FUTURE EVOLUTION OF THE REGIONAL CLIMATE

AIR Focus 2

Climate change due to the increased concentration of greenhouse gases (GHGs) in the atmosphere is now well established[1]. Their impacts vary locally according to the specific vulnerabilities of each environment. Regional climate simulations capable of modelling small-scale meteorological phenomena are therefore essential in assessing the impacts of climate change.

From global climate simulations...

A climate model is a mathematical representation of the global climate system. This representation incorporates the equations that govern the various components of the climate system and can be solved digitally by supercomputers at a resolution typically in the order of 100 km. Some twenty models based on different physical parameterisations and resolution methods have been developed independently of each other.

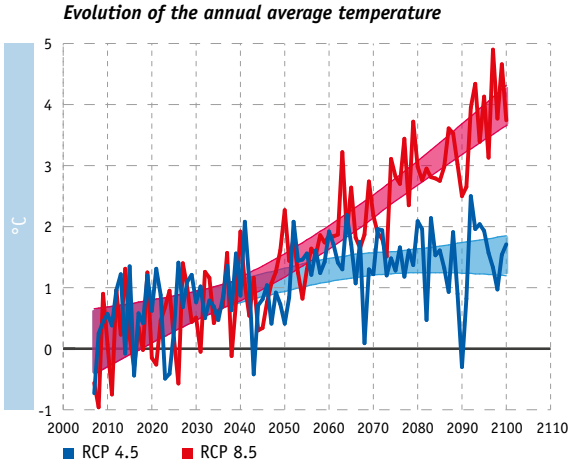
These models make it possible to estimate the climate in the coming decades on the basis of scenarios relating to the evolution of GHG concentrations by the year 2100. The 5th Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) combines and summarises forecasts from a large number of global models[1].

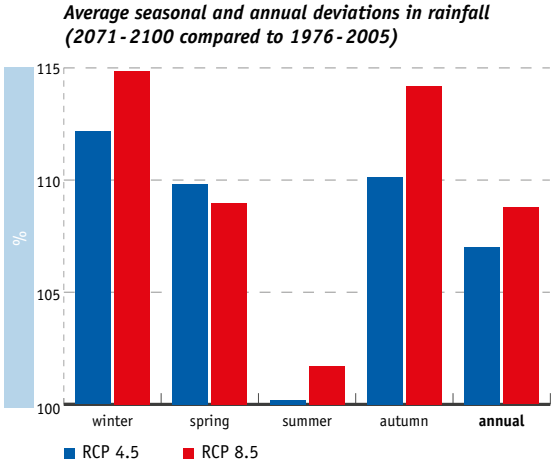
... to regional climate simulations

In order to assess the impacts of climate on a regional scale, it is necessary to carry out a downscaling of global modelling. Regional climate models, which cover only part of the Earth and whose boundary conditions are described by global simulations, offer a high spatial resolution that allows a better representation of regional physical processes. Following the international CORDEX initiative launched in 2009[2], the EURO-CORDEX project[3] centralises a set of high spatial resolution climate projections for the year 2100 on a Europe-wide scale. The Royal Meteorological Institute (RMI) is contributing to this project with regional simulations at a resolution of 12 km calculated with the ALARO[4] regional climate model. These simulations are currently available for 2 GHG concentration scenarios: RCP[5] 4.5 (intermediate scenario, with a moderate increase in GHGs) and RCP 8.5 (severe scenario, with a large increase in GHGs). These simulations indicate an increase in temperatures over Wallonia, on average, of almost 2°C in the case of RCP scenario 4.5 and around 3.5°C for RCP 8.5 by 2100 compared to the reference period 1976-2005. This rise in temperatures is highest in winter and lowest in summer[6]. As regards rainfall amounts, these simulations show an increase of around 7 to 9%, more pronounced in winter (12 to 15%), spring (10 to 9%) and autumn (10 to 14%). A set of regional climate simulations is nevertheless required to assess the uncertainties of these projections. Such a set, at a very high resolution of 4 km, is available following the CORDEX.be[4] project (Belgian offshoot of the EURO-CORDEX project).

[1] IPCC, 2015 | [2] Giorgi *et al.*, 2009 | [3] http://www.euro-cordex.net/ | [4] http://cordex.meteo.be | [5] *Representative concentration pathway* | [6] → Map 23

Fig AIR Focus 2-1 Simulations* of changes in temperature and rainfall by 2100 compared to the period 1976-2005 in Wallonia, according to two scenarios** of GHG concentration.





* ALARO: regional climate simulation model
** RCP 4.5: intermediate climate change scenario, with a moderate increase of GHGs
RCP 8.5: severe climate change scenario, with a strong increase in GHGs

SOERW 2017 – Source: RMI