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PEDESTRIANIZATION OF A MULTIFUNCTIONAL SPACE: CHALLENGES AND EARLY OBSERVATIONS OF THE BRUSSELS PENTAGON

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Abstract

After recalling the definition, characteristics and functioning of the city centre, this chapter addresses three questions: what functionally characterizes a city centre in Europe? To what does this correspond in Brussels? What has the extension of the pedestrianization changed and what else may it change?

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Drawing on these three perspectives, this chapter examines the residential, economic, commercial and tourist functions of the city centre. Several empirical elements show that what has been observed in the field appears to be the result of both contemporary developments in city centres across Europe and a direct effect which may be attributed specifically to the extension of the pedestrianization. Naturally, renovation is not a new phenomenon in the Pentagon. However, a wider pedestrian zone reveals tensions between urban functions and even within different functions. It highlights the challenges facing functional and social diversity, which requires governments to assume or at least acknowledge their responsibilities and arbitrations.

Over the past three decades, the definition, delimitation, characterization and functioning of the city centre have been notably absent from urban research agendas. In a rather characteristic manner, one of the most important syntheses of socio-spatial structures of European cities at the end of the 20th century (Vandermotten et al., 1999) questioned neither the contours nor the functions of the city centres studied, meaning that, in the face of metropolization, the emergence of new urban centralities and the formation of so-called 'polycentric' agglomerations, there is a urgent need to pose questions about the city centre; if not for research purposes, then at least for urban managers.

The objective of this chapter is simple, albeit ambitious. It seeks to respond to three questions: What functionally characterizes a city centre in Europe? What does this mean in Brussels? What has the expansion of pedestrianization changed, and what else could it change?

For the purpose of answering these questions, we will use the available scientific and technical literature, and, where possible, mobilize statistical data that may be disaggregated on a sufficiently detailed scale.

1 > HOW CAN WE DEFINE A CITY CENTRE IN EUROPE?

Geographers who addressed this theme in the 1970s and 1980s (see, for example, Beaujeu-Garnier, 1972; Carter, 1981; Lévy, 1986) focused primarily on the differences between urban centres in North America and Europe. In North America, with the exception of larger agglomerations, city centres are exclusively occupied by a Central Business District, where high value-added financial activities (head offices, companies specializing in transactions, etc.) and associated proximity services (shops, restaurants) are concentrated in high-rise buildings. In Europe, on the contrary, city centres are characterized by a variety of functions, whereby houses, public facilities, diversified services, light industry, seats of power, and large office spaces dedicated to decision-making services coexist.

Despite the residential and commercial peri-urbanization observed since the 1960s, European city centres are therefore privileged places of interaction. As Lévy (1986) points out, the plurality of functions favours random encounters of different individuals (inhabitants, shoppers, workers, tourists, etc.), thus complicating exchange patterns.

Drawing on the studies undertaken by Beaujeu-Garnier (1972) in particular, it is possible to provide an overview of what, in Europe, sets the city centre apart from the rest of the urban fabric. First, at the spatial level, the city centre is often a focal point, centrally situated, for a long time surrounded by a medieval enclosure, towards which communication routes converge. While the city centre occupies a specific space, it also embodies history, as Roncayolo aptly summarizes: 'The city, in its materiality, is consolidated time' (Chesnau and Roncayolo, 2011). That the city centre is the oldest built-up and occupied area is far from trivial. Even today, this fact continues to condition a number of its characteristics.

Until the urban revolution of the 19th century, marked by strong demographic and spatial growth in European cities, the city centre was the only built-up area of the agglomerations that not only concentrated the population but also exclusively housed the inner workings of urban life (administrative, commercial, cultural, crafts and even industrial activities). There also existed – and Brussels is no exception to this rule – ancient spatial dissociations between where the civil or religious authorities were established and places of trade.

Because of this pre-industrial heritage, as transport networks developed, the centres of major European cities accumulated, within their central urban fabric, both a high economic value, reflected in land prices, and an exceptional symbolic value, expressed by the presence of iconic buildings, vectors of collective imaginaries. As a result of this initial accumulation, city centres have remained places where the main urban functions are concentrated, despite the peri-urbanization of businesses and services, first to the suburbs of the 19th century and later to more distant areas.

Various factors explain the reasons for residential areas being maintained in many urban centres in Europe, even as they whittled away in the centres of the North American model: a relatively delayed and slower development of private vehicles, the persistence of dense intra-urban transport networks, international immigration which filled the residential spaces left vacant by those emigrating to the suburbs, the persistence and/or development of local businesses and services aimed at both inhabitants and the users of the city centre, etc. Alongside these factors, the effects of which were felt as early as the 1960s, the gentrification process which began in the 1990s also helped keep housing within city centres while increasing real estate pressure for the populations already in place (Clerval et al. 2011).

The historic centre of Brussels, commonly referred to as the Pentagon, which resulted from the delimitation of the medieval city by a second enclosure in the 14th century, is a densely inhabited area. And this despite the fact that offices, places of power, public facilities (courts, hospitals, schools, sports and cultural facilities, etc.), businesses, tourist accommodation and the Parc de Bruxelles occupy vast areas.

2 > THE CITY CENTRE: A LIVED SPACE

While in the Pentagon population densities remain modest, i.e. less than 5,000 inhabitants per km^2 between the Parc de Bruxelles and the Central Station, they reach or exceed 10,000 inhabitants per km^2 in several neighbourhoods of the city centre that nevertheless accommodate a wide range of non-residential functions (around the Grand-Place and the Place de la Monnaie). Finally, in the western part of the Pentagon, from the Marolles to the Béguinage-Dixmude neighbourhoods, there are well over 15,000 inhabitants per km^2. Together with the 'poor crescent' (the working-class neighbourhoods bordering the western part of the first ring, from the lower end of Saint-Gilles to Saint-Josse, and passing through Molenbeek), these are the most densely inhabited areas in the Region (Figure 1a).

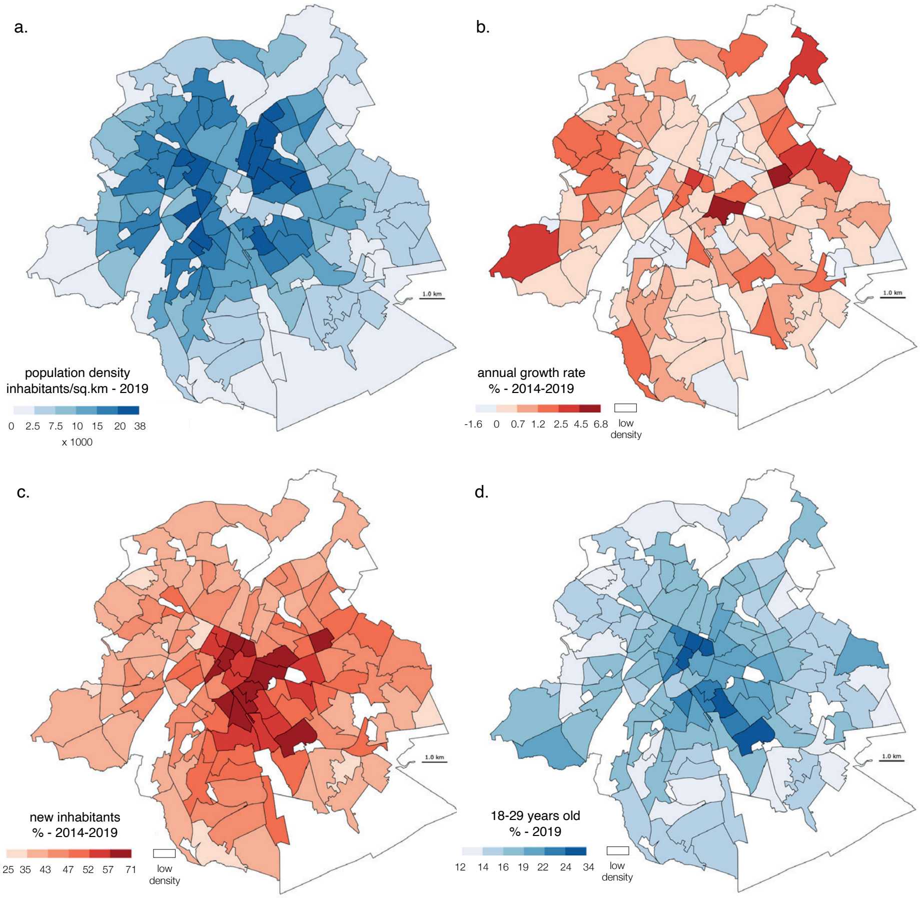
During the 20th century, the Pentagon experienced a sharp decline in population, from 140,000 to 40,000 between 1910 and 2000. Over the past two decades, the population growth has been higher than that of the regional average, and this has been achieved both by increasing the population density of existing residential buildings and by converting areas originally dedicated to other activities into residential buildings (Figure 1b).

The demographic shift observed since the early 2000s is the result of several processes.

First, immigration from abroad, which increased sharply between 2000 and 2010 across the entire Region, was concentrated in the densest and poorest areas of the city, notably in the west of the Pentagon. A detailed observation shows that, while migrant populations born in countries that may be classified as 'poor' or middle-income had a preference for the working-class neighbourhoods of the Pentagon (from Anneessens to Béguinage-Diksmuide), those from 'rich' countries preferred areas undergoing gentrification, such as the Dansaert and Sablon neighbourhoods.

Second, although the Brussels-Capital Region continues to exhibit a highly negative migration balance with the rest of Belgium, the neighbourhoods of the Pentagon are distinguished by slightly negative or even positive balances, in the context of high residential mobility (Figures 1b. and 1c .). Some of these neighbourhoods host precarious populations who often reside there for long periods, either because of material difficulties to leave the need to draw on the resources such as social networks , or because these neighbourhoods have a more affordable cost of living (Van Hamme et al., 2016). The other neighbourhoods, which are gentrified or in the process of gentrification, attract young adults, students or graduates from privileged backgrounds, at least in terms of cultural capital.

Figure 1. Population density (2019), average annual population growth rate (2014-2019), share of new inhabitants in the territory (2014–2019) and share of 18-29-year-olds in the population (2019)



Source: monitoringdesquartiers. brussels

Lastly, the recent strong demographic growth in the Pentagon may be explained by the impact of the age structure on the birth rate. In the Pentagon as a whole, the considerable levels of immigration of young adults, both from outside and within Belgium, is reflected in the substantial over-representation of young adults, who correspond to the age of the highest fertility rate (Figure 1d).

2.1 What the pedestrian zone has changed with regard to the residential function of the city centre

The construction of the pedestrian zone was accompanied by the eviction of cars from this space and by the transformation of its uses. These two phenomena have affected the residential function of the city centre in several ways.

The development of car-free zones and the associated reduction in road traffic has had two positive effects on the living conditions of inhabitants within the pedestrian zone (Hubert et al., 2017, 2020): improved air quality and reduced noise pollution.

Following widespread mobilization by citizens, civil society and academia, air pollution is now considered an important indicator of the quality of life. Recent research shows that air pollution is particularly problematic in disadvantaged neighbourhoods, in which there seem to be significantly higher pollution-related death rates compared to wealthier neighbourhoods (Noel et al. 2020). Given that air pollution concentrations in Brussels follow concentric patterns, with neighbourhoods in the city centre generally more polluted than those situated in the peripheries, analysing the impact of pedestrianization on pollution is an unavoidable issue.

To assess the level of air pollution in and around the pedestrian zone, various measurements were undertaken before and after the closure of the central boulevards to car traffic. These first surveys show that the development of the pedestrian zone resulted in a significant reduction, i.e. between 35% and 55%, in the concentration of black carbon particles, a pollutant that results from the incomplete combustion of hydrocarbons emitted by exhaust pipes (predominantly of diesel engines) and from the combustion of certain domestic heating appliances. The pedestrian zone therefore significantly reduced the concentrations of this pollutant during peak hours: there was a drop in pollution 'peaks'. However, this had almost zero impact on the substantive effect generated by sources other than local traffic, such as the traffic across the entire Region and heating (Beaujean et al., 2016). Analyses undertaken in neighbouring areas revealed an increased local presence of this pollutant, with higher concentrations of pollution in areas such as Boulevard de l'Empereur (134%) and Marché au Bois (128%).[6]

These observations therefore suggest that a public space without traffic has the direct effect of reducing the exposure of those who 'use' it by passing through it, working in it and, in general, spending time there. For those living within the pedestrian zone, positive health effects are to be expected, because the concentration of indoor air pollution is influenced in part by outdoor air pollution.

6 See the parliamentary inquiry mentioning the results of the ExPair project at http://weblex.brussels/data/crb/biq/2016-17/00037/images.pdf

Outside the extended pedestrian zone itself, the improvement in air quality is by no means established. The wider impact of a pedestrian zone on pollution depends on whether or not it is involved in a broader strategy of cleaner transport and mobility solutions. While the pedestrian zone remains a car-free island in a city structured by – or for – the car, traffic and the associated pollution simply shifts to adjacent streets. Locally, as has been partly observed, this has a low net positive impact on the city centre and its inhabitants, or a negative impact if traffic is redirected to a narrower street where the dispersion of pollutants is less evident. In this case, residents and pedestrians in the city centre benefit from cleaner air, but to the detriment of the health and quality of life of those in the surrounding areas.

To address the issue, a multi-scalar analysis is therefore crucial. Increased traffic on one street and an overall decrease in traffic are not incompatible phenomena. It is likely that the closure of the central boulevards, which are a major transit infrastructure, has played a significant role in the net reduction of vehicular traffic across the Pentagon through the 'traffic vanishing' effect. Studies have regularly shown that the closure of vehicle infrastructure generally leads to a decline in road traffic as opposed to merely a shift to adjacent streets (Crozet and Mercier, 2017).

The pedestrian zone and other (semi-)pedestrianization projects in the city can provide a valuable opportunity to practically and symbolically redefine its pedestrian spaces. This can only succeed if a car-free street is part of a neighbourhood renovation plan and is supported by effective strategies to avoid traffic percolation into neighbouring areas and to ensure that the area becomes accessible through cleaner and/or less punitive options for residents (see Mezoued et al., 2020).

With respect to vehicle-related noise, observations (Fenton et al., 2020) suggest that there has been a decrease in general road noise in pedestrian zones. However, most importantly, a modification of the sound landscape has been observed. Even the traffic noise itself has changed and is now focused on the streets open to motorized traffic (including buses) and crossing the pedestrian zone, or the horns of the vehicles involved in the numerous conflict situations on the pedestrian zone. It has been reported that some inhabitants consider these intermittent, rather than background, noises to be more stressful.

Moreover, pedestrianization has helped transform the uses of the space concerned, making it 'favourable' for hotels, restaurants and catering services (Horeca industry) and for festive events, while encouraging the 'stagnancy' of party-goers and alcoholics living on the margins of society in the public space (see Rosa et al., 2020 and Fenton et al., 2020). These uses are associated with various nuisances, such as the noise of partygoers, and, above all, the noises associated with people leaving bars and being inebriated. Inhabitants have reported these noises as more annoying than traffic noise, because they are intermittent and occur in the middle of the night. In the absence of management by the authorities, inhabitants have to deal with a space that is probably less noisy 'on average', but is actually less quiet at a number of 'key periods' that guarantee liveability (predominantly nights and early mornings).

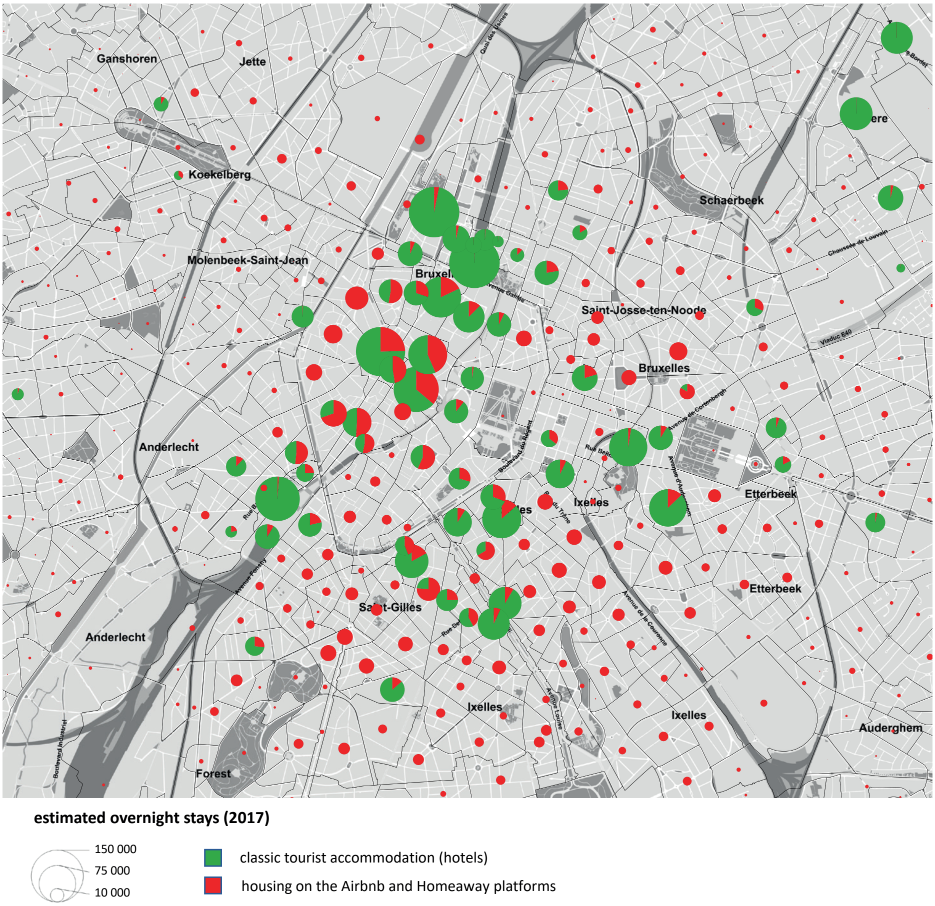
The pedestrian zone is therefore a quiet space in terms of car traffic, probably less polluted than before and potentially less noisy on average, but it is not always quiet throughout the night. Outside the pedestrian area, it is unlikely that the situation improved ubiquitously in terms of pollution or traffic noise. In some streets, the situation most likely even deteriorated. In the case of Brussels, and despite a likely decrease in traffic throughout the Pentagon, traffic nuisances have partly shifted outside the pedestrian zone and now affect the more working-class neighbourhoods located to the west (Aneessens) and south (Marolles) of the Pentagon. At the spatial level, therefore, there are arguably winners and losers of pedestrianization.

2.2 What the pedestrian zone may change relative to the residential function of the city centre

While the issue of the socially contrasting effects of pedestrianization may be addressed at a particular moment in terms of its spatial dimension, it may also be addressed diachronically, in terms of its temporal dimension. Indeed, the development of a pedestrian zone is a signal which, if it does not generate, may yet reinforce certain developments, particularly with regard to the residential real estate market. In the latter context, property value is determined by the intrinsic characteristics of the property, but also by the environment in which it is located. However, the characteristics of the properties (size, equipment and price) largely determine the profile of the (future) inhabitants. This means that the inhabitants of the pedestrian zone today will not necessarily be those of tomorrow, especially in a space where residential movements abound, and the composition of inhabitants changes at a relatively rapid pace.

In this regard, it is worth mentioning that the perimeter of the Pentagon has experienced a sharp increase in the number of tourist offers (furnished rooms and apartments) rented for short periods on platforms such as Airbnb and HomeAway. This development is itself likely to induce a process of tourism gentrification, both indirectly, through an increase in rent and residential property prices, and directly, through the eviction or non-replacement of tenants when leases end (for a summary, see Cocola-Gant, 2019).

> **Figure 2.** Estimated nights in hotels and accommodations available for rent on Airbnb and Homeaway in 2017



Source: H. Perilleux (ULB) from Statbel, Brussels Economy and Employment, AirDNA

Inexistent in Brussels 10 years ago, Airbnb and HomeAway accounted for 2.3 million overnight stays in 2019, or 25% of all regional overnight stays, with an average growth of 40% per year between 2015 and 2019. The short-term accommodation offered upon these platforms is highly concentrated in the Pentagon (21% of the regional offer) and in the eastern area of the first ring road (34% of the regional offer), from the Haut de Saint-Gilles neighbourhood to the European neighbourhood, via Ixelles. The Pentagon distinguishes itself through its high proportion of fully leased properties, of properties possessed by multiple owners, and of properties frequently put up for rent. In other words, this is a privileged space in which the investment logics associated with hosting platforms play out. It is also in this part of the city, which is characterized by a strong social heterogeneity of its inhabitants, that one finds the strongest competition between tourist accommodation platforms and housing for precarious and even middle-class populations. Conversely, in the more peripheral areas, where the opportunistic logic dominates, i.e. the occasional renting of a room in one's house to a private individual, little pressure is exerted on the housing market.

Within the Pentagon, the offer of furnished accommodation on the platform was primarily implemented in the Îlot sacré area and the adjacent neighbourhoods. The statistical areas around the pedestrian zone (Grand-Place, Bourse, Bourse-Nord-Ouest et Monnaie) provide by themselves one-third of the entire properties and a quarter of the rooms available for rent on Airbnb and HomeAway. Even more significantly, there are nearly 120 entire properties for rent per 1,000 inhabitants and just over 20 whole properties per 100 private dwellings. Elsewhere in the Pentagon, the relative weight of furnished tourist accommodation is much lower, with values ranging from 4 (Marolles) to 8 (upper part of the town) entire properties for 100 private dwellings. The tourism function thus exerts strong pressure on the residential housing market within the pedestrian zone itself. While a reduction in the number of inhabitants is yet to be seen, it is likely that the conditions of access to housing for the working classes have already deteriorated and will continue to do so in the future, unless there is a long-term slowdown of tourism flows.

This issue emerged quite early in the debates on the pedestrian zone, with associations and members of the scientific community rapidly highlighting the need to act *on* and *through* housing. Property rights and housing regulations are a prerequisite for establishing some form of equilibrium: for instance between the need to revitalize the city centre and the risk of gentrification, and between the rise of temporary housing (Airbnb, hotels, bed and breakfasts, etc.) and the need for permanent residents (Hubert et al., 2017). The need to maintain residential functions (including for the working-class populations) is thus more acute in a pedestrian zone placed under increasing pressure from tourism.

3 > THE CITY CENTRE: A WORKING AREA

The city centre is not a Central Business District (CBD) in the strict meaning of the term. Indeed, in the centre of Brussels there has been no complete elimination of residential functions, industrial activities, or even certain forms of commerce in order to set up a space where administrative tertiary activities (head offices, public decision-making centres) and the associated services (businesses focused exclusively on office clientele and Horeca) are exclusively concentrated. In the Pentagon itself, apart from the very functionalist Philips tower and its esplanade above street level, the administrative centre of the City and the Post Office, and the administrative area of Pacheco Boulevard, there are few very tall buildings which occupy a large surface, due to the high land prices associated with centrality. The Brussels CBD will be referred to rather in regard of peri-central spaces, such as the European Quarter and the Northern Quarter, where the defining elements of this urban

Table 1. Number of employment opportunities recorded by the social security agencies (workstations), by place of employment in 2011, by sector of activity. The workstations only very partially include workers from international institutions. Jobs that could not be situated at the statistical sector level were accounted for at the level of the municipality. Self-employment is located at the head office. The north–south axis is reconstructed by combining the statistical sectors adjacent to the boulevards, from Rogier to Midi: A001, A002, A01-, A02-, A03-, A20-, A21-, A32-, A35- and A83-

NACE	**Sector of activity**	**North-south axis**		**Pentagon**		**Brussels-City municipality**		**Brussels-Capital Region**	
		#	*regional share*	#	*part régionale regional share*	#	*regional share*	#	*regional share*
K	Financial and insurance activities	13,490	*21.1%*	19,849	*31.1%*	31,293	*49.0%*	63,841	*100.0%*
O	Public Administration	13,054	*10.6%*	37,205	*30.1%*	55,571	*45.0%*	123,617	*100.0%*
G	Wholesale and retail trade; repair of motor vehicles and motorcycles	4,689	*6.2%*	7,516	*9.9%*	20,929	*27.5%*	76,208	*100.0%*
I	Accommodation and catering	4,348	*14.3%*	6,542	*21.5%*	11,652	*38.3%*	30,392	*100.0%*
N	Administrative and support service activities	4,211	*7.6%*	7,436	*13.4%*	21,602	*38.8%*	55,616	*100.0%*
P	Education	2,467	*5.0%*	5,420	*11.1%*	11,024	*22.5%*	48,971	*100.0%*
Q	Human Health and Social Action	2,166	*3.6%*	7,599	*12.6%*	14,270	*23.6%*	60,490	*100.0%*
STU	others	1,984	*6.8%*	4,911	*16.9%*	11,988	*41.2%*	29,101	*100.0%*
M	Professional, scientific and technical activities	1,427	*2.9%*	4,981	*10.0%*	16,544	*33.2%*	49,759	*100.0%*
R	Arts, entertainment and recreation	1,295	*14.4%*	2,606	*29.0%*	3,832	*42.6%*	9,000	*100.0%*
H	Transportation and Warehousing	953	*3.0%*	2,091	*6.5%*	9,359	*29.3%*	31,940	*100.0%*
ABCDEF	Agriculture and Industry	691	*1.3%*	4,348	*8.3%*	12,448	*23.8%*	52,194	*100.0%*
J	Information and communication	385	*1.0%*	3,107	*8.4%*	8,873	*24.0%*	36,995	*100.0%*
L	Real estate activities	153	*2.2%*	436	*6.1%*	1,684	*23.7%*	7,102	*100.0%*
	Total	**51,313**	**7.6%**	**114,047**	**16.9%**	**231,069**	**34.2%**	**675,226**	**100.0%**

Source: IRIB/IGEAT calculations based on Belgium Statistics, 2011 Census typology, including the skyline and the magnitude of vertical rather than horizontal buildings, are fully present (Vandermotten and Wayens, 2009).

Although the administrative function is not dominant in the Pentagon, it is very much present, because almost a third of the employment opportunities in the financial sector or public administration in the Brussels-Capital Region are located there, with a significant proportion bordering the north–south axis located around the boulevards (in 2011, respectively 21.1% and 10.6%, see Table 1). Adding the administrative and support services raises the figure to approximately 30,000 administrative jobs identified in the neighbourhoods along the North–South axis.

Given the strong presence of commercial and tourist functions, retail and hospitality (Horeca) services also constitute a large proportion of the jobs along the north–south axis (close to 9,000 of the 14,000 jobs listed in the Pentagon). The hospitals and schools present entail employment in the health and education sectors of more than 4,500 jobs on the north–south axis. While this may appear a considerable figure at the Pentagon level, compared to the proportion of these types of jobs across the entire Region, it is actually quite low. Lastly, we must highlight the relative importance of the arts, entertainment and leisure activities sector (14% of regional employment on the north–south axis, 29% in the Pentagon), which reflects the rich cultural life of the city centre.

The city centre thus remains a major employment hub, relatively diversified in terms of sectors and the economic base of activities. One may find both local activities, such as commercial services and activities requiring more extensive recruitment, benefiting from the centrality of Brussels in terms of employment or associated with the region's cultural or touristic influence.

3.1 What the pedestrian zone may change for business mobility in the city centre

Naturally, the observations and issues associated with the evolution of the living environment mentioned above also largely apply to the working environment of the Pentagon, involving many of Brussels's inhabitants and commuters. This view, however, may be supplemented by elements more directly associated with employment, in particular in terms of home/work mobility or deliveries.

The mobility of active workers in and around the Pentagon, and the ways in which this mobility has changed, have been analysed primarily by two groups of researchers. Ermans and Huynen (2019) processed data from the 2014 and 2017 Company Mobility Plans (CMP) for businesses with more than 100 workers within a 300-metre radius of the pedestrian zone. The MOBI team of the Vrije Universiteit Brussel (VUB) on the other hand, conducted an online survey of 2,406 workers working in the Pentagon (Keserü et al., 2018). Both analyses show that public transport, particularly rail transport, is the dominant mode of transportation for workers working in and around the pedestrian zone. While the CMP analysis shows a modal share of public transport of approximately 75%, the online survey estimates it to be just under two-thirds. This strong modal share may be explained by the good accessibility of public transport: urban, with STIB underground metros, trams and buses, regional, with De Lijn and TEC bus lines, and national, with the three main train stations of the country, i.e., Brussels North, Brussels Central and Brussels Midi, in the immediate vicinity of the pedestrian zone. Moreover, the strong presence of banking and insurance services, head offices, and public administration bodies means that numerous employees commute from relatively far away.

The data from the CMP show an average commuting distance of approximately 30 kilometres between, which is higher than the regional average in Brussels. The train is the most common mode of transport for these longer distances (Strale, 2019). As a result, few people walk or cycle to work, i.e. approximately 5%, which is less than the regional average. Nevertheless, between one-in-five and one-in-six workers have a parking space at work, and 13 to 15% have a company car, which corresponds to the regional average.

Changes in modal shares are difficult to assess because of the small decrease. Moreover, information on this subject may be contradictory, depending on the sources and methodologies used. The CMP analysis shows a significant decrease in train usage, an increase in the use of STIB's public transport, and an increase in the use of De Lijn and TEC interregional buses. In general, the use of public transport has declined in favour of cars. A possible explanation for this may be the increase in the proportion of workers with a company car, which would affect, in particular, commuters living outside Brussels and travelling by train. It should not be forgotten that the CMP sample is comprised of large businesses. In contrast, the MOBI survey, which was based on individual rather than on company statements, is more optimistic about the evolution of public transport usage. Ermans and Huynen suggest several possible explanations for this divergence: respondents may tend to give positive impressions about their behaviour and to align their responses with current trends. Moreover, with multimodal transport developments, an increase in the use of public transport does not necessarily mean a change in the main transport mode declared by the CMP.

The issue of deliveries is another aspect of business mobility that must be considered (Sotiaux and Strale, 2017). With the exceptions of retail trade and the hospitality industry, most businesses directly affected by the pedestrianization of the city centre fall within the office sector. Their supply primarily depends on road mobility. Vans are the most frequently used mode of transport, although these businesses frequently receive a not-negligible number of heavy-duty vehicles. This modal breakdown is primarily due to the nature of the transport flows: they include deliveries of office equipment, food products, machinery, and also parcels they receive or ship. Although the number of deliveries per worker is much lower than in the retail trade, the large size of the companies concerned nevertheless leads to a large volume of deliveries in and around the pedestrian zone. Deliveries and shipments consist primarily of cartons , and particular constraints are associated with the value of goods in the banking sector, and with the urgency of shipments and deliveries within the sector in general with regard to parcels. From this perspective, it is evident that the share of unplanned shipments or receipts, which is approximately one third, is higher than in retail trade.

The extension of the pedestrian zone and the constraints it imposes on delivery times have been highlighted as a potential obstacle to these urgent flows, but also to access for technicians involved in urgent infrastructure or office equipment repairs. As far as parking is concerned, the large companies in the sector are distinguished by the frequent presence of parking sites situated outside the road network, but access to these sites is considered problematic by a majority of stakeholders surveyed.

Overall, the pedestrianization of the city centre appears to have had minimal impact on the mobility behaviour of people working in the city centre. An aspect that has received scant attention to date is the evolution of employee practices in the middle of the day and after work. In addition to the small number of access difficulties that are likely to be resolved gradually, the impact on the logistics of companies appears to be particularly sensitive to less predictable flows and interventions involving deliveries that fall outside authorized delivery hours. As with the flow-leaving businesses, one must therefore also reflect on logistical issues (as well as technical interventions) that cannot be addressed through a 'simple' definition of delivery schedules. This is not to mention private construction sites, which require lorries for long hours and over longer periods.

4 > THE CITY CENTRE: A COMMERCIAL SPACE

Although the term 'hypercentre' is often used to refer to the commercial function of city centres, it remains largely undefined. It may be used in a very broad sense, corresponding, for instance, to the areas within the city boundaries, or even to an extension of the city, or, on the contrary, in a very narrow sense, reducing the city to its 'main streets'. There are three possible meanings of the term hypercentre, and these fit perfectly together, much like Russian dolls (Grimmeau et al. 2004).

The narrowest possible definition of the term corresponds to the 'main streets' as seen by real estate brokers, where the most ambitious brands are concentrated, those looking for the highest number of occasional shoppers and willing to pay exorbitant rents.

The second, intermediate, definition comprises all the streets with a commercial structure typically found in city centres (clothing, shoes, jewellery, perfumery, leather goods, chocolates, waffles, etc.). This covers a more extensive space than the former, with ambitious brands pushing similar shops run by self-employed workers, as well as less ambitious brands or those associated with specific segments of the population, to adjacent streets.

Lastly, the broadest definition incorporates specialized neighbourhoods and specialized services, both of which can only exist with the city centre's extensive customer catchment area. In specialized shopping areas, one may find businesses present elsewhere, albeit in lower proportions, for instance restaurants, antique shops, sex shops, etc. Specialized businesses do not necessarily correspond to 'rare' shops but rather to rare specializations of businesses that already exist or to particularly reputable businesses, justifying the need for an extensive catchment area, such as, for instance, a store classified as toy shop but actually specializing in scale models; one classified as a garment manufacturer but specializing in uniforms or other occupational clothing; a footwear shop offering half sizes and different shoe width options; reputable pharmacists, cutlery manufacturers or cheese makers, etc. Specialized shopping areas are thus *not characterized by a strong over-representation of a certain type of business* but rather *by a strong presence of diversified specialized shops*.

A particular characteristic of Brussels is that it has two spaces that attract ambitious brands: the city centre, around Rue Neuve and City II, and the upper part of the city that extends between the Porte de Namur and the Louise area. The two spaces are extended, by a specific commercial offer, from Rue Neuve to Boulevard Adolphe Max, Rue des Fripiers, Le Marché aux Herbes, Agora Gallery and Saint-Hubert; from the top of the city towards Avenue Louise beyond Place Stéphanie, towards Boulevard de Waterloo and Rue de Namur, towards Chaussée de Wavre. Several extensions may stand apart, such as Rue Antoine Dansaert. Specializations in Horeca are primarily concentrated in and around Sainte-Catherine, Saint-Géry, Rue des Bouchers, Marché aux Fromages and, in the upper part of the city, Rue Jourdan and the end of Avenue de la Toison d'Or on the side of Porte de Namur. The neighbourhoods around the Grand-Place are highly oriented toward a touristic clientele.

The Sablon is the area of antique dealers, a specialization that extends towards the Marolles, which, however, is more focused on decoration. The luxury business is also divided into two areas: one is classic, with well-established brands such as Cardin, Vuitton, Ricci, etc. on Boulevard de Waterloo, the other is trendy, with designers better known to the wealthy young people conscious of contemporary fashion trends on Rue Antoine Dansaert.

In the upper part of the city, the beginning of the Chaussée de Wavre, commonly referred to as 'Matonge', is the meeting place for Congolese and other Africans from Belgium and the surrounding area (specialized hairdressers, clothing fabrics, fruits and vegetables, music and videos, travel agencies, etc.). In addition to several bookkeepers, Boulevard Lemonnier concentrates Moroccan cultural businesses (books, music, specific keyboards , religious articles, etc.) and services (Moroccan banks, hairdressers, travel agencies, etc.). This commercial fabric clearly differs from the businesses closer to neighbourhoods with a strong Moroccan or Turkish presence.

But the retail hypercentre is probably even larger, though it would, in an extension, include more spread out centres which also benefit from Brussels's customer catchment area: bazaar-style shops on Rue de Brabant, prostitution on the nearby Rue d'Aerschot, near the Gare du Nord, Turkish restaurants on the Chaussée de Haecht, etc.

Regarding retail activities, both the Pentagon and the upper part of the city are among the areas at the heart of the Brussels two-pole hypercentre. They are characterized by the diversity and relative specialization they offer, particularly in the areas on the outskirts of the hypercentre, where rents are lower. This also leads to a multitude of customer profiles, who mix in some spaces, but not in all areas of the retail centre, making multiple buyer journeys possible in the city centre.

4.1 What the pedestrian zone changes for retail businesses in the city centre

From 2015, businesses which had a high visibility upon pedestrianized streets had to start dealing with the widening of the pedestrian zone to a broader portion of the Pentagon. Indeed, the pedestrianization of commercial spaces began in the 1970s (including Rue Neuve) and extended to other commercial spaces in the city centre (notably Ilot Sacré). The impact of these transformations on the functioning of businesses has been the subject of many studies focusing on European cities (Mérenne-Schoumaker, 2008). These studies have identified the common features of these developments:

- faster changes in retail operator;
- growth in the share of integrated retail and decline in the share of self-employed businesses;
- decline in the supply of common products and a shift towards semi-common, exceptional and entertainment products;
- strengthening of a model focused on mass consumption, with high profit margins and a weak presence of luxury businesses;
- the near-disappearance of activities dependent on direct access by car;
- development of the Horeca sector, which benefits in particular from the possibility of extending its terraces.

The extension of the pedestrian zone in the Pentagon and the drastic restriction of road access has largely expanded the zones where pedestrians have priority. Never have the latter occupied such a large space since cars first emerged (Figure 3). Although the lack of hindsight prevents us from examining the evolution of commercial structures, changes in supply within these perimeters are evident, and consistent with the observations associated with the previous wave of pedestrianization, albeit with slight differences. The relative weight of catering services has probably become much greater, because it is both a growing sector in the most central urban areas and one of the major beneficiaries of the increased tourist presence and, more broadly, of changing lifestyles. The expanded pedestrian zone has probably become less exclusive of the food sector as well, although this is likely to be primarily of benefit to organized brands, which are developing new adapted formats. It remains uncertain, however, whether the increase in pedestrian-priority zones will help strengthen textile retail (at least in terms of the number of outlets), which is subject to the double pressure of online commerce and developments at the periphery of the city centre. It will probably be reluctant to increase its number of urban outlets. More broadly, in a context where the demand for commercial real estate is showing signs of weakness nationally (Grimmeau and Wayens, 2016; Wayens et al., 2020), the question remains as to whether the multiplication of upgraded commercial spaces in the city centre will (not) be accompanied in the long term by a difficulty in finding tenants.

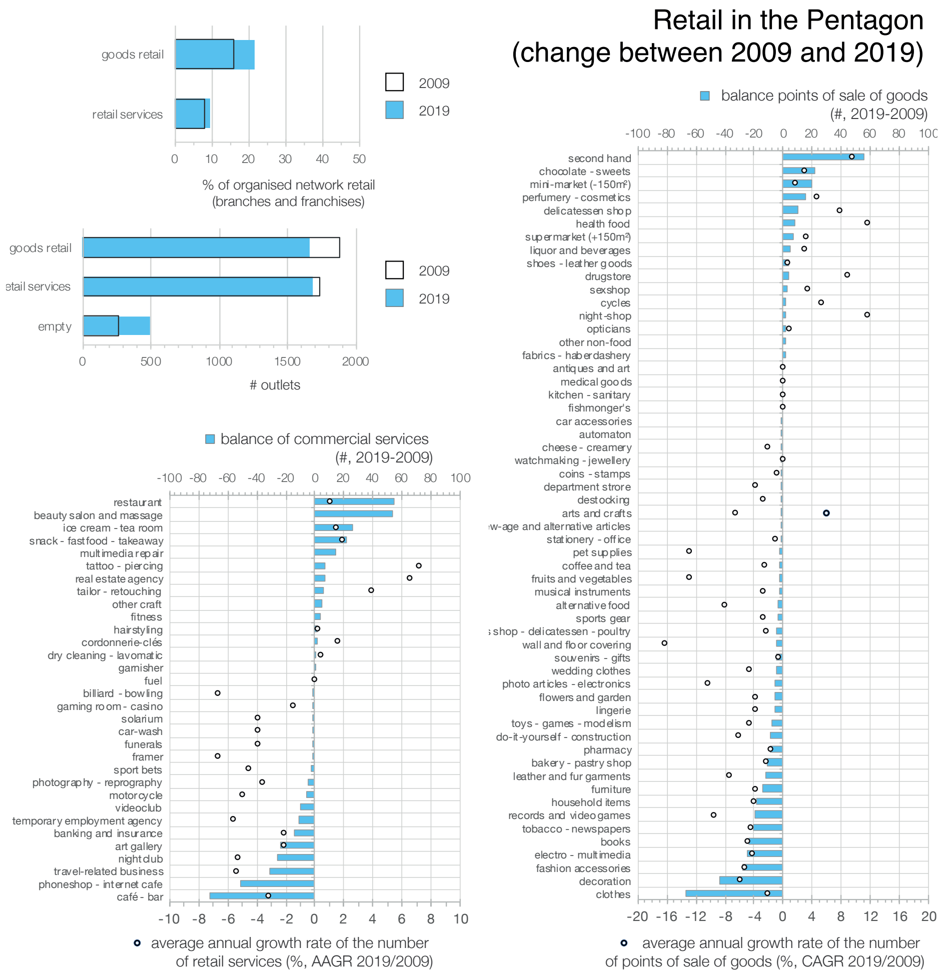
This observation highlights the extent to which a pedestrian zone must be considered within its metropolitan context. An analysis of the scant recent literature shows that the success of this zone is explained in part by the presence of a critical mass of residents (or tourists) in the city centre, the existence of an efficient public transport network, low car dependency in the catchment area, but also the implementation of policies discouraging the development of commercial areas in the region's outskirts (Boussauw, 2016).

Moreover, the development of the central boulevards also reveals the intention of making this part of the city more attractive for tourists. However, the degree of 'touristicity' of a business, i.e. the share of its activity that is directly generated by tourism, varies depending on the business sector (it differs significantly between a souvenir shop and a DIY shop, for example). This impact of tourism on businesses may also vary depending on geographic location, with a possibly higher impact for a larger proportion of the city centre than previously (Wayens and Grimmeau, 2003; Wayens and Grimmeau, 2006).

Regardless of the changes observed in the nature of the businesses present, two elements connected to the extensive pedestrianization of the city centre seem to have already had an impact on the day-to-day operations of businesses.

In terms of deliveries, the logistics of businesses in the city centre is distinguished by the exceedingly high use of vans. Indeed, these light-duty vehicles offer flexibility and frequent transport of small volumes which correspond to the expectations of many independent retailers. These logistics are also highly individualized,because of the difficulty of grouping flows from multiple sources and collaborating between retailers with different and sometimes contradictory expectations. Flows are concentrated at the opening hours of the businesses,

Figure 3. Changes in commercial supply in the Pentagon between 2009 and 2019



Source: Calculations by B. Wayens (ULB), based on Locatus field inventories

and this may be a point of conflict with pedestrian traffic, other road traffic, and with the regulations that expect deliveries to take place as early as possible. Integrated retail, i.e. brands and their franchises, revolve around more centralized logistics than sole retailers, and thus require more heavy-duty vehicles; lorries and semi-trailers (Strale et al., 2015). This is an important parameter to consider, because it implies facilities that are adapted to accommodate such vehicles, including in the pedestrian zone. Following the redesigning of the city centre, economic actors' rates of satisfaction regarding their delivery conditions in and around the pedestrian zone remained relatively high, even though they dropped significantly. A final interesting element is the gap between the solutions proposed by the authorities and praised in the scientific literature (deferred deliveries, urban distribution centres, bicycle deliveries) and professionals' lack of interest.

This reveals authorities' difficulties in understanding and managing this issue, which is optimized at the level of the individual merchant, who is able to manage it at both the organizational and financial level (Sotiaux and Strale, 2017).

On a completely different level, many business owners deplore the growing presence of homeless people and the increased levels of begging. The increase in homelessness is widespread in Brussels (Quittelier and Horvat, 2019) and has been reinforced by migrant flows associated with political instability and numerous international conflicts. As long as the care of these people continues to be insufficient and limited to only shelter for the night, the pedestrian zone, which primarily consists of commercial spaces, will remain a refuge for populations that are marginalized in urban space for many reasons: social control, specific urban morphology, availability of cardboard boxes, pedestrian flows, etc. (Malherbe and Rosa, 2017; Rosa et al. 2020). This affects the functioning of businesses in terms of image, but also occasionally practical terms (for instance, difficulties with deliveries in the early morning, extra cleaning, etc.). A primarily safety-oriented response is obviously inadequate given the extent of this social crisis. It is high time to invest massively, jointly with business owners, in a pragmatic and humane management of the issue of marginalization and homelessness in the public space, especially when this space is adjacent to a semi-public space (i.e. one accessible to the public) such as a commercial zone.

5 > THE CITY CENTRE: A TOURIST AREA

The embodying of new practices has led to drastic changes in the patterns of tourism across cities in Europe. For example, greater importance is attached to festive events, nightlife and visits to 'off-the-beaten track' places. At the same time, there has been a surge in the use of alternative forms of accommodation, such as bed and breakfasts, couch-surfing and furnished tourist accommodation rented on platforms such as Airbnb. Despite these developments, the urban tourist space has remained rather limited on the whole (Gravari-Barbas and Fagnoni, 2013).

The Brussels metropolis has not escaped this strong trend. Indeed, a large majority of the attractions, tourist services and visits are concentrated in the Pentagon, especially around Ilot sacré, les Boulevards Centraux and the Mont des Arts. In this sense, the Pentagon is indeed a Central Tourist District, in the sense that it is a 'space of embodied tourist practices, which combines places to visit, stroll through, shop, eat, and, to some extent, reside' (Duhamel and Knafou, 2007: 49). As with other Central Tourist Districts, Brussels asserts its identity less through a specific landscape (such as the office towers of a Central Business District) than through the considerable presence of tourists.

In terms of tourist attractions, several indicators show the predominance of the Pentagon. In tourist brochures, for instance, the Pentagon is present in more than 60% of the pages devoted to the description of places to visit, 64% of the section 'What to see and do' in the 2010 edition of the *Guide du Routard* dedicated to Brussels, and 75% of the pages of the section 'Discover Brussels through its six major quarters' in the 2007 edition of the *Cartoville* Guide (Gallimard) for Brussels. Similarly, two thirds of the 15 'trendy bars for a relaxed aperitif or rock evening' mentioned by *Le Guide du Routard* are located within the small ring. Lastly, 25 (62%) of Brussels's City Sightseeing Hop On Hop Off bus stops are located in the Pentagon, mainly near Sablon, Parc de Bruxelles, Grand-Place and Place de la Monnaie.

The cultural offer, which targets tourists, visitors and the region's residents in equal measure, also exhibits a high degree of spatial concentration. For instance, almost a third of the museums in Brussels are located within the Pentagon, mostly between the Mont des Arts and the Grand-Place. While this distribution is partly a legacy of the decision that prevailed in the 19th century to place 'national' museums in a central location, it also reflects a contemporary trend. Indeed, the majority of new museums opened in Brussels since 2000 are located within the Pentagon. Moreover, museums found in central locations also attract greater attention from tourist promotion bodies and published guides.

Tourist services are also concentrated within the Pentagon. In 2015, 40% of hotels and bed and breakfasts within the region were established there, particularly on both sides of the North–South axis, between the Bourse building and Place Rogier (Figure 3). While the hotels in the city centre are, on average older than those in the rest of the region, they offer average capacities, reputations and prices that are remarkably similar to them. Similarly, the market share of hotel chains and the occupancy rates do not differ greatly from regional trends.

As with museums, the spatial concentration of hotels results in part from the region's legacy: at the beginning of the 20th century, most of the Brussels hotels mentioned in tourist guides were located within the Pentagon, notably along the central boulevards, between the Bourse building and Place Rogier (Jourdain, 2011). This structure persists even today, with a progressive reduction associated with the emergence of new hotel complexes, first in the Louise neighbourhood then in the European quarter.

More surprisingly, new forms of tourist accommodation, such as furnished tourist accommodation available on booking platforms such as Airbnb, are more numerous in the Pentagon than in other parts of the city, both in absolute (number of properties) and relative (percentage of properties available for rental in relation to the total available accommodation) terms (see Section 1 above).

Although we lack accurate data on the actual number of tourist visits to the different parts of the city, it is now possible to obtain a first impression by analysing geolocated activity on social networks. The location of Tweets that visitors publish from Brussels, and the photos they post on Flickr, reveal a very simple geography. With the exception of the Heysel Plateau, the European Quarter and the Gare du Midi, tourists almost exclusively visit the Pentagon, with a preference for the axis between the Palais de Justice and the Parliament, the Ilot sacré and the Sainte-Catherine neighbourhood. Museum attendance data confirms the touristic and cultural attractiveness of the city centre. Apart from the Museum of Natural Sciences (Parc Leopold) and the Royal Museums of Art and History (Cinquantenaire), all museums that receive a significant number of visitors are located in the Pentagon, such as the Royal Museums of Fine Arts and the Belgian Comic Strip Centre.

5.1 What the pedestrian zone changes for tourism in the city centre

The tourism sector plays a crucial role in the city's economic growth and creates jobs that cannot be easily relocated. While it offers new opportunities for the so-called creative industries and for the enhancement of cultural heritage, the local benefits revolve primarily around two sectors of activity: accommodation and retail (restaurants and cafes, alongside the sale of goods and services). *The recreational turn* (Stock, 2007) is now affecting major multifunctional cities in which tourism was, for a long period of time, simply one economic activity among others. Tourism is becoming a more decisive factor of urbanity and attractiveness. In this context, major cities such as Brussels are increasingly witnessing their space become structured by and for tourists.

Commercial activities, which have a strong presence within the pedestrian zone, have played a major role in this restructuring, either passively (by shifting towards offers tailored to the reality) or actively (by transforming commercial activities into a major element of tourist attractiveness and placing them at the same level as the events and major conference, cultural or leisure facilities). Clearly, the pedestrianization of the central boulevards may be interpreted as the city centre's attempt to adapt public spaces to tourists' expectations. And naturally, this (increased) tourism has been a source of worry and protests. People have begun to oppose the reorientation of the use of space in favour of tourists, who, in their view, threaten the viability, functioning and sustainability of the city for its residents and other users (Hubert et al., 2017; Fenton et al., 2020).

The pedestrian zone also offers a space where multiple events may be organized more easily (from the Christmas market to the start of the Tour de France). It is also a particularly unhindered space for tourists, who are essentially pedestrians. There is no doubt that the pedestrian zone contributes to the spread of tourists in the city centre. This reinforces its position as a tourist area, especially when new tourism facilities are still emerging within the pedestrian zone (one naturally thinks of the reallocation of the Bourse building). In the coming years, changes will have to align with the wishes expressed by the Brussels Region, of more evenly distributing tourism across all 19 municipalities.

Tourists appear to strongly appreciate this layout of the city centre as a pedestrian zone. Foreign tourists account for 22% of the people who visited the pedestrian zone in the survey conducted by the Mobi research team of VUB (Keserü et al., 2018). Among those who use the city centre, they view the extension of the pedestrian zone most favourably, with the survey suggesting that 80% of them would support this measure. Indeed, very few foreign tourists visit the city centre by car, and they primarily use the space on an occasional basis and for leisure activities. Although directly concerned, they are hardly involved in the divisions and debates that have taken place around this redevelopment of the city centre.

6 > CONCLUSION: WHEN CARS LEAVE THE CITY CENTRE, DOES ANYTHING REALLY CHANGE?

The city centres of European metropolises are unique spaces that still benefit (or suffer) from the accumulation of long periods of urban history. Our survey of the socio-economic functions that the Brussels Pentagon exhibits highlights an important legacy, i.e. its wide variety of uses. Residential function, administrative, commercial and public service activities, and tourist and leisure facilities coexist. Moreover, there is great diversity within each function: diverse resident profiles, commercial offers, and touristic and cultural opportunities.

This diversity of functions leads to the coexistence of different users within the city centre, notably, but not exclusively, across different timescales. The spatial stratification, which is often more vertical than horizontal, implies that a pattern of specialization by streets or neighbourhoods often needs to be nuanced. A shift from a sectoral to an intersectoral perspective is probably increasingly required. Lastly, it should not be forgotten that while these coexisting functions may receive positive feedback, they may also lead to conflicts in terms of use and competition, particularly reflected in the property market.

According to the public authorities, the pedestrianization of the central boulevards had a two-fold objective: 'To shift from a utilitarian city designed for car transit, to a city shaped for its inhabitants and where it feels good to live'; and 'to revitalize economic activity in the centre'[7] by targeting visitors (workers, tourists, consumers, culture enthusiasts, etc.) in the main.

The debates around the pedestrian zone have revolved around the extent to which the opposition between 'inhabitants' and 'visitors' has fuelled controversies (Hubert et al., 2017), implying that the two objectives of public authorities would be difficult to reconcile, due to the fact that the zone would prejudice certain categories of actors, namely the inhabitants and/or business owners in the city centre, depending on the views they support.

7 Ville de Bruxelles, 2015. *Ensemble, faisons battre le cœur de Bruxelles*, p. 3.

Comparing our description of the main uses of the city centre with the effects of pedestrianization that are already evident reveals that this somewhat simplistic binary opposition needs to be reformulated. The real question, then, is which inhabitants (those within pedestrian zones or in adjacent streets, which household type or level of wealth) and which retailers (specialists or generalists, Horeca or others, sole retailers or franchises), but probably also which tourists (party goers or families, excursionists, city-trippers or long-term visitors, users of hotels or furnished accommodation), are the winners and losers of the pedestrianization of the city centre? We have chosen to omit the workers and commuters in/of the city centre from this debate, upon whom this new pedestrian zone appears to have a relatively neutral impact (although, admittedly, we know little about possible practices in the middle of the day and after work).

The available empirical evidence suggests that what has been observed is a result of both contemporary developments in city centres and a (direct) effect that may be attributed to the extension of pedestrianization. It should be noted that urban renewal is far from a new phenomenon in the Pentagon (Van Criekingen, 2013). However, affecting a vast and symbolic space that must be 'justified' insofar as the impacts of this renewal may substantially affect certain actors such as retailers, the pedestrian zone lays bare the tensions between and within the different urban functions (between different types of retail, but also between different types of housing). This highlights the issues associated with functional and social diversity that require the authorities to assume (or at least acknowledge) their responsibilities and arbitration.

Moreover, in several places there appear to exist genuinely different spatial impacts, which strongly suggests that the issue must be considered from beyond the local perspective, taking other scales into account: the pedestrianization of specific streets must be (better?) aligned with a regional vision of the management of public space and the location of activities.

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