

## City-hubs for smarter cities. The case of Lille “EuraFlandres” interchange

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### Abstract

**Introduction** The importance of the transport infrastructure role is often described in the attempt to describe the characteristics of a “smart city”. Good planning and organization of communication networks contributes to the development of cities that are more fluid and user-friendly and sustainable, concepts underlying “smart cities”. The paper focuses on the impact on social organisation and on conception of transport intermodal infrastructures such as city-hubs inducing new and smarter practices of transport infrastructure, but also the urban dimension and their insertion through the actual city and, even more, by the creation of an entirely new neighbourhood and the preoccupation of a better quality of life. As part of the European research project FP7 “City-HUB”, 27 interchanges have been studied in nine European countries. The paper emphasises on the implementation of the City-HUB interchange typology to the case study of Lille European Metropolis (MEL) where two contingent railway stations, Lille Flandres and Lille Europe, were analysed as a potential unique interchange named “Euraflandres” with socio-economic impacts and the possibility that it may become a “place” of life in the smart city.

**Methods** Within the FP7 project City-HUB a literature review was conducted on the role and characteristics of interchanges in the cities and their contribution to smart cities [29]. For 27 interchanges in nine European countries, we have determined a number of relationships between these transport multimodal interchanges and their environment, and established a typology capturing different interchanges and a scheme for scoring their characteristics in terms of function and logistic dimensions (demand, number of transport modes, services and facilities, location in the city) and their local constraints. The governance framework was specified through carrying out semi-structured interviews with key interchange actors for each City-HUB case study that also questioned about the role of interchanges in local economies and their potential impact on that. The Lille Flandres and Lille Europe as a unique landmark “Euraflandres” were particularly studied to understand their characteristics and role to contribute to a smarter city.

**Results** Based on the City-HUB typology, the “Euraflandres” gets a score of 9 because its demand is higher than 120,000 in daily passengers, includes 13 public and private transport modes (several PT, long distance coaches, car and bike), is located in the city centre and is included into a local plan of urban development and TOD definition. “Euraflandres” has all the characteristics for becoming an urban Landmark for the city of Lille. We show how this interchange gets a higher role for being a node on the international railway network, and how their inside and outside spatial and functioning reorganisation contribute to ease the use of public transport for travellers by introducing ITS, innovations in ticketing and providing new urban characteristics transforming transport infrastructures into new places to live.

**Conclusions** Linking the smart city and the development made with “Euraflandres”, we have seen that an opportunity exists to join together the two Lille railway stations and urban Public Transport interchanges in order to combine a great urban interchange. It will procure advantages for increasing the accessibility for all destinations at urban Lille metropolis and regional level, but also at the national and international levels by the possibility offered by the French TGVs running on national network and the Railteam high speed trains such as Eurostar and Thalys. Each type of interchange, according to the identified functions and local constraints, should require the involvement of different stakeholders interchanges and the Lille City-HUB management with its stakeholders’ committees seems to be oriented to make effort for finding an agreed way for reducing conflicts, in order to better plan outcomes and to allow communities to have an influence over the future shape of the places where they live. The community-led

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participation is the first step to identify requirements and needs of operators (i.e. transport activities including services and facilities) and of users who will perceive the City-HUB as a transport node and a place where to have access to their mobility mode and where to carry out some other activities during their waiting time. Despite existing barriers (complex governance framework, physical barriers, functions and logistics to revise, local constraints), all the stakeholders are willing to improve the visibility and the functionality of these interchanges. “Euraflandres” has the role of developing activities and regenerating the urban environment, by transforming the surrounding area features. All this will make cities more convivial and fluid, answering to two key aspects of the Smart City, when we follow the definition of the smart city as a “fluid”, “intelligent” and “convivial” city by [4]. The extension of the Euralille neighbourhood where is located “Euraflandres”, is part of the Lille urban regeneration, still under construction, will provide new housing and also social housing for low income people and new city amenities transforming it in a new place to live transforming the current two separated interchange towards the future one landmark interchange with a higher share of sustainable and affordable public transport modes share.

**Keywords** City-hubs · Multimodal interchanges · Smart cities · Stakeholder involvement · Socio-economic impacts · Urban planning · Euraflandres

## 1 Introduction & background

In the call for papers for the European transport research review (ETRR) special issue on “smart cities and transport infrastructures”, the editors stipulate that “smart cities are concerned with new consideration towards environment, such as new ways for consuming and producing clean energies through mobility, oriented with new uses of information, but also better interconnection of networks, including transport means and infrastructure” [7]. This article tries to answer a key question: how an integrated and land mark transport interchange contributes to a smarter, more sustainable and friendly city? What is the role of public transport network connections to increase the use of eco-friendly transport modes? Within this context the paper focuses on the conception of intermodal transport infrastructures such as city-hubs and on their contribution to enhance urban mobility. This having an impact on smart cities environmental and quality of life aspects. After a literature review on the smart city concepts from technological, people and communities points of view (section 2), section 3 presents the evolution of the interchanges definition and their spatial organisation. We develop the idea that City-HUB interchanges are inducing new and smarter practices of transport infrastructure(s). In particular, the organisation of transport networks in City-hubs, associated with their fluidity, their comfort and their eco-friendly characteristics plays a key role within a Smart City. This section presents how the City-HUB interchanges typology works to rank transport interchanges and create a smart and eco-friendly urban environment. Section 4 is dedicated to the interchange case study of the Métropole Européenne de Lille (MEL) where two adjacent interchanges, “Gare Lille Flandres Interchange” and “Gare Lille Europe Interchange”, are becoming a potential unique interchange named “Euraflandres”. We describe its location as a node within the regional, national, and international railway networks, its socio-economic, spatial organisation and governance. In the conclusion (section 5) we present the main findings of our research work.

## 2 Literature review on smart cities and consideration of transport dimension

### 2.1 The smart city concept from a technological point of view

At the end of 90’s the accent was put on technical aspects and particularly on the ICT (Information and Communication Technologies) to define smart cities [19].

Technology for smart cities is described by Washburn et al. [38] as “smart computing”. Smart computing refers to “a new generation of integrated hardware, software, and network technologies that provide IT systems with real-time awareness of the real world and advanced analytics to help people make more intelligent decisions about alternatives and actions that will optimize business processes and business balance sheet results”.

Bertossi and Charreyron-Perchet [4] stressed the role of transport infrastructures in its capacity to contribute to the smart city as a “fluid”, “intelligent” and “convivial” city. Intermodal city hubs are specific infrastructures that can combine these concepts by enhancing the mobility fluidity, the use of connected tools, and develop urban new neighbourhoods within the combination of transport and urbanism policies seeking conviviality and trying to enhance urban amenities for their citizens.

As explained by Albino et al. [1], “cities worldwide have started to look for solutions which enable transportation linkages, mixed land uses, and high-quality urban services with long-term positive effects on the economy. For instance, high-quality and more efficient public transport that responds to economic needs and connects labour with employment is considered a key element for city growth”.

In its paper on smart cities, the European Parliament [17] counts smart mobility as a fundamental component of smart cities with smart governance, smart economy, smart environment, smart people and smart living. “By Smart Mobility we

mean ICT supported and integrated transport and logistics systems. For example, sustainable, safe and interconnected transportation systems can encompass trams, buses, trains, metros, cars, bicycles and pedestrians in situations using one or more modes of transport". Moreover, it insists on the interaction between stakeholders. "Smart Mobility prioritises clean and often non-motorised options. Relevant and real-time information can be accessed by the public in order to save time and improve commuting efficiency, save costs and reduce CO<sub>2</sub> emissions, as well as to network transport managers to improve services and provide feedback to citizens. Mobility system users might also provide their own real-time data or contribute to long-term planning ([17], p.28)".

The necessity to combine urban planning and smart cities initiatives is also stressed by Anthopoulos and Vakali [2] who examine their interrelations and reciprocities between these policies.

## 2.2 The smart city concept from the involvement of people and communities

Transport infrastructures are also seen as a means to contribute to smarter a city and provide its inhabitant with a better quality of life. The review of literature made by Albino et al. [1] shows that there is a need to reintroduce organisation, and "look at people and community needs".

For Chourabi et al. [8] infrastructures that contribute to smarter cities are seen as technical ones such as wireless infrastructure (fibre optic channels, WI-Fi networks, wireless hotspots), and service-oriented information systems. But they determine eight critical factors such as management and organisation; technology; governance; policy context; people and communities; built infrastructure and natural environment to understand smart cities. When describing one of these factors particularly important related to people and communities, they count accessibility to provide an impact on citizen's quality of life.

Nam and Pardo [31] firstly made a literature review to understand the common multidimensional components underlying the smart city concept. They describe a smart city as "an organic connection among technological, human and institutions components". They provide a scheme linking these three factors nourishing the vision of a smart city including smart transportation. They affirm that "social factors other than smart technologies are central to smart cities". When defining smart cities concepts from a technological point of view they say that "ITS can help people make more intelligent decisions about alternatives".

In a new publication, Nam and Pardo [32] insist on the fact that "smart is more user-friendly than intelligent which is limited to having a quick mind and being responsive to feedback. A smart city is required to adapt itself to the user needs and to provide customised interfaces". They conclude that "a smart city is not only a technological concept but a socioeconomic

development one, service oriented. It is a "new concept of partnership and governance developed through electronic linkage of multi-level, multi-jurisdictional governments and all non-governmental stakeholders such as firms ... and citizens".

## 3 Methods to detect City-HUBS role in a smart City

### 3.1 Evolution of interchanges' definitions

As seen above, smart mobility and good use of transport infrastructures contribute to smarter the city. Intermodal transport interchanges are specific infrastructures enabling this smart mobility.

In this section we demonstrate that the definition of interchanges evolves from a purely functioning one describing the ease of movement inside and outside the interchange towards its integration into a more complex vision of its interactions with transport, service and city functions. Furthermore it describes how they provide better citizen's quality of life by linking institutional, governance, and socioeconomic development within the urban context.

A clear definition of interchange was elaborated by the Madrid Regional Transport Authority in 1985 with a vision of making them accessible, working and convenient i.e.: an "Area whose purpose is to minimize the inevitable sensation of having to change from one mode of transportation to another, and efficiently using the inevitable waiting time" [9].

Public transport hubs in many European cities are often designed for different scale functions. Richer [35] describes the three functions of an interchange. He associates the transport function enhancing the mobility fluidity using smart transport services with the city function combining city and land planning, the neighbourhood development and new territorial polarisation, providing city services. The service function represents services that concern the different domains of the previous functions (Fig. 1).

They can also provide new functions and determine new roles for national rail and road network accessibility, creating new hierarchies within cities. They can have a very important function within the regional planning context providing new urban centralities as explained in section 5.1. Multimodal poles are also integrated into urban and local land planning. They can produce urban regeneration of some areas and be part of a transit oriented development (TOD) policy [5, 6].

The ultimate function of an interchange is to easily transfer from one mode of transport to another. The main idea is to facilitate intermodal transfers, increase the sustainable transport mode use, and reduce the total journey time, improving the quality of service. Interchange nodes are oriented to coordinate modes from private car modes, rail to urban public transport and to non-motorised transport modes, such as

private bicycles and public bike sharing services or to ease walking access or egress.

### 3.2 Spatial organisation within the interchanges

Di Ciommo et al. [12] show that users identify the improvement of city-hubs with the quality of time spent inside. The current challenge of interchanges is to facilitate transfer from the use of private motorized vehicles to a shared use of cars (i.e. car sharing or carpooling), to the use of public transport, and non-motorized modes. It is, in a certain way, a planning principle. A comfortable and practicable connection by platforms, information systems, bike and ride options, and pedestrian flows organization around an interchange, will be the pivot for designing, constructing and renewing interchange spaces. Travel intermodality could become a real policy goal to provide passengers with seamless journeys even when they use a combined trip chain.

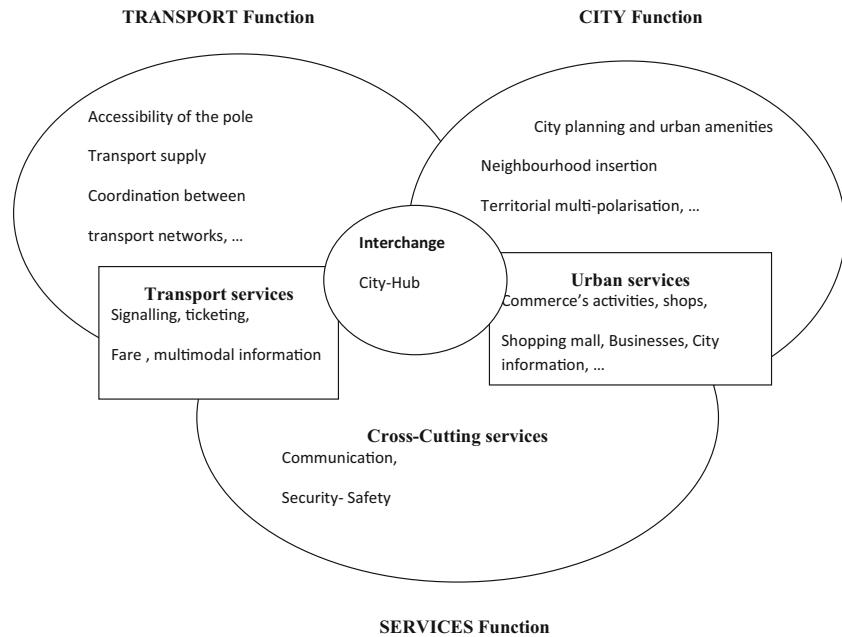
It is essential to make interchanges attractive places in order to reach or maintain a good level of public transport use. As travel patterns become more complex, currently many public transport users have to make transfers between different transport modes to complete their daily journeys. In this respect, measures oriented to improve public transport service quality are required, such as reducing the transfer inconvenience and providing a seamless travel experience [24]. Moreover, total travel time directly influences trip choices. Good connectivity at public transport stops and stations is therefore critical to overall transportation network effectiveness [25]. Urban transport interchanges play a key role within transport network

since they allow that different modes can be used in an integrated manner. However, transport stations in general must be considered multimodal facilities where travellers are not only passing through; they are also spending time there [37]. For this reason, public transport users are particularly affected by the quality of the service provided.

The European “City-HUB” project investigated how transport interchanges work from the point of view of governance and the organization of facilities [10]. This project has determined a number of relationships between transport infrastructure such as multimodal interchanges and their environment. A good link between transport functions and urbanism planning provides efficient use of urban spaces, especially in city centres where there is scarcity of space and where multiple types of trips coexist. The social link represents the necessity to deploy inclusive mobility where persons with special needs could access the transport modes at a fair price. Developing strategic governance between planners, policy makers, operators and the business world ensure a good functioning of these city interchanges. The technical link develops innovations and can change user’s habits by implementation of intelligent transport systems (ITS) and nomad technologies like itinerary devices on smart phones.

The aim of an interchange will generally be oriented to improve the quality of public transport services and support seamless door-to-door travel. But nowadays an interchange is more than a simple node in a transport network; it includes many elements. Research literature shows that the benefits of urban interchanges relate to time savings, better use of waiting times, urban integration, and improved operational business

**Fig. 1** The three functions of a city-hub. Source: [35]



Source: Richer, 2008

models [11]. Besides accessibility improvements, management, and innovation, an efficient use of interchanges should also be considered. It also concerns the urban environment related to its impacts on the land use or constraints by the land use around the interchange. On this basis, we defined a typology of interchanges to classify those interchanges and select the key elements to improve the interchanges location, construction, and organisation.

### 3.3 Scoring interchange weight

These different functions as described above can be applied to interchanges that present particular dimensions and sizes. On the basis of the 27 analysed interchanges in the City-HUB project [29] we have established a typology capturing different interchanges and a scheme for scoring their characteristics in terms of function and logistic dimensions (demand, number of transport modes, services and facilities, location in the city) and their local constraints [13]. In particular, the first group of aspects (Dimension A) is related to the internal functions and logistics of an interchange, including transport elements of the interchange and the services and facilities necessary to fulfil the transfer functions properly. This dimension determines the size of the terminal building. The second group (Dimension B) includes the external aspects of the city environment that affect how the building could be in reality. This dimension includes the location of the interchange within the city and whether or not the interchange plan is in conflict with the existing land uses in the surrounding area (Table 1).

The values given in Dimension A determine the need for space: interchange size. Total score lower than 4 require a Small interchange. Scores 5–7 indicates the need for a Medium one, while higher than 8 means that the interchange should be rather big, becoming an urban Landmark. Dimension B aspect could be negative, positive or neutral, modifying in this way the previous scores and the type of required interchange.

This typology is applied to our “Euraflandres” interchange case study in section 4.5 when questioning its possibility to become a City-HUB landmark.

### 3.4 The interchange governance framework

Once the typology of an interchange and urban planning has been defined, the second relevant aspect is its managing and the regulation behind governance. The governance framework was specified through carrying out semi-structured interviews with key interchange actors for each City-HUB case study [33].

The co-ordination of modes is related to the involvement of different stakeholders in a common governance framework to plan interchange practices and urban space with an urban sustainable scope. The friendly use of these interchanges by citizens is also a goal to attain and new technologies can be

deployed in the context of smart cities, such as on-time information, free access networks for mobility purpose but also providing new public spaces and urban facilities.

Despite existing barriers (complex governance framework, physical barriers, functions and logistics to revise, local constraints), all the stakeholders are willing to improve the visibility and the functionality of these interchanges. The City-HUB interchange has the role of developing activities and regenerating the urban environment, by transforming the surrounding area features. All this will make cities more convivial and fluid, answering to two key aspects of smart cities, when we follow the definition of a smart city as a “fluid”, “intelligent” and “convivial” city by [4].

## 4 The case study of the “EURAFLANDRES” city-HUB

In this section, we need to precise some definitions of used names. “Gare Lille Flandres” means the “Gare Lille Flandres” railway station. “Gare Lille Flandres Interchange” means the interchange composed of the “Gare Lille Flandres” railway station and the metro and tramway stations bearing the same name linked with the other public transports such as buses, free access bikes named V'Lille and free access car system named Lilas. The same distinction occurs for the “Gare Lille Europe” that is the railway station and the “Gare Lille Europe Interchange” that combines the entire urban public transports and the future private coaches station.

“Euralille” is the name of the shopping mall that is located between the “Gare Lille Flandres Interchange” and the “Gare Lille Europe Interchange”.

“Euralille” is also the name of the new business centre created at the end of the 90' at the occasion of the Northern TGV network achievement. In the literature it is also named “Euralille 1” or the CIAG (Centre International d’Affaires des Gares). We will call it the “Euralille CBD (central business district)”.

“Euralille 3000 project” is the name of the future “Euralille CBD” development project until the year 2030.

“Euralille spl” is the name of the company in charge of the “Euralille CBD” development.

“Euraflandres” is the future name of the bigger interchange. It will include the “Gare Lille Flandres Interchange”, the “Gare Lille Europe Interchange”, the “Euralille” shopping mall and the “Euralille CBD”.

### 4.1 The place of the “Euraflandres” interchange as a node on networks

The main reason to develop a joint interchange as a unique node is to reduce car dependency and increase public transport use. Effectively we describe in section 4.5 how “Euralille

**Table 1** Interchange Dimensions: Function and Logistics, Local Constraints

	<i>Dimension A Function and Logistics</i>	<i>Levels</i>	<i>Need for space</i>	<i>Score</i>
Demand (users/day)	< 30,000		Low	1
	30–120,000		Medium	2
	> 120,000		High	3
Modes of transport	Dominant – bus		Low	1
	Dominant - rail		Medium	2
	Several modes and lines		High	3
Services and facilities	Kiosks, vending machines		Low	1
	Several shops and basic facilities		Medium	2
	Integrated shopping mall with all facilities		High	3
<i>Dimension B</i>	<i>Levels</i>		<i>Upgrading level</i>	<i>Value</i>
<i>Local constraints</i>				
Location in the city	Suburbs		Less	–
	City access		Neutral	O
	City centre		More	+
Surrounding area features	Non-supporting activities		Less	–
	Supporting activities		Neutral	O
	Strongly supporting activities		More	+
Development plan	None		Less	–
	Existing		Neutral	O
	Existing and including intermodality in the area		More	+

Source: [13]

CBD” is the result of political will combining railway infrastructure investment and urban public stations on a high speed railway network and the creation of a completely new business and commercial district.

In February 2016, the MEL published its new document for planning and sustainable development of its territorial Scheme of Territorial Coherence (SCOT). For the first time the SCoT, introduces the city-HUB of “Euraflandres” as the linkage of the two interchanges of “Gare Lille Flandres Interchange” and “Gare Lille Europe Interchange” in relation with the new district of Euralille CBD [28]. In January 2017, new interviews were conducted with “Euraflandres” stakeholders in order to understand the transformations and evolutions that are projected within the MEL interchanges of “Gare Lille Flandres Interchange” and “Gare Lille Europe Interchange” to become “Euraflandres”.

In this SCoT planning document, the name of “Euraflandres” appears and is put forward to affirm its role as the gateway to the MEL. “In the centre of the MEL, the railway stations “Gare Lille Europe” and “Gare Lille Flandres” associated with urban transport constitute a real transport hub. “Euraflandres” is a key nerves centre for travels and must be an attractive, readable and radiant pole serving the users and the overall image of the territory” [28].

“Euraflandres” is located at a hub on the regional, national and international high speed train rail network linking France to the United Kingdom, the Netherlands, Germany, and Belgium.

This new position on the international high speed railway network created new centrality for Lille. Effectively, Lille, which was previously at the end of the French networks, being placed at the crossroad of the Northern high speed train network changed its role. Lille has become more central within the European transport network, in connection with different sub-regional areas with access to regional trains and intercity buses (Figs. 2 and 3).

“Euraflandres” is composed of two main interchanges in the MEL: “Gare Lille Flandres interchange” and “Gare Lille Europe interchange”. They are located 500 m from each other in the “railway stations triangle” and offer possibilities to transfer from urban public transports to rail services at the mainly regional level for the “Gare Lille Flandres” railway station and the mainly national and international level for the “Gare Lille Europe” railway station.

A big shopping mall is located between these two interchanges (Fig. 4). It is located in the centre of the new business district of “Euralille CBD” and bears the same name of Euralille. The Euralille shopping mall is 67,000 m<sup>2</sup> and includes 164 shops and services of which one is a hypermarket.

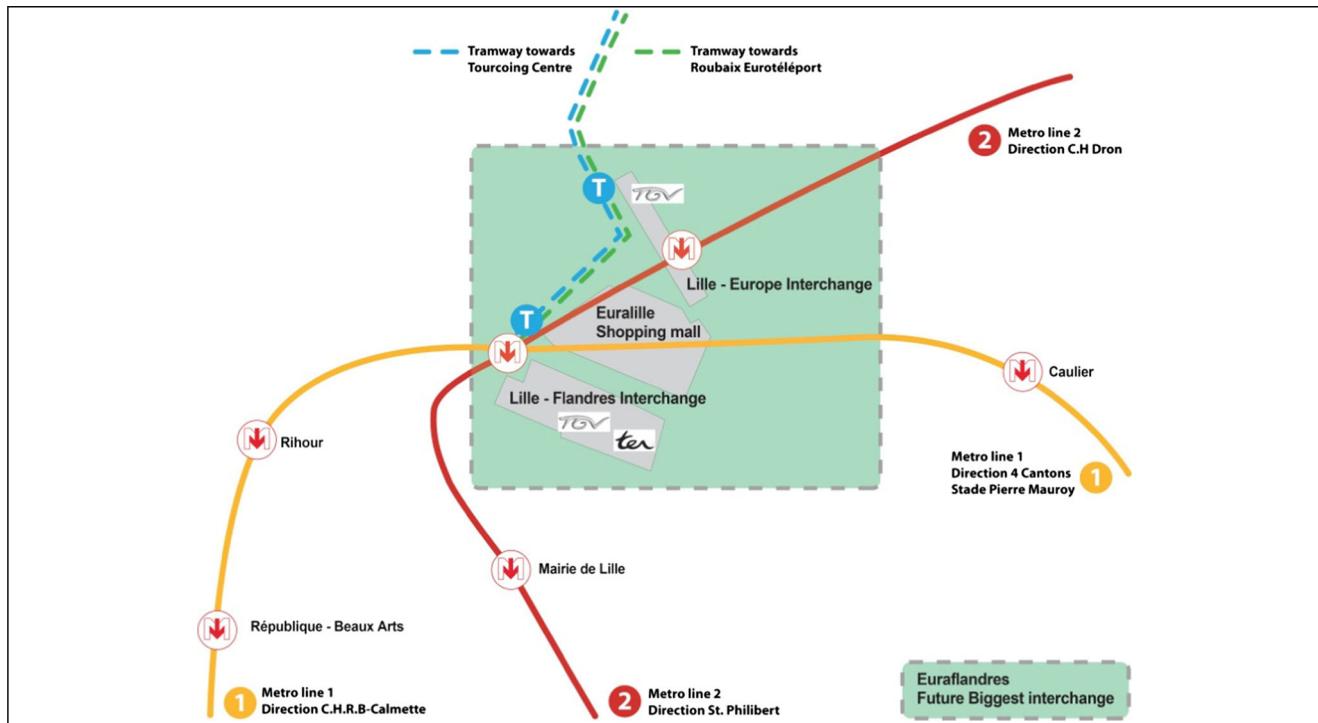
#### 4.2 Spatial organisation within the future city-HUB of “Euraflandres”

The “Gare Lille Flandres interchange” is composed of the railway, metro and tramway stations bearing the same name

**Fig. 2** Place of the “Euraflandres” interchange in Lille within the French and international railway network. Source: Scheme D. Bourbotte Ifsttar



Source: Scheme D. Bourbotte Ifsttar



Source: Scheme D. Bourbotte, Ifsttar based on Gares & connexions SNCF, spl Euralille (2015), SCOT, (2016)

**Fig. 3** “Euraflandres”: linking the “Gare Lille Flandres Interchange” and “Gare Lille Europe Interchange” (train, metro and tramway lines) within the “Euralille CBD”. Source: Scheme D. Bourbotte, Ifsttar based on Gares & connexions SNCF, spl Euralille [16], SCOT [36]

**Fig. 4** Inside the “Gare Lille Flandres interchange” (left) and the “Gare Lille Europe interchange” (right). Photos: O. Heddebaut (left), Gares & Connexions (right)



Photos: O. Heddebaut (left), Gares & Connexions (right)

of “Gare Lille Flandres”. The “Gare Lille Flandres” Railway Station is an old construction inside the city very close to the main square, and near the old part of Lille. This station opened in the nineteenth century in 1848. Its façade is the previous “Gare du Nord” from Paris that was reconstructed in Lille in 1867. It is the second regional train traffic station in France after Lyon. The “Gare Lille Flandres” railway station serves the regional towns with regional trains named TER (Express Regional Trains). It also links in one hour Lille to Paris with direct TGV trains.

“Gare Lille Flandres” railway station counts 17 platforms for more than 500 trains per day and has a traffic of 20 million passengers per year (2012) and 110,000 daily users of which 70,000 take the train and 40,000 are only crossing, using services or going into its shops. It has a lot of connexions with the urban transport network with the metro VAL (light automated vehicle) line 1 and line 2 (located underground second level), two tramway lines towards Roubaix and Tourcoing (at intermediate level) (see Fig. 1). Since the refurbishment of “Gare Lille Flandres” railway station, other shops have opened such as a sport bike-based shop, a supermarket and restaurants.

The “Gare Lille Europe interchange” is composed of a very modern railway station, metro and tramway stations bearing the same name of “Gare Lille Europe”. The railway station was constructed to host the Northern high speed trains (French TGVs, Eurostars and Thalys) on the high speed railway network (see Fig. 1) and urban public transport station. It opened in 1994 with the opening of the Channel tunnel and the northern TGV network. It also serves the other French regions by TGV trains that go directly to the South East (Lyon, Marseille, Nice), or the East (Strasbourg). It connects the Western parts of France (Brittany to Nantes, Rennes, and South West to Bordeaux...) by means of trains that go around Paris and after westwards. All the TGVs stop at the international airport of Roissy Charles De Gaulle when going southwards.

The “Gare Lille Europe” railway station counts 4 platforms and 2 central railway lines for Eurostar trains coming from Paris and going directly to London. It has a daily traffic of 8500 passengers. It connects Lille to Paris by TGV (1 h), and to Brussels (38 min) and London (1 h 20 min) with the Eurostar trains. Since 2014 works have been undertaken on

the departure concourse for the cross-Channel trains (Eurostar): it will provide new control desks, and a bigger boarding area.

It also serves regional high speed trains named TER-GV. These trains run on the high speed tracks to link the “Côte d’Opale” coastal area and the cities of Calais, Dunkirk, Boulogne sur Mer until Rang-du-Fliers at the South West of the region.

In order to facilitate moving between different means of transport for passengers, in the two railway stations a new color-coded information is used to display information: in blue, information about railway services (platform number); in green, information about the intermodal transport modes (metro, tramway, buses, taxis, self-service bikes, car-sharing, ...) in yellow, information about services (ticket sales counters, waiting rooms, meeting points, toilets, ...). It has been tested for the first time in the “Gare Lille Europe” railways station and is now applied in all the French railway stations in order to provide the same travel information and ease the passenger’s trips inside the interchanges. This new colour code can be seen inside the two railways stations on Fig. 4.

Innovations have been made for fares and ticketing information with the new “PassPass” smart card information and ticketing. On-time information displays for train departures are located in the railway stations and in the “Gare Lille Flandres” metro station; in the O’Conway pub and in coffee shops in the “Gare Lille Europe” railway station. Nevertheless there is nearly no transport information in the Euralille shopping mall. A new “mobility agency” the “Pass Pass Boutique” gives information on the public transport network and sells special subscription cards (for students, schoolchildren, etc.) at the “Gare Lille Flandres” railway station. It also sells tickets for either urban trips on urban public transport network or railway trips on the TER regional passenger’s network. This “Pass Pass Boutique” is the result of good governance between the different stakeholders allowing the share of transport data.

Intelligent transportation supports the improvement of the quality of life in the city, while it offers tools for traffic monitoring, measurement and optimization [2]. An application provides real time information inside the “Gare Lille Flandres” railway station for all the MEL urban buses

departures. This necessitates good coordination and sharing on data between the railway and urban public transport operators. Here is displayed the fluidity of travels and comfort of passengers that contribute to the concept of smart cities as described by Bertossi and Charreyron-Perchet [4] and the EU parliament [17].

The smartness of use of these interchanges is provided inside the interchanges. Information to travellers is provided on the Internet and smartphones; there is an intermodal map with the location of each transport mode; free-of-charge and unlimited Wi-Fi access. Inside the two interchanges there are facilities such as new tickets purchase machines, new waiting lounges with special lounges for the “grand voyageurs” loyalty programme members, coffee shops and pubs, press kiosks, left-luggage service, toilets.

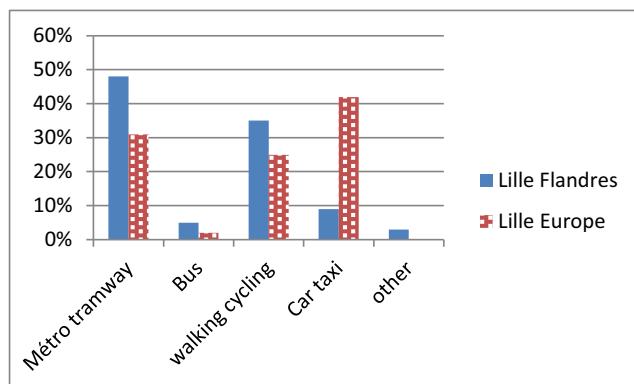
They also offer new facilities: Wi-bike (biking plugs), children’s area in the concourse and free use pianos that contribute to a pleasant ambiance.

On Fig. 4 (left) we see that the interchange is used by people that are not travelling but who want to benefit from the facilities such as tables equipped with plugs, free Wi-Fi, and it looks like a “café” ambience with shops surrounding the travel facilities. This show that interchanges become places to meet and live in the city.

#### 4.3 Spatial organisation outside “Gare Lille Flandres Interchange” and “Gare Lille Europe interchange”

“Gare Lille Europe Interchange” and “Gare Lille Flandres Interchange” are offering numerous transport modes to access and egress the two railway stations bearing the same name. They are close to regular bus routes and one specific bus route the Citadine serves them on a circular route inside Lille. Twelve bus routes stop at the “Gare Lille Flandres interchange” exits and seven bus routes and long-distance coaches stop at the “Gare Lille Europe interchange”. Self-service bikes in free access stations named V’Lille are placed near the two interchanges’ main exits and a supervised bike garage which is free-of-charge for public transport passengers and train users is located at “Gare Lille Flandres interchange”. For these two interchanges paid parking facilities exist.

Located between the two interchanges, a special “shuttle” bus links the Lille airport and another one the Charleroi airport in Belgium. Car-sharing possibility is offered at “Lille Flandres Interchange”. The “Gare Lille Flandres” railway station passengers mainly come from the metro (44%) or tramway (4%) and flows are mainly coming from the underground access; or are walking or cycling (35%). The facts that there is a supervised free of charge garage for private bikes eases the use of that non-motorised mode. The “Gare Lille Europe” railway station passengers mainly come by car and taxis (42%) or metro and tramway (31%). In Fig. 5 we have



Source: Gares & Connexions, 2014

**Fig. 5** Modal share of both “Gare Lille Flandres” and “Gare Lille Europe” railway stations. Source: Gares & Connexions [18]

regrouped the metro and tramway figures because tramway access trips to the railway stations are very low.

We notice the differences in access modes for the two railway stations. This could be explained by travel motives. Effectively in “Gare Lille Flandres” railway station, there is more travel for work or study motives. The free access garage for private bikes could explain the cycling practice. In “Gare Lille Europe” railway station there is more travel for leisure or business motives that could explain partly the importance of access by cars or taxis. Daily travellers taking the TGV for work, can park their cars underneath this railway station and access directly to the platforms to take their trains. There is a big issue for these interchanges to make possible the modal shift to public transport modes.

#### 4.4 “Euraflandres”: a city-HUB typology implementation

Urban policy plays an important role in shaping and changing the regional, national and even global linkages of cities. As described by Nam and Pardo [32] coordination of policies—across a variety of spatial scales, across organizational practices, and across all levels of governance—is of vital importance to innovation in a city. They remark that “integration is not merely for technologies, systems, infrastructure, services or information but for policies”. Governance involves the implementation of processes to share information and set up policies and actions to develop common projects [8].

Within the Lille metropolitan area, transport services’ implementation is under the responsibility of different transport authorities at different institutional scales (national, regional and local). The regional express trains (TER) supply (investments, timetables, frequency, quality of service ...) is ordered and financed by the Hauts de France regional Council. It is composed of TER trains in “Gare Lille Flandres” railway station and TER-GV (High speed TER) in “Gare Lille Europe” railway station. The urban public transport modes

are operated by Transpole (Keolis) and the urban transport authority is the MEL. The MEL elaborates urban sustainable mobility plans (SUMP) to enhance its inhabitants' mobility [26]. The railway stations are run by Gares & Connexions and "SNCF-mobilités" is the rail operator. The tracks are under the property of previously RFF (Réseau Ferré de France) that became "SNCF Réseau" on 1st July 2015. In the "Gare Lille Europe" railway station, national trains are scheduled and operated by "SNCF-mobilités" and international trains belong to the Railteam Company (SNCF, Eurostar, Thalys...).

All these different stakeholders meet regularly in common committees in order to provide better supply and services to passengers and citizens. As seen above, the joint "Pass Pass Boutique" is the result of a good cooperation and governance between transport authorities and operators at these different scales in order to share data, give information and purchase possibilities in the same site. This contributes to ease and facilitate passengers' trips. Joint committees are also organised between these previous stakeholders and other policy makers in urbanism and business domains. All this, to say that the governance issue for the possible "Euraflandres" interchange is complex to understand and operate.

We have conducted two series of interviews one in 2015 during the City-HUB project and the other in 2017 to understand the "Euraflandres" interchange's development as a MEL landmark.

We met the political and decision makers, the MEL's transports, roads and urbanism directors. They are in charge of planning transport investments and organisation within the MEL urban public transport territory. They consider the future "Euraflandres" interchange achievement as a priority to ease the inhabitants and visitors' travels and accessibility. The Haut de France TER service responsible plans and organises the TER supply and is in charge of investments in the regional railway stations. He supervises the future "Euraflandres" interchange accessibility by trains.

The City of Lille director in charge of the circulation organisation plan that was implemented in August 2016 with three loops that serve the "Euralille CBD" but cars can no more cross it.

Keolis operator for Transpole services told us how they were reorganising the urban public transport access in the vicinity of the future "Euraflandres" interchange.

The regional railway stations director received us to show the transformations undertaken inside the "Gare Lille Flandres" and "Gare Lille Europe" railway stations in cooperation with the other stakeholders involved in the future "Euraflandres" development.

The "Euralille spl" director told us that they are willing to develop the "Euralille CBD" with a greater consideration of the neighbourhood quality of life and give its inhabitants more urban facilities such as restaurants, cafés, and leisure facilities. The facility/estate owners and/or estate companies who are in

charge of the construction and maintenance of the interchange were also questioned about the role of interchanges in local economies and their potential impact on that.

They all together work in order to realise the renewing of the two interchanges. Within the "Gare Lille Flandres interchange", a first refurbishment was made in 2008 for the "Gare Lille Flandres" metro and tram stations. The "Gare Lille Flandres" railway station is under refurbishment since 2013 with works on the tracks for a better train supply. Since 2014 further works were undertaken to provide new concourse, new joint Public Transport and rail ticket office (purchase of rail and/or public transport tickets, joint information, network maps, etc.). These works will also give a wider access to public transports, linking the ground floor level with bus access to underground levels where are located the "Gare Lille Flandres" tramway station and underneath the "Gare Lille Flandres" metro station. The first two floors of the railway station will be converted into a new 1300 m<sup>2</sup> business centre with commercial and office spaces. The refurbishment budget is €18 million (in € 2013). It is shared between SNCF Gares & Connexions (€14,019,862), Nord Pas-de-Calais Region (€2,000,000), European Union (€1,320,138), the State (€660,000) and the City of Lille (€115,500).

According to the stakeholders' interviews, the "Gare Lille Flandres interchange" and "Gare Lille Europe interchange" refurbishment occurred after identifying the needs of the operators and clients. They also consulted the reduced mobility persons association. Moreover, the "Gare Lille Flandres" railway station stakeholders have set up discussion groups for the operation of the 13 regional TER routes involving elected members, operators and passengers for resolving problems and enhancing travel quality.

The SNCF director who is in charge of the two "Gare Lille Flandres" and "Gare Lille Europe" railway stations said during our interview that "before the railway stations were considered to be places where we took the train and it is everything with just a waiting room and a few services. There is nowadays a strong expectation of customers before taking the train to be able to get more services and shops. The second aspect is to include the railway station in the city. From this point of view, there are several functions which the railway station must complete: there is a function for connecting to different modes of transport. There is also an ambition to offer shops to the inhabitants of the district, a range of restaurants. So it's really a willingness to see the railway station as being an address in the city, really turned outwards and not towards the platforms".

#### **4.5 The future "Euraflandres" interchange as a city-HUB landmark**

Based on the typology described in section 3.3, the "Euraflandres" interchange gets a score of 9 because its

demand is higher than 120,000 daily passengers, includes 13 public and private transport modes (several PT (metro, tram and urban buses), long distance coaches, car and bike sharing, taxis and even bike taxis), and is located in the inner city centre in the new “Euralille CBD”. It is the result of reflexions included into local plans of urban development such as the SUMP and SCoT documents and TOD definition. The “Euraflandres” interchange has all the characteristics for becoming an urban landmark for the city of Lille and the MEL.

As highlighted by Banister and Berechman [3] three conditions must be present in order to induce economic development.

- 1) The first condition is the existence of political willingness to implement complementary policies in order to provide a better environment, boost the transport investment and obtain economic development.
- 2) The second condition is the significant size of the transport investment. A new interchange must provide new accessibility and new connections between transport modes.
- 3) The third condition is the economic context. It must reach high quality of labour forces and present underlying dynamics economic externalities at a local, regional or national level.

These complementary conditions can be useful to implement a transport hub as the part of an overall larger integrated policy and/or plan aiming at (re)developing linked economic activities and urban function (re)development. Moreover they conclude that “policy design also has a crucial role in influencing and strengthening the potential impact of transport infrastructure investment on local economic development.”

For the “Euraflandres” interchange, a huge urban development project “Euralille CBD” was created. The political willingness, first condition for economic development, can be illustrated by Pierre Mauroy the President of the MEL and former Prime Minister. His, ambition was to modernise the Lille city centre by constructing an entirely new district “Euralille CBD” and he gave it the name of “tertiary turbine”. It was constructed from a *non aedificandi* zone corresponding to the ancient walls of the city and military lands [34]. A political decision was taken to create a completely new neighbourhood named “Euralille” seen as an important factor of the new social and economic policy for the MEL. This new neighbourhood was firstly developed as a “complex of economic functions rather than a neighbourhood” [30].

The second condition for economic development and the landmark city-HUB label is a transport investment of significant size. In the context of the Channel tunnel (1986–1994) and the Northern high speed train network (1987–1993) constructions, important urban investments were realised in Lille [20, 21].

As seen above, the “Gare Lille Europe” railway station of international dimension represents an investment of € 146 million (in 1994) and was planned to host the Eurostar trains from London to Paris and to Brussels. It also host the French TGV, High Speed Trains, linking the main French cities in different regions: eastwards (Strasbourg), south wards (Lyon and Marseille) westwards (Bordeaux and Toulouse) and the Brittany (Nantes and Rennes). All these TGV serve and stop at the international Charles de Gaulle airport [22].

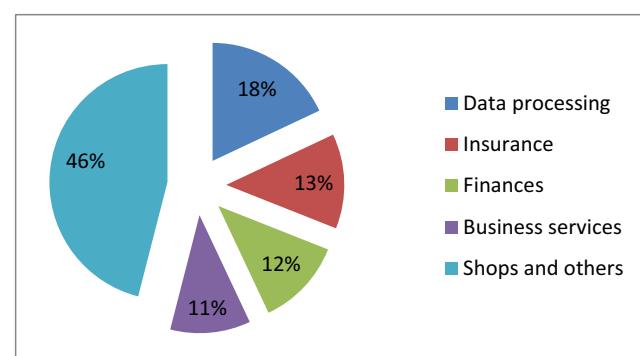
The third condition for obtaining economic development is the high quality of the labour force. The new jobs created in the “Euralille CBD” correspond to these criteria. They all belong to the tertiary sector with a high representation of commerce (46%) and high skilled jobs in data processing ((18%), insurances (13%) and finance (12%) (Fig. 6).

As described by Banister and Berechman [3] three conditions are necessary to induce economic development. This first condition is illustrated by Pierre Mauroy’ commitment that convinced all the regional political stakeholders to develop a new neighbourhood in Lille. The sufficient size of the transport investment, second condition, is represented by the new “Gare Lille Europe” railway station and the successive refurbishments of the “Gare Lille Flandres interchange” (railway station, tramway and metro station). The high quality of labour force, third condition, is illustrated by the distribution of jobs in this new neighbourhood of “Euralille CBD”.

Different phases have been realised providing this new “Euralille CBD” neighbourhood with housing for local population, local culture, conviviality, etc. The Euralille shopping mall was created between the two “Gare Lille Flandres interchange” and “Gare Lille Europe interchange”. New office buildings and housing have been constructed in the vicinity of the “Euraflandres” interchange.

Further extensions are foreseen to enlarge the “Euralille CBD” under the “Euralille 3000 project” (Table 2).

The findings after the different interviews realised during the City-HUB project show that there is a greater ambition in Lille. To link transport and land-use planning, all of the



Dieng (2017); data 2008.

**Fig. 6** Distribution of jobs according to the sectors in the “Euralille CBD” area. Dieng [14]; data 2008

**Table 2** Surfaces constructed and functions in “Euralille CBD”

M <sup>2</sup> of SHON*	Euralille 1	Further extensions
Housing	138,000	+75,000
Offices	240,000	+140,000
Commerce	110,000	+30,000
Hotels	28,000	+5000
Equipments	80,000	
Total	596,000	250,000

Source: [16]

\*Net surface area

planning stakeholders are involved in a Metropolitan development view (the regional council in charge of the regional planning and regional express trains development, the City of Lille, the Nord Département, the MEL that is the urban transport authority, the SNCF and Transpole the transport operators and Euralille Spl in charge of developing this area [23]).

Three development areas are still under construction within the actual “Euralille CBD”. Euralille 1 or the CIAG international centre for businesses included into the future “Euraflandres” interchange, and two other development zones a little further, but linked to the two railway stations by the metro line 2 as explained during the Euralille Spl Director’s interview during the city-HUB project.

Two other development projects are under construction [15]. The first one of 22 ha constructed on the wastelands of the former Lille International Fair is called “Euralille 2” close to “Euralille CBD” and will create a neighbourhood called “inhabited wood” with a 600 housing programme; offices and activities; the extensions of Lille Grand Palais the international congress centre and the headquarters of the Region and the implementation of 13,000 m<sup>2</sup> of public facilities (schools, nurseries, kindergartens, sports equipment). The second one called “Porte de Valenciennes” is a 18 ha program creating 1000 housing units including 360 social housing (120 social rental and 240 free rental and accessions) carried by CMH and LMH that are companies for social housing development in the Lille metropolis. 30,000m<sup>2</sup> of offices and 6,600m<sup>2</sup> of businesses and shops are being constructed and a part of this land will be converted into public spaces and squares.

New coordinated planned actions are undertaken to make this development within the further development and enlargement of the “Euralille CBD” under the name of “Euralille 3000 project”. The new interviews realised in 2017 explain how “Euraflandres” is becoming a city-HUB landmark taking into account the communities and residents desires to make a liveable neighbourhood.

“Euraflandres” is part of the “Euralille 3000 project”. Two periods of consultation took place in 2013 and 2015 with the involvement and the participation of the MEL’s citizens and “Euralille CBD” residents prior to the launch of the “Euralille

3000 project” in 2016. A MEL decision (2015) taken after this consultation stipulates that “the mobility project will aim to reorganise the flow of travel through traffic loops that will improve access conditions to “Euraflandres”. It will allow the development of soft modes and protect the city centre from car flow. The future “Euraflandres” interchange will host new programs and refurbishment to make it more comfortable for residents and users of the various modes of transport present on the sector” [27].

There are nowadays 6000 persons per day walking between the “Gare Lille Flandres interchange” and “Gare Lille Europe interchange”. More pedestrian and bike lanes will be built. A new signage to find its way will be implemented. Urban parks will offer a better connected neighbourhood networks.

Effectively, “this gateway must be prepared to accommodate 50% of additional passenger flow in the coming years. The urban project must also accompany these developments. The hub must maintain or improve its effectiveness. Not only accommodate more travellers but welcome them in better conditions [16]”.

All this contributes to smarter the city by providing facilities to city-hub users as passengers but also to the MEL citizens and the “Euralille CBD” inhabitants. The “Euraflandres” interchange implementation is creating economic development in the MEL and moreover is becoming a city-HUB landmark to smarter the city of Lille.

## 5 Conclusion

We have seen that the opportunity of joining together the two “GareLille Flandres” and “Gare Lille Europe” interchanges in a unique interchange under the name of “Euraflandres” will contribute to build a great urban interchange. It will procure the advantage for increasing the accessibility for all destinations at urban Lille metropolis and regional levels, but also at the national and international levels by the possibility offered by the French TGVs running on national network and the Rail team high speed trains such as Eurostar and Thalys.

Each type of interchange, according to the identified functions and local constraints, should require the involvement of different interchange stakeholders. “Euraflandres” management with its stakeholders’ committees seems to be oriented to make effort to find an agreement to reduce conflicts, in order to plan outcomes better and to allow communities to have an influence over the future shape of the places where they live. The community-led participation intended here [16] is the first step to identify operators and users’ requirements and needs (i.e. transport activities including services and facilities) and who will perceive “Euraflandres” as a transport node where to have access to their mobility mode and a place

to carry out some other activities during their waiting time or leisure activities.

Following, the Stated Preference results of the City-HUB [12], a good interchange could increase between 7% and 20% the use of intermodal and public transport modes. The development of “Euraflandres” could attract additional public and active modes users with a real decreasing of car use that contributes to an eco-friendly city, one of the aspects of smart cities. Further research is however required to measure the actual participation of the “Euraflandres” customers and “Euralille CBD” residents role contributing to enhance this smart city aspects and if the MEL is actually involved in a Smart City global policy at a metropolitan level.

Actually the smart aspects of a transport interchange are deeply related with the modal shift, the environmental and health impacts, and the potential use of ITS for smooth intermodal changes. All these aspects are key characteristics for a city-HUB such as schedules consistency, the wayfinding, the use of the waiting time, the comfort during the waiting time, all aspects that make a City-HUB smarter and contribute to a smart city. This article has shown how “Euraflandres” potentially includes all these smart elements.

We have demonstrated that the “Euraflandres” interchange is able to induce economic development but also to play the role of developing activities and regenerating the urban environment, by transforming the surrounding area features. The extension of the “Euralille CBD” is part of the Lille urban regeneration and still under construction. It will provide new housing and also social housing for low incomes and new city amenities transforming it in a new place to live. The transformation of the two current separated interchanges towards “Euraflandres” will achieve a landmark interchange with a higher share of sustainable and affordable public transport modes share. All this will make Lille more convivial and fluid, answering to two key aspects of the Smart City, when we follow the definition of the smart city as a “fluid”, “intelligent” and “convivial” city by [4].

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