Editorial

The Inter-Governmental Panel on Climate Change (IPCC) has carried out a great deal of impressive work since its establishment in 1998. Its Fourth Assessment Report (AR4) was published in 2007, and it is currently working towards the Fifth Assessment which will be reported in 2014. Its role of reviewing and synthesizing the work of climate scientists around the world was recognized in 2007 by the award of the Nobel Peace Prize.

It is widely accepted that climate change is likely to impact on water resources as well as water supply and sanitation services in the coming decades. Different countries and regions will experience the effects of climate change in different ways and at different rates. What is clear is that prediction of the impacts is both complex and uncertain.

This complexity and uncertainty concerning the future is in part due to a chain of direct causal and indirect linkages which themselves involve a great deal of uncertainty. Increasing levels of greenhouse gases (GHGs) in the atmosphere will lead to increasing temperatures, and this link is known with a relatively high degree of certainty. Changes in temperature have corresponding effects on other climatic variables such as rainfall and the parameters which combine to affect evapotranspiration rates. Global circulation models (GCMs) attempt to predict these effects, starting with assumptions about future GHG emissions (emissions scenarios), and concluding with the likely corresponding changes in rainfall and other climate variables at various spatial scales.

The way in which changes in future rainfall affect surface runoff and groundwater recharge depends on simultaneous changes in evapotranspiration, but also importantly on changes in land use and land cover. The local water balance (how rain falling at a particular place becomes divided between surface runoff and infiltration, and then between evapotranspiration and groundwater recharge) is very sensitive, not only to changes in climate, but to changes in soil properties and vegetation cover.

To make the situation even more complicated, the way in which local changes in the amount and timing of surface runoff and groundwater discharge combine over larger areas to affect regional water resources depends on the nature of the corresponding changes in downstream areas too. As a consequence, the prediction of the impact of climate change on water resources becomes complex because of the inherent uncertainty about many of the factors which affect this relationship.

Richard C. Carter is Professor of International Water Development, Cranfield University, UK

doi: 10.3362/1756-3488.2009.020, ISSN: 0262-8104 (print) 1756-3488 (online)

The IPCC's AR4 indicated the likely changes in mean annual rainfall which may occur in different regions of the world. In some places mean annual rainfall will increase, in other areas it will decrease, and in others it may remain unchanged. The AR4 also predicted that in most regions the frequency of extreme rainfall events (leading to floods and droughts) will increase, but it could not be very specific as to the magnitude of these changes. Nor could it make predictions about the way in which land use and land cover will change in future.

Part of the problem is that other changes are taking place, especially in the low- and middle-income countries, of a magnitude and at a pace which probably far exceeds that of climate change. In many low-income countries population is still growing at 2–3 per cent per annum, implying a doubling every two to three decades. Urban populations are growing even faster. These trends alone are affecting demand for food and energy, demand for both domestic and irrigation water, and consequently changes in crops grown, areas cultivated, and therefore the local and regional water balance.

At the present time a great deal of attention is being focused on climate change. Some would argue that this is distracting attention from best practice and good governance in basic management of water resources, the supply and extension of water and sanitation services, and attempts to strengthen the ability of communities and institutions to adapt to an uncertain present and future. After all, present climate and water resources are already very variable; demands for agricultural, industrial and domestic water are increasing; and here and now we are failing to manage the sector effectively. Climate change will make the future less certain, but many of the measures which need to be put in place constitute what the climate change fraternity refer to as 'no regrets' actions, in other words, measures worth doing anyway.

At this year's annual get together of water and sanitation professionals organized by the UK Government Department for International Development, this point was made more explicitly than at some times in the recent past. To quote correspondence after that meeting, 'we noted that although climate change provides a good "political hook" for framing water resources management issues, current variability and vulnerability remain the major challenge'. In other words, and as the papers in this issue of *Waterlines* all conclude in various ways, climate change does matter, but the immediate and pressing priorities are to continue to strive for better water resources management and better implementation and management of water and sanitation services. An increasing focus on flexibility, adaptability and empowerment of the most vulnerable will also contribute to 'no-regrets' approaches.

Richard C. Carter