

Water at a crossroads

Climate and water expert Pavel Kabat — director and CEO of the International Institute for Applied System Analysis in Austria — calls for a long-term system approach to water research, new partnerships with the developing world and a change in donor practices, to tackle water-climate issues. He talks to *Nature Climate Change*.

■ Where are the freshwater hotspots worldwide? What are the key challenges in those areas under climate change?

We are currently using almost 6,000 km³ yr⁻¹ of fresh water across the world, of which 70% goes to agriculture and is mostly needed in Asia. According to recent scenario analyses done at the International Institute for Applied System Analysis (IIASA), we are expecting an additional two billion people by 2050, most of whom will be in Asia. Therefore Asia is the water hotspot of the coming decades (Fig. 1a). Another critical issue is salinity. In the Bay of Bengal, for example, saline water is intruding up to 100 km from the coast, and affected people in Bangladesh already suffer from skin diseases and diarrhoea during dry seasons.

There are already 'salinity refugees', thousands of people leaving their homes temporarily for lack of fresh water for cooking, drinking and washing. Similar patterns are seen in the Mekong Delta, an area that is developing very quickly. In the future, due to climate change and coastal land subsidence, sea level will rise and exacerbate salinity intrusion. Furthermore, freshwater recharge from the Himalayan glaciers will change; upstream countries like India and China will build more dams in the future, reducing freshwater influx to the downstream areas. The combination of more salinity from the sea and less recharge from upstream will have devastating impacts on coastal populations in the dry season. As we speak, Cambodia and Laos are planning new dams. Little attention is paid to these issues because we continue to discuss water availability in a classic sense without considering the threat of salinity.

■ What needs to change in water research and debates?

Water has traditionally been analysed by different communities as a special sectoral issue. My view is that we need to look at the future of water resources as a cross-cutting system issue. In terms of research, no study so far has integrated the different water uses — food, energy, industry, domestic and environmental — to provide insights about how to prioritize competing needs and how we could generate synergies in the future (Fig. 1b). Also, research centres — as well as the international agencies at UN level and



© 2012 IIASA

beyond — focusing on water issues still tend to look back or summarize the current state. Very few studies look into the future, and those that do so are mainly scientific studies, often based on a single model. There is an urgent need for a multi-model ensemble approach to future scenarios for water. It is surprising that the only comprehensive global outlook on water use and resources was produced for the Second World Water Forum in March 2000 in The Hague, and has not been updated since. To address this gap, IIASA is currently collaborating with UN Water/UNESCO, World Water Council and the Korean government, to initiate the 'Water Futures and Water Solutions Project', which will deliver the first results by the 7th World Water Forum in 2015.

■ Why, in your view, is interest in water at international levels still lagging behind?

World leaders agree that water is one of the most pressing matters but there is still a lot of conceptual and methodological disagreement on water issues. In the case of climate change, the global impacts of greenhouse-gas emissions from single countries are easier to perceive as we all depend on the atmosphere, which is a fast 'mixer' and cannot be segmented geographically. Water, instead, is visible and manageable in confined geographical areas, and it has usually been treated as a regional and national issue with strong political implications. Water has a trans-boundary dimension at the same time, which leads to the ongoing discussion about

trans-boundary and global water governance. Tension also emerges from the continuing debate on whether water is a human rights issue or a commodity.

■ Do you think of water as the new oil?

Actually, water is much more valuable than oil; there are alternatives to oil, but there are no alternatives to water. With the expected growth in population in the decades to come, we will face a food shortage. According to recent scenario analyses, the food shortage could be as high as 20% of the amount required to meet the growing global demand, due to lack of water for irrigation. With a changing climate, there will be some regions with surplus but, on average, the picture is pretty scary, with food shortages potentially rising by an additional 20%, mainly concentrated in the regions of the world where water resources are already scarce. Water businesses will face increasing challenges as the intake points for fresh water will have to change due to sea-level rise and increasing saline contamination. Existing technologies for desalination of water are expensive, and scaling them up would require new partnerships and long-term contracts between industry, academia and the public sector.

■ Surface water and groundwater: where are the priorities?

The only way to manage water resources effectively is to take an integrated system view. We cannot concentrate only on surface water, as it is connected to groundwater ecologically and in terms of use. For example, in India, about 60% of water for irrigation comes from groundwater and it is reasonable to expect the rate of groundwater use for irrigation to go down in the future, due to dwindling supply. Addressing the needs of the agricultural sector will therefore require increasing use of surface water, where many more competitors come in to play. That's why we need to look at the different sectors as a system — both in space and time.

■ How do you see water management fitting into the climate change adaptation agenda?

Engineers use statistical distributions calculated from records of water flow and

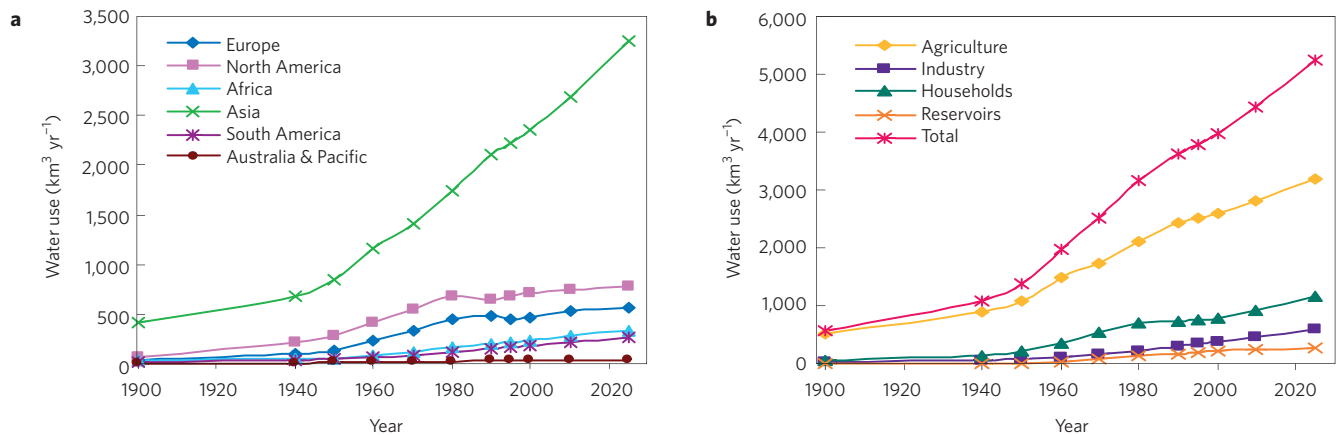


Figure 1 | Breakdown of water-use data. **a**, Global water-use by region. **b**, Water used across different sectors.

rainfall to design water infrastructure, such as dams. For a long while, the implicit assumption has been that the hydrological statistics of the past will remain unchanged in the future. Under climate change, however, such a stationary paradigm has to change and, to this end, the dialogue between hydrologists and engineers on one side and climatologists on the other needs to improve. Infrastructure designers need to accept that they will have to work with distributions of water discharge under different scenarios if they are to incorporate climate change into their analyses and find adequate solutions. Moreover, given the complexity of the water system, there is need for a no-regret, adaptive-management approach. One good example in the Netherlands is the new nationwide Delta Programme to protect a large portion of land around the Rhine–Meuse–Scheldt delta from floods. Historically, the focus was on hard solutions such as surge barriers and sea-dykes, but it has become clear now that it is a rigid approach with cost implications if the rise in sea level turns out to be different from that expected. Therefore, the focus gradually shifted from hard to soft solutions, such as fortifying the coast by digging sand from the bottom of the channel — beach nourishment. If sea-level rise turns out to be less than expected, you simply stop digging sand, a no-regret practical tool. Flexible, soft solutions that can go hand in hand with the monitoring of uncertainty are the answer for infrastructure in water adaptation.

■ What about water, climate adaptation and development?

I was in Johannesburg, back in 2002, assisting at the launch of the Millennium Development Goals (MDGs) and climate was not included in the portfolio. However, in developing countries there is an urgent need to build basic infrastructure, such

as water storage and flood protection, before even starting to plan investments for development. In a recent study we tried to calculate how long it would take to improve water infrastructure in sub-Saharan countries, to the level of South Africa where a water storage capacity of about 1,000 m³ per capita is available. Assuming that a sustained growth in gross domestic product of 5% per year (MDGs require 7% per year) would be reinvested locally to build up the storage capacity, we found that for most of the sub-Saharan countries it would take around 50 years to do so. The truth is that we have shied away from building water storage because dams are controversial; we haven't looked for alternative water-storage infrastructure and we haven't learned from the failures in infrastructure registered in these countries. We, in the developed world, prefer to build schools as they give us better publicity. In my view, there is a fundamental threshold of water infrastructure which needs to be met for other investments to be sustainable.

■ Why is basic water infrastructure in the developing world still missing?

The first blame goes to donor countries that have tended to look for the short-term impacts and visible benefits, such as sending aid after disasters. We know that every dollar spent on pre-disaster infrastructure improvement is worth up to \$10 spent after a disaster, and yet 90% of aid is delivered after disasters because it appears in news headlines. Governments have a short-term approach, and therefore there is no will to go for long-term investments to build infrastructure and maintain it. This is a big political-governance issue and it is not about lack of money. I think we should re-examine the way the developed world collaborates with developing and emerging economies, not only for

water-related issues, but for development-aid practices in general.

■ How critical is it to establish co-operation and partnerships between developing and developed countries to address the water issue?

Although the scientists now see the need for more equitable co-operation, the agencies in the donor countries do not. During the 1970s there was this idea of exporting our knowledge, R&D and technology to the developing world, and now that paradigm needs to shift into building fully engaged partnerships. The level of education in recipient countries has gone up incredibly and young people returning from the US and Europe with their PhDs suffer from the attitude of donor countries, which is still oriented to educating the developing countries and to the one-way transfer of knowledge there. Resources directed to developing countries, partly as a result of the difficult economic climate, are now often conditioned to making economic profit for the donors, and this is very sad. Even when we officially commit to partnerships with developing countries, we don't really mean it and we need to change this. Unless in a true collaboration where we respect knowledge locally available, we will never be able to make the progress we aim to. I urge for a change in the attitude and practice of co-operation with developing countries and, more generally, for a fundamental change in investment practice for development. Even the well-known institutional vacuum existing in many of those countries could — at least in part — be addressed by more effective and more equitable North–South partnerships.

INTERVIEW BY MONICA CONTESTABILE

Published online: 25 November 2012