Introductory summary of co-benefit issues and Stockholm Conference objectives

Contexte et objectifs de la conférence de Stockholm sur la recherche de co-bénéfices

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According to the Intergovernmental Panel on Climate Change (IPCC), warming of the climate is unequivocal, and it is very likely that most of the increase in global average temperatures since the mid 20th century is due to increases in man-made emissions of greenhouse gases. At the same time, the health and environmental effects associated with the so-called "conventional" or "traditional" air pollution – particularly in developing nations – are so significant that there is an urgent need to promote more effective systems and frameworks for addressing these problems at the local, regional, hemispheric and possibly global scales.

There are critical, well-documented linkages between air pollution and climate change – in terms of sources and effects – and emerging evidence of substantial potential benefits and synergies from integrated strategies that address both issues together, achieving "co-benefits". However, the air pollution and climate change communities have until now moved in separate policy and science arenas.

This paper provides background on the links between climate change and air pollution, and why this issue is important to policy makers. It also summarizes the goals and objectives of the Global Atmospheric Pollution Forum's Stockholm co-benefits conference.

1. A brief background: Climate change and air pollution

Both climate change and air pollution pose major threats to sustainable development, and are important impediments to efforts to bring nations and societies out of poverty.

The fourth IPCC assessment, released in 2007, reported that global atmospheric concentrations of carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values over the last 650,000 years. The IPCC also found that hotter temperatures and rising sea levels "would continue for centuries" even if greenhouse gas levels are stabilized, although the likely amount of temperature and sea level rise varies greatly depending on the fossil intensity of human activity during the next century.

The World Health Organization [WHO] estimates that over 800,000 premature deaths occur each year as the result of outdoor "traditional air pollution". Air pollution is responsible for tens of millions of cases of respiratory and other illnesses, severely affecting quality of life, reducing economic activity and affecting the disadvantaged and poorest most severely. Overwhelmingly, the main impacts now occur in developing countries where increased health costs, reductions in crop yields, and other impacts on natural ecosystems and man-made materials significantly reinforce the downward cycle of poverty. Importantly, while air pollution remains a local-scale problem in many parts of the world, long-range transport of pollutants at the regional, hemispheric and global scales is increasingly recognized as a serious challenge.

Certain parts of the world have seen the benefits resulting from the development of comprehensive air pollution policies and programmes. Many countries have successfully reduced air pollution over the past four decades and, in the process, have developed an extensive scientific, technical and legal basis on which to implement air pollution policies. However, the impacts of air pollution measures on climate change are often not considered adequately, and vice-versa.

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2. Links between climate change and air pollution

Historically air quality and climate change have been treated as two separate and distinct policy issues. Air pollution control strategies have traditionally been focused on reducing emissions of "traditional" air pollutants, or those that are harmful to breathe or damage the environment. These include pollutants like particulate matter (PM), ozone (O_3), sulphur dioxide (SO_2), nitrogen oxides (NO_x), toxic air pollutants, and heavy metals. Climate change policy has focused on reducing emissions of greenhouse gases (GHGs), primarily CO_2, but also CH_4 and N_2O.

However, as climate change science has advanced, it has become clear that traditional air pollution and climate change are intimately interrelated and interlinked – with respect to sources, atmospheric processes and human and environmental effects. Depending on the choices made, strategies to reduce emissions of traditional pollutants may increase or decrease emissions of greenhouse gases. And, likewise, strategies to reduce greenhouse gases can have positive or negative effects on air pollution.

Fossil fuel combustion is a major source of both traditional air pollutants and GHGs. The combustion of fossil fuel results in the emissions of greenhouse gases, like CO_2, CH_4 and N_2O. Burning fossil fuels also emits a range of traditional air pollutants, including carbon monoxide, mercury, carbonaceous aerosols ("soot"), nitrogen oxides (NO_x) and SO_2. Some of these compounds react in the atmosphere to form secondary pollutants such as O_3, particulate sulphate, nitrate and organic matter. The air pollutants impact on ecosystems and human health but some also impact on climate change and it has become clear that air pollution can affect greenhouse gas cycles, and climate change will likely influence the emissions, transport, chemical behaviour and impacts of atmospheric pollutants.

Traditional air pollutants, like O_3 and PM, contribute in their own right to direct or indirect climate impacts, though the associated timescales of these impacts (days to months) are generally far less than those of the global pollutants (decades to centuries). For example, changes in tropospheric ozone were found to have third-largest positive radiative forcing after CO_2 and CH_4 (IPCC, 2001). Because ozone plays an important role as a GHG, altering the emissions of ozone precursors such as NO_x and volatile organic compounds has implications for climate.

Emissions of SO_2 lead to the formation of sulphate aerosol particles in the atmosphere, which reflect incoming solar radiation, thereby reducing air temperatures. Aerosol particles also influence the reflectivity of clouds (albedo) so as to reduce temperatures at the earth's surface.

There are important and often complex interlinkages of pollutant emissions arising from interventions which are designed to improve local air quality or intended to reduce GHG emissions. Methane, for example, is both an ozone precursor and a GHG; methane abatement programmes will have positive synergistic effect, and certain abatement measures may be highly cost-effective. On the other hand, because the cooling effects of sulphate aerosol are believed to have masked some of the warming effects of increased greenhouse gas concentrations, the further abatement of SO_2 emissions may lead to enhanced warming.

At the same time, greenhouse gas reduction programmes can have important effects on air pollution. For example, demand-side management programmes and certain renewable energy policies will not only reduce emissions of greenhouse gases, but will have significant air pollution benefits, as well. The IPCC 4th Assessment found that mitigation strategies aimed at moderate reductions of carbon emissions in the next 10 to 20 years (typically involving CO_2 reductions between 10 to 20% compared to the business as

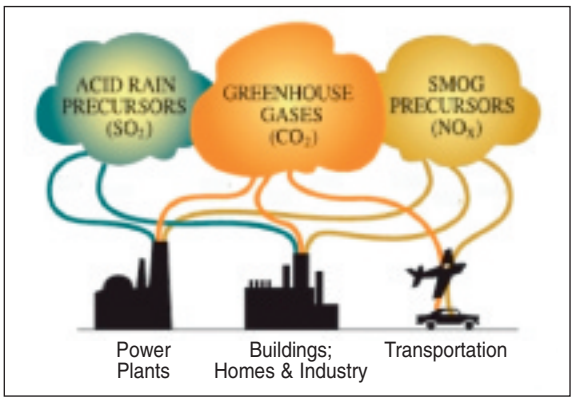

Figure 1.
Inter-linkages between sources and effects of air pollution and climate change.
(Source: Massachusetts Department of Environmental Protection).

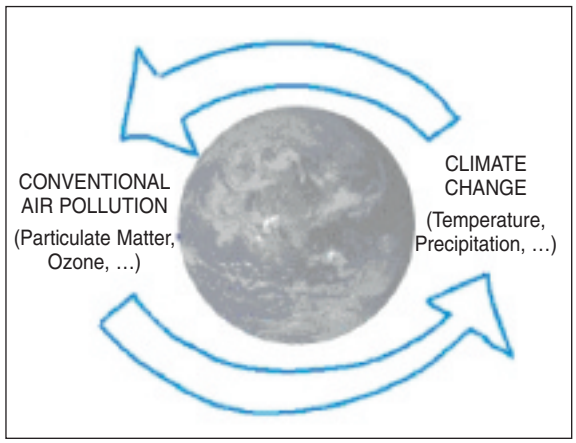

Figure 2.
Air Pollution and Climate Interactions.
(Source: Dr. Frank Raes, EC Joint Research Centre).

usual baseline) also reduce SO_2 emissions by 10 to 20%, and NO_x and PM emissions by five to 10%. The associated health impacts are substantial, and depend on the level at which air pollution emissions are controlled and how strongly the source sector contributes to population exposure. According to the IPCC Assessment, studies calculate for Asian and Latin American countries several ten thousand cases of premature deaths that could be avoided annually as a side-effect of moderate CO_2 mitigation strategies. [IPCC Climate Change 2007: Synthesis Report; chapter 11, page 76].

However, certain climate strategies can adversely affect air pollution. For example, increasing the use of diesel fuel and vehicles over those powered by petrol can reduce emissions of CO_2, but can increase emissions of particles (PM_{10}, $PM_{2.5}$). And studies have shown that expanding the use of biofuels can reduce emissions of CO_2, but increase emissions of NO_x and PM_{10} over their life cycle compared with baseline petrol and diesel vehicles [DEFRA 2007, UK, p. 185].

3. Why co-benefits approaches are so important

There is increasing evidence that there are large benefits (costs versus environmental and climate benefits) in linking air pollution and climate change policies [Saltsjöbaden 3].

In the developing world, efforts to reduce poverty and grow employment and economies are the major goal of nations and governments. Even serious air quality problems and climate change fall far below poverty-related issues in terms of concern in many developing countries. For example, in India, 34 percent of the population lives on less than $1/day. An increase in the energy needs and in the demand for goods and services in the developing world is critical and inevitable.

In the absence of other measures, growth in demand for such goods and services would lead to a "lose-lose" scenario for climate and air quality policies. A number of measures can be defined that lead to a reduction of greenhouse gases and an increase in traditional air pollutants and *vice versa,* so called "win-lose" (e.g. biofuels replacing gas) or "lose-win" (e.g. particle traps on diesel vehicles). But we can also distinguish a number of "win-win" measures reducing at the same time air pollutants and greenhouse gases (fuel switching, energy efficiency measures). [Salsjobaden 3].

A combined approach to deal with both climate change and air pollution can therefore have a number of positive synergistic effects. Because many developing countries are in the early stages of considering or adopting policies and programmes to address either air pollution or climate, some excellent opportunities exist to build in strategies that tackle both problems in a cost-effective way.

In fact, commitment to climate change measures seems unlikely in many developing countries unless other benefits can also be identified. And while there remains a suspicion of climate change policies in many developing countries, policies to address air pollution are relatively acceptable. Carefully chosen air pollution abatement policies – which can achieve immediate positive benefits – can therefore become a means of securing climate change abatement.

4. Lack of policy linkages to date

It has become increasingly clear that climate change and air pollution can no longer sensibly be tackled separately. Doing so will require the adoption of long-term integrated strategies. Integrating policies will allow benefits to each to be optimized, and correspondingly, will prevent their acting against each other.

Analyzing and designing air quality and climate change strategies independently can result in a number of risks: a failure to spot trade-offs early enough; an incomplete assessment of benefits (co-benefits ignored); a double-counting of costs; an incomplete assessment of the mitigation potential; and the possibility of overlooking the best overall option in favour of one focusing on only one of the issues. Assessments and design of strategies therefore need to be brought together [Saltsjöbaden 3].

Various integrated assessment techniques have been developed to examine potential synergies and trade-offs between greenhouse gas mitigation and air pollution policy. One major tool available today to explore the linkages between climate change and air pollution strategies is the Greenhouse Gas (GHG)-Air Pollution Interactions and Synergies (GAINS) model, which allows users to quantify the linkage between air quality and greenhouse gas emissions, control costs, atmosphere chemistry and impacts. GAINS can be used for joint assessment of air quality and climate change and constitute a basis for drawing up common strategies. Another framework that has been used in various Asian and Latin American countries to examine air pollution/climate trade-offs and cost-effective solutions is the U.S. Environmental Protection Agency's Integrated Environmental Strategies (IES) programme.

The benefits of integrated approaches and policies are obvious in terms of achieving combined improvements at less cost. Although there is increasing interest in this area, actual implementation of co-benefits strategies has been relatively limited to date. Opportunities for combining control policies on air pollution and climate change exist, all the way from local measures to the development of new international frameworks and agendas within the international UNFCCC system. Yet there is no international framework for promoting consensus on the problem and potential solutions similar, for instance, to UNFCCC for climate change.

In the absence of such a framework, there is no effective route for addressing the implications of the interaction of climate change and air pollution through a connection to the climate change community. Indeed the two issues are now so closely linked that it may no longer make sense, at the international scale, to see them as separate issues. There is an urgent need to interpret it for the circumstances of developing countries where a joint approach could potentially have greatest benefit.

The implications of failing to act in this area are significant. The impacts of air pollution at the regional, hemispheric and global scales will not be tackled without the development of new policy options and new institutional processes. While, over time, the reductions in pollution which have been seen in recent decades in western countries should progressively emerge elsewhere, this will be a very long and costly process in terms of health and sustainable development. It is important therefore to focus on ways to speed that process and to find short cuts.

It is important that developing countries be assisted towards integrated long-term strategies to jointly address climate change and air pollution, at the urban, national and regional levels. The failure to adapt such policies and processes to facilitate climate change abatement, will miss major opportunities to reduce its long-term costs and time scale.

5. Goals and objectives of the Stockholm conference and the Global Forum co-benefits program

In 2008 the Global Atmospheric Pollution Forum ("Global Forum") has undertaken a major programme to examine the potential linkages and synergies between policies at various scales to address both air pollution and climate change. The programme is funded primarily through a grant from the Swedish International Development Cooperation Agency (Sida), and focuses on three major themes:

- Developing optimized integrated strategies for air pollution and climate change;
- Potential regional, hemispheric and global frameworks for managing air pollution and their relevance to and interaction with climate change; and
- Delivering co-benefits at urban, national and regional scales in developing nations.

The programme includes a series of papers, conferences and initiatives designed to help develop recommendations to relevant international negotiating fora, including the 14th meeting of the Climate Change Conference of Parties (COP-14) in Poznan, Poland, in December 2008. The programme is seen as supportive in particular of the objectives of the Ad-hoc Working Group on Long-term Cooperative Action (AWG-LWA) established at the COP-13 meeting in Bali in December 2007.

The focal point of the programme was the international conference held 17-19 September in Stockholm, Sweden. The conference was held under the auspices of the United Nations Environment Programme (UNEP) and the UNECE Convention on Long Range Transboundary Air Pollution. It has been developed in consultation with the secretariat of the UN Framework Convention on Climate Change (UNFCCC), as well as all the organizations that comprise the Global Atmospheric Pollution Forum.

The Stockholm conference brought together experts from around the world working in the fields of air pollution, climate change, and co-benefits. They include individuals from the science community, governments, international organizations, regional networks, foundations, non-government organizations and industry. An emphasis was given to the developing world, in particular Asia. While the conference was intended to focus primarily on policy issues and strategies, it included a major session on the scientific understanding of linkages between air pollution and climate change.

Conclusions from the Stockholm conference have been presented and further considered at a number of associated regional co-benefits conferences held around the world in late 2008. These associated regional conferences could then explore the potential implications of the Stockholm conference's conclusions in different regions in the world. These associated regional conferences currently scheduled include:

- The annual regional conference of the International Union of Air Pollution Prevention and Environmental Protection Associations (IUAPPA) held in South Africa on 1-3 October 2008 and including sessions on climate and co-benefits.
- The Clean Air Initiative-Asia's Better Air Quality (BAQ) conference in Bangkok on 12-14 November. Its theme, *Air Quality and Climate Change: Scaling up Win-Win Solutions for Asia,* was designed to help provide an Asian focus to the recommendation of the Intergovernmental Panel on Climate Change to integrate air quality management and climate change.
- The European Federation of Clean Air and Environmental Protection (EFCA), in conjunction with IUAPPA, held a conference on climate co-benefits in Strasbourg, France, on 6-7 November 2008, to raise awareness amongst the scientific communities, the European policy makers and concerned stakeholders (industry, civil society, local authorities) on the need to integrate air pollution and climate change.

Structure and operation of the Stockholm co-benefits conference

The conference combined plenary sessions, discussion and breakout sessions to develop a set of conclusions and recommendations on how best to maximize the impact of strategies that promote air pollution and climate change co-benefits.

The conference was examining four key areas: 1) Science linkages between air pollution and climate change; 2) The effectiveness of integrated assessment techniques to link air pollution and climate policy; 3) Challenges in developing and applying integrated approaches at various policy and geographic levels; and 4) Developing strategies, frameworks, and processes for better integrating air pollution and climate change programmes. Background papers on each of these areas were maid available to the conferees before the conference.

Resources

– Air pollution and its relationship to climate change and sustainable development: Linking immediate needs with long term challenges (“Saltsjöbaden 3”). Main Conclusions and Reports from Working Groups 1 and 2 from Conference held in Gothenburg 12-14 March 2007.
– Air Quality and Climate Change: A UK Perspective, Air Quality Expert Group, March 2007 Published by the Department for the Environment, Food and Rural Affairs; March 2007.
– Estimated deaths and DALYs attributable to selected environmental risk factors, by WHO member state, 2002. Department of Public Health and Environment, World Health Organization, 2007.
– Fourth Assessment Report: Climate Change 2007: Synthesis Report. Intergovernmental Panel on Climate Change, 2007.