SEGMENTATIE IV

TYPOLOGIES METHODOLOGY

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TYPOLOGIES METHODOLOGY

Economy typologies are defined as areas characterized by a similar economic fabric continuity, an homogeneous context and the predominance of an economic use or a mix of economic uses.

To define these typologies a four GIS (ArcMap) steps and visual interpretation methodology has been developed and is here explained.

The first step consist in the creation of a selection of parcels with economic use, based on the economic mapping data collected on the field and contained in the economic activities MS access database. Starting from the cadastral parcels shapefile of Flanders (GRB Vlaanderen), and using the "Capakey" field as common one, a join between this shapefile and the dominant economic use parcel table is necessary to obtain the basic layer of parcels with economic use. The use of the economic categories layer file is necessary to visualize parcels categorization.

The second step is to run the "near" tool to calculate the distance from each parcel with economic use to the nearest. This distance is then used to divide parcels in five different categories (Fig. 1)
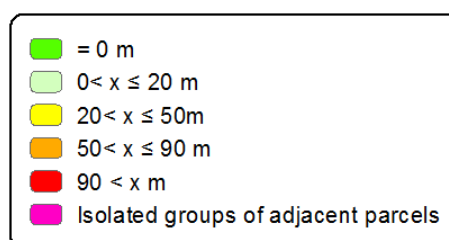

Fig 1: Near distance categories

Inside the first category (near distance = 0m) there could be the presence of some parcels that should not be part to it. In some cases the "near" tool could classify isolated groups of parcels as part of this category only because they are located one next to each other, even if they are isolated from all the other parcels where the near distance is 0. In order to filter them out is necessary to first make a selection of the parcels with a near distance of 0 and save it as a separate shapefile. After this, using the "dissolve" function is possible to merge together the adjacent parcels. The new produced layer, in which a new field containing parcels area is manually added and calculated, is used as an input for the "near" tool in order to calculate distances between features. A selection of features in which the near distance is 0 and the area smaller than 5400m^2 (based on empirical observation) is made, exported and named as "Isolated groups of adjacent parcels".

Fig 2: Near distance map

The third step consist in the morphology creation through a visual interpretation of the second step results. The term economic morphology is defined as the distribution of economic functions related to a specific context.

At this point a orthophoto is added to the parcels layer, in order to add an extra level of information about the mapped area. These information are fundamental for a correct visual interpretation because they allow a more comprehensive understanding of the possible relations between economic activities on a parcel level and their context. Economic parcels located one next to each other are not necessarily always related. For example two parcels facing two different streets, like a shopping street and a dead end residential one, connected to each other through their back sides are not part of the same economic context and for this reason they should be located in two different morphological areas. Six categories (Fig. 3) are used to divided the economic fabric into morphological areas, based on distances and relations between parcels, and are:

- (1) Continuous economic fabric (= 0 m)
- (2) Almost continuous economic fabric (0< x ≤ 20 m)
- (3) Discontinuous economic fabric (20< x ≤ 50m)
- (4) Cluster of solitary activities (50< x ≤ 90 m)

- (5) Solitary activities (90 < x m)

- (6) Non visible economic activities

Fig 3: Morphology categories

In order to create this areas, and editing session in GIS is necessary. This consist in splitting the mapped area shapefile in polygons and coding them according to the morphologic areas definition. The distance between parcels is used as an indicator and not as a restriction. In a morphological area the presence of some parcels with a near distance bigger or smaller than the category one (i.e. 20 to 50m) is allowed.
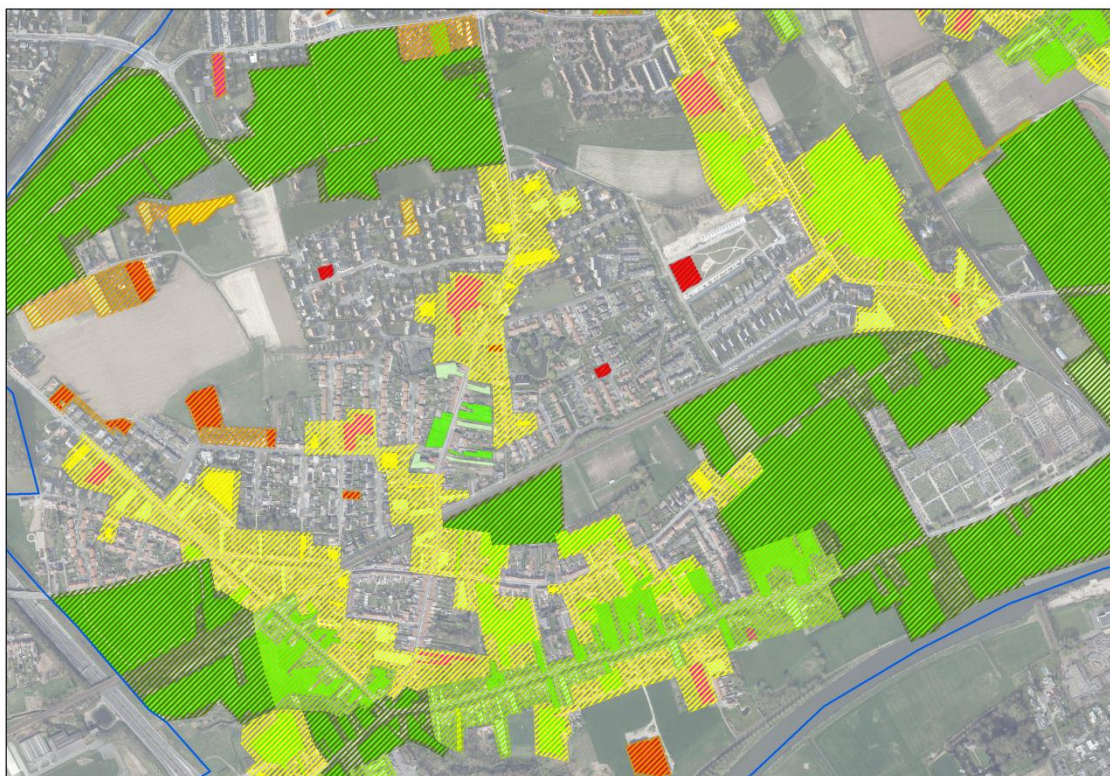

Fig 4: Morphology map

The fourth and last step is the economic typologies definition based on the data produced and elaborated in the previous phases. This consists in a visual interpretation of a three layers overlay. The layers are: the area orthophoto, the dominant economic use and as last the morphology.

Also in this phase an editing GIS session, in which the morphological areas previously created are subdivided and coded as types, is necessary. The criteria used for types definition are:

- Common economic use or mix of economic uses
- Presence of shared infrastructures common to all the parcels
- Environment with similar characteristics

Before moving to the typologies categories, three examples about types creation are here presented. For each one a picture (Fig. 5,6,7) showing the dominant economic use map (1), the near map (2), morphology (3) and typologies (4) is showed. The intention is to explain the logic behind the type definition and categorization for some specific examples.

Fig 5: Shopping street example

The first example (Fig.5) is located in Roeselare, more precisely around Ooststraat, the city's biggest shopping street. By looking at the maps number 1 and 2 it is possible to see how present the economy is in the area. Many parcels are located next to each other creating a strong economic continuity and only few gaps are existing. This continuous an apparently homogenous economic area, clearly visible in the number 3 map, contains some differences not only in terms of economic uses but also in economic location characteristics.

In an area like this, from an economic point of view, it is very different for an economic activity to be located on the main shopping street or in a side one. Being just behind the corner present some differences, like for example a different visibility. These differences are taken into account while splitting the extensive continuous economic fabric in two different economic types, the first one containing only the main shopping street and the second defined by the continuous and almost continuous areas around it.
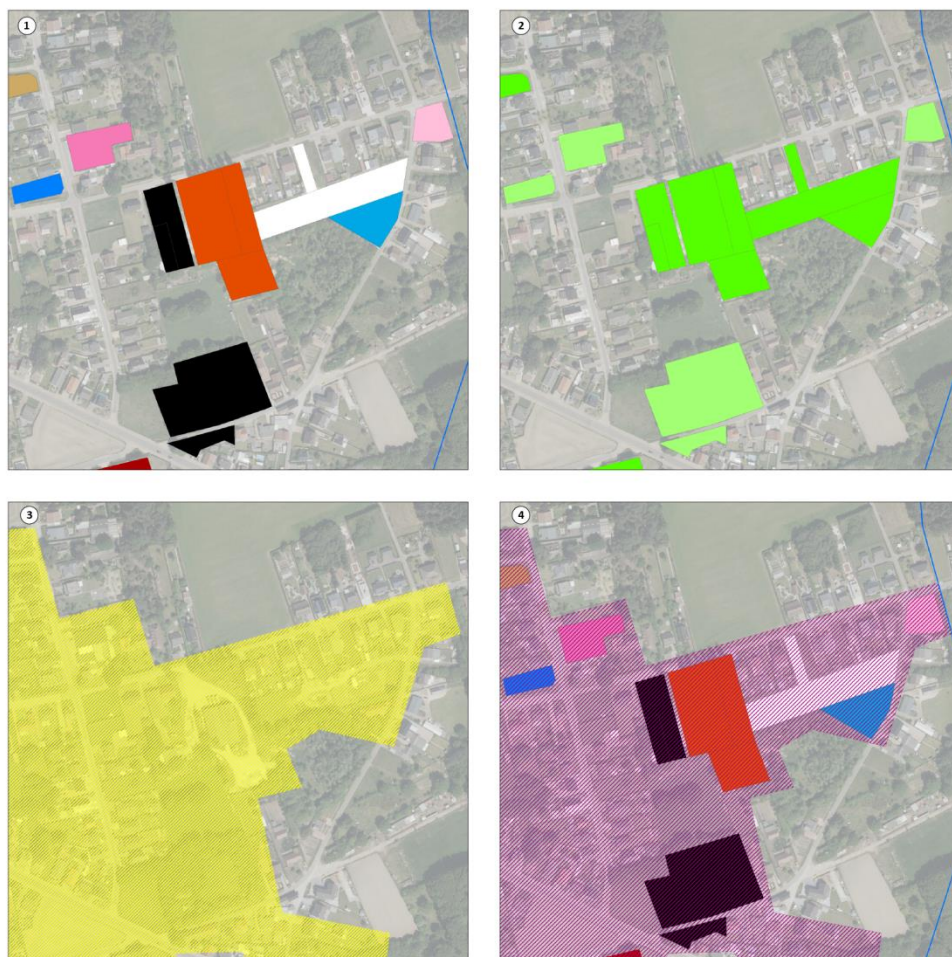

Fig 6: Non continuous area example

The second example (Fig.6) is located in the outskirt of Morkhoven, a village close to Herentals. Map number one helps to understand the context, a mainly residential area next to some agriculture fields with some economic activities in between. In the second picture a big green cluster in the middle of the map is recognizable, this could easily lead to the definition of a continuous economic. A more detailed interpretation shows how there is no real spatial connection between this companies, which are only located on adjacent parcels. For this reason the possible green continuous cluster in nothing than part of the same context in which the other activities in the area are located.
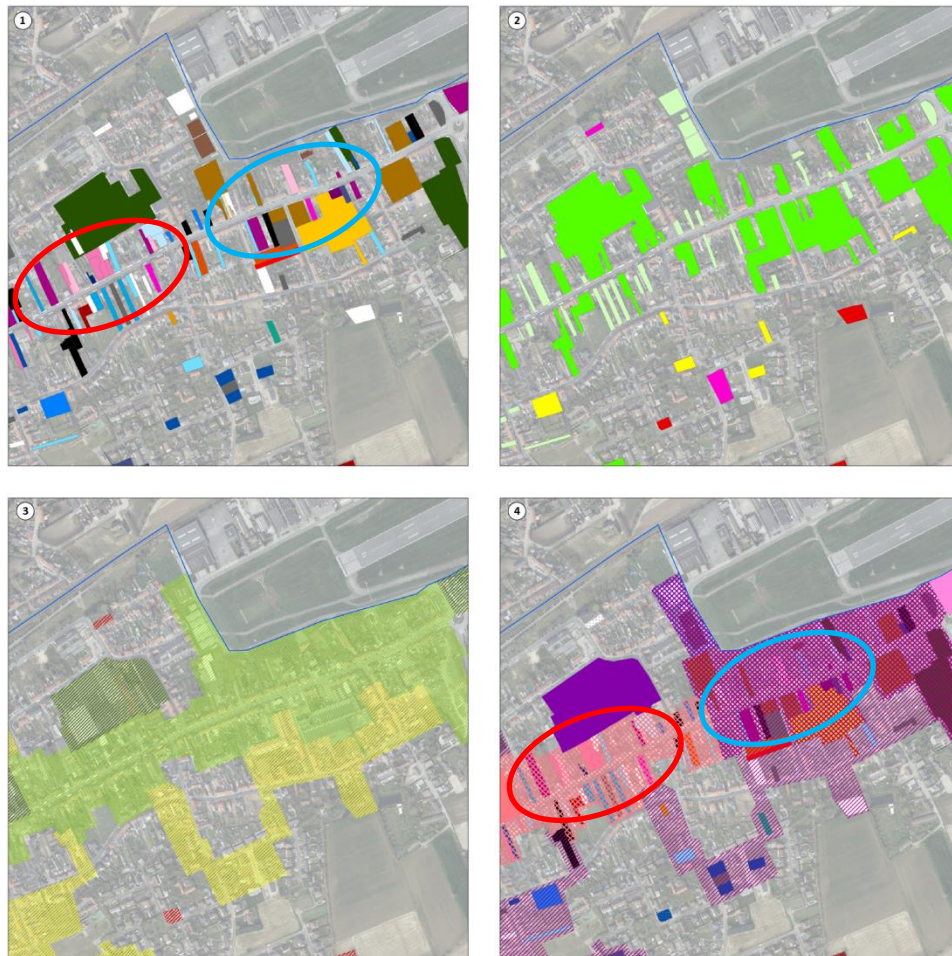
Fig 7: Almost continuous subdivision example

The third and last example (Fig.7) shows a section of Kortrijkstraat in Wevelgem, the main road between the village and Kortrijk. From both the dominant economic use map (1) and the near map (2) is possible to see a sort of economic continuity along the street, with several parcels for which the near distance is between 0 and 20 meters. From the overlay between the dominant economic use and the morphology map (3) two different sections are visible, the first (red circle) characterized by a mix

between retail and services and the second (blue circle) in which retail and services are mixed with industrial activities. For this reason two different economic types are created, with the same distance between parcels and located on the same infrastructure but with a difference in terms of economic uses.

Finally the 16 economic typologies (Fig.9,10), each one identified by a specific code, are here presented:

- (11) **Continuous predominant retail**: Area with a continuous economic fabric in which the main dominant economic use is defined by retail activities, restaurants and hotels.

- (12) **Continuous predominant services**: Area with a continuous economic fabric in which the main dominant economic use is defined by services (supporting services are excluded)

- (13) **Continuous predominant art, culture & leisure**: Area with a continuous economic fabric in which the main dominant economic use is defined by art, culture & leisure activities

- (14) **Continuous predominant industrial & production**: Area with a continuous economic fabric in which the main dominant economic use is defined by industrial activities (Manufacture, construction ,vehicle related, wholesale and transport) and supporting services.

- (15) **Continuous retail & services mixed**: Area with a continuous economic fabric in which the main dominant economic use is defined by a mix of retail, restaurants, hotels and services (supporting services are excluded)

- (16) **Continuous retail, services, industrial & production**: Area with a continuous economic fabric in which the main dominant economic use is defined by a mix of all economic uses

- (20) **Close activities (Retail & services)**: Area with an almost continuous economic fabric in which the main dominant economic use is defined by a mix of retail, restaurants, hotels and services (supporting services are excluded)

- (21) **Close activities (retail, services & industrial)**: Area with an almost continuous economic fabric in which the main dominant economic use is defined by a mix of all economic uses

- (22) **Close activities (Industrial & production)**: Area with an almost continuous economic fabric in which the main dominant economic use is defined by industrial activities (Manufacture, construction ,vehicle related, wholesale and transport) and supporting services.

- (23) **Discontinuous predominant art, culture & leisure**: Area with a discontinuous economic fabric in which the main dominant economic use is defined by art, culture & leiusure activities

- (24) **Discontinuous predominant industrial & production**: Area with a discontinuous economic fabric in which the main dominant economic use is defined by industrial activities

(Manufacture, construction ,vehicle related, wholesale and transport) and supporting services.

- (25) **Discontinuous retail services & mixed**: Area with a discontinuous economic fabric in which the main dominant economic use is defined by a mix of retail, restaurants, hotels and services (supporting services are excluded)

- (26) **Discontinuous retail, services, industrial & productive**: Area with a discontinuous economic fabric in which the main dominant economic use is defined by a mix of all economic uses

- (31) **Cluster of solitary activities**: Group of activities located in a close disperse economic fabric, located on the same infrastructure or in a similar environment.

- (32) **Solitary activities**: Isolated activities not connected or related to others.

- (33) **Non visible economic activities**

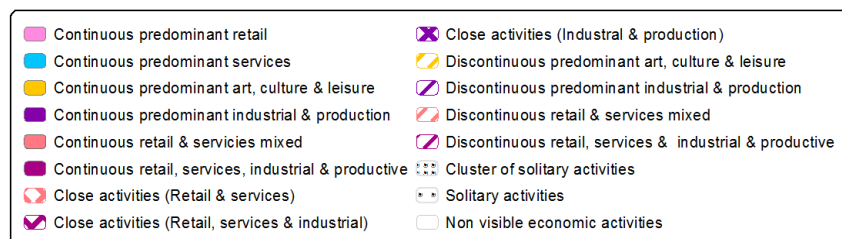|	
▢ Continuous predominant retail	⊠ Close activities (Industral & production)
▢ Continuous predominant services	▨ Discontinuous predominant art, culture & leisure
▢ Continuous predominant art, culture & leisure	▨ Discontinuous predominant industrial & production
▢ Continuous predominant industrial & production	▨ Discontinuous retail & services mixed
▢ Continuous retail & servicies mixed	▨ Discontinuous retail, services & industrial & productive
▢ Continuous retail, services, industrial & productive	⦂⦂⦂ Cluster of solitary activities
▢ Close activities (Retail & services)	⦁⦁ Solitary activities
✓ Close activities (Retail, services & industrial)	▢ Non visible economic activities

Fig 8: Economic typologies
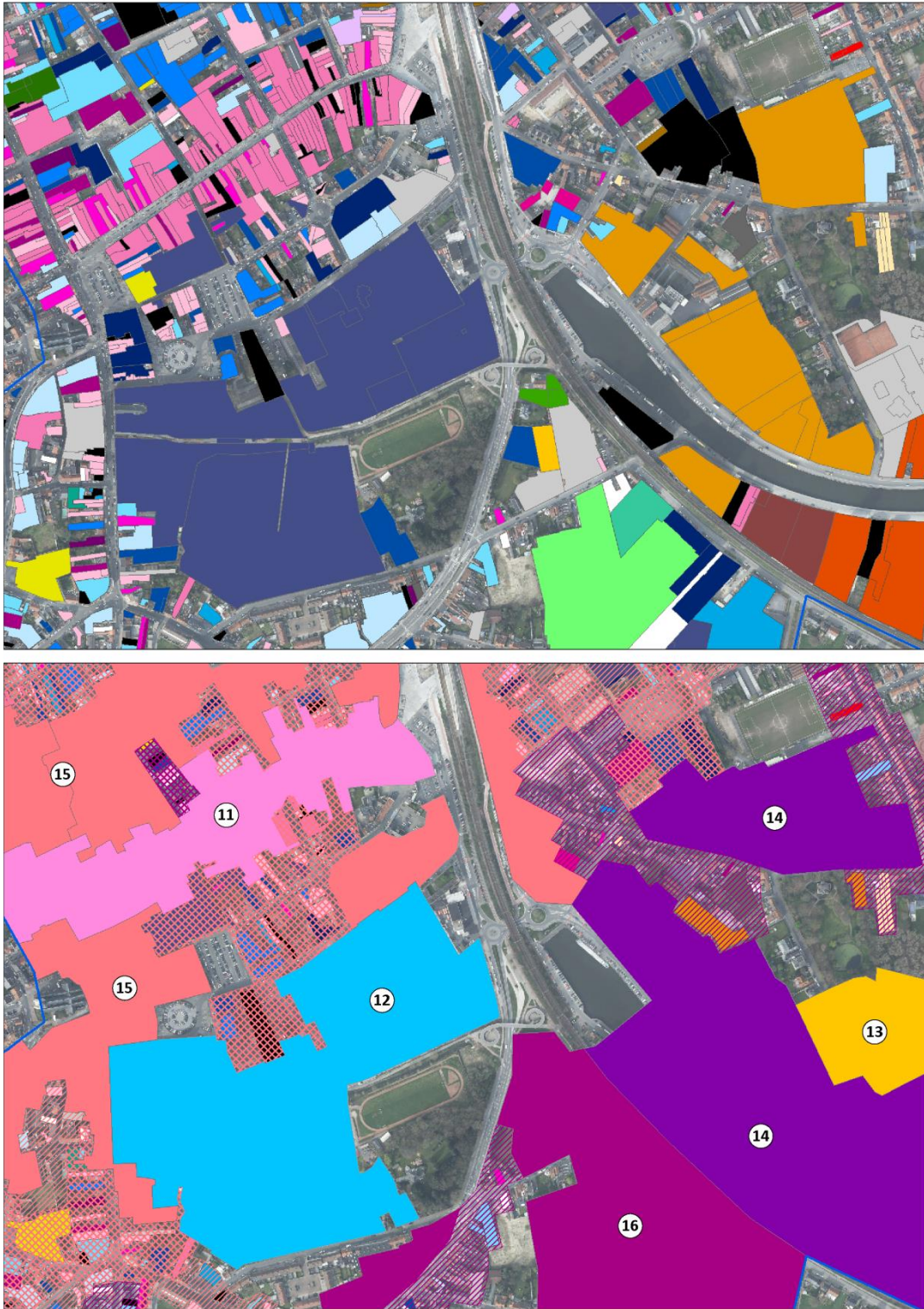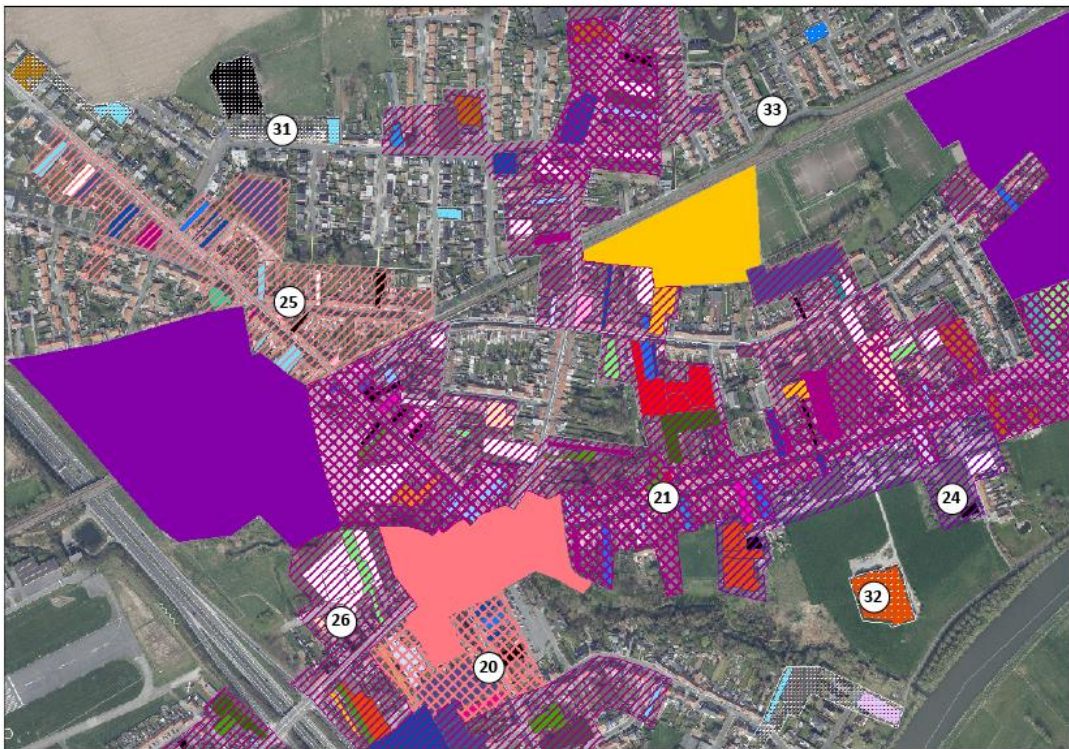
Fig 9: Continuous typologies example

Fig 10: Typologies examples

TYPOLOGIES REVIEW

After the typologies definition, a review of the result is important to verify the presence of mistakes in types definition, coding or delimitation. This quality control is carried out throughout different phases which are here explained.

The first phase consists in a visual check of the typologies topological integrity. A visual comparison between two printed maps, one for the mapping and the other one for typologies could lead to the identification of imprecisions in the types creation. Some examples of topological mistakes are the presence of:

- Natural or anthropic infrastructures (Highways, railways, canals, rivers etc.) that are not used by the economic activities in the type. Fig. 11a shows an example of a canal which is not used by the activities in the type, for this reason it should not be considered as part of it.

- Generous buffers around solitary or cluster of solitary activities. In these cases the type is limited only to the economic parcels area or to the immediate surroundings in case of a cluster of solitary activities. Fig. 11b shows and example of buffers that are not limited only to the economic parcels.

- Wrong types delimitations, in which economic parcels are located in a wrong type because of an inexact visual interpretation.
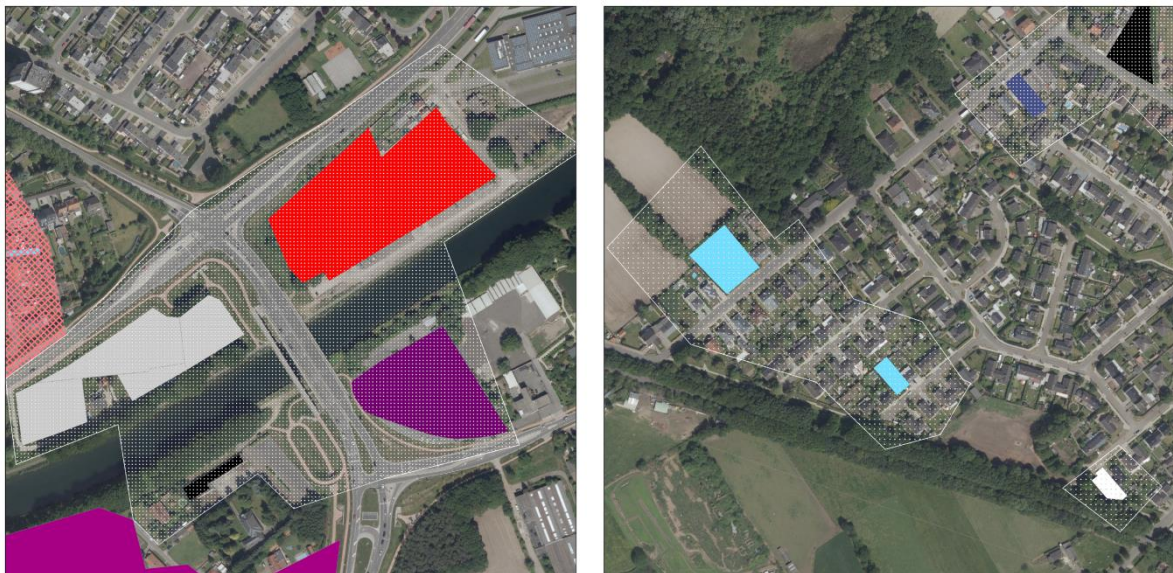

Fig 11a & Fig 11b

The second phase of the review consist in the analysis of every type (feature) compositions in terms of: number and type of economic units, number, area and type of economic parcels uses (parcel's dominant economic use is considered).

In order to proceed with the analysis is necessary to identify every single feature with a specific ID. For this reason a new ID field in the types shapefile attribute table is added and calculated, using Pyton to insert the following two auto numbering codes, one for each of the two text boxes:

```
rec=0
def autoIncrement():
 global rec
 pStart = 1
 pInterval = 1
 if (rec == 0):
  rec = pStart
 else:
  rec += pInterval
 return rec
```

```
autoIncrement()
```

Fig 12: Auto numbering code

The second step consist in importing in GIS (ArcMap) the parcels and units data contained in the MS Access economic activities database. A MS access selection query allows the creation of an unique table in which data about parcels and units are combined. This table is then imported in GIS and joined to the cadastral map shapefile using "Capakey" as common field. Once this shapefile containing the entire mapping dataset for a given area is created, a "One to many Spatialjoin" (Analysis tools > Overlay > Spatial Join) between this shapefile and the typologies one is necessary in order to relate every economic parcel to the a specific type. The final product of this phase is a shapefile that contains all units and parcels information for every single feature (Fig. 13)

morph	Types	n	index	ID_1	Parcels_se	Units_Capa	SHAPE	Parcels	Dominant_u	Combined_w	Number_of	Number_of1	Name	Type_of_ac	Units_A
1	11	5	2	1295	36015A0114/00K000	36015A0114/00K000	89,34	RP	Housing	-1	1	3	Steps dresses	Clothing	RP
1	11	5	2	1294	36015A0114/00H000	36015A0114/00H000	44,13	SPR	Economy	0	1	3	Sofimo	Real estate	SPR
1	11	5	2	1291	36015A0112/00N000	36015A0112/00N000	87,86	SFL	Economy	0	1	3	Beo bank	Bank	SFL
1	11	5	2	1292	36015A0112/00P000	36015A0112/00P000	153,5	E	Housing	-1	1	4		Shop	E
1	11	5	2	1293	36015A0112/00R000	36015A0112/00R000	130,04	RB	Housing	-1	1	4	Roeselare bloeit	Bar	RB
1	11	5	2	1290	36015A0111/00B000	36015A0111/00B000	147,74	RP	Economy	0	1	3	Hans anders	Optician	RP
1	11	5	2	1289	36015A0110/00D000	36015A0110/00D000	154,66	RB	Economy	0	1	3	Les Petit Poulets	Restaurant	RB
1	11	5	2	1288	36015A0109/00B000	36015A0109/00B000	114,22	RP	Economy	0	1	3	Comme ca	Clothing	RP
1	11	5	2	1287	36015A0105/00L000	36015A0105/00L000	240,3	RP	Housing	-1	1	3	Mephisto	Shoes shop	RP
1	11	5	2	1286	36015A0103/00H000	36015A0103/00H000	243,76	RP	Economy	0	1	2	Bloemen Orchidee	Florist	RO

Fig 13: Attribute table example

This shapefile is then used as an input for the next phase. In this for every feature the number of economic units, number, area and type of economic parcels uses are calculated. The "Frequency" tool (Analysis tools > Statistics > Frequency) is used to make this calculations. This tool reads a table and a set of fields and creates a new table containing unique field values and the number of occurrences of each unique field value. In other terms it counts the number of unique values (economic units, economic parcels number, economic parcels) for each type (Fig.14). This function is used once for every information.
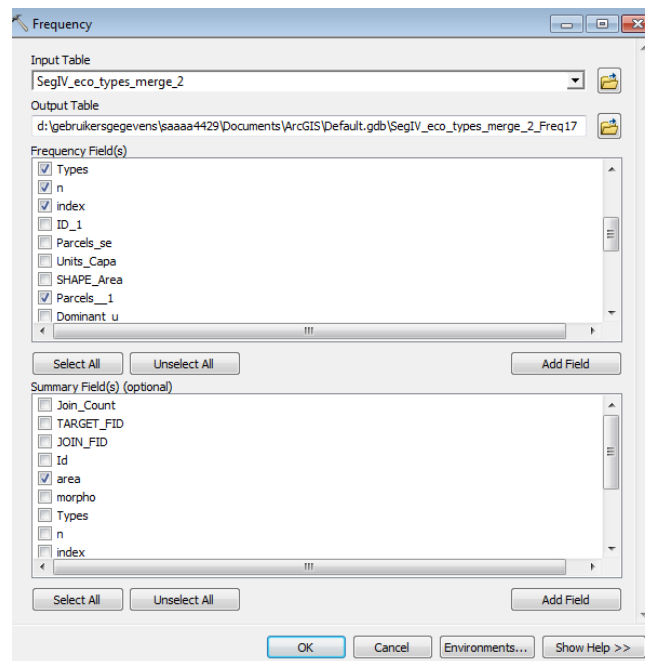

Fig 14: Frequency function

Figure number 15 show and example of a frequency table, in which for every type (index column) the number of parcels for every specific economic use (frequency)and their total area (shape area) is calculated.

FREQUENCY	Types	n	index	Parcels__1	SHAPE_Area
1	11	2	175	RB	445,286506
3	11	2	175	RF	20154,770323
1	11	2	175	RP	3827,568904
1	11	2	175	SOP	211,006134
14	11	2	226	E	3680,317107
1	11	2	226	OU	187,092761
11	11	2	226	RB	2014,967131
3	11	2	226	RF	536,087153
2	11	2	226	RG	617,52686
9	11	2	226	RO	2716,444909
36	11	2	226	RP	12257,215727

Fig 15: Frequency table

Frequency tables cannot be analyzed in ArcMap or in the format they are once produced. For this reason the creation of a pivot table is necessary. In order to do this frequency tables are exported to

Microsoft Excel and transformed into pivot ones. Economic activities categories are used as columns labels, types ID as rows values (index) and the sum of Frequency as table values. Two other columns are then added: "Types" containing the type code, and "N" containing the case study area number.

Index	Types	N	MAG	ACS	CGA	CGS	CIE	E	F	MCO	MFC	MMM	MO	MPP	OU	RB	RC	RF	RG	RH	RO	RP	SE	SFL	SHC	SOP	SPC	SPR	SPU	SRD	SSC	SSG	UT	VA	VB	VC	VW	WC	WF	WO	WTS	(blank)	Total
1	33	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
2	11	5	0	1	0	0	0	16	0	0	0	0	0	0	0	11	0	6	0	0	12	89	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	137
3	15	5	0	2	0	0	0	5	0	0	0	0	0	0	0	4	0	2	1	0	0	6	0	13	4	5	2	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0	49
4	33	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
5	33	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
6	33	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
7	12	5	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	14	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16
8	15	5	0	3	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	9
9	20	5	0	1	0	0	1	4	0	0	0	0	0	0	0	12	0	0	0	2	4	4	3	3	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	36
10	33	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
11	20	5	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
12	25	5	0	1	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5

Fig 16: Pivot table

After the pivot tables are created, the 40 economic activities categories are grouped in 9 categories (Fig.17) . The aim is to reduce the number of categories to facilitate the data analysis while creating groups of activities that usually have a similar location on the field. The 9 categories are:

1. **Agriculture**: "Manufacture agriculture"
2. **Industrial activities**: "Construction Gardening and landscaping", "Construction Interior and exterior finishing", "Construction General and structural", "Manufacture Construction materials", "Manufacture Food", "Beverages & Catering", "Manufacture Metals & Machinery", "Manufacture Other", "Wholesale Construction", "Wholesale Food & Beverage", "Wholesale Other", "Transport & Storage", "Printing & Publishing", "Utilities", "Vehicles air", "Vehicles cycle", "Vehicles cars & trucks", "Vehicles rail", "Vehicles water", "Utilities".
3. **Industrial services**: "Supporting services Building related and construction", "Supporting services: Goods related".
4. **Office services**: "Services Creative, Media & Advertisement", "Services Research, Innovation & Development", "Services Professional".
5. **Urban services and leisure**: "Services Healt Care", "Services Other Personal", "Services Education", "Services Public", "Arts, Culture, Leisure and Sports", "Faith"
6. **Retail construction**: "Retail construction"
7. **Retail, restaurants and hotels**: "Hotels, B&B", "Restaurants, Cafés & Takeaways", "Retail Food", "Retail Home and Gardening", "Retail Other", "Retail Person Related".
8. **Vacant**: "Vacant"
9. **Unknown**: "Unknown"

Fig 17: Analysis categories

Activities grouping is carried out in MSAccess. Nine new fields, one for each category, are added to the pivot table and calculated using the "Expression builder" as shown in Fig. 18. Frequency values for each category are calculated while summing subcategories values.
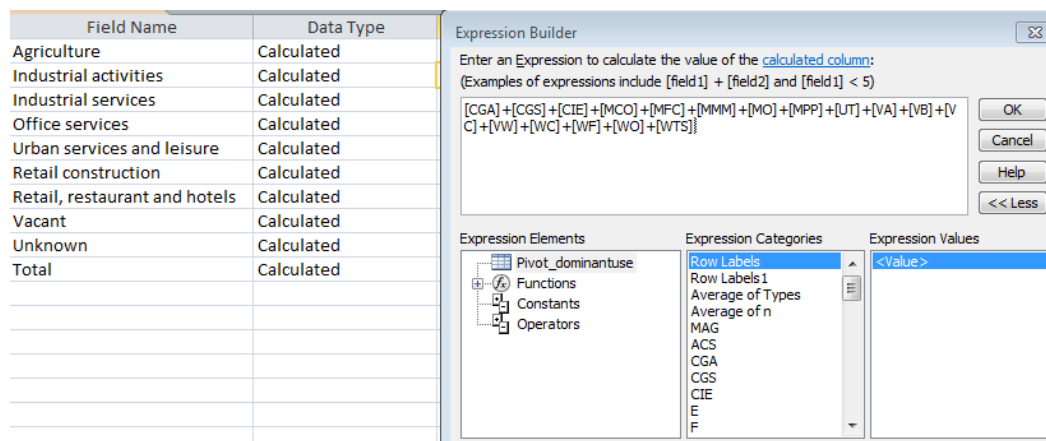

Fig 18: Categories grouping

The last step of the second phase is the report creation, in which for each type in the pivot table three tables and their related graphs are automatically created. The three tables are:

1. Number of units
2. Number of parcels (Dominant economic use)
3. Sum of parcels area (Dominant economic use)

Fig. 19 shows an example of the possible layout to use for data representation. For each type, the case study area name, ID number and type category are added.
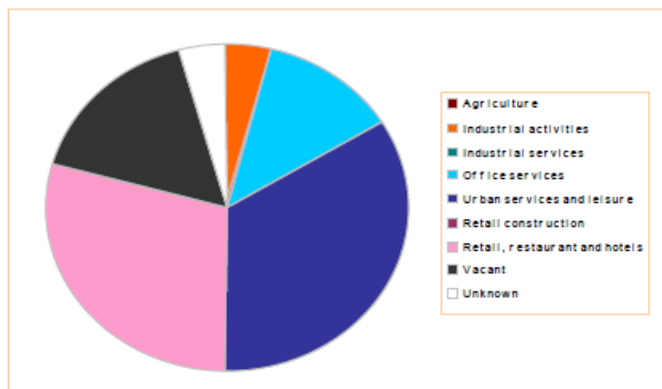
**Continuous retail & servicies mixed**   Type number 58

Number of Units

Agriculture	0
Industrial activities	1
Industrial services	0
Office services	3
Urban services and leisure	8
Retail construction	0
Retail, restaurant and hotel	7
Vacant	4
Unknown	1
Total	**24**

Number of Parcels

Agriculture	0
Industrial activities	0
Industrial services	0
Office services	2
Urban services and leisure	11
Retail construction	0
Retail, restaurant and hotel	6
Vacant	2
Unknown	1
Total	**22**
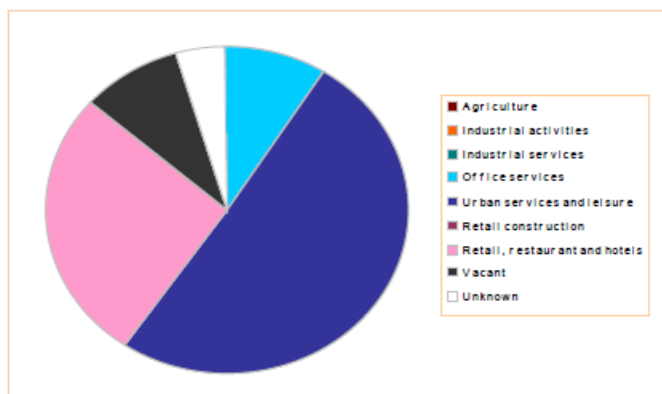
Sum of area (sq. m)

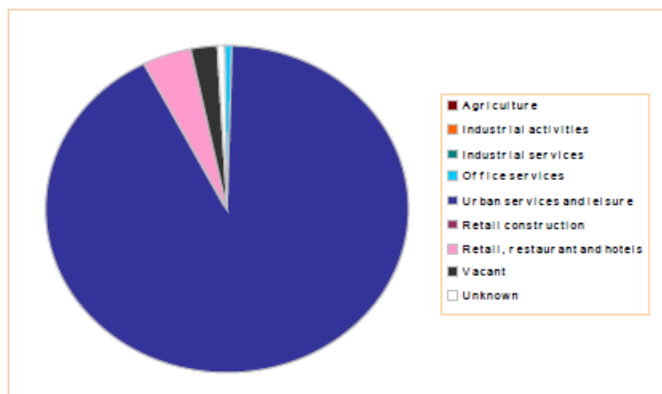|	
Agriculture	0
Industrial activities	0
Industrial services	0
Office services	225
Urban services and leisure	40.292
Retail construction	0
Retail, restaurant and hotel	1.945
Vacant	1.004
Unknown	280
Total	**43.746**

Fig 19: Report example

The third review phase consists in manually checking all the created graphs and tables for each type. The aim of this phase is to identify the presence of types that are classified using the wrong category. This could happen for different reasons. The most obvious two are errors during types spatial definition or in the code attribution. As explained the GIS visual interpretation is based on the dominant economic use of the parcels, which represent only a part of all the available data. The visualization of the three graphs and their related tables (Fig. 19) could lead to a different type definition, especially when differences between the sum of area graph and the other two are visible. In this specific example the type is classified as "Continuous retail and services mixed", in which an equilibrium between these two categories is expected. The mix between services and retail is almost constant in terms of units and economic parcels and matches the type definition. On the other hand the parcels area analysis reveals a different story, "Urban services and leisure" are using the 92% of the economic space, for this reason the type should be classified as "Continuous predominant services" or divided in two separate types.

The fourth and last review phase consists in redoing the typology review as quality control, starting from the first step. The aim is to check that all the possible mistakes are solved, with the types correctly defined and classified.