Geospatial student activity

Royal Geographical Society with IBG

This task is created by geographer, **Momin**. Momin is a geospatial consultant in the space industry.

He studied g**eography** at university and has a Masters in sustainable urban development. Momin chose geography because it was '*essential for my career as it gave me an early introduction to GIS and remote sensing, which is rarely offered as part of other degree programmes.*'

Momin's task is based on the work he does using GIS and satellite imagery to inform humanitarian response to disaster and conflict.

Data acquisition and analysis exercise

Satellite Images © Maxar technologies 2022

Example Scenario:
The 2020 Beirut explosion led to severe infrastructure damage as well as many civilians in need of urgent medical support

Only a couple of medical centres were functioning due to power cuts leaving multiple areas lacking any access to medical support

Question
Which areas / how many structures in Beirutare more than a 6-minute drive time fromany medical centres?

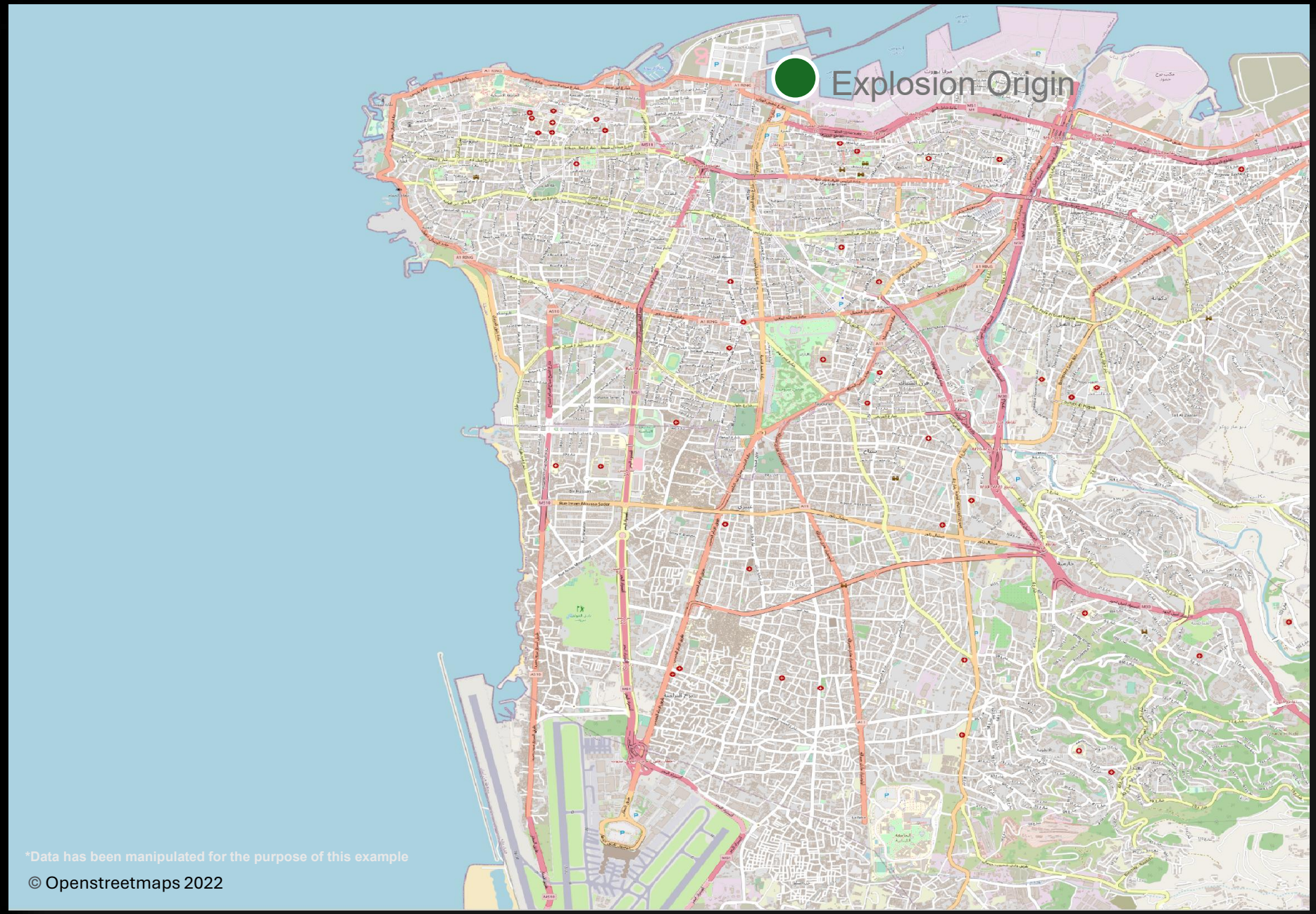
We start by adding a basemap layer

There are diverse range of basemaps available on both QGIS and ArcGIS

For this example, we have chosen to use an OpenStreetMaps (OSM) basemap

TASK – What 3 key datasets do you think will beneeded for us to do ouranalysis to answer thequestion below

Which areas / how manystructures in Beirut aremore than a 6-minute drivetime from any medicalcentres?



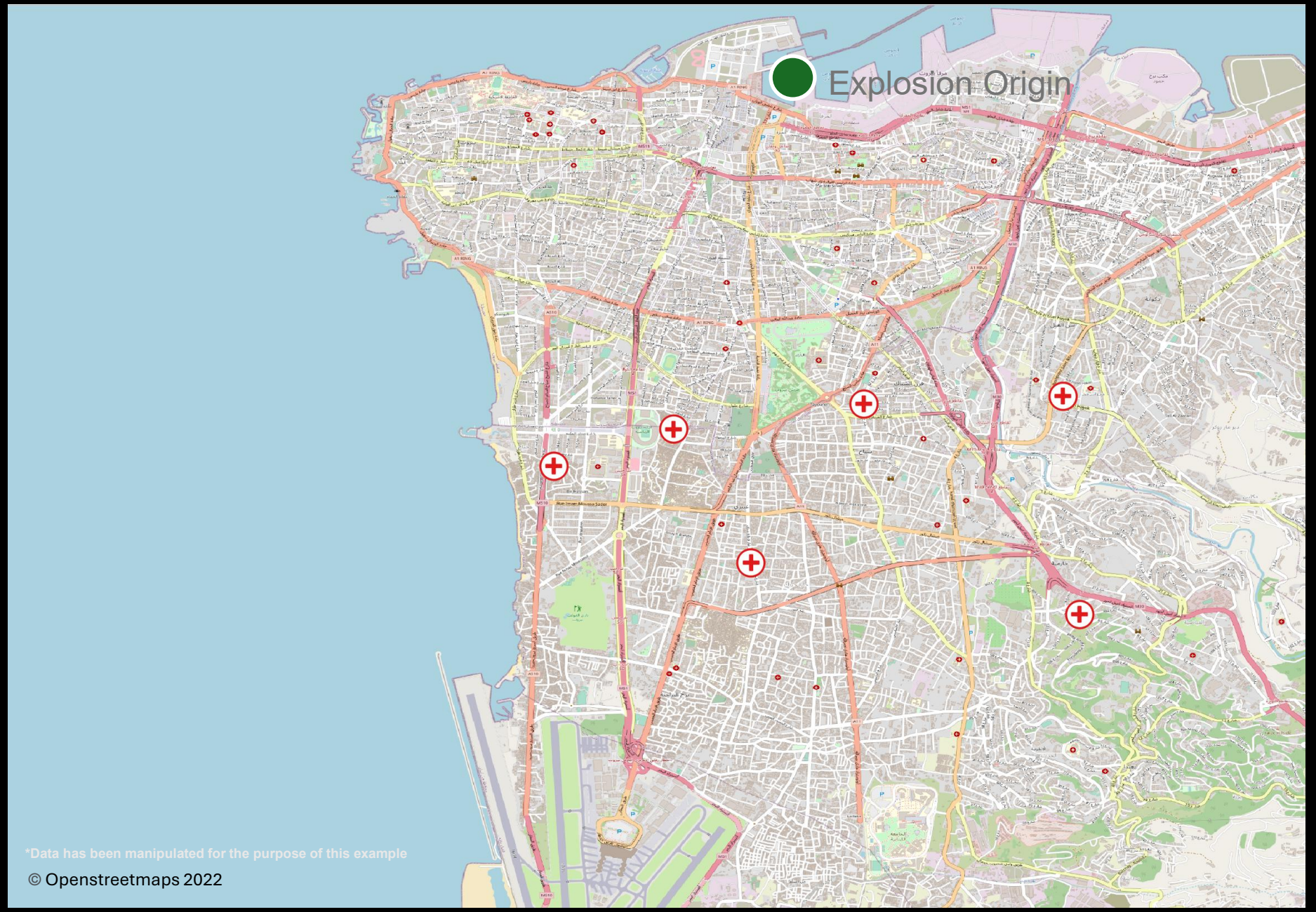
Answer 1

1. Hospitals

For this example, we use a study by **Kerbage et al 2021 that reported that most hospitals** near the explosion were heavily damaged as well as many areas across Beirut facing power cuts

(gather information from anywhere, news etc.)

Taking Kerbage's study into consideration, for this example, we will **only use six existing hospitals in Beirut that we will assume are able to function** effectively

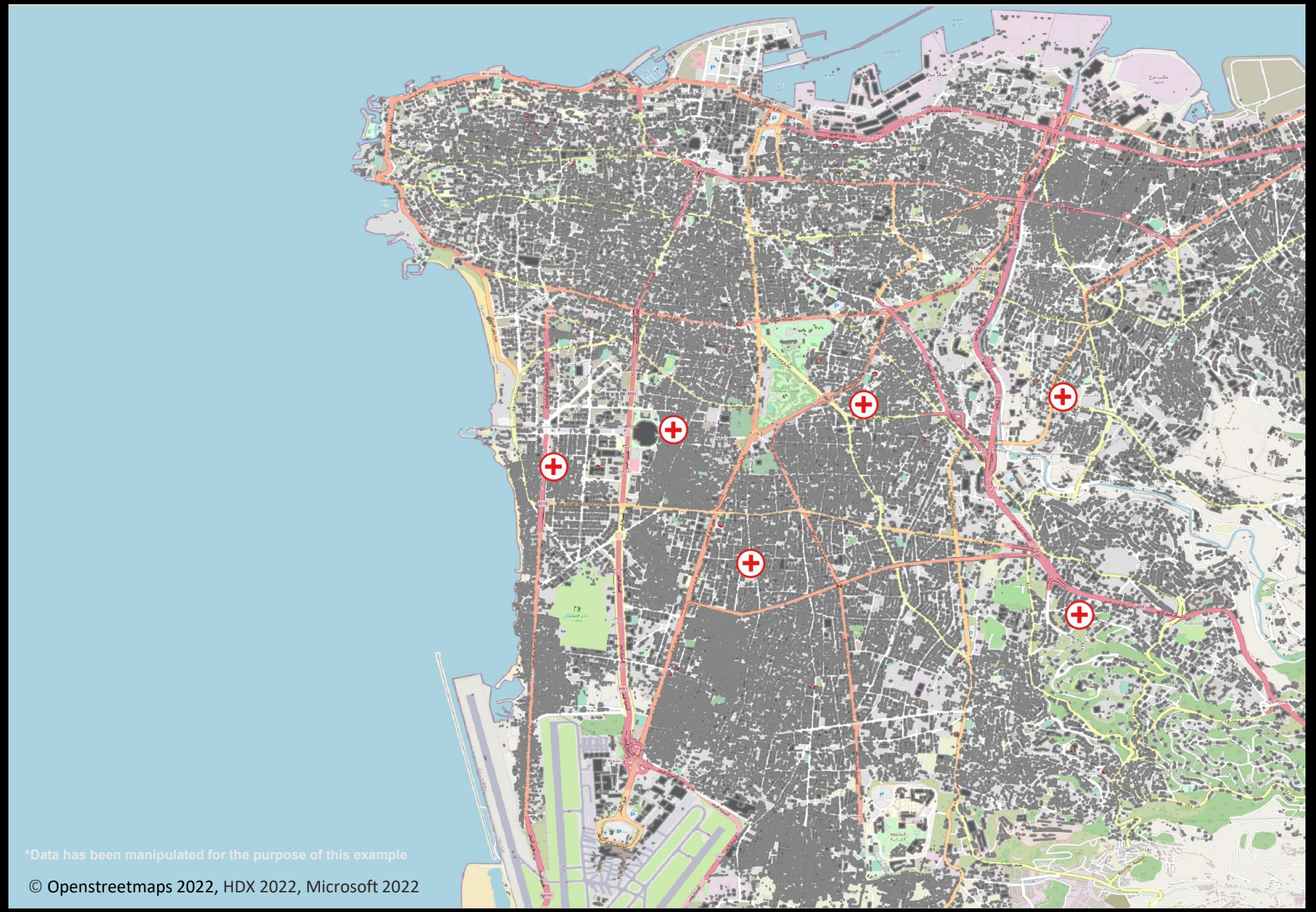


Answer 2

2. Buildings

We then add our Lebanon layer that contains all the structure data for Lebanon we acquired from Microsoft global footprint data – it uses machine learning and satellite imagery to create global building footprints

We clip the layer so that we only have the structure data for Beirut

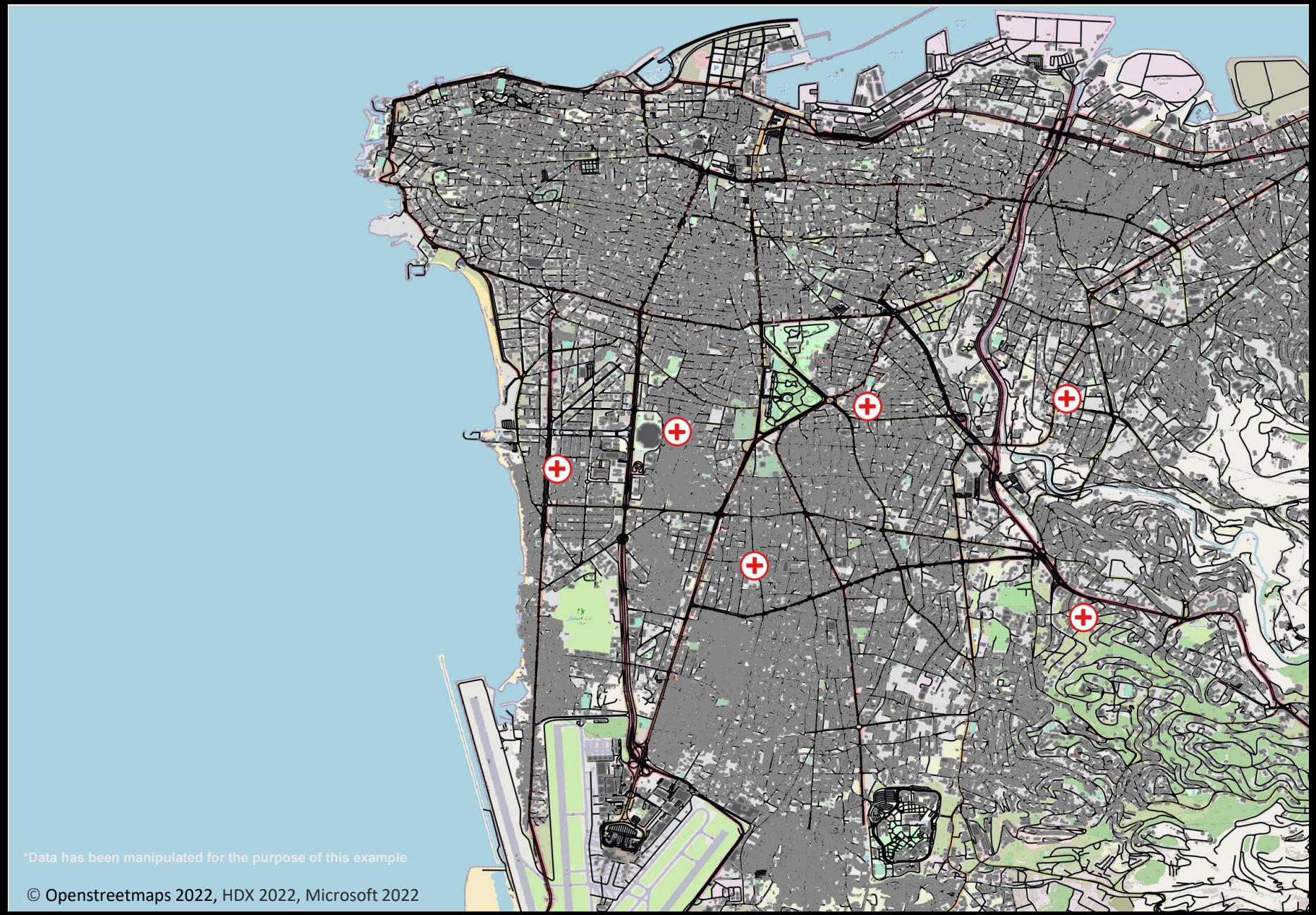


Answer 3

3. Roads

Our next step is to add the road network from HDX (a humanitarian database) by the humanitarian OSM team

This will be key when for our analysis



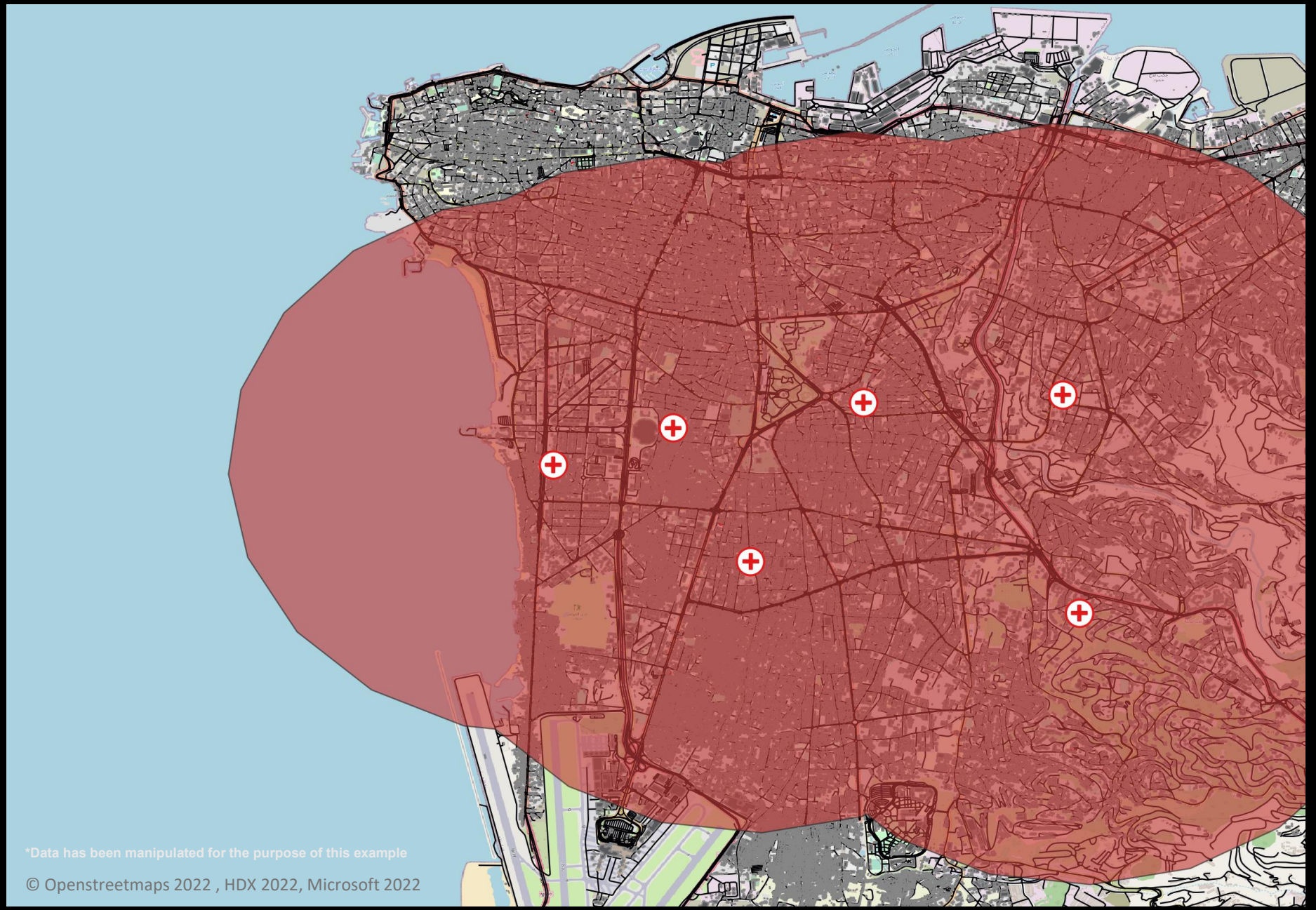
Buffer zone

Using **Lupa et al 2021** study we take the average **ambulance speed to be 20mph-40mph (We'll assumed slowest in busy cities)**

Question
How many meters can each ambulance travel in 6 minutes to reach emergencies?

Answer

See next slide for answer



Buffer zone

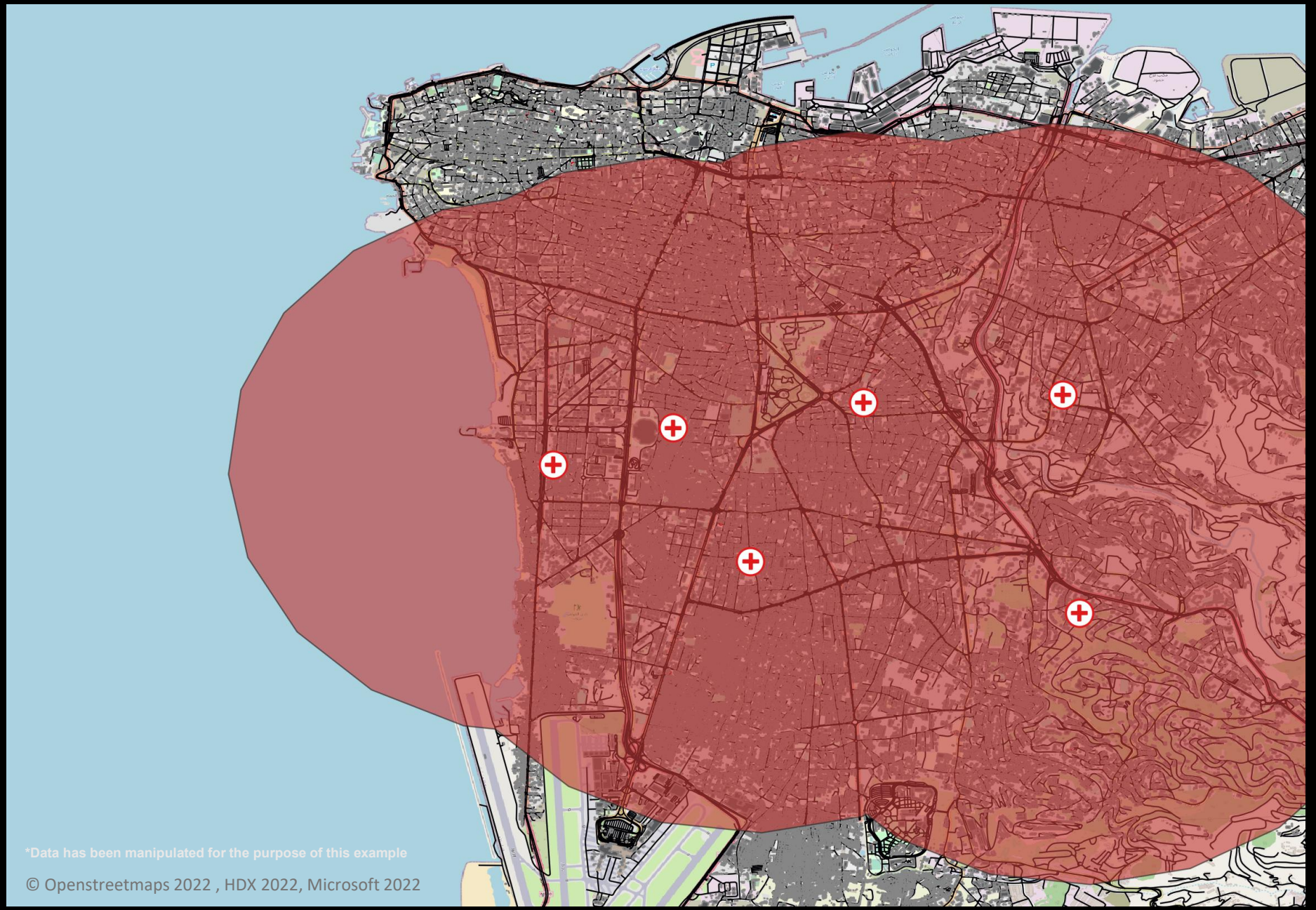
Using **Lupa et al 2021** study we take the average **ambulance speed to be 20mph-40mph (We'll assumed slowest in busy cities)**

Question
How many meters can each ambulance travel in 6 minutes to reach emergencies?

Answer
We can create a buffer around each ambulance point of **3218 meters** that gives us the visualisation present to our right

However, this is not accurate at all as it does not take into account the road network

(buffer function in both QGIS and ArcGIS)



Network buffer

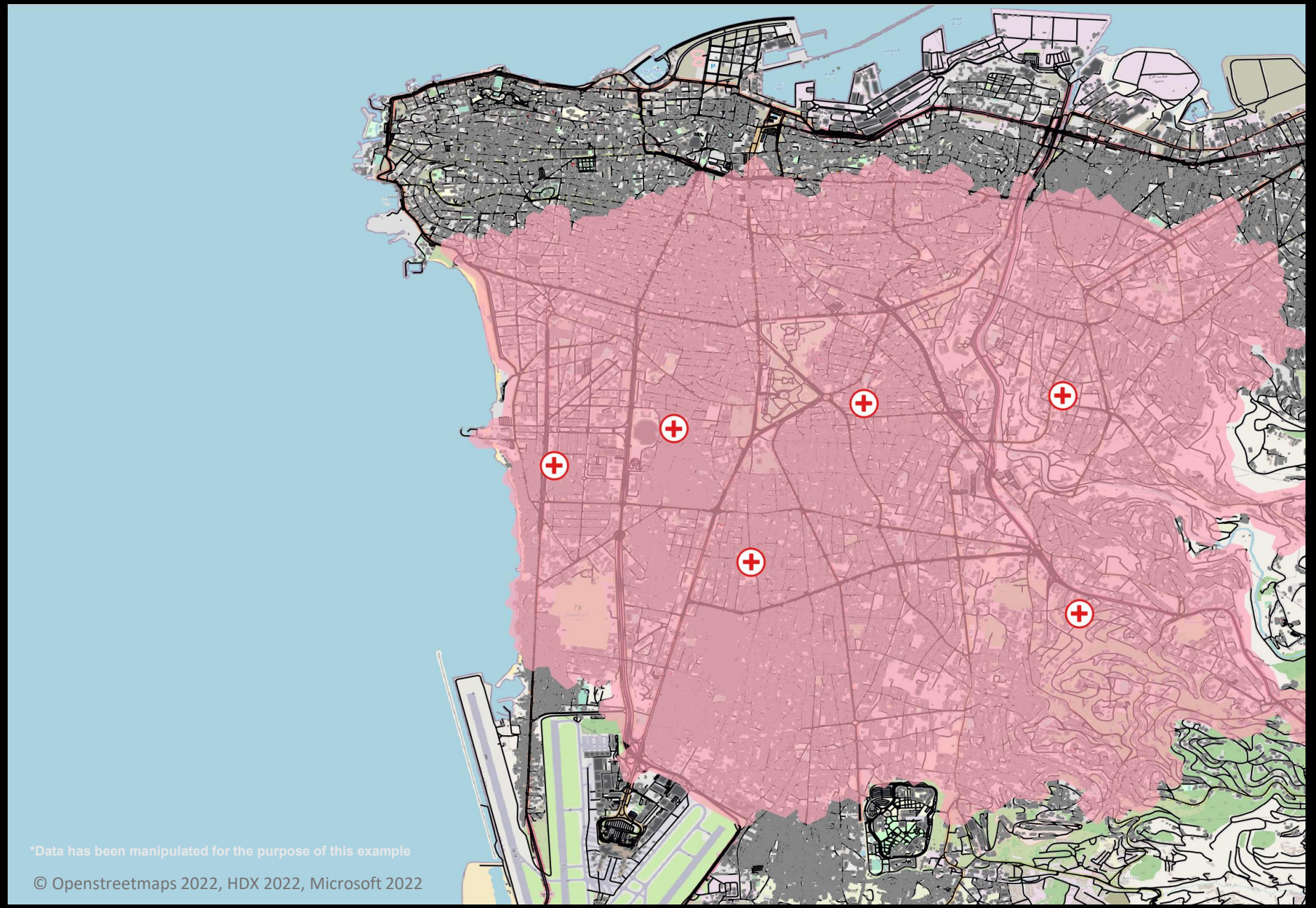
By performing a network analysis, we can use the road layer as a reference for the buffer

The prior visualisation overlapped with areas that could not have been reached by ambulances when taking roads into account. This would have assumed that people in the defined radius would have been able to get access to medical attention

This provides an accurate visualisations of the ambulance's travel journey

Network analysis – ArcPro

Service area - QGIS



Export

Finally, we can select and highlight structures that fall outside the ambulance 6-minute drive time

We now have crucial data we can use during a humanitarian emergency

This 'allows us to reshape our humanitarian efforts – feed into better outcomes'

It allows us to ask different questions – think of the problem in a different way

'select by location'