

# REFLECTIONS ON QUALITY AND ACCOUNTABILITY IN COMMUNICATING SCIENCE INTERNATIONALLY

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## A World of **SCIENCE**

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### EDITORIAL

## Water too has a **tipping point**

**In** 2009, Rockström *et al.* proposed the concept of 'planetary boundaries', beyond which lay the point of no return, or tipping point. They estimate that humanity has already transgressed three out of nine boundaries, those for climate change (greenhouse gas levels), the rate of biodiversity loss and the global nitrogen cycle. Humanity may even have transgressed a fourth boundary, they suspect, the limit for freshwater use, or may be close to doing so. Current consumption is estimated at 2 600 km<sup>3</sup> per year – and rising.

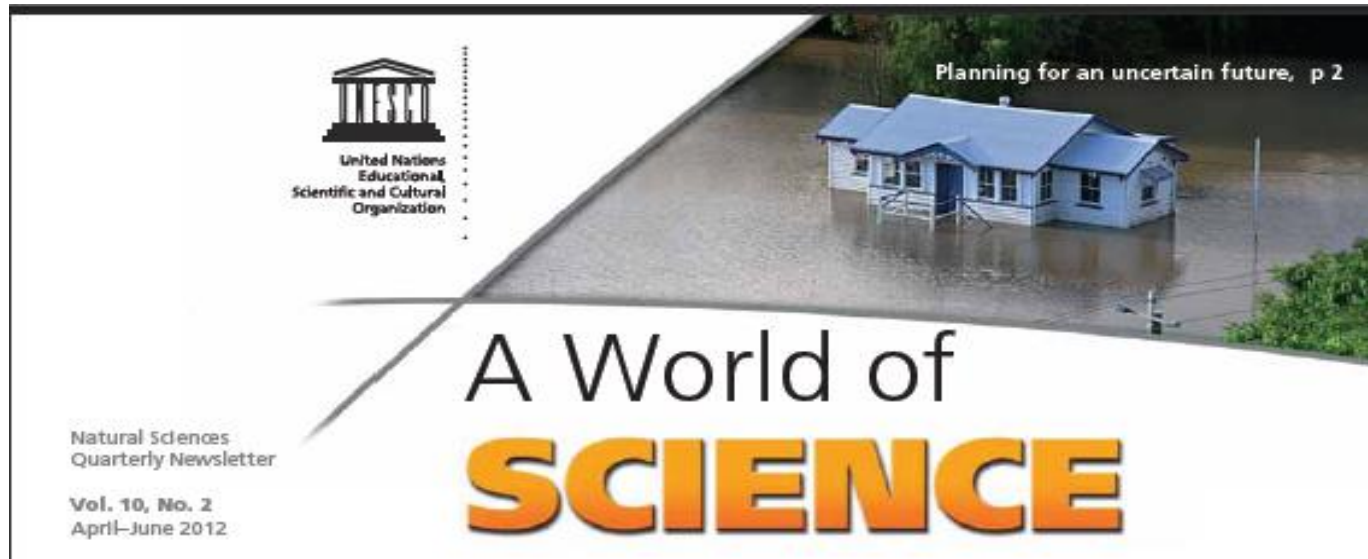
This study is cited in the Fourth World Water Development Report, *Managing Water under Uncertainty and Risk*, launched by UNESCO on 12 March on behalf of the 28 agencies comprising UN-Water. Rockström *et al.* suggest that the social cost of transgressing the planetary boundaries will depend upon how resilient and green our societies are. Going green will not alone ensure more water-friendly policies, however, as exemplified by the controversies over biofuels and large-scale foreign acquisitions of arable land. Above all, the report observes, we need to acknowledge the cross-cutting nature of water across the entire development spectrum. Food and energy production, industry, human and environmental health are *all* dependent on water, *all* essential for socio-economic development and *all* increasingly interdependent.

Forgetting that water flows over sectoral boundaries can be a costly mistake. The Mississippi Delta in the USA has been radically modified to supply agriculture and hydro-power. By reducing risks to agriculture upstream, the scheme has amplified risks downstream, exacerbating the impact of Hurricane Katrina on New Orleans in 2005. Where is the link? The dam constructed on the river interrupts sediment transfer. Without the constant deposition of sediment, tidal and wave action is gradually eroding the delta on which New Orleans is built, causing the city to sink and thus to flood more easily. The pumping of groundwater, oil and natural gas in the delta has caused further subsidence.

This example illustrates a wider problem. The lack of interaction between sectors, as well as between users, decision-makers and managers, has allowed water resources to become seriously degraded around the world, threatening all the sectors that depend on water and thus compromising development. With climate change likely to make water resources less abundant in future, even as demand for water grows, humanity finds itself on an unsustainable development path.

At a time when humanity is facing an uncertain and perilous future, *Managing Water under Uncertainty and Risk* drives home the point that a 'business-as-usual' approach to water management is not an option. We must adapt our development planning and management to reflect the bigger picture. And we don't have much time. Herein lies the key message of the report, extracts from which you will find overleaf. The Earth Summit in Rio in June should offer an ideal occasion to drive this message home.

Gretchen Kalonji  
Assistant Director-General for Natural Sciences



Via articles written by scientists or reviewed by them:

- describes UNESCO's work in accessible language, alerts to emerging issues
- popularizes mainstream science
- promotes science in the South
- strives to show cultural sensitivity and avoid eurocentrism



# Journal's message: science is universal



## UNESCO's role

- No sustainable development without science and technology: capacity-building, policy advice, clearing house for scientific information and data;
- Approach both global and local. Example: climate diplomacy, climate mitigation and adaptation

## Science is universal

- Throughout history, civilisations have applied science and technology: 'golden age' of Islamic civilisation, ancient Egyptians, Greeks, Romans, Chinese, Indians, Inca, Maya, etc.
- Growing international co-authorship – in astronomy, for example, can be 100 authors or more (facilitated by Internet)
- international years useful for conveying universal message: freshwater 2003, physics 2005, planet Earth (Earth sciences for society) 2008, astronomy 2009, biodiversity 2010, chemistry 2011

## Readership of *A World of Science*

- Between 2002 and 2011, distributed in 192 countries in English, French, Russian and Spanish, to governments, parliamentarians, specialists, development partners, universities, schools, etc, via open access and free print and e-subscriptions

# Show cultural sensitivity

## Science has a multicultural history



IN FOCUS



## The miracle of light

There may be more to celebrate in the International Year of Physics than meets the eye. Indeed, the Year marks not only the centenary of Einstein's miraculous year but also the millennium of the founding of modern optics by physicist Ibn Haitham (Iraq, 965–1040). Among a number of major contributions, Ibn Haitham put experimental science on the map by decisively settling the heated debate over the basics of vision, through a remarkable series of experiments. Having pioneered the pinhole camera, he successfully explained sight in terms of light travelling into the eye rather than the other way round. This finally discredited the now absurd emission theory of Plato and Ptolemy<sup>1</sup>, effectively rewriting centuries of scientific thought.... Here, we voyage through one thousand years of the physics of light, with a special focus on optics.





# Show cultural sensitivity

Time is not the same for everyone

(even if Gregorian calendar is UN standard)



UNDER THE PATRONAGE OF H.M. KING ABDULLAH II BEN AL-HUSSEIN, AND IN THE PRESENCE OF H.E.MR KOICHIRO MATSUURA, DIRECTOR-GENERAL OF UNESCO, WITH GOD'S BLESSING THE GROUND-BREAKING CEREMONY AND THE ESTABLISHMENT OF THE SYNCHROTRON LABORATORY COMPLEX (SESAME) WERE INAUGURATED ON MONDAY DATED 2/11/1423H., 6/1/2003 A.D.

# Promote science in the South

Scientists from the South on issues of importance to the South

## INTERVIEW

Khady Nani Dramé

**'The rice farmer need no longer sustain heavy losses in times of drought'**



Although the degree of drought tolerance varies from one rice variety to another, most studies have so far been confined to Asian rice, *Oryza sativa*. In the first of a series of interviews commemorating the 10<sup>th</sup> anniversary of the L'ORÉAL-UNESCO Awards for Women in Science, we talk to Khady Nani Dramé, who is devoting her L'ORÉAL-UNESCO Fellowship obtained in February 2007 to the study of the genetic basis for drought tolerance not in *O. sativa* but in another species, *O. glaberrima* or African rice, grown exclusively in West Africa.

Born in Senegal 28 years ago, Khady Nani Dramé holds a PhD in molecular ecophysiology from the University of Paris XII (France), where she focused on the drought tolerance of the peanut. In West Africa, drought is one of the primary constraints for both rainfed and artificially irrigated rice production, owing to poor water management. With rice being a staple food for both urban and rural populations and with domestic production unable to keep pace with demand, most African countries import large quantities of the high-yielding *O. sativa*. Through her research, Khady Nani Dramé hopes to reduce this dependence on rice imports.

A World of **SCIENCE**, Vol. 6, No. 2, April – June 2008

# Alert to emerging issues

NB 57 scientists from 18 countries combined their expertise here: *Australia, China, Denmark, France, Germany, Indonesia, Ireland, Japan, Rep of Korea, Kuwait, Malaysia, Oman, Philippines, Sweden, South Africa, UK, USA, Vietnam*



## INTERVIEW

Patricia M. Glibert

## Scientists take a stand against ocean fertilization with urea



With atmospheric emissions of CO<sub>2</sub> growing at an alarming rate, there is no shortage of geo-engineering schemes to limit the effects of climate change. One of the most extravagant proposes installing a giant parasol in orbit to cool the planet! More down to Earth are schemes to inject CO<sub>2</sub> into the ground or ocean or to 'fertilize' the ocean. The ocean is a tempting target because it absorbs about one-third of atmospheric CO<sub>2</sub>. In recent decades, several controversial experiments have 'fertilized' parts of the ocean with iron in an attempt to stimulate plankton growth at the surface. Now, attention is turning to doing the same with urea. Plankton absorb carbon through photosynthesis, so accelerating plankton growth would remove massive amounts of carbon from the Earth's atmosphere, the theory goes. When these microscopic plants died, they would conveniently carry the carbon to the ocean floor, storing it there for eons. Many marine biologists and climate scientists shudder at the thought: we simply do not know yet whether fertilizing the ocean might trigger runaway algal blooms which could deprive vast expanses of ocean of oxygen. This uncertainty has not deterred companies from proposing to dump large quantities of urea into the sea.

A World of SCIENCE, Vol. 6, No. 3, October–December 2008

# A universal challenge for science communicators

A basic antagonism:  
the public thrives on certainty,  
scientists thrive on uncertainty.

How does the science communicator convey uncertainty convincingly to the public?

- Scientific uncertainty is normal: science is a process, not an event.
- Policy-makers act on certainty, should take uncertainty into account by adopting the precautionary principle = in the absence of scientific consensus, the burden of proof that an action/policy is not harmful falls on those intending to act.





# Scientific uncertainty is healthy



## The way forward

Water and land have become vitally strategic resources, more interlinked than ever before. Confronted with competing demands, policy-makers are faced with a dilemma: how can they ensure food security without penalizing energy security, or satisfy both industrial and agricultural demands for water?

The key to rational management will be to consider different uses of water alongside each other, including domestic use, land management, agriculture, mining and energy production. The best way to do this is to create a structure within which competing interest groups – such as water utilities, farmers, industry and mining, communities and environmentalists – can hammer out coherent strategies for meeting future challenges and uncertainties. To be fully inclusive, a broad group of stakeholders should also be involved in the rule-setting process for the management of both domestic and transboundary water resources. Combine these twin elements and you have what is called integrated water resource management.

Water management has always been underpinned by uncertainty but global trends in demography, consumption patterns, industrial development, migration and climate change are driving the level of uncertainty to unprecedented levels, exacerbating risk. Integrated water resource management offers stakeholders the flexibility they need to be able to adapt strategies for water management when the future doesn't go according to plan.

This will be the challenge for water authorities: to move from planning for one defined future to the use of plans that are responsive to a range of possible future scenarios, all uncertain but presenting varying degrees of probability.

## Venice will succumb to sea-level rise, the question is when

The newly published report of a workshop run by UNESCO's Venice Office on 22–23 November 2010 has concluded that 'the planned mobile barriers (MOSE) might be able to avoid flooding [of the World Heritage site of Venice and its Lagoon] for the next few decades but the sea will eventually rise to a level where even continuous closures will not be able to protect the city from flooding. The question is not if this will happen, but only when it will happen.'

In order to avoid flooding, the Italian authorities have authorized the construction of an underwater barrier system, referred to as the MOSE Project, which should be operational by 2014. During the project planning phase, three scenarios for sea-level rise by 2100 were considered: 16.4 cm, 22.0 cm – the scenario recommended for the MOSE project – and a pessimistic scenario of 31.4 cm. Today, even the pessimistic scenario is considered overoptimistic.

The Intergovernmental Panel on Climate Change (2007) forecast global sea-level rise of 18–59 cm to 2100 but excluded ice melt from its calculations, as this parameter could not be modelled. Observed global sea-level rise actually exceeded the model projections for the period 1961–2003 by 50% and for 1990–2008 by 80%.

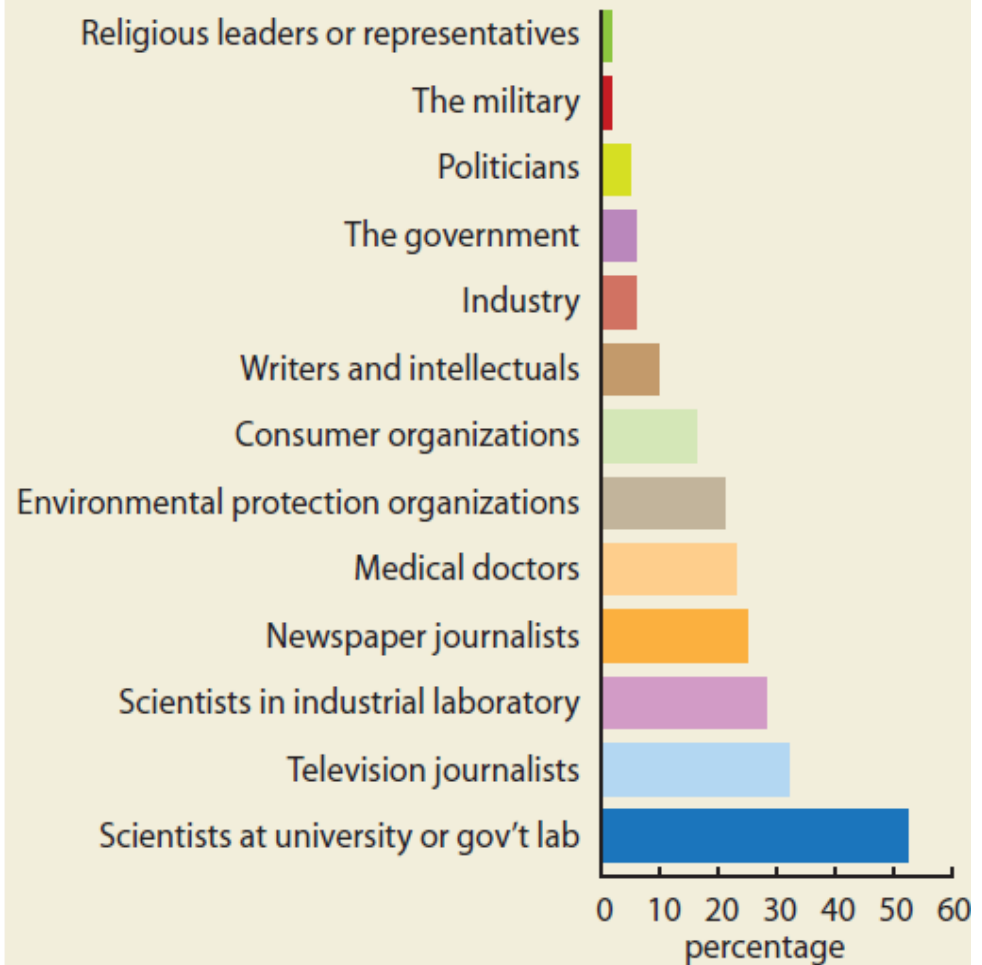
Other uncertainties stem from the insufficiently understood dynamics of heat uptake by the oceans, which causes oceans to swell and thus sea level to rise, as well as from the variety of possible scenarios for future carbon emissions and the consequential heating of the atmosphere.

European public shows a high level of trust in scientists and journalists

NB prior to 2009 « climategate »

Source of graphic: UNESCO Science Report 2010

**Figure 8:** Professions trusted by the European public to explain the impact of S&T on society, 2005 (%)



Note: Survey in 2005 of 30 000 respondents in the EU-25, Bulgaria, Romania, Croatia, Turkey, Iceland, Norway and Switzerland

Source: Special EUROBAROMETER 224

# Merchants of doubt: a universal threat to quality communication

IPCC authors have responded to the public's demand for certainty by introducing measurable degrees like 'very likely' into the 2007 IPCC report = 90% probability of occurrence: *'Most of the observed increase in global average temperatures since the mid-20th century is **very likely** due to the observed increase in anthropogenic greenhouse gas concentrations.'*

Climate sceptics have seized upon this concession (and rare errors in the IPCC report) to ascertain a lack of consensus and sow doubt about the human role in climate change.

Oreskes and Conway argue that climate sceptics consider science 'as politics by other means'. These lobbyists feel threatened by environmental science because it has pinpointed the negative impact of the free market system (acid rain, DDT etc) on the environment and thus the need for government regulation. To pressure the media to introduce 'balance' in their reporting, they insist on debate via their Fairness Doctrine developed at the time of the tobacco issue.

- *While the idea of equal time for opposing opinions makes sense in a two-party system, it does not work for science because science is not about opinion. It is about evidence. It is about claims that can be, and have been, tested through scientific research ... that is subject to critical review by a jury of scientific peers. Claims that have not gone through that process - or have gone through it and failed - are not scientific and do not deserve equal time in a scientific debate.*

Naomi Oreskes & Erik M. Conway  
*Merchants of Doubt*, 2010

# Making science accessible to the masses: the best way to combat ‘merchants of doubt’



## IN FOCUS



Charles Darwin (1809-1882) aged about 30

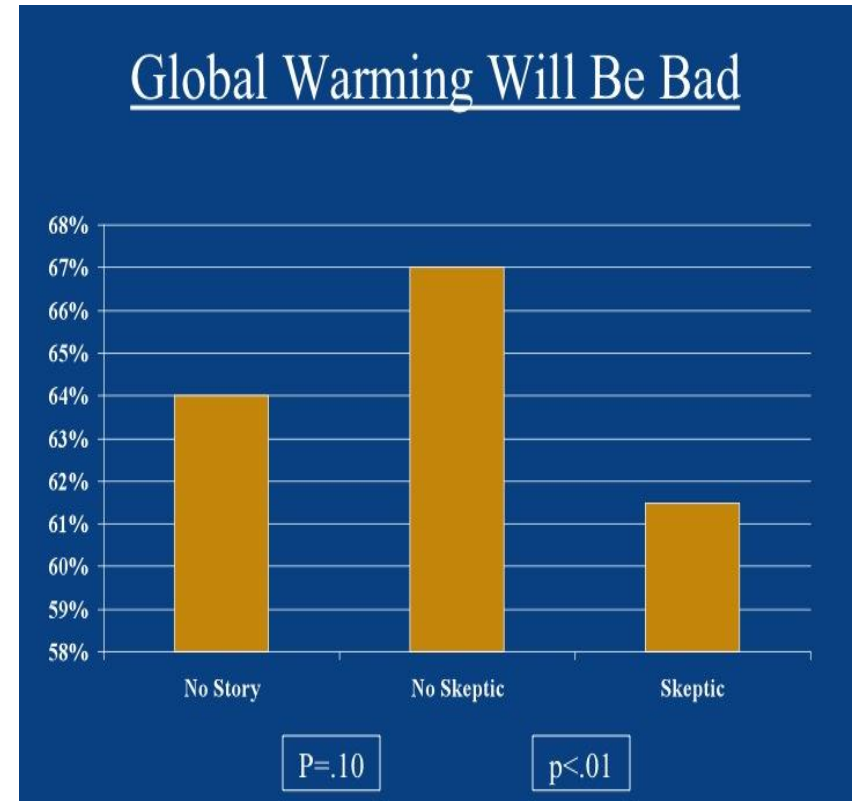
## Darwin lives!

Charles Darwin turned 200 years old on 12 February 2009. Happily, the 150<sup>th</sup> anniversary of his book *On the Origin of Species by Means of Natural Selection* falls later in the same year. Darwin's work, which led him to defy respectable convention and develop his own version of 'transmutation' (today called 'evolution'), remains compelling today, as the evidence that he amassed and analysed and the ideas he generated to explain how evolution works still remain at the core of evolutionary science.

Since Darwin's day, of course, the world has moved on. Enormous strides have been made in genetics, developmental biology, palaeontology and anthropology, rendering the case for evolution vastly more detailed and robust. Yet, the essence of Darwin's theory – that all species of life on Earth are related by a process of ancestry and descent, and that the changes we witness in life through time are moulded in large part through the action of 'natural selection' – remain as true today as when Darwin published *On the Origin of Species* in 1859.

# Adding the sceptic to the mainstream scientific message on global warming made the American public:

- Less likely to believe that scientists agree that global warming has been happening
- Less certain that global warming has been happening
- Less likely to ascribe high personal importance to the global warming issue
- Less likely to believe that global warming would be bad for people (figure)
- Less likely to believe that global warming is a very serious issue
- Less likely to support more government action to deal with global warming
- Less likely to support a cap and trade system to limit greenhouse gas emissions



Source: Internet survey (2009)

<http://woods.stanford.edu/research/global-warming-skeptics.html>



# To sum up



UNESCO Director-General Irina Bokova:

*'Our vision is clear. Social equity, environmental protection and sustainable, green economic development are part of a single agenda. Science must be an integrating factor in this agenda.'*

UNESCO's mission is to educate about the importance of sustainable development for our planet's future. With climate change, we have seen just how closely science and policy are intertwined today. If decision-makers and the general public don't understand what is at stake, they will not be willing to act. We will lose precious time, even though urgent action is needed to avoid severe environmental degradation and runaway climate change and to ensure food, energy and water security.

As science communicators, we must remain vigilant, to ensure that:

- we live up to the public's trust by producing accurate, timely information that helps them to understand the issues and the world around them;
- we do not abandon the public to the lobbies which refuse to see science for what it is - the pursuit of knowledge and truth, even uncomfortable truths - but rather which see science as politics by other means, to be combatted at all costs – and at any cost.

**Thank you**

**[www.unesco.org/en/a-world-of-science](http://www.unesco.org/en/a-world-of-science)**

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