

# Session #1: Getting started with the QGis tool (1h)

# GIS tools



MapInfo  
eSoftner



**GEOconcept**  
THE GEOPTIMIZATION COMPANY



**uDig** User-friendly Desktop Internet GIS

**OPEN JUMP**  
Jump Unified Mapping Platform

**OrbisGIS**  
An opensource GIS software



**QGIS**

# Objectives of the TP

- Download data
- Understand the structure of the working directory
- Load vector data
- Visualize geometric primitives (points, lines, polygons)
- Manipulate the basic functions of Qgis
- Format data
- Semiological formatting
- Label formatting
- Filter data
- Exercises

# Download TP data

[Download data](#)

Unzip the directory to a working directory

Open TP1 file

› 2020-2021 › TP1

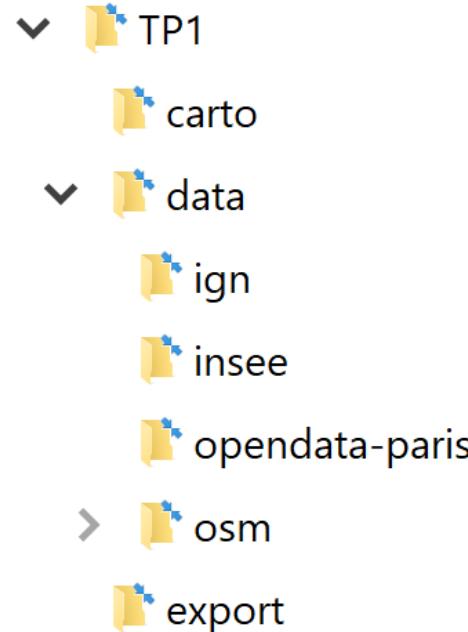
Nom	Modifié le	Type	Taille
carto	29/10/2020 11:05	Dossier de fichiers	
data	29/10/2020 11:06	Dossier de fichiers	
export	29/10/2020 11:05	Dossier de fichiers	
TAIS-TP1.qgz	29/10/2020 11:16	QGIS Project	6 Ko

# Recommended structure of GIS directories

The recommended structure forms a tree structure that must be specific to each Qgis project.

The goal: to avoid data problems that are in non-generic directories of type  
C:\Users\First Name or mixed in a data disk like D:\data\...

What happens when you change machines or export the project to another user?



# Open Qgis project file

> 2020-2021 > TP1

Nom	Modifié le	Type	Taille
carto	29/10/2020 11:05	Dossier de fichiers	
data	29/10/2020 11:06	Dossier de fichiers	
export	29/10/2020 11:05	Dossier de fichiers	
TAIS-TP1.qgz	29/10/2020 11:16	QGIS Project	6 Ko

→

The screenshot shows the QGIS application window. The title bar reads "TAIS-TP1 — QGIS". The menu bar includes "Projet", "Éditer", "Vue", "Couche", "Préférences", "Extensions", "Vecteur", "Raster", "Base de données", "Internet", "Maillage", "MMQGIS", "Traitement", "HCMGIS", and "Aide". The toolbar has various icons for selection, zoom, and measurement. The "Couches" (Layers) panel on the left shows a tree view with four layers: "quartier\_paris" (selected), "buildings", "waterways", and "roads". The main canvas displays an aerial-style map of a city area, likely Paris, with a large, irregular brown polygon overlaid on the map. The bottom status bar shows coordinates "Coordonnée 2.2413,48.8606", scale "Échelle 1:49481", a magnifying glass icon for "Loupe 100%", rotation "Rotation 0,0 °", a checkmark for "Rendu", and EPSG code "EPSG:4326".

# Qgis interface details

TAIS-TP1 — QGIS

Projet Éditer Vue Couche Préférences Extensions Vecteur Raster Base de données Internet Maillage MMQGIS Traitement HCMGIS Aide

Couches

- ✓ quartier\_paris
- ✓ buildings
- ✓ waterways
- ✓ roads

Explorateur

Couche

Taper pour trouver (Ctrl+K)

12 px

Data visualization

The screenshot displays the QGIS application window. On the left, the 'Layer Manager' panel is visible, containing a tree view of layers: 'Couches' with 'quartier\_paris' (selected), 'buildings', 'waterways', and 'roads'. Below it is the 'Explorateur' panel. The main canvas shows a satellite-style map of Paris, France. A large, irregularly shaped area in the center is filled with a brown color and contains a fine grid pattern, representing the 'quartier\_paris' layer. The rest of the map is composed of green lines representing roads and waterways. A black arrow points from the text 'Data visualization' to the brown-filled area on the map.

7

Coordonnée 2.2413,48.8606 Échelle 1:49481 Loupe 100% Rotation 0,0 ° ✓ Rendu EPSG:4326

# Notion of data layer

GIS datasets represent logical sets of features associated with geographic positions and shapes, as well as descriptive information related to each feature, stored as attributes.

In our case, the layers are vector entities that include a particular data theme: roads, waterways, buildings, neighborhoods.

<input checked="" type="checkbox"/>		<b>quartier_paris</b>
<input checked="" type="checkbox"/>		<b>buildings</b>
<input checked="" type="checkbox"/>		<b>waterways</b>
<input checked="" type="checkbox"/>		<b>roads</b>

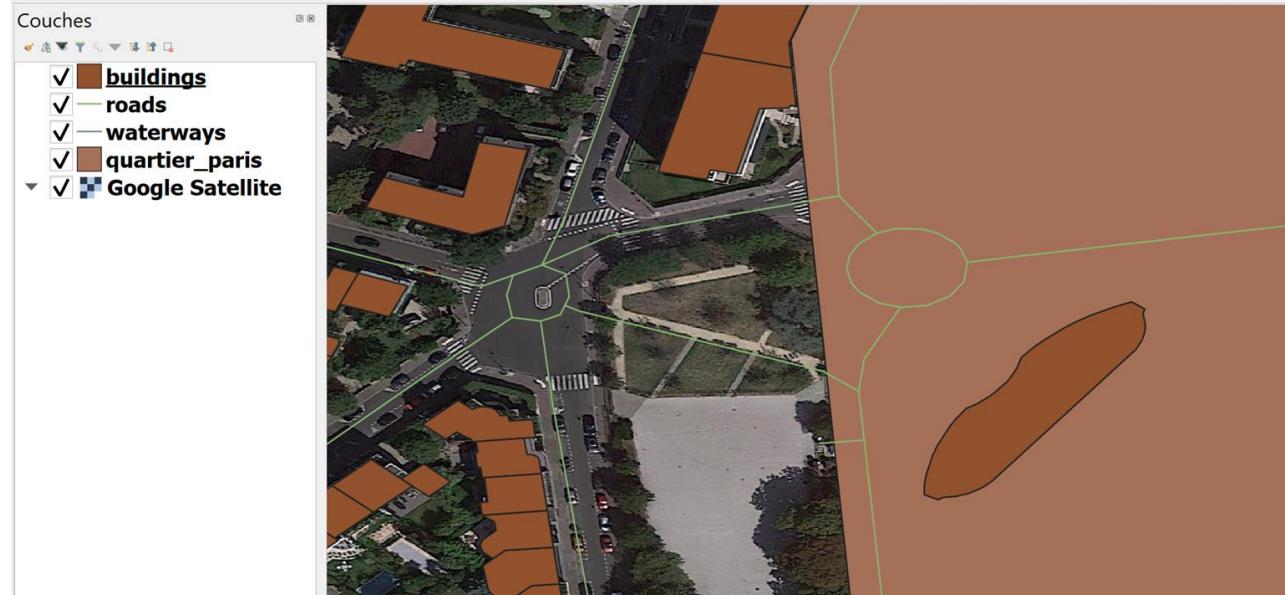
The order in which the layers are displayed from top to bottom reflects the display on the viewing window. Layers can be rearranged by dragging and dropping.

To do: put the layers in a more appropriate order

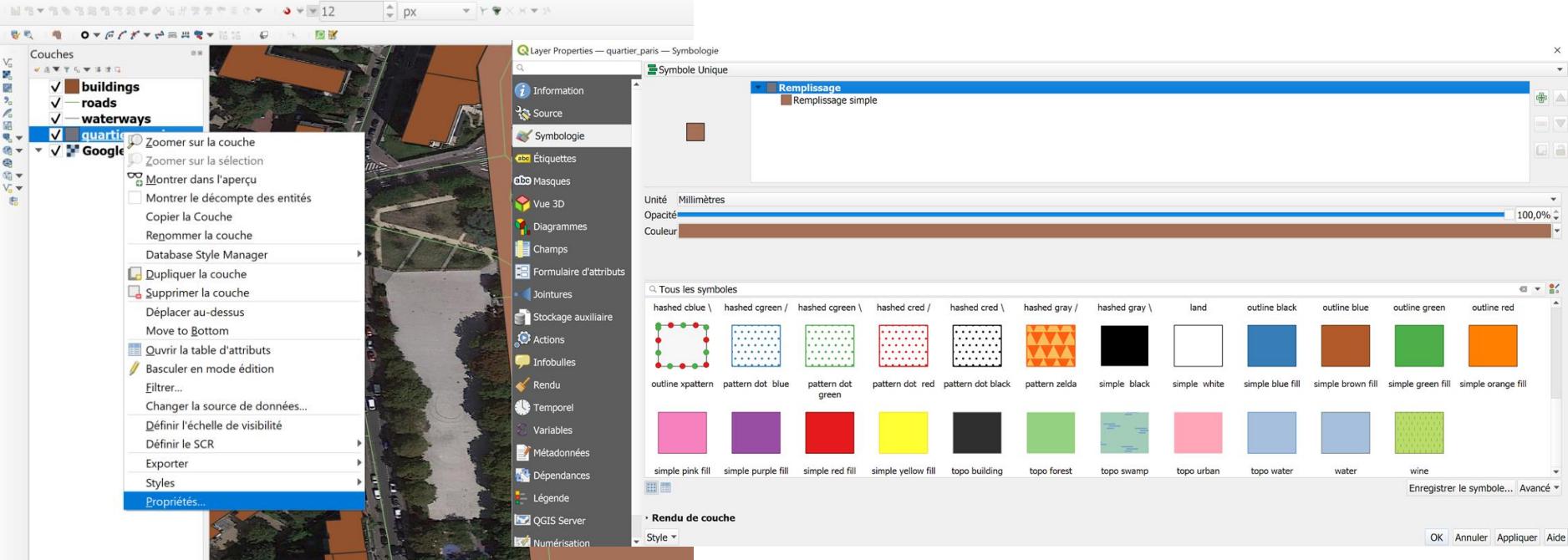
# Adding an external layer (Google Maps or OSM)

We reorder the Google Satellite layer in the manager.

The Google Satellite layer is an image layer.  
What do we observe?



# Single symbol formatting (1)



1. Right-click on layer quartiers\_paris then Properties
- 2.

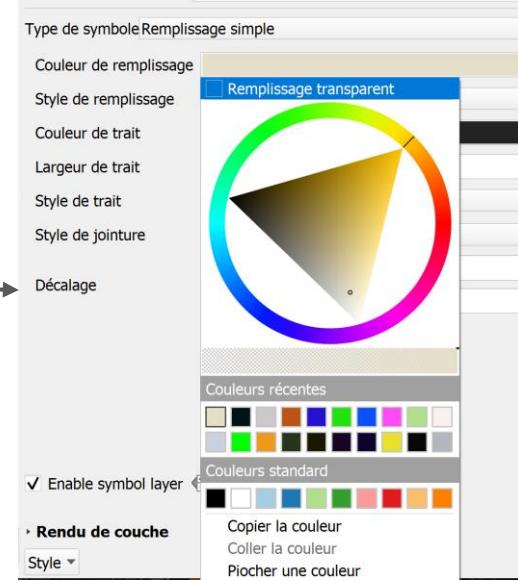
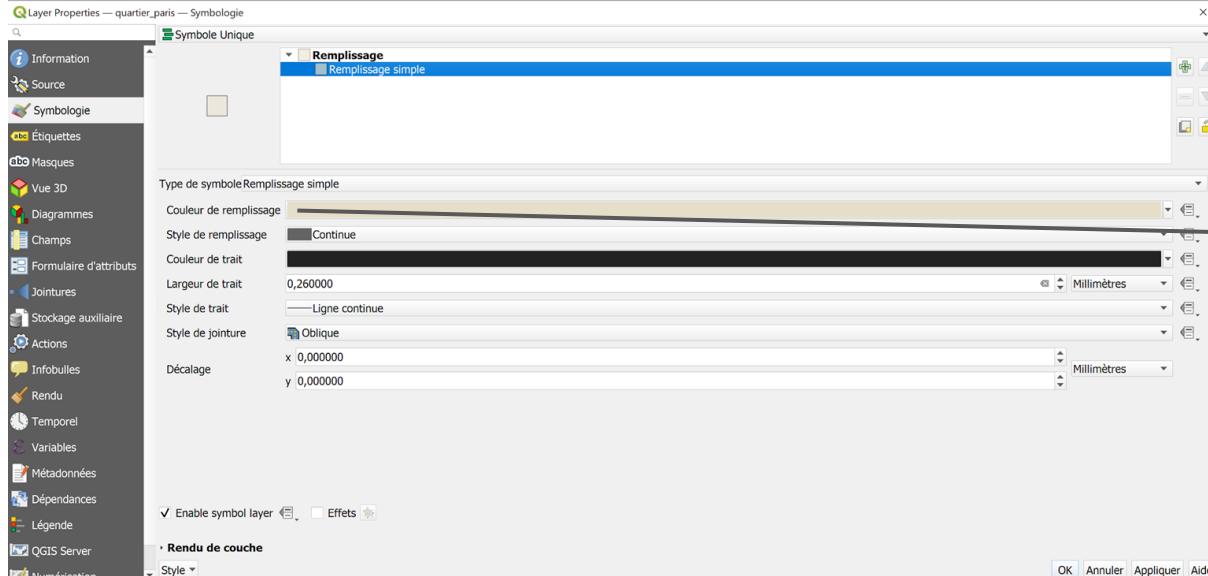
2. Symbology tab / choose a suitable color (Light Grey)  
Set opacity to 50%  
Then Ok

# Single symbol formatting (2)



We can now see through the shapes of the quartiers\_paris layer.  
Is this enough?

# Single symbol formatting (3)



1. Again, right-click on the layer  
quartiers\_paris

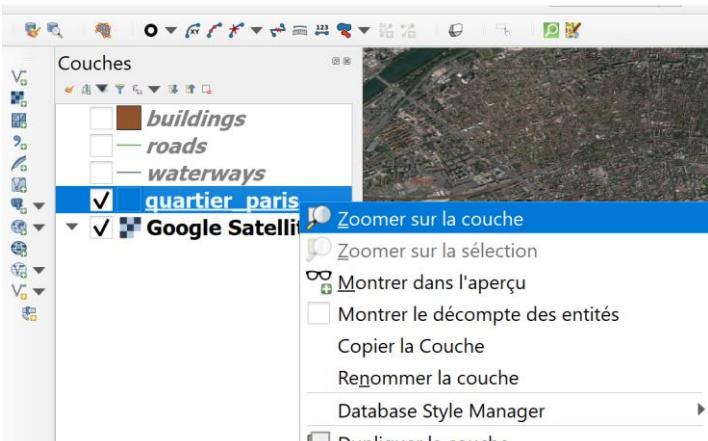
Then Properties



2. Symbology tab / Click Simple Fill to access other options, including:
  - change the fill color to "Transparent Fill"
  - Line color: choose a light gray
  - Line width: 0.06Then Ok

# Refocus the view / move the view

1. Disable buildings, roads, waterways layers
2. Right-click on the quartiers\_paris layer / Zoom on the layer
- 3.



The movement of the view is done with the "hand" icon,  
or better: with the mouse (almost mandatory) by pressing the middle button,  
in addition to the zoom in/out wheel.

# Exercise: Single symbol formatting

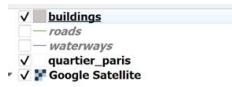
Format the buildings layer with the following settings:

Right-click / Properties on the buildings layer / Symbology

Fill color: light gray, hexa code#c8c4c1

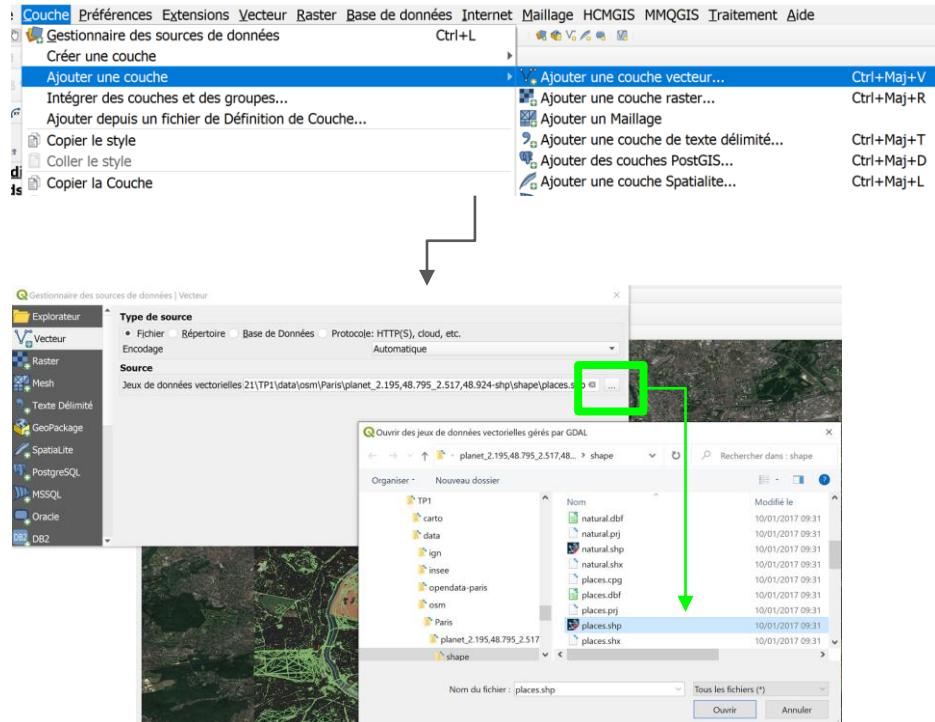
Line color: dark gray, hexa code #232323

Line width: 0.06



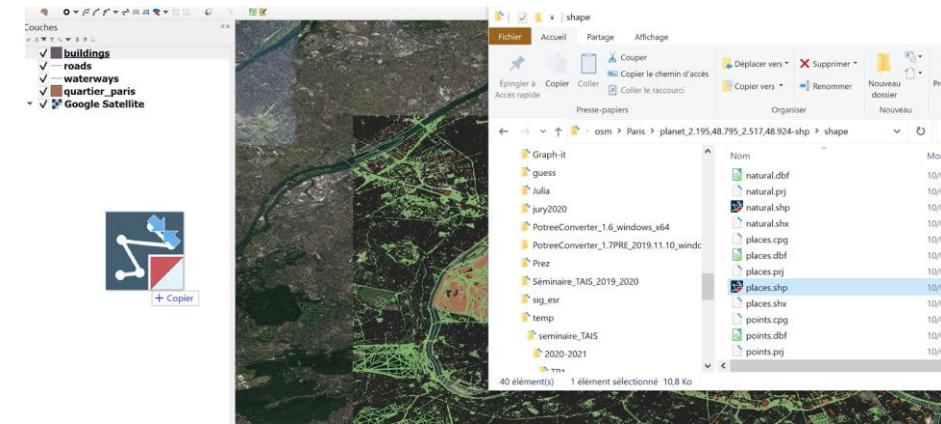
# Adding a data layer (place names)

## Method 1:



By clicking browse, open the places.shp file located in TP1/data/osm/Paris/planet.../shape

## Method 2:



From the system's file explorer, drag and drop the places.shp file to the layer manager or to the visualization part.

Optionally reorder the layers.

# Exercise: Single symbol formatting

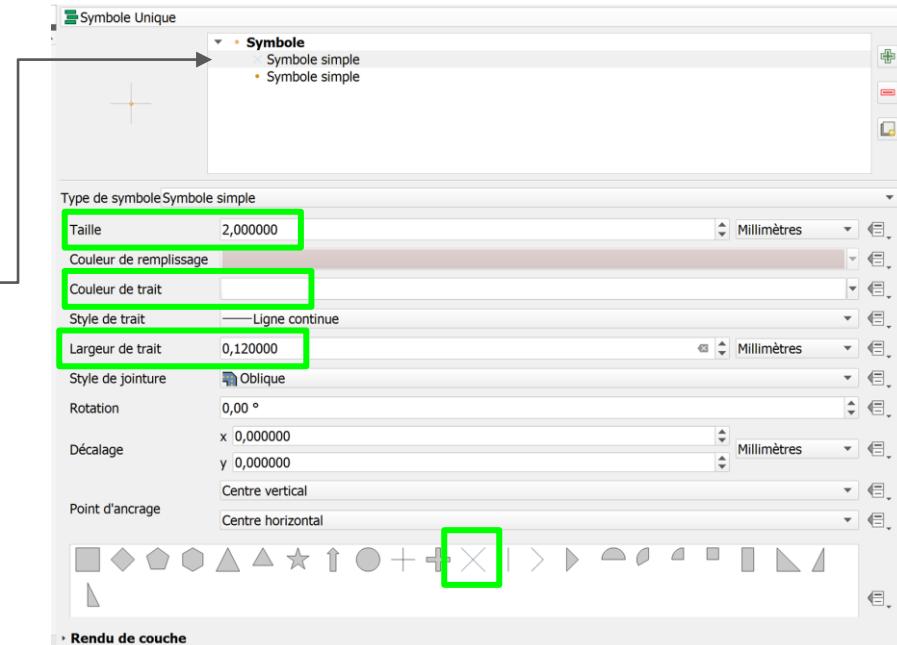
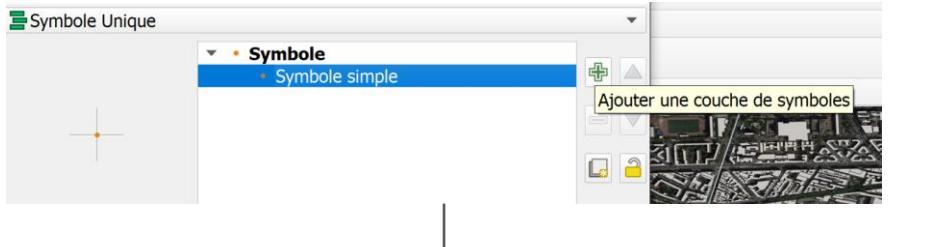
Format the "places" layer with the following parameters

Access to the symbology can be done by double-clicking on the layer symbol

- Size : 1.00
- Fill color: orange, hexa code#e18915
- Line color: no stroke / transparent outline

# Implementation of a complex symbology

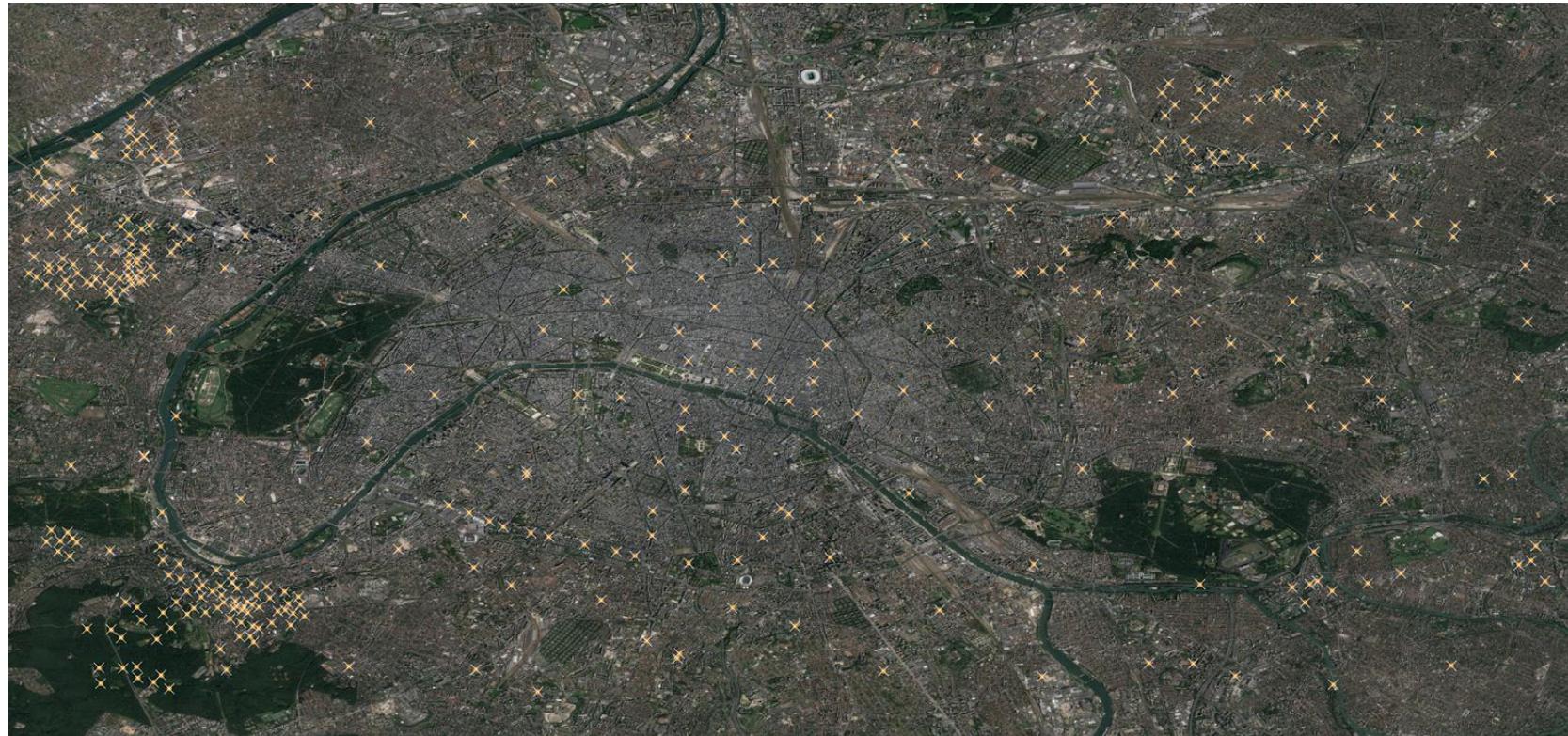
Symbology also has a layered operation.  
Sub-symbols can be added to the dots symbol.  
Click on "Add a layer of symbols".



In the settings of this subsymbol:

1. Choosing an oblique cross
2. Set the size to 2
3. a white line color
4. a line width of 0.12

# We should observe ...



# Data & attribute table

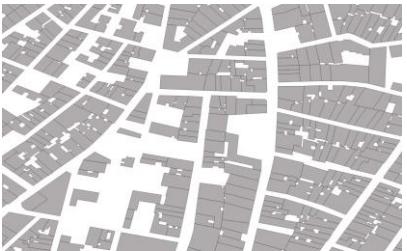
GIS data =  
geometric primitives



Points

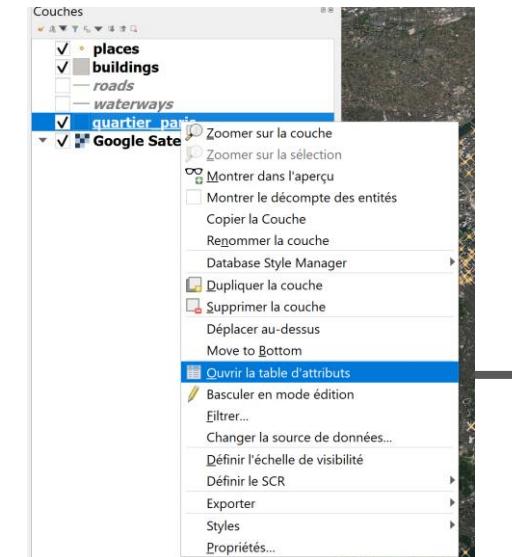


Lines



Polygons

+ attribute data (attribute table)



n_sq_qu	c_qu	c_quinsee	l_qu	c_ar	n_sq_ar	perimetre	surface
1	750000070	70	7511802 Clignancourt	18	75000018 6005,5203887...	1653715,1625...	
2	750000076	76	7511904 Combat	19	75000019 4435,2732519...	12494987,8919...	
3	750000050	50	7511302 Gare	13	75000013 7070,3505668...	3044177,5148...	
4	750000004	4	7510104 Place-Vendôme	1	75000001 2147,8176017...	269456,7809...	
5	750000008	8	7510204 Bonne-Nouvelle	2	75000002 2233,9760301...	281448,20657...	
6	750000049	49	7511301 Salpâtre	13	75000002 4759,962387...	1181560,2674...	
7	750000007	7	7510203 Mail	2	75000002 2179,153604...	278142,58508...	
8	750000041	41	7511101 Folie-Mâcri...	11	75000011 3724,3526943...	725752,49104...	
9	750000028	28	7510704 Gros-Caillou	7	75000007 4720,9943725...	1381893,2764...	
10	750000016	16	7510404 Notre-Dame	4	75000004 3283,1633706...	378252,15367...	
11	750000013	13	7510401 Saint-Merri	4	75000004 2346,0046867...	313040,39654...	
12	750000073	73	7511901 Villette	19	75000019 5191,0188296...	1285705,0123...	
13	750000001	1	7510101 Saint-Germain...	1	75000001 5057,5494750...	869000,66456...	
14	750000038	38	7511002 Porte-Saint-De...	10	75000010 2736,3929536...	472113,59989...	
15	750000025	25	7510701 Saint-Thomas...	7	75000007 3827,2533528...	826559,43678...	
16	750000014	14	7510402 Saint-Gervais	4	75000004 2678,3409233...	422028,17132...	
17	750000003	3	7510103 Palais-Royal	1	75000001 2166,8392391...	273696,9330...	
18	750000034	34	7510902 Chaussée-d'...	9	75000009 3133,5800917...	543441,16771...	

Beware of character encoding: here diacritics are problematic  
See in right click on layer/Properties/Source/Source data encoding

# The attribute table

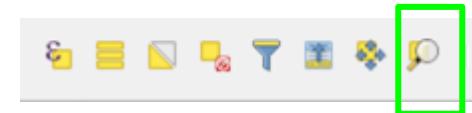
It is the database underlying the representation of geometries.  
The columns are called fields, here 8 in number.

quarter\_paris — Features Total: 80, Filtered: 80, Selected: 0

	n_sq_qu	c_qu	c_quinsee	l_qu	c_ar	n_sq_ar	perimetre	surface
1	750000070	70	7511802	Clinancourt	18	750000018	6005,5203887...	1653715,1625...
2	750000076	76	7511904	Combat	19	750000019	4435,2732519...	1294987,8919...
3	750000050	50	7511302	Gare	13	750000013	7070,3505668...	3044177,5148...
4	75000004	4	7510104	Place-Vendôme	1	750000001	2147,8176017...	269456,78059...
5	750000008	8	7510204	Bonne-Nouvelle	2	750000002	2233,9760301...	281448,20657...
6	750000049	49	7511301	Salpatrière	13	750000013	4759,0962387...	1181560,2674...
7	750000007	7	7510203	Mail	2	750000002	2179,1536048...	278142,58508...
8	750000041	41	7511101	Folie-Méricourt	11	750000011	3724,3526943...	725752,49104...
9	750000028	28	7510704	Gros-Caillou	7	750000007	4720,9943725...	1381893,2764...
10	750000016	16	7510404	Notre-Dame	4	750000004	3283,1633708...	378252,15367...
11	750000013	13	7510401	Saint-Merri	4	750000004	2346,0046867...	313040,39654...
12	750000073	73	7511901	Villette	19	750000019	5191,0188296...	1285705,0123...
13	750000001	1	7510101	Saint-Germain...	1	750000001	5057,5494750...	869000,66456...
14	750000038	38	7511002	Porte-Saint-De...	10	750000010	2736,2929536...	472113,59989...
15	750000025	25	7510701	Saint-Thomas...	7	750000007	3827,2533528...	826559,43678...
16	750000014	14	7510402	Saint-Gervais	4	750000004	2678,3409233...	422028,17132...
17	750000003	3	7510103	Palais-Royal	1	750000001	2166,8392391...	273696,79330...
18	750000034	34	7510902	Chaussée-d'...	9	750000009	3133,5800917...	543441,16771...

Montrer toutes les entités

Each line corresponds to a geometric entity.  
Select a line by clicking on its numeric ID, then in the toolbar, click on the magnifying glass.



What do we observe on the view?

(You can also select several lines with a Shift+click or Ctrl Click)  
(Deselection is done via the menu)

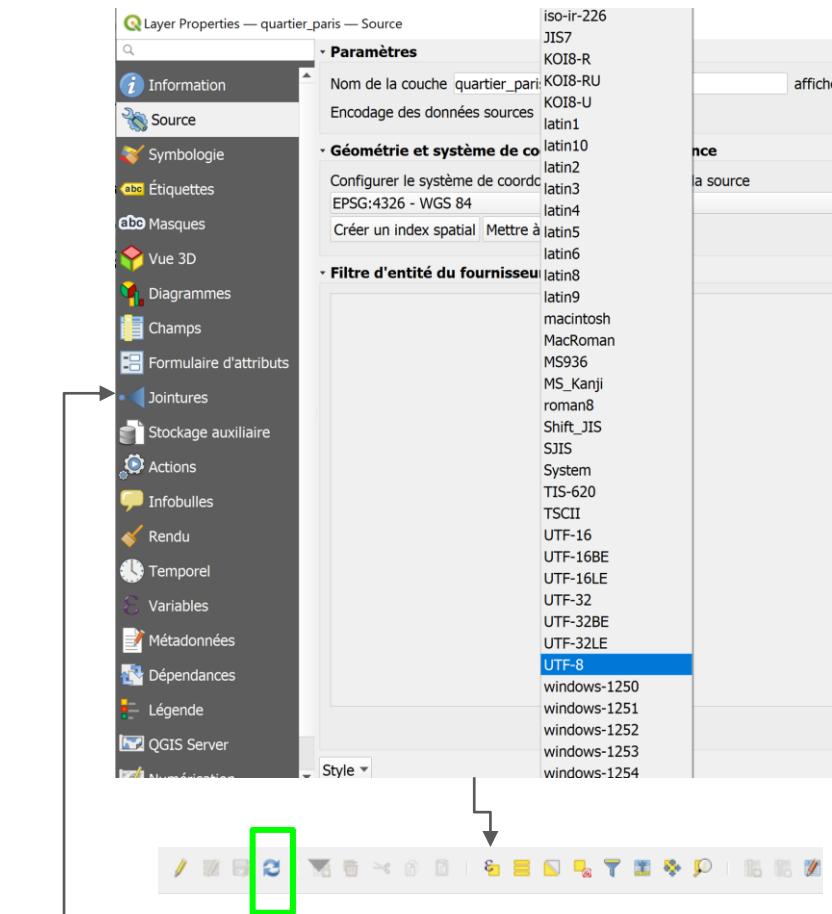


# Character encoding

c_quinsee	l_qu	c_ar	
7511802	Clignancourt	18	
7511904	Combat	19	
7511302	Gare	13	
7510104	Place-VendÃ ´me	1	
7510204	Bonne-Nouvelle	2	
7511301	SalpÃ ¨atriÃ ¨re	13	
7510203	Mail	2	
7511101	Folie-MÃ ©rico...	11	

Attention to the encoding of characters: here diacritics are problematic (on Windows or Mac, not on Linux)

See in right-click on the layer/Properties/Source-Encoding of source data, and choose UTF8.



In the Attribute Table window, refresh the view.

# Towards a symbology by category (1)

The database will allow you to adapt the display according to the attributes of the fields.  
Especially with the fields c\_qu and c\_ar: understand neighborhood number, borough number.

quartier_paris — Features Total: 80, Filtered: 80, Selected: 0								
	n_sq_qu	c_qu	c_quinsee	l_qu	c_ar	n_sq_ar	perimetre	surface
1	750000070	70	7511802	Clinancourt	18	750000018	6005,5203887...	1653715,1625...
2	750000076	76	7511904	Combat	19	750000019	4435,2732519...	1294987,8919...
3	750000050	50	7511302	Gare	13	750000013	7070,3505668...	3044177,5148...
4	75000004	4	7510104	Place-Vendôme	1	750000001	2147,8176017...	269456,78059...
5	750000008	8	7510204	Bonne-Nouvelle	2	750000002	2233,9760301...	281448,20657...
6	750000049	49	7511301	SalpÃ©trÃ©e	13	750000013	4759,0962387...	1181560,2674...
7	750000007	7	7510203	Mail	2	750000002	2179,1536048...	278142,58508...
8	750000041	41	7511101	Folie-MÃ©ricourt	11	750000011	3724,3526943...	725752,49104...
9	750000028	28	7510704	Gros-Caillou	7	750000007	4720,9943725...	1381893,2764...
10	750000016	16	7510404	Notre-Dame	4	750000004	3283,1633708...	378252,15367...
11	750000013	13	7510401	Saint-Merri	4	750000004	2346,0046867...	313040,39654...
12	750000073	73	7511901	Villette	19	750000019	5191,0188296...	1285705,0123...
13	750000001	1	7510101	Saint-Germain...	1	750000001	5057,5494750...	869000,66456...
14	750000038	38	7511002	Porte-Saint-De...	10	750000010	2736,2929536...	472113,59989...
15	750000025	25	7510701	Saint-Thomas...	7	750000007	3827,2533528...	826559,43678...
16	750000014	14	7510402	Saint-Gervais	4	750000004	2678,3409233...	422028,17132...
17	750000003	3	7510103	Palais-Royal	1	750000001	2166,8392391...	273696,79330...
18	750000034	34	7510902	Chaussée-d'...	9	750000009	3133,5800917...	543441,16771...

By the way, you can see that it is possible to sort a column by clicking on its title.  
It can be seen that:

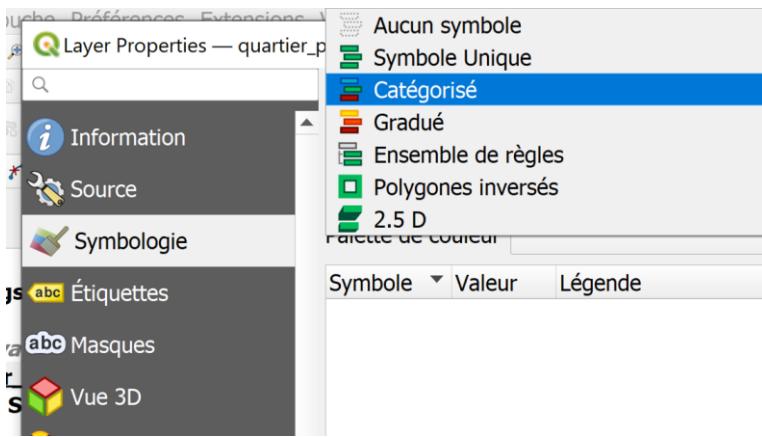
$$\max(c_{\text{qu}}) = 80$$

$$\max(c_{\text{ar}}) = 20$$

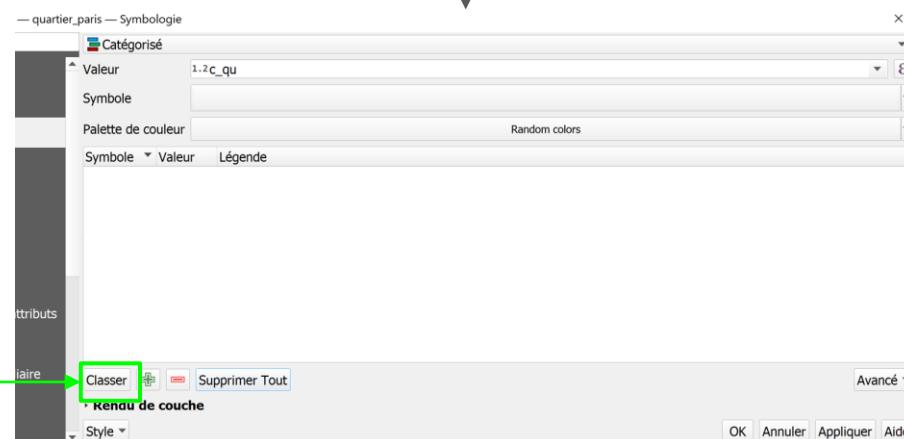
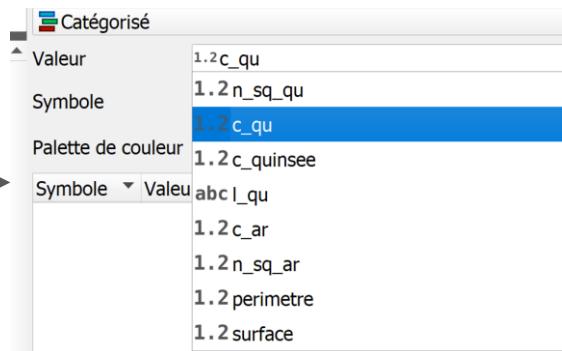
Two numeric fields are also interesting:  
the "perimeter" and "surface" fields.

# Towards a symbology by category (2)

1. In the layer properties, click Unique Symbol to choose Categorized



2. In Value, choose the c\_qu field



3. Click on Categorize

# Towards a symbology by category (2)

Layer Properties — quartier\_paris — Symbologie

Information  
Source  
Symbologie  
Etiquettes  
Masques  
Vue 3D  
Diagrammes  
Champs  
Formulaire d'attributs  
Jointures  
Stockage auxiliaire  
Actions  
Infobulles  
Rendu  
Temporel  
Variables  
Métadonnées  
Dépendances  
Légende  
QGIS Server

Catégorisé

Valeur: 1.2c\_qu

Symbol:

Palettes de couleur:

Symbol	Valeur	Légende
1	1	
2	2	
3	3	
4	4	
5	5	
6	6	
7	7	
8	8	
9	9	
10	10	
11	11	
12	12	
13	13	
14	14	
15	15	
16	16	
17	17	
18	18	
19	19	
20	20	
21	21	
22	22	
23	23	
24	24	
25	25	
26	26	

Classer    Supprimer Tout

Rendu de couche

Style ▾

Double-click a symbol  
Provides access to the  
symbology interface

Sélecteur de symbole

Remplissage

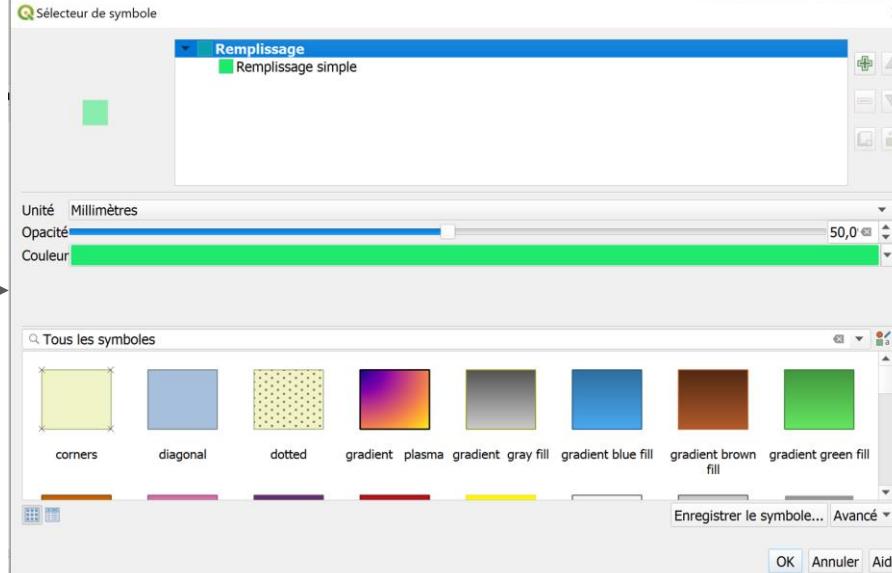
Remplissage simple

Unité: Millimètres  
Opacité: 50,0  
Couleur

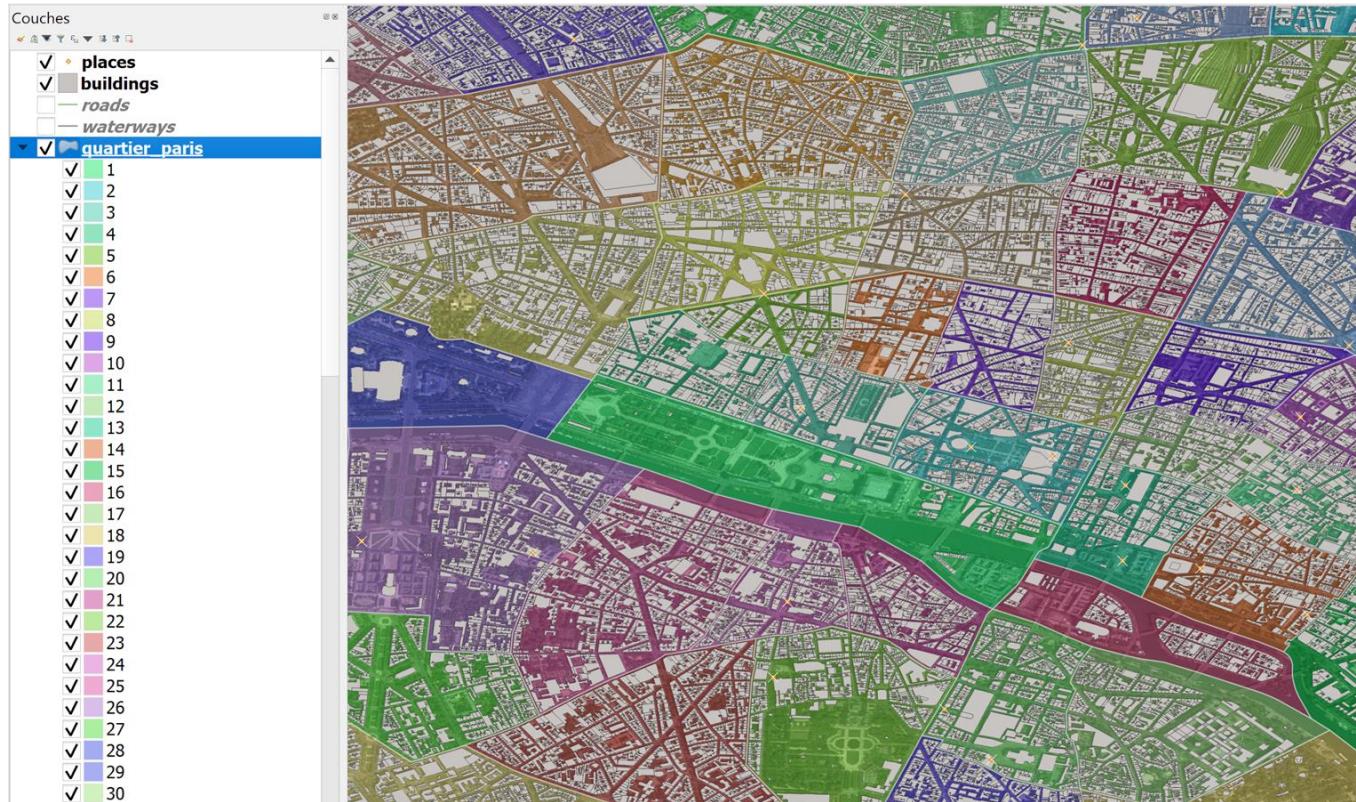
Tous les symboles

corners diagonal dotted gradient plasma gradient gray fill gradient blue fill gradient brown fill gradient green fill

Enregistrer le symbole... Avancé OK Annuler Aide



# Towards a symbology by category (3)



Exercise: Repeat the symbology by choosing this time the "c\_ar" field.

# Text on visualization: labelling (1)

1. In the properties of the layer, go to labels

- 2.

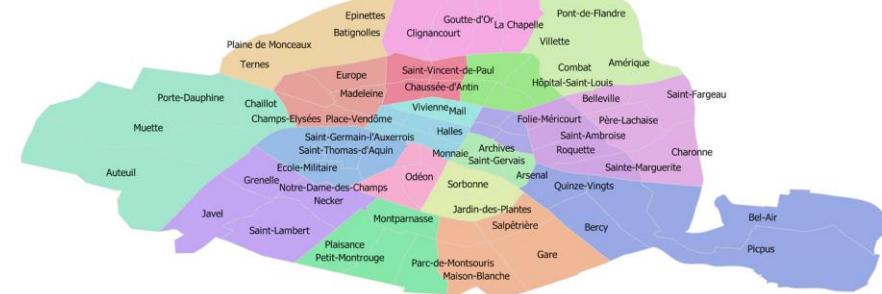
2. Click on No label and choose Simple labels

partie\_paris — Étiquettes

- Pas d'étiquette
- Étiquettes simples**
- Étiquetage basé sur des règles
- Bloquant

Valeur abc I\_qu

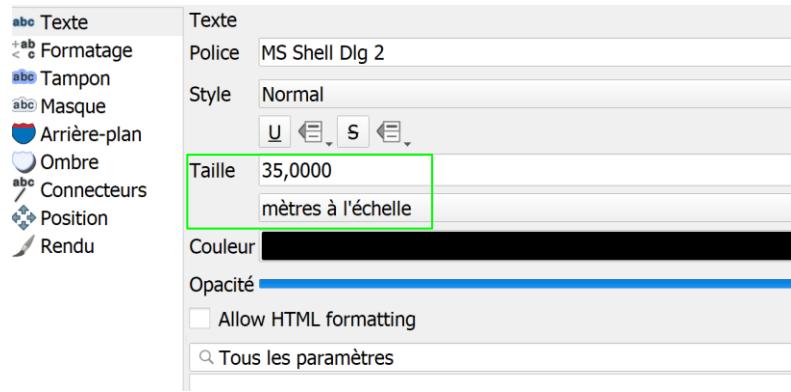
- Echall.2 n\_sq\_qu
- Loren1.2 c\_qu
- 1.2 c\_quinsee
- abc I\_qu**
- Lorem1.2 c\_ar
- abc Tel.2 n\_sq\_ar
- +ab < c Fol.2 perimetre
- abc Tal.2 surface
- abc Ma.2 surface



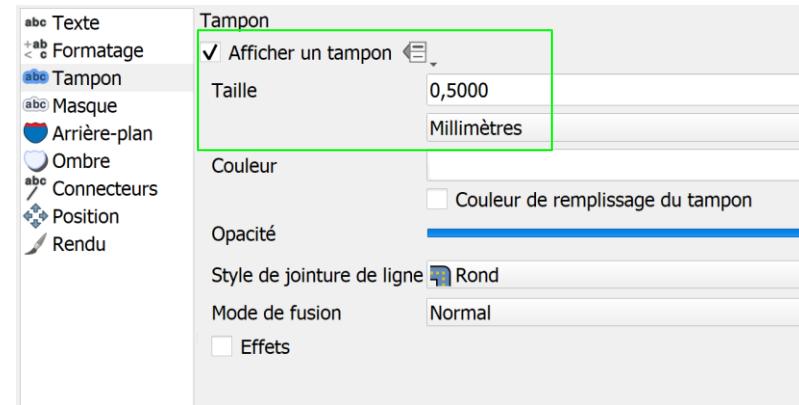
3. Choose the "I\_qu" field as the value.

# Text on visualization: labelling (1)

Set the following options in the Text and Buffer subtabs:



In Text: 35 meters to scale



In Buffer: Show a stamp,  
Size 0.5 millimeters

# Semiology exercises

On the "places" layer:

Observe the attribute table.

Set up a label with the text of the toponym.

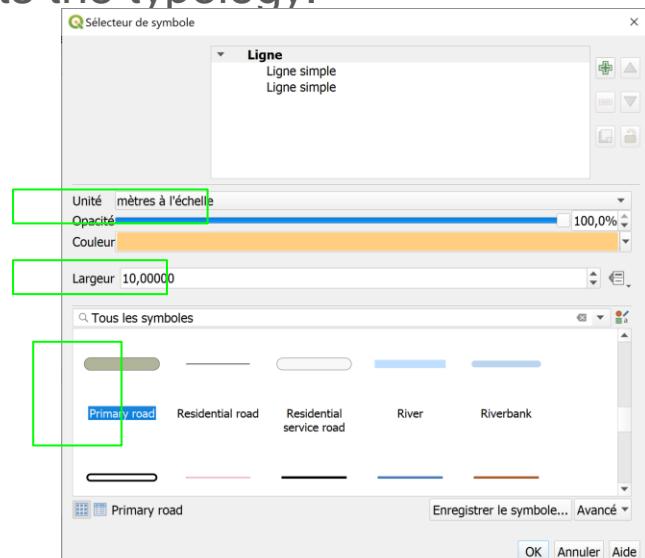
On the "roads" layer:

Observe the attribute table and see the available fields.

Set up a categorized symbology that reflects the typology.

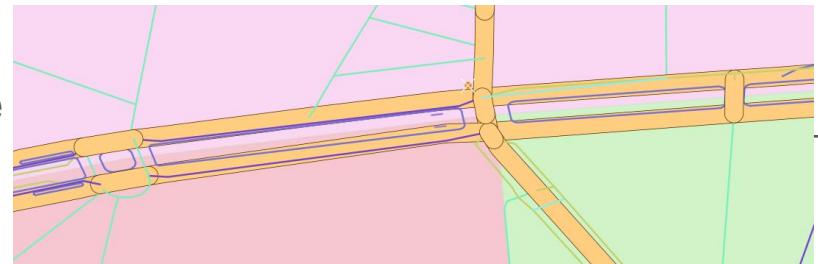
Implement appropriate labelling.

Be careful, see the parameter "meters to scale",  
rather than millimeter which may be interesting.  
Here the example for the "primary road" style.



# Semiology exercises

Attention, the lines (polylines) being separate geometries, we observe:



To solve this problem, it is possible to adjust the merging between objects, in the symbology, unfold the layer rendering and change the blending mode of entities to "Lighten"

✓ no no  
✓ path path  
✓ pedestrian pedestrian  
✓ platform platform  
✓ primary primary  
primary\_link primary\_link

Classer Supprimer Tout

Avancé

Rendu de couche

Opacité: 100,0%

Mode de fusion: Couche: Normal Entité: Eclaircir

Effets

Contrôle de l'ordre de rendu des entités

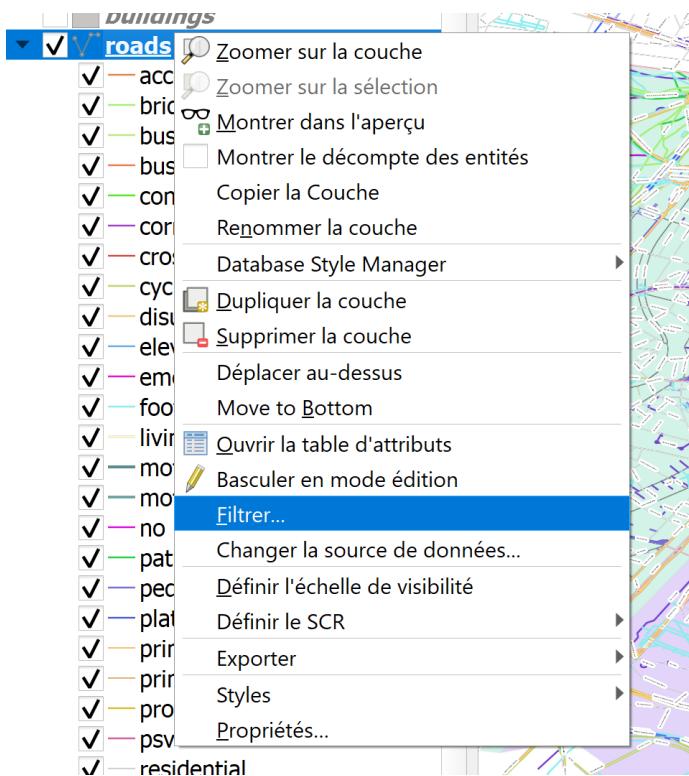
Style OK Annuler Appliquer Aide

# Sélection des données et filtrage

The selection of visible information is crucial when you want to press on a particular phenomenon. This process could be particularly interesting in the case of shaping streets containing a large number of different types, some of which can be considered "noise" on the map.

The information selection operation is called filtering.

It is done by right-clicking on the layer to filter, then Filter.



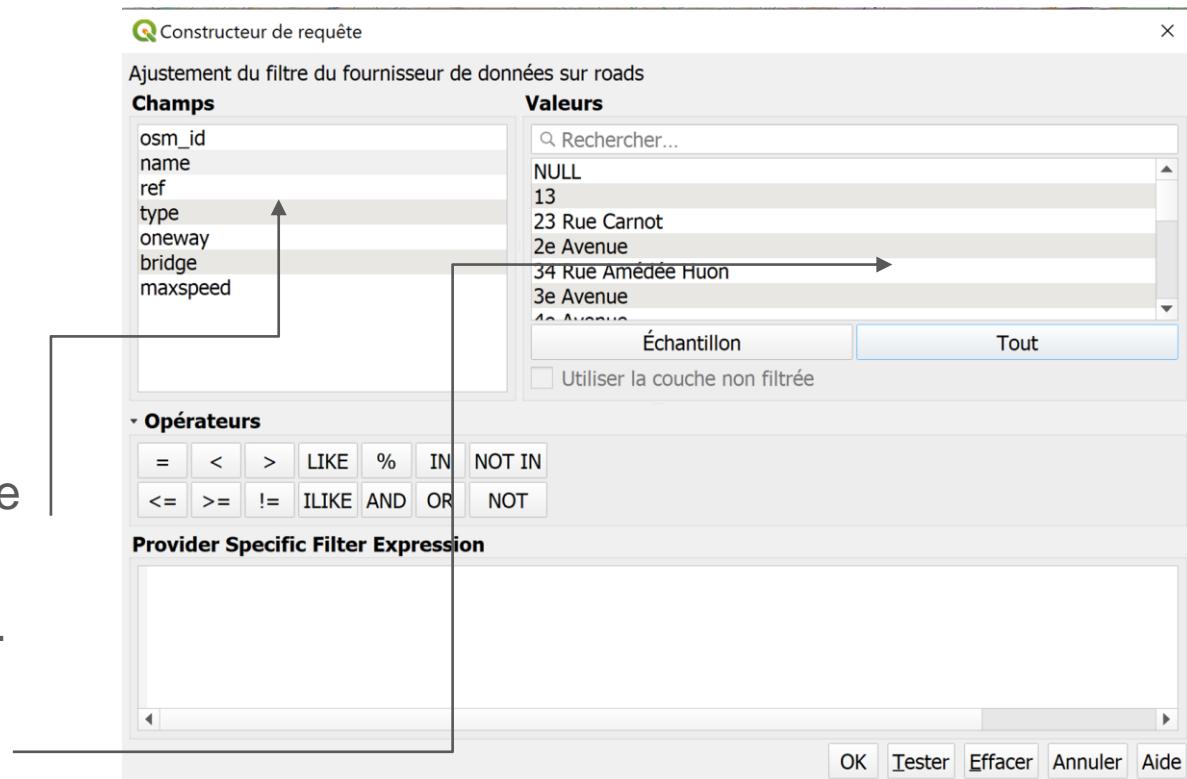
# Filtering operations (1)

Filtering is done by writing a query in a database language.

Qgis has a suitable query builder.

There are the fields of the roads table.

Selecting a field, for example "name" and pressing All displays all available values.



# Filtering operations (2)

A double click on type, passes it in the expression.

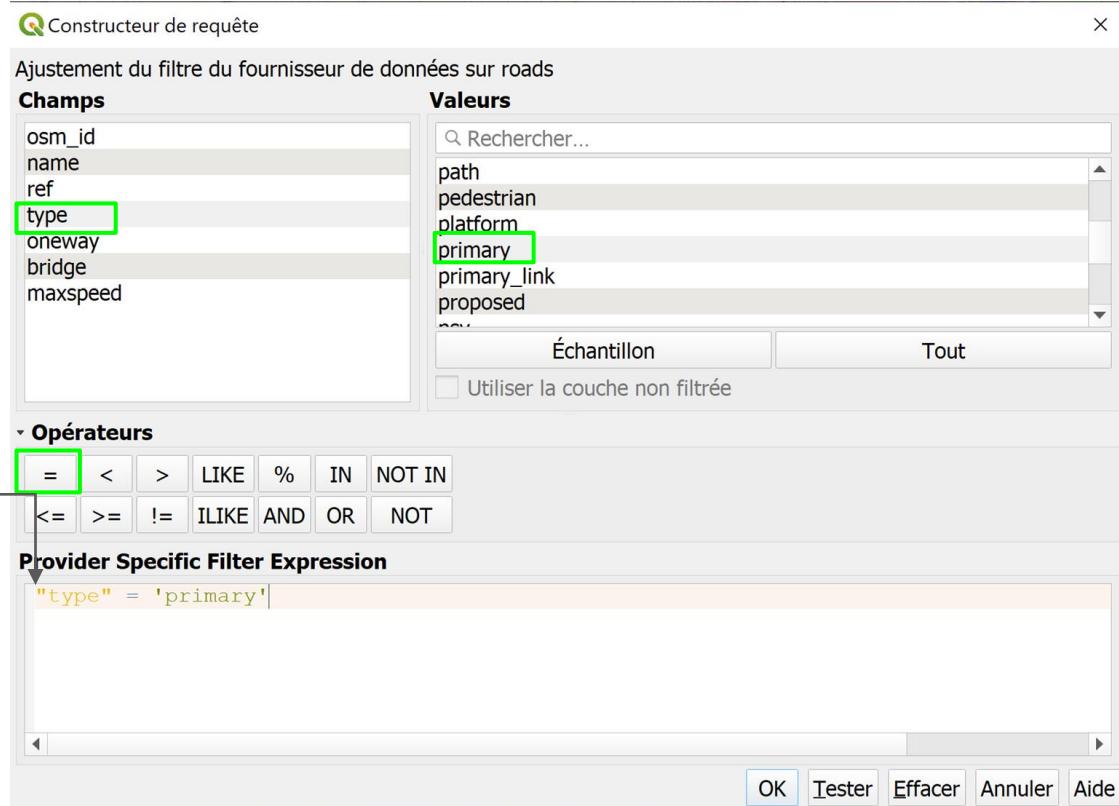
Then click on =

And finally on "primary"

The request is written as and when.  
It can of course be typed directly

"type" = 'primary'

We can click on "Test" to see if the request is well constructed, a pop-up should return 3756 lines



# Filtering operations (3)

Let's add/build more queries:

"type" = 'primary' OR "type" = 'primary\_link'

Attention, it will be necessary when displaying the values to click on "Use the unfiltered layer"

Here we involve a Boolean operator OU. Implied, the type field must be either "primary" or "primary\_link".

Note that it is necessary to systematically rewrite "type" =

Be careful, putting an AND, another Boolean operator on the same field would mean that an object can have two types, but in this model, a road can not be "primary" and something else...

Exercise: add the types motorway, motorway\_link, secondary, secondary\_link, tertiary, tertiary\_link, residential.

# Filtering operations (4)

We are now trying to display only the boulevards.

In this case, it is not a particular type that is an administrative classification, but rather an attribute that falls under the name of the channel.

Indeed, the "name" field contains the name of the street.

Then construct the query:

"name" LIKE 'Boulevard%'

We search for all objects whose name begins with Boulevard, the % operator is used to complete the string.



# Final exercises

1. Semiology: make a display that shows the typology of buildings.
2. Filtering: which districts have a perimeter of less than 3000 m<sup>2</sup>?
3. On the places layer, display only labels of type locality.
4. Write a query on the roads layer that selects the avenues and boulevards that are of primary or secondary types and whose maximum speed is less than or equal to 50 km/h.