The importance of adapting Irish woodlands to climate change

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With climate change now one of the greatest global challenges, research is underway to establish the likely impacts on the environment. For the forestry sector there is considerable urgency in this task because trees planted now will experience a century of unprecedented climate change. It is therefore vitally important that researchers assemble and disseminate information on the expected impacts, and suggest strategies to adapt forestry to climate change. In May 2007, a research team co-ordinated by Kevin Black started work on a COFORD funded 5-year programme of work (CLIMIT) to develop a carbon accounting and reporting system to help the Irish Government meet both Kyoto Protocol and Marrakesh Accord mitigation commitments. The main purpose of the programme is to calculate the sequestration potential of Ireland's woodland resource, although one of the key projects in the programme is more about adaptation. This project is called CLIMADAPT, and it will deliver spatial and stand-based decision support tools to help forest practitioners choose the correct tree species for site types, whose quality will change with the climate.

There is now widespread scientific evidence that the emission of greenhouse gases into the earth's atmosphere is forcing global climate change. General circulation models (GCM) predict how changes in greenhouse gas concentrations will affect the atmosphere and oceans and, in turn, the global climate. However GCMs work at a coarse resolution, unsuitable for a country the size of Ireland. The Community Climate Change Consortium For Ireland (C4I) has implemented a regional climate model (RCM) developed by the Rossby Centre in Sweden to provide a more detailed assessment of the predicted changes in Ireland's climate through the 21st century.

Major changes are expected in terms of warmth and summer droughtiness, both factors are important for tree growth and survival. Figure 1 shows a comparison of the measured 30 year mean moisture deficit (MD — a droughtiness index) for the baseline period (1961-1990) and simulated for the period 2050-2080 for a medium-high carbon emissions scenario. The decadal frequency of extreme climatic events will also increase. In the last 10 years 1 severe drought occurred in the south and east of the country. Dry summers are predicted to increase so that 3-4 droughts per decade will occur over large parts of central, southern, and eastern Ireland by 2050, increasing to more than 7 droughts per decade towards the end of the century. In the south and east of Ireland, drought sensitive species such as Sitka spruce (Figure 2) and beech are very likely to become unsuited to freely draining soils, as well as shallow soils and soils prone to winter waterlogging, both of which restrict tree rooting depth. Irish forestry must therefore adapt to climate change. This involves making changes to species, provenance selection, and silviculture. There will be opportunities for 'new' species too, for example Monterey pine (Figure 3) and southern beech are both highly productive.

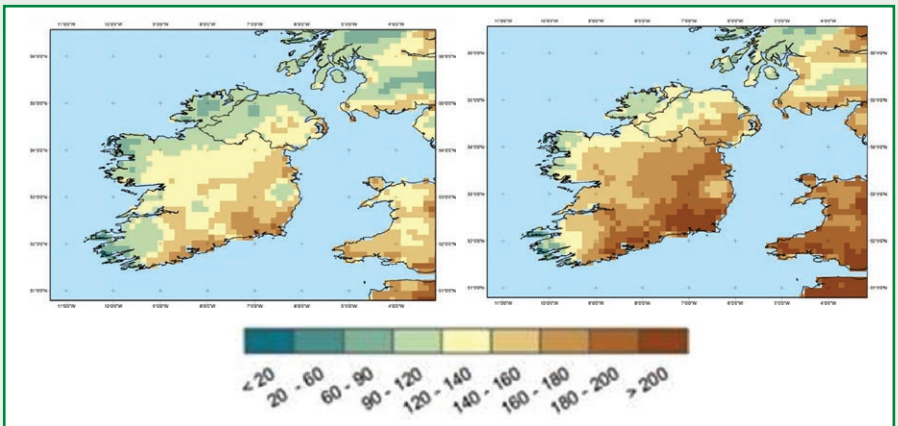

Figure 1 Average moisture deficit (mm) calculated for two 30 year climate periods from c4i regional climate model simulations, for a) the baseline period 1961-1990, and b) the period 2051-2080 for the medium-high emissions scenario.

Figure 2 Longitudinal cracks and resin flows developing on a Sitka spruce stem in Durris forest (Grampian, Scotland) following the 2003 drought (© Crown Copyright 2007, Forestry Commission)

The CLIMADAPT decision support tool will use new web-based technology, including Google maps and AJAX (Asynchronous Javascipt And Xml), to deliver spatial strategic analyses, as well as a site-based assessments for operational use. These tools are urgently required to guide strategic policy, to guide woodland grant incentives that will maintain a robust and sustainable forest policy response to climate change. Tools are also required to support the operational response, to identify potential site and climate related problems, to identify well-adapted species, provenance and silvicultural systems. CLIMADAPT DSS tools will be available in 2009.

*Figure 3 Monterey Pine (*Pinus radiata*) A species that is suitable in the south and east of Ireland; it is drought tolerant, exposure tolerant, tolerant of infertile soils, and fast growing (© Crown Copyright 2007 - Forestry Commission Picture Library).*