



C3S CLIMATE & ENERGY EDUCATION DEMONSTRATOR VARIABLE FACT SHEET

SOLAR RADIATION

Historical & Projected 1971-2100

WHAT IS SOLAR RADIATION?

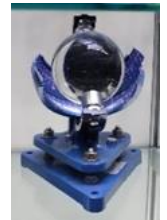
Solar radiation is the amount of energy the Earth surface receives from the sun. During the northern hemisphere winter, the Earth tilts away from the sun and Europe on average receives less solar radiation. The opposite is true in the summer. This is why solar panels produce a lot more electricity in the summer than in the winter.



HOW IS IT MEASURED?

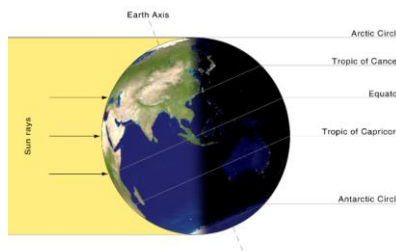


One piece of equipment used to measure solar radiation is a **pyranometer** (pictured left). The units used is **watts per square meter (W/m^2)**. On a cloudless day when the sun is directly above, roughly $1000W/m^2$ hits the Earth's surface. Some weather stations also record how long the sun shone for during the day using a sunshine recorder (right), which is a glass globe that focus the sun's rays into a beam, burning a piece of paper.



DID YOU KNOW?

There are areas of the world that receive 24 hours of daylight for a part of the year! During the middle of the northern hemisphere summer (left), the tilt of the Earth means that everywhere north of the Arctic Circle the sun never sets, at the same time everywhere south of the Antarctic Circle on the other side of the world experience 24 hours of darkness! The opposite is true during the northern hemisphere winter.



GLOSSARY

LATITUDE The measure of how far a place is on Earth, north or south from the equator. The equator is given the number 0 (zero) degrees and the further north or south you go, that number goes up. The north pole is 90 degrees north and the south pole is 90 degrees south.

LONG-TERM MEAN An average that has been taken over a long period of time, usually 30 years. E.g. Spain's June solar radiation long-term mean between 1981 to 2010 was $305W/m^2$.

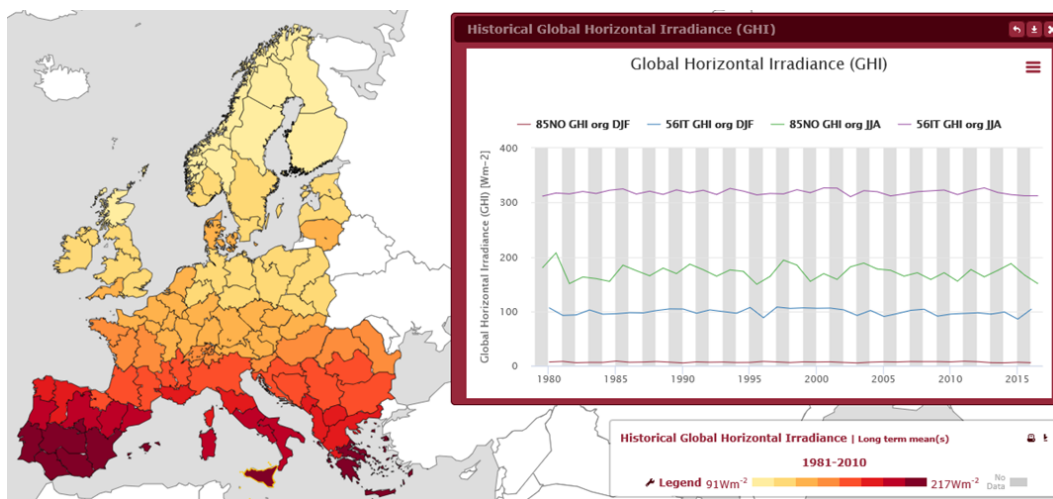
SEASONAL Something that changes as the seasons (Spring, Summer, Autumn & Winter) change. Solar radiation, and so the heat and light a place gets from the sun, can be much less in the winter than in the summer, for example.

KEY MESSAGES FROM THE DATA

- Solar radiation **varies much** from year to year.
- Projections indicate **small increases in radiation** in **southern Europe** and **small decreases** in **northern Europe**, with **little change** in **central Europe**, over the next several decades.



THE IMPACT OF LATITUDE ON CLIMATE



Why is it that countries closer to the equator are on average warmer? The map showing the average amount of solar radiation received across Europe between 1981-2010 has a clear pattern. The northern tip of Norway received around 2.5 times less solar radiation than the southern tip of Spain, Italy and Greece. This is because the sun's rays strike southern Europe more directly than northern Europe due to the curve of the Earth. Northern Norway in winter receives almost no solar radiation, as it is close to the Arctic Circle (see overleaf).

i FOR MORE DETAILS AND ACTIVITIES, AND FOR OTHER CASE STUDIES, SEE THE "RESOURCES" SECTION VIA THE MENU.

BE DATA SMART



Solar radiation is very seasonal, especially the further from the equator you go. Countries in Europe can have vastly different amounts of it during certain times of the year. Between 1981-2010 Finnmark in northern Norway received $97\text{W}/\text{m}^2$ on average per year. However, it was $170\text{W}/\text{m}^2$ during the summer and only $7\text{W}/\text{m}^2$ during the winter! When something changes so much month-to-month or season-to-season, make sure you look at differences within the year as well as the yearly average!

The [Copernicus Climate Change Service \(C3S\)](#) is one of the European Union's Copernicus Earth Observation Programme services and is operated by the European Centre for Medium-Range Weather Forecast (ECMWF) on behalf of the European Commission.

SEE THE 'REFERENCES & SOURCES' SHEET FOR SOURCES OF INFORMATION. FOR TECHNICAL INFORMATION, LICENSE CONDITIONS, LINEAGE STATEMENT ETC SEE THE EUROPEAN CLIMATIC ENERGY MIXES (ECM) VARIABLE FACT SHEET 005: http://ecem.wemcouncil.org/pdf/ECM_VFS_C05_GHI_20171128.pdf

CONTENT: Kit Rackley (WEMC), DESIGN LEAD: Elena Bertocco (WEMC). PUBLISHED 27/03/2020 (v1.0)