ENGINEERING FOR THE FUTURE
Micro Drainage designs climate change into new software

How does it feel to be the subject of a long-term climatic experiment? A report from the new Construction Research and Innovation Strategy Panel (nCRISP) suggests that all the citizens of the planet are guinea pigs in an unwitting test of the Earth's climate. It has, says nCRISP, been brought about by our modification of the natural radiation balance through the emission of greenhouse gases such as carbon dioxide.

The nCRISP report also states that "the vast majority of scientists agree that the changes in climate we are now experiencing portend much more serious changes in the future," (source, nCRISP "Building Knowledge for a Changing Environment", February 2003, published under the UK Climate Impacts Programme).

While terms such as global warming and "the greenhouse effect" have long passed into the language, their familiarity is perhaps in danger of breeding complacency about what they really mean. Yet the UK Climate Impacts Programme (UKCIP – see www.ukcip.org.uk) states that the changes in the climate are too distinctive to be dismissed simply as cyclical effects.

Sensitivity

From an engineering perspective, the consequences are already making an impact, both in terms of increasing incidences of flooding to be addressed, and the regulations and guidelines governing the profession. The Precautionary Principle set out in Planning Policy Guideline 25 (PPG25) calls for designs to be tested for sensitivity to flooding and for engineers to be mindful of the possible effects of climate change and to consider the use of sustainable urban drainage techniques. In addition, the fifth edition of Sewers for Adoption (SFA5) calls for flood flow paths to be considered, rather than simply flooding at a given node.

Aidan Millerick, managing director of drainage software developers Micro Drainage, explains how those requirements are now being applied within his company's WinDes drainage design suite: "In order to comply with the requirements of PPG25, most engineers would consider sensitivity analysis to require increased loadings as high as 20% as a minimum," he says.

"However, if you look at the UKCIP research, and some of the scenarios they are extrapolating, there are instances where much higher loadings may be possible. Call it pessimism or realism, but in the development of our WinDes W9 drainage design software suite we have allowed for sensitivity analysis for up to 40% excess volume."

Cost-effective

The Environment Agency and many approving authorities are already adopting strategies designed not only to accommodate the needs of the future, but also to alleviate the problems already being experienced. While much has been made of the need for improved

defences, Aidan Millerick has found that new forms of flood prevention are increasingly being recognised as cost-effective options for the long-term. In addition, the new Building Regulations published in 2002 give priority to the use of infiltration systems.

"A glance at the relevant figures clearly shows why the regulatory bodies are taking climate change seriously," says Aidan Millerick. "The latest research shows that since the industrial revolution, and during the last 30 years in particular, we have seen changes in climate which UKCIP estimates to be without precedent in the last 10,000 years."

Among some of the most compelling findings are the figures relating to the UK climate. The 1990s was the warmest decade in central England since records began in the 1660s and this warming of climate over land has been accompanied by warming of UK coastal waters.

The agency's analysis of other climate data also reveals the following changes in UK climate:

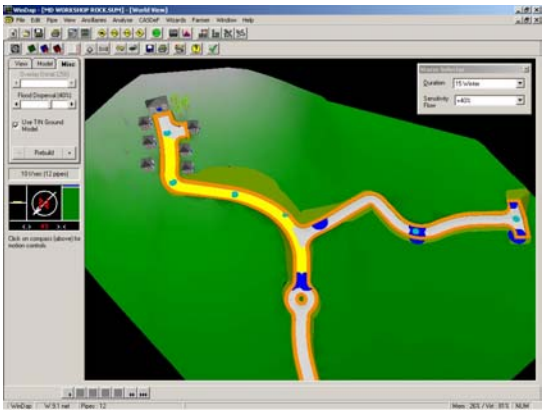
- *Winters over the last 200 years have become much wetter relative to summers throughout the UK.*
- *A larger proportion of winter precipitation in all regions now falls on heavy rainfall days than was the case 50 years ago.*
- *After adjusting for natural land movements, average sea level around the UK is now about 10cm higher than it was in 1900.*

In short, we are living through what may be the most volatile climatic conditions experienced by humanity since the earliest civilisations. Since much of our engineering is based on historical rainfall data, the rapidity of these changes has serious implications for the integrity of the data on which future drainage system designs are based.

Radical

For Aidan Millerick, this era of uncertainty has meant a radical overhaul of WinDes, which is the industry-standard drainage design software, used by all the water companies and 90% of the consultancies in the UK. "We have released four new modules and radically updated the entire suite in the last three years," explains Aidan Millerick.

Since introducing Sustainable Urban Drainage Systems (SUDS) into WinDes, Aidan Millerick has seen a substantial increase in the number of clients viewing SUDS as a practical alternative to conventional controls. The Source Control module within WinDes has made it possible to test the feasibility of systems such as porous car parks, swales and lined soakaways alongside offline and online controls, and then to design them into the system and run a complete analysis from end-to-end.



WinDes allows the representation of flood flow paths in accordance with SFA

"In WinDes W9, Source Control will now calculate Mean Annual Flood and other runoff values for rural or partly urbanised catchments," adds Aidan Millerick, "and, in recognition of another trend driven by climate change, we have introduced a facility to design rainwater harvesting tanks into a system based on daily demand."

In a time of deep political uncertainty, the issue of climate change has been forced further down the news agenda. Nevertheless, the publication of the nCRISP report and the continuing work of UKCIP shows that it is still a critical issue and that pressure on the industry to address it is only going to increase.

Says Aidan Millerick: "We are, perhaps, entering an age where projections into the future are going to be more relevant to civil engineers than records of the past. It means an increasing reliance on technology that can accommodate a broader range of climatic possibilities than we have ever encountered before."