

# Land use and soil consumption in south Milan's periurban areas



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# 1. Introduction

The following research aims to represent and document the main transformations of land cover and use, which have affected a part of the Milanese periurban territory in the last twenty years. The territory taken into consideration corresponds to 3 municipalities in the southern part of the Milan province: Carpiano, San Donato Milanese and San Giuliano Milanese. Following this comparison it will be possible to establish the extent of the ongoing land consumption. Hence the title “Use and consumption of soil”

Land cover and land use are concepts that are related but different from the concept of consumption of soil. Land cover and land use describes the physical and biological coverage of the earth’s surface, including artificial surfaces, agricultural areas, wood and forests, semi-natural areas, wetlands, and water bodies.

Instead, the land consumption is defined as a variation from a non-artificial cover (unconsumed soil) to an artificial cover of the soil (soil consumed). The land consumption must be understood as a phenomenon associated with the loss of a fundamental environmental resource, due to the occupation of the originally agricultural, natural or semi-natural surface. The phenomenon therefore refers to an increase in artificial land cover, linked to settlement dynamics. A process mainly due to the construction of new buildings, warehouses and settlements, the expansion of cities, the densification or conversion of land within an urban area, the infrastructure of the territory.

In addition to this brief introduction and conclusions, the research consists of two main parts. The first part consists in a rapid description of the territory in analysis, so as to understand its position, the main components that characterize it and some data about population and surface.

The second, more detailed, aims to describe the change in land use of the 3 municipalities (and consequently of land consumption), taking into consideration the period 1999 - 2015.

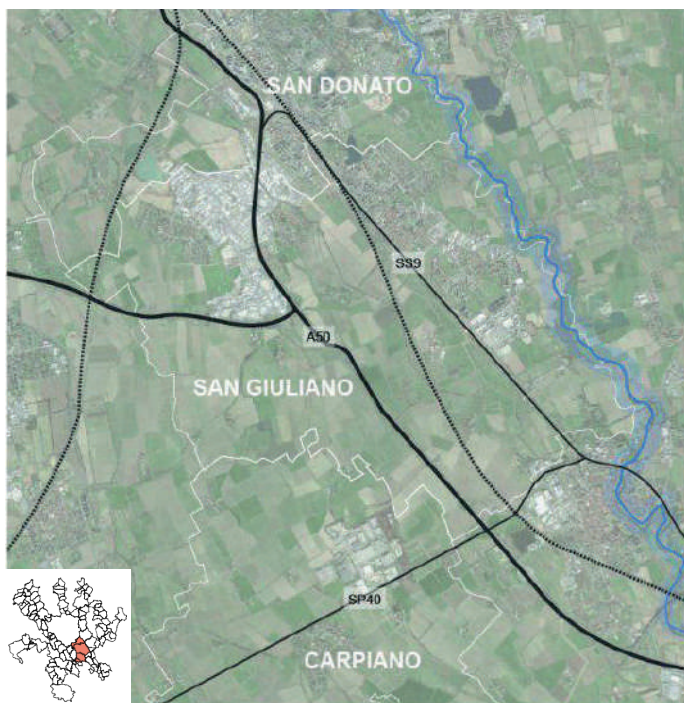
In this part are described, in addition to the results, the different steps that were necessary to achieve them. As will be seen in detail, the main application used for the processing of these analyses is the QGIS software.

## 2. Localization of the areas

The area takes into account corresponds to the municipalities of San Donato Milanese (further north), San Giuliano Milanese (in the center) and Carpiano (further south).

The territory on which the three municipalities are developed is affected by massive infrastructural presences. In the north part of San Donato, in an east-west direction, the SP 415 (Strada Paullese) flows, an important artery connecting the area of Milan to that of Crema and Cremona. This street separates the municipality of San Donato from Linate airport, further north. In the north-south direction, in the municipalities of San Donato and San Giuliano, there is the state road 9 (Via Emilia). A little further west, in the same municipalities, parallel to the Via Emilia flows the A50 (Autostrada del Sole). Carpiano is not directly crossed by these roads, but by its arteries. Another important element of the mobility system is the presence of the metropolitan transport service: San Donato is the southern terminus of the M3 line.

The agricultural areas, the network of farms, the water bodies (first of all the Lambro river) the presence of the South Milan Agricultural Park (to which Capriano belongs), give to the considered territory a high agricultural-landscape value.



### 1 SAN DONATO MILANESE

Population: 32511 Inhabitants  
Surface: 12,88 Km<sup>2</sup>  
Average Density: 2524,15 Ab/km<sup>2</sup>

### 2 SAN GIULIANO MILANESE

Population: 38132 Inhabitants  
Superficie: 30,87 Km<sup>2</sup>  
Average Density: 1235,24 ab/km<sup>2</sup>

### 3 CARPIANO

Population: 4131 Inhabitants  
Surface: 30,87 Km<sup>2</sup>  
Average Density: 239,62 ab/km<sup>2</sup>

### 3. Land use analysis

#### *Tools and Data*

The analysis was carried out on the municipalities of San Donato Milanese, San Giuliano Milanese and Carpiano in two historical years: 1999 and 2015. The work was mainly done using the QGIS software. The geographical information was found using the Lombardy Geoportal. The Geoportal is a unified point of online access to the vast patrimony of geographical information related to the Lombard territory. It offers tools for searching, visualizing, locating geographical data, converting to other reference systems and downloading data.

In particular, considering the purpose of the work, we used the DUSAF database (Use of Agricultural and Forest Soils): a multi-temporal geographic database that classifies the territory on the basis of the main types of land cover and land use, allowing comparison between different historical moments. All levels of information are comparable, as they use the same legend, that is divided into 3 main levels, the first of which includes the 5 main categories of coverage (anthropized areas, agricultural areas, wooded areas and semi-natural environments, wetlands, water bodies), progressively detailed at the second and third levels. Two further levels of local scope (the fourth and fifth) represent the specific features of the Lombard territory.

In the case of this analysis the operations were carried out considering only the 3 main levels. Through this type of study we can reach a level of reconstruction that is quite effective to compare the consumption of soil to the possible causes of it.

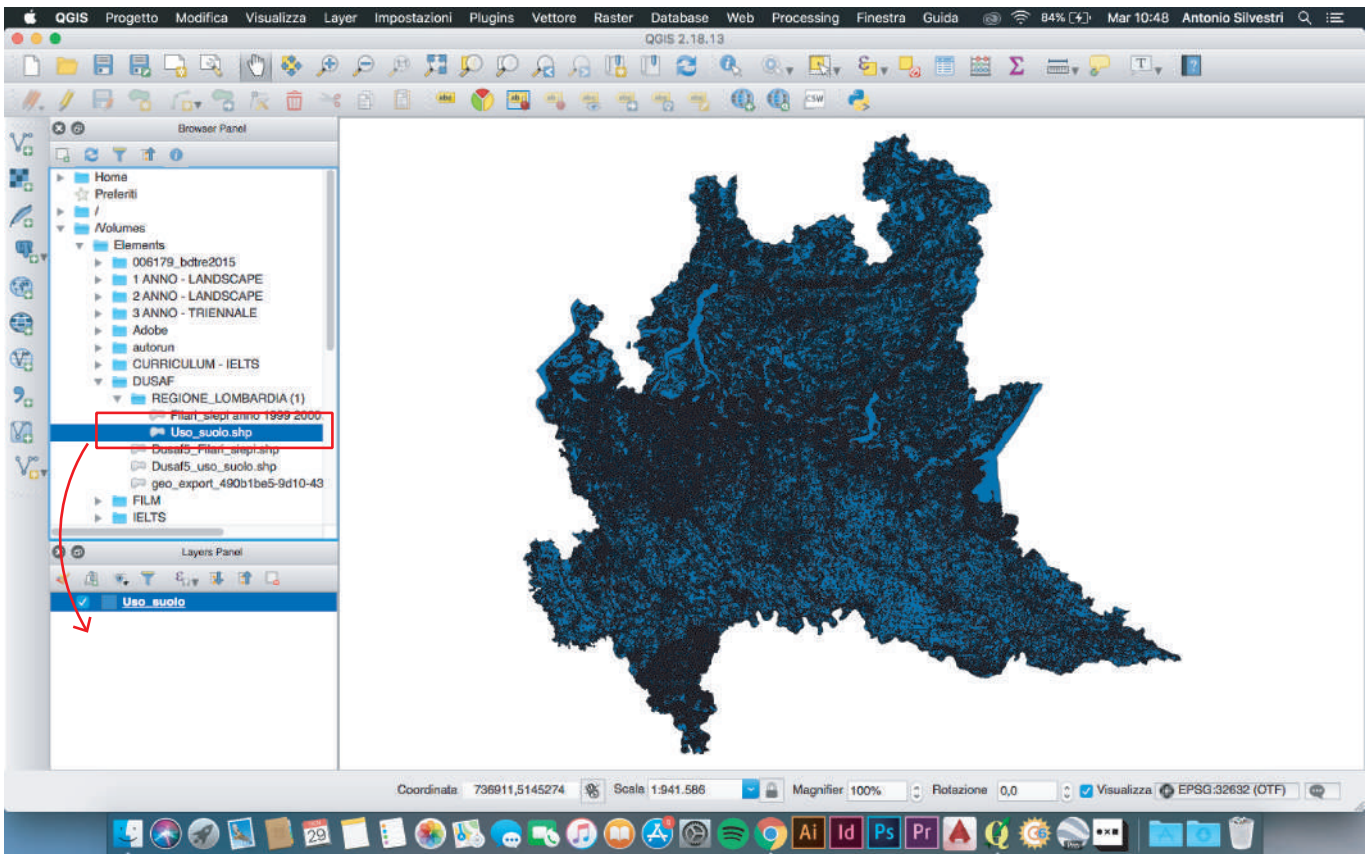
To carry out the analysis of land use within the three municipal borders, it was necessary to download the maps containing the municipal administrative boundaries of the metropolitan city of Milan from the Lombardy Region website.

Once these data were found, a comparison was made between the two dates (1999: fotointerpretazione del volo IT 2000 realizzato da Blom CGR; progetto DUSAF 1.1 e 2015: fotointerpretazione delle foto aeree Agea, di maggior dettaglio rispetto alle precedenti, su tutto il territorio regionale, integrata con informazioni derivanti da numerose banche dati regionali; progetto DUSAF 5.0) for each municipality. The result is a cartographic layout that shows the transformations of land use. Later, using Excel, a calculation was performed to demonstrate the percentage of land use change also quantitatively. Finally, by consulting the ISTAT website, it was possible to provide charts on the demographic trend of the territory. These data is interesting when put in relation with the trend of land consumption.

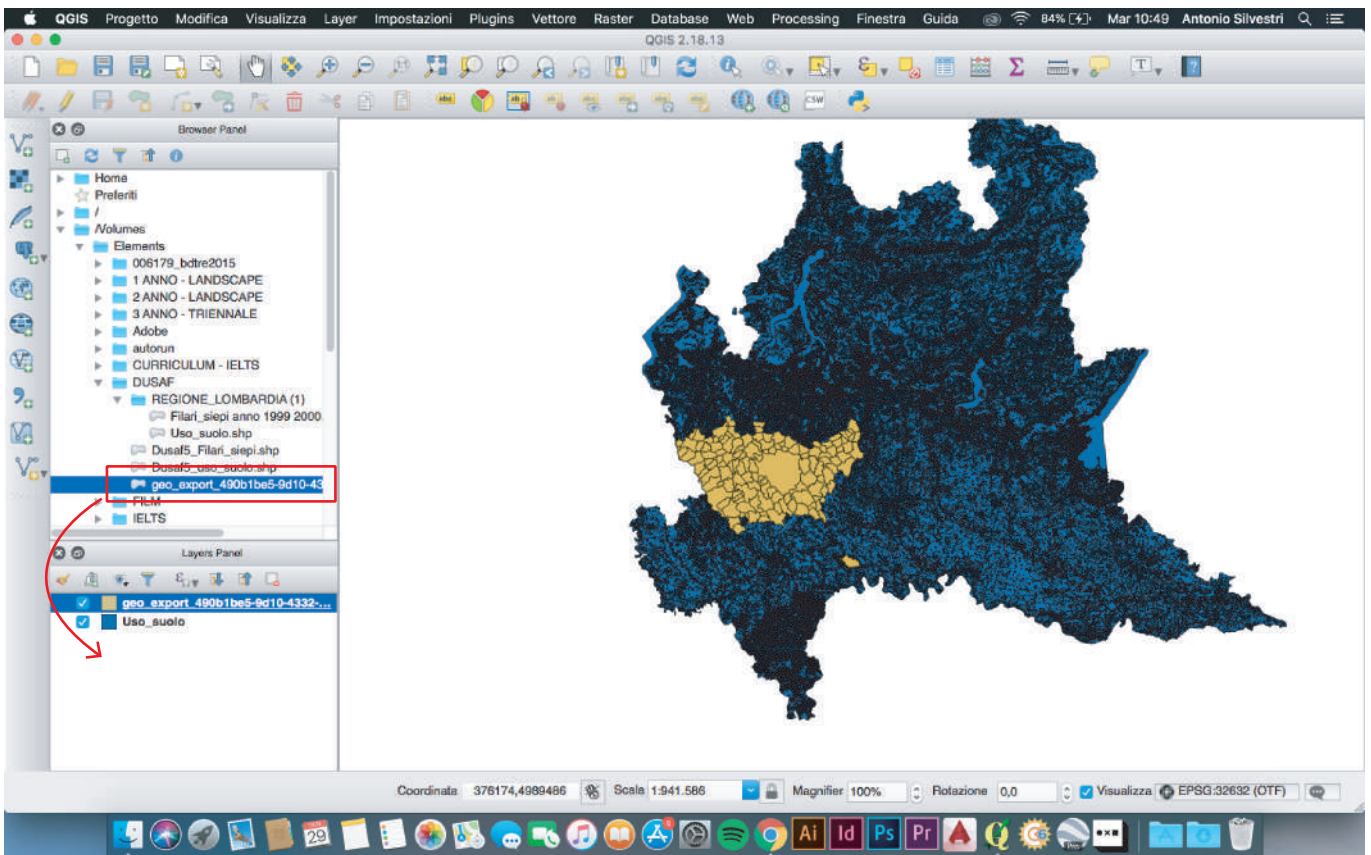
## *Qgis step by step*

After identified the areas and analyzed the tools and the data that are useful to reach our goal, we start the operational part using the software Open sources Qgis. In this section we describe the most important passages that we did to reach a final cartographic material and the data for the following analysis.



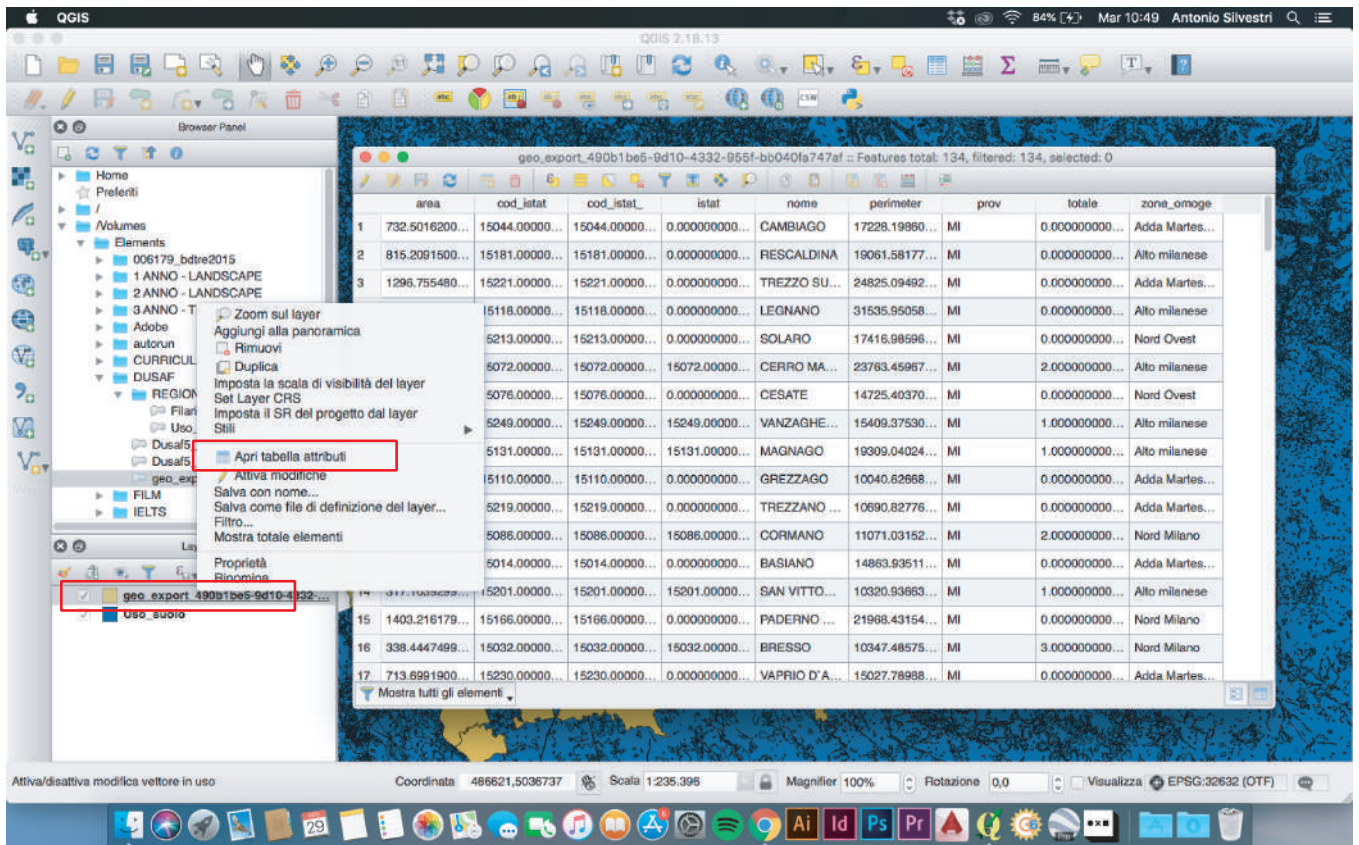


Step 1:  
Opening of the layer, drag the “.shp” file into the layers panel.

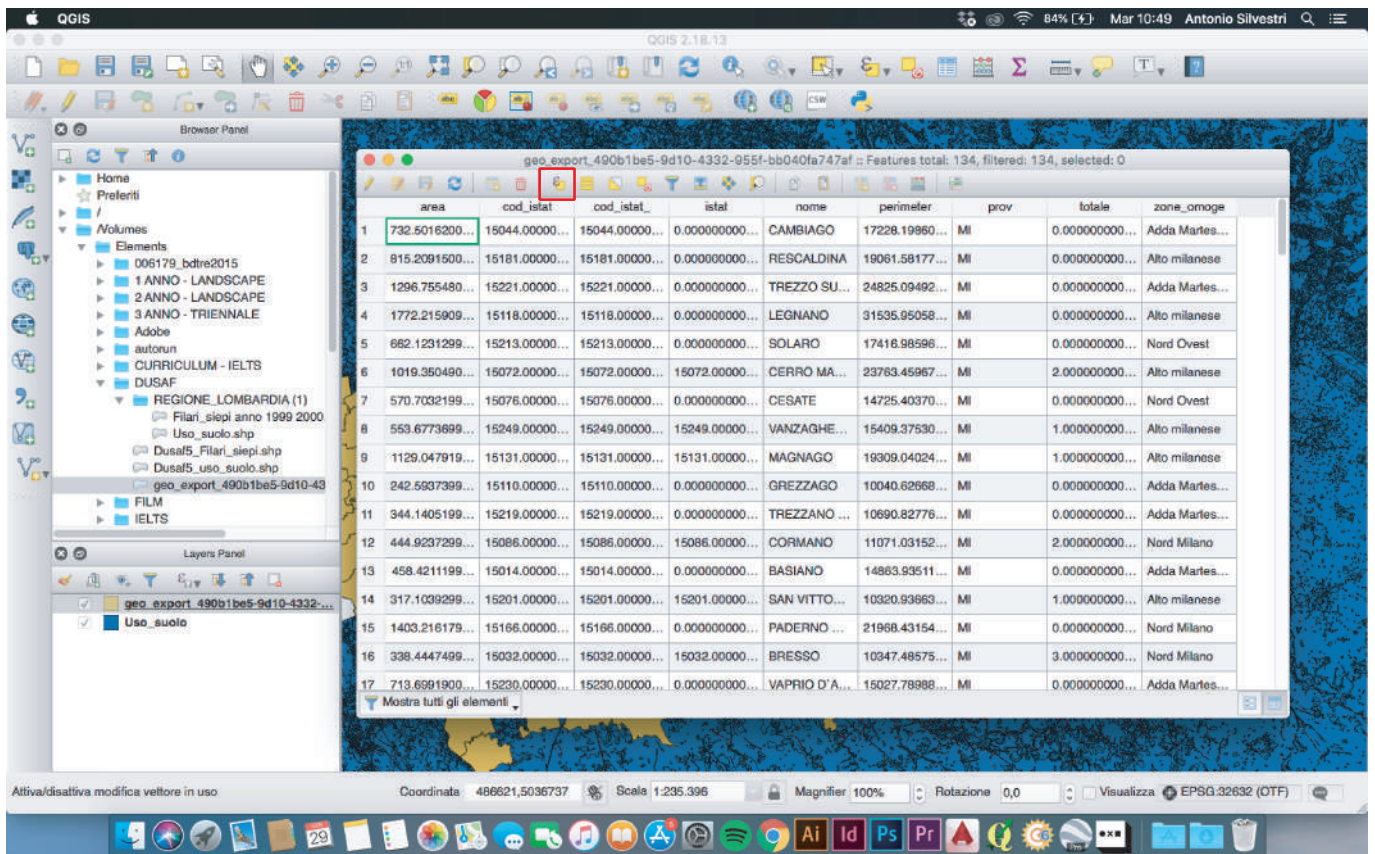


Step 1:  
Opening of the layer, drag the “.shp” file into the layers panel.



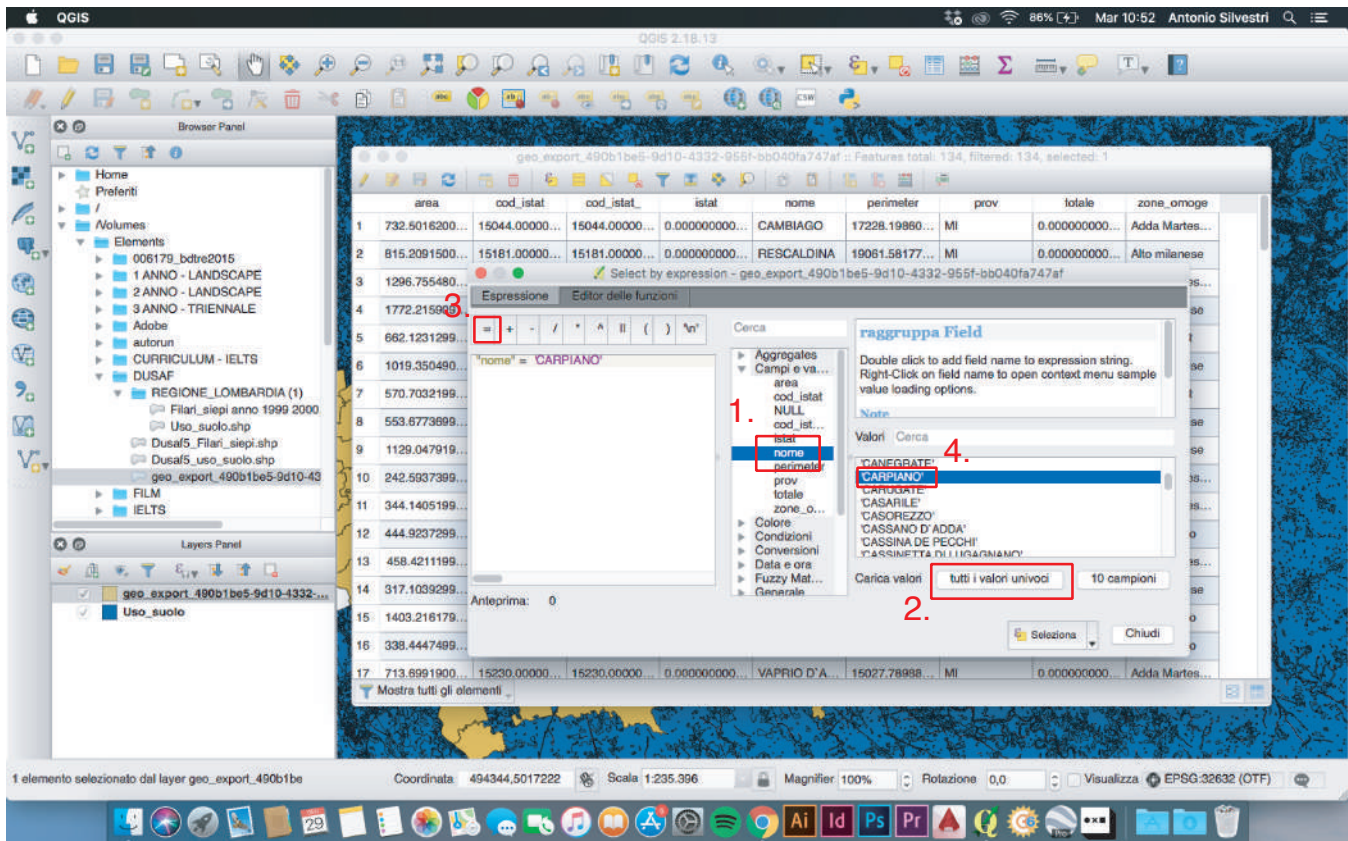


Step 2:  
Right click with mouse on the layer and opening of "tabella attributi".



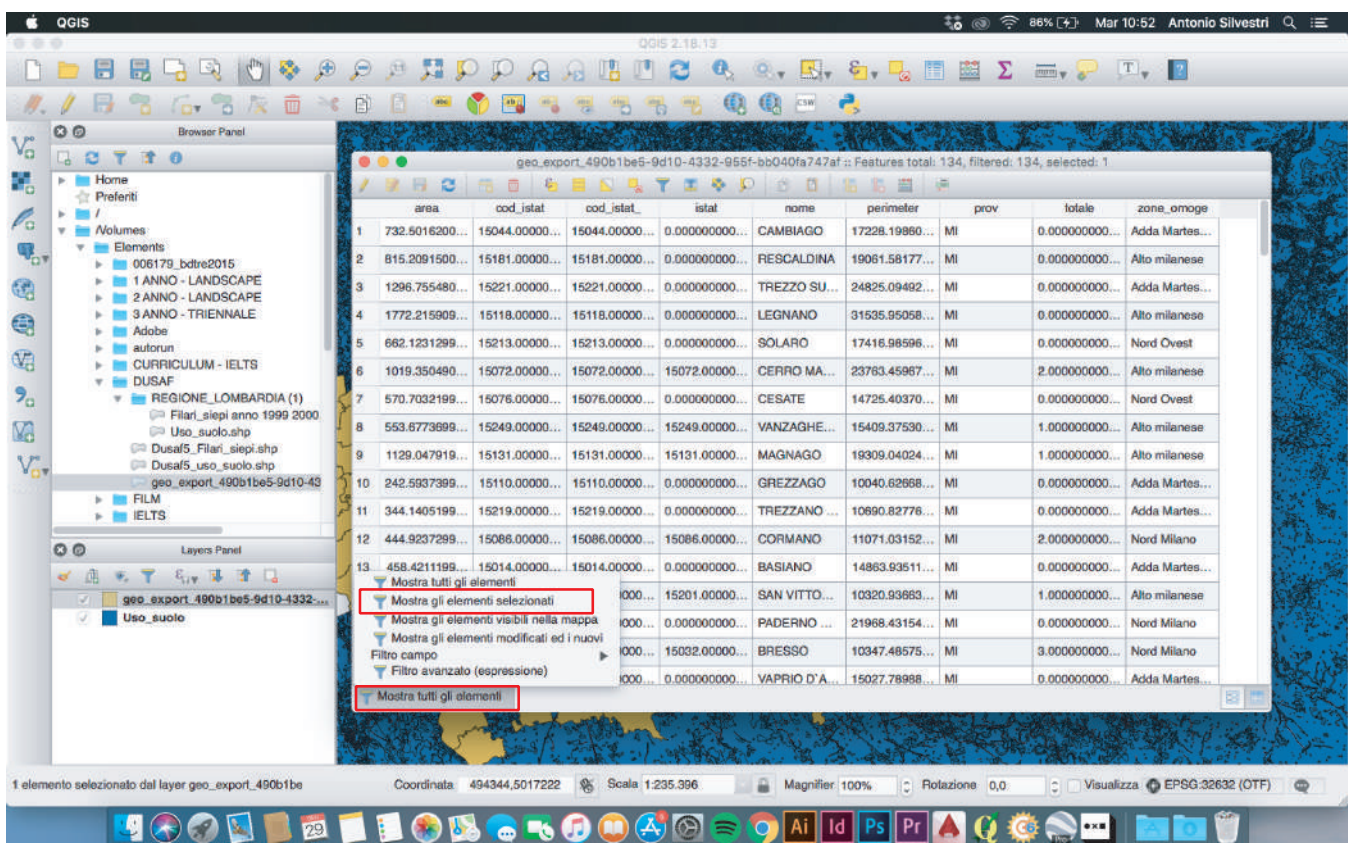
Step 3:  
Choosing "Selecting by expression".





#### Step 4:

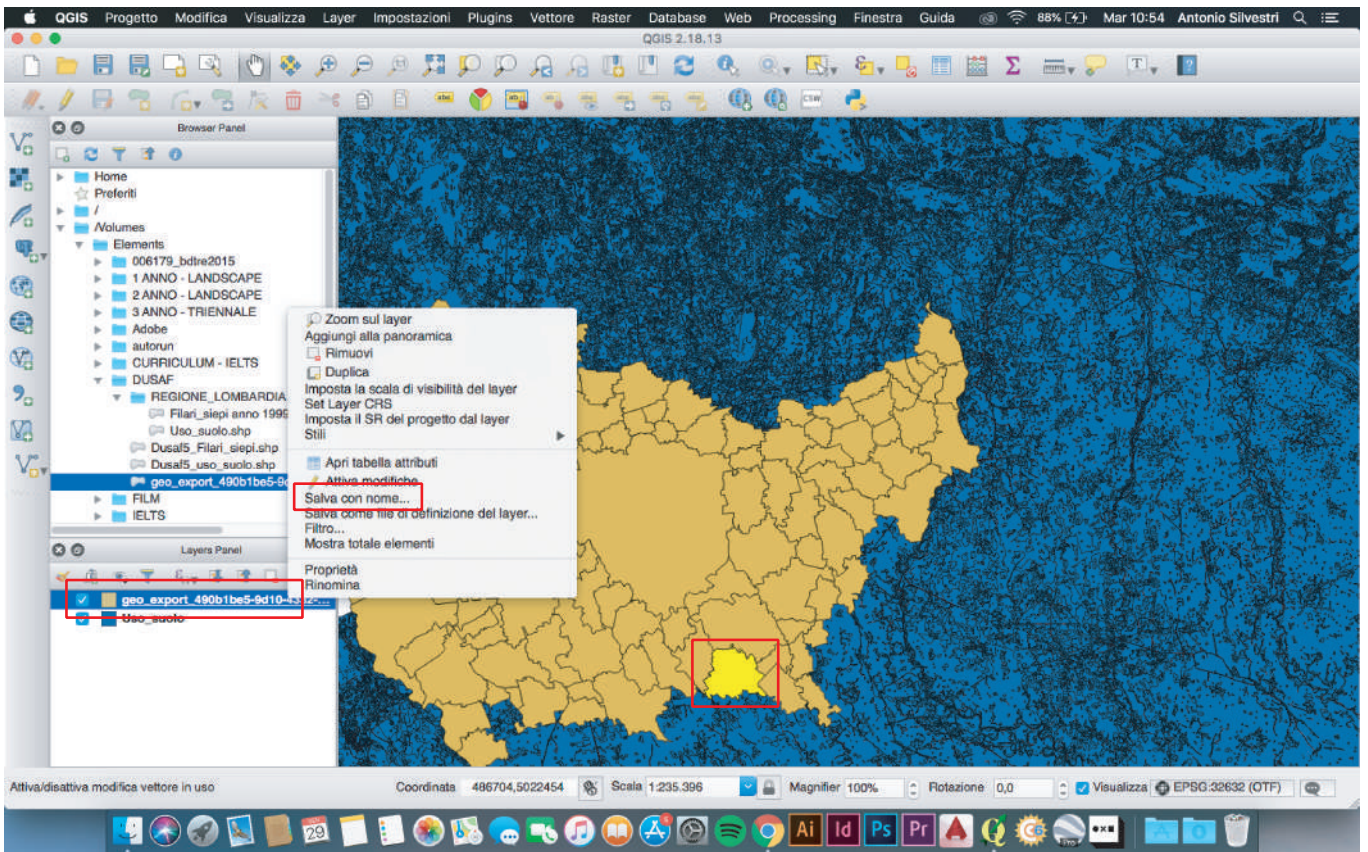
Choosing "Campi e valori", double click on "Nome"<sup>(1)</sup>, click on "tutti i valori univoci"<sup>(2)</sup>, after double click on "="<sup>(3)</sup> and double click on the interested name (Carpiano)<sup>(4)</sup>. After this, click on "Seleziona"



#### Step 5:

Check of "selection". Click on "Mostra tutti gli elementi" and after choose "Mostra gli elementi selezionati".

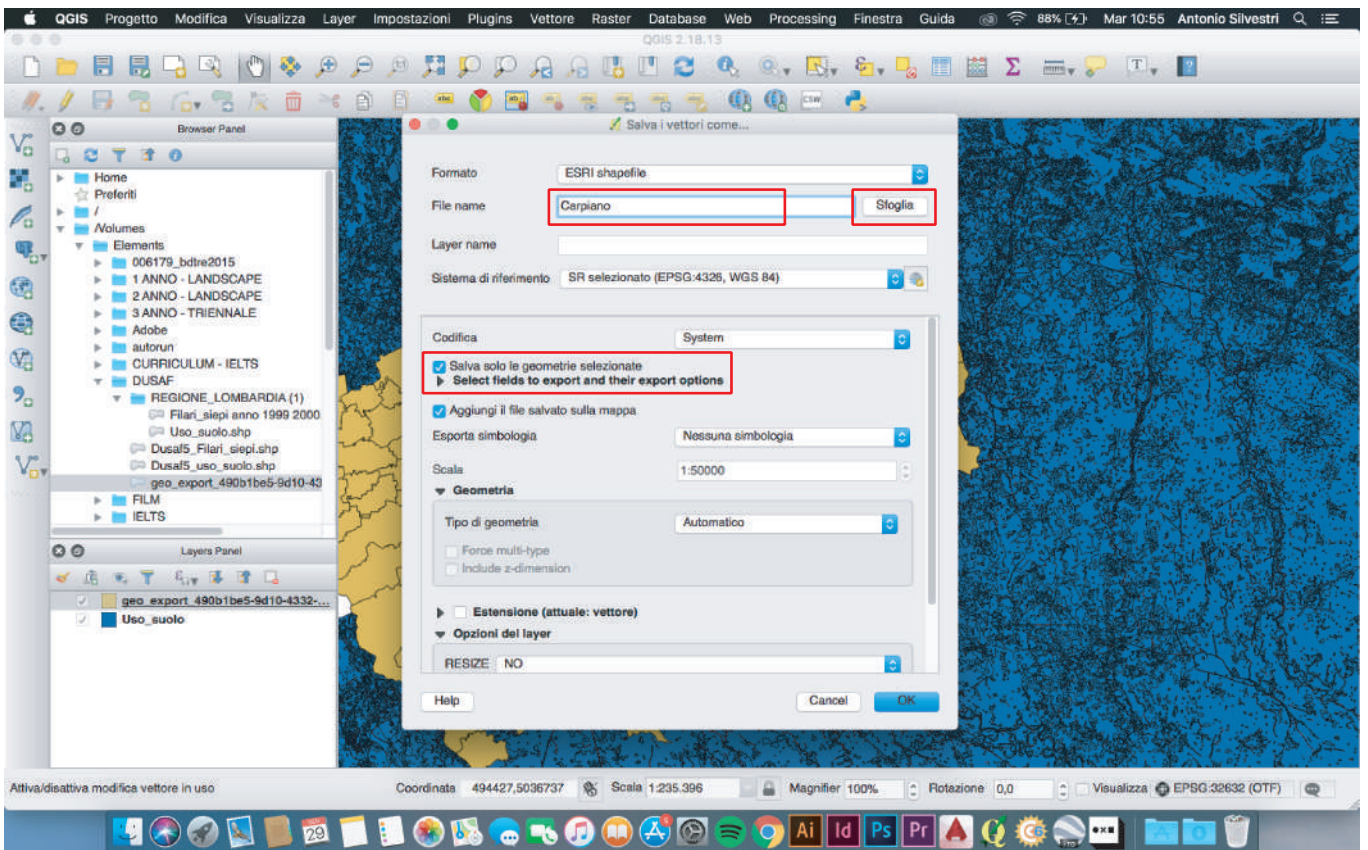




### Step 6:

Exporting a single geometry from the main layer.

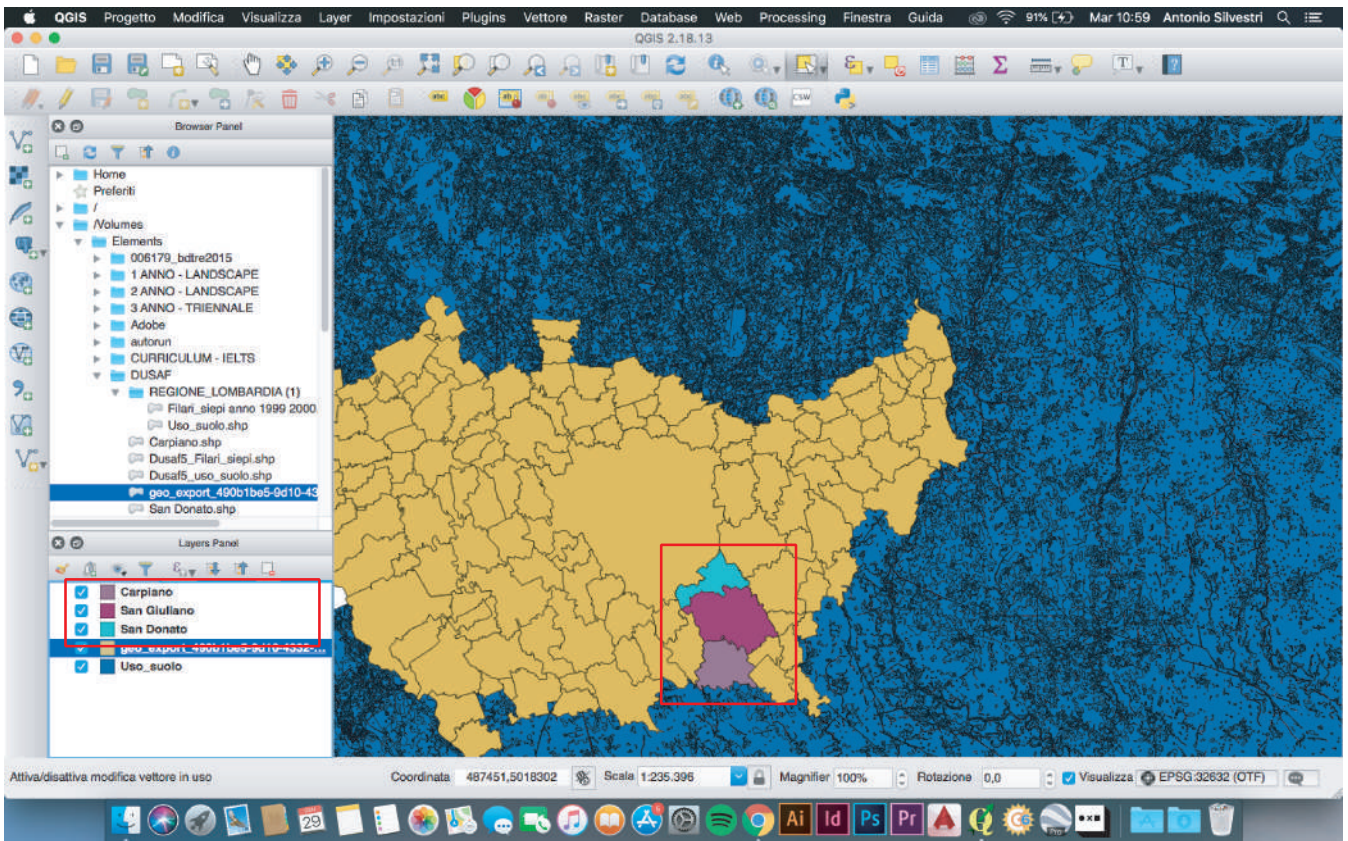
Right click on the layer and choosing "Salva con nome..."



### Step 7:

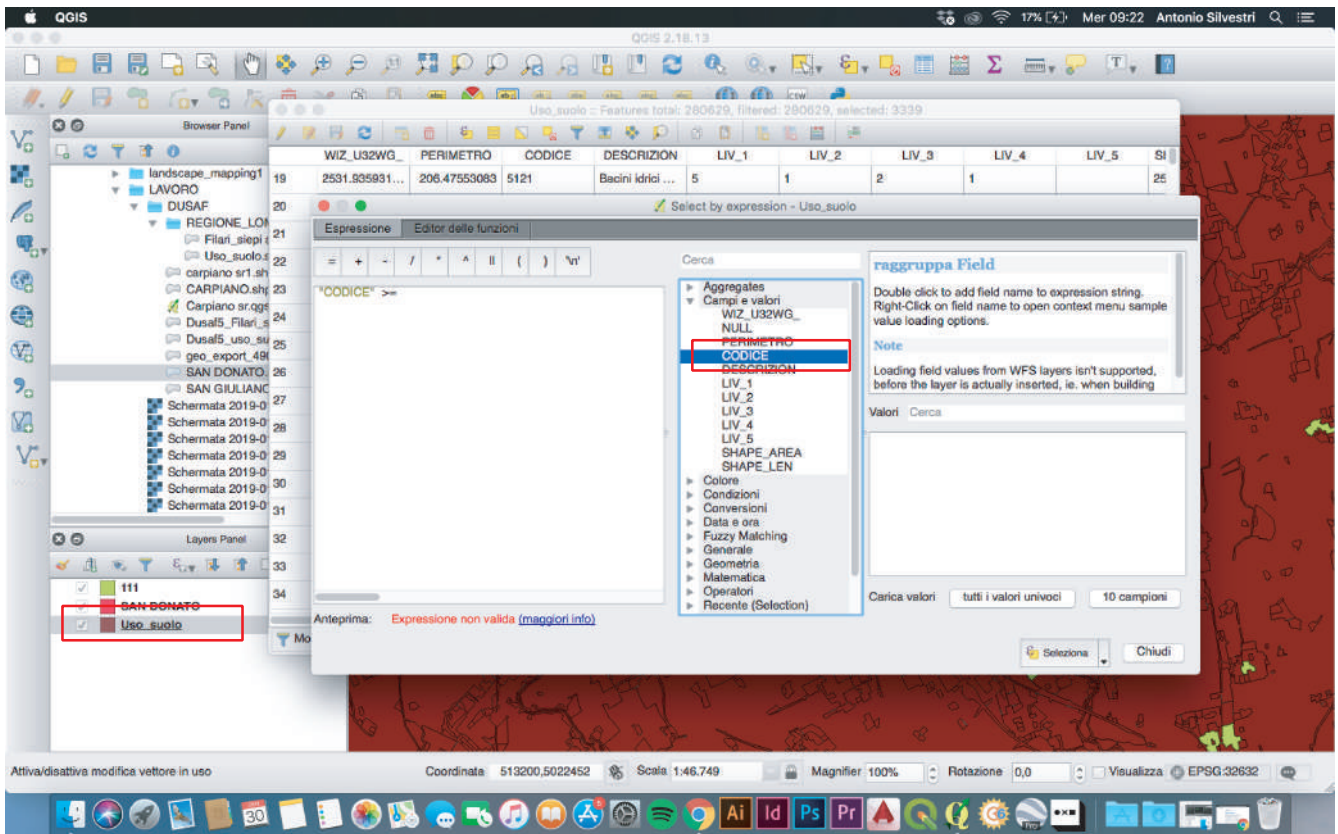
Choosing "Salva solo le geometrie selezionate" and after choose the destination folder.



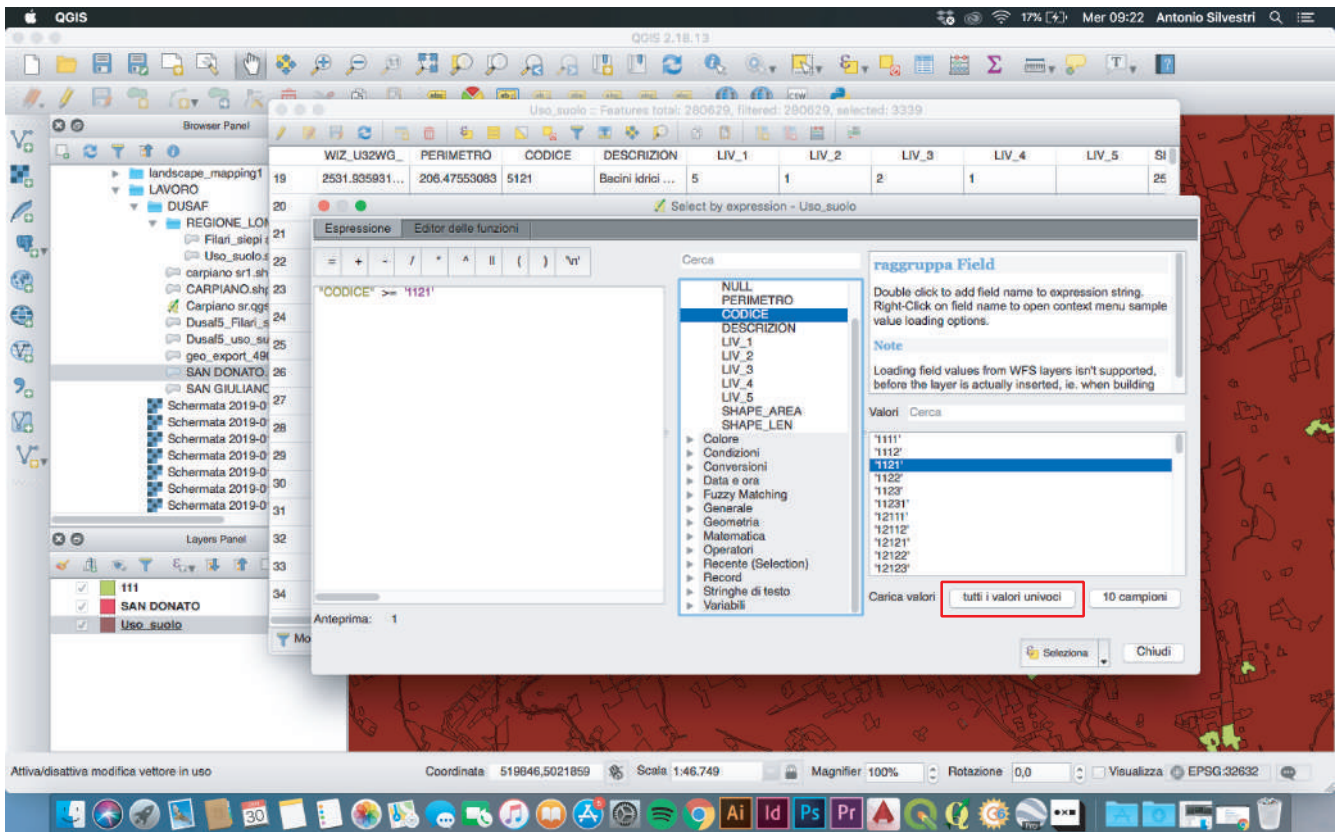


### Step 8:

The divided “copy” of the interested part of the layer will be automatically open in the “Layers Panel”.

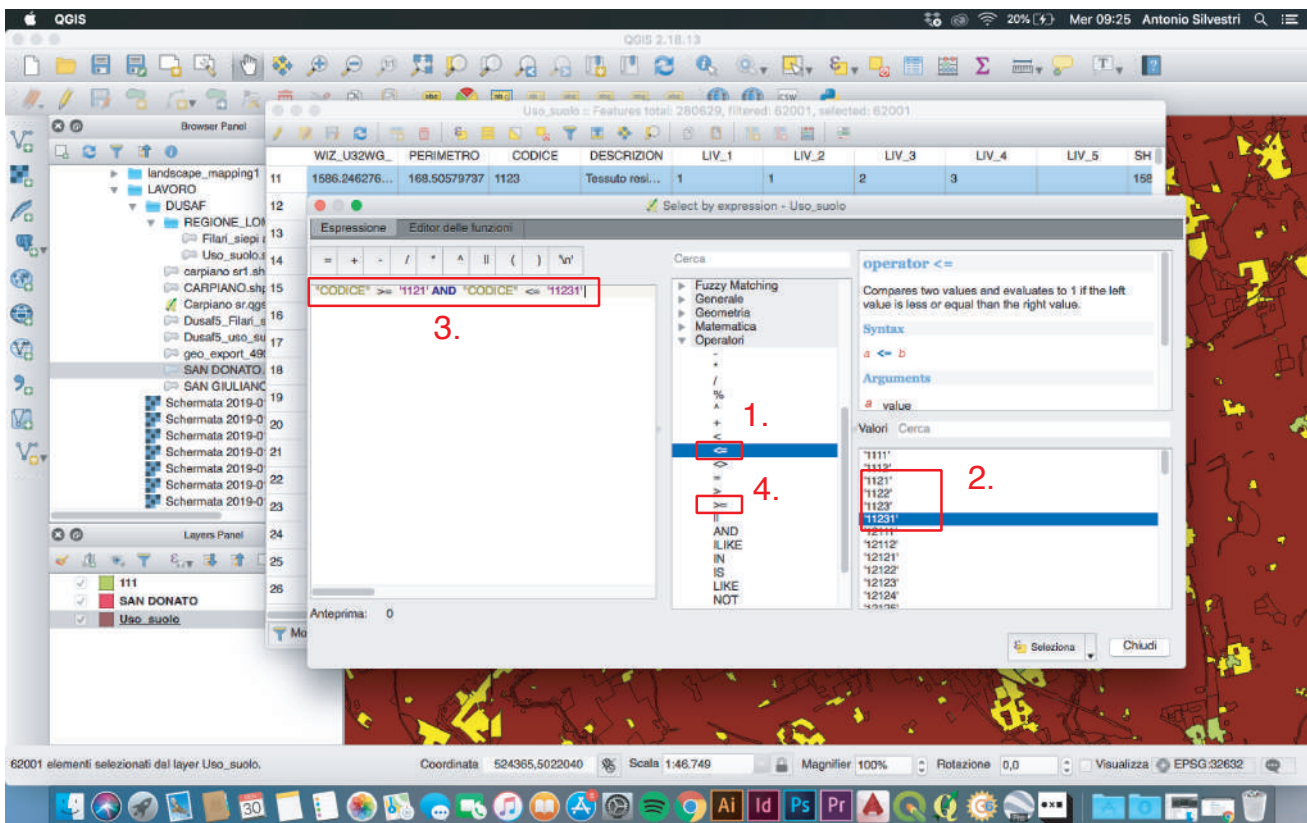


Step 9:  
 Selecting, considering the first three numbers of the “Code” in the layer proprieties.



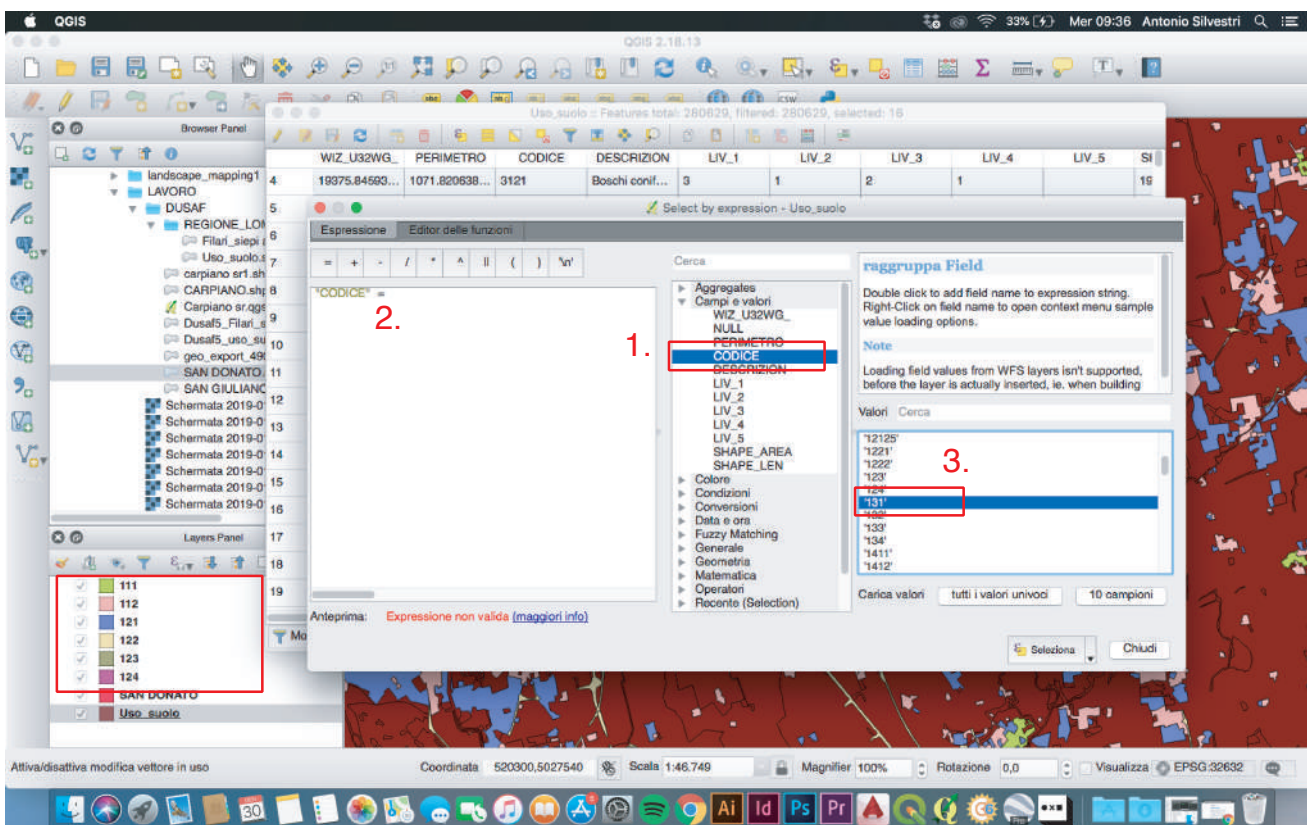
Step 10:  
 Click on “tutti i valori univoci”.





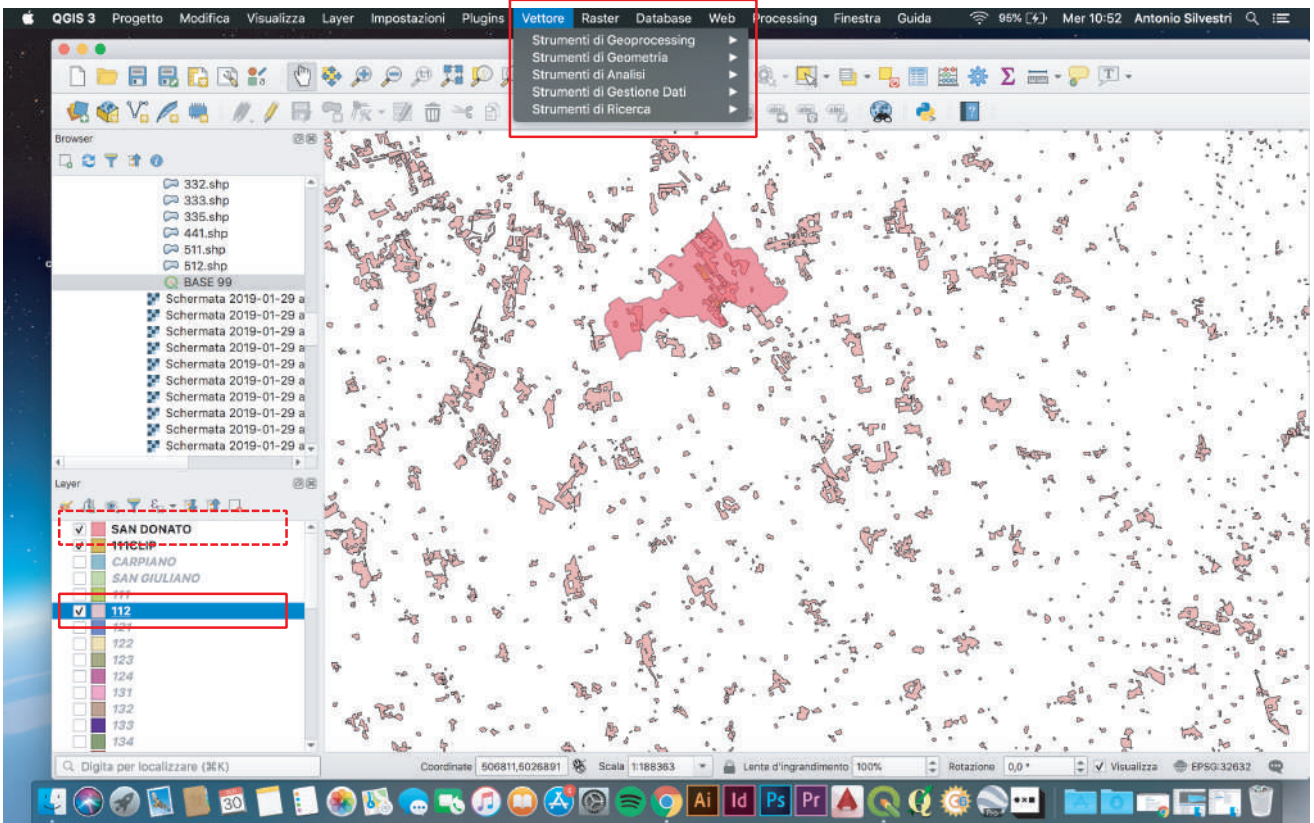
### Step 11:

Choosing “Campi e valori”, double click on “Codice”, double click on the simbol “>=” (1.), after click on “the lower interested number”(1121)(2.), after writing “AND” (3.), after the process is the same but with the simbol “<=” (4.) and with the higher number.

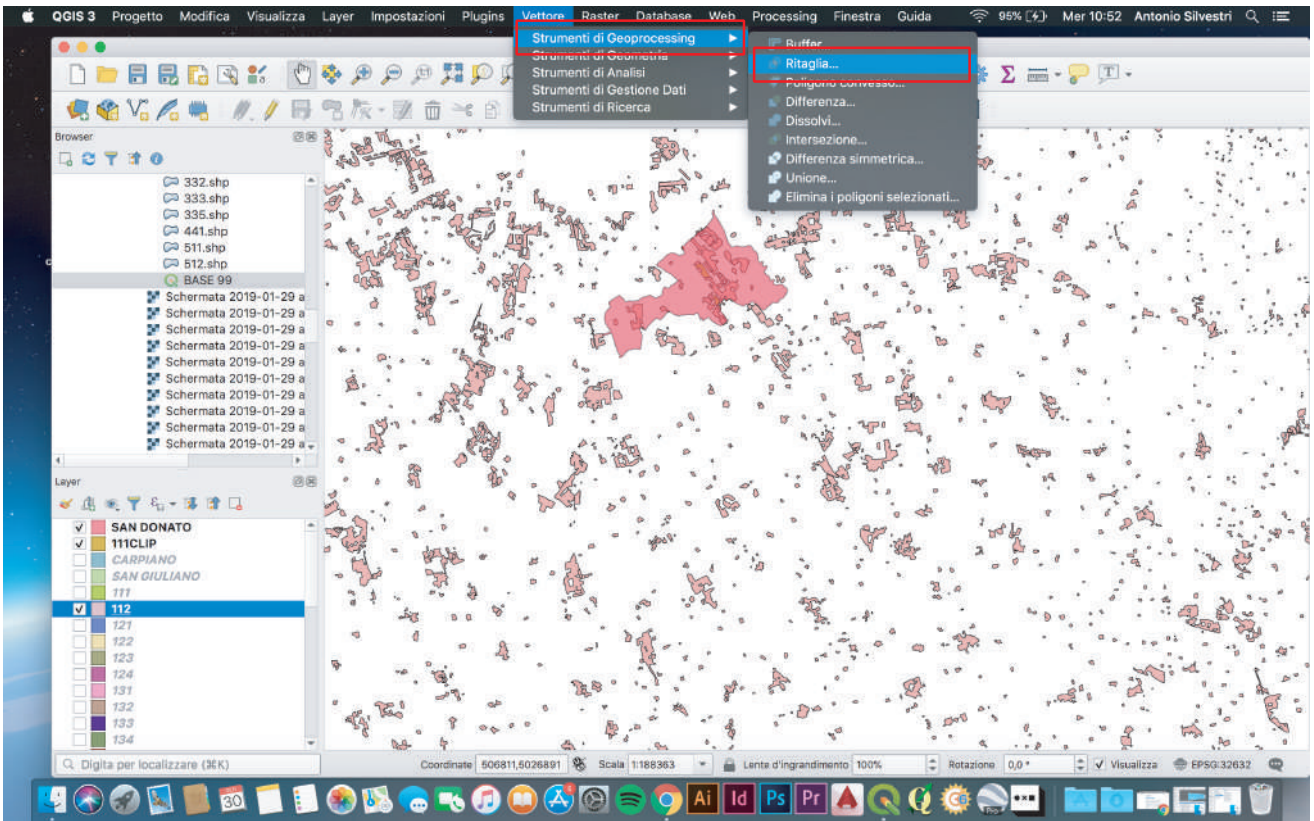


### Step 12:

Selecting of the normal “Code”. Choosing “Campi e valori”, double click on “Codice” (1.), double click on the simbol “=” (2), after click on “the interested number”(131)(3.). After this “select” and “save” the layer.

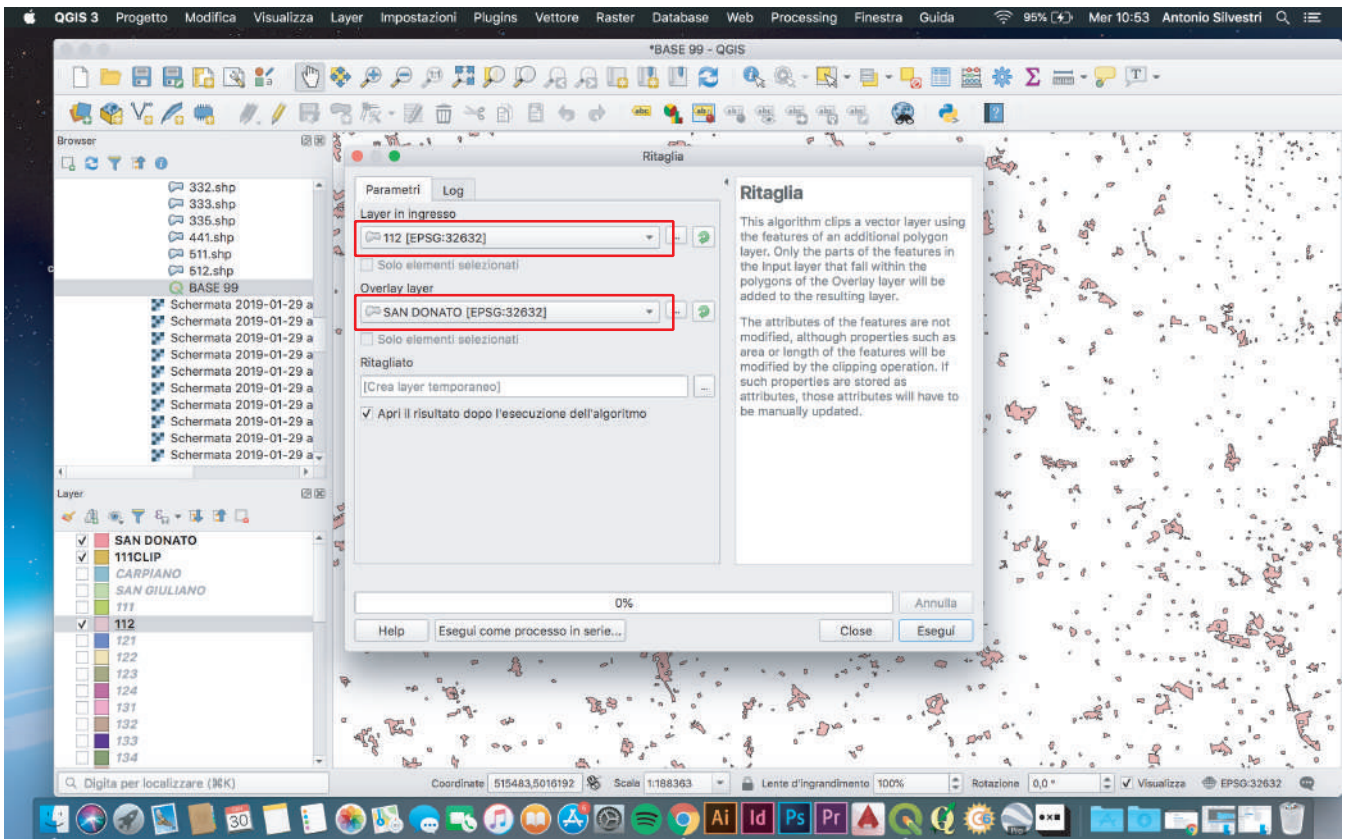


**Step 13:**  
 “Clipping” of the layer inside the interested area.  
 Open the interested layers and click on “Vettore”.



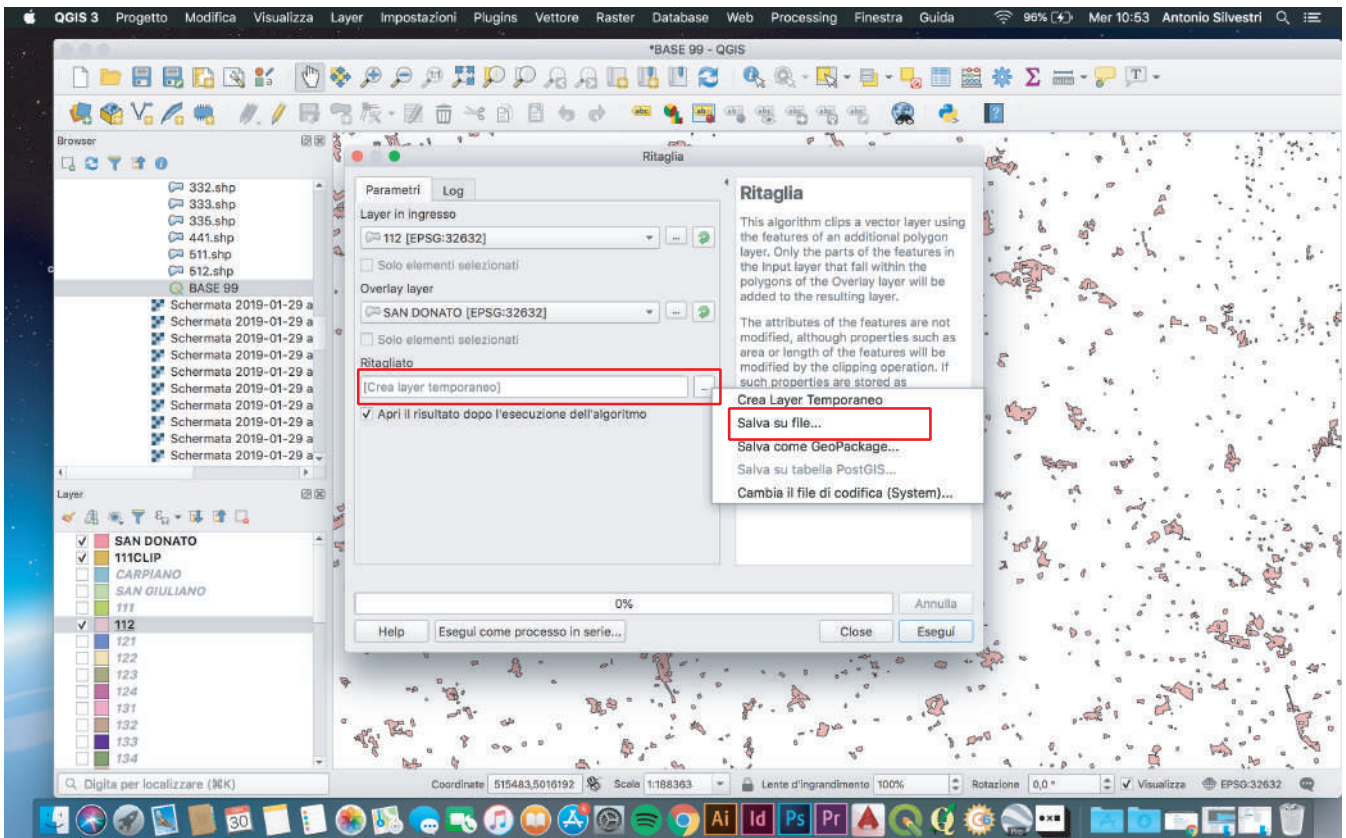
**Step 14:**  
 “Clipping” of the layer inside the interested area.  
 Open the interested layers click on “Vettore”, click on “Strumenti di Geoprocessing” and after “Ritaglia”.





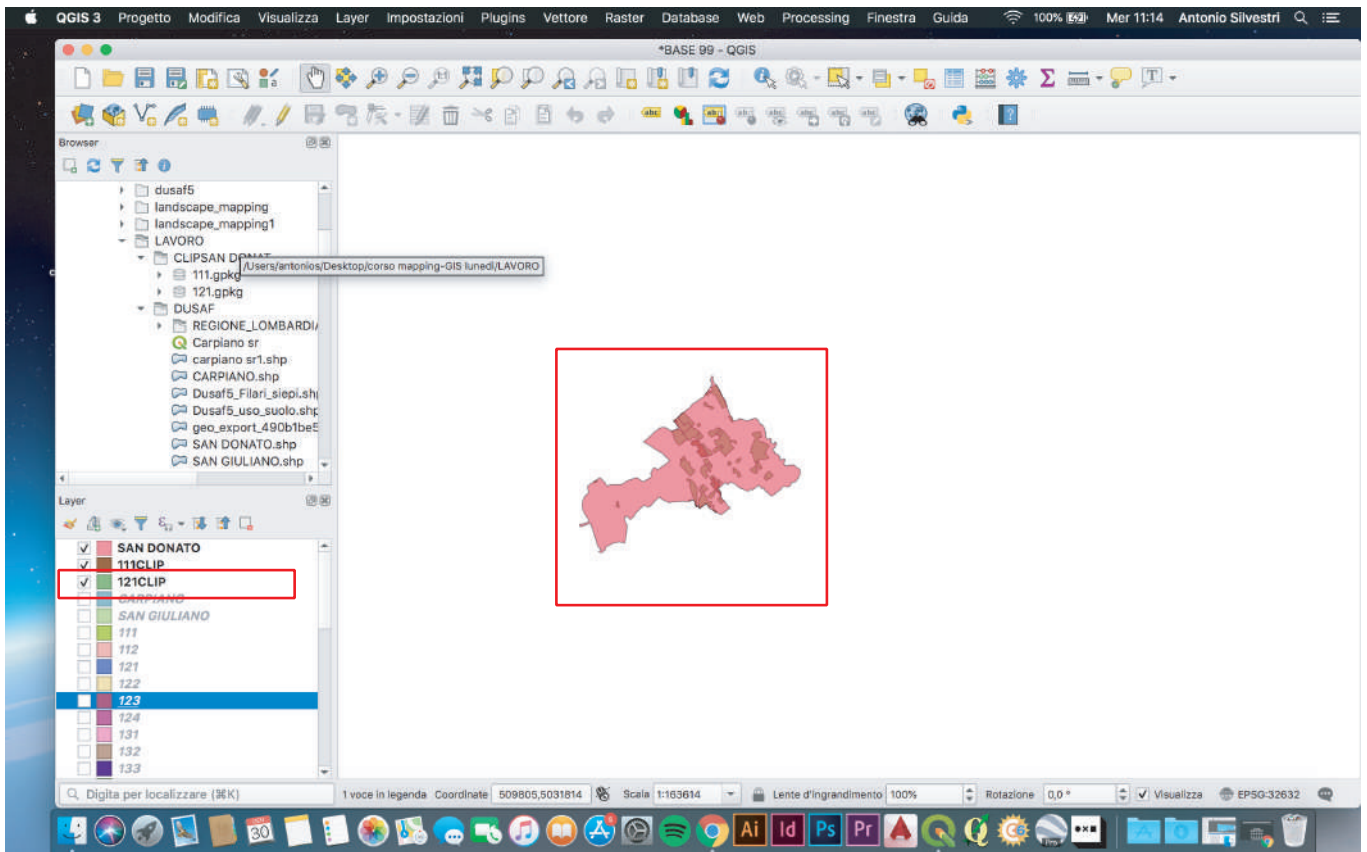
### Step 15:

Insert in “Layer in ingresso”(112) the Layer we want to clip and in “Overlay layer”(San Donato) the boundaries that we want to use to clip.



### Step 16:

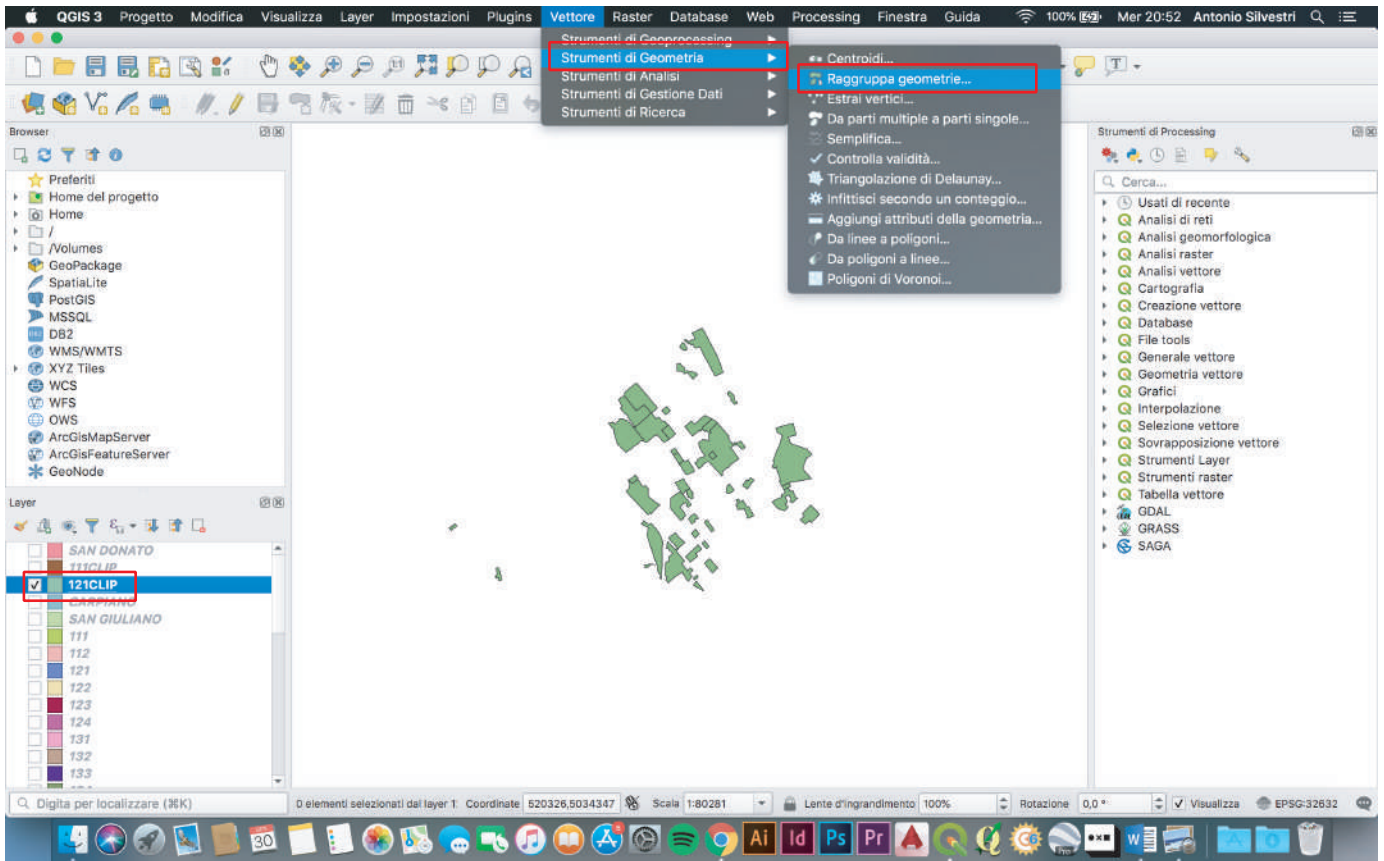
To finish the “clipping”, click on the tree dots near “crea layer temporaneo” and choose “Salva su file...”.



**Step 17:**

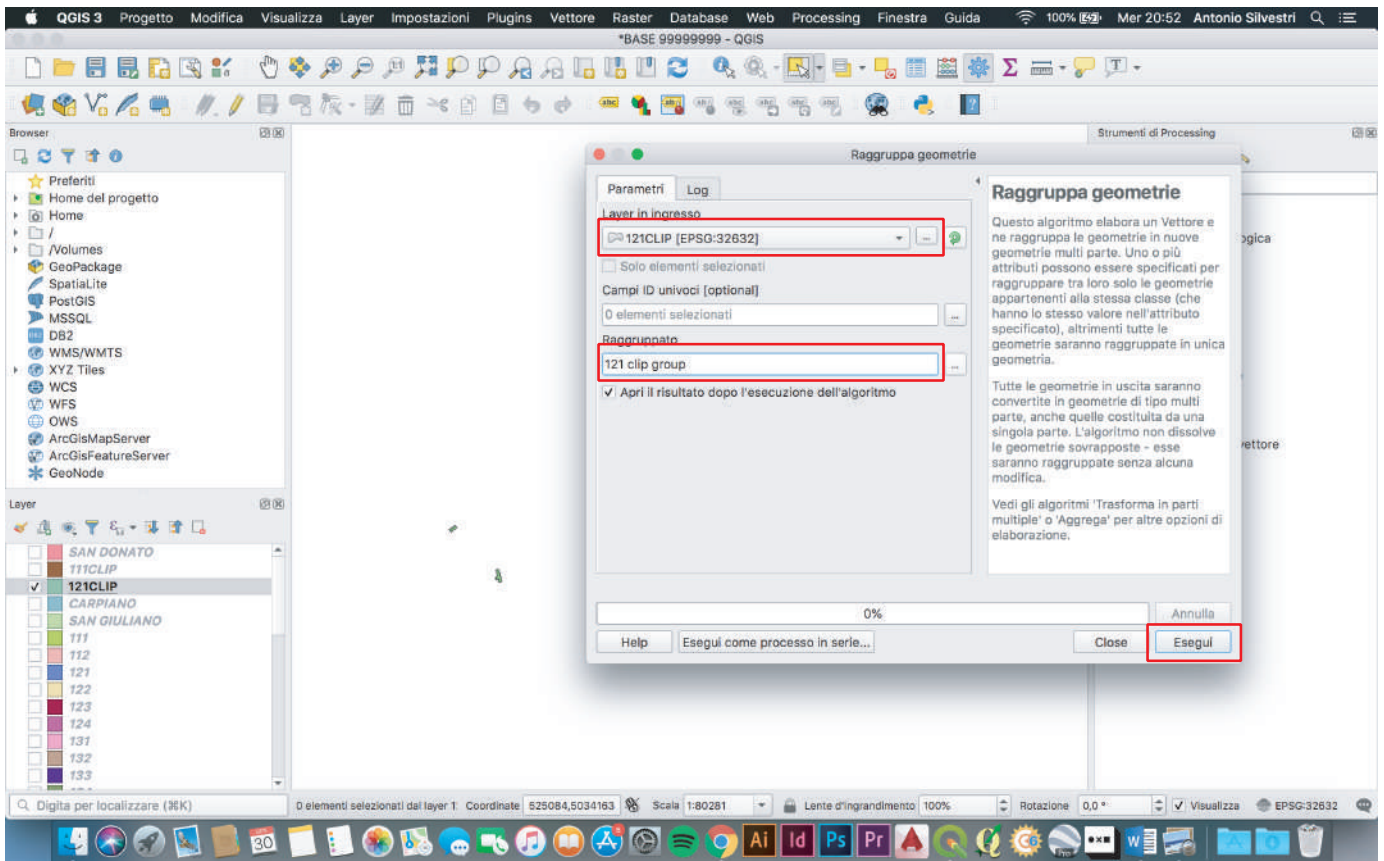
The clipped layer will be automatically insert in the “layers panel”.





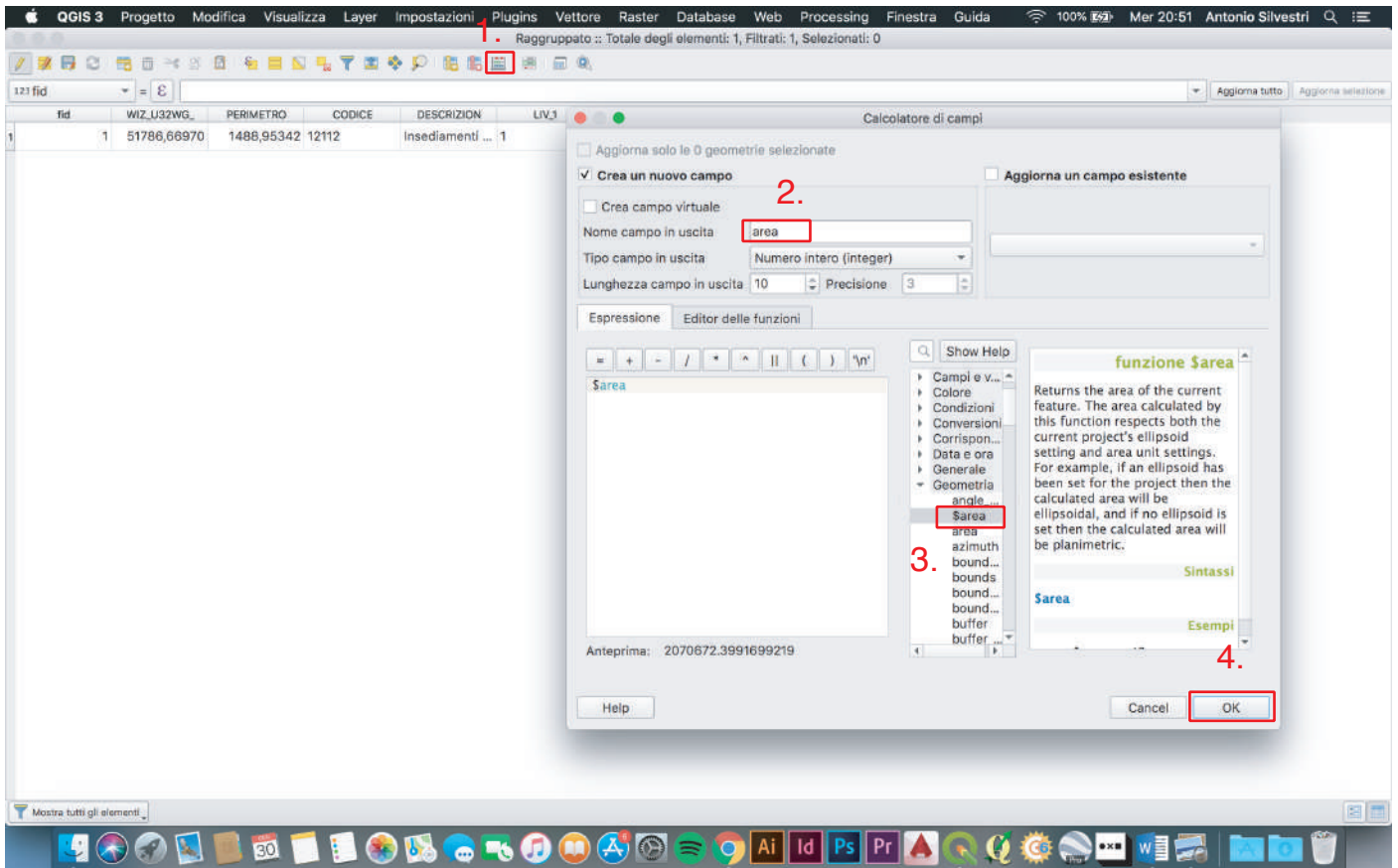
### Step 18:

To calculate the area easily we decided to merge all the geometries inside the interested layer. Click on “Vettore” and after “Raggruppa geometrie...”



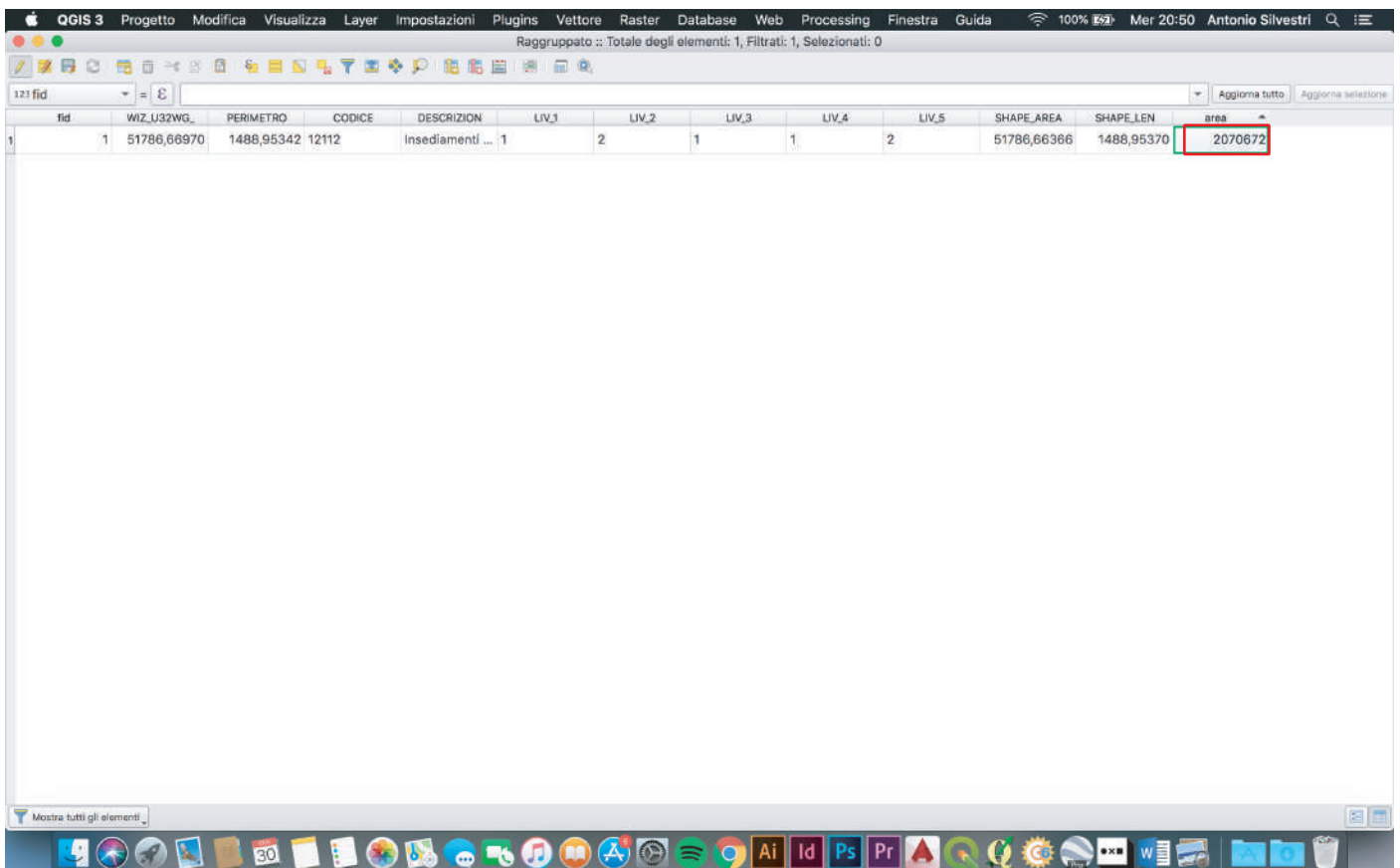
### Step 19:

Chose the interested layer in “Layer di ingresso” (121clip), write something (121 clip group) in the space called “Raggruppatore”, and after “Esegui”.



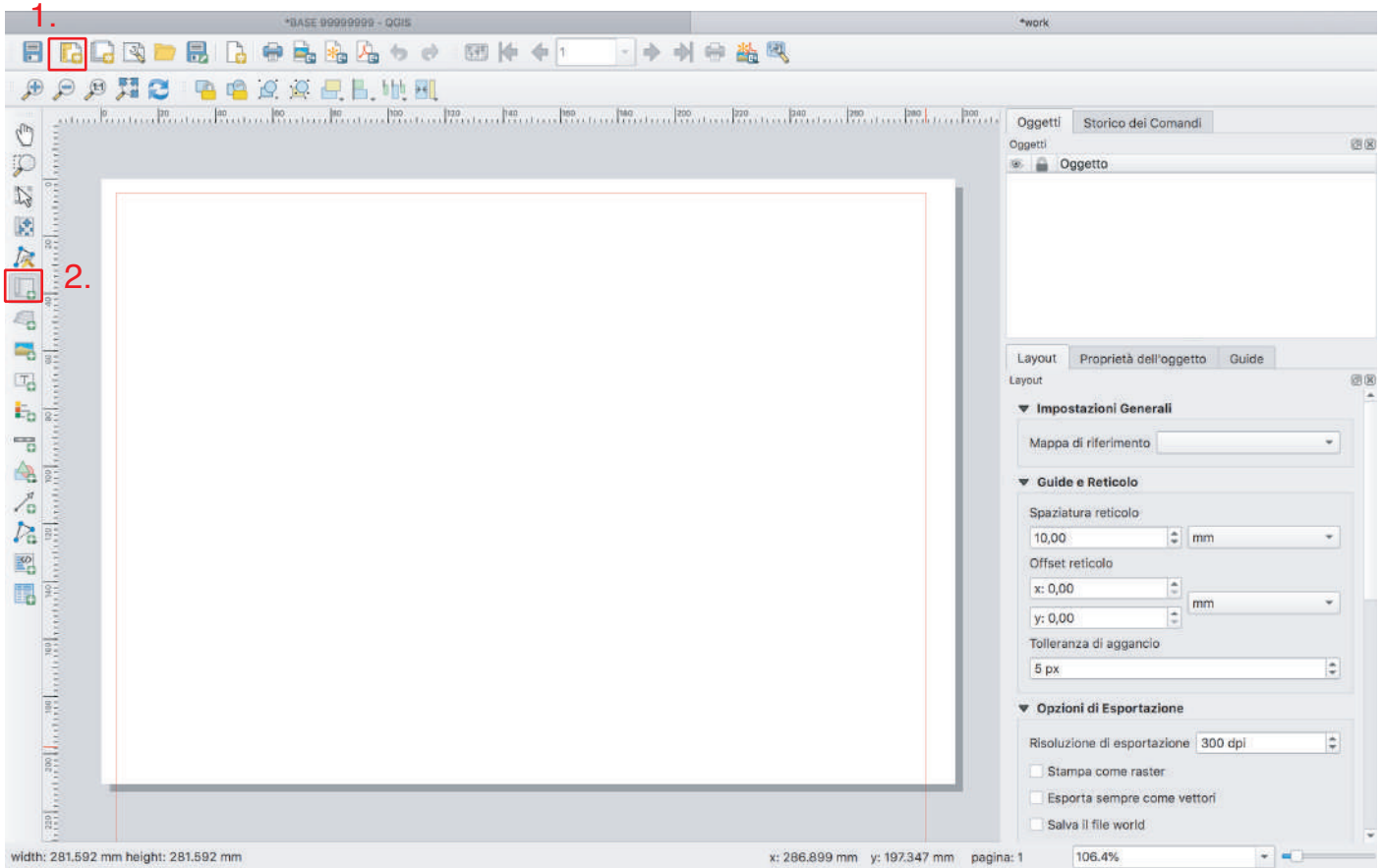
### Step 20:

To check the area in the layer, open “Tabella attributi”, click on “Calcolatore di campi” (1.), write on “Nome campo in uscita” (area)(2.), double click on “\$area” (3.), and after “OK” (4.)



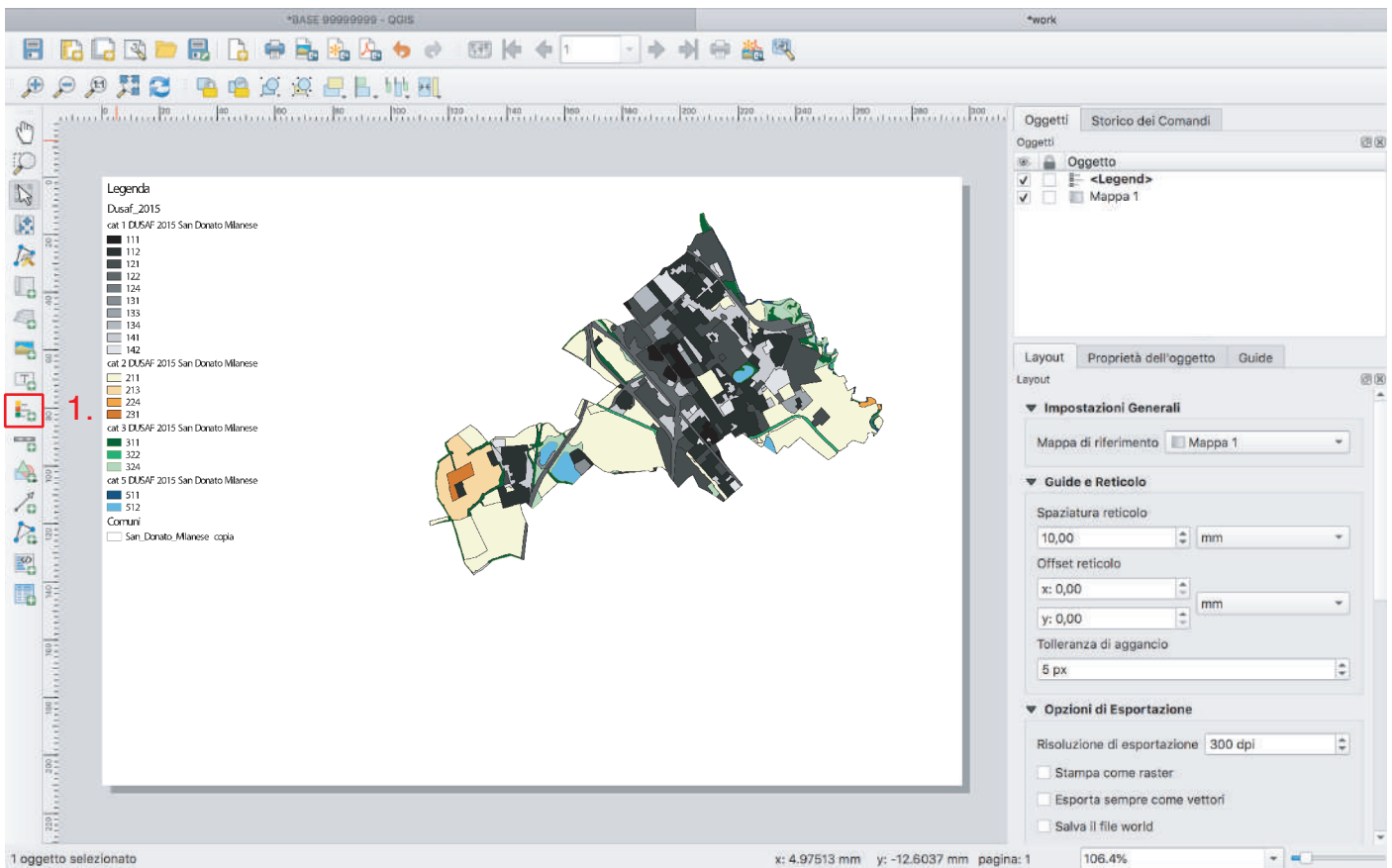
### Step 21:

The result of the total area will be automatically insert in a new column.



## Step 22:

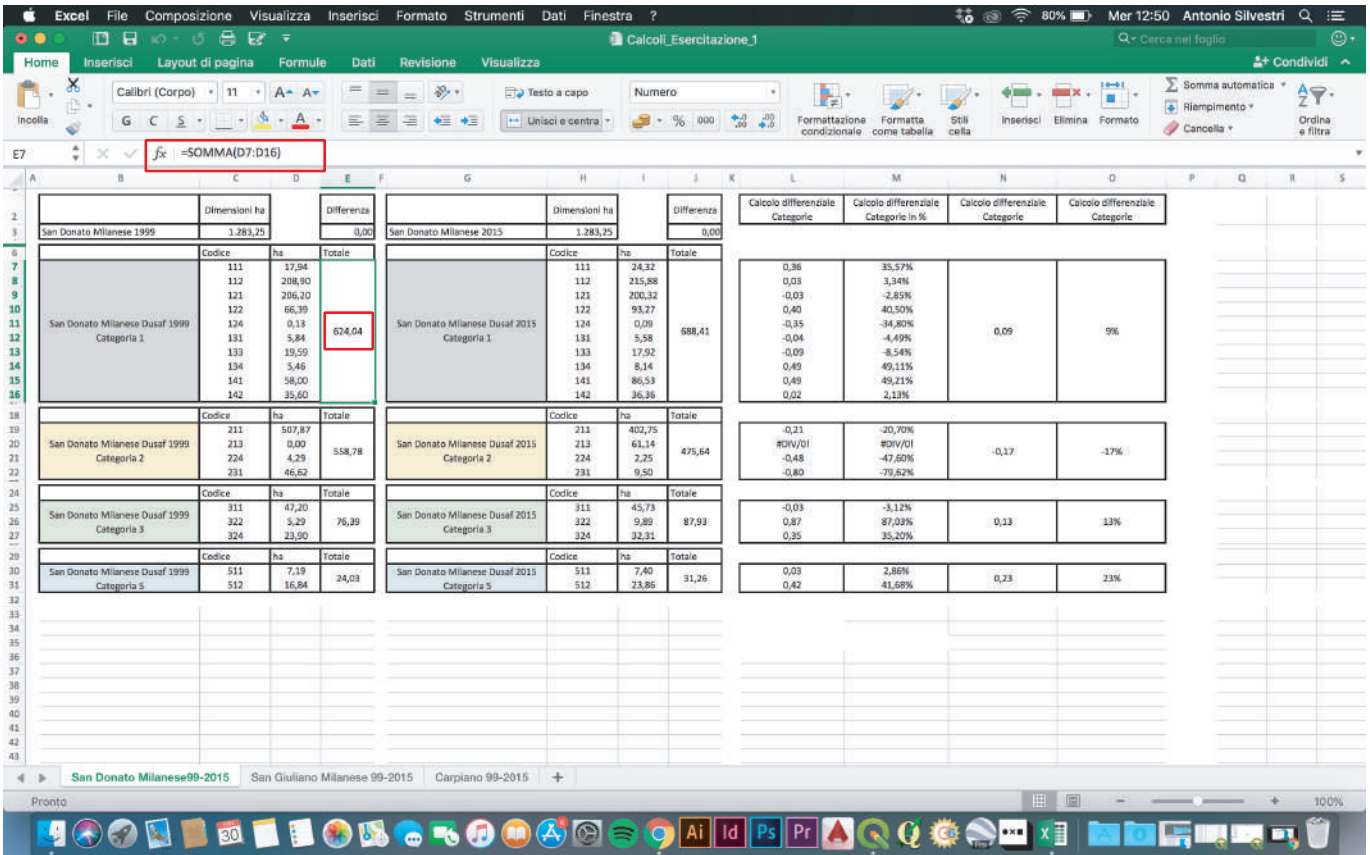
To print the map, click on command “New Layout” (1.), and after “Add new map on layout” (2.).



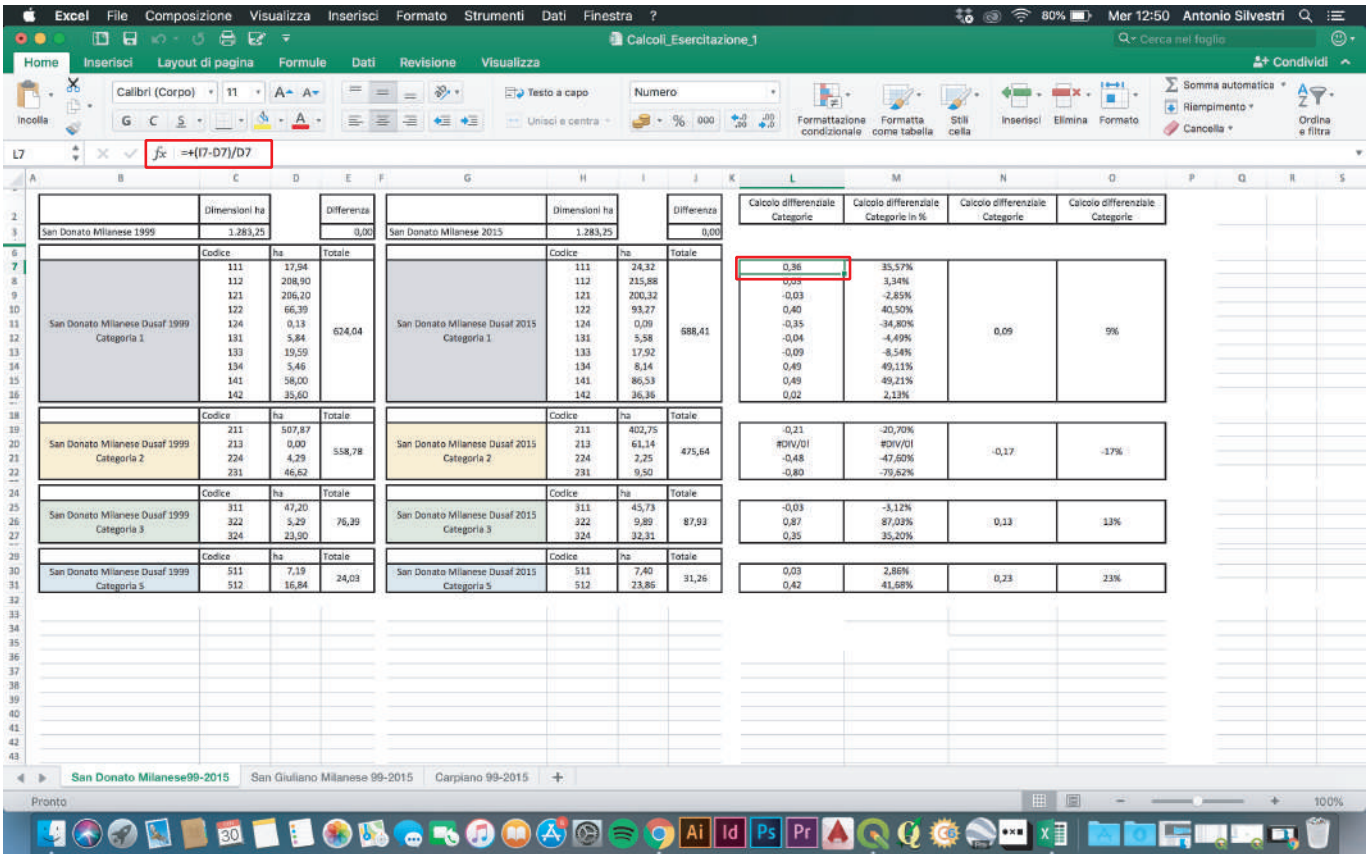
## Step 23:

The final step is “Add new legend on the layout” (1.), and after “save as pdf”.





Step 1 (Excel):  
Calculation of the sum in the categories.



Step 2 (Excel):  
Differential calculus of the single category.



Excel File Composizione Visualizza Inserisci Formato Strumenti Dati Finestra ?

Home Inserisci Layout di pagina Formule Dati Revisione Visualizza

Calibri (Corpo) 11 A A Testo a capo Numero

Formattazione condizionale Formatta come tabella Stili cella Inserisci Elimina Formato

Somma automatica Riempimento Cancellazione Ordina e filtra

N7 fx =+(I7-E7)/I7

San Donato Milanese 1999			San Donato Milanese 2015			Calcolo differenziale Categoria		Calcolo differenziale Categoria in %	
Dimensioni ha			Dimensioni ha			Differenza		Differenza	
1.283,25			1.283,25			0,00		0,00	
Codice ha Totale			Codice ha Totale						
111 37,94			111 24,32			0,36		35,57%	
112 208,90			112 215,88			0,03		3,34%	
121 206,20			121 200,32			-0,03		-2,85%	
122 66,39			122 93,27			0,40		40,50%	
124 0,13			124 0,09			-0,35		-34,80%	
131 5,84			131 5,58			-0,04		-4,49%	
133 19,59			133 17,92			-0,09		-8,54%	
134 3,46			134 8,34			0,49		49,11%	
141 58,00			141 86,93			0,49		49,21%	
142 35,60			142 36,86			0,02		2,13%	
624,04			688,41			0,09		9%	
Codice ha Totale			Codice ha Totale						
211 507,87			211 402,75			-0,21		-20,70%	
213 0,00			213 61,14			#DIV/0!		#DIV/0!	
224 4,29			224 2,25			-0,48		-47,60%	
231 46,62			231 9,50			-0,80		-79,62%	
558,78			475,64			-0,17		-17%	
Codice ha Totale			Codice ha Totale						
311 47,20			311 45,73			-0,03		-3,12%	
322 5,29			322 9,89			0,87		87,03%	
324 23,90			324 32,31			0,35		35,20%	
76,39			87,93			0,13		13%	
Codice ha Totale			Codice ha Totale						
511 7,19			511 7,40			0,03		2,86%	
512 16,84			512 23,86			0,42		41,68%	
24,03			31,26			0,23		23%	

San Donato Milanese 99-2015 San Giuliano Milanese 99-2015 Carpiano 99-2015

Pronto

Step 3 (Excel):  
Differential calculus of the category.

## *Final Results*

The reading took place in the municipalities of San Donato, San Giuliano and Carpiano in two historical thresholds, 1999, and 2015. In this section are showed the final cartographic material after the processing in qgis and the data showing the characteristics of the three municipalities; population, territorial area, influential transformations to the environmental and landscape field. At the end a brief description and considerations about the episodes that may have led to a more or less intense consumption of the soil in this areas of Milan.

## SAN DONATO 1999

### Aree antropizzate

■	Tessuto urbano continuo, 111 (17,4 ha)
■	Insedimento discontinuo, 112 (209,90 ha)
■	Zone produttive e insediamenti di grandi impianti di servizi pubblici e privati, 121 (206,20 ha)
■	Reti stradali, ferroviarie e spazi accessori, 122 (66,39 ha)
■	Aeroporti ed eliporti, 124 (0,13 ha)
■	Cave, 131 (5,84 ha)
■	Cantieri, 133 (19,59 ha)
■	Aree degradate non utilizzate e non vegetate, 134 (5,46 ha)
■	Aree verdi urbane, 141 (58,00 ha)
■	Aree sportive e ricreative, 142 (35,60 ha)

### Aree agricole

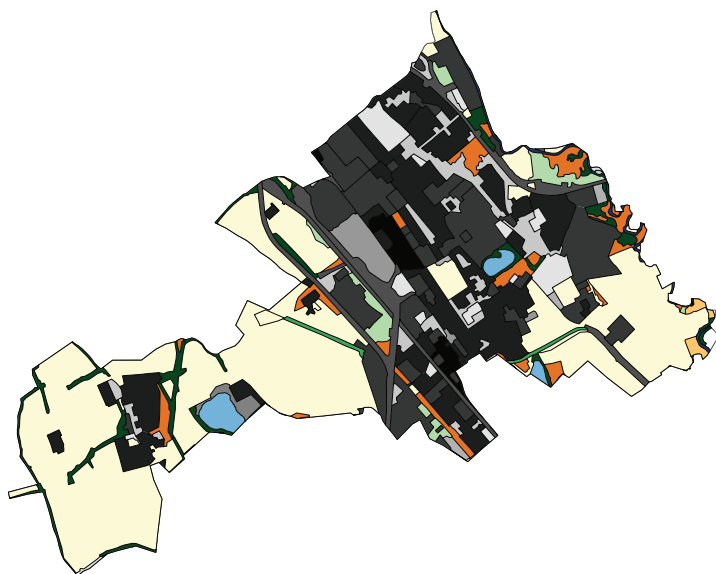
■	Seminativi semplici, 211 (507,87 ha)
■	Arboricoltura da legno, 224 (4,29 ha)
■	Pratipermanenti, 231 (46,62 ha)

### Territori boscati e ambienti seminaturali

■	Boschi di latifoglie, 311 (47,20 ha)
■	Cespuglieti e Arbusteti, 322 (5,29 ha)
■	Aree in evoluzione, 324 (23,90 ha)

### Corpi idrici

■	Alvei fluviali e corsi d'acqua artificiali, 511 (7,19 ha)
■	Bacini idrici, 512 (16,84 ha)



## SAN DONATO 2015

### Aree antropizzate

■	Tessuto urbano continuo, 111 (34,32 ha)
■	Insedimento discontinuo, 112 (215,88 ha)
■	Zone produttive e insediamenti di grandi impianti di servizi pubblici e privati, 121 (200,32 ha)
■	Reti stradali, ferroviarie e spazi accessori, 122 (93,27 ha)
■	Aeroporti ed eliporti, 124 (0,09 ha)
■	Cave, 131 (5,58 ha)
■	Cantieri, 133 (17,92 ha)
■	Aree degradate non utilizzate e non vegetate, 134 (8,14 ha)
■	Aree verdi urbane, 141 (86,53 ha)
■	Aree sportive e ricreative, 142 (36,36 ha)

### Aree agricole

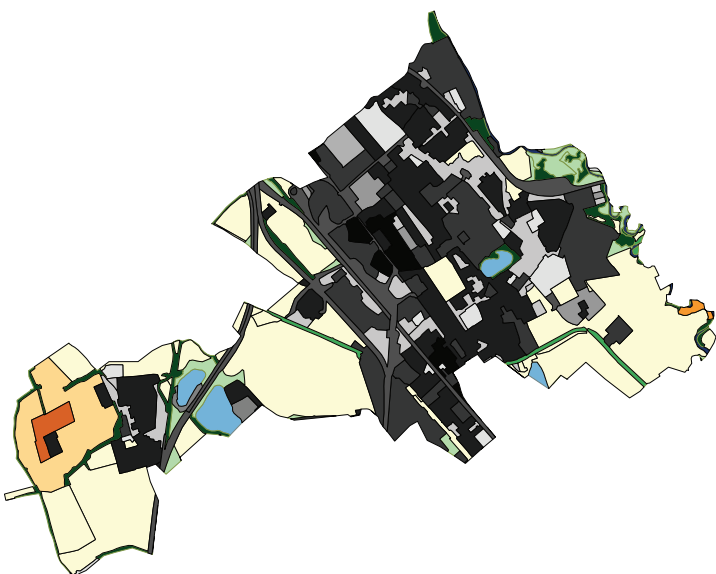
■	Seminativi semplici, 211 (402,76 ha)
■	Risaie, 213 (61,14 ha)
■	Arboricoltura da legno, 224 (2,25 ha)
■	Prati permanenti, 231 (9,50 ha)

### Territori boscati e ambienti seminaturali

■	Boschi di latifoglie, 311 (45,73 ha)
■	Cespuglieti e Arbusteti, 322 (9,89 ha)
■	Aree in evoluzione, 324 (32,31 ha)

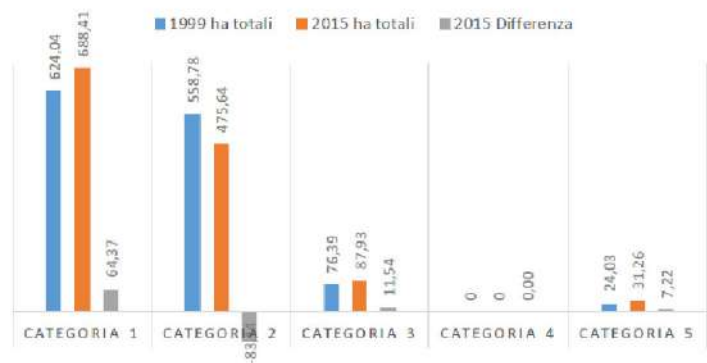
### Corpi idrici

■	Alvei fluviali e corsi d'acqua artificiali, 511 (7,41 ha)
■	Bacini idrici, 512 (23,86 ha)



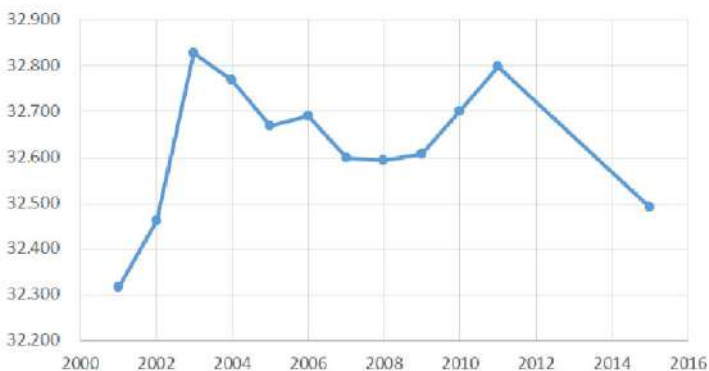
San Donato Milanese 1999			San Donato Milanese 2015			Calcolo differenziale					
Dimensioni ha			Dimensioni ha			Calcolo differenziale	Calcolo differenziale	Calcolo differenziale	Calcolo differenziale		
1.283,25			1.283,25			Categorie	Categorie in %	Categorie	Categorie		
Differenza			Differenza			0,00					
San Donato Milanese Dusaf 1999 Categoria 1	Codice	ha	Totale	San Donato Milanese Dusaf 2015 Categoria 1	Codice	ha	Totale	0,36	35,57%	0,09	9%
	111	17,94	624,04		111	24,32	688,41				
	112	208,90			112	215,88					
	121	206,20			121	200,32					
	122	66,39			122	93,27					
	124	0,13			124	0,09					
	131	5,84			131	5,58					
	133	19,59			133	17,92					
	134	5,46			134	8,14					
141	58,00	141		86,53							
142	35,60	142	36,36								
San Donato Milanese Dusaf 1999 Categoria 2	Codice	ha	Totale	San Donato Milanese Dusaf 2015 Categoria 2	Codice	ha	Totale	-0,21	-20,70%	-0,17	-17%
	211	507,87	558,78		211	402,75	475,64				
	213	0,00			213	61,14					
	224	4,29			224	2,25					
231	46,62	231		9,50							
San Donato Milanese Dusaf 1999 Categoria 3	Codice	ha	Totale	San Donato Milanese Dusaf 2015 Categoria 3	Codice	ha	Totale	-0,03	-3,12%	0,13	13%
	311	47,20	76,39		311	45,73	87,93				
	322	5,29			322	9,89					
324	23,90	324		32,31							
San Donato Milanese Dusaf 1999 Categoria 5	Codice	ha	Totale	San Donato Milanese Dusaf 2015 Categoria 5	Codice	ha	Totale	0,03	2,86%	0,23	23%
	511	7,19	24,03		511	7,40	31,26				
	512	16,84			512	23,86					

DUSAF



As we can see from the graph on the left, we see how the increase in urbanization has increased to the detriment of agricultural areas, which have been partially converted into wooded areas.

ANDAMENTO DEMOGRAFICO



The demographic trend of the municipality of San Donato remained almost constant over a period of 15 years, with an average of about 32,500 inhabitants.

This makes us understand that the increase in urbanization does not seem to have happened to satisfy the demand for housing, but probably the increase in services and / or infrastructure.



## CONSIDERATIONS...

### *CAT1- ANTHROPIZED AREAS*

If we consider the urban areas, there is an increase of 35% in a period of 16 years, due to a demographic growth recorded in the 2000s, in which the population has increased compared to previous decades. The motivation for this demographic evolution, can be linked to various social causes, this can however be linked to the construction of the project of the Business District and the San Francesco District in the late 1990s. The discontinuous settlement remains almost unchanged, increasing by 3.3%. Another strong growth data is about degraded areas and that of urban green areas, for both categories there is an increasing of 49%. The green urban areas were the subject of great discussions in the regional and municipal political world, their growth is also linked to this legislative action in which it is proposed the enhancement of areas dedicated to green in the urban system of the city; the typical urban structure of the Lombardy cities is precisely to assume an intense fragmentation of the green system. The city is built on its road and infrastructures, which are a skeleton to the different systems that works with overlapping, the category of road networks, railways and accessory spaces shows an increase of 40%. The opening in 2003 of the station of San Donato and the suburban trains of the S1 line at its service are included in this substantial figure.

### *CAT2- AGRICULTURAL AREAS*

The data found on agricultural areas has an overall decrease in term of surface. The most significant figure is the decrease of almost 80% of permanent grasslands. The percentage of simple arable crops that fluctuate with a decrease of 20% is milder.

### *CAT3- WOODLANDS AND SEMI-NATURAL ENVIRONMENTS*

The increase in these areas of 35% is linked to the increase in the areas destined for urban green areas analyzed in the category of anthropized areas. While the decreasing, even if minimal of broad-leaved forests can be linked to what is the general decrease of agricultural areas, especially as regards fruit trees. The strong urbanization of San Donato has often sacrificed the agricultural and landscape value of the areas for the spread of impermeable soil.

### *CAT5- WATER*

In recent years the great works of channelling and large water courses that surround the territory of the municipality of San Donato produced the increase of water basins.

To conclude the discussion about San Donato, we can consider decreasing of agricultural areas and increasing of anthropized areas like the main topic. The building of the ENI headquarters after the Second World War has certainly created a real working district within the municipal boundaries, attracting a large number of people. The presence of the IRCCS Policlinico San Donato hospital, the branch of the medical school of the University of Milan and the plans for new neighborhoods make San Donato a real magnet of the metropolitan city, which has often sacrificed agricultural and landscape areas for the promotion of this continuous urban evolution.

## SAN GIULIANO 1999

### Aree antropizzate

- Tessuto urbano continuo, 111 (86,05 ha)
- Insedimento discontinuo, 112 (191,96 ha)
- Zone produttive e insediamenti di grandi impianti di servizi pubblici e privati, 121 (348,89 ha)
- Reti stradali, ferroviarie e spazi accessori, 122 (100,58 ha)
- Cave, 131 (0,11 ha)
- Cantieri, 133 (5,94 ha)
- Aree degradate non utilizzate e non vegetate, 134 (8,75 ha)
- Aree verdi urbane, 141 (50,77 ha)
- Aree sportive e ricreative, 142 (42,29 ha)

### Aree agricole

- Seminativi semplici, 211 (1.903,14 ha)
- Risaie, 213 (214,17 ha)
- Frutteti e frutti minori, 222 (0,31 ha)
- Arboricoltura da legno, 224 (3,27 ha)
- Prati permanenti, 231 (21,24 ha)

### Territori boscati e ambienti seminaturali

- Boschi di latifoglie, 311 (54,48 ha)
- Cespuglieti e Arbusteti, 322 (2,95 ha)
- Aree in evoluzione, 324 (6,88 ha)
- Spiagge, dune ed alvei ghiaiosi (0,16 ha)

### Aree umide

- Vegetazione delle aree umide interne e delle torbiere, 411 (1,63 ha)

### Corpi idrici

- Alvei fluviali e corsi d'acqua artificiali, 511 (11,49 ha)
- Bacini idrici, 512 (7,92 ha)



## SAN GIULIANO 2015

### Aree antropizzate

- Tessuto urbano continuo, 111 (94,83 ha)
- Insedimento discontinuo, 112 (220,09 ha)
- Zone produttive e insediamenti di grandi impianti di servizi pubblici e privati, 121 (388,73 ha)
- Reti stradali, ferroviarie e spazi accessori, 122 (36,76 ha)
- Cave, 131 (1,09 ha)
- Cantieri, 133 (4,35 ha)
- Aree verdi urbane, 141 (82,53 ha)
- Aree sportive e ricreative, 142 (47,17 ha)

### Aree agricole

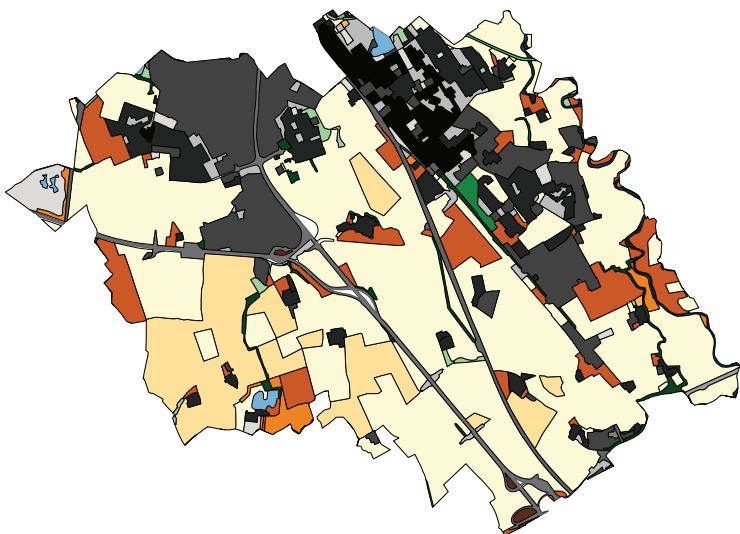
- Seminativi semplici, 211 (1.506,94 ha)
- Risaie, 213 (317,60 ha)
- Frutteti e frutti minori, 222 (1,50 ha)
- Arboricoltura da legno, 224 (29,44 ha)
- Prati permanenti, 231 (230,16 ha)

### Territori boscati e ambienti seminaturali

- Boschi di latifoglie, 311 (45,62 ha)
- Rimboschimenti recenti, 314 (9,96 ha)
- Cespuglieti e Arbusteti, 322 (3,63 ha)
- Aree in evoluzione, 324 (16,00 ha)
- Spiagge, dune ed alvei ghiaiosi (0,05 ha)

### Corpi idrici

- Alvei fluviali e corsi d'acqua artificiali, 511 (11,70 ha)
- Bacini idrici, 512 (13,21 ha)





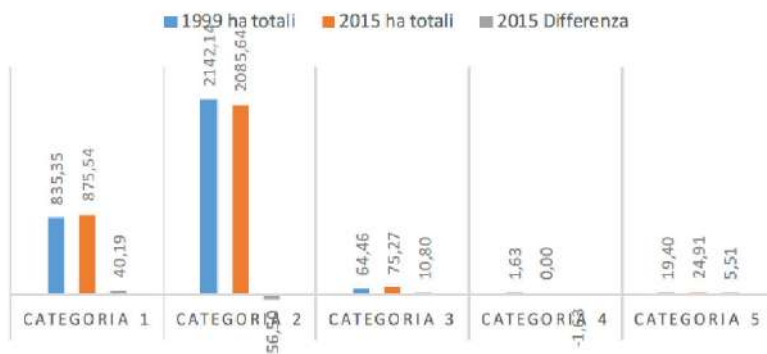
SAN GIULIANO  
1999

SAN GIULIANO  
2015

CHANGE OF USE OF LAND IN 16  
YEARS (%)

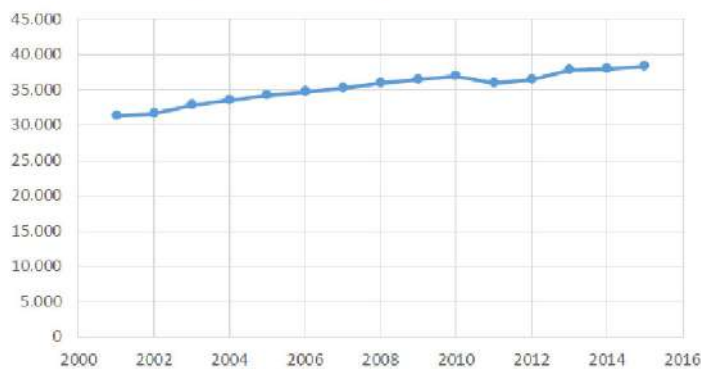
San Giuliano Milanese 1999				San Giuliano Milanese 2015				Calcolo differenziale			
Dimensioni ha				Dimensioni ha				Calcolo differenziale			
3.062,99				3.061,36				1,63			
Differenza				Differenza				Calcolo differenziale			
								Calcolo differenziale			
								Calcolo differenziale			
San Giuliano Milanese Dusaf 1999 Categoria 1	Codice	ha	Totale	San Giuliano Milanese Dusaf 2015 Categoria 1	Codice	ha	Totale	0,10	10,20%	0,05	5%
	111	86,05	835,35		111	94,83	875,54				
	112	191,96			112	220,09					
	121	348,89			121	388,73					
	122	100,58			122	36,76					
	131	0,11			131	1,09					
	133	5,94			133	4,35					
	134	8,75			134	0,00					
141	50,77	141		82,53							
142	42,29	142	47,17								
San Giuliano Milanese Dusaf 1999 Categoria 2	Codice	ha	Totale	San Giuliano Milanese Dusaf 2015 Categoria 2	Codice	ha	Totale	-0,21	-20,82%	-0,03	-3%
	211	1903,14	2142,14		211	1506,94	2085,64				
	213	214,17			213	317,60					
	222	0,31			222	1,50					
	224	3,27			224	29,44					
	231	21,24			231	230,16					
San Giuliano Milanese Dusaf 1999 Categoria 3	Codice	ha		Totale	San Giuliano Milanese Dusaf 2015 Categoria 3	Codice		ha	Totale	-0,16	-16,27%
	311	54,48	64,46	311		45,62	75,27				
	314	0,00		314		9,96					
	322	2,95		322		3,63					
	324	6,88		324		16,00					
331	0,16	331		0,05							
San Giuliano Milanese Dusaf 1999 Categoria 4	Codice	ha	Totale	San Giuliano Milanese Dusaf 2015 Categoria 4	Codice	ha	Totale	-1,00	-100,00%		
	411	1,63	1,63		411	0,00	0,00				
San Giuliano Milanese Dusaf 1999 Categoria 5	Codice	ha	Totale	San Giuliano Milanese Dusaf 2015 Categoria 5	Codice	ha	Totale	0,02	1,85%	0,22	22%
	511	11,49	19,40		511	11,70	24,91				
	512	7,92			512	13,21				0,67	66,86%

DUSAF



As we can see from the left graph, there has not been an excessive increase in excessive urbanization for the municipality of San Giuliano Milanese.

ANDAMENTO DEMOGRAFICO



The demographic trend of the municipality of San Giuliano has increased steadily over a period of 15 years, rising from 31,200 to about 38,200 inhabitants, then comparing this data with the land consumption data, we note that this municipality has probably recovered degraded areas, redeveloping them and thus creating new areas to be allocated to the inhabitants, homes or services in the future, without the consumption of soil.

## CONSIDERATIONS...

### *CAT1-ANTHROPIZED AREAS*

The continuous urban fabric, the discontinuous settlements and the productive areas have seen a more or less proportional increase (respectively 10%, 14% and 11%) of their values. The greater value of discontinuous settlements is linked to the choice to build less and to maintain consolidated settlements. These data are also connected to the history of San Giuliano, which saw its demographic evolution and an impetuous building development after the second post-war period. An interesting fact is that the degraded areas have become almost nil, due to a work of redevelopment and regeneration implemented by the municipal councils, this is also connected to the increase of 62% of urban green areas. The road and rail networks have not developed in this time interval, contrary to what happened in previous years with the opening of the Milan-Bologna high-speed line, which crosses the territory of San Giuliano.

### *CAT2-AGRICULTURAL AREAS*

The municipality of San Giuliano has always had a propensity to agriculture, given its location and its territorial conformation. The rice fields have increased by 60%. Furthermore, wood arboriculture and minor orchards have increased exponentially, to the detriment of traditional arable crops.

### *CAT3-WOODED TERRITORIES AND SEMI-NATURAL ENVIRONMENTS*

The broad-leaved woods decrease by 16%, also due to a large increase in these species of fruit tree. Another interesting fact is that these areas are increasing, thanks also to an environmental policy proposed by a specific party to go against cement abuses.

### *CAT4-WET AREAS*

The wet areas, important natural areas deriving from the presence of soil and water, are almost nil. Their disappearance is also connected to the growing artificial canalization.

### *CAT5-WATER BODIES*

There is an increase in water basins especially for irrigation of agricultural areas.

The conclusions regarding San Giuliano first of all denotes the increase in the specialization of agricultural areas towards the cultivation of orchards and rice fields. A nil increase in the areas destined to the infrastructure, perhaps a consequence of the boom in the construction of mobility that took place in the 1960s.

## CARPIANO 1999

### Aree antropizzate

- Insediamiento discontinuo, 112 (66,42 ha)
- Zone produttive e insediamenti di grandi impianti di servizi pubblici e privati, 121 (58,35 ha)
- Reti stradali, ferroviarie e spazi accessori, 122 (2,90 ha)
- Cantieri, 133 (6,03 ha)
- Aree degradate non utilizzate e non vegetate, 134 (2,82 ha)
- Aree verdi urbane, 141 (12,90 ha)
- Aree sportive e ricreative, 142 (4,37 ha)

### Aree agricole

- Seminativi semplici, 211 (1.189,39 ha)
- Risaie, 213 (361,99 ha)
- Frutteti e frutti minori, 222 (0,56 ha)
- Arboricoltura da legno, 224 (12,33 ha)
- Prati permanenti, 231 (133,10 ha)

### Territori boscati e ambienti seminaturali

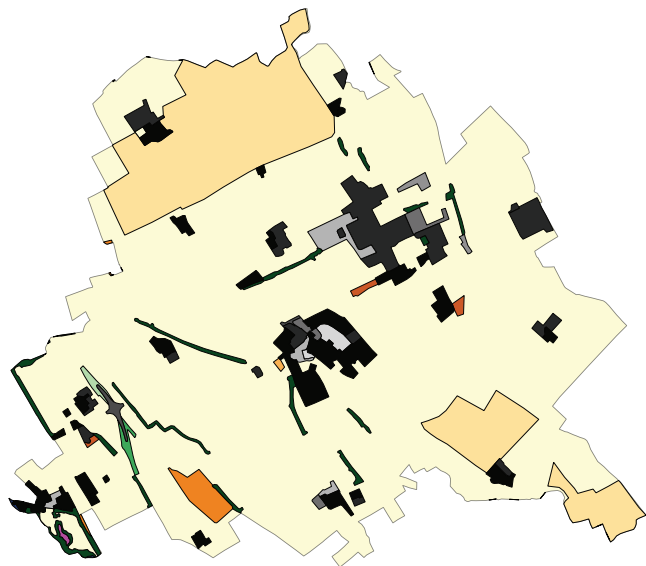
- Boschi di latifoglie, 311 (27,27 ha)
- Cespuglieti e Arbusteti, 322 (2,75 ha)
- Aree in evoluzione, 324 (1,96 ha)

### Aree umide

- Vegetazione delle aree umide interne e delle torbiere, 411 (0,72 ha)

### Corpi idrici

- Alvei fluviali e corsi d'acqua artificiali, 511 (0,35 ha)



## CARPIANO 2015

### Aree antropizzate

- Insediamiento discontinuo, 112 (90,86 ha)
- Zone produttive e insediamenti di grandi impianti di servizi pubblici e privati, 121 (105,04 ha)
- Reti stradali, ferroviarie e spazi accessori, 122 (13,89 ha)
- Cantieri, 133 (5,38 ha)
- Aree degradate non utilizzate e non vegetate, 134 (7,36 ha)
- Aree verdi urbane, 141 (9,99 ha)
- Aree sportive e ricreative, 142 (7,93 ha)

### Aree agricole

- Seminativi semplici, 211 (981,80 ha)
- Risaie, 213 (550,42 ha)
- Frutteti e frutti minori, 222 (0,73 ha)
- Arboricoltura da legno, 224 (12,13 ha)
- Prati permanenti, 231 (135,33 ha)

### Territori boscati e ambienti seminaturali

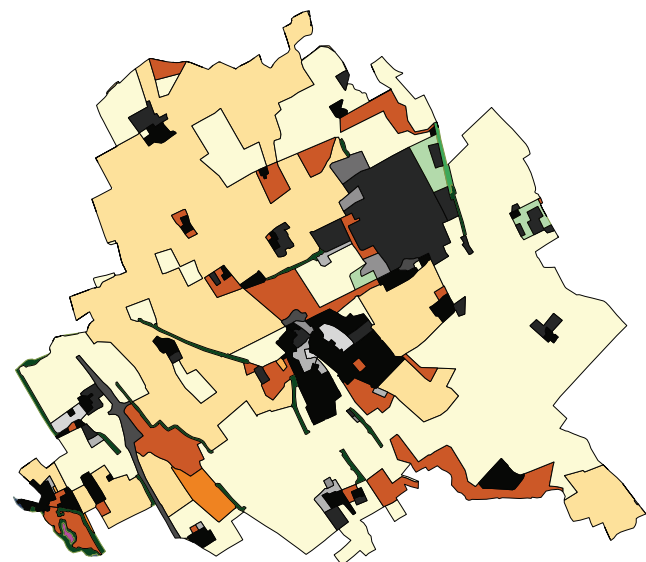
- Boschi di latifoglie, 311 (25,04 ha)
- Cespuglieti e Arbusteti, 322 (2,43 ha)
- Aree in evoluzione, 324 (14,51 ha)

### Aree umide

- Vegetazione delle aree umide interne e delle torbiere, 411 (0,72 ha)

### Corpi idrici

- Alvei fluviali e corsi d'acqua artificiali, 511 (0,31 ha)



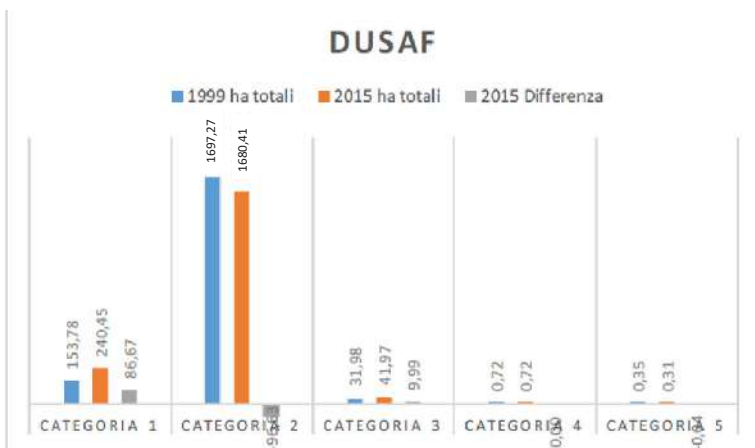


## CARPIANO 1999

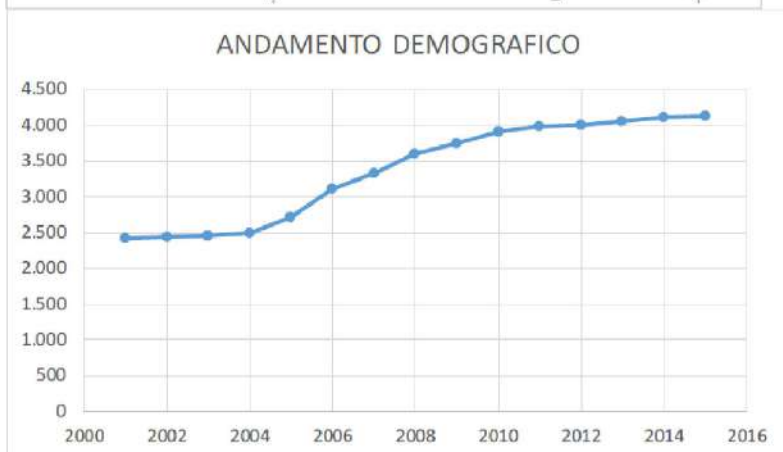
## CARPIANO 2015

## CHANGE OF USE OF LAND IN 16 YEARS (%)

Carpiano 1999				Carpiano 2015				Calcolo differenziale			
Dimensioni ha				Dimensioni ha				Calcolo differenziale			
1.884,10				1.963,86				-79,76			
Differenza				Differenza				Calcolo differenziale			
								Calcolo differenziale			
								Calcolo differenziale			
Carpiano Dusaf 1999 Categoria 1	Codice	ha	Totale	Carpiano Dusaf 2015 Categoria 1	Codice	ha	Totale	0,37	36,80%	0,56	56%
	112	66,42	153,78		112	90,86					
	121	58,35			121	105,04					
	122	2,90			122	13,89					
	133	6,03			133	5,38					
	134	2,82			134	7,36					
141	12,90	141		9,99							
142	4,37	142	7,93	142	7,93						
Carpiano Dusaf 1999 Categoria 2	Codice	ha	Totale	Carpiano Dusaf 2015 Categoria 2	Codice	ha	Totale	-0,17	-17,45%	-0,01	-1%
	211	1189,39	1697,27		211	981,80					
	213	361,99			213	550,42					
	222	0,56			222	0,73					
	224	12,33			224	12,13					
	231	133,00			231	135,33					
231	133,00	231		135,33							
Carpiano Dusaf 1999 Categoria 3	Codice	ha	Totale	Carpiano Dusaf 2015 Categoria 3	Codice	ha	Totale	-0,08	-8,17%	0,24	24%
	311	27,27	31,98		311	25,04					
	322	2,75			322	2,43					
	324	1,96			324	14,51					
324	1,96	324		14,51							
Carpiano Dusaf 1999 Categoria 4	Codice	ha	Totale	Carpiano Dusaf 2015 Categoria 4	Codice	ha	Totale	0,00	-0,05%	0,00	0%
	411	0,72	0,72		411	0,72	0,72				
Carpiano Dusaf 1999 Categoria 5	Codice	ha	Totale	Carpiano Dusaf 2015 Categoria 5	Codice	ha	Totale	-0,11	-11,43%	-0,13	-13%
	511	0,35	0,35		511	0,31	0,31				



As we can see from the graph on the left, the consumption of soil by the Municipality of Carpiano has increased by about 50%, all at the expense of agricultural areas.



The demographic trend of the municipality of Carpiano has doubled, from 2,400 to 4,200 inhabitants.

## CONSIDERATIONS...

### *CAT1-ANTHROPIZED AREAS*

The discontinuous settlements recorded a medium increase, due to the emergence of sporadic nuclei that are interspersed with the typical agricultural expanses of that area. The productive areas have an interesting increase linked in particular to the agricultural economy and the improvement of the network of farms, protagonists of the territory of Capriano and a great landscape-territorial heritage. A peculiarity of this category is the data that refers to the sports areas, which recorded an increase of 80% due to the construction of a real sports center equipped with several playgrounds built in the late 90s.

### *CAT2-AGRICULTURAL AREAS*

The most significant data of this category are those related to the increase of rice fields and orchards. The permanent meadows remain almost unchanged and linked to the presence of the farms outside the inhabited center. There is a decrease in simple arable land, perhaps replaced by cultivations of fruit plants and wood arboriculture.

### *CAT3-WOODED TERRITORIES AND SEMI-NATURAL ENVIRONMENTS.*

If the soil for the deciduous forests and the bushes decreases, the wooded territories and semi-natural areas increase. This is probably connected to the increase of abandoned areas within the municipal boundaries.

### *CAT4-WET AREAS*

The wetlands have also decreased due to the work of man who has channeled spontaneous springs into fontanili. The territory of Capriano was the first where the first marcita was born.

### *CAT5-WATER BODIES*

The presence of natural sources and sources of water have been channeled mainly through fontanili. This did not increase the need to build a canalization of water basins.

To conclude in Capriano there is a medium increase in discontinuous settlements and a significant increase in agricultural production areas, as well as in sports services. In agricultural areas in particular there is an increase in rice fields and orchards to the detriment of simple arable land. Finally, the increase in water channels is almost nil.

## 4. Conclusion

The conclusions regarding these three municipalities show first of all the decrease in agricultural areas and an increase in anthropized areas. This figure is very relevant for the municipality of San Donato and San Giuliano as they are more in proximity with the boundaries of the great urbanized Milanese, while the town of Carpiano remains in a more agricultural area. In addition, San Donato in particular is home to large companies that have decided to settle in the suburban area of Milan. In general we can say that since these municipalities are located south of Milan and have three different vocations, they were useful for collecting important data on soil consumption, a current problem that we will have to find an answer in the years to come.