

What's happening with climate or climate change in Luxembourg?

Temperature and precipitation changes in Luxembourg.

Although we know well about the changing climate on our planet, especially after the publication of AR5-WG1, I wondered if there are similar signs showing up in my country. You should however know that Luxembourg is a small country, with a surface of only 2586 sq km (49°45'N, 6°10'E) with max. distances of 57km (East-West) and 82 km (North South) in the middle of western Europe. [1]

The number of measuring stations (7) [2] are in relation to the size of the country, but well distributed to the different zones. An additional and interesting way to collect data relies on the production of wine close to the Moselle river on the east border. The quality and the quantity of wine has been analysed for a period of 1000 years. [Pfister, CRP Gabriel Lippman]. Mr. Pfister expressed this information during a High-school discussion on climate change. [3]

Different organizations collect meteorological data in Luxembourg:

- The meteorological station at the national airport (Findel)
- The farmer's organization ASTA,
- The national institute of viticulture

The studies to analyze these data are done by the national research center CRP Gabriel Lippmann.

Temperature changes

The first dataset of temperatures comes from the meteorological station at the airport Findel in Luxembourg. The reference lines indicate clearly a rise of the temperature during this period.[4]

Administration de la Navigation Aérienne– Service Météorologique de Luxembourg
Températures moyennes par année 1947-2009

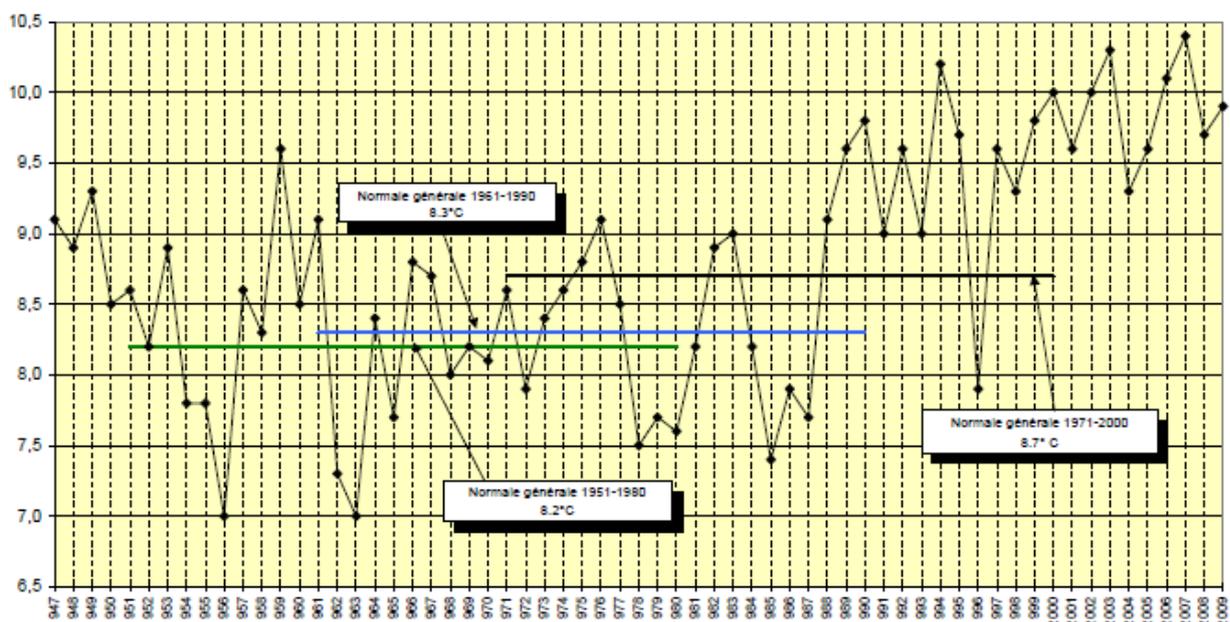


Figure 1 Annual mean temperatures from 1947-2009

The second figure originates from the National research center CRP Gabriel Lippmann and compares IPCC (2007) with temperatures from Luxembourg.

In a comparison of global versus Luxembourg-City temperatures, the correlation between the two curves is impressive. They are of course different, but the trend appears clearly, also in Luxembourg.

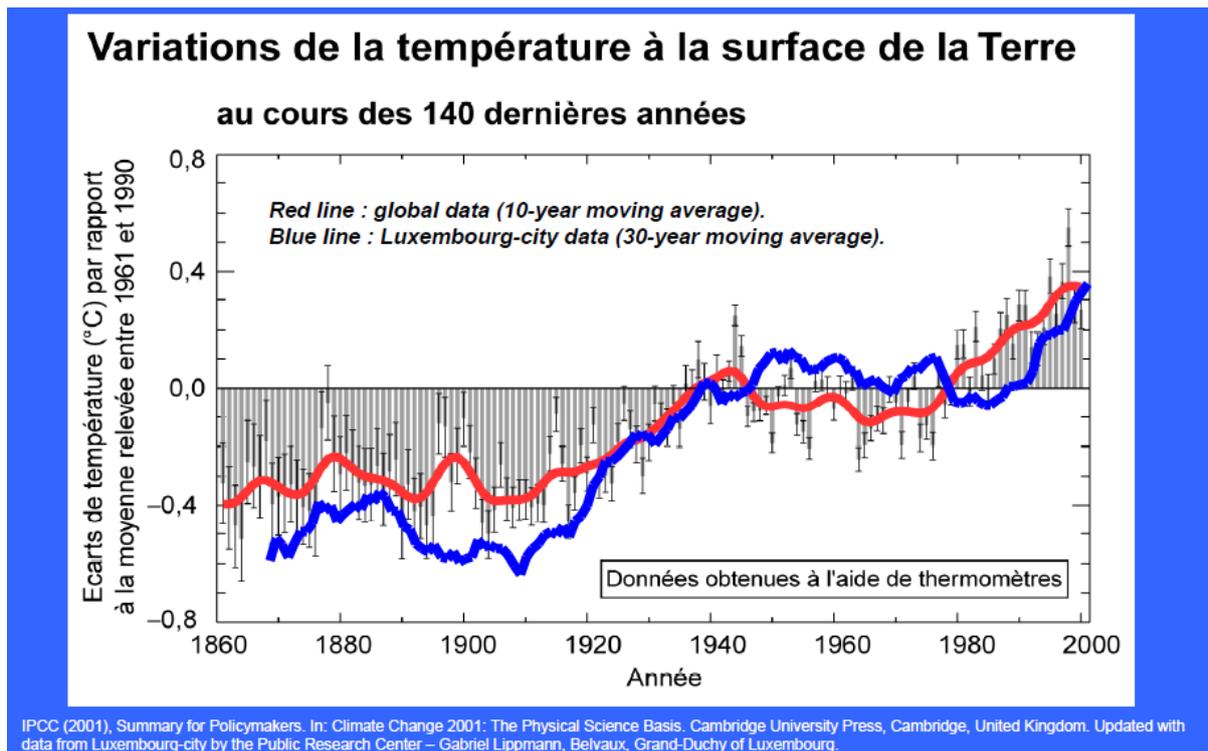


Figure 2 Comparison of near ground temperatures (dataset from thermometers)

Additional information comes from the concerned Ministry in Luxembourg (MDDI), they consider the rise of temperature as quite important:

“Annual mean temperatures for Luxemburg-City were around 9°C higher than during the period from 1971 to 2000. Mean annual temperatures are expected to reach up to 11.6°C for the period 2071 till 2100”. [5]

The changes of temperatures are not equally distributed over the year, but dependent on the season. Winters get warmer, where temperatures of annual mean increased from 2,6°C to 3,8°C , but during summer, the temperatures do not show a long term rising trend. [6]

Translation: Moyenne mobile trentennale = moving average on 30 years

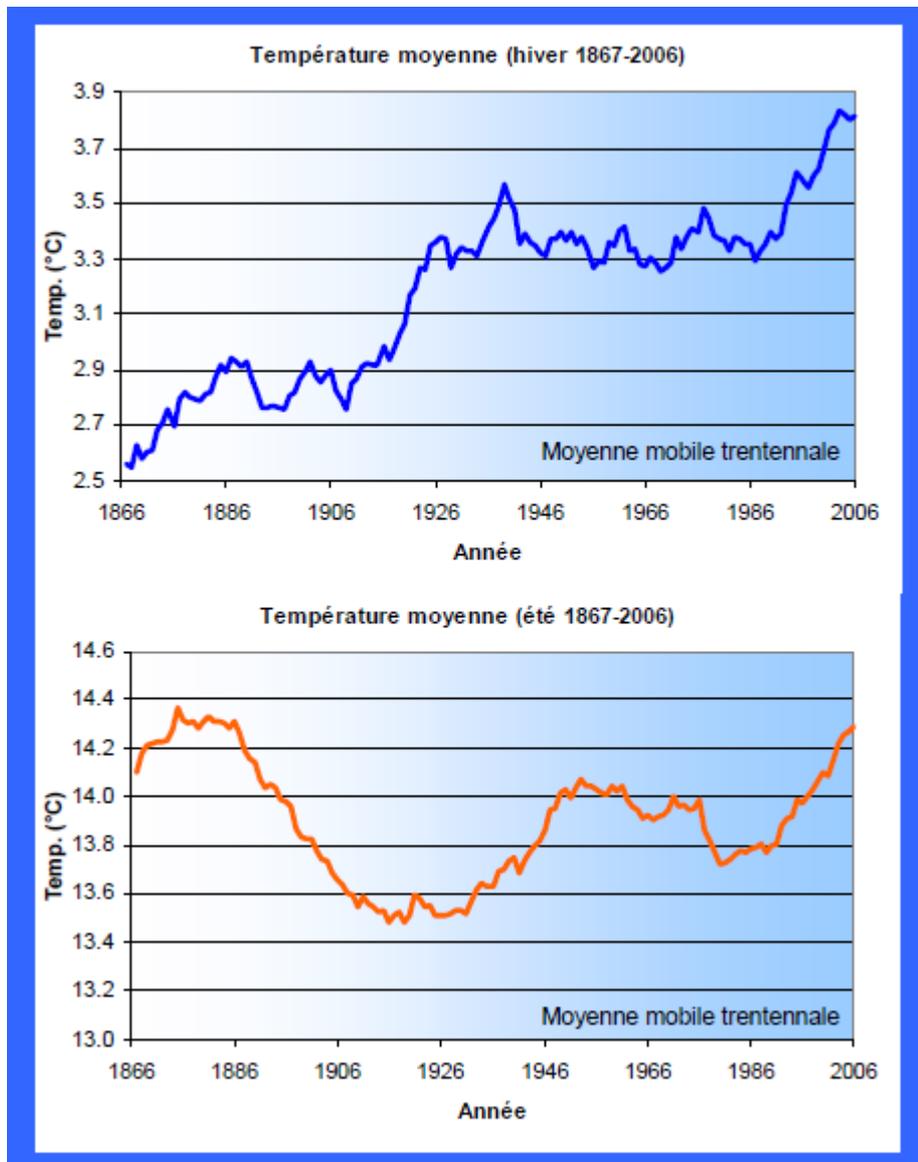


Figure 3 Winter versus summer temperatures, upper=winter, lower=summer, 30 years mean (CRP Lippmann)

A critical point for Luxembourg relies however on precipitation, and research has been initiated to understand both flooding's and changes, especially during winter time. The precipitation during the period of winter months (November to march) is critical to fill up groundwater basins in our area. The study led by Pfister shows clear changes in precipitation connected to the NAO (North Atlantic Oscillation), which is in turn responsible to send rainfall on western Europe, including Luxembourg. [6]

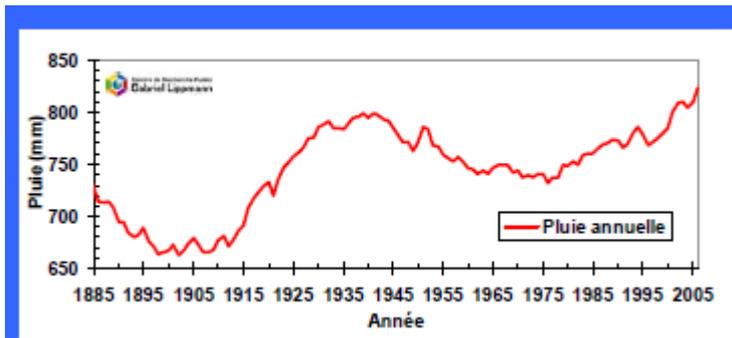
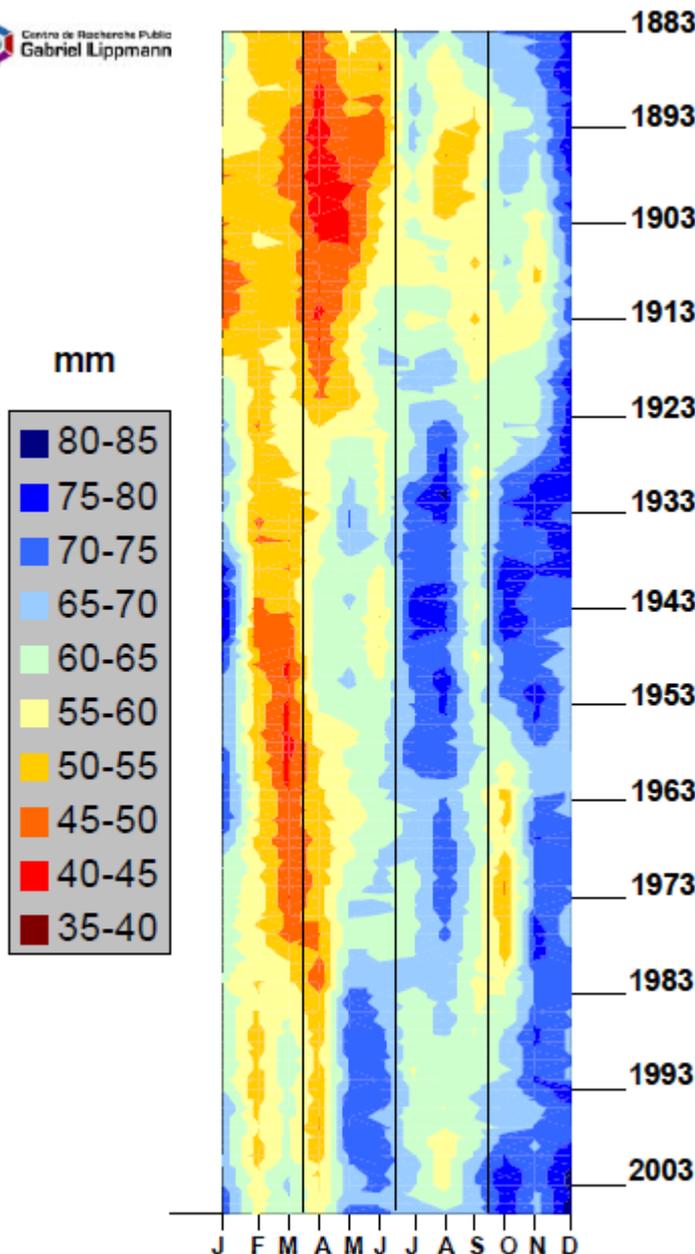


Figure 4 Annual precipitation change, 30 years mean [6]

Figure 4 shows an increase of precipitation, but it is also important to have a look at the precipitation per month over the time period from 1883 to 2005. The graphic below shows how the precipitation changed over the years. Generally speaking, the quantity of rain is rising, but the

Centre de Recherche Public
Gabriel Lippmann



difference in quantity of precipitation between the seasons declines. [6]

Final remarks

The country is small, the geographical location not too bad, but the rise in temperature can also be measured here. Additionally, changes in precipitation affect both the quantity (rising) and the distribution over the year. Based on the references, it is likely that these changes are linked to the global climate change.

References

[1] Details about Luxembourg, Wikipedia

http://en.wikipedia.org/wiki/Geography_of_Luxembourg

[2] Map of Meteo stations in Luxembourg

<http://mnhnl.lu/cgi-bin/baseportal.pl?htx=/topics/climatology/map&mapid=1>

[3] Laurent Pfister

“Des études relatives à la quantité et à la qualité des vins de la Moselle fournissent d’intéressantes informations sur les conditions météorologiques et confirment une forte variabilité des conditions climatiques dans notre région au cours des 1000 dernières années. “

Translation

“Research about the quantity and the quality of wines from the Moselle [riverside Luxembourg] showed interesting information about meteorological data and confirmed a high variability of meteorological conditions in our region over the past 1000 years.”

Round-table discussion organised by the Athénée de Luxembourg

http://158.64.21.3/comenius/comenius09/pdf/Table_ronde_rapport.pdf

[4] http://www.ana.public.lu/fr/statistiques/temperatures-moyennes/temp_moyenne.pdf

[5] Ministry of Sustainable Development and Infrastructures of Luxembourg – Department of the Environment (2010)

<http://www.climateadaptation.eu/luxembourg/climate-change/>

[6] Variabilité et changement du climat au Luxembourg

http://www.google.lu/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CDEQFjAA&url=http%3A%2F%2Fwww.klimabuendnis.lu%2Fde%2Fforcedownload.php%3Fdownload%3D41357654144%26type%3D_pdf_%26ei=z-N2Uq_7I43Qsga18YCADA&usg=AFQjCNGyfq7Ki6e7oXBAvt8hB8QG2Ld5zA&sig2=0eG9nEnXF3XMMz326nzOCg&bvm=bv.55819444,d.Yms&cad=rja

Additional sources

Climatology dataset

<http://mnhnl.lu/cgi-bin/baseportal.pl?htx=/topics/climatology/download>

Laurent Pfister, CRP Gabriel Lipmann

[http://www.lippmann.lu/index.php?id=154&no_cache=1&tx_ttnews\[year\]=2012&tx_ttnews\[month\]=01&tx_ttnews\[tt_news\]=179&tx_ttnews\[backPid\]=160&cHash=cf9b26dfc6bceb441111c94aaf28f974](http://www.lippmann.lu/index.php?id=154&no_cache=1&tx_ttnews[year]=2012&tx_ttnews[month]=01&tx_ttnews[tt_news]=179&tx_ttnews[backPid]=160&cHash=cf9b26dfc6bceb441111c94aaf28f974)

Administration de la navigation aérienne (National air navigation authority)

<http://www.ana.public.lu/fr/statistiques/index.html>

Farmers (ASTA) Database of weather information

<http://www.wetter.rlp.de/dienststellen/oppenheim/html/am/LUAM/index.htm>

Atlas Climatique du Grand-Duché de Luxembourg

<http://mnhnl.lu/cgi-bin/baseportal.pl?htx=/topics/climatology/download>