

## Can an Economic Activities Inventory Fill the Knowledge Gap about the Economic Sector in a Policy Making Process?

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### 1 ABSTRACT

Nowadays, Brussels' population is growing and requires more and more space for housing. This constantly growing process tend to push the industrial and medium / large economic activities out of the city. These activities are wrongly perceived to be unsightly for an urban environment. Economic activities, often mixed with other functions play an important role within cities and their suburbs areas. However this role is not well understood. For that reason an analysis that identifies the different types of activities and their location can be fundamental in the early phase of a urban development project, to give at all the stakeholders a better and more complete view.

This work is based on the will to get a better and new kind of knowledge about the location and differentiation of economic activities in Brussels metropolitan northern area. The visualization of the diversity of types and scales of economic activities, and understanding trends and dynamics, can be considered as a useful set of information to be used in a urban development and economic policy making process.

The work, conceived as a pilot project, which could be extended and repeated in other areas, is based on an empirical research, done by a visual check of what is identifiable as economic or designed for an economic use directly on the site, aimed to identify, locate and classify all the different types of existing economic activities in the selected areas. This economic activities inventory is the only one existing for Brussels Capital and Flanders Regions based on field work.

In this paper we will explain the method used for the field work and inventarisation, the possible link with existing economic databases and the difficulties encountered during the work. We will also show how this new data is used in ongoing spatial planning processes and to what extend these new insights promote different spatial planning proposals and realisations.

Keywords: GIS, database, economy, knowledge, policy making

### 2 INTRODUCTION

Urban planning and related policies are frequently criticised for their poor ability to accommodate economic dynamics. This led to tensions between spatial and economic development and inefficient planning decision and instruments (Friedmann, 2005; Zhenshan, 2010). Planning policies and tools, to be efficient, should consider and include all the dimensions of urban development: Spatial, socio-cultural, economic and environmental (Allmendinger and Tewdwr-Jones, 1997; Mega, 2009). In this paper we decided to focus on the economic one, in order to understand and figure out how this sector is actually treated in a policy making process.

The economic sector plays an important role within cities and their surroundings. One obvious reason is because there are functions and activities that are fundamental to keep the city functioning, while providing goods and services to its businesses and residents, to deal with its waste, to provide materials for its construction, and so on (Ferm and Jones, 2016). For example we can consider the diversity of services and products consumed by the average office building. Activities related to catering, cleaning, furniture, maintenance and fit out, office equipment and supplies, print and copy, security, waste disposal and more are usually located away from the central areas, often clustered in the suburbs or even further out in the countryside. Despite this, those activities are vital to the efficient functioning of the city and in supporting its global role (Harris, 2013). For those reasons, in order to guarantee time deliveries to customers or just to have an adequate location for their showrooms and outlets, a central location for such business is important.

In the last decades, many cities around the world, have been characterized by the process of deindustrialisation. That happened when companies, mass production and large factories moves away from

high value inner cities locations, where they are seen as unsightly for an urban environment, to lower land value spots on the edge of cities or in other parts of the country.

In Brussels, the renewal process of the European city was accompanied by the rapid growth of services and knowledge economy. That turned the city into an attractive living and working environment, while pushing a huge part of industries out of the city. Productive areas disappeared into the outskirts of the city or to low-wage countries. The city turned into a place of consumption, without production (Atelier Brussels, 2016). Despite this the Brussels-Capital Region on its own produces 18.9% of the national GDP (Vandermotten et al, 2009). From the end of World War I to the early 1970s Brussels was the country's main industrial city, and in 1970 it still held 158,000 jobs in industrial manufacturing. During this period Brussels was home to some 12% of the national manufacturing jobs. The deindustrialisation process that began in the late 1960s is still continuing. In 2009, at the beginning of the financial crisis, only 38,000 manufacturing jobs were left in Brussels, a mere 5% of the Region's total employment (Vandermotten et al, 2009). The Region's economy is dominated by the public administration sectors. This is even more so when we factor in the international public function (over 21% of the total employment, without counting public status jobs such as teaching, healthcare,etc), as well as financial services and business-support services: a total of 48% of jobs.

The mentioned deindustrialisation process, both in Brussels and in other cities, led to the creation of a new type of urban economy where the services sector plays the most important role in terms of both employment and GDP. This raises some questions: Despite this, what is left about the old industrial economy in the city? How is that related to today's city? Is it possible to identify and locate the different types of economic activities? Can we predict what is where?.

In order to answer those questions we started exploring the available existing informations about the economic sector for Brussels capital and Flanders regions. Soon we realised that a lack of knowledge exist, even if some data about activities and companies are in place. For example, existing data are spread and fragmented in different databases, often hardly comparable or joinable, moreover even if two economic activities databases are actually available for both regions, they do not reflect the reality. This mean that even while using and combining existing data, a complete view on what kind of activities are really present and how are they spread and organised on the field simply do not exist in Brussels and Flanders regions. The result is that most of the time, stakeholders, developers and policy makers do not have an overall vision on the economy of the area they are working on. This lead to a twisted vision that can affect the efficiency of proposed policies and tools.

### 3 METHODOLOGY

#### 3.1 Methodology definition

The methodology we followed from the start is based on an empirical research and a learn by doing process, with the aim of identify and map what is actually used or meant to be used by economic activities. A learning by doing process is essentially about getting involved in an activity and, through the process of doing this activity, learning about it in order to answer at some questions like: how that activity works, what the activity makes you think about and how can you improve it, or what doing this activity enables you to do.

In the first place we started mapping all visible economic activities in a small area located both in Brussels capital and Flanders regions. Fieldwork has been done whilst manually collecting data about economic activities like, companies names and a small description of what was visible,while compiling a simple table and georeferencing the entities thanks to a map created by a combination between a topographic and a cadastral maps. While using this materials we were able to collect at the same time data for parcels and buildings, resulting in a considerable amount of data to be processed. Immediately afterwards we started processing field work data, at the time we did not think about creating a database to organize collected data. For that reason all the data where digitalized directly while working in ArcMap (GIS), while typing and adding informations to existing cadastral shapefiles, both parcels and building ones. At this point a first basic classification of economic activities were defined, in order to fit every different economic entity in a specific category. The aim was not to describe all the different types of activities, but to group them in macro categories able to describe urban interactions between economic units and among them and the environment in which they are located.

It is important to point out that in this early phase of the project, even while working just on 2D maps, buildings and parcels with multiple and different activities in it were splitted in parts, one for every single economic unit. Activities located on the same parcels but on different floors were simply included inside the parcels, without distinguish on which floor they were located. The creation and presentation of maps about economic activities location and classification in the first mapped area, created as a result of previous phases, started to generate some discussion and suggestions on how to use and improve this methodology.

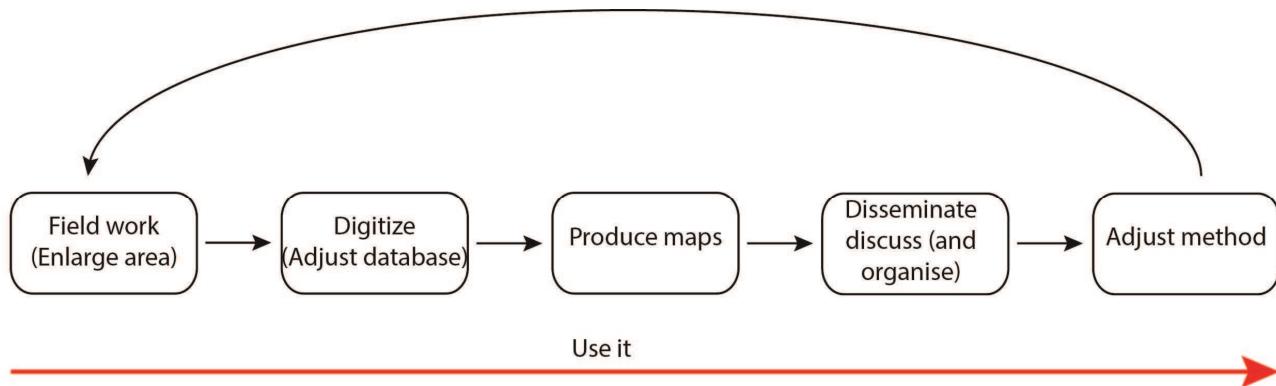


Fig.1: Project phases and cycle

First of all, at the end of the first project cycle (Fig.1) we realised that working on both parcels and buildings was too time consuming, because the same information about economic units needed to be typed twice, one for each layer. Splitting parcels and buildings to accommodate different activities in specific parts of those resulted first in a huge amount of work and then hardly updatable; every single cadastral parcel or building is characterized by a unique code called “Capakey”, an alphanumeric code made by a combination of alphabetic and numeric characters. Splitting polygons resulted into the loss of this code, making as mentioned before, an hypothetical update of collected data more and more difficult. In addition of this, in order to understand what really happened in a specific area and to contextualize it by an economic point of view, a greater amount of both data and mapped area is required. This translates into more time to be spent while doing field work, the need of a less time consuming digitalizing process and finally a bigger amount of data. Last but not least, while presenting the preliminary version and results of our project, the used classification resulted to be too generic and barely understandable. For that reason a more detailed version of it resulted to be paramount for the project continuation.

At a later time, considering all the interesting point explained above we decided to modify our methodology in order to make it more efficient, presentable and sharable with other stakeholders who started to show interest in the project and the obtained results. In the first instance the digitalization of activities in building layer has been abandoned, in order to save time. All collected data from that point onward are referred to the parcel they are related to, identified by a unique alphanumeric code, the Capakey. As explained before this code is unique for every parcel. In addition of this, if a parcel is later divided in multiple parcels or merged with another one a new and also unique Capakey code is created and linked to it. Thanks to this, the creation of doubles inside the database is not possible, whereas is always possible to go back to the history and related data of an old parcel. Moreover some new data were collected during the fieldwork phase, like parcel dominant economic use, presence of housing, groundfloor use, number of buildings and storeys. Data collection on the field has been carried out using the same methodology previously explained, in short, a combination of a table where to write economic unit and parcels data and a map to locate them.

We decide also to look for a different way to deal with the rising amount of data, ending in the decision of creating a relational database using MS Access. Thanks to this software we were able to incorporate all data collected during the first phase and processing new data from field work in a more efficient, resilient and faster way. MS Access database allowed us to extend the amount on information that can be added to a single economic unit or parcel, data like photos or interviews are, when available, are just some examples of the potential of this tool. The creation of queries can easily improve the way of representing existing data, while producing more sofisticated and complex maps, instead of a simple “Dominant economic use” produced whit the previous methodology.

As mentioned before, after the initial phase of the project the need for a new and more detailed economic activities classification became clear. The purpose of the second proposed and then used classification was the same as in the previous one: group activities in macro categories able to describe urban interactions between economic units and among them and the environment in which they are located. A total of 30 different categories were defined, based and developed on the work done by Mark Brearley and his students of Cass Cities (London Metropolitan University) where they studied economic activities distribution and differentiation along Old Kent Road in London. The motivation behind defined categories and a list is consultable at chapter 3.3.

During following months, once the method became clear, we started mapping and digitalizing new areas around the border between Brussels capital and Flanders regions and as a consequence, new maps showing an overall view and economic activities presence in the area were provided and used by stakeholders and policy makers in their discussions. Those discussions provide suggestions on how to adjust the methodology, mainly while changing and organising differently collected data and modifying database structure regarding different purposes and goals.

At this point the database use and creation process finally became an ongoing one. Thanks to a non stop field work and digitalization phase new areas were constantly added and, at the same time, the use and dissemination of the collected results and data in various discussions continually produced useful feedbacks and tips. Figure 2 shows mapped areas around Brussels capital region, our idea is to fill in next months the gap between the north and south areas, especially along Brussels canal.

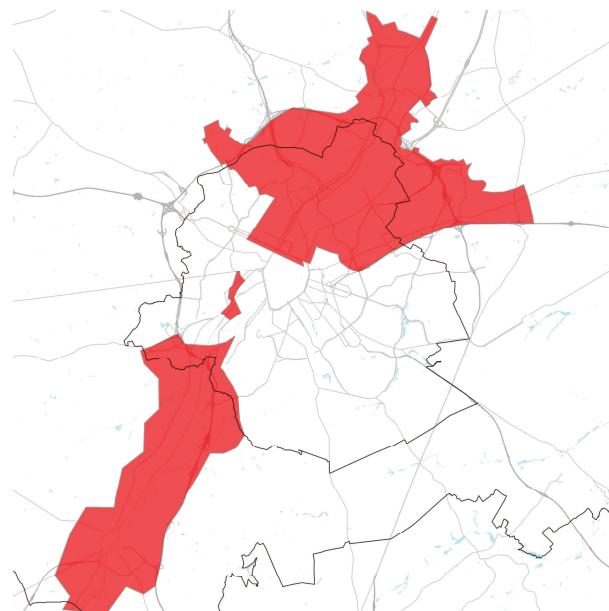


Fig. 2: Mapped areas

### 3.2 Economic spaces and units definition

The methodology we followed, as explained before, is based on an empirical research and a learn by doing process, aim of identify and map what is actually used or meant to be used by economic activities while directly observing it in the field. In this project, economic activities are defined as places or units in which an economic use is visible and recognizable or as sites designed for an economic use. Shops, workshop, warehouse, officies, schools and all other sites where people are actually working, or where they can work are considered. Places like former corner shops, or former industrial buildings now converted and used by housing are not taken into consideration, because in the current conditions they are not able to host an economic activity regardless their past.

It must be specified one more time that our work is not trying to describe all the different types of activities, for that there are already some more complex and sometimes not completely clear databases. What we are trying to do, is describe urban interactions between economic units and among them and the environment where they are located. For that reason all possible economic uses have been subdivided in a total of 30 different categories representing with a good but not too deep level of the detail the economy main sectors.

As a result, we think that thanks to this categorisation is possible to give both a good overview and understandig of economy differentiation and distribution in a given area.

<b>Manufacture: Agriculture</b>	<b>Vehicle Air</b>	<b>Wholesale: Food &amp; Beverage</b>
<b>Manufacture: Metals &amp; Machinery</b>	<b>Vehicle Bicycles</b>	<b>Wholesale: Other</b>
<b>Manufacture: Food, Beverages &amp; Catering</b>	<b>Vehicle Cars &amp; Trucks</b>	<b>Transport and storage</b>
<b>Manufacture: Other</b>	<b>Vehicle Railways</b>	
<b>Printing and publishing</b>	<b>Vehicle Water</b>	
<b>Servicies: Education</b>	<b>Retail: Food</b>	<b>Utilities</b>
<b>Servicies: Health care</b>	<b>Retail: Construction</b>	<b>Construction</b>
<b>Servicies: Public</b>	<b>Retail: Other</b>	<b>Arts, Culture, Leisure and sports</b>
<b>Servicies: Professional</b>	<b>Retail: Personal</b>	<b>Faith</b>
<b>Servicies: Others</b>	<b>Restaurants, Cafés &amp; Takeaways</b>	<b>Unknown</b>
	<b>Hotels, B&amp;B</b>	<b>Vacant</b>

**Fig. 3: Activities classification**

It has to be pointed out that in our opinion not all activities have the same importance and weight in an urban environment, especially in Brussels capital and Flanders regions. For instance we decide to highlight and consider all vehicles related activities as the most important category, represented by five different subcategories, one for each way of moving and transport. Both regions are always facing problems related to traffic and congestion, due to car dependant mentality and behaviours. Consequently vehicle related activities and especially car related one, are widespread but usually not well understood in their distributions, dimensions and differentiations. Be aware of those informations regarding vehicle related activities can for instance give a great knowledge support in transport related policy making process, that nowadays do not exist or is not properly considered.

We used decision trees to better explain how the coding process has been carried out, starting from how to define an economic space, then divide it into economic units, while making one record for each of the entities visible in the building or on the parcel and finally the definition of the activity code, based on the different weights defined for each one of the 30 categories showed in Fig.3.

### 3.3 Qualitative control and integration with other databases

This methodology works smoothly and quickly, and led us to cover big areas in a relative shot period of time producing a decent amount of new data. Despite of this considering that the majority of field and digitalize works are carried out manually, the possibility than some human errors are done exist and it is real. Some commons errors we are already facing are:

- Location of an economic unit on a wrong parcel;
- Typing and spelling mistakes in company name, description or code;
- Wrong choice of an activity code.

For that reason a phase of qualitative data controls is essential, in order to maintain the utility and a good overall quality for the proposed and created data. We think that multiple options are available but, they have not been yet applied to our database. It has be to pointed out that in our opinion a quality control is characterised mainly by two type of actions. Corrections, when data about an activiy are mainly correct but there are some errors which do not affect the final activity categorisation, and updates that are defined as incongruities between data on a specific location and the company actually located there.

Some examples of possible quality controls options are here explained. Drop-down menus for specific fields represent and easy and fast way to avoid typing errors in fields that are filled with a limited numbers or letters, i.e activity code or date. Queries could be used to double check the presence of doubles or incomplete rows and fields, like the dominant use or combined with housing ones. Quality field work done for limited samples and within a short period of time since the first visit can provide corrections and updates immediately applicables. The creation of a link with existing databases, even referred just to one or few economic categories, could integrate and help verify a part of the collected data. Last but not least, the diffusion,discussion and use of the database in existing planning programmes could lead to an overall quality improvement, thanks to the knowledge and experience of people actively involved in related processes.

## 4 ANALYSIS RESULTS

In this chapter we present some results obtained while analyzing collected data for the northern area between Brussels capital and Flanders regions. All maps showed below are made while importing and then processing database data from MS Access into Arcmap (GIS). Those maps represent just few example of the possible applications and uses of existing dataset and, are actually used as a base of common and shared knowledge in several discussions and projects in Brussels capital and Flanders regions.

### 4.1 Base maps and queries

The first and for the moment most used map we produced (Fig. 4), the “Dominant economic use” one, allow us to show mainly a complete overview of mapped areas and how and where economic activities are located. For each parcel only the dominant economic used is showed, even if more and usually different economic uses are present on the same parcel. A selection query about dominant uses of parcels done in MS Access led to the creation of this map.



Fig. 4: Dominant economic use map

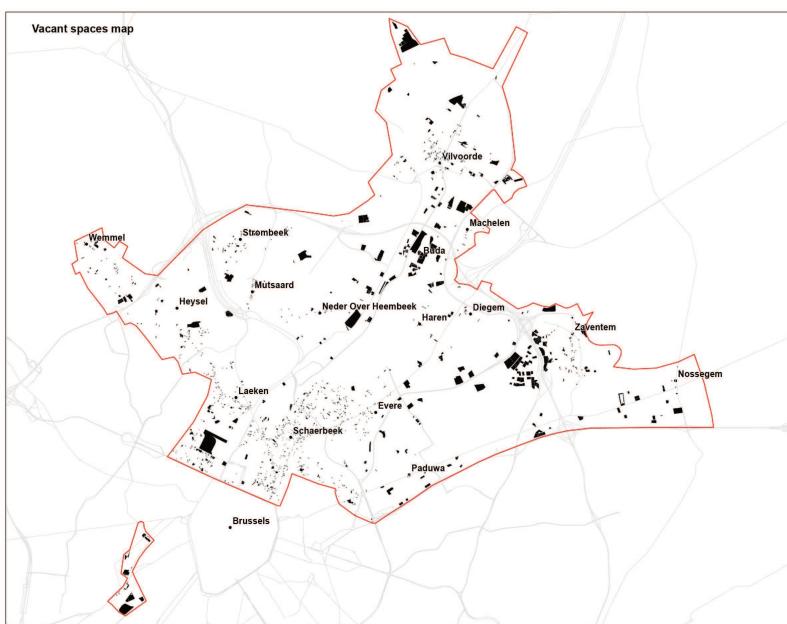


Fig. 5: Vacant economic spaces map

Thank to MS Access selection queries is also possible to extract and visualise just specific categories from the original dataset, that in a complete overview like the one showed above are sometimes not so easily visibles. One interesting example of this is shown in Fig. 5 and represent all the parcels with a vacant economic unit in it. Stakeholders, developers and companies are always looking for empty spaces informations, because those could represent new opportunities for each one of them. For that reason some data about vacant buildings or parcels are already available in both regions, representing a good possibility of double checking and integrating our database.

#### 4.2 Hot spot Analysis

This analisy has been carried out using the Hot spot Analysis tool (Getis-Ord GI\*) present in Arcmap (GIS). This tools work by looking at each feature withing the context of neighboring features. A feature with high value (i.e. number of economic units and companies within a parcel) is interesting, but may not be statistically significant hot spot. To be a statistically significant hot spot, a feature will have a high value and be surrounded by other features with high values as well (Zaman, 2014). In addition of this the result depend also by the distance band considered around every single point as shown by Fig. 6 and 7. The base of data used in this phase has been create by converting and clumping in a point layer all the data about economic units, in short, one point for each unit referred and located on the parcel centroid.

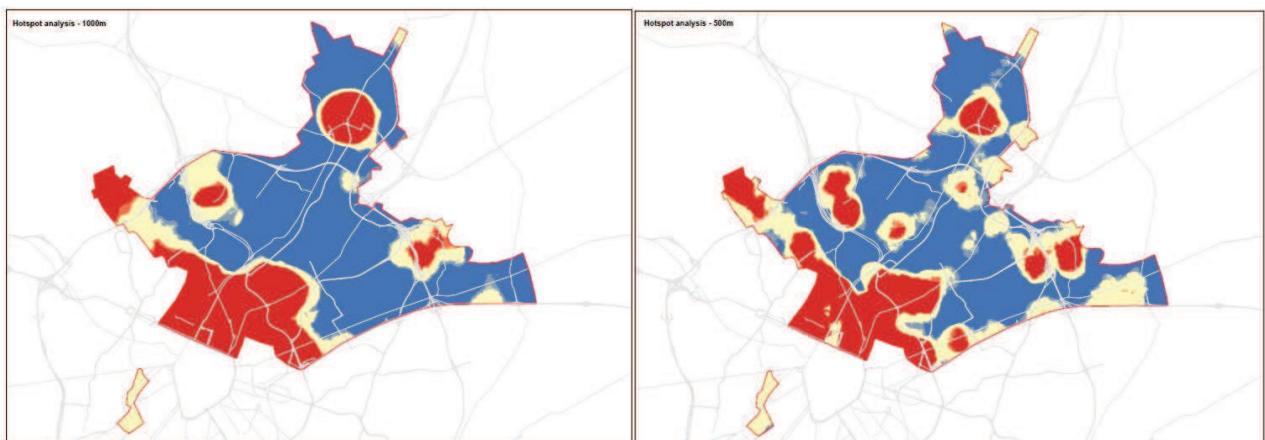


Fig 6: Hot spots Analisys with 1000m and 500m distance bands

Colour scale goes from more dense areas (Hot spots = Red ones), where more activities are located to low density areas (Cold spots = Blue ones) where density is lower. 1000m distance band map show areas with the highest density of economic activities in Brussels northern area, located mainly around the city and in Vilvoorde, the main small-medium size town in the area. Low density areas are not completely empty of economic activities, this became clear while looking at 250m and 150m distance band Hot spot Analysis versions (Fig. 7). Areas like village centers, office parks and industrial areas start being visibles giving a first detailed view of the economy structure and distribution in the area.



Fig.7: Hot spots Analisys with 250m and 150m distance bands

### 4.3 Cluster Analysis

We decide to try move our analysis in a more specific level of detail while working on clusters level. First notable difference between the maps showed in previous chapters and the two presented here (Fig. 8a and 8b), is the difference of scale. This because cluster analysis results do not depend by the size of considered area, like Hot spot Analysis, and let you work both on a sample size or on the maximunt extent of you dataset while obtaining omogeneous results. In this case we choosed to work on a sample scale, in order to test our methodology and represent results with a decent level of detail. The idea of analyse this specific type of clusters pop up after the creation of the previous explained “Dominant economic use“ map, where we noticed agglomeration of similar or probably related activities.

First map (Fig. 8a) represent an analysis about economic clusters of retail, restaurants, hotels and bars. An economic cluster refer to a relatively geographically bounded group of similar, related or complementary enterprises which are functionally interconnected and share commons infrastructures and servicies. Clustered shops, restaurants, hotels and bars that are either larger than 10000m<sup>2</sup> or less than 50m away from the next clusters are visible in pink. In blue outline others bars, shops etc. not included in clusters are represented as a reference. This analysis could be easily repeated for other categories (i.e. offices or vehicle related activities) and scaled up even if a 9 steps Arcmap (GIS) producure is needed to modify original dataset and obtain this result.



Fig. 8a: Economic Cluster analysis. Fig. 8b: Education activities in relation to retail clusters (education activities in Green scale, quantile classification in 5 classes)

In the second and last map (Fig. 8b) education related activities, like schools of every type and level are related with “retail, restaurants, hotels and bars“. The purpose was to identify if there were any relation between those two categories, considered that in our opinion schools are often served by bars, restaurant, snack bars and groceries shops in their surroundigs. Schools are represented while using a green coloured scale, where a darker greens are used when distance between schools and other activities is relatively small (i.e. between 0 and 30 meters) and light ones when distance became longer (i.e. more than 30m). In blue outline bars, shops etc. are represented as a reference. Thanks to obtained results is possible to declare that in our sample schools are frequently surrounded by the above mentioned activities, within a short walkable distance. In our sample area, around 20% of the education activities are next to retail activities, and a total of 80% of the schools have retail activities within 60 meters.

### 4.4 Shopping streets analysis

In the last part (Fig.9), thanks to the results obtained by the previous GIS analysis phase, we decided to focus on shopping streets, considered their constant presence and importance inside the project area. We identified and defined two different types of shopping streets: Regional (1) and local ones (2 to 5). The classification in this two categories is based on some specific characteristics and our knolwedge about each of the five sites, like for example the spatial and economic relevance. Regional shopping streets (1), like Rue de Brabant in

Brussels, are characterized by a monofunctional use (Retail, restaurants and bars), with an extremely low number of vacant spaces, and a similar scale of building sizes. The importance of this streets led to the creation of a solid structure that usually is not effected by changes in surroundigs areas or in the neighborhood. As a consequence shop prices tend to be higher than in other less relevant streets, and activities (Servicies, offices, grocery stores or agencies) that can not afford high rents or prices tend to be pushed out to other cheaper places. A quick rental market research about site n.1 showed that 480€/m<sup>2</sup> (Citydev.brussels, 2017) per year is a good and indicative value about rents inside a regional shopping street in Brussels.



Fig. 9: Shopping streets

On the other hand, local shopping streets (2 to 5) are characterized by differents uses. Retail, restaurant and bars remain the dominant activities, but despite this they are mixed with a lot of other different activities like hairdressers, travel or employment agencies, car repair, grocery shops, supermarkets and last but not least schools and hospitals. The last two mentioned activities are actually playing an important role in the structure of local streets, not just because their different and bigger scale but also for the reason that they function as attractors for other activities, like explained before in chapter 4.3 for schools. In addition of this the number of vacant spaces is higher in the local streets than in regional ones, this togheter with mixity reveals a more fragile structure. The creation of a new shopping center nearby, changes related to mobility or policies inside the street itself or in the surroundigs could really effect and damage this already fragile structure. Rental market prices for the considered local shopping streets, located in Brussels capital region (3 and 4) and not more than 20 Km away from the city center (2 and 5), result to be lower than previous ones, range between 260 and 375 €/m<sup>2</sup> per year (Immoweb, Realo, 2017). Finally, is possible to declare that local shopping streets are a good example of how different economic functions and scales can work togheter in the same environment, while sharing spaces and infrastructures.

## 5 CONCLUSIONS

Building a database showing the way economic activities are visible in the field is a much needed but achievable goal. Through the first phases of the project, we gradually made the data collection easier to do and the method is now widely accepted by the main actors. Discussions with people involved in spatial and economic data collection and visualisation were extremely helpful and each presentation and debate improved the database. We saw that the more territory that was covered by the database, the relevance of the maps increased, both as a policy instrument and for research purposes.

Now we have a coverage that is large enough to start spatial and economic analysis. In a next step we will try to highlight different patterns, similar to the cluster, and hot spot analysis shown in this paper. A more detailed analysis, like the shooping streets one, based on the combination between GIS data, morphology and other spatial or economic data will be required, in order to obtain a better understanding about economic dynamics.

The main challenge remains the use of the database as a first step in auditing the economy in relation to spatial policy preparation. The selection of the territory started from a need of better understanding the

economy in specific areas in the Brussels Northern area, where we are using the database inside a spatial planning proces. To this moment, the use of the data is very promising and seems to guide us towards new insights in spatial and economic dynamics.

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