal (*Hartel* canal) was planned at the opposite side of the island behind a lock system. As a result, a three-fold infrastructure was built in Rotterdam consisting of the New Waterway and two canals – the *Caland* and the *Hartel*, whereas in Antwerp, the Canal Docks had the potential to combine all

these three functions into a single infrastructure project. The area taken up by both canals together with the preservation of the Rozenburg community limited the net surface area available for industrial settlement in the *Europoort*, much to the frustration of harbour director Posthuma.⁴⁷ In Antwerp, however, the entire area around the Canal Docks was available for industrial settlement.

The presence of large areas for industrial settlement would prove to be a crucial advantage for Antwerp during the 1960s and the following decades, as this condition catered directly to the needs of private enterprises looking for deepwater-related production sites. A number of German firms in the basic chemicals industry were looking for new areas in which to expand. The case of BASF analysed by De Goey illustrates the fierce competition between Antwerp and Rotterdam to attract these chemical firms.⁴⁸ After negotiations with both ports, BASF decided to settle in Antwerp because there the company could acquire a very large area of industrial land. In Rotterdam, only long-term concessions were possible, another factor that favoured Antwerp. Finally, in Rotterdam, BASF was required to provide housing for its employees, whereas no such condition was set in Antwerp.

Due to economic agglomeration effects and input–output relations between different companies, the entire area in between the Canal Docks, the Scheldt River and the Dutch border developed rapidly into the second largest petrochemical complex in the world after Houston, Texas. The rapid success of the northern extension plan as an industrialization undertaking prevented residential development in Lillo. Although Braem's scheme occupied only a very small portion of land on the bank of the river, any residential development so close to the industrial area would jeopardize the establishment of hazardous production activities such as petrochemicals.

Infrastructure construction appears then as a strategic investment opening up a large area of polder land to industrial activities. Its actual value as a transportation (canal) and transshipment (dock) infrastructure is of secondary importance.⁴⁹ Infrastructure construction thus serves as a strategic instrument of urbanization that changes existing patterns of land use. As such, the Ten-Year Plan can be interpreted primarily as a successful instance of urbanization. In its ulterior development, it becomes a fully fledged urbanization endeavour that structured and guided the transformation of the city of Antwerp into a city region, a modern metropolitan area exceeding the traditional boundaries of the pre-war agglomeration.

The harbour extension as the infrastructure and economic backbone of an urbanization project

The satellite town and the linear city revisited

The transformation of the port of Antwerp into a petrochemical cluster reveals the strategic nature of the Ten-Year Plan. Translated into contemporary spatial economic development thinking on the 'pôles de croissance', it was the 'élément motrice' setting in motion the industrialization process.⁵⁰ First, it answered directly to the needs of private parties that played a crucial role in the development of the port. Second, it introduced a functional zoning of urban activities, even though no formal zoning plan was established. As such, the principle of zoning, as a means to isolate conflicting activities, was at work in a very direct way, even without the intermediary of a formal spatial plan.

Nonetheless, the issue of residential expansion, as raised by Braem, could not be ignored. The 'residence question' – the development of Antwerp 'as a ribbon along the stream' and its impact on the mobility of workers – was also raised by the municipality's housing and social services administration.⁵¹ While calling for a comprehensive town planning approach to solve this question, the city official also covertly pleaded for additional annexation of municipalities under the city's territorial jurisdiction⁵² in order to plan the area as a whole. As noted earlier, the national authorities, by means of Inspector General Hendrickx, prevented this annexation, thereby limiting the port territory to the part west of the route traced for the Rotterdam highway, while at the same time requesting a zoning plan to allow for further expropriations as the construction of new docks proceeded. As a result of this request, the ACUSH presented a new plan that in fact translated Hendrickx's ideas on the expansion of the port and the city (Figure 5).⁵³

In a publication on the development and planning of large agglomerations in Belgium, Hendrickx gave his vision on the development of the wider Antwerp agglomeration. He argued:

Given the location of the port [i.e. the expansion to the north], it is not necessary to expand the existing agglomeration: new settlements can be built eastward of the port complex under

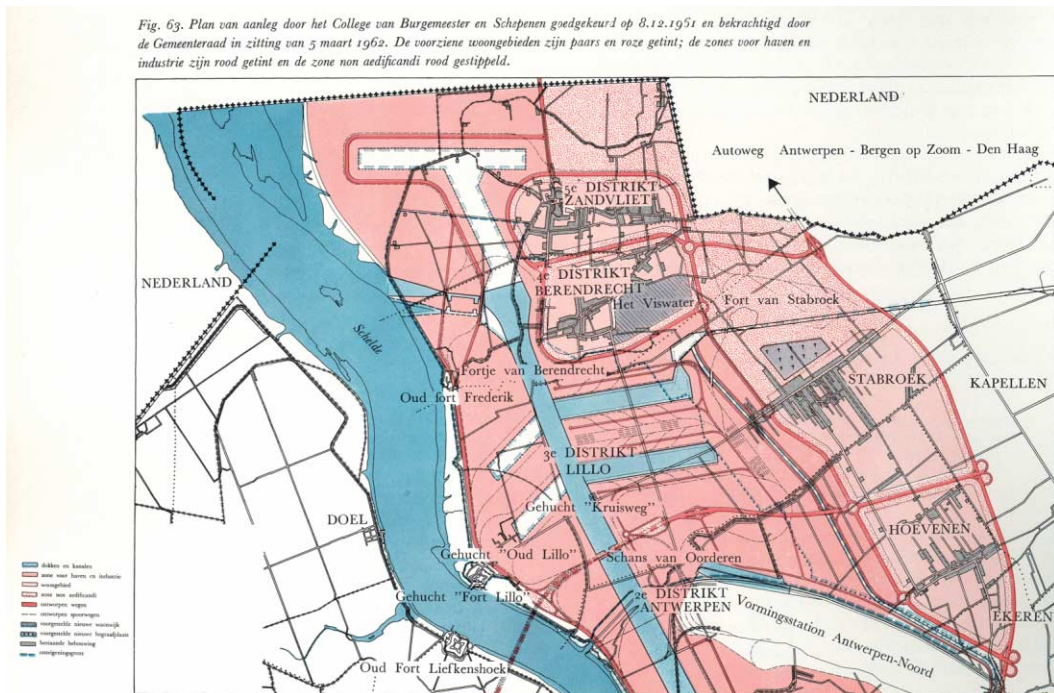


Figure 5. Urban plan for the northern port extension adopted by the Antwerp municipality with satellite communities near the polder villages, surrounded by a newly designed road network set in green buffers, 8 December 1961. Source: De Kesel, *Het Tienjarenplan 1956–1965, 1967*.

the condition that air pollution under dominating winds is no obstacle for the expansion on the eastern side.⁵⁴

Delivered at an international congress where Jean Francois Gravier spoke about limiting the growth of Paris⁵⁵ and Robert Shaw presented the British policy for New Towns,⁵⁶ this remark by Hendrickx has to be interpreted as identifying an opportunity to limit and guide the uncontrolled expansion of the agglomeration. Hendrickx advocated the decentralized growth of the agglomeration, a reference to the 'satellite town' concept. Satellite towns occupied a prominent place in Belgium's contemporary urban planning literature. In 1958, Groupe Alpha had put forward this concept when planning the Brussels agglomeration.⁵⁷ In Antwerp, Braem's proposal for Lillo was inspired by similar thinking. Hendrickx was probably well aware of Braem's project, as they had befriended each other in the 1930s while both studying architecture at the Academy of Fine Arts in Antwerp.⁵⁸ The satellite town of Hoogvliet, designed and built in the wake of the *Europoort* plan near Rotterdam, was undoubtedly a further point of reference in Antwerp circles.⁵⁹

The new plan for Antwerp – presented by the ACUSH and based on Hendrickx's views – was tailored to meet the realities of the local context, while at the same time deriving some of its inspiration from Braem's *Bandstad* model. It illustrates how the Belgian satellite town approach differed from the canonical examples of modernist planning in the post-war years, such as Hoogvliet in Rotterdam, and other classical, textbook examples of the satellite or new town idea in Britain and Scandinavia. Rather than a radial concentric pattern of self-sufficient new towns, the Antwerp 'satellite towns' proposal adopted the idea of a linear development of the city, consisting of decentralized communities attached to the Antwerp city centre. The plan attempted to create well-defined communities around the polder villages, bound and framed by a new road network of intermediary scale. The spatial vocabulary of these new communities is similar to the 'neighbourhood units' as they appeared in the British and Scandinavian examples of the time, be it that they lack the larger urban framework. They form separate units, each with their own civic centre, and are integrated by means of the new traffic system. This mesh of circumferential roads served in the first place to avoid through traffic on the inadequate existing road network.

Secondly, the ring roads were set in green buffers that served to contain the growth of the residential nuclei, buffer the units from each other and the adjacent port installations. Although the intermediary road network was never built, the residential expansion of the polder villages that took place during the 1960s and 1970s effectively protected them from being incorporated into the harbour extension. Hendrickx's assumption of their being exempt from pollution under dominating winds was, however, not met and poses serious challenges to the present-day development of these polder villages.

The northern harbour extension as a part of Bandstad België

The discussions on the accommodation of the residential expansion in the wake of the Ten-Year Plan reveal that the infrastructure project triggered a debate on the urban future of the Antwerp agglomeration. The concepts voiced – utopian in nature in Braem's version and better adapted to the existing situation in Hendrickx's case – translate a clear vision on the development of the Antwerp agglomeration, a vision that was capable of guiding the actual urbanization process, even if little comprehensive planning was applied to do so.

The project established a well-defined system of strips parallel to the river. The consecutive strips, each with their distinct nature and function, comprise the petrochemical complex, the Canal Dock system, the port area with transshipment and non-hazardous industrial activities, the Antwerp–Rotterdam highway, and the string of old polder villages turned into satellite communities (Figure 6). Finally, beyond the string of polder villages that act as a buffer of regional scale, the *Voorkempen*, a formerly agrarian and recreational territory of woods and heath, became subject to a widespread suburbanization with mostly high-class, dispersed, low-rise, single-family homes.⁶⁰ The combined intervention of local and central government planning and public works agencies engineered a very clear structure for the north-eastern expansion of the agglomeration of Antwerp into a regional metropolis – that, in its basic spatial pattern, forms an implicit implementation of Renaat Braem's idea of the *Bandstad België*. Indeed, the Antwerp case was the first but not the only example of strip-like development. Also, in other areas of the country, such as in the Port of Ghent, or along the Albert Canal running between Antwerp and Liège, similar industrialization logics gave rise to (proposals for) linear urbanization patterns in which the residential component is systematically referred to in terms of satellite communities or neighbourhood units.

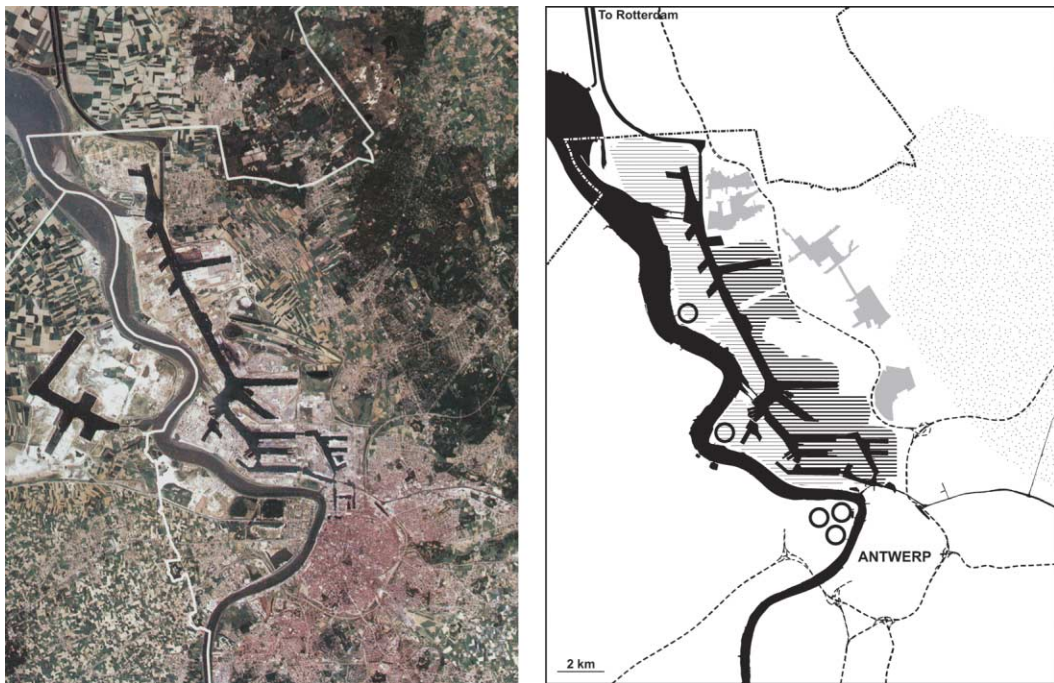


Figure 6. Urbanization pattern in the northeast of Antwerp with functionally distinct parallel strips along the Scheldt River, the Canal Docks and the highway. The area in between the river and the Canal Docks is the petrochemical complex (light hatch). The next band is occupied by transshipment and non-hazardous industrial activities (dark hatch), followed by the string of polder villages (grey). Beyond that is the suburbanized *Voorkempen* area with mainly low-rise, detached, single-family housing (dotted area). The circles indicate the location of the satellite towns proposed by Renaat Braem. Map prepared by the author. Aerial photograph © Eurosense Belfotop 1988–1989.

Conclusion

The preceding analysis shows that the infrastructure project is primarily a strategic trigger serving an economic development agenda, that of opening up land for industrial settlement. Subsequently, it forms the economic core and physical backbone of an urbanization project, shaping the Antwerp metropolitan area. Through a complex interplay of different actors and agencies, a relatively coherent spatial structure emerges. In particular, the organization of the territory in a set of parallel strips bears a striking resemblance to the linear city models of the modern planning tradition. Rather than an explicit application of the idea of the ‘*cit  lin aire industrielle*’ after which Braem had modelled his *Bandstad*, it is the analogy with the paradigm of the organization of industry in a territorial production line – one of the premises of the Russian De-urbanist linear city proposals as Cohen has shown – that led to this particular organization.

The Antwerp development, however, pays the price of the limited and selective regulatory framework that was set up. This becomes clear mostly in the unhindered sprawl of residential development of the *Voorkempen* area that has transformed into a vast residential park. While nature and dwelling continue to co-exist in a relatively balanced way, the very scale of the residential sprawl generates mobility problems. Similarly, while the safeguarding of the polder villages was a victory for the local communities, their location to the east of the port complex within the area that buffers the petrochemical industries results in environmental problems and health issues. The Rotterdam development, while being more model-like in its explicit implementation of the satellite town concept at Hoogvliet, too is problematic. Here, socio-economic problems that are typical for large-scale post-war housing estates, as well as environmental and health problems related to the proximity of the port, have necessitated a large-scale redevelopment.⁶¹

While it could be argued that in comparison to the Dutch case, the Antwerp example offers a pragmatist and ad-hoc approach, it is also true that in the dominance of the key infrastructure project, we can recognize the contours of what would be called today a strategic project. It is a public–private enterprise, in which one key public investment initiates a broader development, guided by private actors. While the public project is tuned to the needs of private actors, these adapt their strategies to the former. Planners, such as Braem or Hendrickx, recognize the generated pattern as a possible framework for urbanization and adapt their strategies, utopist for the former and pragmatic for the latter, to the established pattern, thus explaining how the idea of the *Bandstad* finds an implicit application in the territory. It is an approach that ties in with a tradition of urban planning in which the ‘project’ is – both in the organizational and in the spatial sense – at the core of the planning endeavour.

A distinct merit of this approach, again as compared to Rotterdam, is the inherent flexibility and the ability to incorporate seemingly incompatible functions in one integrated spatial design. The superposition of functionally distinct infrastructures in the *Europoort* plan, each designed by separate bureaucratic agencies with conflicting visions, is an example of the bureaucracy and lack of flexibility often associated with ‘die-hard’ modernist planning and strict functionalism, in stark contrast with the hybrid concept of the Canal Docks used in Antwerp.

Not surprisingly, infrastructure is the core of the urbanization project in Antwerp. For lack of a well-grounded planning tradition based on zoning, or a thorough and powerful land policy,

infrastructure is the one and key domain for public authorities to steer spatial development. Bearing in mind Picon's analyses on the importance of engineering and infrastructure construction in the emergence of modern urbanism as a discipline, the Antwerp case studied here reveals that the 'minimal rationality' of the typical late twentieth-century sprawling urban developments resides not merely in real estate or economic development logics but also in clear intentions about the organization of physical space through infrastructure.

Notes on contributor

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Notes

1. Bernardo Secchi, *La città del ventesimo secolo* (Roma: Laterza, 2005).
2. David Harvey, *Social Justice and the City* (Baltimore: Johns Hopkins University Press, 1973); Manuel Castells, *The Informational City. Information Technology, Economic Restructuring and the Urban Regional Process* (Oxford: Blackwell, 1989); Rem Koolhaas, 'The Generic City', in *Small, Medium, Large, Extra-Large*, ed. Rem Koolhaas and Bruce Mau (Rotterdam: 010, 1995), 1239–64.
3. Bernardo Secchi, 'Descrizioni/interpretazioni', in *Le forme del territorio italiano. i. temi e immagini del mutamento*, ed. Alberto Clementi, Giuseppe Dematteis, and Pier Carlo Palermo (Bari: Laterza, 1996), 83–92. According to Secchi, the accumulation of individual decisions by citizens, businesses and public authorities, each answering to their own rationality, results in complex urban landscapes that neither architecture nor planning can steer in the right direction.
4. Philippe Panerai et al., *Éléments d'analyse urbaine* (Bruxelles: Archives d'architecture moderne, 1980); Kevin Lynch, *The Image of the City* (Cambridge, MA: MIT Press, 1960); Robert Venturi, Denise Scott Brown, and Steven Izenour, *Learning from Las Vegas* (Cambridge, MA: MIT Press, 1972); John Brinckerhoff Jackson, *A Sense of Place, a Sense of Time* (New Haven: Yale University Press, 1994). Boeri has proposed the concept of the 'eclectic atlas' to frame the variety of analytical approaches suitable for the analysis of the contemporary city, pleading for an expansion of the cartographic approach or the 'zenithal' gaze, with other viewpoints such as interviews, photography, historical and biographical accounts. Stefano Boeri, Arturo Lanzani, and Edoardo Marini, *Il territorio che cambia. Ambienti, paesaggi e imagine della regione milanese* (Milano: Abitare, 1993); Stefano Boeri, 'Eclectic Atlases. Four Possible Ways of Seeing the City', *Daidalos* 69–70 (1998): 102–13.
5. Geneviève Dubois-Taine and Yves Chalas, *La ville émergente* (Paris: Editions de l'Aube, 1997); Thomas Sieverts, *Zwischenstadt. Zwischen Ort und Welt, Raum und Zeit, Stadt und Land* (Wiesbaden: Vieweg verlag, 1997). The Dutch term 'nevelstad' (*nebular city*) is used to refer to the nature of the present-day built environment, mainly in Flanders. André Loeckx compared a map of built-up spaces in Flanders with a *nebula*. André Loeckx, 'Het ruimtelijk structuurplan Vlaanderen als kader en inzet voor architectuur', in *Jaarboek architectuur Vlaanderen 1994–1995* (Brussel: Ministerie van de Vlaamse Gemeenschap, 1996), 26–37. Subsequently, various publications have focussed on unravelling the logics of the 'nevelstad' in Belgium. Bruno De Meulder et al., 'Sleutelen aan het Belgisch stadslandschap', *Oase* 52 (1999): 78–113; Michael Ryckewaert, 'The Minimal Rationality of Dwelling Patterns in Flanders' Nevelstad', *Oase* 60 (2002): 49–60; Geert Bekaert and Lieven De Boeck, *After-Sprawl. Research for the Contemporary City* (Rotterdam: NAI, 2002).

6. Mark Gottdiener, *Planned Sprawl. Private and Public Interests in Suburbia* (Beverly Hills, CA: Sage, 1977); David Mangin, *La ville franchisée. Formes et structures de la ville contemporaine* (Paris: Ed. de la Villette, 2004).
7. Antoine Picon, *Architectes et ingénieurs au siècle des Lumières* (Marseille: Parenthèses, 2004).
8. Jean Louis Cohen, 'L'oncle Sam au pays des Soviets. Le temps des avant-gardes', in *Américanisme et modernité*, ed. Jean Louis Cohen and Hubert Damisch (Paris: Flammarion, 1993), 403–35; Jean Louis Cohen, *Scenes of the World to Come. European Architecture and the American Challenge 1893–1960* (Paris: Flammarion, 1995).
9. Nikolai Milioutine and Jean Louis Cohen, *Sotsgorod. Le problème de la construction des villes socialistes, Tranches de villes* (Besançon: Editions de l'Imprimeur, 2002).
10. François Perroux, *La coexistence pacifique. 2: Pôles de développement ou Nations?* (Paris: PUF, 1958); Olivier Vanneste and Guido Declercq, *Structurele werkloosheid in West-vlaanderen. Een regionaal-economische studie* (Roeselare: Bank van Roeselare, 1954); Olivier Vanneste, *Het groei-poolconcept en de regionaal-economische politiek. Toepassing op de Westvlaamse economie* (Brussel: Standaard Wetenschappelijke uitgeverij, 1967).
11. Reginald Loyen, 'Throughput in the Port of Antwerp (1901–2000). An Integrated Functional Approach', in *Struggling for Leadership. Antwerp-Rotterdam Port Competition between 1870–2000*, ed. Reginald Loyen, Eric Buyst, and Greta De Vos (Heidelberg: Physica-Verlag, 2003), 29–61.
12. Reginald Loyen, Erik Buyst, and Greta De Vos, *Struggling for Leadership. Antwerp-Rotterdam Port Competition between 1870–2000* (Heidelberg: Physica-Verlag, 2003).
13. Greta Devos, 'De ruimtelijke structuur van de Antwerpse haven tussen traditie en vernieuwing (1870–1994)', in *Stroomversnelling. De Antwerpse haven tussen 1880 en nu*, ed. Jan Blomme (Antwerpen: Pandora, 2002), 79–96, 82.
14. Willy Winkelmans, *De moderne havenindustrialisatie* (Rijswijk: Nederlands vervoerswetenschappelijk instituut, 1973); Jacques Meuris, 'L'industrie belge de l'assemblage automobile', *Industrie* 10 (1954): 573–80.
15. Devos, 'De ruimtelijke structuur'.
16. Van Cauwelaert as cited in Devos, 'De ruimtelijke structuur', 83.
17. The Marshall dock was built with funding of the European Recovery Fund (or Marshall Plan) of 1947. The facilities of the new petrochemical companies were published in a theme issue of the architectural magazine *Bouwen en Wonen* on the Antwerp port expansion. Walter Bresseleers, 'De industriële uitbreiding van Antwerpen', *Bouwen en Wonen* 4 (April 1, 1956): 135–42.
18. Peter Van der Hallen, 'Onbevredigde wensen (1951–1956). Antwerpse havenproblematiek voorafgaand aan het Tienjarenplan' (master's diss., K.U. Leuven, 2004).
19. L. De Kesel, 'Havenproblemen. Toekomstbepaalingen', *Antwerpen* 1 (1955): 42–59, 53.
20. Ibid.
21. Van der Hallen, *Onbevredigde wensen (1951–1956)*.
22. Ibid.
23. Ibid.
24. Ferry De Goey, *Ruimte voor industrie. Rotterdam en de vestiging van industrie in de haven 1945–1975* (Delft: Eburon, 1990).
25. Van der Hallen, *Onbevredigde wensen (1951–1956)*.
26. *Parliamentary discussions of the Belgian Senate*, session June 26, 1956.
27. L. De Kesel, *Het Tienjarenplan 1956–1965. De havenuitbreiding van Antwerpen in de realiteit, Havenstudies*, vol. 2 (Antwerpen: Stad Antwerpen. Technische dienst van het havenbedrijf, 1967).
28. *Parliamentary discussions*, session June 26, 1956.
29. *Ambtenaren Commissie voor de Uitbreiding van Stad en Haven* – Commission of City Officials for the Extension of City and Port. Records of the ACUSH for the period of 1958–1959 are held in the Antwerp City Archive (collection no. 27 'Noordergronden en zuiderdokken – aangehechte gemeenten' folder 1) 'ACUSH', box '44.956 D8 Aangehechte gemeenten - Lillo - Zandvliet - Berendrecht: ambtenarencommissie voor Uitbreiding van Stad en Haven' (henceforth ACUSH records).
30. *Parliamentary discussions*, session June 26, 1956. The local communities from the remaining polder villages to the north of Antwerp strongly opposed the harbour extension, remembering the earlier experience of the first post-war harbour extension, in which villagers were faced with 20 years of

- uncertainty between the formal expropriation of their homes in the 1930s and their ultimate eviction in 1950s.
31. Arguing that it 'cut through a dock designed by our services' (my translation). L. Craeybeckx and J. Crahay, *Protestbrief van Stad Antwerpen tegen het tracé van de snelweg Antwerpen – Bergen-op-zoom dat een dok door hen ontworpen doorkruist*, Beglian State Archives in Bruges, Achilles Van Acker records (henceforth Van Acker records), no. 1702, January 24, 1958.
 32. L. De Kesel, 'Havenuitbreiding. Reden en vormgeving', *Antwerpen* 4 (1965): 1–19.
 33. 'The municipal service for urbanization has conducted informal discussions with an officer of the national planning administration, Mr Hendrickx. In order to follow an expedited expropriation procedure, it would no longer be possible to point to the Convention of 1927. Nor would it suffice, as the municipal public works service thought, to consider re-allotment as an argument ... In order to expropriate the area in question through an expedited procedure the argument should rely on the investment act (i.e. the Ten-Year Plan) and an urban plan covering the entire area should be presented' (my translation). *Report of ACUSH meeting* no. 6, August 21, 1958, ACUSH records; De Kesel, *Het Tienjarenplan 1956–1965*, 116.
 34. H. Cooreman, 'Stedebouwkundige problemen, woningbouw en hernieuwing van stadswijken', *Wonen* 10 (October 1960): 29–56.
 35. Renaat Braem, 'De 2^{de} revolutie', *Bouwen en Wonen* 12 (December 1955): 418–427.
 36. Francis Strauven, *Renaat Braem. De dialectische avonturen van een Vlaams functionalist* (Brussel: AAM, 1983).
 37. Renaat Braem, *Alles of niets*, Mededelingen van de koninklijke Vlaamse academie voor wetenschappen, letteren en schone kunsten van België – Klasse der Schone Kunsten, 1, vol. XXXIII (Brussel: Paleis der academiën, 1971), 45; G.R. Collins, 'Linear Planning', *Forum* 20, no. 5 (1968): 14–15. The linear city was a planning concept that had received a great deal of attention in Belgian planning circles since the early twentieth century. Belgian variants of Sorio y Mata *Ciudad Lineal* were proposed, and near Ghent, a small neighbourhood was built in the 1920s as an intended first step in the development of a linear industrial city along the Ghent sea canal. See Collins, 'Linear Planning'.
 38. Strauven, *Renaat Braem*.
 39. Le Corbusier and Ascoral, *Les trois établissements humains* (Boulogne: Editions de l'architecture d'aujourd'hui, 1945).
 40. Documents concerning this project are held in the *Vlaams Instituut voor het Onroerend Erfgoed* in Brussels, Renaat Braem Records (henceforth VIOE Braem Records) as project no. 114 – Lillo, Stad België.
 41. Reginald Loyen, *Functionierschuivingen in de Antwerpse haven. Een macro-economische benadering (1901–2000)* (Diss., K.U. Leuven, 2003).
 42. Due to the oil crisis and the construction of the Rotterdam Antwerp Pipeline in 1970. Jan Blomme, 'The Antwerp Port. Elements of Spatial Planning', in *Struggling for Leadership. Antwerp-rotterdam Port Competition between 1870–2000*, ed. Reginald Loyen, Erik Buyst, and Greta Devos (Heidelberg: Physica-verlag, 2003), 161–8.
 43. My translation. Loyen, *Functionierschuivingen in de Antwerpse haven*, 266.
 44. 'Advies over de vraagstukken inzake de waterwegen en havenproblemen, uitgebracht aan de regering van België en Nederland door de Heer F. Van Cauwelaert en M.P.L. Steenberghe', Van Acker Records, no. 1718.
 45. Peter Hall, *Urban and Regional Planning* (London: Routledge, 1992).
 46. De Goey, *Ruimte voor industrie*.
 47. Ibid.
 48. Ibid.
 49. The Canal Docks would only take on this function at the end of the 1980s when the Rhine link and the Delwaide dock (for container transport) were finished.
 50. Perroux, *La coexistence pacifique*.
 51. J. Gaack, 'Het woningvraagstuk in verband met de havenuitbreiding', *Antwerpen* 4 (December 1956): 159–60.
 52. 'The designed annexation of Zandvliet, Lillo and Berendrecht, first and foremost goal of the Antwerp municipal council' (my translation); Gaack, 'Het woningvraagstuk in verband met de havenuitbreiding', 160.

53. 'In addition to the technical harbor elements (lock, tunnel, etc.) ... attention was also paid to the question of dwelling, especially as the construction of the B2 Canal Dock led to the removal of the agglomeration of Lillo, except (for the time being) for the Lillo Fort. A first proposal pointed to locating the replacement residential unit on the site called "Hoge Maai", near Stabroek, to the south of the Stabroek-Blauwhoef road. Further talks however, also on the urbanism level, showed that ... it would be very difficult to build the dock as designed on the border between Berendrecht and Zandvliet. This was taken in account in the further development of the plan ... For Berendrecht and Zandvliet the only remaining option was to limit the existing agglomerations of both municipalities and develop them into a harmonious unit. A similar approach should be followed for the municipalities of Hoevenen and Stabroek, whose territories would possibly be annexed as well in the future ... All this led to a new General Plan that was adopted by the city council on December 8, 1961 ... Within the city's territory on the terrain called *Het Viswater* in the 4th district, space would be found to build a similar residential area, connected to the existing residential agglomeration' (my translation); De Kesel, *Het Tienjarenplan 1956–1965*, 119.
54. My translation. Leopold Hendrickx, 'Ruimtelijke ordening. Het Belgisch standpunt', *Bouwen en Wonen* 3 (March 1962): 100–2 as part of Stichting Lodewijk De Raet, 'De uitbreiding der grote agglomeraties. Verslagen van de conferentie nov. 61', *Bouwen en Wonen* 3 (March 1, 1962): 89–107.
55. J.F. Gravier, 'Frankrijk. L'aménagement de Paris', *Bouwen en Wonen* 3 (March 1962): 93–6.
56. Robert Shaw, 'Engeland. New Towns in Great Britain', *Bouwen en Wonen* 3 (March 1962): 90–3.
57. Groupe Alpha, *Les centres satellites*, Les cahiers d'urbanisme, no. hors série (Bruxelles: Art et technique, 1958). Clearly inspired by the British proposals for New Towns, the satellite town was a specific interpretation of the concept of decentralized residential development, adapted to the particularities of the Belgian context. Rather than being true towns, the satellite towns imagined by Group Alpha were merely residential centres, very often projected as extensions to existing villages or hamlets.
58. According to Francis Strauven, Hendrickx was part of the 'moderate modernists' of Braem's class at the Academy, while Braem was one of the 'raging modernists'. See Strauven, *Renaat Braem*, 20–22.
59. A plan of the Hoogvliet satellite town was published in J. Rutgers, 'Gemeentelijke grondpolitiek in Nederland', *Wonen* 3 (March 1960): 469–80. *Wonen* was the influential magazine of the Belgian National Housing Institute.
60. M. Van Naelten, *Suburbanisatie. Een onderzoek in het Noord-oosten van Antwerpen* (Brussel: Ministerie van openbare werken. Hoofdbestuur van de stedenbouw en de ruimtelijke ordening. Dienst Algemeen beleid van de ruimtelijke ordening, 1974).
61. Crimson and Felix Rottenberg, *Wimby! Hoogvliet. The Future, Past and Present of a New Town* (Rotterdam: NAI, 2007).

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