

WORLD CLEAN AIR & ENVIRONMENTAL PROTECTION

IUAPPA'S 13TH CONGRESS & EXHIBITION

Conclusions, Key Issues, Highlights

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1. Overview

Even the most fervent advocates of the importance of reducing air pollution will have been surprised by the increasing evidence provided during the conference that this goal is absolutely essential for human health, productive agriculture, environment and a benign climate. Lord Browne, CEO of BP, Amory Lovins, the futurologist, and other business commentators have predicted that achieving this objective and the wider goal of dealing with climate change cannot be done by incremental steps. Rather it will require real paradigm shifts in every aspect of business, politics and how we lead our lives.

We had exciting contributions that point to how these great changes will emerge in many aspects of science and technology, but also in the wider domains of regulation, public

engagement (from local environment to global environment), market/financial mechanisms, and even philosophy. Here the idea was presented that more progress might be achieved by people setting their own goals as much as by 'top-down' public campaigns and by enforcement of societal objectives.

Contributions to the improvement of the atmospheric environment are coming from all over the world and from all kinds of organisations; academic, governmental and non-governmental, ranging from technological to religious. The private sector is heavily involved with internet based companies disseminating data and best practice. Finally, individuals are enormously important in their roles as publicists, thinkers and consumers of products, which have such a large impact on the environment and also as activists, and voters. Organisations and individuals all need information to understand these complex issues. Providing this information is probably the most important task of all the societies belonging to IUAPPA!

2. Topics and Conclusions

(i) Direct Health Effects

In many presentations, speakers emphasised the great value of continuing surveys of public health. On the positive side these surveys demonstrated several examples of improvements in air quality and health world wide. Policy makers now have an indication that the timescale for improvements in public health, following the introduction of new regulations, is about 1-2 years. These regulations generally depend either on establishing thresholds or on continuous improvements. So it was significant to learn from a Swedish study that continually reducing the concentrations of particulates such as PM₁₀ PM_{2.5} has measurable health benefits, even

when their concentrations are below the existing standards. This result shows the need to keep driving down concentrations to the lowest possible values (bearing in mind natural levels). At the same time, high concentrations of pollution occur in many situations, where they have serious effects - notably near road ways where incidence of asthma has been measured in the USA and Europe. Particulate concentrations from the current generation of diesel engines are clearly above generally acceptable health standards. Another aspect emphasised was that people in the presence of local sources of pollution can experience high concentrations for short periods even though the average exposure might be tolerable. This could occur for people moving in street canyons or in emergencies when very high concentrations of smoke, or of even more toxic vapours, may be inhaled. Calculations were presented on how to estimate these effects, though none on the technology that is emerging of how to damp down these vapours in emergency situations. There is growing concern about varied types of indoor pollution. These were illustrated with remarkable 'stories' ranging from problems of the air quality breathed by Egyptologists in underground tombs to new buildings in Japan which could not be used for more than one year after their construction. The social dimension of vulnerability to air pollution is now being thoroughly researched. Public education is part of the solution. However, dealing with most aspects of air pollution requires long term research; a brilliant example was the research work over many years when Professor Lawther at his Medical Research Council Unit at Barts showed conclusively in the 1950's that the effects of smoking are much worse than the most polluted city streets in the world. Finally we learnt about the success of integrating different concepts about how air pollution affects human health through focussing on balance of free radicals in the body. The straight forward conclusion is that the effects of air pollution are minimised by eating more fruit.

(ii) *Atmospheric environment and pollution*

This conference opened with a special session on climate change and air pollution. The observed and predicted features of climate change are now well established, particularly the global effects such as the increase in the average surface temperature and the consequential rise in the level of the sea around the coasts. It is also known that there is considerable variability across the planet in these trends, especially in the temperate and polar regions.

Recent heat waves with their serious health consequences have been exacerbated by the long term trend of rising temperatures. Recent developments in climate change research were highlighted here, notably the effects of aerosols and microscopic particles from industry, motor vehicles and forest fires which disperse in the troposphere over regional to continental distances. These particulates tend to reduce sunlight and average rainfall, but because they trap radiation at night over a 24 hour period their net effect is to accentuate temperature rise. The combination of processes in these 'atmospheric brown clouds' are likely to be particularly damaging to agriculture, especially when associated with high ozone levels. There has been a 15% decrease in crop production in China. Also as the particles are entrained into clouds they tend to reduce average rainfall. But at the same time they deepen the clouds so as to cause damaging increases in the intensity of sudden rain fall events. Together with the change in atmospheric structure flooding over mountain areas is likely to be particularly exacerbated by these aerosol effects and climate change generally. As Baroness Young, Chief Executive of the Environment Agency reminded us in her speech at the Guildhall, as the climate changes flooding will also be very severe in coastal areas.

The extent and the impacts of regional transport of air pollution is now much better understood. The policy implications are that no city or region can improve its air quality without collaborating with neighbouring regions on reducing pollution on a much wider scale. This may even involve collaborating with upwind continental areas separated by substantial oceans, so that Europe now has to consider the effects of air pollution emissions in USA. New institutional arrangements or new responsibilities for existing bodies are necessary to implement all the scientific, technical, economic, and political aspects of these wider and more complex types of environmental collaboration. A special workshop on this issue was held at this conference involving many of the existing governmental, intergovernmental and non-governmental organisations. It was agreed to call for a task force and for urgent efforts by the existing international organisations involved, to produce a recommended plan of action in the next 12-18 months. Meanwhile everyone concerned with air pollution policies must keep this issue in front of policy makers at every level.

(iii) Regulating and planning improvements in air quality

There continues to be a consensus that standards for air quality and for emissions from sources of pollution need to be demanding, both to improve the health of the environment and to stimulate manufacturers to keep improving their products and 'emitters' to reduce the impacts of their operations. It was also recognised that if standards are to keep moving ahead, this cannot be done by seeking universal agreement on global standards. This is likely to slow progress, because standards would then only improve at the pace of the slower. What seems to be needed is first the continued efforts by countries and by regions to introduce new standards and secondly for the international community to adopt whichever of these are most appropriate at any given time. The leadership role of the USA and California, in particular,

was recognised in the field of local air quality and vehicle emission standards. The EU are taking a stronger lead in climate change related standards through restricting green house gas emissions. However, here too, California also has ambitious targets.

One of the reasons for different standards is that they should depend on local meteorological or other conditions. The Californian regulations were influenced by the effects of the intensity of solar radiation, while those in Europe were more influenced by the presence of winds and frequent precipitation. Emission standards are clearly affected by technology and industrial interests. This may explain certain EU policies on diesel engine emissions - which Prof. Schwartz in the spirit of the international frankness of this conference robustly criticised as being likely to cause a public health disaster!

Another advantage of the local approach to regulatory standards is that it leads to an appropriate pace of incremental improvements - which is the defence of the EU to the charges raised by Prof. Schwartz. One way of regulating emissions is simply to reduce them. So there was much commendation of London's local initiative on congestion charges; the Deputy Mayor of London emphasised the role of pioneering initiatives by the smaller cities of Trondheim and Singapore which were an example for London. But political courage is always needed, good examples being the legal challenges by local groups as in Asia. These were very effective in changing policies and greatly improving air quality, as with the clean up of bus exhausts in Delhi and other measures in Bangkok.

Those attending the conference will have had the opportunity this week of looking at London's environment for themselves. It might have been very different if London had decided in 1960's to construct elevated superhighways; just as in USA, Toronto, Tokyo.

There was huge popular and political protest which prevented such development here and in other cities, as I saw from my personal experiences of attending protest meetings at that time.

As to future measures and challenges, strong arguments and new evidence was given for the need to include shipping and aircraft in regulations on local air quality and climate impact. There have been encouraging developments in the EU and international bodies such as the IMO and shipping. Market mechanisms may also play a role, for example by including aviation emissions in the proposed international carbon trading scheme.

(iv) Technology

Several industrial speakers emphasised how technological innovations have improved air quality and how such environmental improvements are driven both by regulations and by the market. The consumer has a significant affect on the environment when he/she purchases products and services, whether it is their house or car or holiday travel. Increasingly they are influenced by their understanding of the environmental effects of their decisions. Consumers generally want to contribute to a better environment, but the cost must be acceptable. They are also interested in taking advantage of new technologies. In reviewing future developments industrial technologists emphasises the remarkable changes that had taken place over the past 30 years, such as in the design and materials of catalytic filters. Although these 'older' technologies can still be made more efficient, new technologies now have the greatest possibilities for really substantial advances in efficiency. In some cases these advances will arise in combination with old technology such as hybrid-electric internal combustion engines, or simply much higher and more efficient car bodies and aircraft. They may arise with the arrival into the mass market of completely new technologies, such as the

fuel cell, or with the serious focus on renewable energy systems exploiting solar, wind and wave power. New materials will be, as they were with the catalytic converters, probably the main way that 'disruptive' breakthroughs will occur.

However, a complementary scenario is the one outlined by Amory Lovins, in which new energy and transportation systems will emerge to make best use of new design and materials through a more holistic approach. One example might be wind power being applied to generate hydrogen which can power cars using fuel cells. Then the enormous reserve of energy that is always stored in the fuel tanks of parked vehicles could in future work interactively with the electrical power needs of the grid. Cars would be connected to the electrical supply during the time they are in office car parks, and then draw down power when they are about to be used.

However as several speakers emphasised we should recall that in many countries air pollution may not be the most serious environmental problem.

Firstly there is the growing shortage of clean water and sewage systems in developing countries. These acute environmental and health problems can in part be dealt with through appropriate energy systems, for examples to filter water and process sewage by using clean electricity from solar power and fuel cells. These can be installed where interconnected electrical grids and water, sewage systems are not available. Secondly to generate the substantial quantities of electricity needed by the world's growing population without greenhouse gas emissions, there is a growing body of opinion advocating the return of nuclear power. But the problem remains about what to do with nuclear waste lasting

thousands of years. Here too there is new science and technology under development. It urgently needs to be applied.

This conference addressed many of the central environmental issues for the whole world and, I think, we can be satisfied that there is the knowledge, the capacity and the experience to deal with them. Is there the will?