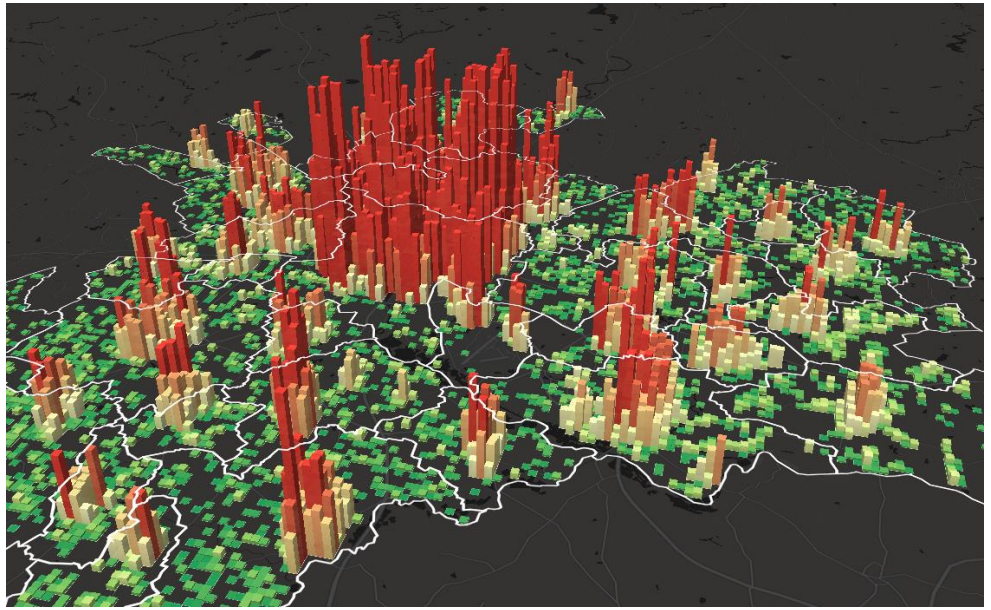
ATELIER : Introduction à la bibliothèque JavaScript MapboxGL



@Boris Mericskay,@comeetie

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MapBoxGL

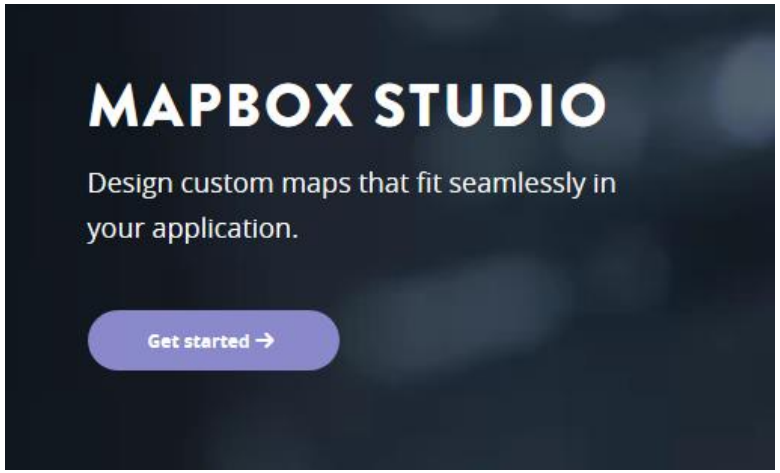
MapBoxGL est une bibliothèque JavaScript libre de cartographie en ligne *open-source* utilisant le WebGL pour l'affichage (tuiles vectorielles, affichage 3D)

https://www.mapbox.com/mapbox-gl-js/

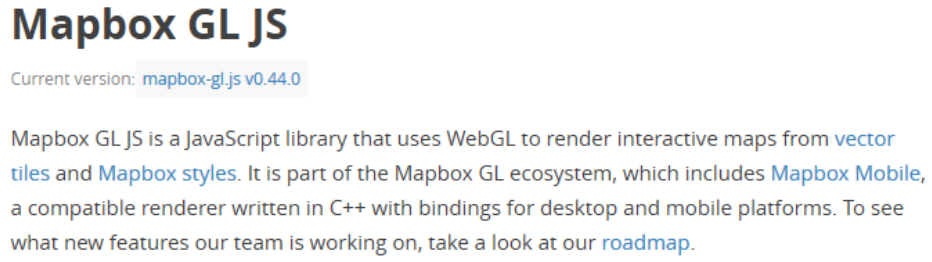
Exemples: https://www.mapbox.com/mapbox-gl-js/examples
Tutoriels : https://www.mapbox.com/help/tutorials/
Documentation: https://www.mapbox.com/mapbox-gl-js/api/

L’écosystème Mapbox

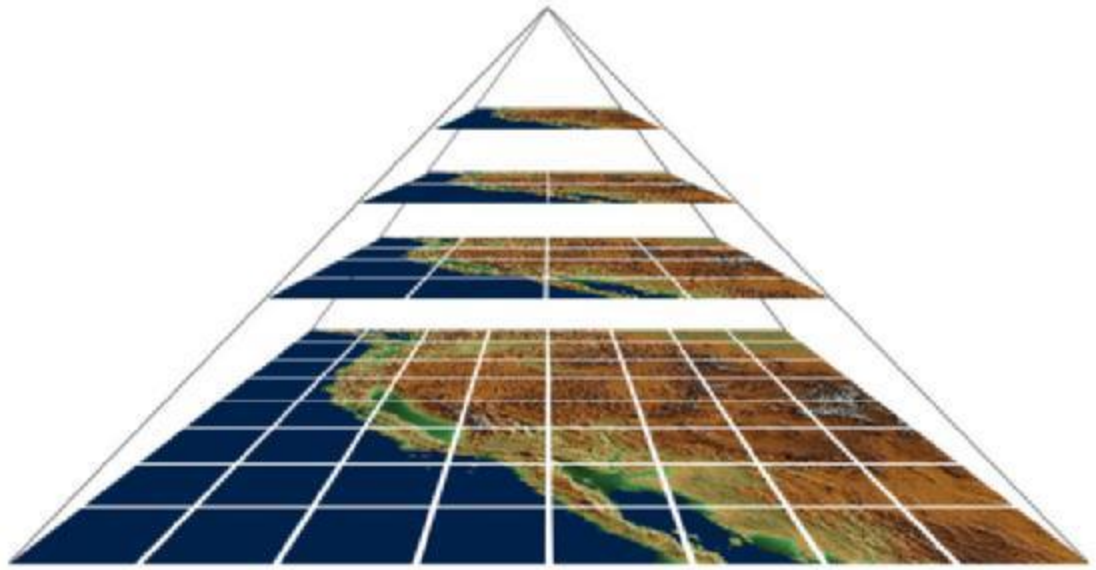
- Mapbox Studio
  - Créer des fonds de carte (*style*)
  - Héberger des jeux de données (*tilesets*)
    - Sous forme de tuiles vectorielles



- API MapboxGL.js
  - Bibliothèque JavaScript pour créer des cartes Web
  - La mobilisation de MapboxGL nécessite une clef d’accès = besoin d’un compte Mapbox



Webmaping



Pyramide de tuile

http://maptime.io/anatomy-of-a-web-map/#38

Webmercator : lat,long + z ↔ x,y,z

- http://www.maptiler.org/google-maps-coordinates-tile-bounds-projection/
- https://wiki.openstreetmap.org/wiki/Slippy_map_tilenames
- https://wiki.openstreetmap.org/wiki/Zoom_levels

Tuiles ?

- Tuiles raster
  - Chaque tuile est une image png 256x256
  - (google maps ~ 2005->2013, leaflet,...)

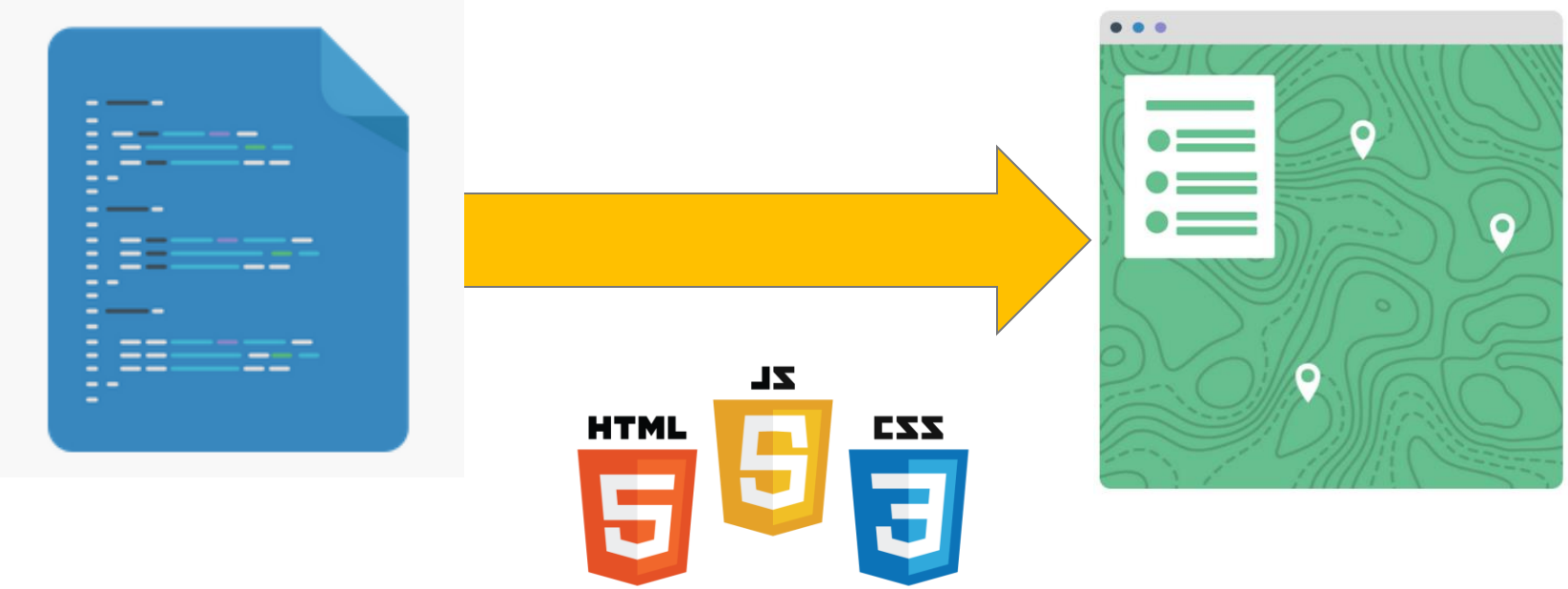
- Tuiles vectorielles
  - Chaque tuile est un fichier de données géographique compressé
  - Séparation fond / forme + poids
  - (google maps 2013, mapbox-gl, tangram, ...)

Quelques exemples

- https://www.mapbox.com/gallery/
- https://bl.ocks.org/mastersigat
- https://htmlpreview.github.io/?https://github.com/mastersigat/Plan-interactif/blob/master/Prototype.html#
- https://medium.com/@BorisMericskay/extrusion-3d-de-donn%C3%A9es-spatiales-9c67d76431b9

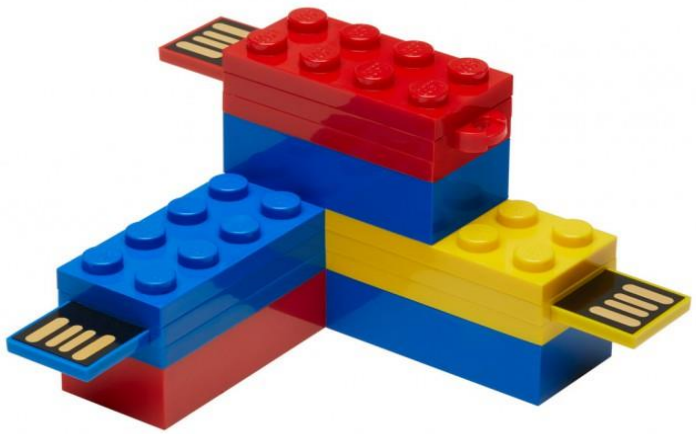
Objectifs atelier

- Publication de données spatiales sur le Web
- De la page HTML à l'application en ligne
- Familiarisation avec le Javascript, l'HTML et le CSS



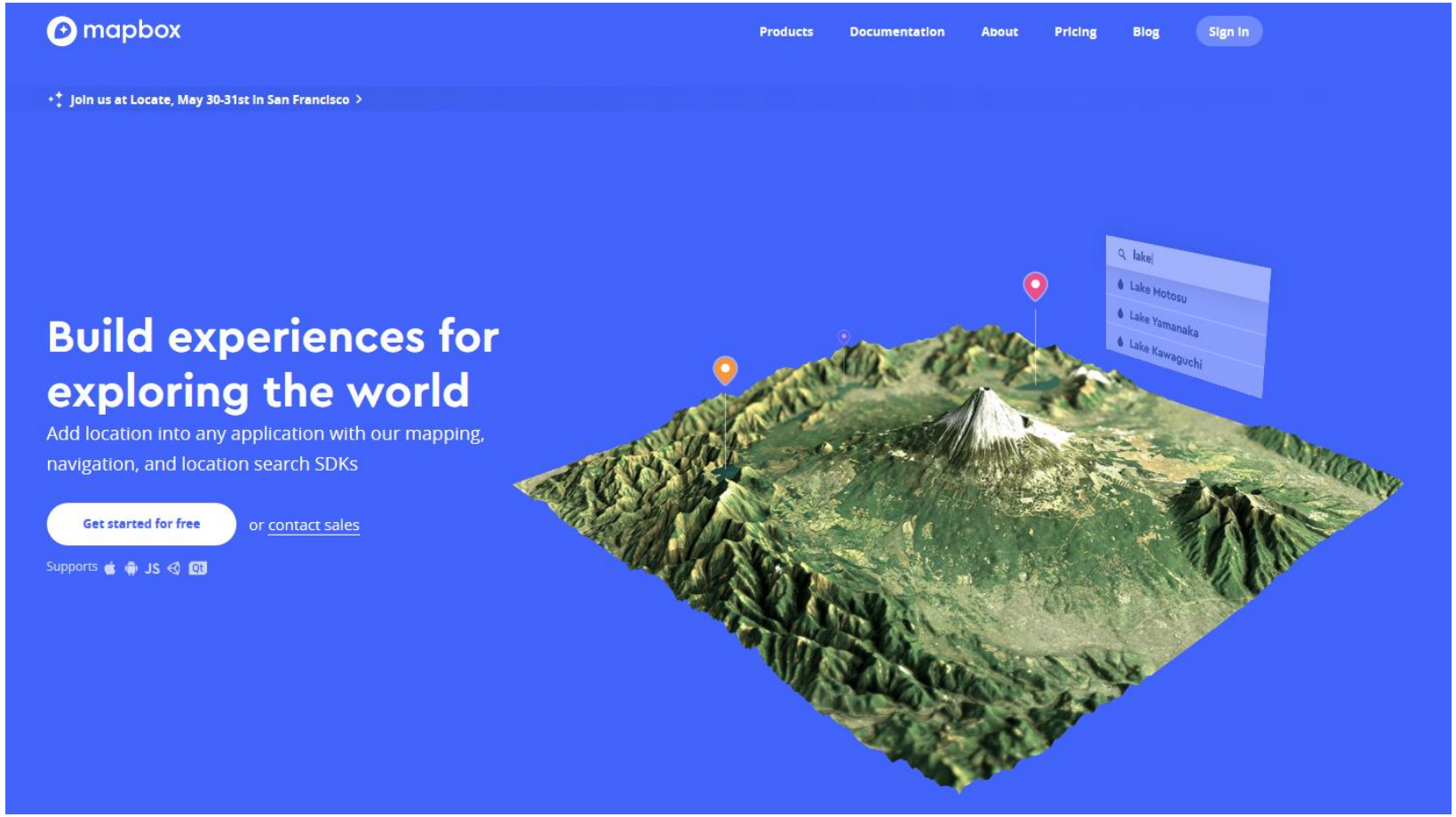
Coder = LEGO

- Vous aller à partir de maintenant « jouer » au LEGO en assemblant des lignes de codes pour construire des cartes sur le Web!



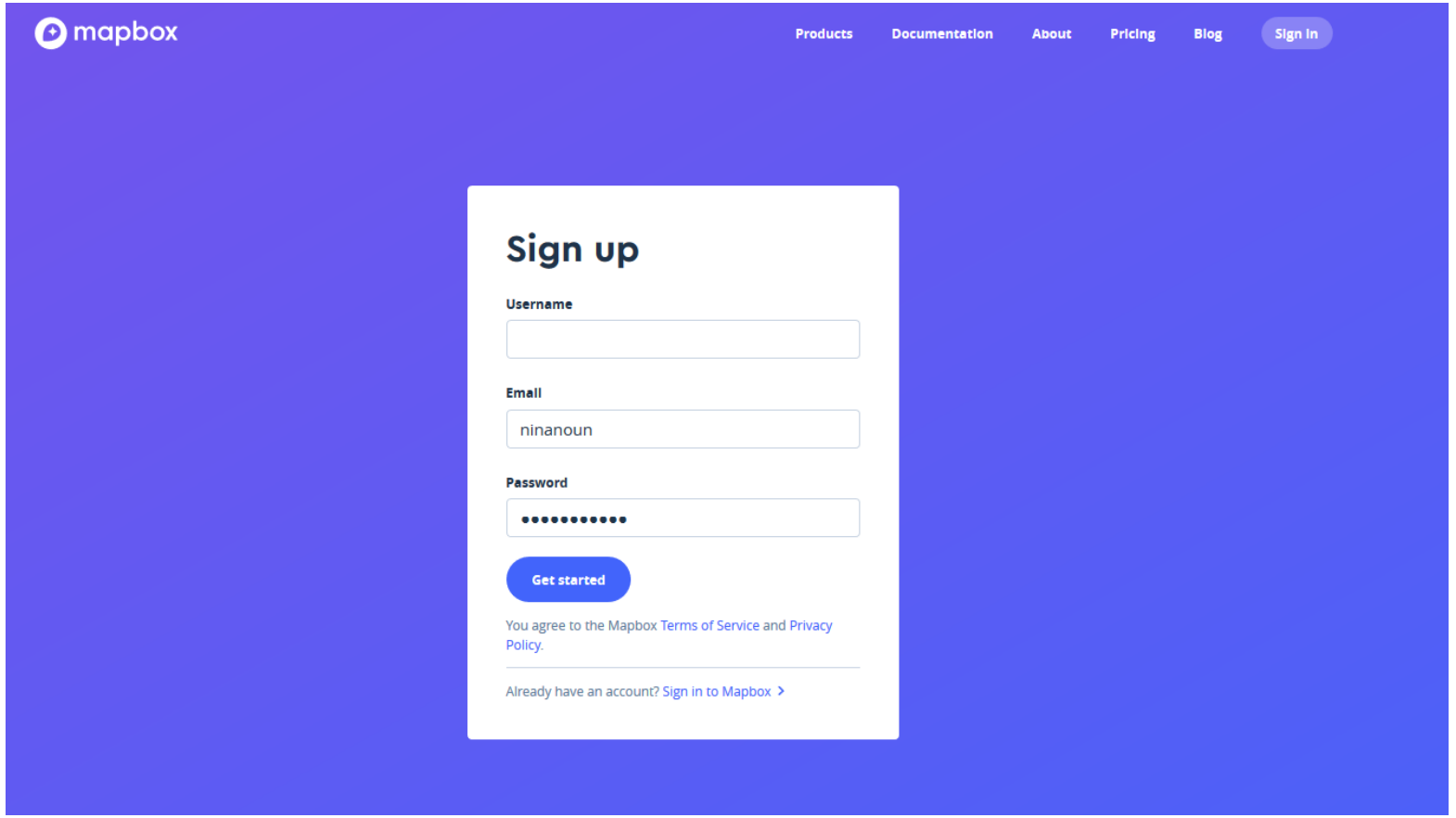
```
L.mapbox.accessToken = 'pk.eyJ1IjoibmluYW5vdW4iLCJhIjoiSkN4dndmTSJ9.6plStO7M5AuAbDa6O1m54A';
var map = L.mapbox.map('map', 'mapbox.light').setView([48.11,-1.66], 13);
// Ajouts des WMS

var orthophotographie = L.tileLayer.wms('http://geobretagne.fr/geoserver/photo/wms?', {
format: 'image/png',
transparent: true,
layers: 'ortho-ouverte'
}).addTo(map);

var quartiers = L.tileLayer.wms('http://geobretagne.fr/geoserver/rennesmetropole/wms?', {
format: 'image/png',
transparent: true,
layers: 'quartiers_vdr'
}).addTo(map);
```

Créer un compte Mapbox

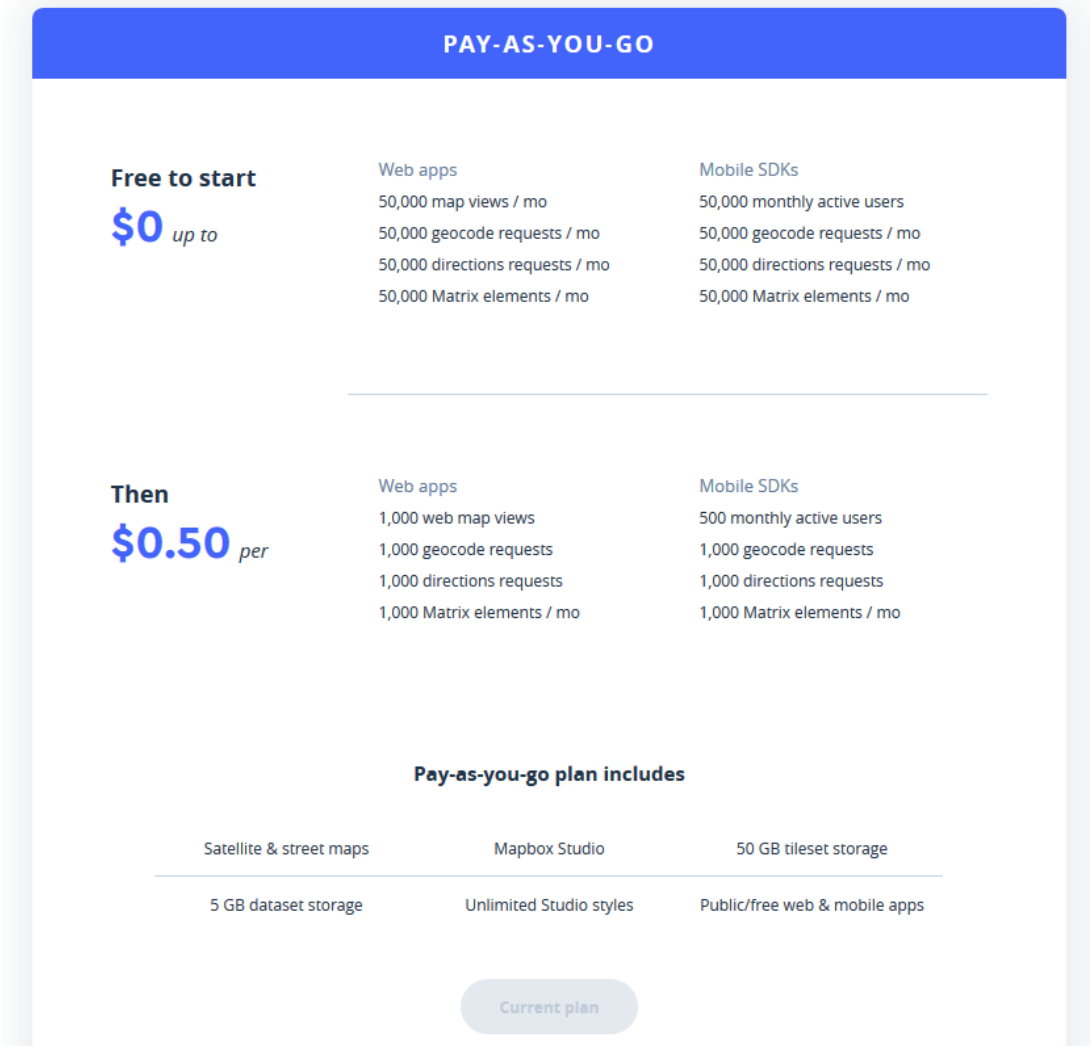


Créer un compte Mapbox

https://www.mapbox.com/signup/

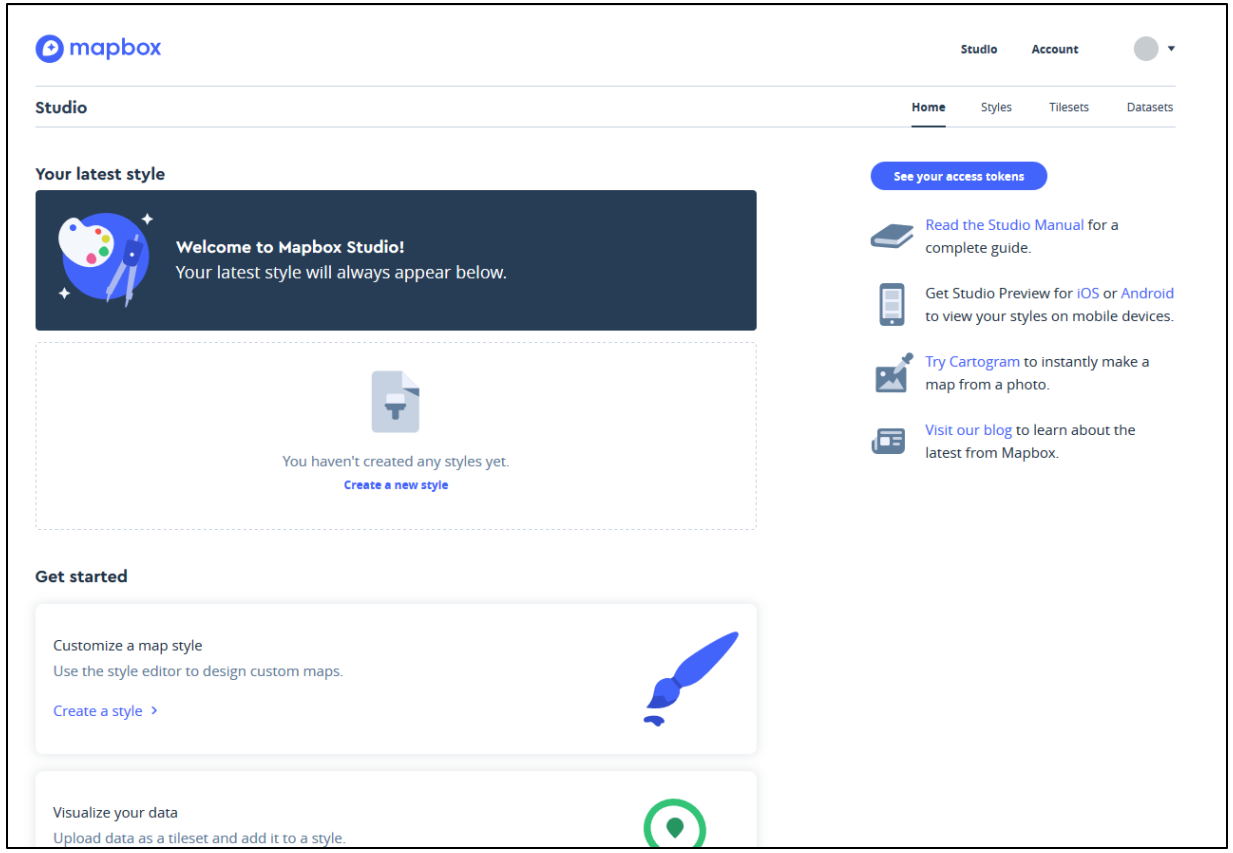


Limitations d’un compte gratuit



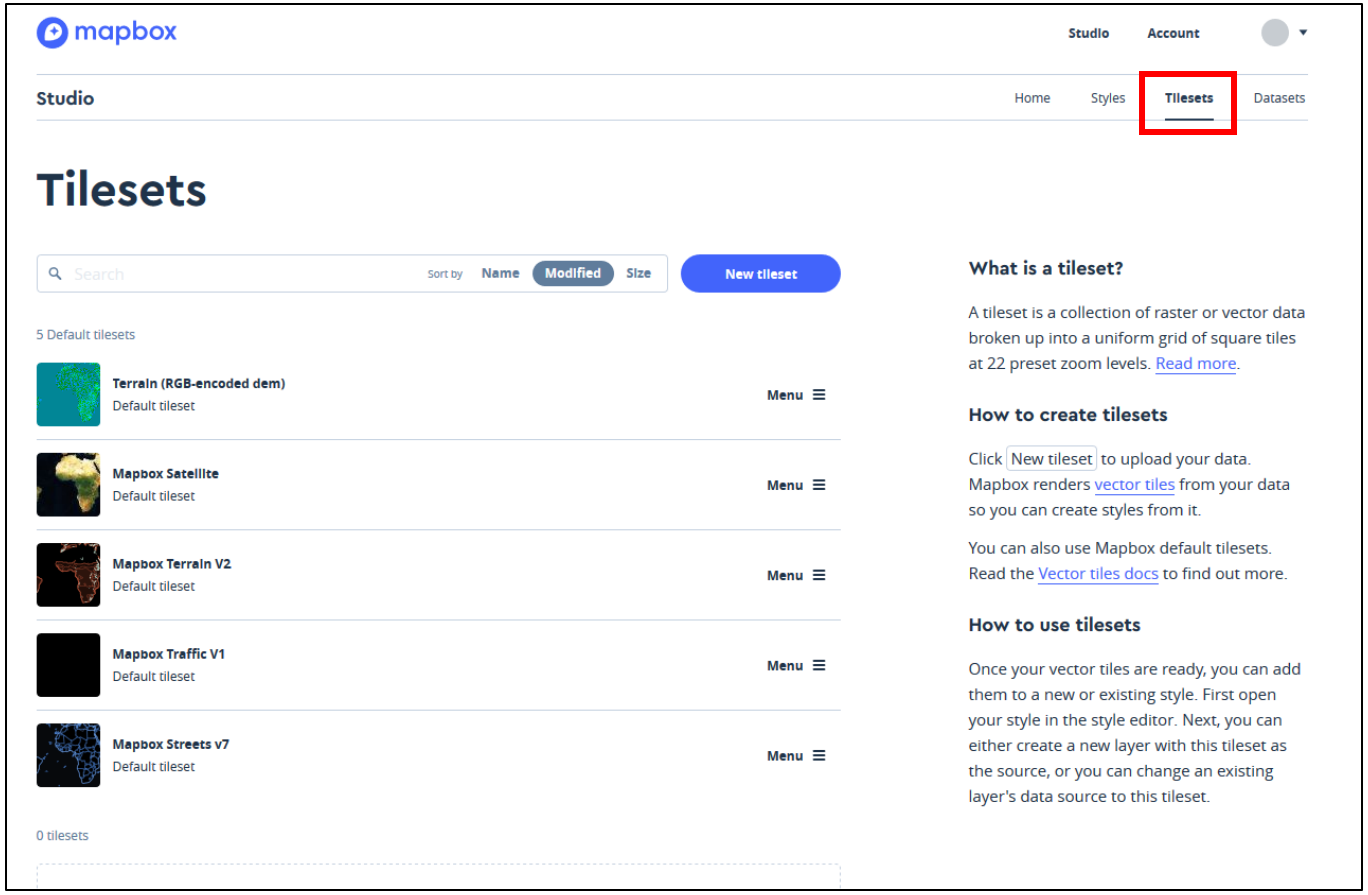
Mapbox Studio

- Environnement en ligne de gestion des :
  - Fonds de carte (*Styles*)
  - Jeux de données (*Tilesets*)
  - Des clefs d'accès à l'API (*Account*)



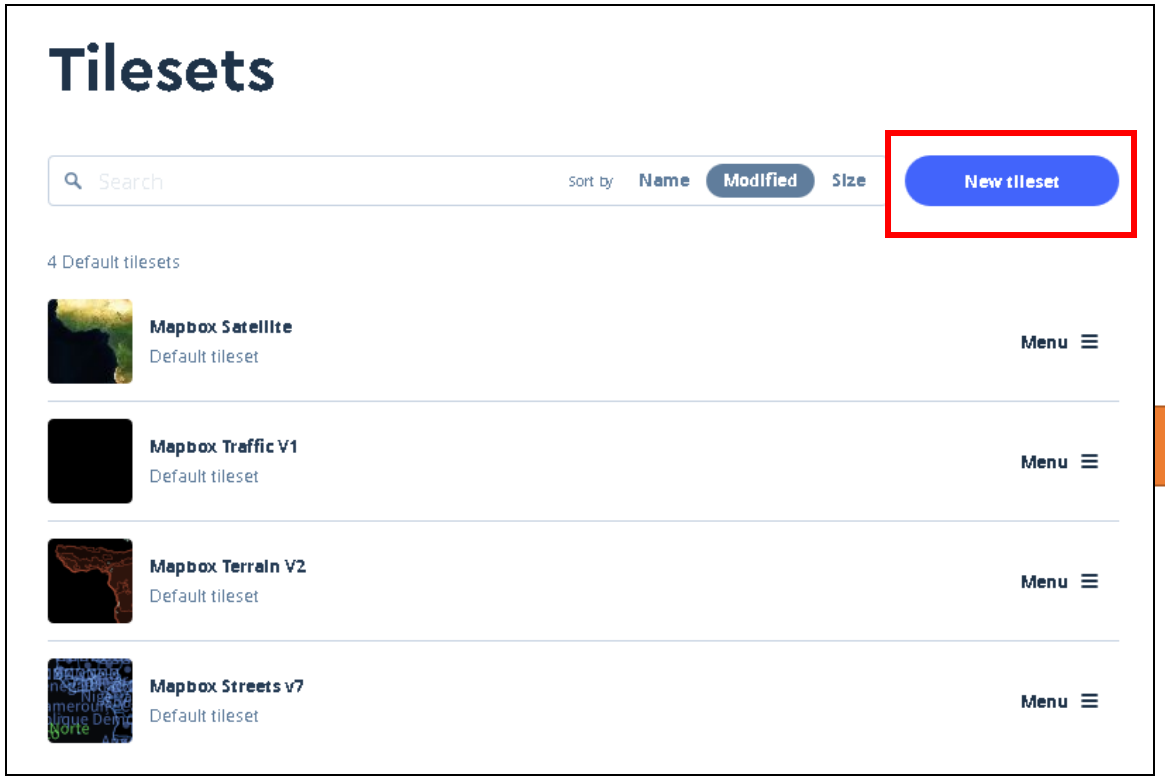
Mapbox Studio

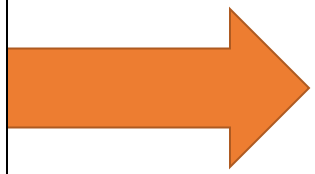
- Créer et gérer des jeux de données (Tilesets)

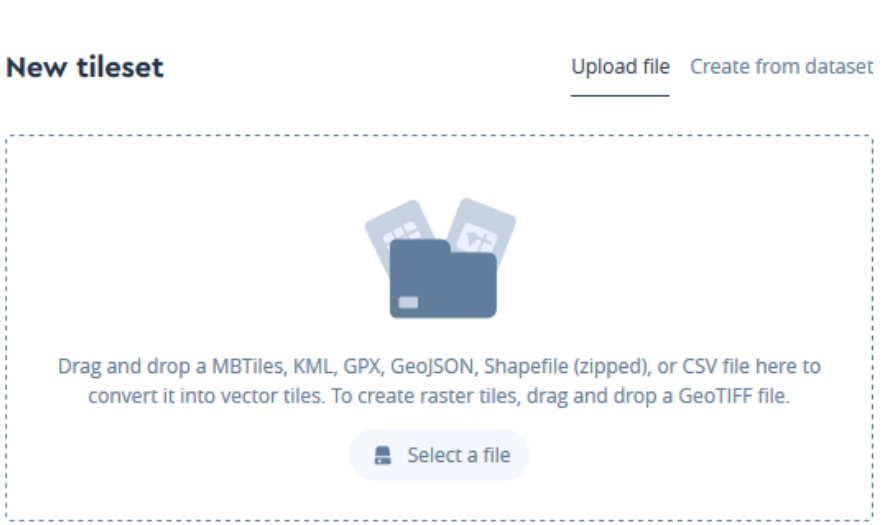


Importer des données dans Mapbox Studio

- Mapbox studio permet de stocker 50GO de données vectorielles et matricielles

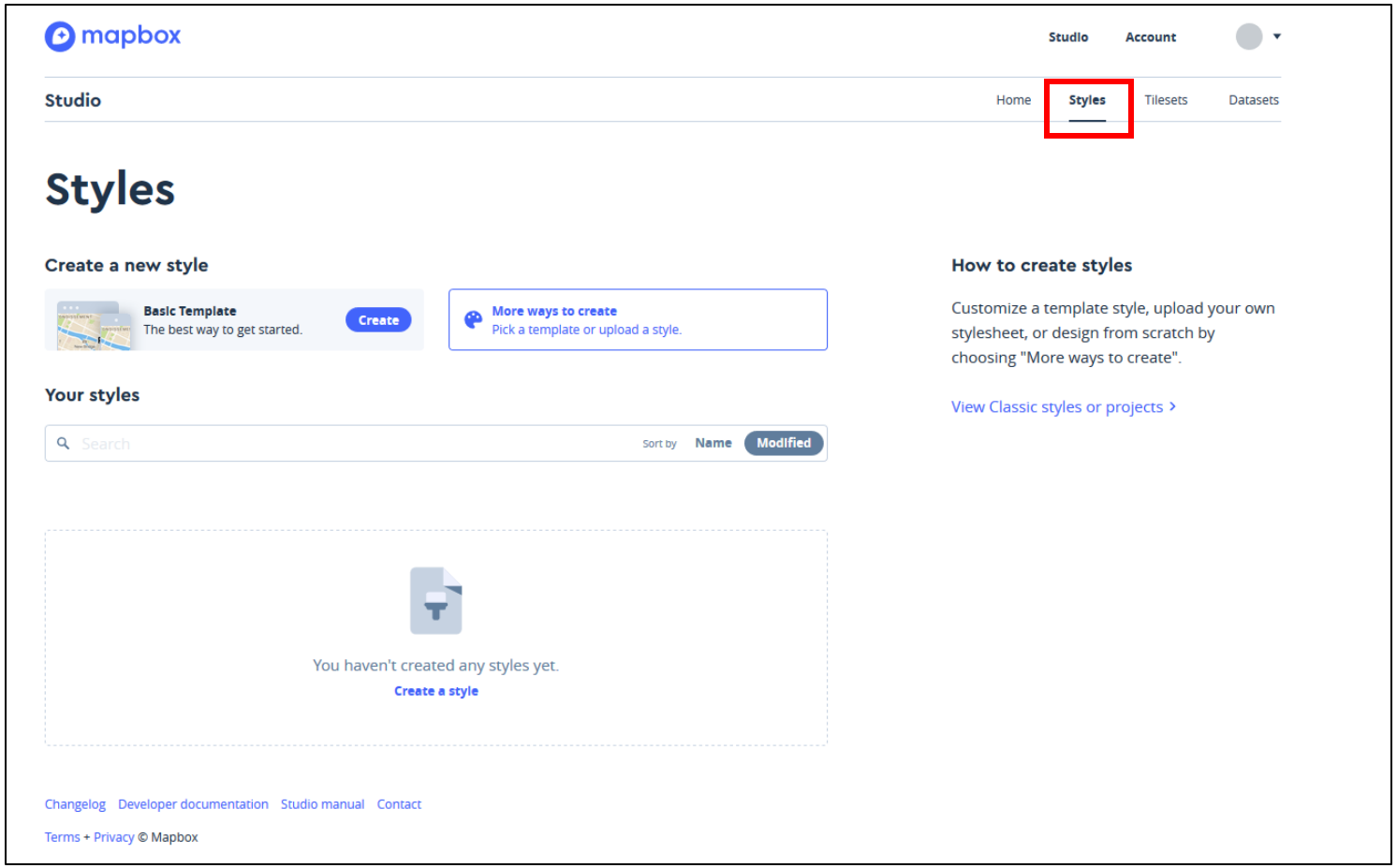






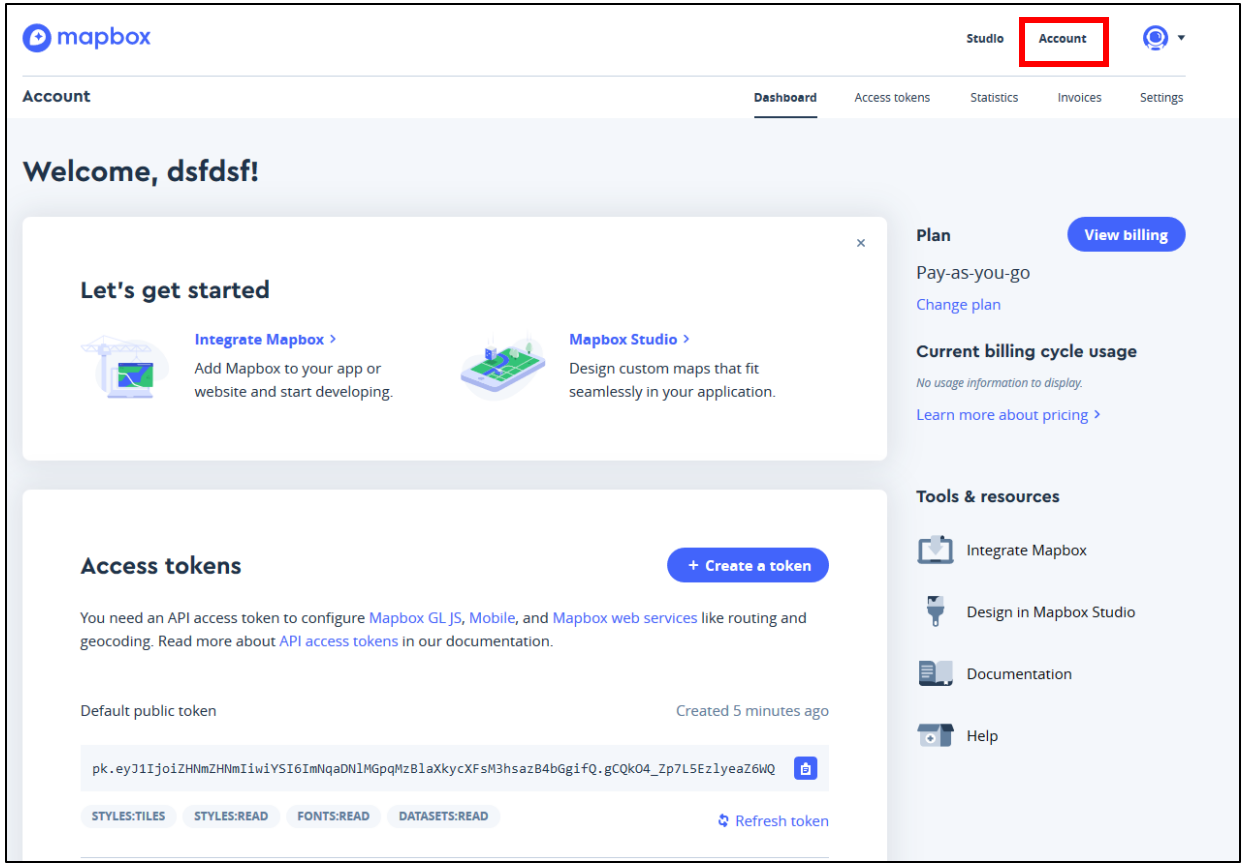
Mapbox Studio

- Créer et gérer des fonds de cartes (Styles)



Mapbox Studio

- Créer et gérer ses clefs d'accès à l'API (Access tokens)



Template de départ

```
<!DOCTYPE html>
<html>
<head>
    <meta charset='utf-8' />
    <title>MapboxGL</title>

<script src='https://api.tiles.mapbox.com/mapbox-gl-js/v0.45.0/mapbox-gl.js'></script>
<link href='https://api.tiles.mapbox.com/mapbox-gl-js/v0.45.0/mapbox-gl.css' rel='stylesheet' />

<style>
#map {position:absolute; top:0; bottom:0; width:100%;}
</style>

</head>

<body>
<div id='map'></div>

<script>
    // AccesToken
mapboxgl.accessToken = 'pk.eyJ1IjoibmluYW5vdW4iLCJhIjoiY2pjdHBoZGlzMnV4dDJxcGc5azJkbWRiYSJ9.o4dZRrdHcgVEKCveOXG1YQ';

    // Configuration de la carte
var map = new mapboxgl.Map({
    container: 'map',
    style: 'mapbox://styles/mapbox/light-v9', // Fond de carte
    center: [-1.68, 48.12], // lat/long
    zoom: 15, // zoom
    pitch: 50, // Inclinaison
    bearing: -10 // Rotation
});

</script>

</body>
</html>
```

Template de départ

```
<!DOCTYPE html>
<html>
<head>
    <meta charset='utf-8' />
    <title>MapboxGL</title>

<script src='https://api.tiles.mapbox.com/mapbox-gl-js/v0.45.0/mapbox-gl.js'></script>
<link href='https://api.tiles.mapbox.com/mapbox-gl-js/v0.45.0/mapbox-gl.css' rel='stylesheet' />

<style>
#map { position:absolute; top:0; bottom:0; width:100%; }
</style>

</head>

<body>
<div id='map'></div>

<script>
    // AccesToken
mapboxgl.accessToken =
'pk.eyJ1IjoibmluYW5vdW4iLCJhIjoiY2pjdHBoZGlzMnV4dDJxcGc5azJkbWRiYSJ9.o4dZRrdHcgVEKCveOXG1YQ';

    // Configuration de la carte
var map = new mapboxgl.Map({
    container: 'map',
    style: 'mapbox://styles/mapbox/basic-v9', // fond de carte
    center: [-1.68, 48.12], // lat/long
    zoom: 15, // zoom
    pitch: 50, // Inclinaison
    bearing: -10 // Rotation
});

</script>

</body>
</html>
```

Appel API MapboxGL

Style de la carte

Clef d'accès à l'API

Fond de carte
Niveau de zoom
Centrage de la carte (X,Y)
Inclinaison de la carte
Rotation de la carte

Coder en ligne ou en local

- Utiliser un éditeur de code installé

OU

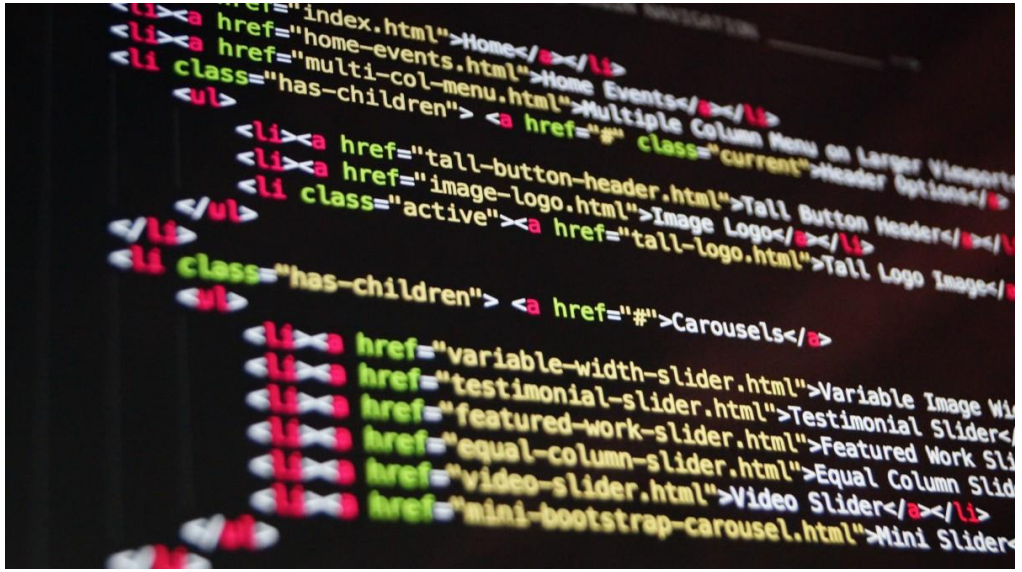
- Utiliser un éditeur de code en ligne

  https://liveweave.com/

  https://plnkr.co/

  https://jsfiddle.net/

  …



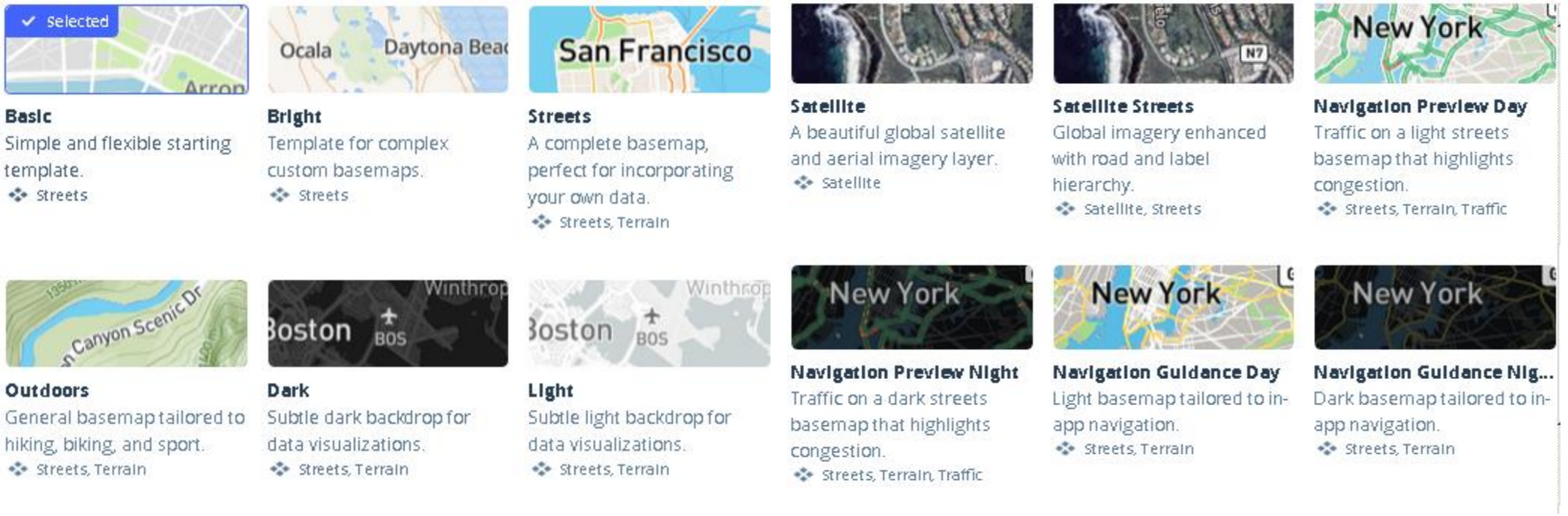
Les fonds de carte

Changer de fond de carte

- Les fonds de cartes de Mapbox > tuiles vectorielles ☺

style: 'mapbox://styles/mapbox/dark-v9',

→ Attention pas de majuscule au nom du fond de carte

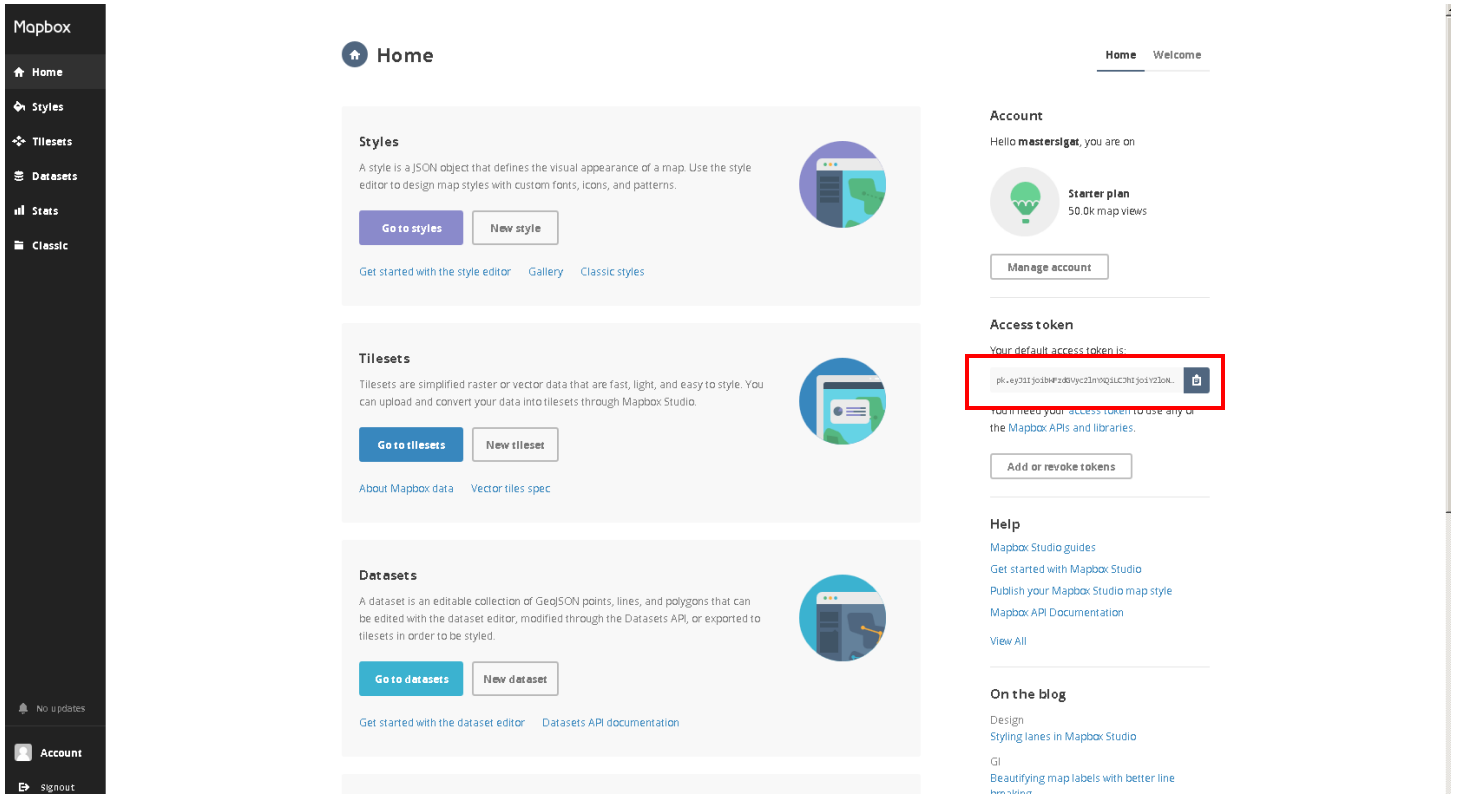


Changer de fond de carte

```
<!DOCTYPE html>
<html>
<head>
    <meta charset='utf-8' />
    <title>MapboxGL</title>

<script src='https://api.tiles.mapbox.com/mapbox-gl-js/v0.44.0/mapbox-gl.js'></script>
<link href='https://api.tiles.mapbox.com/mapbox-gl-js/v0.44.0/mapbox-gl.css' rel='stylesheet' />

<style>
#map { position:absolute; top:0; bottom:0; width:100%; }
</style>

</head>

<body>
<div id='map'></div>

<script>
    // AccesToken
mapboxgl.accessToken = 'pk.eyJ1Ijoibmluyw5vdW4iLCJhIjoiY2pjdHBoZGlzMnV4dDJxcGc5azJkbWRiYSJ9.o4dZRrdHcgVEKCveC

    // Configuration de la carte
var map = new mapboxgl.Map({
    container: 'map',
    style: 'mapbox://styles/mapbox/satellite-v9',
    center: [-1.68, 48.12], // lat/long
    zoom: 15, // zoom
    pitch: 50, // Inclinaison
    bearing: -10 // Rotation
});

</script>

</body>
</html>
```

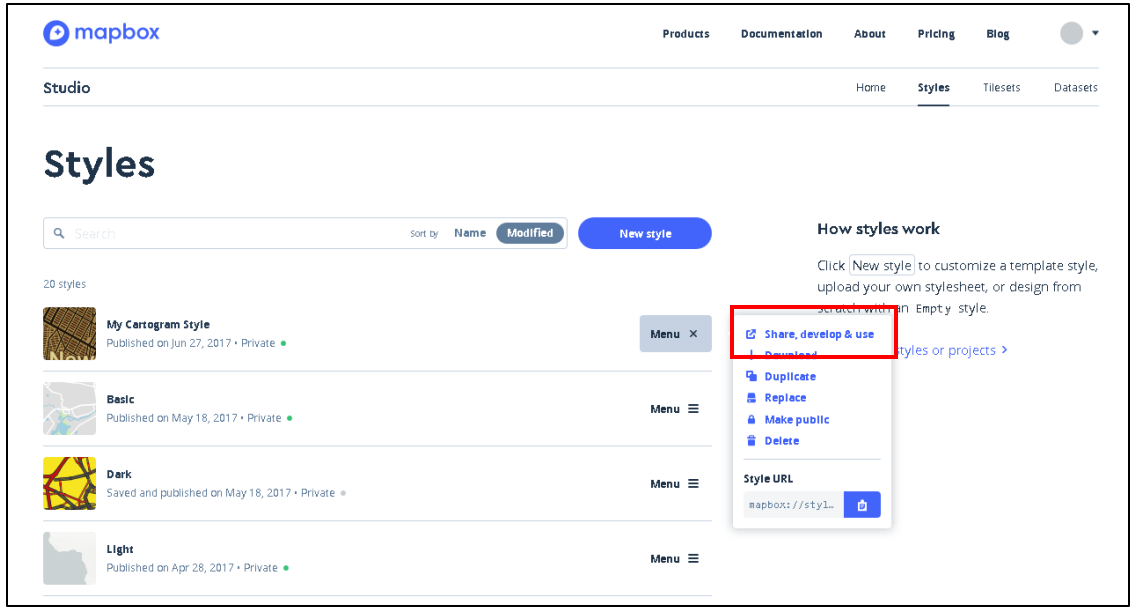
Mettre un fond de carte personnel

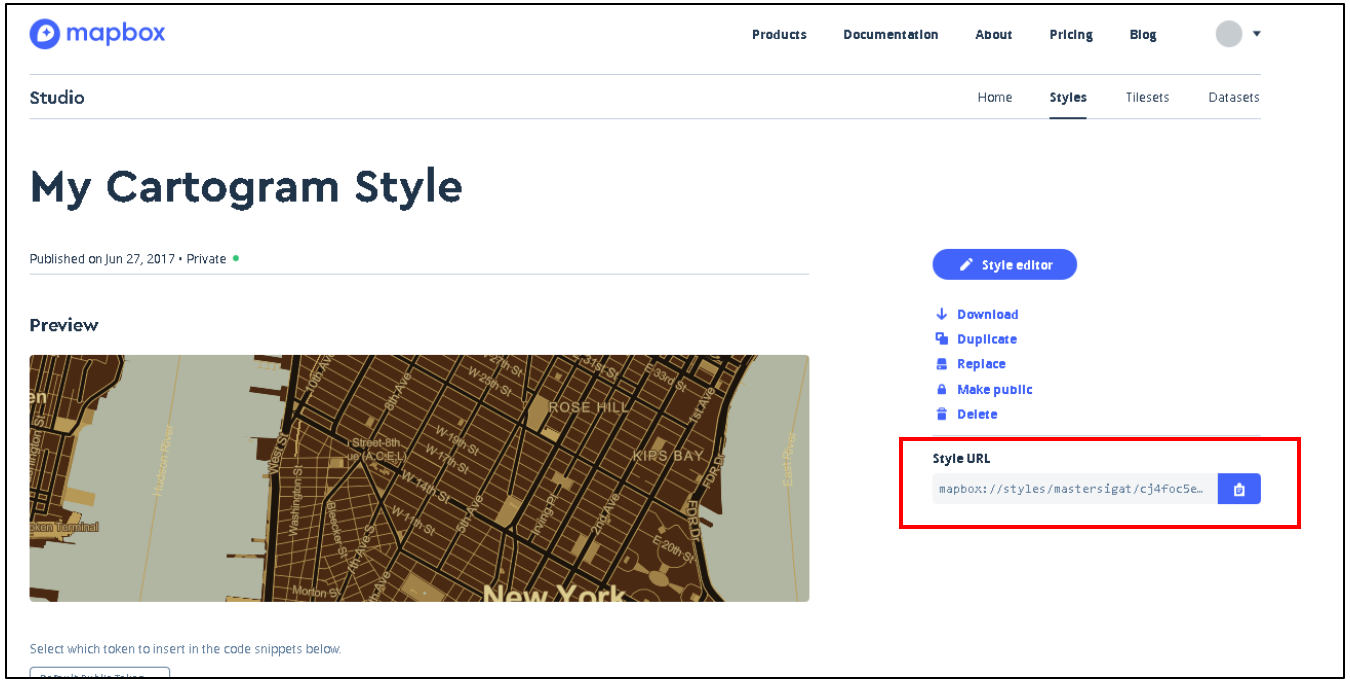
- Mettre votre clef d'accès personnelle à la place de celle fournie



Incorporer un fond de carte personnel

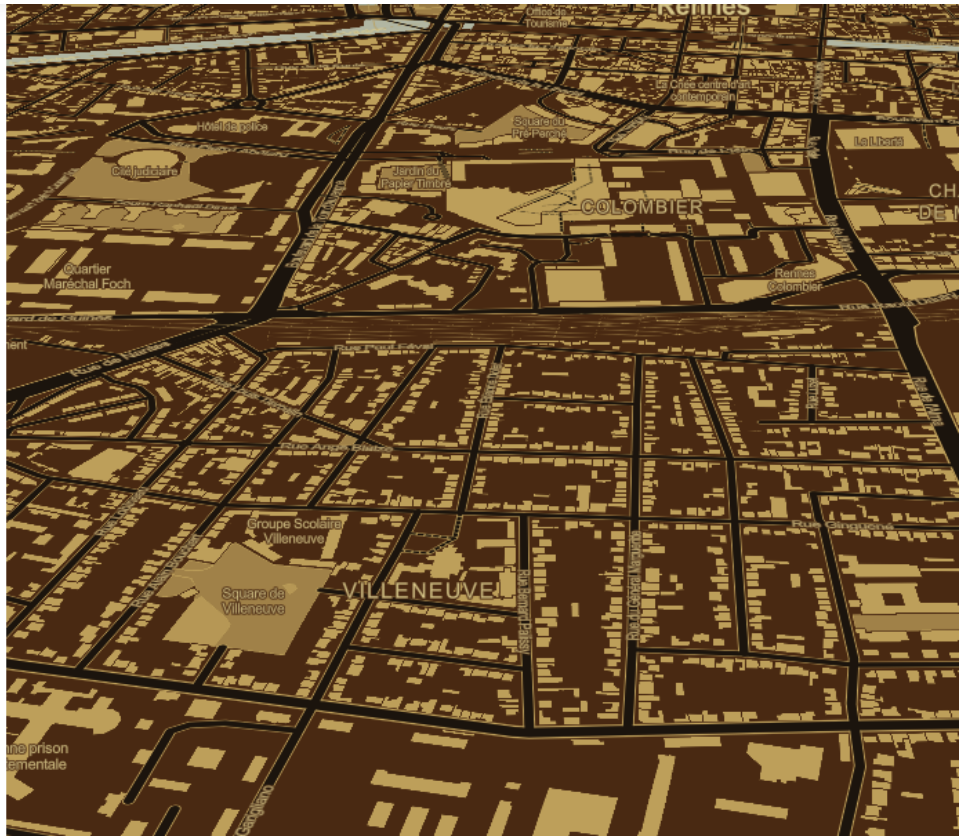
- Récupérer l'URL de votre fond de carte personnel





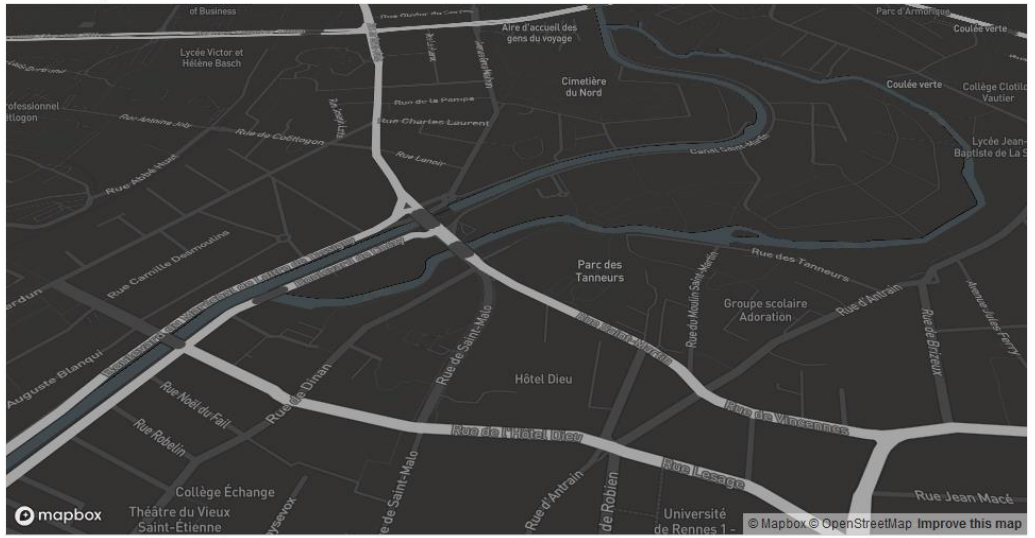
Incorporer un fond de carte personnel

```html
<!DOCTYPE html>
<html>
<head>
    <meta charset='utf-8' />
    <title>MapboxGL</title>

<script src='https://api.tiles.mapbox.com/mapbox-gl-js/v0.44.0/mapbox-gl.js'></script>
<link href='https://api.tiles.mapbox.com/mapbox-gl-js/v0.44.0/mapbox-gl.css' rel='stylesheet' />

<style>
#map { position:absolute; top:0; bottom:0; width:100%; }
</style>

</head>

<body>
<div id='map'></div>

<script>
    // AccesToken
mapboxgl.accessToken = 'pk.eyJ1IjoibWFzdGVyc2lnYXQiLCJhIjoiY2loNG9mamxwMHp2dHgxbTBjY2hlb2RteiJ9.dDYKXX9907pbT6sTAJ4fvA';

    // Configuration de la carte
var map = new mapboxgl.Map({
    container: 'map',
    style: 'mapbox://styles/mastersigat/cj4foc5eo3hsr2sqlomdgeuvd',
    center: [-1.68, 48.12], // lat/long
    zoom: 15, // zoom
    pitch: 50, // Inclinaison
    bearing: -10 // Rotation
});

</script>

</body>
</html>
```



Exemple

#MapboxGL / Première carte



Built with blockbuilder.org Open

index.html

```
<!DOCTYPE html>
<html>
<head>
    <meta charset='utf-8' />
    <title>Display a map</title>
    <meta name='viewport' content='initial-scale=1,maximum-scale=1,user-scalable=no' />
    <script src='https://api.tiles.mapbox.com/mapbox-gl-js/v0.44.0/mapbox-gl.js'></script>
    <link href='https://api.tiles.mapbox.com/mapbox-gl-js/v0.44.0/mapbox-gl.css' rel='stylesheet' />
    <style>
        body { margin:0; padding:0; }
```

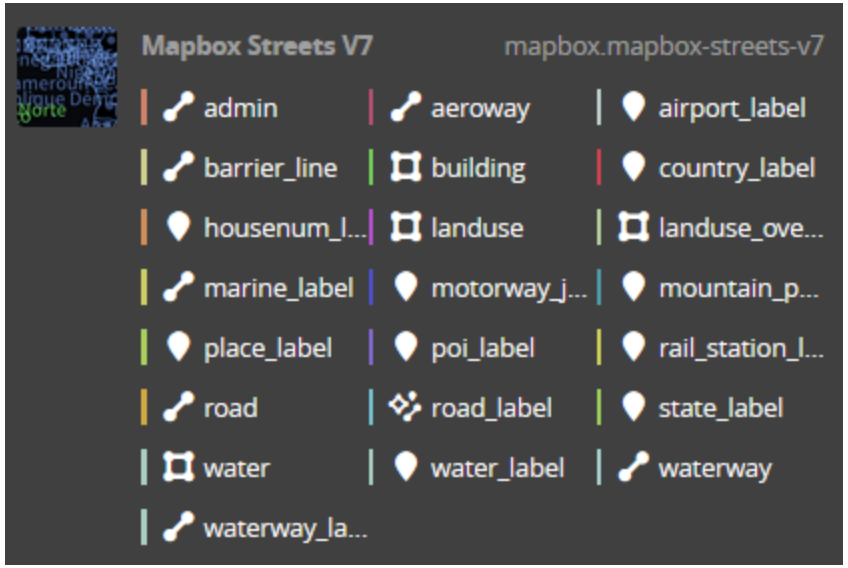
https://bl.ocks.org/mastersigat/3b97a088768a11552fa9c85a1806f3e5

Ajouter des données

OSM, données hébergées et données en local

Ajout de données OSM

- MapboxGL permet aussi de mobiliser des données OSM
  - Le jeux de données (*tileset*) Mapbox Streets v7 propose un ensemble de couches OSM (routes, bâtiments, labels, hydrologie,…)



Ajout de données OSM

- Ajouter cette commande à la fin du script

On appel ici les routes issues d'OSM

```
map.on('load', function () {

 map.addSource('mapbox-streets-v7', {
  type: 'vector',
  url: 'mapbox://mapbox.mapbox-streets-v7'});

 map.addLayer({
      "id": "Routes",
      "type": "line",
      "source": "mapbox-streets-v7",
      "layout": {'visibility': 'visible'},
      "source-layer": "road",
      "paint": {"line-color": "#FF7F50", "line-width": 1}
   });

  });
```

Ajout de données OSM

- Ajouter cette commande à la fin du script

On appel ici les routes

```
map.on('load', function () {

map.addSource('mapbox-streets-v7', {
 type: 'vector',
 url: 'mapbox://mapbox.mapbox-streets-v7'});

 map.addLayer({
      "id": "Routes",
      "type": "line",
      "source": "mapbox-streets-v7",
      "layout": {'visibility': 'visible'},
      "source-layer": "road",
      "paint": {"line-color": "#FF7F50", "line-width": 1}
  });
  });
```

Définition de la source de données

C couche de données

Ajout de données OSM

```
<!DOCTYPE html>
<html>
<head>
    <meta charset='utf-8' />
    <title>MapboxGL</title>

<script src='https://api.tiles.mapbox.com/mapbox-gl-js/v0.44.0/mapbox-gl.js'></script>
<link href='https://api.tiles.mapbox.com/mapbox-gl-js/v0.44.0/mapbox-gl.css' rel='stylesheet' />

<style>
#map { position:absolute; top:0; bottom:0; width:100%; }
</style>

</head>

<body>
<div id='map'></div>

<script>
    // AccesToken
mapboxgl.accessToken = 'pk.eyJ1IjoibWFzdGVyc2lnYXQiLCJhIjoiY2loNG9mamxwMHp2dHgxbTBjY2hlb2RteiJ9.dDYKXX9907pbT6sTAJ4fvA';

    // Configuration de la carte
var map = new mapboxgl.Map({
    container: 'map',
    style: 'mapbox://styles/mapbox/dark-v9',
    center: [-1.68, 48.12], // lat/long
    zoom: 15, // zoom
    pitch: 50, // Inclinaison
    bearing: -10 // Rotation
});

  // Ajout de données OSM

map.on('load', function () {

 map.addSource('mapbox-streets-v7', {
   type: 'vector',
   url: 'mapbox://mapbox.mapbox-streets-v7'});

  map.addLayer({
        "id": "routes",
        "type": "line",
        "source": "mapbox-streets-v7",
        "layout": {'visibility': 'visible'},
        "source-layer": "road",
        "paint": {"line-color": "#FF7F50", "line-width": 1}
    });
   });

</script>
```

Ajout de données OSM

- Ajout du réseau hydrographique
  - Ajouter à la suite de l'appel de la couche des routes juste un appel de couche car la source est la même que pour les routes (*mapbox-streets-v7*)

```
// Hydrologie

map.addLayer({"id": "hydrologie",
                        "type": "line",
                        "source": "mapbox-streets-v7",
                        "source-layer": "waterway",
                        "paint": {"line-color": "#4dd2ff",
                        "line-width": 3}
    });
```

Ajout de données OSM

```
33    // Ajout de données OSM
34
35  map.on('load', function () {
36
37    // Config source
38    map.addSource('mapbox-streets-v7', {
39      type: 'vector',
40      url: 'mapbox://mapbox.mapbox-streets-v7'});
41
42    // Ajout routes
43    map.addLayer({
44          "id": "routes",
45          "type": "line",
46          "source": "mapbox-streets-v7",
47          "layout": {'visibility': 'visible'},
48          "source-layer": "road",
49          "paint": {"line-color": "#FF7F50", "line-width": 1}
50      });
51
52    // Ajout hydrologie
53
54      map.addLayer({
55          "id": "hydrologie",
56          "type": "line",
57          "source": "mapbox-streets-v7",
58          "source-layer": "waterway",
59          "paint": {"line-color": "#4dd2ff",
60              "line-width": 10}
61      });
62
63    });
64
65  </script>
```

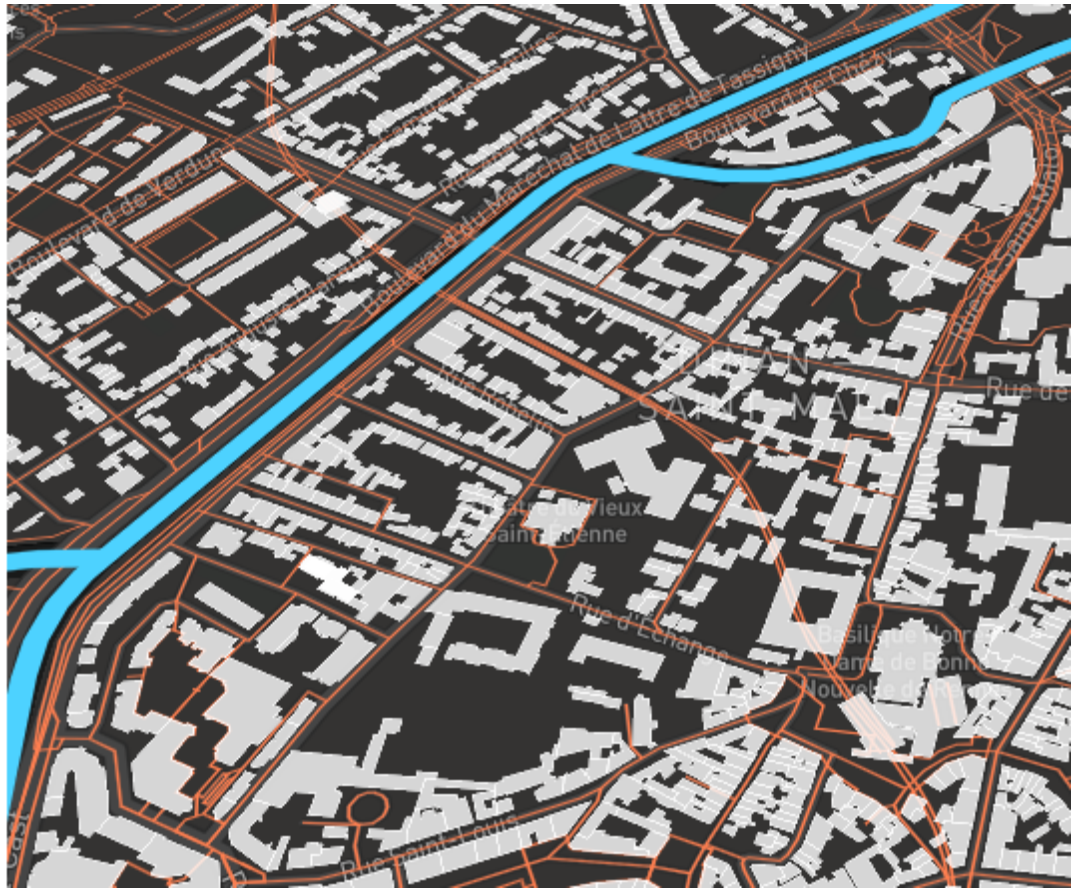
Ajout de données OSM

- Ajout les bâtiments (ajouter juste un appel de couche car la source est la même que pour les routes)

```
// Batiments

map.addLayer({
        "id": "batiments",
        "type": "fill",
        "source": "mapbox-streets-v7",
        "source-layer": "building",
        "paint": {"fill-color": "#FFFFFF",
                  "fill-opacity": 0.8}
    });
```

Ajout de données OSM

```
52    // Ajout hydrologie
53
54      map.addLayer({
55          "id": "hydrologie",
56          "type": "line",
57          "source": "mapbox-streets-v7",
58          "source-layer": "waterway",
59          "paint": {"line-color": "#4dd2ff",
60              "line-width": 10}
61      });
62
63  // Batiments
64
65  map.addLayer({
66          "id": "batiments",
67          "type": "fill",
68          "source": "mapbox-streets-v7",
69          "source-layer": "building",
70          "paint": {"fill-color": "#FFFFFF",
71                    "fill-opacity": 0.8}
72      });
73
74
75    });
76
77  </script>
78
```



Filtrer des données OSM

- Il est possible de filtrer les données pour l'affichage
  - On peux par exemple filtrer les routes selon leur classe

road

5 properties | This layer contains mostly LineStrings

class One of: 'motorway', 'motorway_link', 'trunk', 'primary', 'secondary', 'tertiary', 'link', 'street', 'street_limited', 'pedestrian', 'construction', 'track', 'service', 'ferry', 'path', 'golf'

layer Number. Specifies z-ordering in the case of overlapping road segments. Common range is -5 to 5. Available from zoom level 13+.

oneway Text. Whether traffic on the road is one-way. One of: 'true', 'false'

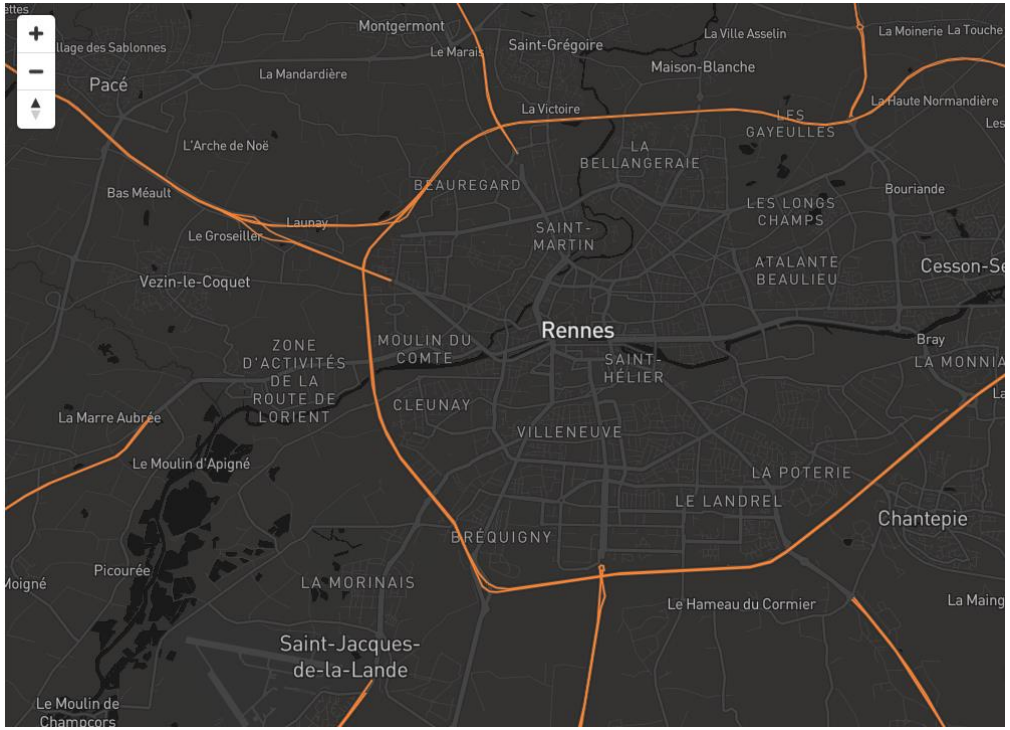
structure Text. One of: 'none', 'bridge', 'tunnel', 'ford'. Available from zoom level 13+.

type In most cases, values will be that of the primary key from OpenStreetMap tags.

Filtrer des données OSM

- Je ne veux afficher que les routes à double sens

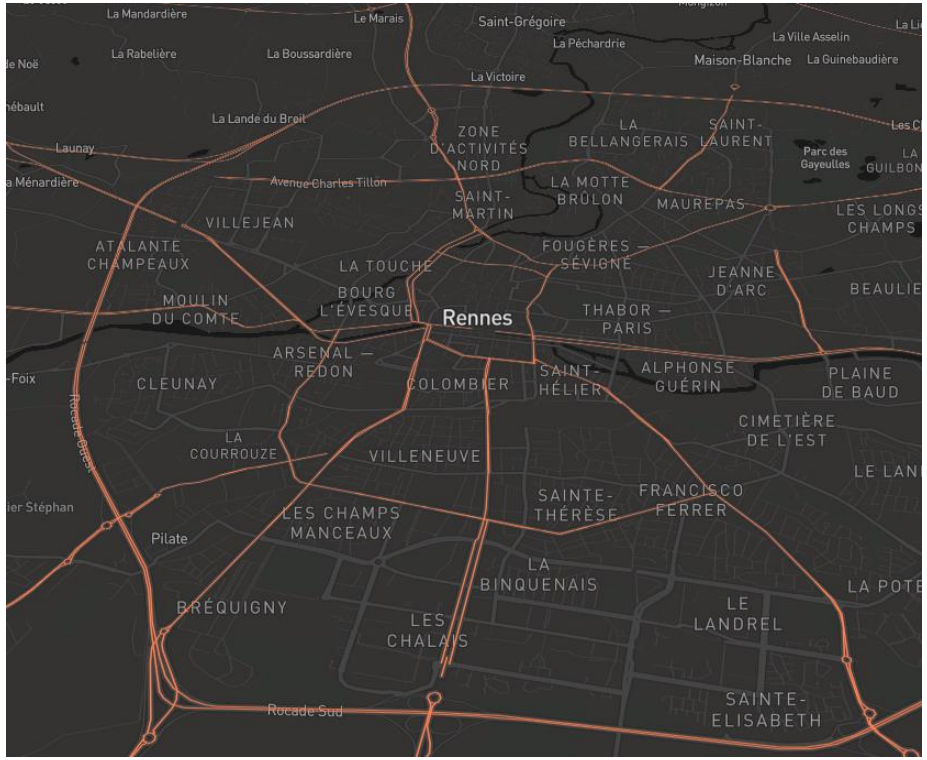
```
map.addLayer({
        "id": "routes",
        "type": "line",
        "source": "mapbox-streets-v7",
        "source-layer": "road",
        "filter": ['==', 'class', 'trunk'],
        "layout": {'visibility': 'visible'},
        "paint": {"line-color": "#ff8533", "line-width": 1.3}
    });
```



Filtrer des données OSM

- Je ne veux afficher que les routes principale (double sens, principale,…)

```
map.addLayer({
        "id": "routes",
        "type": "line",
        "source": "mapbox-streets-v7",
        "source-layer": "road",
        "filter": ["all",  ["in", "class", "motorway", "trunk", "primary"]],
        "layout": {'visibility': 'visible'},
        "paint": {"line-color": "#ff8533", "line-width": 1.3}
    });
```



Exemple

#MapboxGL / Afficher et filtrer des données d'OSM

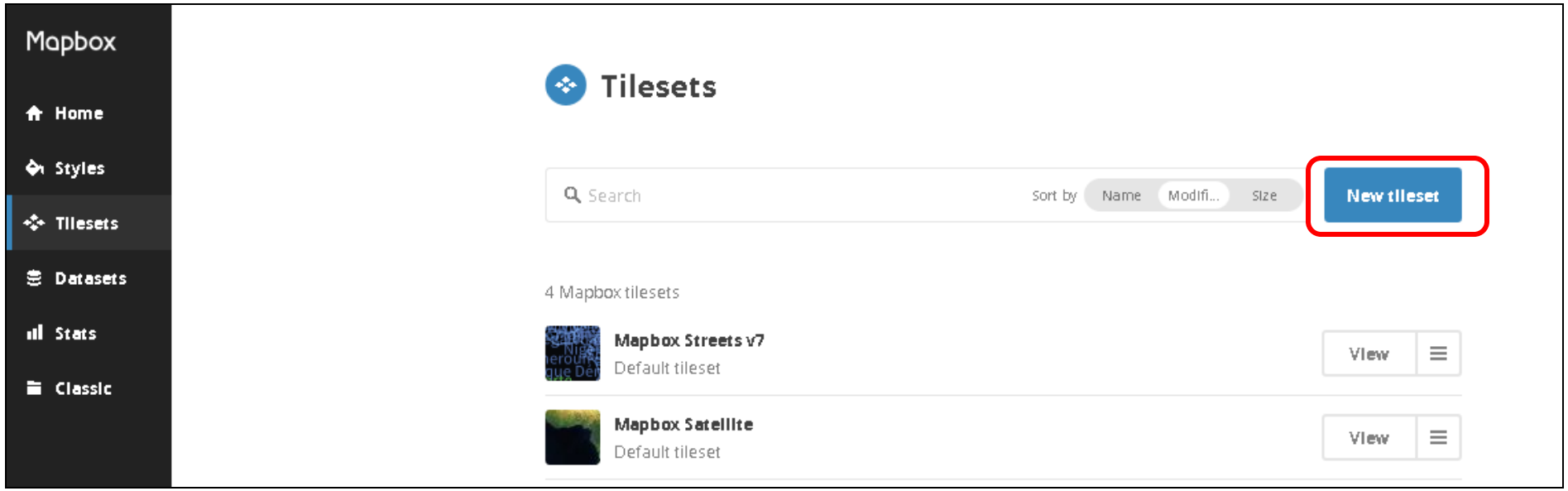
Built with blockbuilder.org

Open

https://bl.ocks.org/mastersigat/deff3908c0f5a4ab86b1167069e03a0d/373ca79f998e08aa42742d03891fcaf732dc3f39

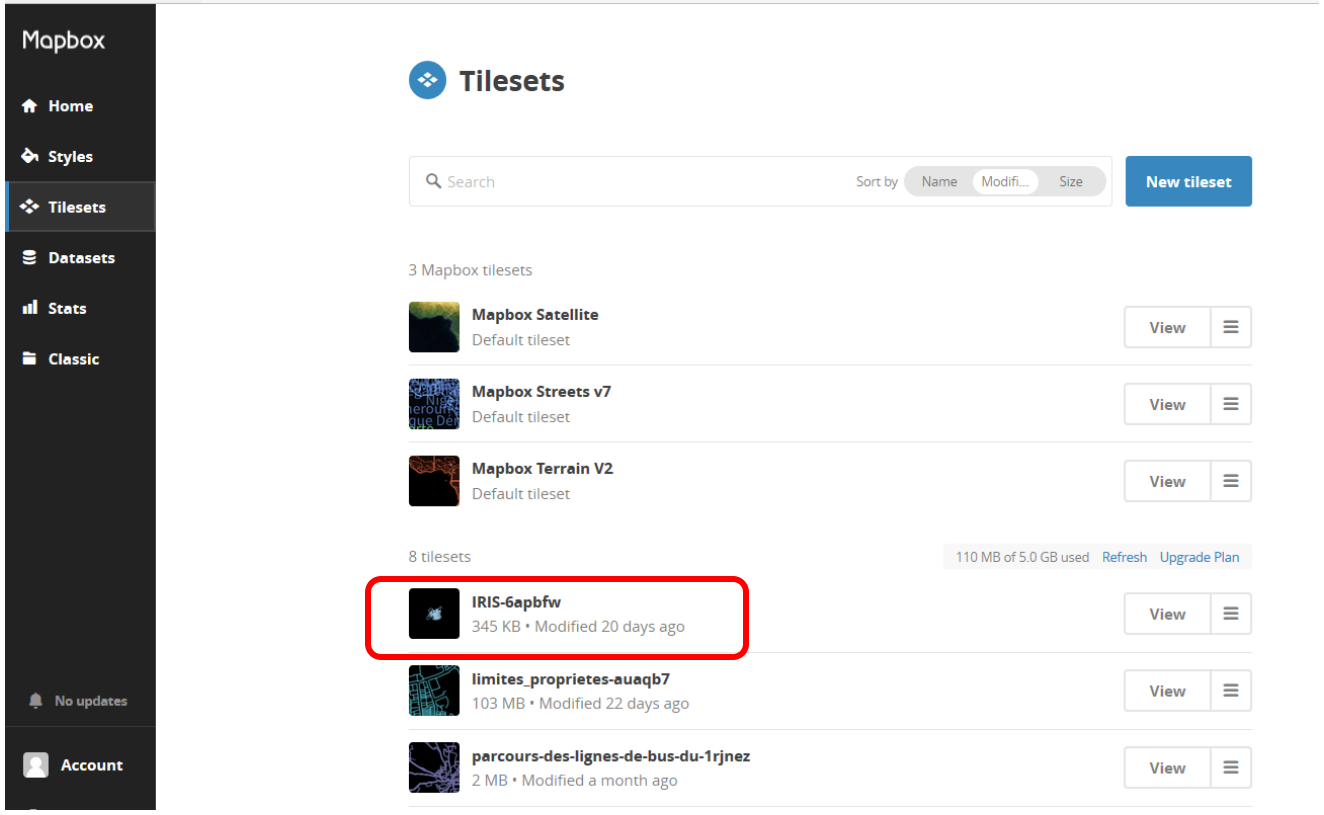
Ajout de données personnelles

- Première étape charger des données comme des Tilesets dans le Studio de Mapbox (csv, geojson, gpx, kml, shapefile zippé)
  - Intégrer le jeu de données des arrêts de bus et celui de la base équipements



Ajout de données personnelles

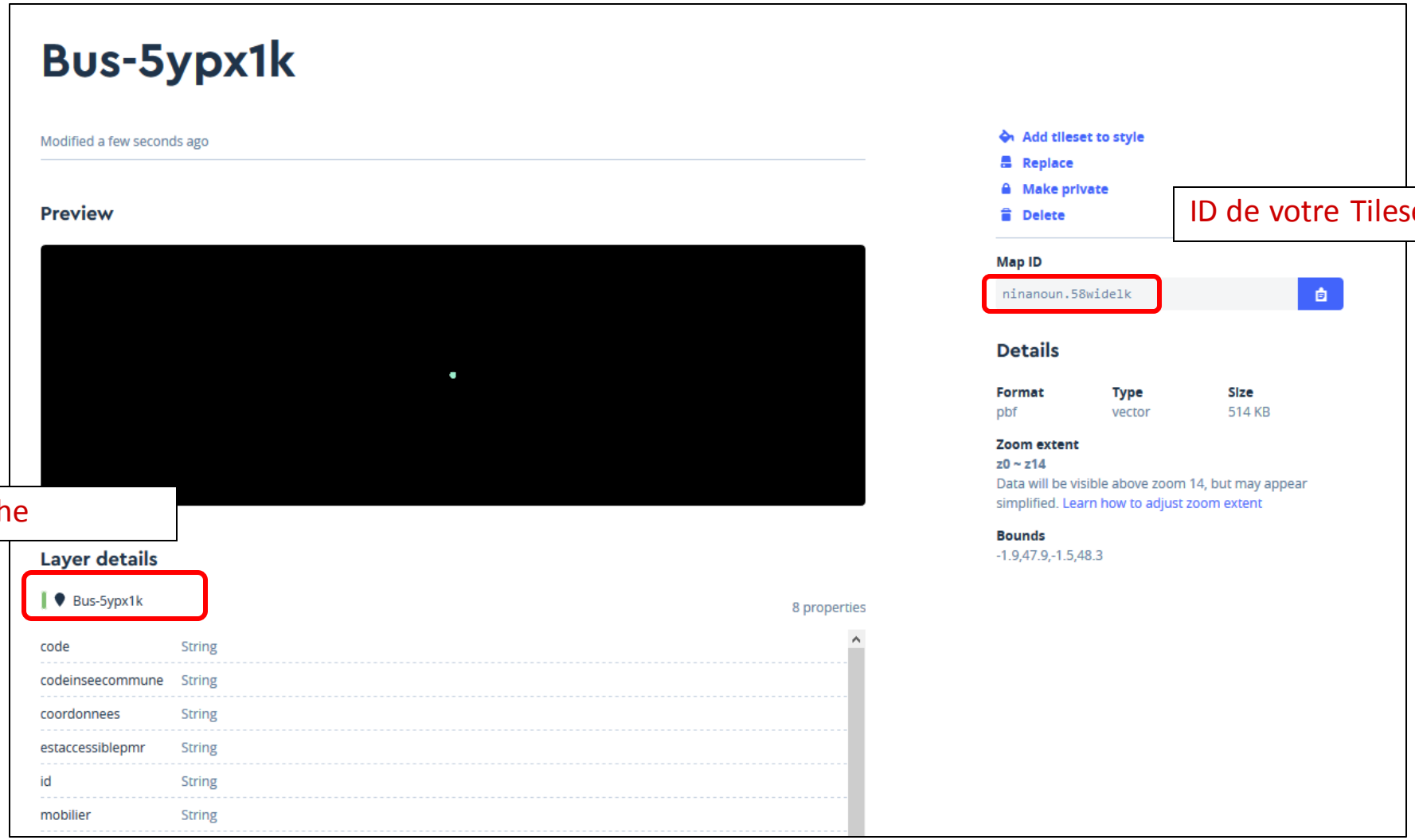
- Aller chercher les infos dans le studio de Mapbox (Tilesets)



Ajout de données personnelles

```
map.addSource('Arrets', {
        type: 'vector',
        url: 'mapbox://' iddutileset'});

map.addLayer({
        'id': 'Arrets',
        'type': 'circle',
        'source': 'Arrets',
        'source-layer': 'nomdelacouche',
        'layout': {'visibility': 'visible'},
        'paint': {'circle-radius': {'base': 1.5,'stops': [[13, 2], [22, 60]]}, 'circle-color': '#000000',}, minzoom:10
});
```

Ajout de données personnelles



Ajout des arrêts de bus

```
map.addSource('Arrets', {
      type: 'vector',
      url: 'mapbox://ninanoun.58widelk'});

map.addLayer({
      'id': 'Arrets',
      'type': 'circle',
      'source': 'Arrets',
      'source-layer': 'Bus-5ypx1k',
      'layout': {'visibility': 'visible'},
      'paint': {'circle-radius': {'base': 1.5,'stops': [[13, 2], [22, 60]]}, 'circle-color': '#000000',}, minzoom:12
   });
```

Bien renseigner l'ID de votre Tilesets

Bien renseigner le nom de votre Tilesets

Ajout des arrêts de bus

```
<script>
    // AccesToken
mapboxgl.accessToken = 'pk.eyJ1IjoibmluYW5vdW4iLCJhIjoiY2pjdHBoZGlzMnV4dDJxcGc5azJkbWRiYSJ9.o4dZRrdHcgVEKCveOXG1Y

    // Configuration de la carte
var map = new mapboxgl.Map({
    container: 'map',
    style: 'mapbox://styles/mapbox/dark-v9',
    center: [-1.68, 48.12], // lat/long
    zoom: 15, // zoom
    pitch: 50, // Inclinaison
    bearing: -10 // Rotation
});

map.on('load', function () {

 map.addSource('mapbox-streets-v7', {
   type: 'vector',
   url: 'mapbox://mapbox.mapbox-streets-v7'});

  map.addLayer({
        "id": "routes",
        "type": "line",
        "source": "mapbox-streets-v7",
        "layout": {'visibility': 'visible'},
        "source-layer": "road",
        "paint": {"line-color": "#FF7F50", "line-width": 1}
    });

    map.addSource('Arrets', {
        type: 'vector',
        url: 'mapbox://ninanoun.58widelk'});

map.addLayer({
        'id': 'Arrets',
        'type': 'circle',
        'source': 'Arrets',
        'source-layer': 'Bus-5ypx1k',
        'layout': {'visibility': 'visible'},
        'paint': {'circle-radius': 5, 'circle-color': '#f5f60d',}
    });


  });

</script>
```

Ajout la couche équipements

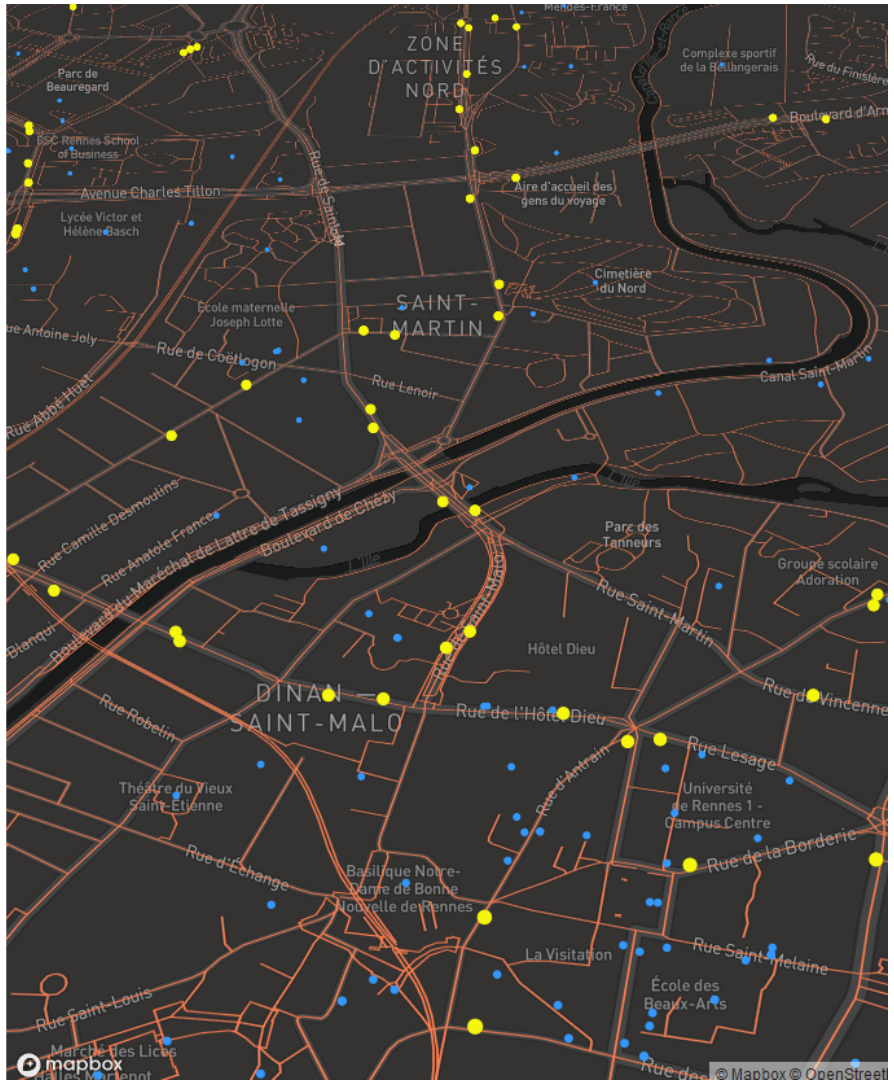
```
map.addSource('Equipements', {
      type: 'vector',
      url: 'mapbox://ninanoun.4xcn5ude'});

map.addLayer({
      'id': 'Equipements',
      'type': 'circle',
      'source': 'Equipements',
      'source-layer': 'base-orga-var-6k0zky',
      'layout': {'visibility': 'visible'},
      'paint': {'circle-radius': {'base': 1.5,'stops': [[13, 2], [22, 60]]}, 'circle-color': '#3399ff'}, minzoom:14
   });
```

Bien renseigner l'ID de votre Tilesets

Bien renseigner le nom de la couche a afficher

Ajout la couche équipements

```
map.on('load', function () {

 // Ajout routes OSM

 map.addSource('mapbox-streets-v7', {
   type: 'vector',
   url: 'mapbox://mapbox.mapbox-streets-v7'});

  map.addLayer({
        "id": "routes",
        "type": "line",
        "source": "mapbox-streets-v7",
        "layout": {'visibility': 'visible'},
        "source-layer": "road",
        "paint": {"line-color": "#FF7F50", "line-width": 1}
    });

// Ajout arrets de bus

map.addSource('Arrets', {
        type: 'vector',
        url: 'mapbox://ninanoun.58widelk'});

map.addLayer({
        'id': 'Arrets',
        'type': 'circle',
        'source': 'Arrets',
        'source-layer': 'Bus-5ypx1k',
        'layout': {'visibility': 'visible'},
        'paint': {'circle-radius': 5, 'circle-color': '#f5f60d'}
    });

// Ajout couche équipements

map.addSource('Equipements', {
        type: 'vector',
        url: 'mapbox://ninanoun.4xcn5ude'});

map.addLayer({
        'id': 'Equipements',
        'type': 'circle',
        'source': 'Equipements',
        'source-layer': 'base-orga-var-6k0zky',
        'layout': {'visibility': 'visible'},
        'paint': {'circle-radius': 3, 'circle-color': '#3399ff'}
    });

  });

</script>
```



Mettre en forme les données

- Pour personnaliser la symbologie des données se référer à la documentation

  https://www.mapbox.com/mapbox-gl-js/style-spec/#layers

Type d'objets géographiques dans MapboxGL :

- circle (point)
- symbol (point avec pictogramme)
- line (ligne)
- fill (polygone)
- fill-extrusion (polygone 3D)
- …

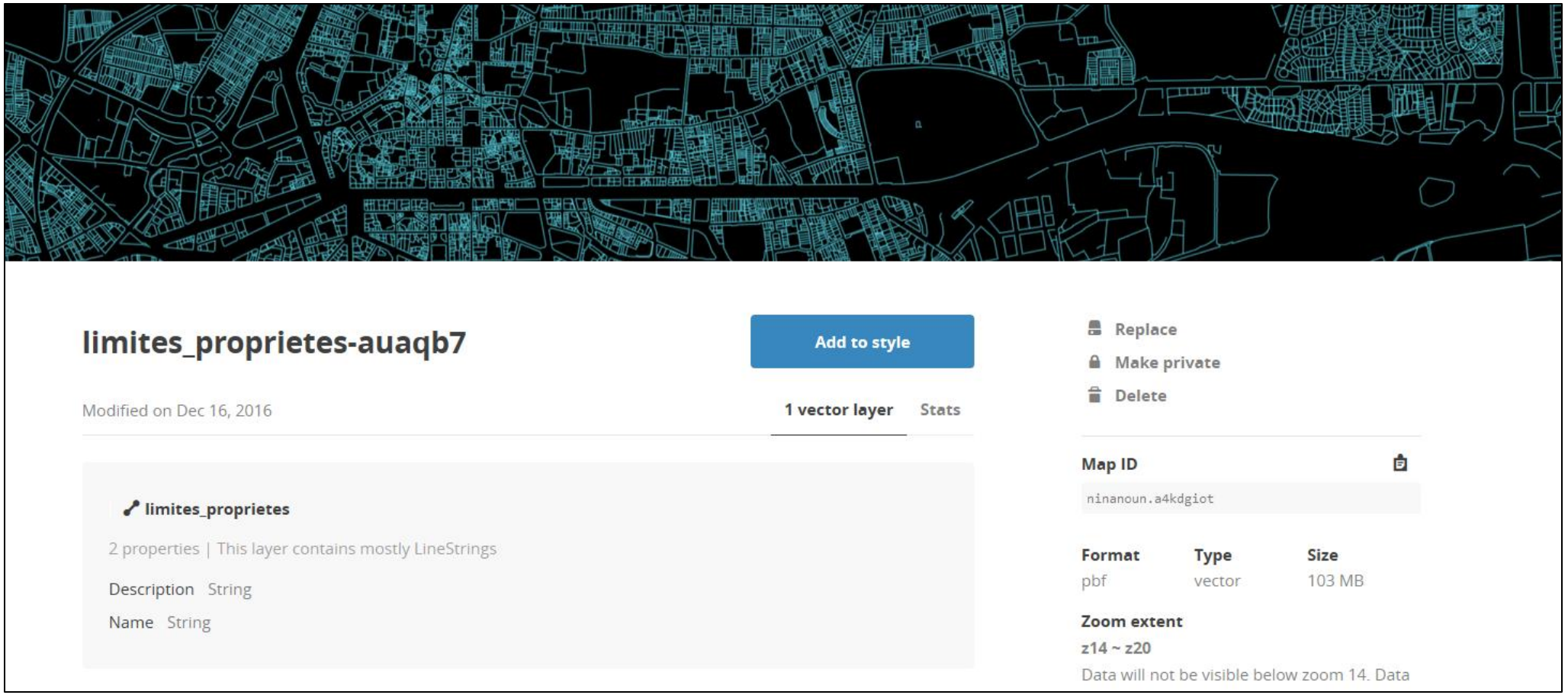
Mettre en forme les données

- Changer la taille
- Changer la couleur

  http://www.code-couleur.com/
- Définir des niveaux de zoom (max/min)

```
'paint': {'circle-radius': {'base': 1.5,'stops': [[13, 2], [22, 60]]}, 'circle-color': '#3399ff'}, minzoom:14
```

Ajouter les limites de propriétés

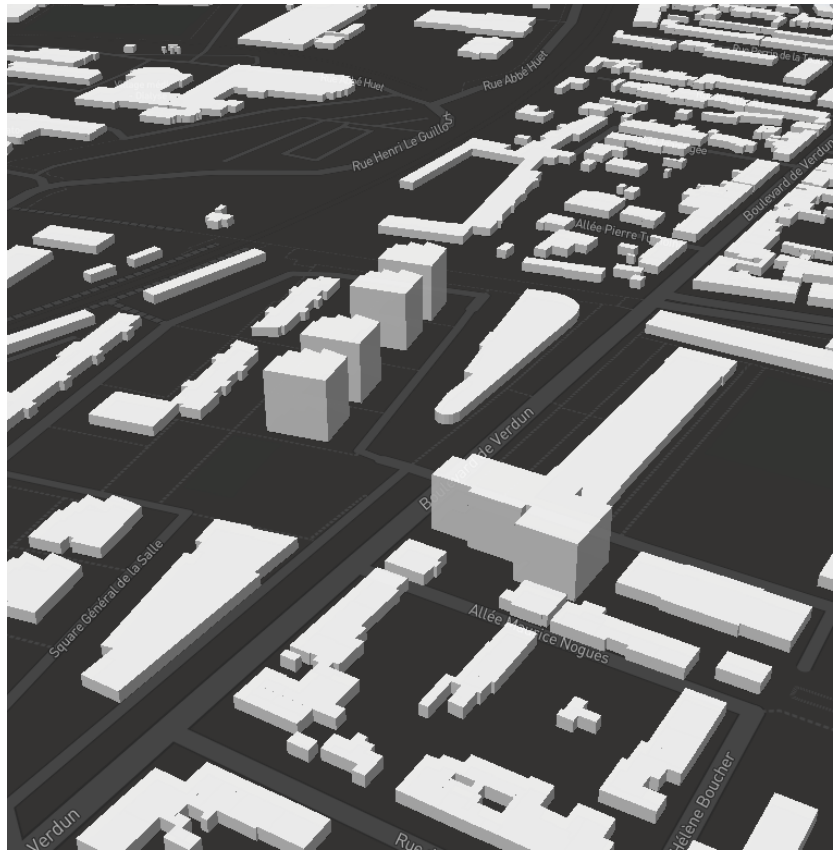


Ajouter les limites de propriétés

```
//Proprietes

map.addSource('Proprietes', {
        type: 'vector',
        url: 'mapbox://ninanoun.a4kdgiot'
    });

map.addLayer({
        'id': 'Proprietes',
        'type': 'line',
        'source': 'Proprietes',
        'source-layer': 'limites_proprietes',
        'layout': {'visibility': 'visible',
        'line-join': 'round','line-cap': 'round'},
        'paint': {'line-color': '#FFFFFF', 'line-width': 1.5}
});
```

Ajouts de données 3D

```
// Ajout batiments 3D

map.addLayer({
        'id': 'Batiments_3D',
        'source': 'composite',
        'source-layer': 'building',
        'filter': ['==', 'extrude', 'true'],
        'type': 'fill-extrusion',
        'minzoom': 15,
        'paint': {'fill-extrusion-color': '#555555', 'fill-extrusion-height':
        {'type': 'identity','property': 'height'},
        'fill-extrusion-base': {'type': 'identity','property': 'min_height'},
        'fill-extrusion-opacity': 0.8
        }
    });
```



Exemple

https://bl.ocks.org/anonymous/f2c04bc06e759c2da1c3c9767fe572fa/923cca7180834e94060c4032d0e412e5ee92ae47

Ajouter des données en local

- Il est possible de mobiliser des jeux de données (Geojson) stockés en local (même dossier que la page html) ou accessible via une URL

```
map.on("load", function() {
//Couche EPCI
map.addLayer({
        id: "epci",
        type: "line",
        source: {type: "geojson",
                    data: "./epci.geojson" },

        paint: {'line-color': '#000000',
                    'line-width':1}
        });
 });
```

```
map.on("load", function() {
//Couche EPCI
map.addLayer({
        id: "epci",
        type: "line",
        source: {type: "geojson",
                    data: 'URL'
        paint: {'line-color': '#000000',
                    'line-width':1}
        });
 });
```

Interactivité avec les données

Hover et Click

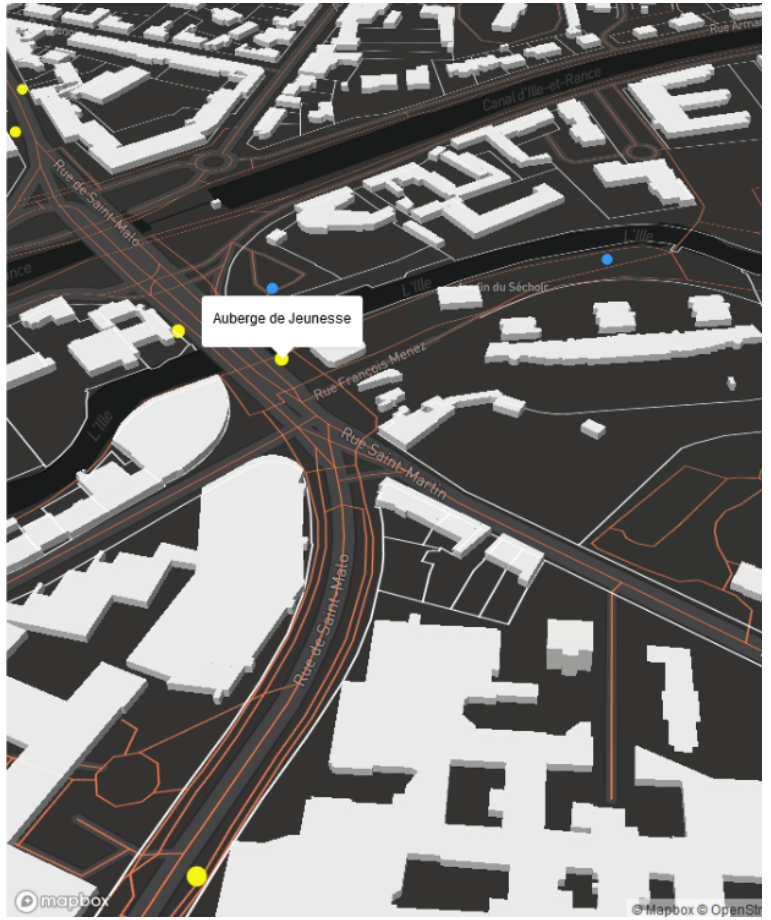
Interactivité avec les données / Hover

- Hover de d'une couche (survol) = couche arrets
  - Cette commande doit être placée à la fin du script

```
//Interactivité HOVER

var popup = new mapboxgl.Popup({
   closeButton: false,
   closeOnClick: false });

map.on('mousemove', function(e) {
   var features = map.queryRenderedFeatures(e.point, { layers: ['Equipements'] });
   // Change the cursor style as a UI indicator.
   map.getCanvas().style.cursor = (features.length) ? 'pointer' : '';

   if (!features.length) {
      popup.remove();
      return; }

   var feature = features[0];
      popup.setLngLat(feature.geometry.coordinates)
      .setHTML(feature.properties.organom)
      .addTo(map);

});
```

Interactivité avec les données / Hover

```
        'type': 'line',
        'source': 'Proprietes',
        'source-layer': 'limites_proprietes',
        'layout': {'visibility': 'visible',
        'line-join': 'round','line-cap': 'round'},
        'paint': {'line-color': '#FFFFFF', 'line-width': 1.5}
});

  // Ajout batiments 3D

map.addLayer({
        'id': 'Batimenst_3D',
        'source': 'composite',
        'source-layer': 'building',
        'filter': ['==', 'extrude', 'true'],
        'type': 'fill-extrusion',
        'minzoom': 15,
        'paint': {'fill-extrusion-color': '#FFFFFF', 'fill-extrusion-height':
        {'type': 'identity','property': 'height'},
        'fill-extrusion-base': {'type': 'identity','property': 'min_height'},
        'fill-extrusion-opacity': 0.9
        }
    });

  });

//Interactivité HOVER

var popup = new mapboxgl.Popup({
    closeButton: false,
    closeOnClick: false });

map.on('mousemove', function(e) {
    var features = map.queryRenderedFeatures(e.point, { layers: ['Arrets'] });
    // Change the cursor style as a UI indicator.
    map.getCanvas().style.cursor = (features.length) ? 'pointer' : '';

    if (!features.length) {
        popup.remove();
        return; }

    var feature = features[0];
        popup.setLngLat(feature.geometry.coordinates)
        .setHTML(feature.properties.nom)
        .addTo(map);

});

</script>
```



Interactivité avec les données / Hover

- Hover de deux couches (survol)

```
//Interactivité HOVER

var popup = new mapboxgl.Popup({
   closeButton: false,
   closeOnClick: false });

map.on('mousemove', function(e) {
   var features = map.queryRenderedFeatures(e.point, { layers: ['Arrets'] ['Equipements'] });
   // Change the cursor style as a UI indicator.
   map.getCanvas().style.cursor = (features.length) ? 'pointer' : '';

   if (!features.length) {
      popup.remove();
      return;
   }

   var feature = features[0];

      popup.setLngLat(feature.geometry.coordinates)
      .setHTML(feature.properties.nom)
      .addTo(map);

    var feature = features[1];

       popup.setLngLat(feature.geometry.coordinates)
      .setHTML(feature.properties.organom)
      .addTo(map);
});
```

Interactivité avec les données / Hover

```
115
116  //Interactivité HOVER
117
118  var popup = new mapboxgl.Popup({
119      closeButton: false,
120      closeOnClick: false });
121
122  map.on('mousemove', function(e) {
123      var features = map.queryRenderedFeatures(e.point, { layers: ['Arrets'] ['Equipements'] });
124      // Change the cursor style as a UI indicator.
125      map.getCanvas().style.cursor = (features.length) ? 'pointer' : '';
126
127      if (!features.length) {
128          popup.remove();
129          return;
130      }
131
132      var feature = features[0];
133
134          popup.setLngLat(feature.geometry.coordinates)
135          .setHTML(feature.properties.nom)
136          .addTo(map);
137
138       var feature = features[1];
139
140          popup.setLngLat(feature.geometry.coordinates)
141          .setHTML(feature.properties.organom)
142          .addTo(map);
143  });
144
145
146  </script>
147
```

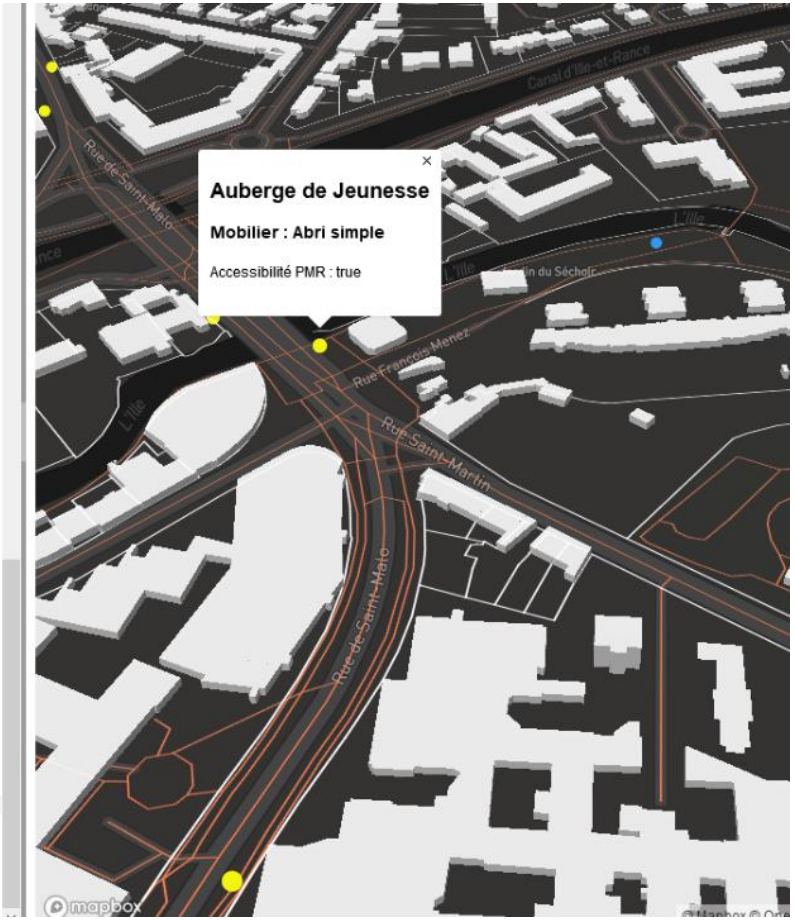
Interactivité avec les données / Click

- Click d'une couche (popup) = couche arrets

```
//Interactivité CLICK

map.on('click', function (e) {
   var features = map.queryRenderedFeatures(e.point,  { layers: ['Arrets'] });

   if (!features.length) {
      return;
   }

   var feature = features[0];
   var popup  = new mapboxgl.Popup({  offset: [0, -15] })
      .setLngLat(feature.geometry.coordinates)
      .setHTML('<h2>' + feature.properties.nom  + '</h2><h3>'
                                    +"Mobilier : " + feature.properties.mobilier  + '</h3><p>'
                                    +"Accessibilité PMR : " + feature.properties.estaccessiblepmr + '</p>' )
                  .addTo(map);
});

map.on('mousemove',  function (e) {
   var features = map.queryRenderedFeatures(e.point,  { layers: ['Arrets'] });
   map.getCanvas().style.cursor = (features.length) ? 'pointer' : '';
});
```

Interactivité avec les données / Click

```
});

  // Ajout batiments 3D

map.addLayer({
        'id': 'Batimenst_3D',
        'source': 'composite',
        'source-layer': 'building',
        'filter': ['==', 'extrude', 'true'],
        'type': 'fill-extrusion',
        'minzoom': 15,
        'paint': {'fill-extrusion-color': '#FFFFFF', 'fill-extrusion-height':
        {'type': 'identity','property': 'height'},
        'fill-extrusion-base': {'type': 'identity','property': 'min_height'},
        'fill-extrusion-opacity': 0.9
        }
    });

  });

//Interactivité CLICK

map.on('click', function (e) {
    var features = map.queryRenderedFeatures(e.point, { layers: ['Arrets'] });

    if (!features.length) {
        return;
    }

    var feature = features[0];
    var popup = new mapboxgl.Popup({ offset: [0, -15] })
        .setLngLat(feature.geometry.coordinates)
        .setHTML('<h2>' + feature.properties.nom + '</h2><h3>'
    +"Mobilier : " + feature.properties.mobilier + '</h3><p>'
    +"Accessibilité PMR : " + feature.properties.estaccessiblepmr + '</p>' )
      .addTo(map);
});

map.on('mousemove', function (e) {
    var features = map.queryRenderedFeatures(e.point, { layers: ['Arrets'] });
    map.getCanvas().style.cursor = (features.length) ? 'pointer' : '';
});


</script>

</body>
</html>
```



Exemple

https://bl.ocks.org/anonymous/32ab9ab043074bd5cb38fb153237ef2e/7c1739a41825727cd73aaed9a94af9f91a7f4e99

Mise en forme poussée des données spatiales

Pictogrammes, catégorisation, graduation, cercles gradués, extrusion 3D, combinaison de deux variables

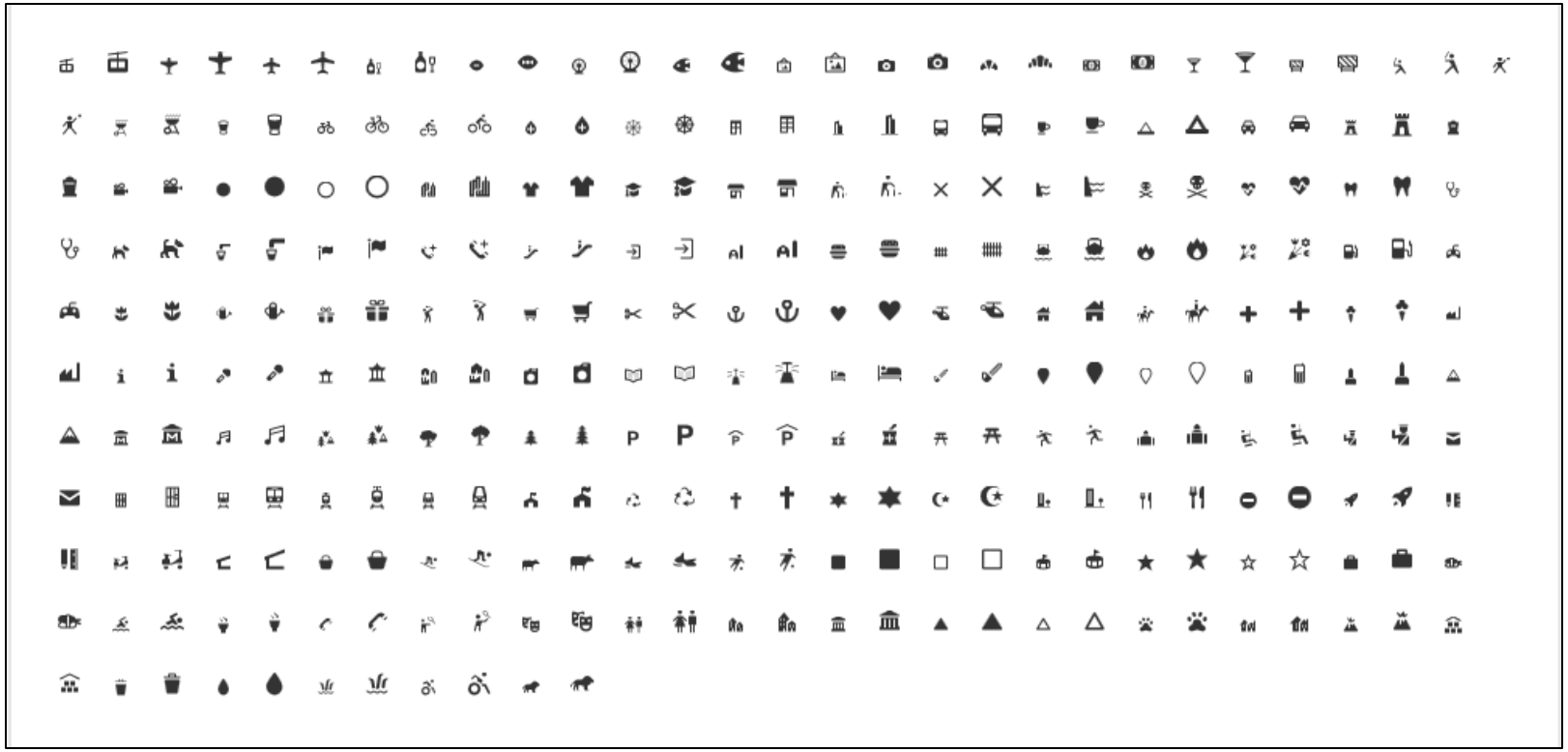
Utiliser des pictogrammes

- Utiliser la symbologie des symboles (pictos)

```
map.addSource('Arrets', {
        type: 'vector',
        url: 'mapbox://ninanoun.7mtp5buo'});

  map.addLayer({
            "id": "Arrets",
            "type": "symbol",
            "source": "Arrets",
            "source-layer": "topologie-des-points-darret-d-9ya955",
            "layout": { "icon-image": "bus-15",
                        "icon-size": 1.5}
        });
```

Mise en forme de données personnelles

- Mobiliser la bibliothèque vectorielle Maki
  https://www.mapbox.com/maki-icons/



Graduation couleur

- Configurer les options de mise en forme
  - Il faut spécifier la variable mobilisée, le type d'échelle, les valeurs des bornes et les couleurs

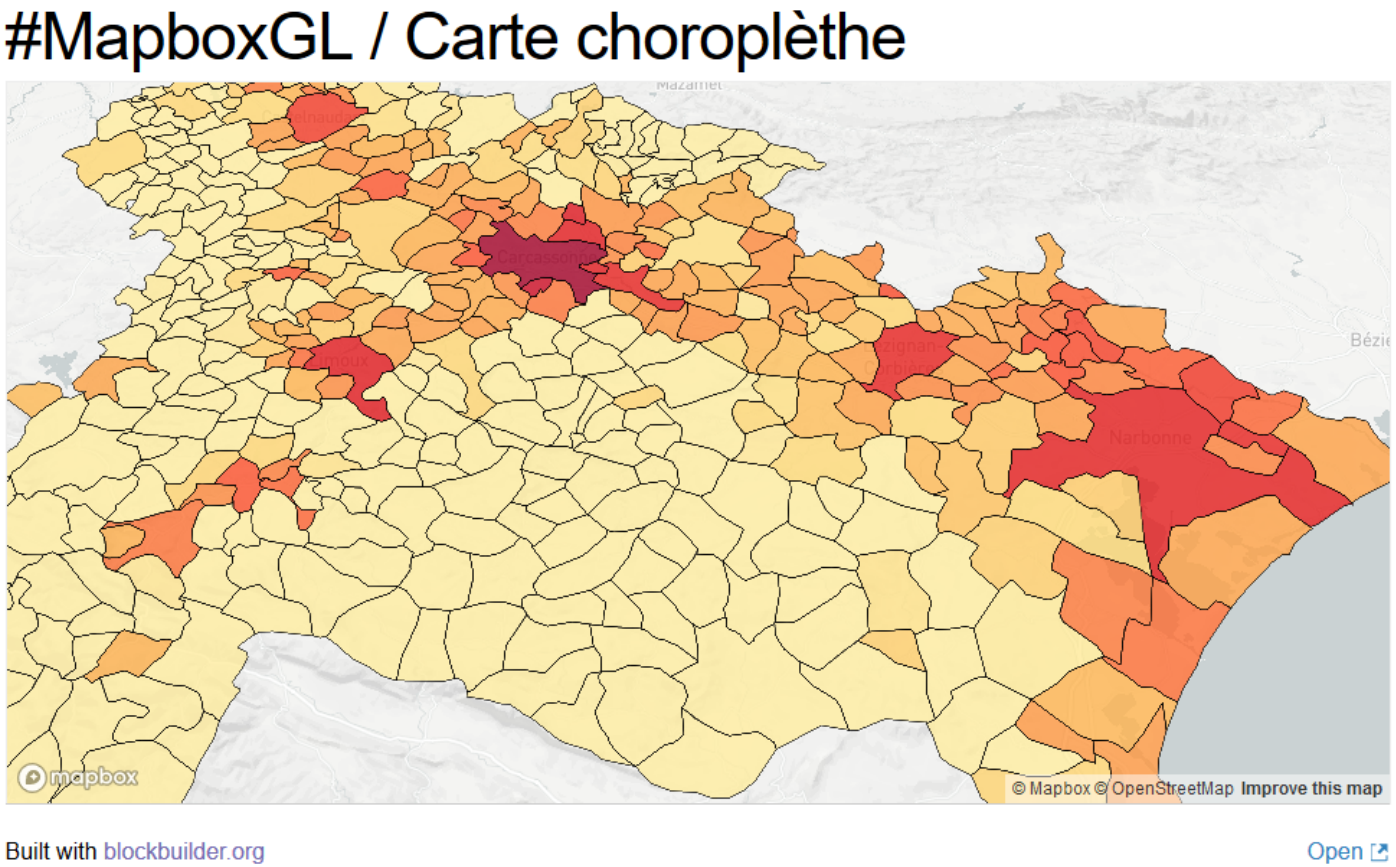
Cercles

```
'paint': {'circle-radius': {'base': 1.5,'stops': [[13, 2], [22, 60]]},
          'circle-color': {property: 'hauteur',
          type: 'exponential',
          stops: [[0, '#edf8e9'],
                  [5, '#c7e9c0'],
                  [10, '#a1d99b'],
                  [15, '#74c476'],
                  [20, '#006d2c']]
}
```

Polygones

```
'paint': {'fill-color': {'property': 'densite',
          'stops': [[1, '#1a9850'],
                    [10, '#91cf60'],
                    [20, '#d9ef8b'],
                    [50, '#ffffbf'],
                    [100, '#fee08b'],
                    [150, '#fc8d59'],
                    [200, '#d73027']]},
          'fill-opacity': 0.9}
```

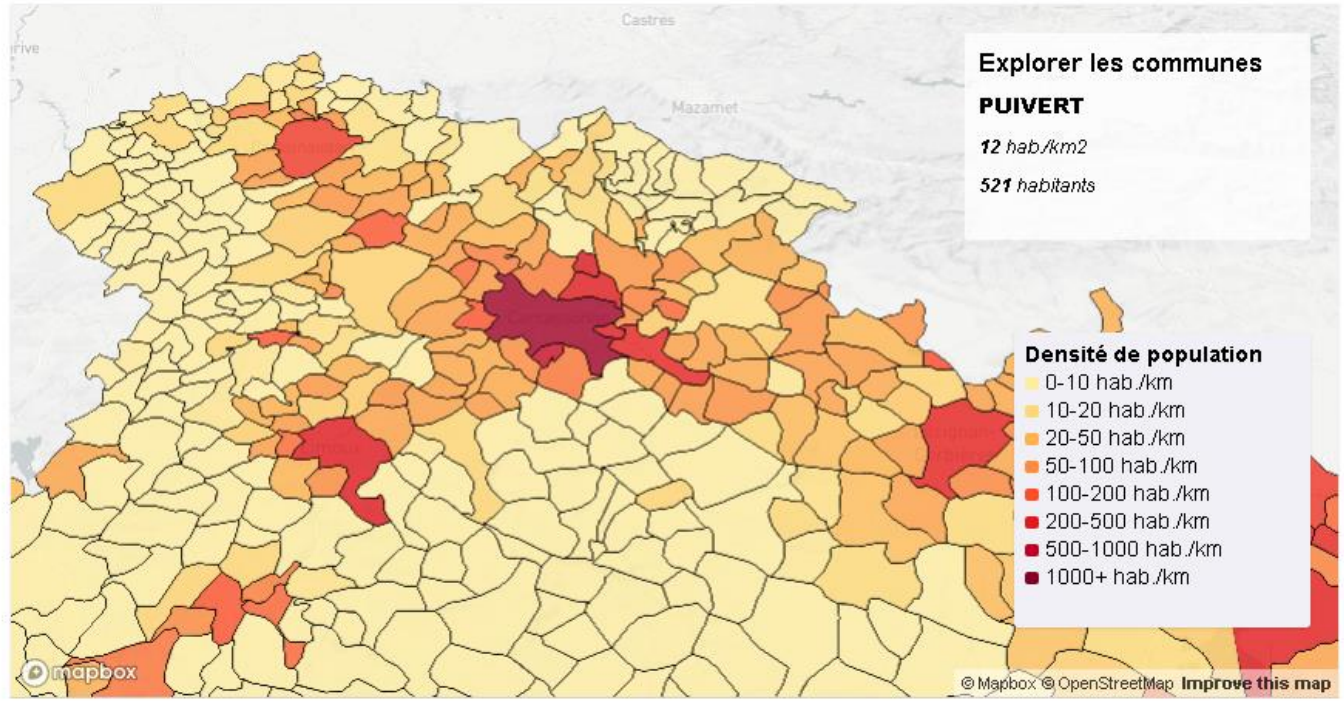
Exemple



https://bl.ocks.org/mastersigat/d6c98f9c0f2e60811fc1da967f3c79d5/f4bfae333f5fccf219481b9e636807d6ed930ad4

Exemple

#MapboxGL / Carte choroplèthe interactive



Carte choroplèthe interactive

Open

https://bl.ocks.org/mastersigat/02576120fff70307c85ebb7eeef3d05e

S’affranchir des fonds de carte de Mapbox

- Objectif = éviter les limites Access Token ;)
- Solution : Mobiliser des fonds de carte en tuiles vectorielles fournis « sans limites » d’utilisation par Etalab

  https://openmaptiles.geo.data.gouv.fr/

  Adresse du flux : https://openmaptiles.geo.data.gouv.fr/styles/osm-bright/style.json

```
    // Configuration de la carte
var map = new mapboxgl.Map({
    container: 'map',
    style: 'https://openmaptiles.geo.data.gouv.fr/styles/osm-bright/style.json', //
fond de carte
    center: [-1.68, 48.12], // lat/long
    zoom: 15, // zoom
    pitch: 50, // Inclinaison
    bearing: -10 // Rotation
});
```

Fond de cartes, données carroyés

```
map.addSource('inseedata',{
      "type": 'vector',
      "url" : 'http://www.comeetie.fr/tileserver-php/inseedata_metropole.json'
});
```

Tuiles vectorielles maison construite à partir des données carroyés par agrégation successives. https://github.com/comeetie/insee_formation

Variables disponibles :

- men_basr : # ménages sous le seuil de bas revenus
- men : # ménages
- pop : population résidentes
- rev : revenus total
- m25ans : # population de – de 25ans
- P65ans : # population de + de 65 ans
- ….

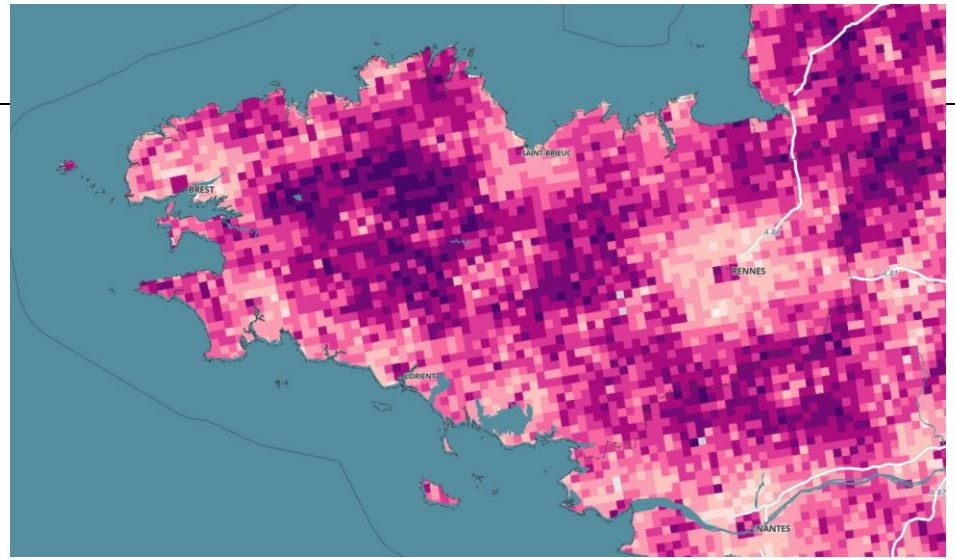
Fond de cartes, données carroyés

```
map.addLayer({
    "id": "mbasr",
    "type": "fill",
    "source": "inseedata",
    "source-layer": "inseedata",
    "paint": {
        "fill-color": ['step',
       ['/',['get','men_basr'],['get', 'men']],"#555555",
       0, "#fff7f3",  0.045, "#fde0dd", 0.077, "#fcc5c0",  0.11, "#fa9fb5",  0.148,  "#f768a1",
       0.182,  "#dd3497", 0.22,   "#ae017e",0.27,"#7a0177",   0.345 ,"#49006a"],
         "fill-opacity": 1
         }
},'waterway');
```

Expression de calcul d'une variable dynamique, ici simple ratio

Echelle de couleurs, quantiles et colorbrewer

Nom de la couche sous laquelle faire l'insertion

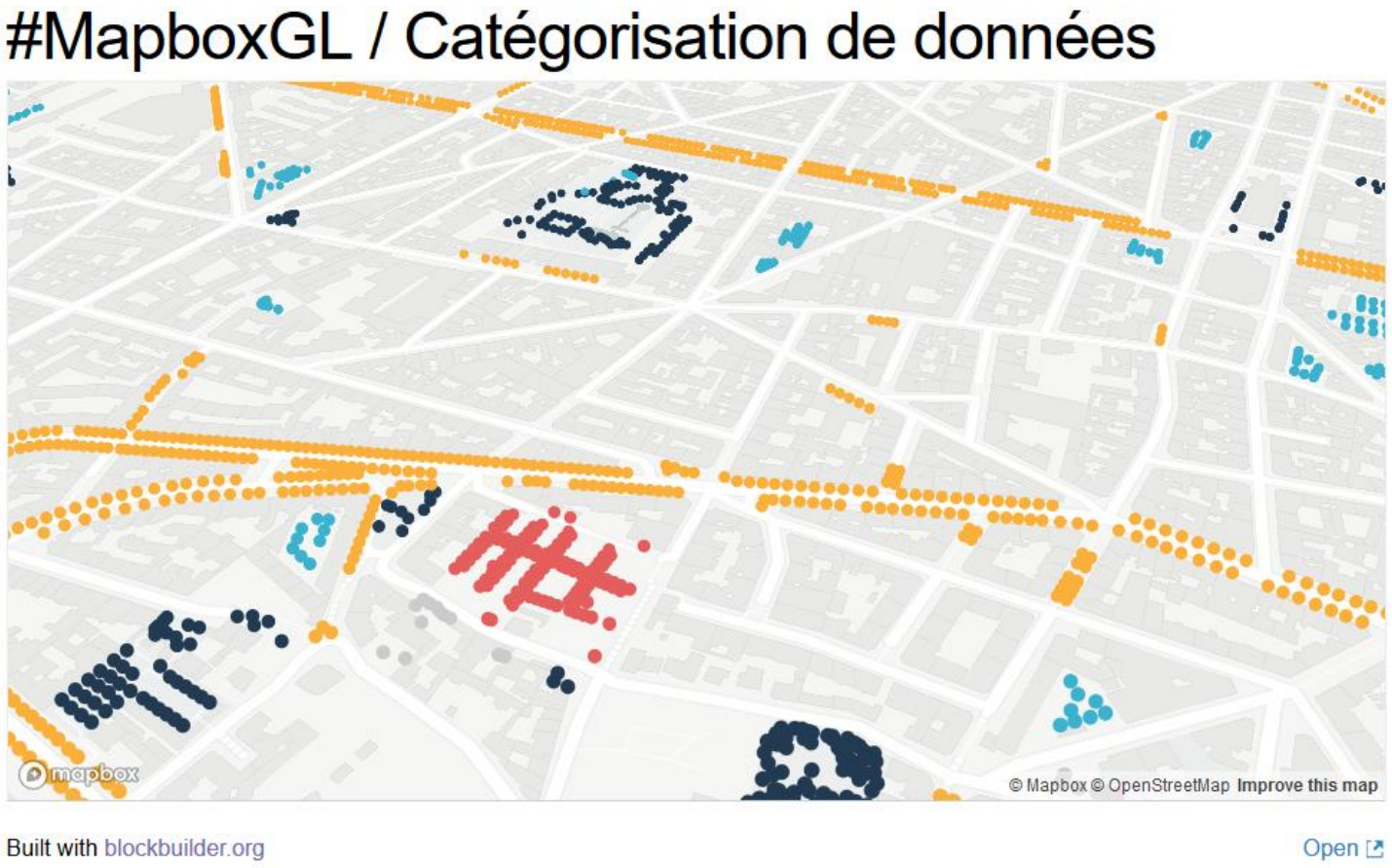


Catégorisation

- Configurer les options de mise en forme
  - Il faut spécifier la variable mobiliser, les valeurs des catégories et les couleurs

```
'paint': {  'circle-radius': {'base': 1.75,'stops': [[12, 2], [22, 180]]},
            'circle-color': ['match',['get', 'ethnicity'],
            'White', '#fbb03b',
            'Black', '#223b53',
            'Hispanic', '#e55e5e',
            'Asian', '#3bb2d0']
         }
```

Exemple



https://bl.ocks.org/mastersigat/b2d09221e018183559391b1f828e5547/7b69c180be73a3695f6e88eecbd5090c4d01b1cd

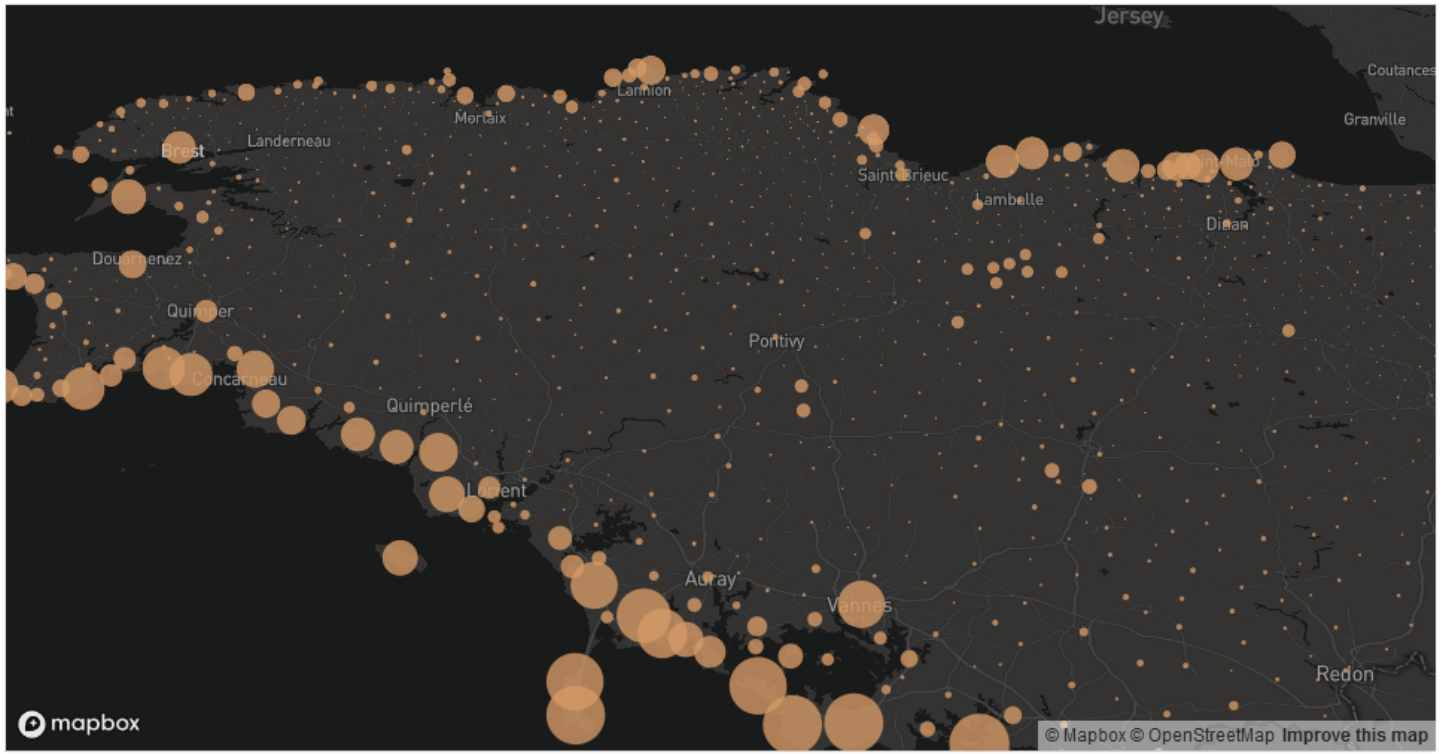
Cercles gradués

- Configurer les options de mise en forme
  - Il faut spécifier la variable mobiliser et les valeurs des bornes *(valeur, taille du cercle)*

```
paint: {'circle-color': '#D49A66',
        'circle-radius': {property: 'population',
         type: 'exponential',
         stops: [[10, 1],[2000, 20]]},
         'circle-opacity': 0.8}
```

Exemple

#MapboxGL / Cercles gradués



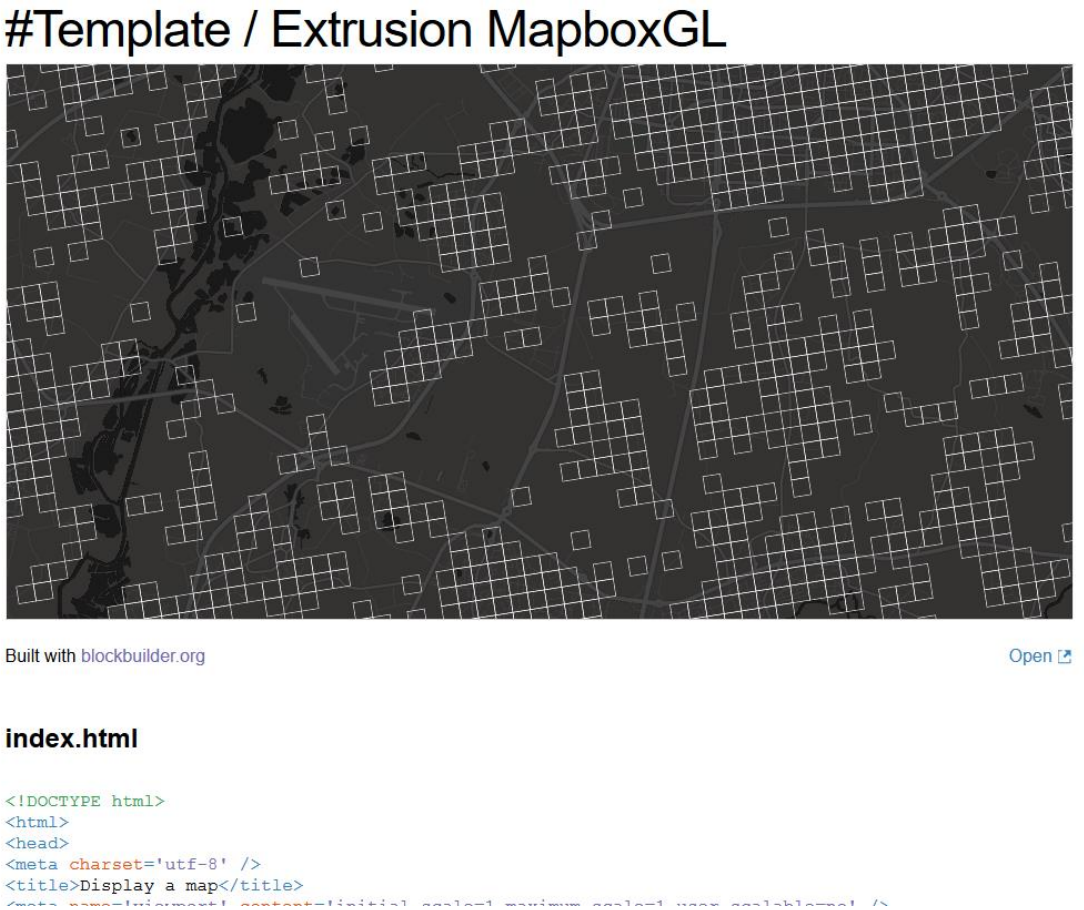
Built with blockbuilder.org

Open

https://bl.ocks.org/anonymous/54872b5379a59b0cee850a112af572b0/3ec842a0b6ff9fe82ed7426309c629a7f2a84efe

Extrusion 3D

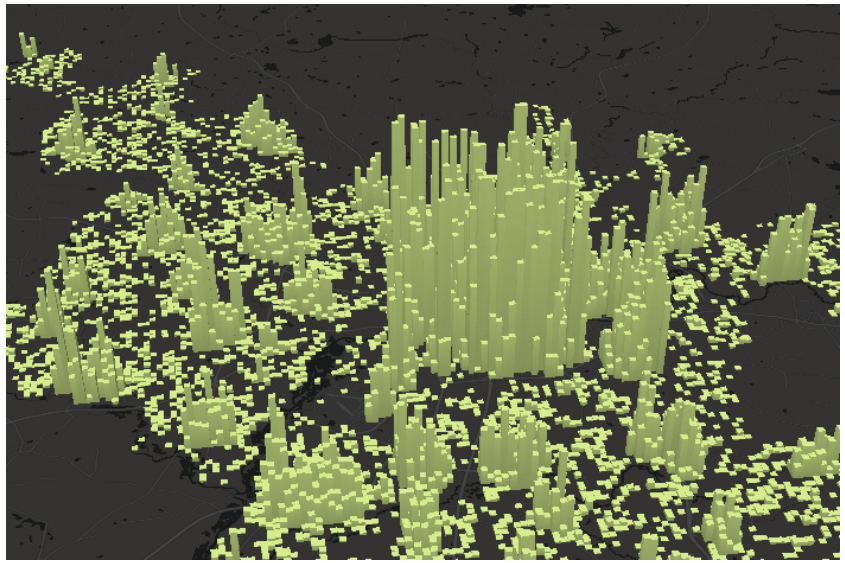
- Récupérer le template



https://bl.ocks.org/mastersigat/64af1a273f155037214d96406cb4777a/7c3f5c36742ec2dcf231059e903b144118c79d42

Extrusion 3D

- Configurer les options de mise en forme
  - Il faut spécifier la variable mobilisée et les modalités de l'extrusion *(valeur, taille de l'extrusion)*



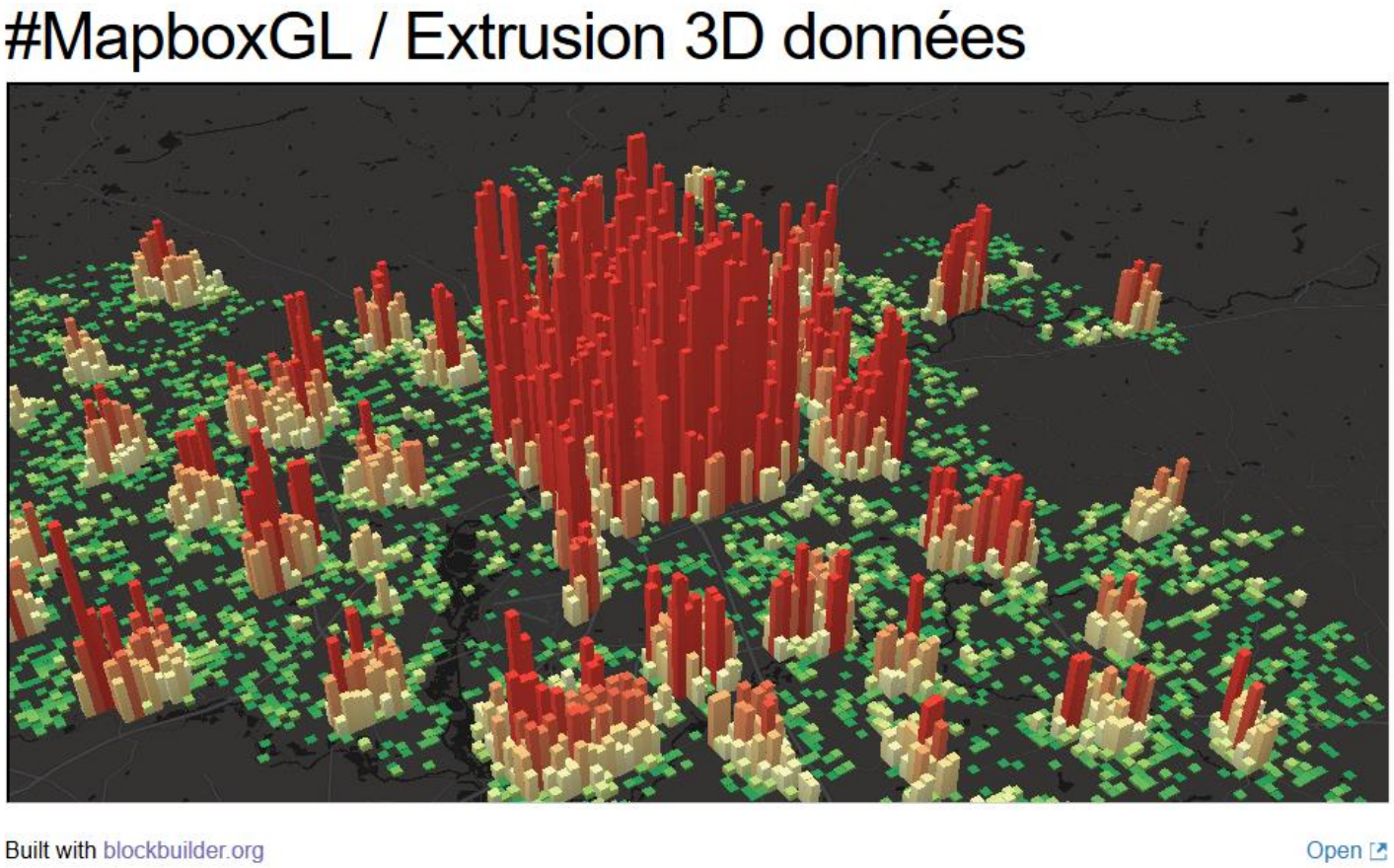
```
map.addLayer({
    'id': 'extrude',
    'type': 'fill-extrusion',
    'source': 'Carro',
    'source-layer': 'karook-dcnhdj',
    'layout': {'visibility': 'visible'},
    'paint': { 'fill-extrusion-color': '#d9ef8b',
               'fill-extrusion-height': {
               'property': 'Individus',
                          'stops': [[1, 0],
                                    [10, 100],
                                    [700, 7000]]},
      'fill-extrusion-opacity': 0.95,
      'fill-extrusion-base': 0 }
});
```

Extrusion 3D

- Ajouter des couleurs

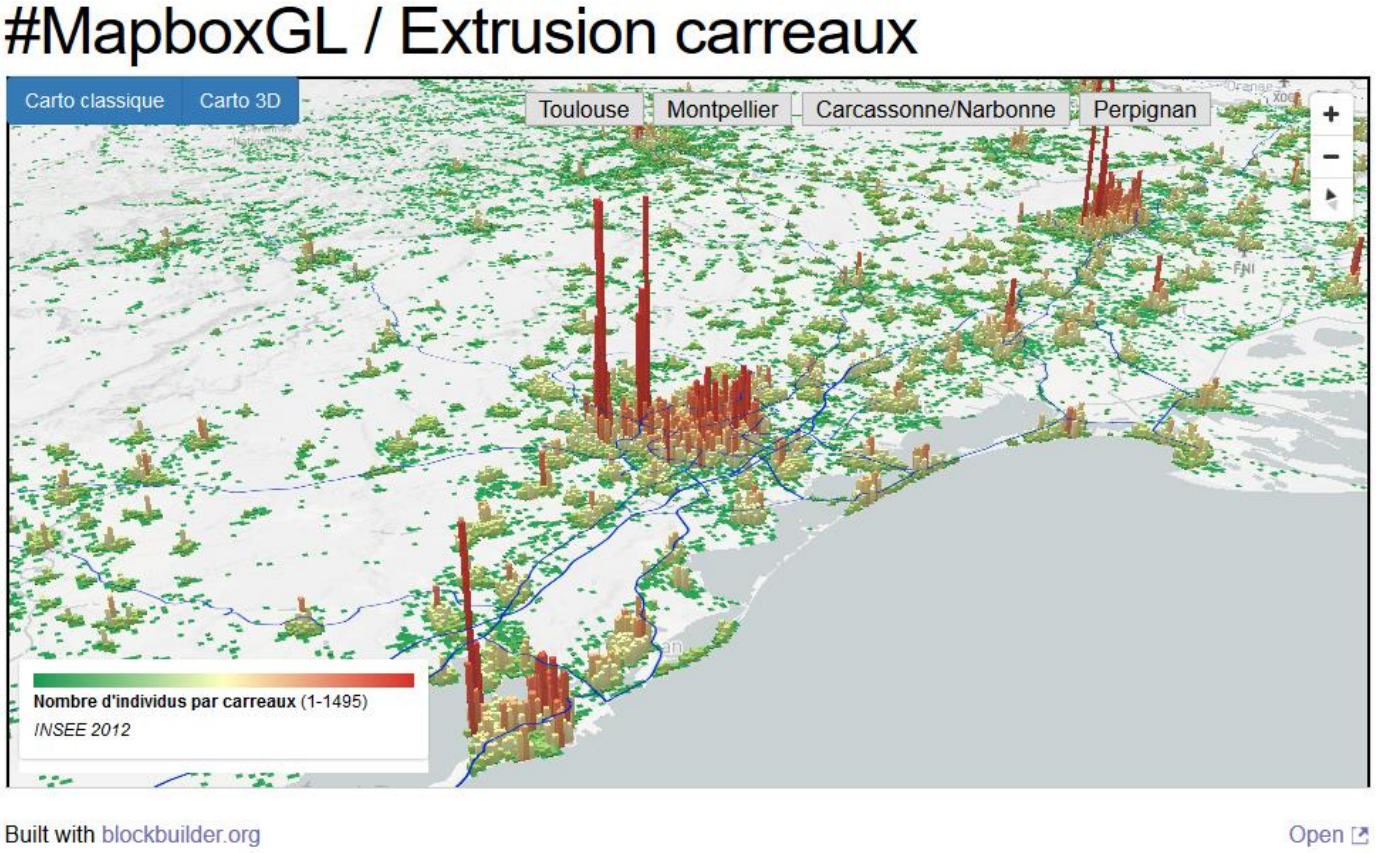
```
'paint': {
    'fill-extrusion-color': {
      'property': 'Individus',
      'stops': [
        [1, '#1a9850'],
        [10, '#91cf60'],
        [20, '#d9ef8b'],
        [50, '#ffffbf'],
        [100, '#fee08b'],
        [150, '#fc8d59'],
        [200, '#d73027']]
    },
    'fill-extrusion-height': {
      'property': 'Individus',
                              'stops': [[1, 0],
            [10, 100],
            …
```

Exemple



https://bl.ocks.org/mastersigat/32c10e630346ff96c5749ba791cb3052/6fc71a60b632aa09540d22aacc619fc7d3552a74

Exemple



https://bl.ocks.org/mastersigat/c5bef54cfad8dd7bd0a9f384a45d771e

Deux variables

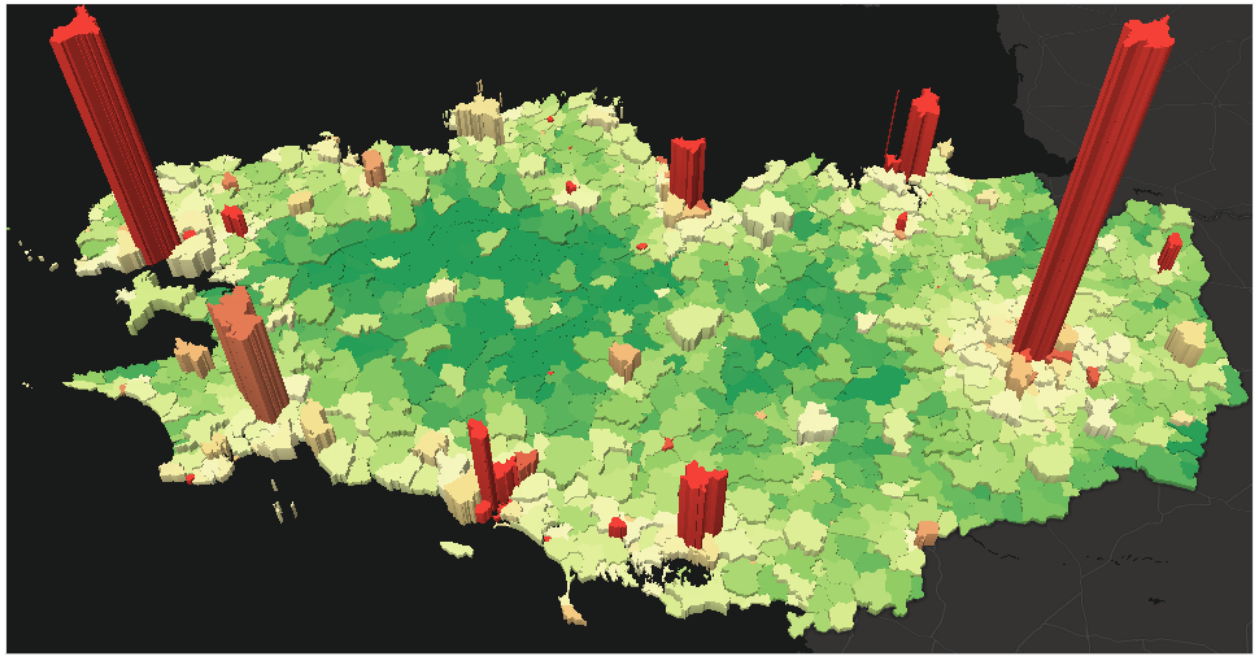
```
map.addLayer({
  'id': 'extrudecommunes',
  'type': 'fill-extrusion',
  'source': 'communes',
  'source-layer': 'TD1_Data-3kid81',
  'layout': {'visibility': 'visible'},
  'paint': {'fill-extrusion-color': {
            'property': 'densite',
            'stops': [[20, '#1a9850'],
                      [50, '#91cf60'],
                      [100, '#d9ef8b'],
                     [200, '#ffffbf'],
                     [500, '#fee08b'],
                      [1000, '#d73027']]},
           'fill-extrusion-height': {'property': 'popOK',
           'stops': [[100, 10],
                     [100, 100],
                     [200000, 100000]] },
            'fill-extrusion-opacity': 0.8,
            'fill-extrusion-base': 0
           }
});
```

Symbologie graduation de couleur (densité)

Symbologie extrusion 3D de la population

Exemple

#MapboxGL / Symbologie deux variables (graduation et extrusion 3D)



Built with blockbuilder.org

Open

https://bl.ocks.org/mastersigat/2eb5c08efe8fcdce104e74a1da83aacf/9456dbafbf83f73492d53310594cf56666fe03c5

Exemples divers

https://bl.ocks.org/mastersigat

Menu de gestion des couches

Ajouter un menu pour gérer les couches

- Première étape: définir le style (CSS) de votre menu

```
#menu {
  width: 20%;
  Z-index: 1;
  top: 10px;
  right: 20px;
  position: absolute;
  opacity: 0.9;
  font-size: 14px;
  font-family: 'Helvetica Neue', Arial, Helvetica, sans-serif;
}
#menu a {
  border-radius: 5px;
  display: block;
  color: #000000;
  margin: 5px;
  padding: 10px 10px;
  text-align: center;
  font-weight: bold;
  border: solid 2px;
  background-color: #FFFFFF;
  text-decoration: none;
}
#menu a.active {
  background-color: #000000;
  color: #FFFFFF;
}
#menu a:hover:not(.active) {
  background-color: #000000;
  color: #FFFFFF;
}
```

```
<!DOCTYPE html>
<html>
<head>
    <meta charset='utf-8' />
    <title>MapboxGL</title>

<script src='https://api.tiles.mapbox.com/mapbox-gl-js/v0.44.0/mapbox-gl.js'></script>
<link href='https://api.tiles.mapbox.com/mapbox-gl-js/v0.44.0/mapbox-gl.css' rel='stylesheet' />

<style>
#map { position:absolute; top:0; bottom:0; width:100%; }
#menu {
    width: 20%; margin-right: auto; margin-left: auto;
    Z-index: 1; top: 10px; right: 10px; position: absolute;
    border-color: #FFFFFF; background-color: #808080 ;
    font-size: 12px; font-family: 'Helvetica Neue', Arial, Helvetica, sans-serif; }

#menu a {
    display: block; color: #FFFFFF; padding: 8px 16px;
    text-align: center;  font-weight: bold;
    border-style: solid; border-color: #000000;}

#menu a.active { background-color: #CC6600;
    color: #FFFFFF;}

#menu a:hover:not(.active) {
    background-color:  #CC6600;
    color: #FFFFFF;}

</style>

</head>

<body>
<div id='map'></div>

<script>
    // AccesToken
```

Ajouter un menu pour gérer les couches

- Deuxième étape: créer un Div pour votre menu et placer la dans la Div de la carte

```
<div id="menu"></div>
```

```
81      <button id='Rennes2'>Université Rennes 2</button>
82  </div>
83
84  <div id="map"><div id="menu"></div></div>
85
86  <script>
87
88  // Appel de la carte
```

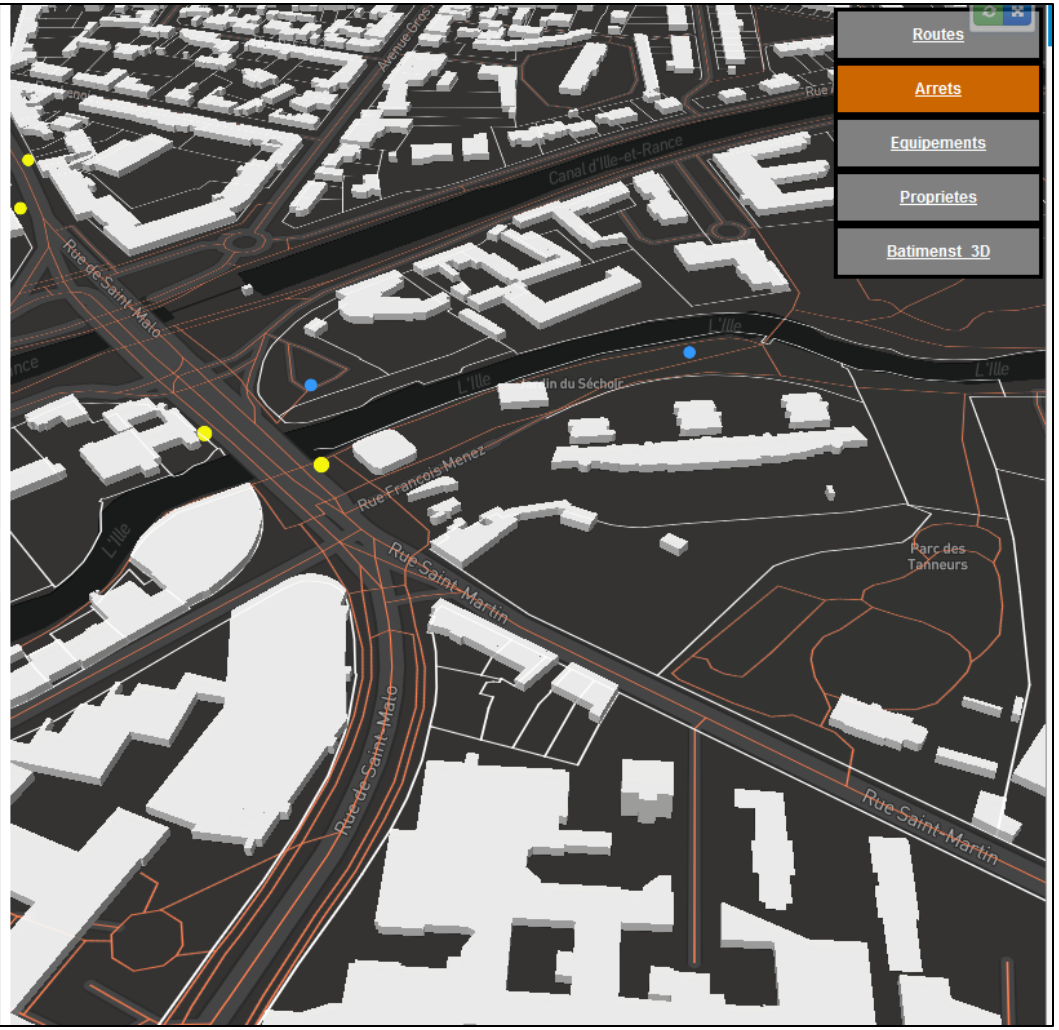
Ajouter un menu pour gérer les couches

- Dernière étape : Ajouter à la fin du script la commande pour configurer votre menu

```
var toggleableLayerIds = ['Routes', 'Arrets', 'Equipements', 'Proprietes', 'Batiments_3D' ];

for (var i = 0; i < toggleableLayerIds.length; i++) {var id = toggleableLayerIds[i];

    var link = document.createElement('a');
    link.href = '#';
    link.className = 'inactive';
    link.textContent = id;

    link.onclick = function (e) {var clickedLayer = this.textContent;
        e.preventDefault();
        e.stopPropagation();
        var visibility = map.getLayoutProperty(clickedLayer, 'visibility');
        if (visibility === 'visible') {
            map.setLayoutProperty(clickedLayer, 'visibility', 'none');
            this.className = '';} else {this.className = 'active';
            map.setLayoutProperty(clickedLayer, 'visibility', 'visible');} };

var layers = document.getElementById('menu');   layers.appendChild(link); }
```

Ajouter un menu pour gérer les couches

```
160
161
162 //Interactivité CLICK
163
164 map.on('click', function (e) {
165     var features = map.queryRenderedFeatures(e.point, { layers: ['Arrets'] });
166
167     if (!features.length) {
168         return;
169     }
170
171     var feature = features[0];
172     var popup = new mapboxgl.Popup({ offset: [0, -15] })
173         .setLngLat(feature.geometry.coordinates)
174         .setHTML('<h2>' + feature.properties.nom + '</h2><h3>'
175     +"Mobilier : " + feature.properties.mobilier + '</h3><p>'
176     +"Accessibilité PMR : " + feature.properties.estaccessiblepmr + '</p>' )
177       .addTo(map);
178 });
179
180 map.on('mousemove', function (e) {
181     var features = map.queryRenderedFeatures(e.point, { layers: ['Arrets'] });
182     map.getCanvas().style.cursor = (features.length) ? 'pointer' : '';
183 });
184
185
186
187 var toggleableLayerIds = ['Routes', 'Arrets', 'Equipements', 'Proprietes',  'Batimenst_3D' ];
188
189 for (var i = 0; i < toggleableLayerIds.length; i++) {var id = toggleableLayerIds[i];
190
191     var link = document.createElement('a');
192     link.href = '#';
193     link.className = 'inactive';
194     link.textContent = id;
195
196     link.onclick = function (e) {var clickedLayer = this.textContent;
197         e.preventDefault();
198         e.stopPropagation();
199         var visibility = map.getLayoutProperty(clickedLayer, 'visibility');
200         if (visibility === 'visible') {
201             map.setLayoutProperty(clickedLayer, 'visibility', 'none');
202             this.className = '';} else {this.className = 'active';
203             map.setLayoutProperty(clickedLayer, 'visibility', 'visible');} };
204
205 var layers = document.getElementById('menu');  layers.appendChild(link); }
206
207
208 </script>
```



Ajouter un menu pour gérer les couches

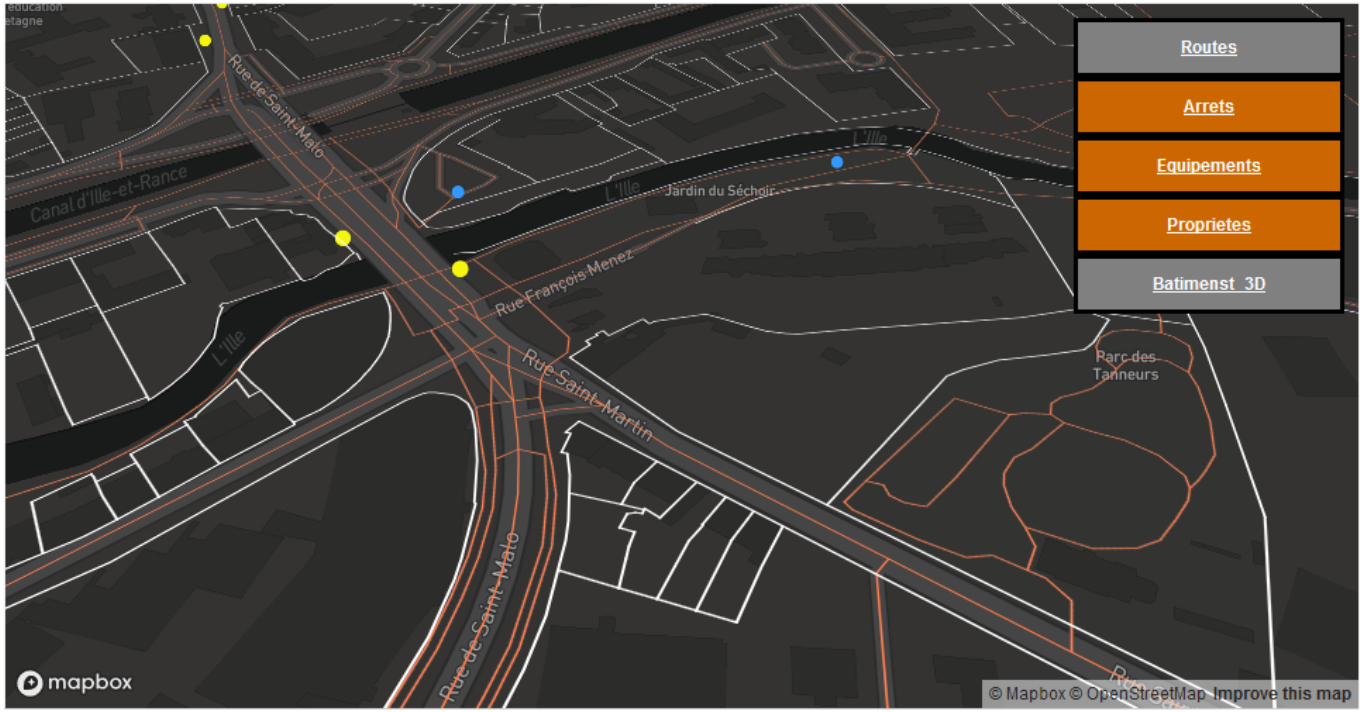
- Pour personnaliser si les couches sont active ou pas il suffit de le préciser dans la commande de visibilité *layout*
  - *visible* = couche active
  - *none* = couche non visible

```
map.addLayer({'id': 'Arrets',
                    'type': 'circle',
                    'source': 'Arrets',
                    'source-layer': 'Bus-5ypx1k',
                    'layout': {'visibility': 'visible'},
                    'paint': {'circle-radius': 7, 'circl
```

```
map.addLayer({'id': 'Arrets',
                    'type': 'circle',
                    'source': 'Arrets',
                    'source-layer': 'Bus-5ypx1k',
                    'layout': {'visibility': ‘none'},
                    'paint': {'circle-radius': 7, 'circle-color': '#f5f60d'}    });
```

Ajouter un menu pour gérer les couches

#MapboxGL / Gestion des couches avec menu



Built with blockbuilder.org Open

http://blockbuilder.org/anonymous/2a2aa65314bd60f6808dd7dc9b3b6241

Ajout d’outils

```
// Ajout boutons navigation a la fin du script

var nav = new mapboxgl.NavigationControl();
map.addControl(nav, 'top-left');
```

```
// Ajout Echelle cartographique a la fin du script

map.addControl(new mapboxgl.ScaleControl({
    maxWidth: 120,
    unit: 'metric'}));
```

Les onglets géographiques

Onglets géographiques

- L'idée est de proposer des boutons pour aller directement à un endroit sur la carte

  - Première étape rajouter une boutons dans la div *map*

```
<div>
        <button id='Gare'>Quartier Gare-Centre</button>
        <button id='Rennes1'>Université Rennes 1</button>
        <button id='Rennes2'>Université Rennes 2</button>
</div>
```

```
</head>

<body>


<div id='map'>
<div>
  <button id='Gare'>Quartier Gare-Centre</button>
  <button id='Rennes1'>Université Rennes 1</button>
  <button id='Rennes2'>Université Rennes 2</button>
</div>
<div id="menu"></div>
</div>

<script>
    // AccesToken
mapboxgl.accessToken = 'pk.eyJ1IjoibmluYW5vdW4iLCJhIjoiY2p
```

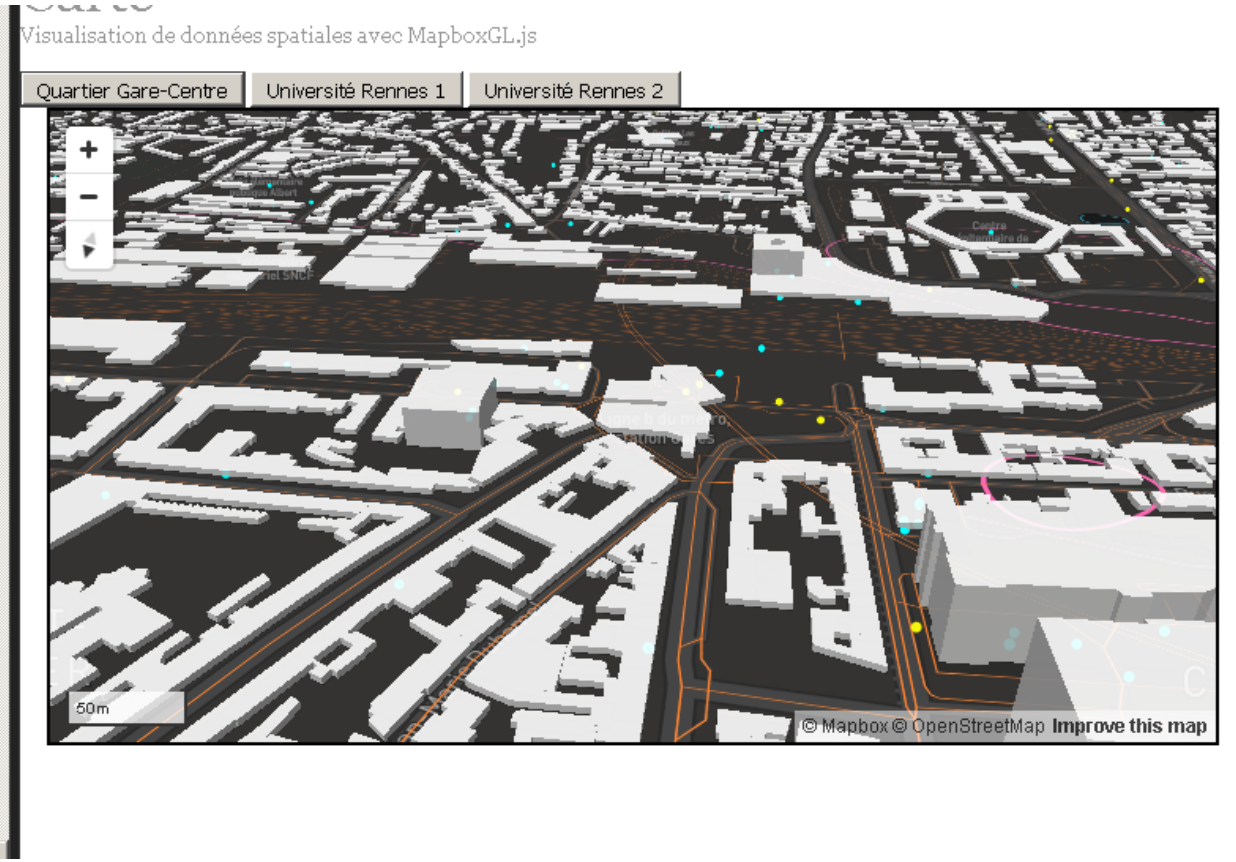
Onglets géographiques

- Seconde étape, rajouter dans le script (à la fin) la configuration des onglets géographiques

```
// Configuration onglets géographiques

document.getElementById('Gare').addEventListener('click', function ()
{ map.flyTo({zoom: 16,
                    center: [-1.672, 48.1043],
                     pitch: 145,
                      bearing: -197.6 });
});
```

Onglets géographiques

```
        .setLngLat(feature.geometry.coordinates)
        .setHTML(feature.properties.nom)
        .addTo(map);
});

map.on('mousemove', function (e) {
    var features = map.queryRenderedFeatures(e.point, { layers: ['Arrets'] });
    map.getCanvas().style.cursor = (features.length) ? 'pointer' : '';
});

var nav = new mapboxgl.NavigationControl();
map.addControl(nav, 'top-left');
map.addControl(new mapboxgl.ScaleControl({
    maxWidth: 120,
    unit: 'metric'}));


// Configuration onglets géographiques

document.getElementById('Gare').addEventListener('click', function ()
{ map.flyTo({zoom: 16,
             center: [-1.672, 48.1043],
             pitch: 145,
             bearing: -197.6 });
});

</script>
```

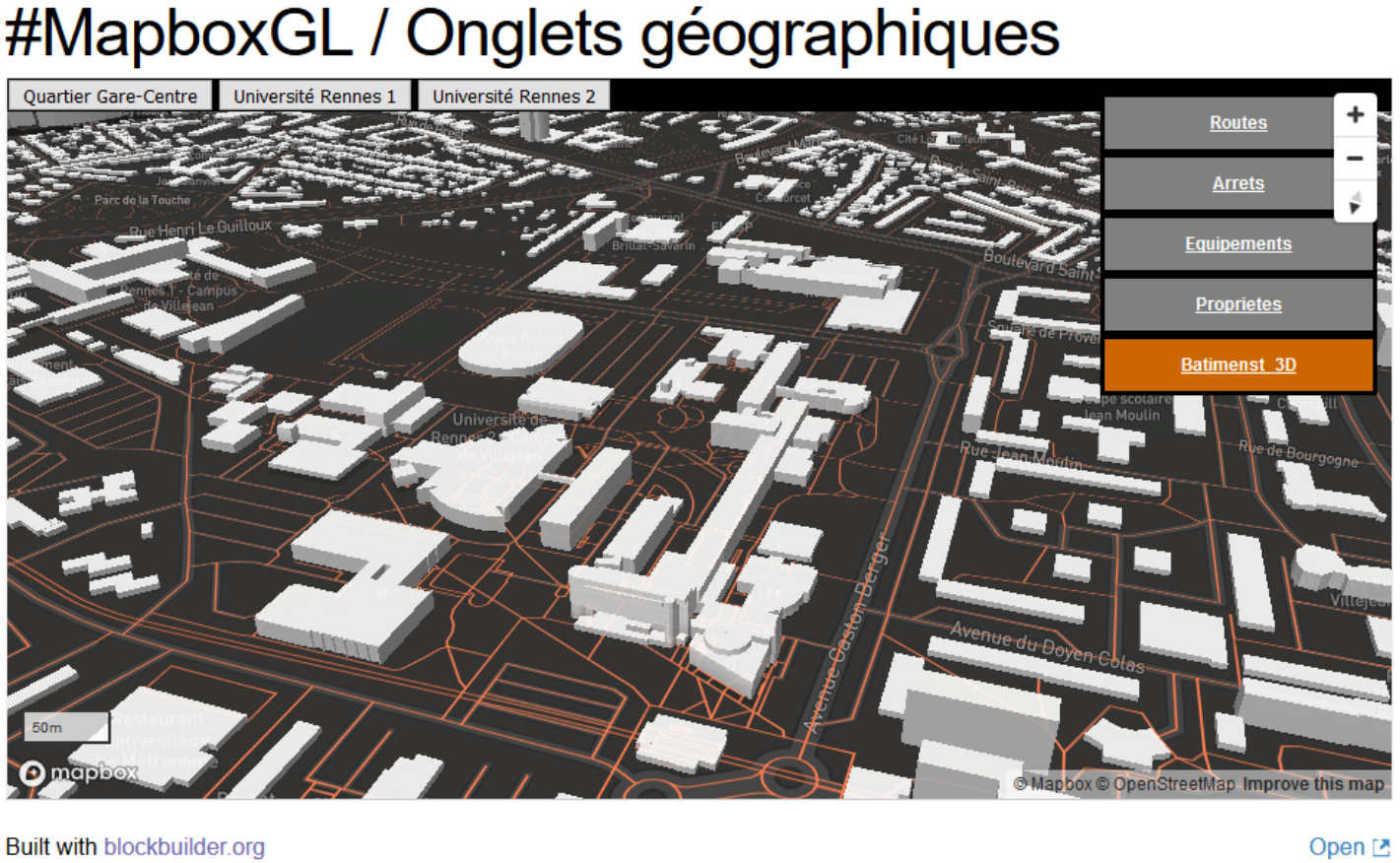


Onglets géographiques

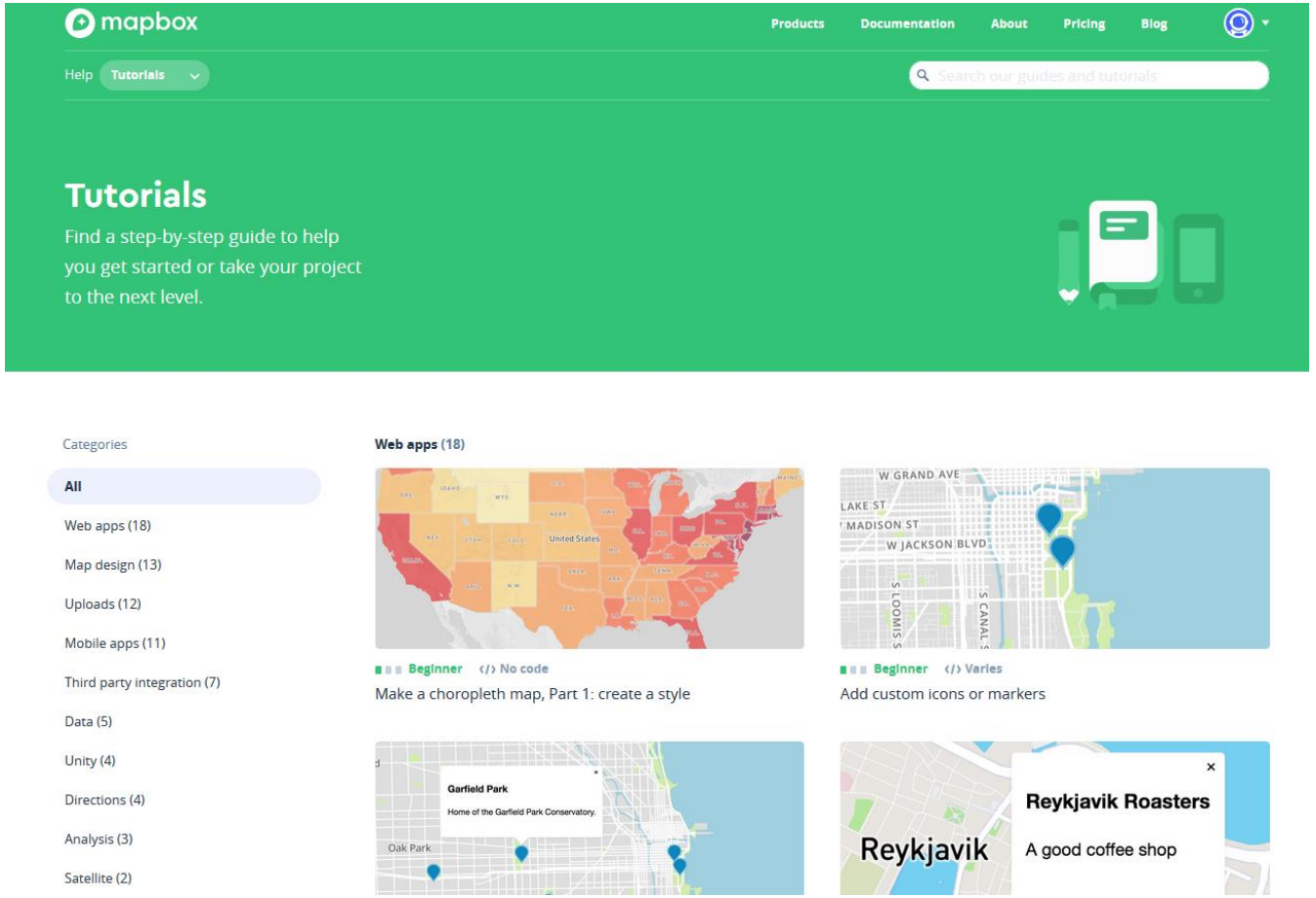
- Configurer les deux autres onglets géographique (Rennes 2 et Rennes1)

```
// Configuration onglets géographiques

document.getElementById('Gare').addEventListener('click', function () {
    map.flyTo({zoom: 16,
    center: [-1.672, 48.1043],
    pitch: 145,
    bearing: -197.6
    });
});

document.getElementById('Rennes1').addEventListener('click', function () {
    map.flyTo({zoom: 16,
    center: [-1.6396, 48.1186],
     pitch: 145,
    bearing: 197.6
    });
});

document.getElementById('Rennes2').addEventListener('click', function () {
    map.flyTo({zoom: 16,
    center: [-1.7023, 48.1194],
     pitch: 45,
    bearing: 50
    });
});


</script>
```

Exemple



https://bl.ocks.org/anonymous/ced9aaa2574f2709ec7f0e25dbf5e84b/96d8ff9ffa7ee1f7f849ed0c999897dfddd61982

Tutoriels

https://www.mapbox.com/help/tutorials/