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Earth at Night- EUROPE

Age group: 10-16

Topics: light pollution, art, hands-on activity, observation

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Observing Night Sky: Step into the enchanting canvas of Europe's night sky as revealed by satellite imagery. This report unveils the vivid interplay of artificial lights, showcasing the impact of human activity on the nocturnal landscapes. Join us in exploring the beauty, consequences, and ecological implications of Earth's illuminated nights.

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ITALY

Complete Italy



- The coastal-line looks like it was drawn by a yellow marker, as there are so much light sources, most likely it has something to do with the tourism on the coast
- Sicily is heavily farmed, as when you look at maps at daylight it looks like very geometric figures / geometric patterns as there are lots of fields, between the fields are the towns and cities which are represented by the yellow dots



Source:

Mountain range of the Apennines is very good visible, especially Appennino settentrionale (northern Apennines) are really dark in the picture, but they range through whole Italy to the south and are quite dark



National parks are quite obviously visible in the picture, especially Sila, which is a mountain-massive in Calabrien, is really dark in the picture, there is also the Nationalpark Sila (Parco Nazionale della Sila) located

Also the *Nationalpark Aspromonte (Nazionale dell'Aspromonte)* in the very southern part of calabrien is very dark and obvious, it is about 75 ha

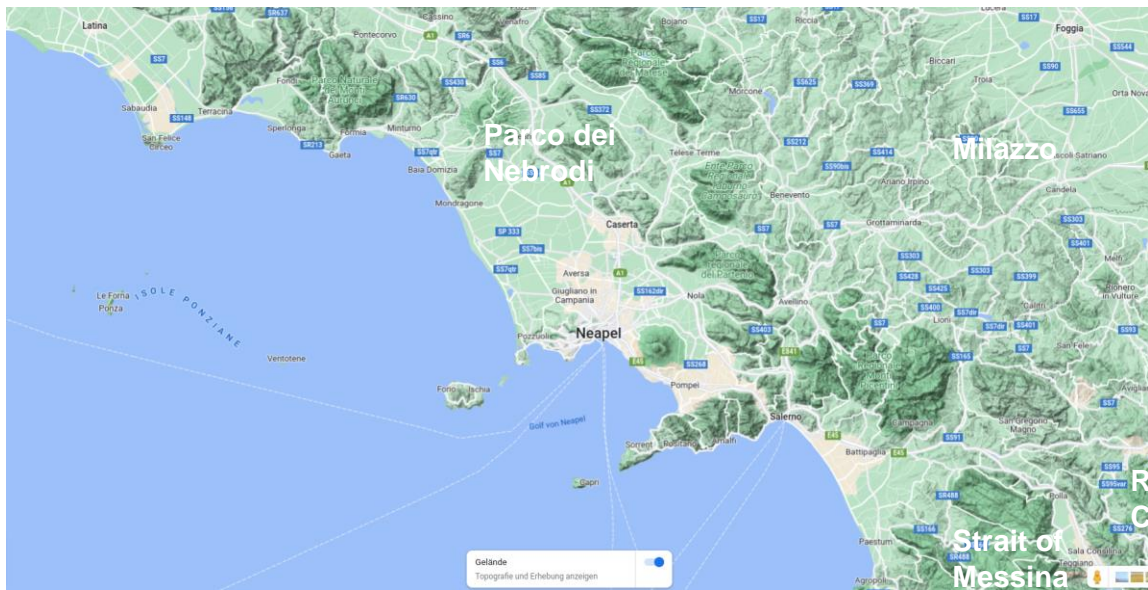
➡ Importance of national parks, nature reserves for keeping places with minimal light pollution

- Light-pollution in Italy is about 40% above the European average (citation needed)

NEAPLES WITH VESUVIO



- Naples with Vesuvio
- Older mercury vapor lamps produce greenish light, newer ones can be colour-corrected and produce white light (Source: <https://swz.it/helle-nacht/>)
- E.g. since 2015 in Germany they must fulfill a certain energy-efficiency and must not be used otherwise, alternatives are metal-halide lamps or LEDs
- Dark regions represent again mountain regions and National parks, compare with figure below



Source: Google Maps, 2022

CATANIA WITH ETNA



- Etna and Catania, again the difference of the greenish and yellow light is quite obvious, as the green represent old mercury lamps
- Dark region above *Parco dell'Etna* is a nature reservation region, called *Parco dei Nebrodi*

WESTERN EUROPE



- If you zoom in very much you can see a little dark area between Le Havre and Rouen, which is the *Parc Naturel Régional des Boucles de la Seine*, which is a natural reservation area.

London and Paris are very bright, but compact, in comparison the cities of Belgium are not so sharp, the lighted motorways make the whole land-area very bright and therefore the surface-brightness is most likely higher.

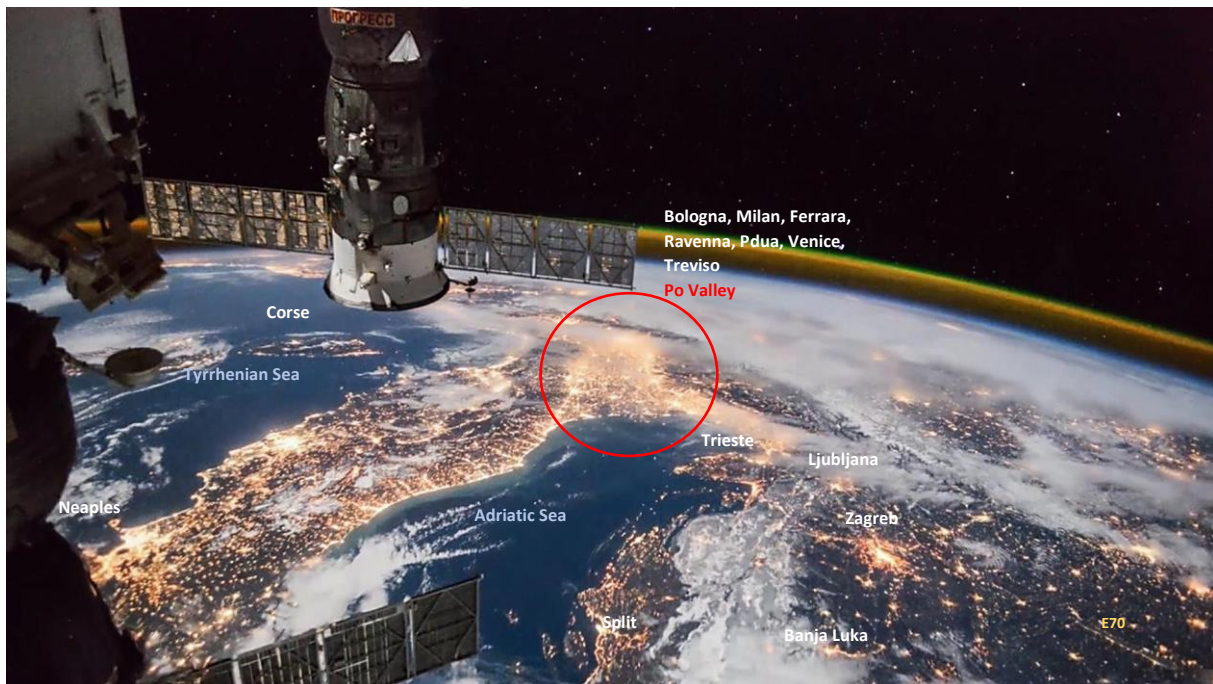
EUROPE



From left to right: Northern Italy with Triest-Mailand-Verona-Venice, Main-Alps, then Austria

- Interestingly northern of Salzburg it is quite dark, as it is where the VEGA Observatory is located
- Why is the image not completely sharp? – Light sources are not punctual, but short lines/ellipses – this is due to the relative velocity of the ISS to the earth
- “The night is dark and full of terrors” – most likely all young people know this cite, but looking at this picture of middle Europe during the night, it is not quite dark at all
- Fun fact: COY03 = Soyuz in Russian (Cyrillic alphabet) which is a series of spacecraft with has been in service since the 1960s ([https://en.wikipedia.org/wiki/Soyuz_\(spacecraft\)](https://en.wikipedia.org/wiki/Soyuz_(spacecraft)))

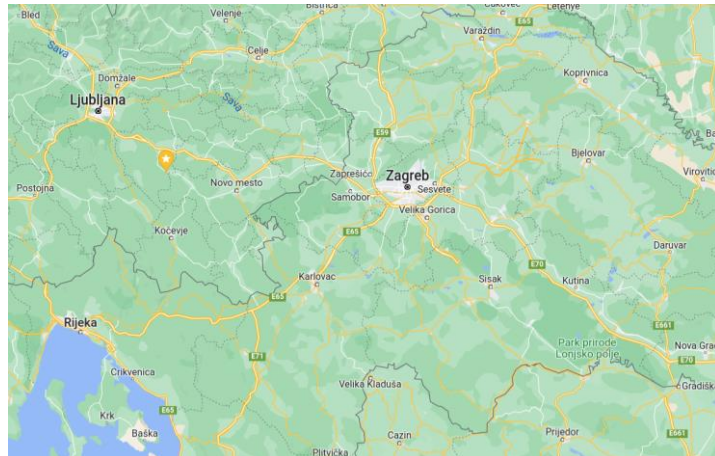
ITALY-SLOVENIA-CROATIA



- Compare Italy with Bosnia and Herzegovina or Serbia; it is more rural with less tourism. E.g. the coast of Croatia, where the people are by trend wealthier due to much more tourism is comparable to Italy
- Slovenia is almost 60% covered by forest and with that the 3rd most forested country in Europe (Source: <https://www.slovenia.info/en/things-to-do/discover-nature>)

Website ,Forest area (% of land area)' https://data.worldbank.org/indicator/AG.LND.FRST.ZS?locations=EU&most_recent_value_desc=true

Motorways are also visible as bright lines compare to the following picture:

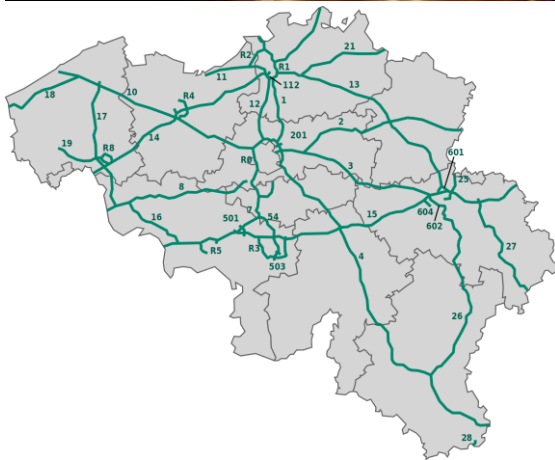


Source: Google Maps, 2022

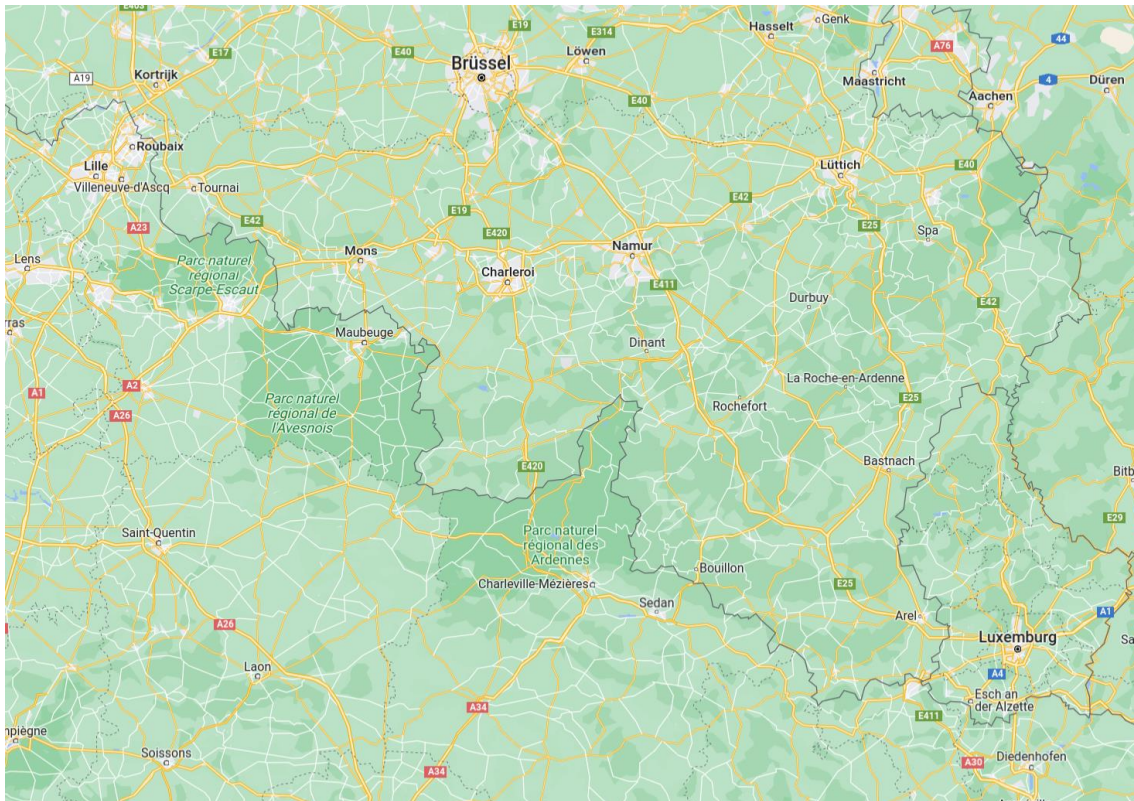
BELGIUM



- Clearly the bright Belgian motorways catch ones eye



- Around 300k lamps on 150k masts enlighten the motorways and speedways of Belgium, they were introduced with the goal to ensure a better safety on the streets and therefore less (fatal) crashes. (<https://phys.org/news/2011-07-belgium-highways-space-.html>)
Due to the energy crisis now many of the lights are turned off. (<https://www.aa.com.tr/en/europe/belgium-turning-off-public-lights-amid-energy-crisis/2689837>)
- W-O most likely E40 (European street 40), starts in Calais in the English Channel in France and ends in Ridder near Russia's border in Kazakhstan and is with 8000km the longest road in the European E-road network
- Only from the strong (and different) lights it is nearly possible to make out the borders of Belgium; the strong difference is even further enhanced between the French and Belgian border due to several dark national parks on the french side



Source: Google Maps, 2022

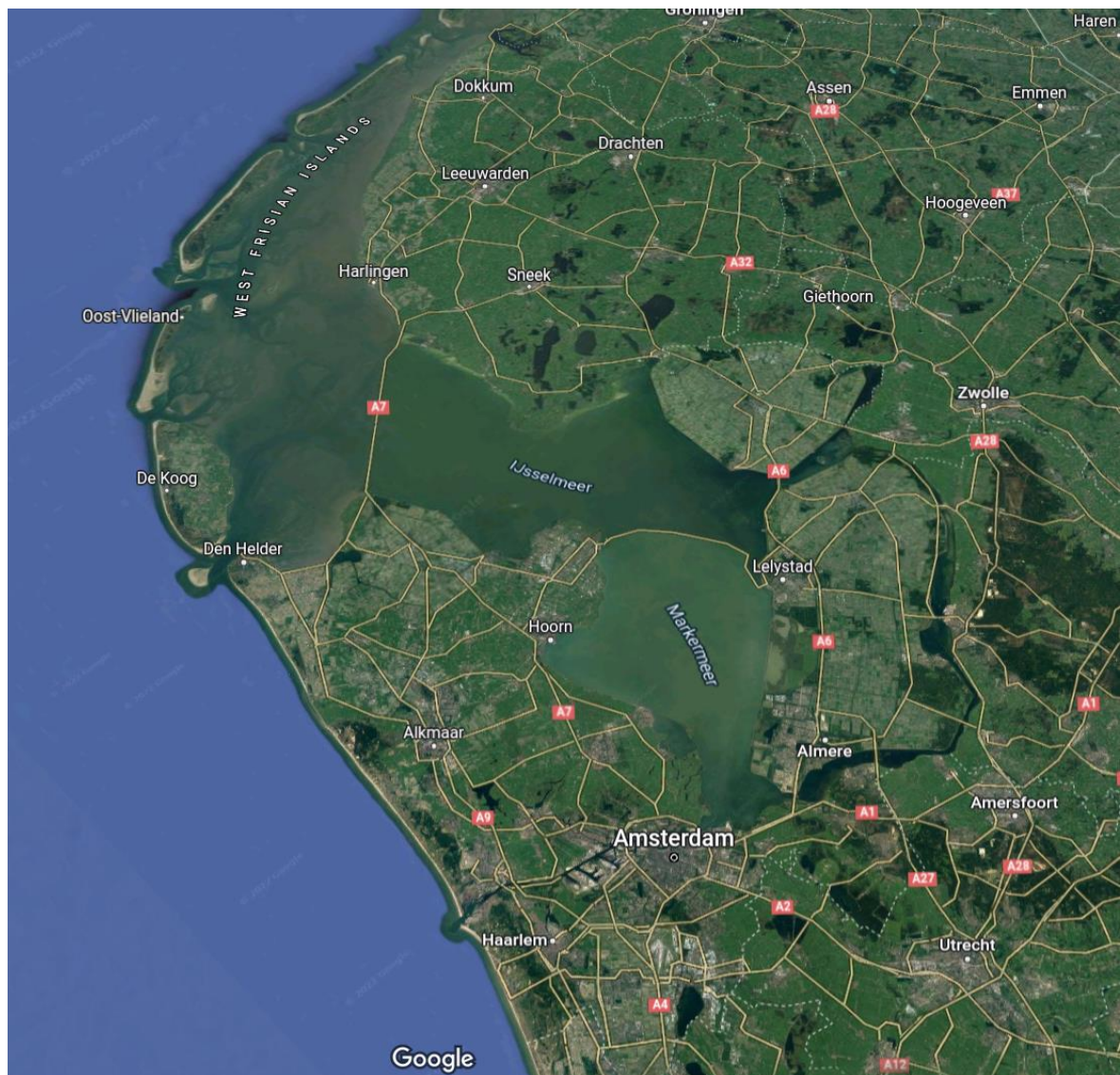
- IJsselmeer and Markermeer are visible on the picture as very dark regions, this are lakes which arose from the Zuiderzee. To gain more land several dikes were constructed and from that several lakes came into existence (IJsselmeer, Veluwemeer, Gooimeer, Markermeer, Drontermeer, Eemmeer und Ketelmeer).

<https://de.wikipedia.org/wiki/Zuiderzee>

- There is also a clear difference in the color of the lights of the Netherlands and Belgium

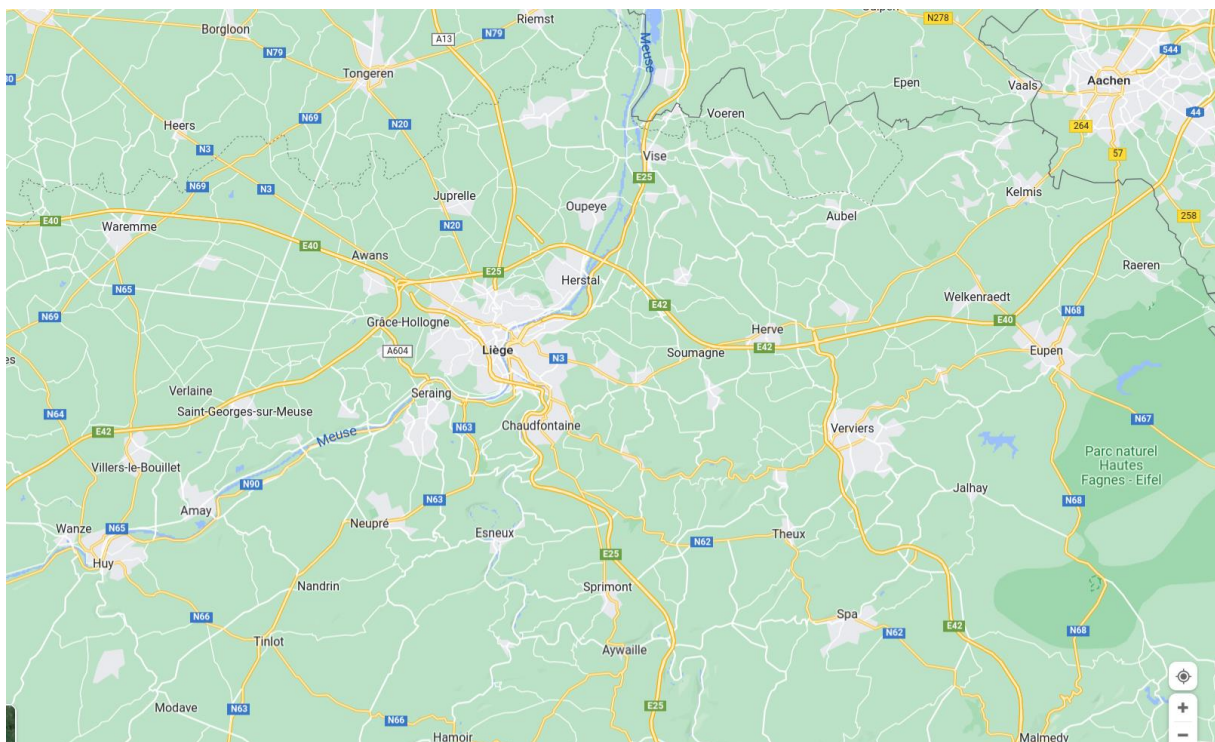


Zeeland is rather dark, which is the westernmost province of the Netherlands and exists of several peninsula, whereof large parts of Zeeland are below sea-level.

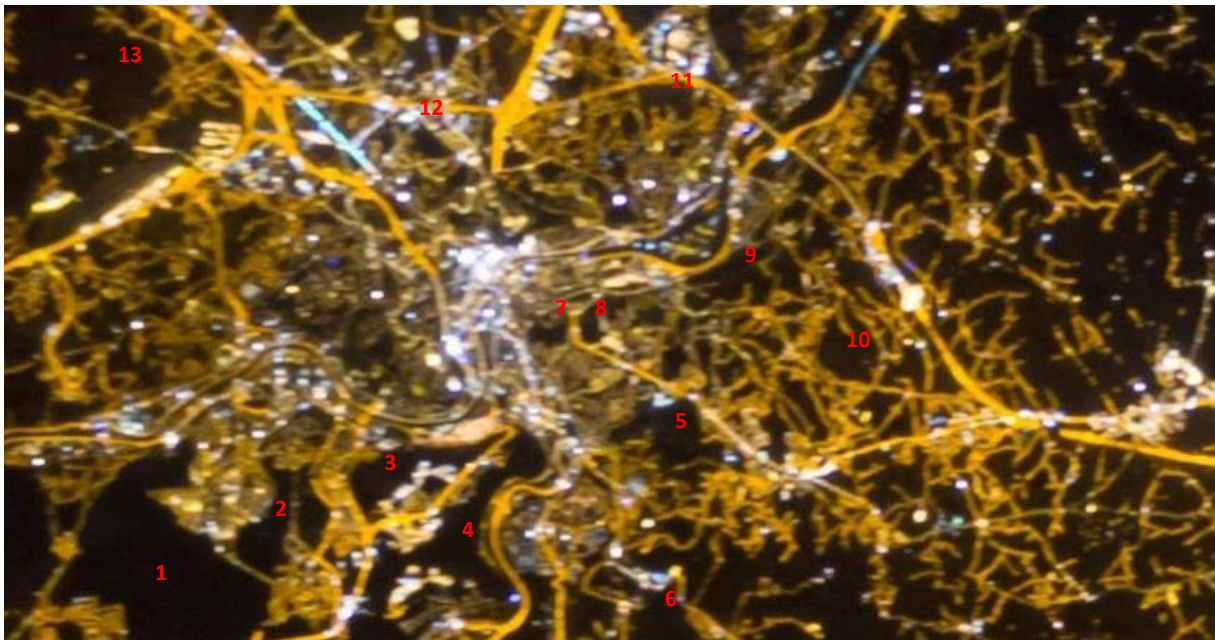


Source: Google Maps, 2022

LIEGE



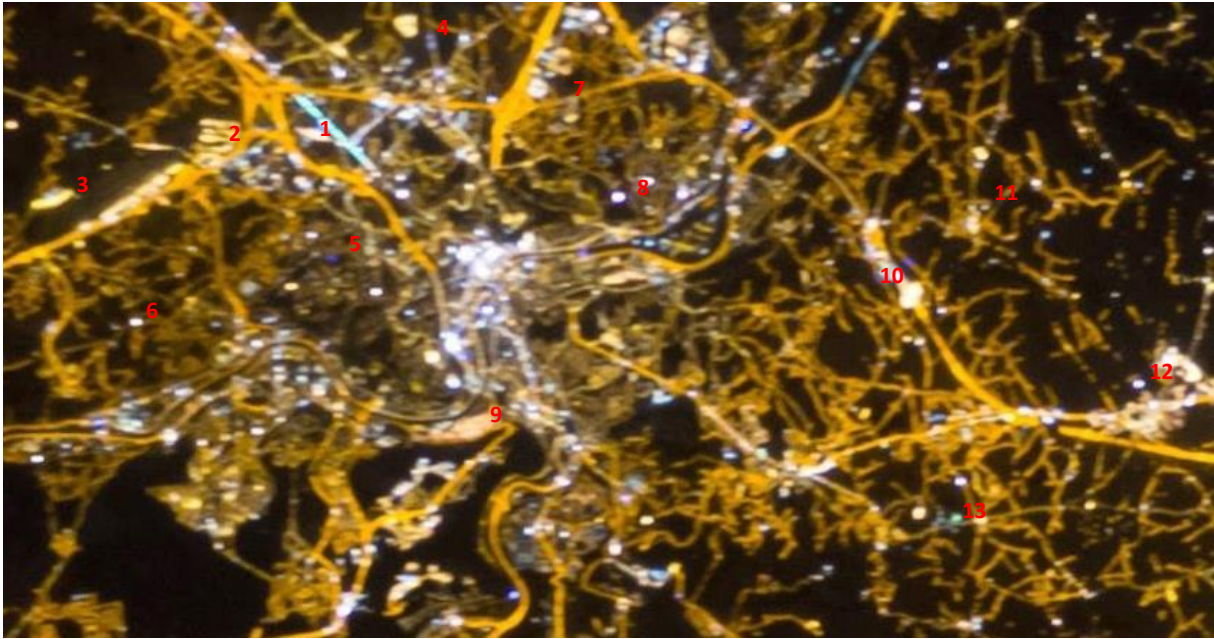
Source: Google Maps, 2022



DARK REGIONS

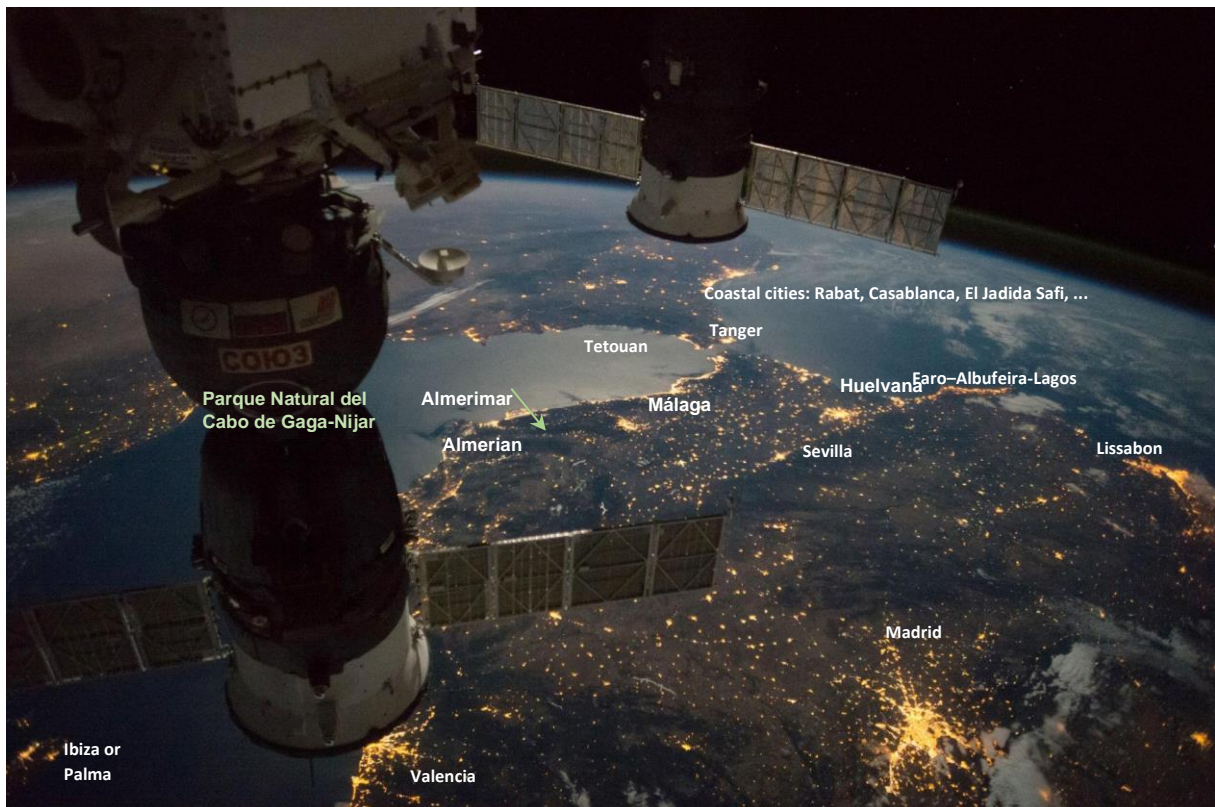


Source: Google Maps, 2022



BRIGHT REGIONS

SPAIN



- Fun fact: СОЮЗ = Soyuz in Russian (Cyrillic alphabet) which is a series of spacecraft which has been in service since the 1960s ([https://en.wikipedia.org/wiki/Soyuz_\(spacecraft\)](https://en.wikipedia.org/wiki/Soyuz_(spacecraft)))
- The Sierra Nevada is quite dark visible, and the city Granada has therefore a quite sharp edge. Sierra Nevada is Spanish and means, snow-covered mountains', which is with 3482m the highest mountain range on the Iberian peninsula.



Source: Google Maps, 2022



- Mountain regions are very dark, also very good visible near Valencia, where it is quite dark. In this region the land is hilly and covered with trees. Fun fact: Valencia has an extremely high percentage in organic farming with ~80%. (<https://www.theolivepress.es/spain-news/2021/12/16/how-spains-valencia-region-became-the-leader-in-organic-farming/>)
- The Strait of Gibraltar is very pronounced, which isolates the Iberian peninsula of Africa
- El Ejido (Provincia de Almería) is surrounded by greenhouses, this city is also very bright visible on the picture, as well as the coastal city Almerimar



- La Mancha (https://de.wikipedia.org/wiki/Kastilien-La_Mancha) is a province in central Spain, where for e.g. the largest wine production region of Spain is located this whole province is really good visible as in Italy very intense farming and punctual condensed



BERLIN



- 1) Alexanderplatz
- 2) Volkspark Hasenheide (li) – Columbiadamm – Tempelhofer Feld (re)
- 3) Julius Leber Barracks: this are barracks; it is very interestint, that it seems as the lightning if different than in the rest of Eastern Berlin; directly under the barracks is the airport Tegel, which is extremely bright; in contrast the runways, west of it, are rather dark and nearly invisible.
- 4) ? (bright)
- 5) ? (bright)
- 6) Betriebshof Indira-Gandhi-Straße BVG : Train depot
- 7) BVG Betriebshof Marzahn = Transit stop of the Berlin public transport services, it is likely, that due to safety aspects it needs to be lightened permanently
- 8) Zossener – Landsberger Straße, as an example of very bright street lights
- 9) Airport Berlin Brandenburg (BER) "Willy Brandt"
- 10) Rummelburger lake & river Spree



- 1 Brandenburg Gate**
- 2 Memorial to the Murdered Jews of Europe**
- 3 Zoo**
- 4 Park am Glasdreieck and Viktoriapark**
- 5 Hofjägerallee**
- 6 Spreebogenpark, German Bundestag (parliament), Plaza of the Republik**
- 7 Alexanderplatz**
- 8 Volkspark Hasenheide (li) – Columbiadamm – Tempelhofer Feld (re)**

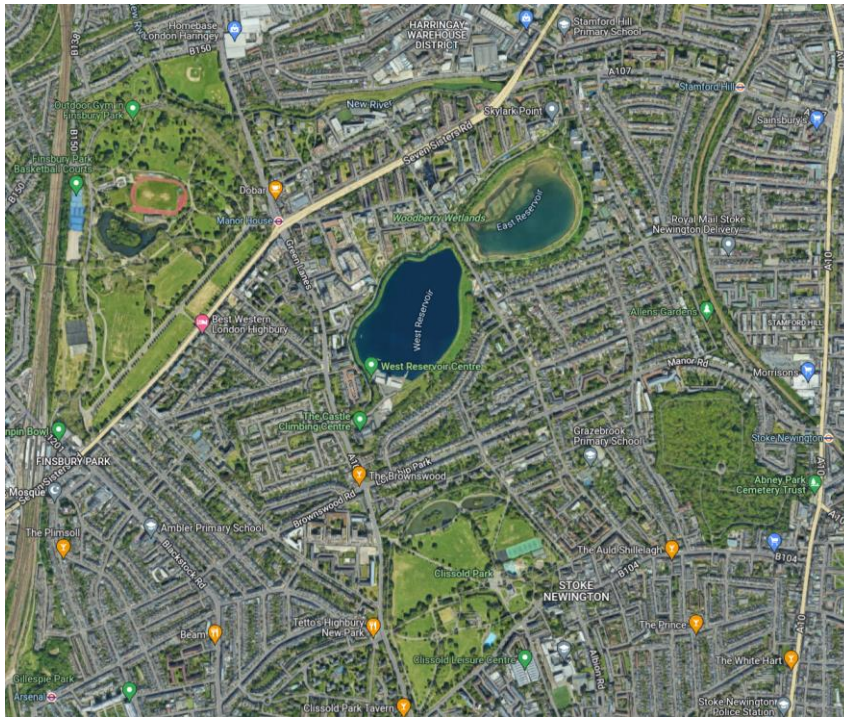
- Although the Berlin Wall was opened in 1989, the difference of Eastern and Western Berlin can still be seen very clearly
- Eastern part: mostly sodium-vapor lamps, which have a warm yellow-orange tone
- Western part: mercury-vapor lamps and fluorescent lamps which produce typical greenish and cool white light
- Aspiration for unification and the use of white LED light but this will need some more time to happen (<https://www.businessinsider.com/divide-between-west-east-berlin-from-space-today-2019-11>)

LONDON



- 1) Themse
- 2) Greenwich Park with the Prime Meridian
- 3) Battersea Park
- 4) Hyde Park: big park with bathing facilities and boat trips (and memorial fountain of princess Diana)
- 5) Regent's Park
- 6) Hampstead Heath: green recreation/health resort with bathing facilities and woods

- 7) Multiple parks: Finsbury Park (left), Woodberry Wetlands (right), Clissold Park (left below), Abney Park (right below)



Source: Google Maps, 2022

- 8) Victoria Park: 84 ha victorian park with seas and fountains; oldest public park of London
- 9) Walthamstow Wetlands, London Wildlife Trust: urban nature reserve with 10 water reservoirs
- 10) Wanstead Park, Wanstead Flats: open area with scientific use and 58 mini football fields, Wanstead Golf Club
- 11) Richmond Park: spacious compound park with hunting ground from the 17th century
- 12) Brockwell Park (left), Dulwich Park (right)
- 13) ? (bright)
- 14) ? (dark)
- 15) ? (bright)
- 16) ? (bright)

London City Center zoom in



1) Canary Wharf near the Isle of Dogs:

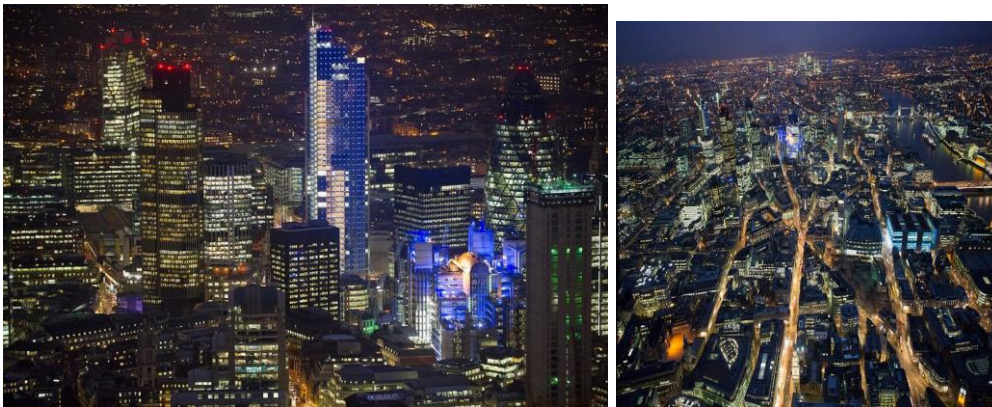


Source: Google Maps, 2022



Source: https://www.tripadvisor.co.uk/LocationPhotoDirectLink-g186338-d1422087-i28778755-London_Showboat-London_England.html

- 2) ? (bright blue lights)
- 3) ? (bright blue lights)
- 4) New Cross Gate Railway Station
- 5) ? (bright light, left of the number)
- 6) Bank and City of London



Source: <https://www.theatlantic.com/photo/2012/05/views-from-the-night-sky-london-and-the-uk/100298/>

“Views From the Night Sky: London and the U.K.”

- 7) London Waterloo Station: Biggest Railway Station of the Great Britain
- 8) London eye (purple light)
- 9) ? (yellow/white light above number)
- 10) Buckingham Palace
- 11) ? (bright greenish light)

- 12) Crowne Plaza London Kings Cross, an IHG Hotel (green light)



Source: <https://www.trip.com/hotels/london-borough-of-camden-hotel-detail-2196192/crowne-plaza-london-kings-cross/>

Below parking lot and mail center, which has a bright yellow light



Source: Google Maps, 2022

- 13) Crossroad of A1 (N), City Road (W-E), St John Street (S), Goswell Road (S-E)
- 14) Ontario Point, Canada Water

London City Center Bridges



1 Tower of London

2.1 Tower Bridge

2.2 London Bridge

2.3 Cannon Street Railway Bridge (R)

2.4 Southwark Bridge Bridge (C+P – tunnel below)

2.5 Millennium Bridge (P)

2.6 Blackfriars Bridge – bridge of the 18th century (C+P left; R right)

2.7 Waterloo Brücke

2.8 Hungerford Bridge (P)

2.9 Westminster Bridge

2.10 Lambeth er Bridge (C+P); built in 1930

2.11 Vauxhall Bridge; monument steel street bridge of the early 19th century,

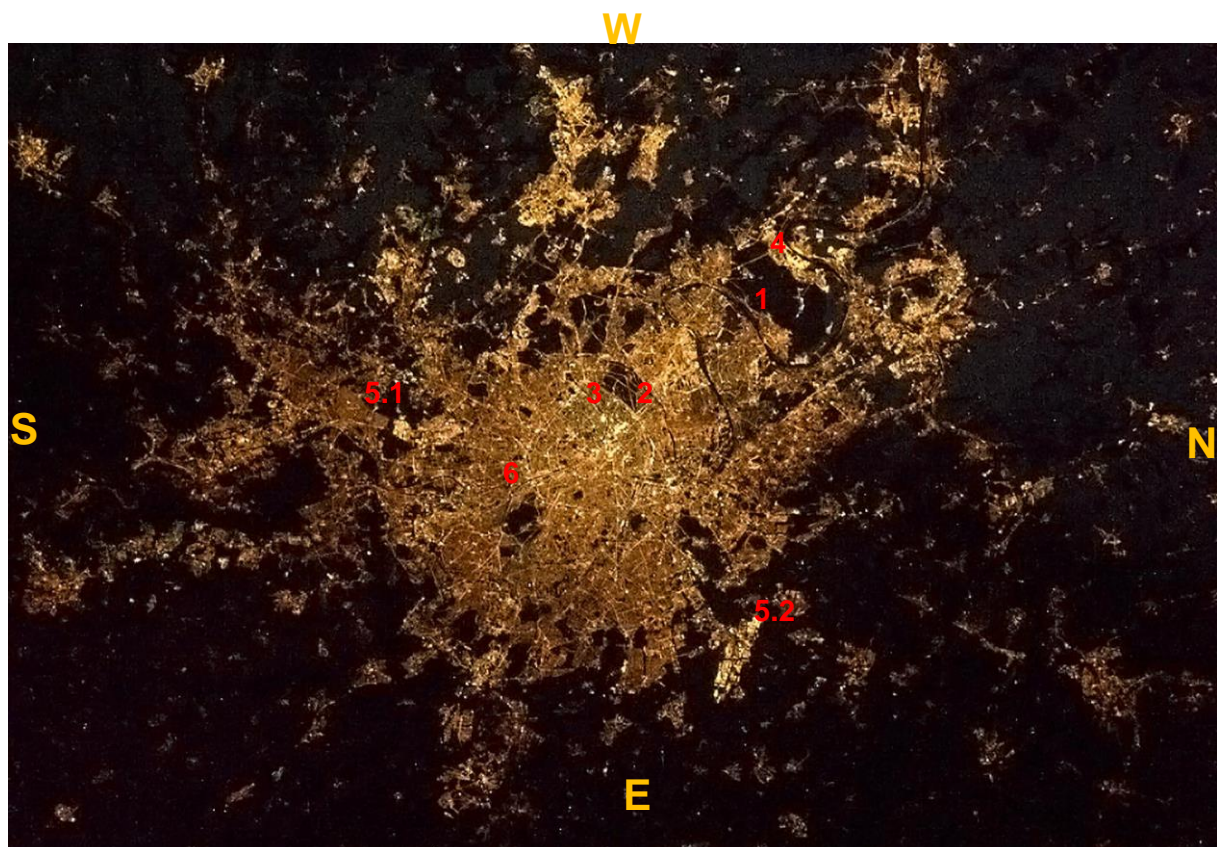
2.12 Grosvenor Bridge (R)

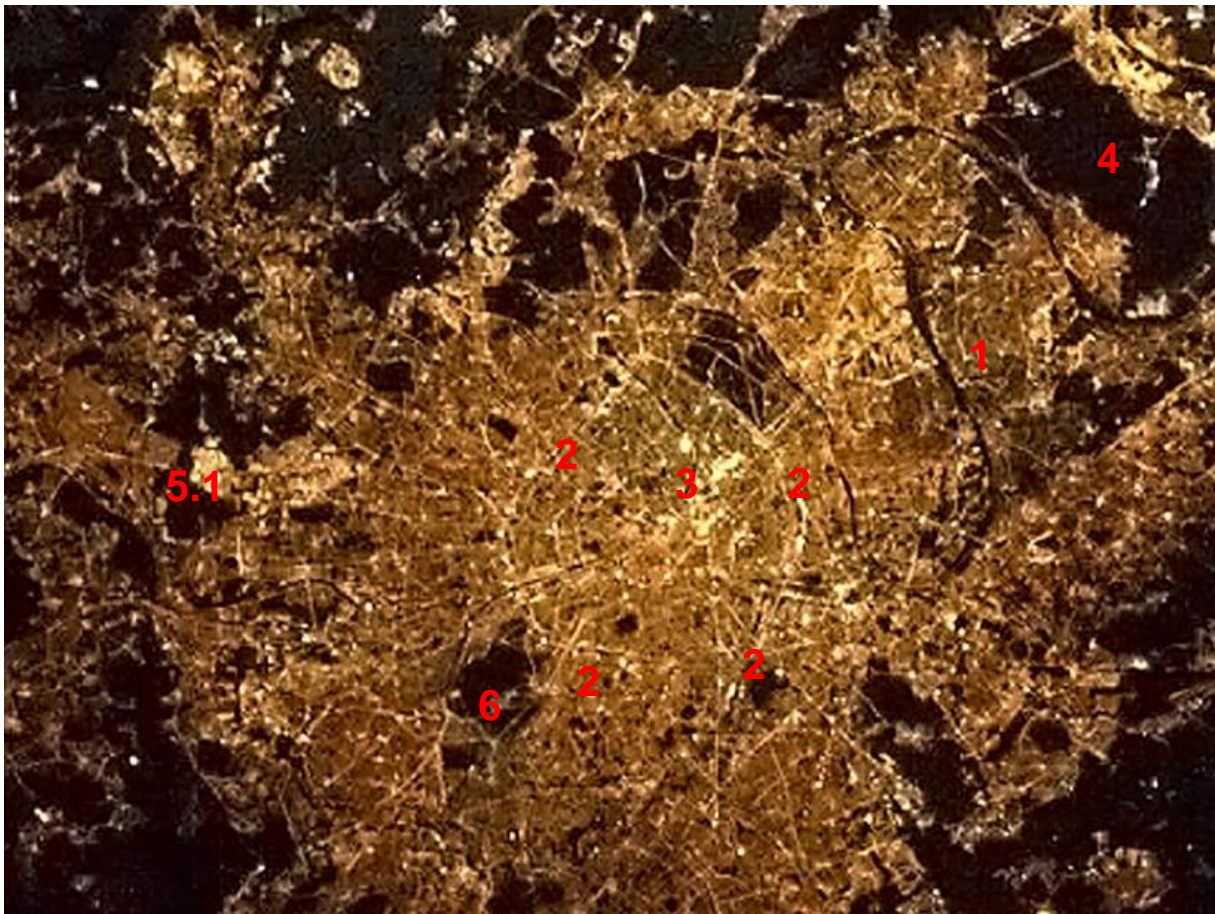
2.13 Chelsea Bridge

2.14 Albert Bridge

2.15 Battersea Bridge

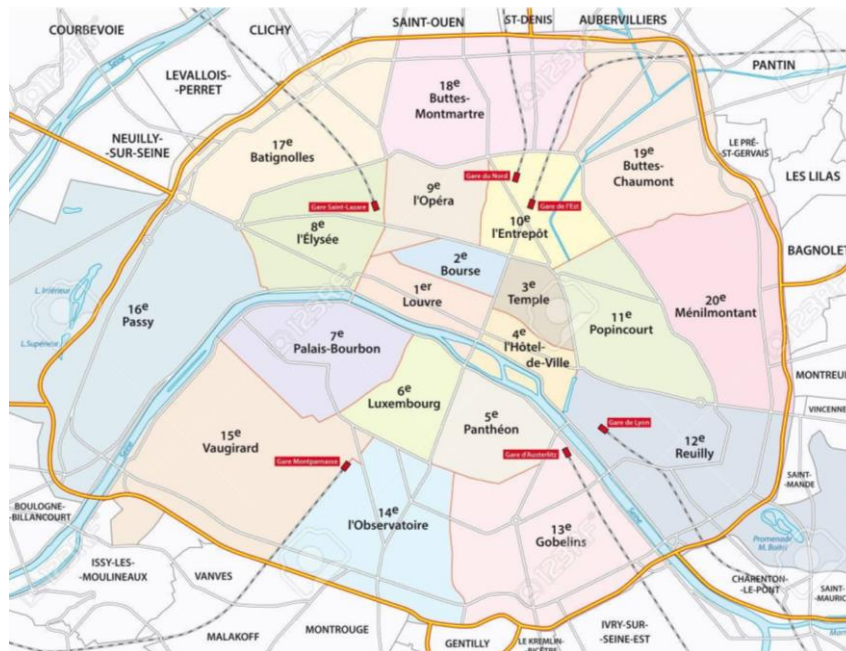
PARIS





1 Seine

2 The inner circle of Paris is quite good as a bright “line” visible, compare to orange/red line on the following map:

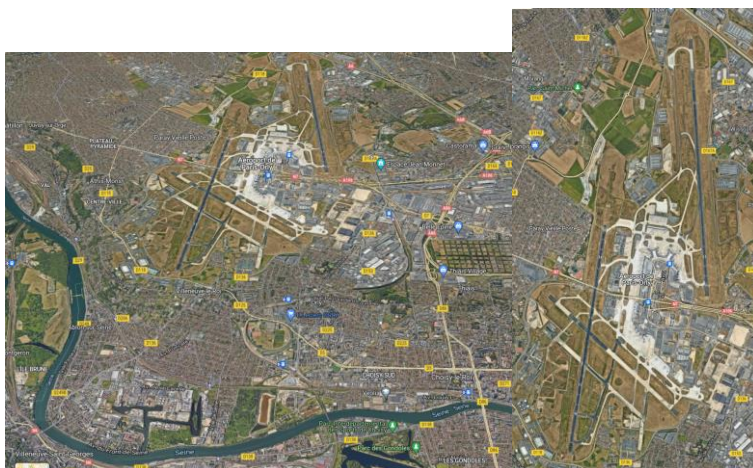


(Source: https://de.123rf.com/photo_35107523_paris-str%C3%9Fe-und-verwaltungs-karte.html)

3 Famous attractions: Louvre, Champs-Élysées, Palais de l'Élysée, Place de la Concorde, Arc de Triomphe de l'Étoile, Tour Eiffel,

4 Forêt domaniale de Saint-Germain: National Forest of Saint-Germain

5.1 Aéroport de Paris-Orly: airport with the most inland flights; the dark and bright region correspond to this airport, as the buildings are very bright but the fields beside the runways are rather dark



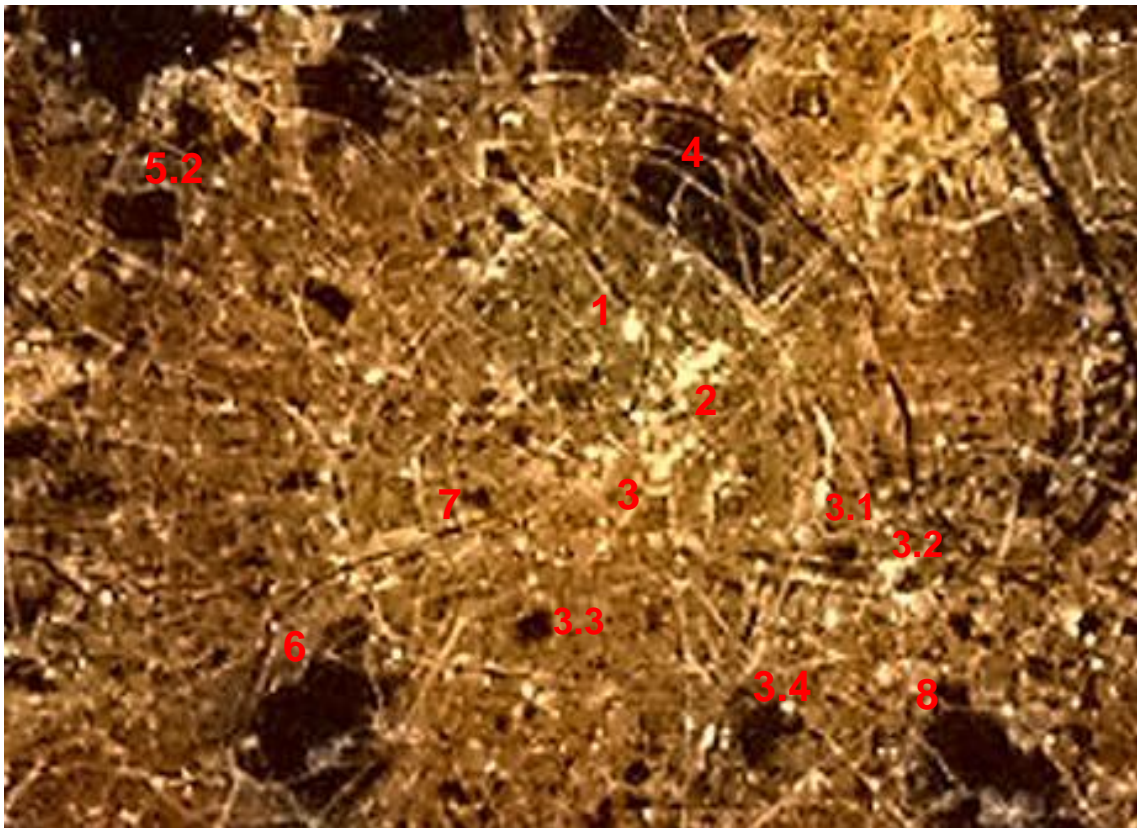
Source: Google Maps, 2022

5.2 Aéroport de Paris-Charles de Gaulle: most important airport for Paris;
very interesting the bright area of the airport,
surrounded with dark farming areas



Source: Google Maps, 2022

6 Bois de Vincennes: Urban green area of 995 ha
with hiking trails, lakes, a botanical garden, and a zoo



Bright places:

1 Tour Eiffel (Eiffel Tower)

2 Arc de Triomphe (bright) dark dot eastern is the Parc Monceau

Dark places:

— Parks and green areas:

4 Bois de Boulogne: Nowadays a public park with lakes, natural paths and a botanical garden. Former a royal hunting ground but nowadays a public park with lakes, natural paths and a botanical garden

5 Domaine départemental de Sceaux– this is a garden of a castle of the 17. Century

6 Bois de Vincennes: Urban green area of 995 ha with hiking trails, lakes , a botanical garden , and a zoo

7 Jardin Des Plantes: Botanical park

8 Parc d'épartemental Georges-Valbon: 415 ha park with a wet land, lakes, waterfalls and 44 bird species

- Cemeteriestries: It is very interesting, that besides parks and green areas some of the darkest spots cemeteries are cemeteries. The following list are the most famous or biggest cemeteries of Paris.

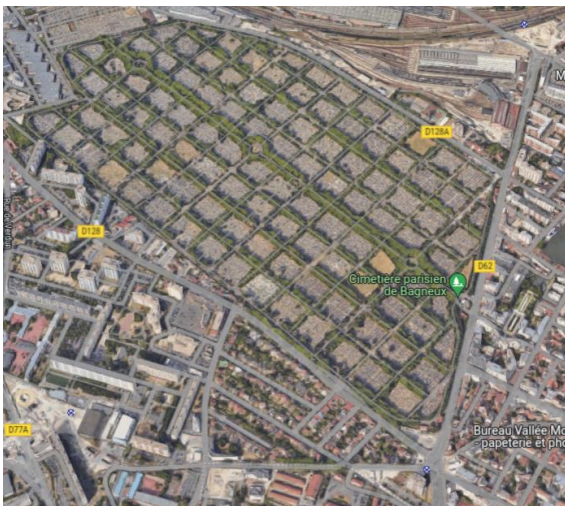
3.1 Cimetière de Montmartre (N)

3.2 Cimetière Parisien de Saint-Ouen

3.3 Cimetière du Père Lachaise (O) – is the biggest cemetery in Paris and one of the most famous in the world (Source: https://en.wikipedia.org/wiki/P%C3%A8re_Lachaise_Cemetery)

3.4 Parisian cemetery of Pantin

3.5 Cimetière parisien de Bagneux

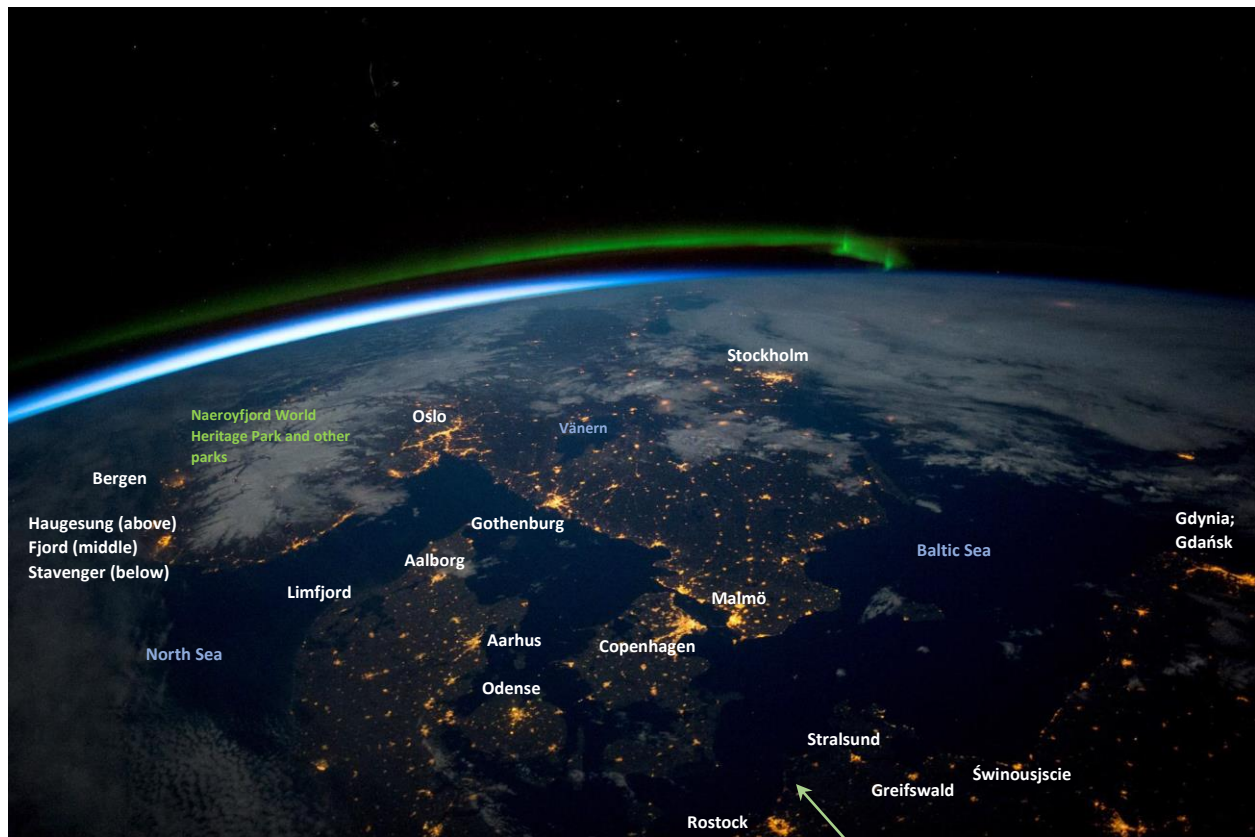


Source: Google Maps, 2022

(3.6 Cimetière du Montparnasse (S)) – ?: not completely sure

(3.7 Cimetière de Passy (S)) – ?: not completely sure

NORWAY-SWEDEN-DENMARK



Nationalpark
Vorpommersche
Boddenlandschaft

Szczecin (bright)
Szczecin Lagoon
(dark, above)



Source: Google Maps, 2022

SCANDINAVIA – GERMANY - POLAND



Look at how bright the area looks with the clouds above the lights. Due to scattering effects the light is distributed over a wide area and the surface brightness increases.

BELGIUM-WARSHWA-SCANDINAVIA



Source: Google Maps, 2022

⇒Note To Educators: This detailed report on Earth at Night Sky in Europe provides a fascinating overview of light pollution across various regions. It offers valuable insights into the patterns of artificial lighting, highlighting the impact of human activities on the environment. You can leverage this resource to engage students in discussions about the consequences of light pollution, its variations in different areas, and its potential effects on ecosystems, energy consumption, and human health. The visual representations of cities, motorways, and natural features at night can serve as excellent teaching tools, fostering an understanding of geographical patterns and the importance of responsible lighting practices. Encourage students to explore the provided information and images, sparking curiosity about the interconnectedness of urbanization, environmental conservation, and human behavior.