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Keynote Speech:
Dealing with Environmental Challenges - new approaches

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I am honoured to address this meeting which is dealing with key issues shared by organisations and governments dealing with major environmental challenges, namely, raising awareness, information, integration and the management of environmental resources. You do of course have your specific interests on water issues and accounting methods. Because the world is facing extraordinary tough decisions about the finite extent of all its natural resources, the only way is to establish policy is through objective and transparent methods that everyone accepts. This technical meeting, which is pioneering these methods, may have repercussions on other environmental policy areas such as climate change, air quality, biodiversity, etc.

It is a pleasure to be here in the Netherlands where I frequently come as a visiting Professor in Engineering at Technical University Delft, and regularly meet hydraulics colleagues researching into problems of floods and tsunamis. As a British scientist it is appropriate to recall with our hosts today at the Netherlands Statistical Office the great contribution made in this country to the early development in the seventeenth century of statistics by Christian Huygens the mathematician and physicists. Perhaps this influenced the British monarch in exile Charles II, who, when he returned to England in 1660 helped set up the Royal Society and particularly encouraged the work of their statisticians. He is reported as saying 'You need more of these tradesmen'! When I was head of the UK Met Office, I was also UK permanent representative at the World Meteorological Organisation (WMO) in Geneva which is responsible for weather, climate and operational hydrology. So I am also pleased to join a meeting under UN auspices for furthering collaboration between technical agencies and research by the UN technical agencies and governments, businesses and civil societies around the world.

At WMO in 1990's we were framing policies about the information and performance issues which were quite controversial at that time. I am pleased to see that these are being considered in more detail at this meeting and I hope with greater consensus.

I must warn you though to be cautious about jokes on accounting matters at an international meeting since they do not translate well into other languages. At WMO I compared the budget data presented to us rather unfavourably with the accounts of the smallest unit of British local government - namely parish councils, which originate from the local role of churches. This was translated into many languages in surprising ways. Afterwards colleagues said I was quite right to connect meteorology and religion; in fact Norway's meteorological service is in the same Ministry as that for Religious Affairs (which is reasonable since on two days every week, Wednesday and Thursday, we recall the Nordic gods Woden and the god of thunder Thor)!

Based on my political as well as scientific experiences I should like to begin by reflecting on the background to the policy themes of this conference which result from the way that governments and societies have dealt with major environmental problems in the past. In some cases they have been successful, for example in tackling local problems such as water pollution in rivers, and urban smog in many areas of the world. Regional and global problems of acid rain and ozone depletion in the polar stratosphere (the 'ozone hole') have also been tackled effectively. By contrast, faced with other environmental threats governments have been much less effective in averting the near disappearance of certain fish stocks, and the nitrogen pollution and ecological collapse of large areas of enclosed seas, notably the Gulf of Mexico, and East China Sea. These were recently emphasised by the US Ambassador for Fisheries, David Balton. The drying out of inland seas and lakes in central Asia and Africa has devastated their riparian communities.

In dealing with the unprecedented, but still uncertain, global threat of climate change it is not yet clear whether governments and the international community will succeed or fail. Policies for water resources that you are discussing here cannot of course be made without considering their linkage to the effect of climate change. By assessing the history of these and other environmental policies, it appears that the policies have succeeded when they have been based on three essential components, all of which relate to the themes of this meeting.

The first is that the policies need to have a firm scientific basis which is also widely accepted by government and society; in other words they must have validity as well as correctness. However as with any scientific conclusion and recommendation, there will always remain rational grounds for doubt. But these should decrease with time as research progresses, provided the science is correct.

The second component for success is that the problems must be recognised by policy makers as having a really significant impact on society and the economy. This is easier to accept if the timescale of the impact is short enough for people to understand and politicians to worry about. This was certainly the case when acid rain was damaging Scandinavian lakes and the fishing of influential land owners along Scottish rivers. In the UK the Duke of Edinburgh was very concerned! The shortage of water resources certainly falls into this category, since it is such an important problem for society and the economy.

The third component is that policy makers and industry should accept that there are practical solutions to the problems, so that raising public concern about these environmental issues is not merely alarmist, but in fact the first step in dealing with them. Dealing with the ozone hole problem was a good example. Once the chemical industry had invented a substitute chemical for refrigerators and aerosol cans that would not damage the ozone layer in the stratosphere, industry and governments were prepared to coordinate international action through the Montreal protocol in 1987.

Following the opening speaker Paul Cheung of the UN Office of Statistics and the writings of social scientists, one might use the concept of 'validity' as a criterion for judging the effectiveness of environmental policies. Where policies have failed, one or more of these three components of validity have been lacking. In some cases scientific results have been sufficiently uncertain, or have been so heavily criticised in public, that decisions were postponed - with calls for research rather than action. Initially this happened in Europe and USA with acid rain. This prevarication continues with marine pollution and climate change. One way of prompting politicians to deal with long term problems is to ensure regular publication and dissemination of data about the relevant environmental issues, e.g. fish stocks, water levels, rainfall, global temperature, and polar ice. This is very effective in establishing the validity of the scientific data. After 1992 the WMO made a yearly assessment of the global rise in temperature - which was then published around the world. Other data including hydrological data also needs to be issued regularly and publicised more widely. Progressively the seriousness of the impact of climate change on every aspect of the natural world and human society has become evident even to the most sceptical politicians and economists. The World Bank has now launched its most ambitious programme on clean energy and climate change last month. This helps place the issue more firmly with the economic and finance departments of Government which tent to have the greatest influence on policy!

Policies also fail when the impacts of the environmental problems are not regarded as sufficiently serious compared to others affecting society and the economy. It is probable when there is a strong health impact, especially with clear statistical data, that governments accept the need for action; the threat of more skin cancer with higher ultra-violet levels greatly influenced the international response to the ozone hole problem in the 1980's. The very high temperatures in Europe in 2003 and the premature deaths of 30,000 people led governments here to institute new programmes of adaptation to climate change. (But it has not yet had much effect on policies to mitigate the greenhouse gas emissions which cause global warming). Clearly shortages of water resources are also having a major health impact. The impact of steady increases in global temperatures or reduction in rainfall may be small. But as much larger fluctuations begin to appear than in the past, which the global climate models predict, these have immediate social and economic impacts. This parallels the world wide concern about the increased damage from natural disasters. Casualty figures and insurance statistics have shown how the impact of naturally caused effects tend to be seriously worsened as the patterns of human habitation change, with more communities located in vulnerable areas, particularly in coastal areas. These are intrinsically susceptible to hurricanes, tsunamis, mud slides and, in some parts of the world, earthquakes and volcanoes as well. Scientific research, new technology and better dissemination of information are helping to moderate the high impact of extreme events, through a range of practical actions, namely: better assessment of the risks, more accurate prediction of these events from a few hours to a few months ahead, through preventative action and effective communication of risks and warnings.

There has been real progress in all these aspects of moderating the impacts of environmental disasters. At the most general level, statisticians and mathematical modellers have discovered that the data covering extreme events has to be analysed

separately from that of the whole distribution of the events. For severe flooding events the result has been that extremes are now predicted to occur more frequently. Using the methods of weather forecasting and climate prediction, the accuracy of forecasting meteorological disasters has improved. The track of hurricane Katrina was forecast to within 100km about 3 days ahead (but tragically the data was not heeded by the relevant agencies). Also the likely occurrence of hurricanes and typhoons over the next season is now quite well predicted. Many of the droughts in the world such as those in NE Africa and Brazil as well as high temperatures in Europe are being predicted. Even warnings of the risks from earthquakes and volcanoes are now possible; such warnings were issued, but only in the scientific arena, before the Asian Tsunami of 2004. For such predictions to be of use to policy makers there has to be some assessment of their reliability. As long ago as 1944, General Eisenhower in his planning for the D-Day invasions across the Channel insisted on evaluating the weather forecasts for 2 months before the operation began. He wanted to assess the reliability of the different methods being used by the US and UK forecasting teams. In fact he combined the results, which is what the national and international agencies do today, because it has been shown statistically to be the most accurate method. This was still controversial in the 1990's, but is now an accepted method in meteorology and even in medical research where different mathematical models for heart mechanics are combined and compared.

There has also been great progress in the way that warnings and other environmental information are disseminated to communities and businesses affected by the environment. Even in developed countries the effective dissemination and use of this information through the media and local agencies is not perfect. Although the average number of casualties from natural disasters and other extreme environmental events has declined greatly, to a few hundred in largest countries, there have been failures, as with of Katrina in 2005 and the European summer heat of 2003. In the largest developing countries new systems of administration are being introduced; in India written warnings from the meteorological and other agencies are now translated electronically into 14 languages and sent out as voice mail to mobile phones and other networks. Similar focussed methods using mobile phones are being used to provide forecasts about air pollution to people suffering from breathing difficulties in London, through the recent ESA project PROMOTE. A vital aspect of all such information is that it should be trusted. That was not the case when hurricane Mitch struck central America in 1998 and wreaked such havoc.

Information is equally important in the effective implementation of practical and effective solutions to environmental problems. But it is considerably more difficult than issuing warnings about particular environmental events.

The first reason for these difficulties is that since the most serious environmental problems are caused by humans, the solutions require changes in human interactions with the environment. For some problems these changes can be effected by a few major industries; acid rain and damage to the ozone layer was dealt with by a few major industries. For mitigating climate change part of the solutions can be provided by big business, e.g. through carbon free nuclear power. But an equally large contribution to

many environmental problems, particularly mitigating and adapting to climate change, reducing waste, minimising pollution and managing water resources require action at every level of industry, communities, businesses and government. The Netherlands of course has a 1000 year old history of collective action in their policies to deal with flooding, through the engineering solutions of dykes, pumping, land reclamation, etc. I have to mention in passing that the British Government specialist said that it was easier to build dykes in the Netherlands, using sand scooped up from the sea bottom (i.e. 'beach replenishment') than in England. That is why there is no policy of 'managed retreat' in the Netherlands. He explained that in England, as always, we have the wrong king of environmental phenomenon. Normally it is rain, or snow, or leaves on railway lines. But in this case we have the wrong kind of mud; the particles on the sea bottom off eastern England are too small, which is probably a result of the last ice age only reaching London and not the Netherlands!

Today the approach of local, national and international government agencies for environmental policies is to use a wide range of information, regulation, financial instruments, technical advice and reporting on achievements against targets. These business methods developed over the past 40 years have only begun to be accepted by environmental agencies over the past 10 years. The objectives of this conference on new accounting systems are certainly consistent with these international trends. One expects that in future these methods will be widely applied in integrated water resource management. The performance of the UK Met Office and the US weather service since the 1990's significantly improved as they became more focussed on delivering improved services, especially in terms of accuracy and timeliness, for example in reducing the errors of hurricane tracks and speeding up delivery of forecasting timelines. Indeed, as Chief Executive I lost my bonus one year when the mean time for delivery of aviation forecasts was 0410 hours in the morning instead of 0400 hours! The information on these targets and also the performance were publicly available. Equivalent output targets are not usual in hydrology, although they are beginning to be established and publicised.

But what kinds of information and targets are useful to enable society more broadly to make the real changes needed to solve environmental problems and in a sustainable way? Some countries governments are combining general public information and education with setting targets and monitoring changes. The EU's Environment Agency has been very effective in using this approach to encourage local communities, governments and industry to improve water quality. The concepts have been clearly set out. Also there have been winners and losers, which the media always likes. By contrast it is not clear how effective nationally provided information is in effecting change in people's energy use, carbon emissions, recycling waste, etc. However, at the more local scale of cities, with their immediate relation to media and to practical measures, some outstanding initiatives to adopt development policies have in fact been successful particularly in greatly reduced energy use and carbon emissions, and in sustainably recycling waste. One thinks of Curitiba in Brazil, Toronto in Canada and Woking in the UK which London, according to Mayor Livingstone, aims to emulate. In the Council buildings and facilities in Woking over 10 years, they reduced energy by 45% and carbon emissions by 70%. However the UK, like other governments, in its own information and

communication programme do not emphasise such local initiatives. Many commentators, including me, have been puzzled. Surely examples of good practice are essential. While economists are sceptical about the need for demonstrations, most politicians find that examples are the most persuasive way to influence people about new proposals.

A salient feature of the more successful sustainable development programmes of cities and industries is that they have indeed attempted to integrate them. Again economists have surprisingly little interest in the synergies and financial savings that this approach can generate. Curtailing private traffic in central London reduced energy emissions but also the costs and health effects associated with air pollution - which is stated by the World Health Organisation to cause more than one million premature deaths per year. The UK figure might be 20 to 30,000. In Woking, by combining alternative energy, combined heat and power systems and local transmissions, electrical energy was 20% cheaper and also the power system more resistant to power failure. For larger urban areas, integrated approaches to reduce energy use, more green spaces, etc., can lead to a virtuous circle of improved environment, lower costs and improved health; while an uncontrolled free market approach of allowing more private transport, more air conditioning, less energy efficient buildings leads to a vicious circle of worsening environment, health, costs, etc. The integrated programmes you are considering should enable several aspects of water management to be achieved simultaneously. But so far targets and measures specifically for encouraging and assessing progress in integration have not been clearly identified and agreed, even among experts. As far as I can see, as a part time politician as well as a scientist, integrated programmes are much more credible to the public, who are generally suspicious of individual targets for specific problems/issues. One approach might be by integrating statistics and targets through their financial aspects. Maybe insured risks will also encourage integrations of policies, as these are compared with uncoordinated policies. This may be one of the topics to be studied at the newly formed Lighthill Risk Network at University College London. Finally perhaps new children's books are needed to introduce schools and children's parents to environmental policies. India has been successful with its school books. I wish you every success in your conference and I hope that you will agree to produce and easily readable version of your official document that will move forward environmental policies and ensure that they are thoroughly integrated into other national and international policies and also the arrangements for funding.