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Convention on Biological Diversity
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Canada

*From the President Lord Rees of Ludlow OM*
17 December 2008

Dear Dr Djoghlaf,

*Re: Nomination of New and Emerging Issues to be considered under the Convention on Biological Diversity (Notification 2008-083)*

The Royal Society would like to propose that the impact of ground level ozone on biological diversity be considered as a new and emerging issue under the Convention. The Society has recently completed a major project looking at ground level ozone, its future trends, impacts and policy implications (Royal Society 2008). One of the objectives of the report was to review what is known about the impacts of ground level ozone on biodiversity, and to evaluate the potential future impacts given trends in ozone precursor emissions. The main points from our study that are of relevance to this submission are outlined below:

- Current concentrations of ozone are already having an impact on terrestrial plants;
- Most research has been conducted on plant and tree species of commercial value, very little is known about the impacts of ozone to biodiversity and ecosystems and very little research is being undertaken on this issue;
- Globally ozone concentrations are likely to remain close to current concentrations, but in the rapidly developing regions, particularly Asia and Africa, concentrations are projected to increase;
- Ozone is a potent greenhouse gas and also has an indirect radiative forcing effect on climate; with consequent indirect effects on biodiversity.

For these reasons we believe that the CBD should accept ground level ozone as a new and emerging issue for consideration. I have provided more specific information according to the criteria specified.

**(a) Why the issue needs urgent attention by the Subsidiary Body on Scientific, Technical and Technological Advice (including how it impacts biodiversity);**

Information is not currently sufficient to enable a comprehensive risk assessment of the significance of impacts to biodiversity, and ozone is not a new issue. However, the Society considers that the evidence that is available regarding impacts to vegetation, and our projections of future increases in ozone concentrations, are sufficient to justify the CBD accepting this issue as a new and emerging issue of relevance to the conservation and sustainable use of biodiversity.

Ground level ozone is a global air pollutant, with impacts to human health, materials and the environment, and an important greenhouse gas (third only to $CO_2$ and $CH_4$ in terms of global radiative forcing). The most important and well documented impacts to the environment are to terrestrial vegetation with reductions in crop production, tree growth and carbon sequestration, and changes in species composition observed. To give an indication of the scale of impacts observed, the annual cost of losses in arable crop production due to ozone in Europe was estimated in 2000 to be €6.7billion – equivalent to 2% of arable crop production. Globally, crop yield losses for wheat, rice, maize and soybean in the year 2000 were estimated to be $14-26 billion (van Dingenen et al in press).

The impacts of ground level ozone on wild species, and on biological diversity and ecosystem structure and function, have been largely overlooked despite the well established impacts of ozone on commercially important plant and tree species. The evidence available suggests that wild plant species in Europe and North America can be as sensitive to $O_3$ as the most sensitive crop species, but very few studies have assessed the long-term effects on biodiversity or ecosystem services. There are almost no studies of the sensitivity of ecosystems outside of North America and Europe, and very little work has been completed looking at the effects of ground level ozone on organisms other than plants.

Impacts to terrestrial biodiversity are likely where ever ozone concentrations are above the threshold at which impacts are observed. Evidence to date suggests that this threshold is 40 ppb, a limit which is currently exceeded in most countries around the world. Our modelling projections suggest that ozone concentrations are likely to increase in many regions in the future (by 2050), particularly over land masses in the tropics, Asia and Africa.

Given the apparent shortage of research on the impacts of ozone on biodiversity the Royal Society analysis was limited to a comparison of the results of modelling work which estimated changes in global plant productivity (GPP) due to ozone (between 1900-2100) (Sitch et al 2007) with the location of priority conservation regions around the world using a map of the Global 200 eco-regions (Olson & Dinerstein 2002). If it is assumed that the threat to biodiversity increases in proportion to the modelled reduction in GPP, the results suggest that the areas of greatest risk are in eastern North America, Central Europe, the northern half of South America, Central Africa and South-East Asia. In total, 17 of the G200 ecoregions, covering an area of 1.4 million $km^2$, have a predicted decrease in GPP above 20% due to $O_3$. Adverse effects of $O_3$ on sensitive native plant species have been demonstrated both in the Appalachian mountains of North America, and in the Swiss mountains, where this value of a 20% reduction in GPP is exceeded. However, nothing is known about the sensitivity of native vegetation in the forests, grasslands and savannah eco-regions in Latin America, Africa and Asia which are identified in this analysis as having high risk of $O_3$ impacts, and reduction in GPP due to $O_3$ may not necessarily be associated with a loss of biodiversity. The long-term effects of $O_3$ on biodiversity are particularly uncertain at lower latitudes where almost no research has been undertaken.

Comparison with a similar exercise, to identify biodiversity hotspots with the greatest rates of nitrogen deposition (Phoenix et al. 2006) shows that some of the hotspots at high risk from $O_3$ effects coincide with those at high risk from Nitrogen deposition, including the forests of South-East Asia and South-West China and the Cerrado of Brazil. The CBD may therefore wish to include Nitrogen and other air pollutants within their consideration of this new and emerging issue.

The CBD SBSTTA is in the unique position of being able to request information on what is known about ozone impacts on biodiversity from its Parties. A review of this information would help to identify which countries are actively undertaking research in this area and where the research and policy gaps currently lie. This information could then be used as the basis of an assessment of the impacts of ozone on biodiversity and ecosystem structure and function, and ultimately could be used to stimulate work on this issue. SBSTTA could also take a role in informing, and contributing to, the capacity building efforts that are currently in place to develop and strengthen air quality networks in the Caribbean, Latin American, Asian, and African regions. These activities are aimed at building capacity for research (including technology transfer), policy development and implementation and present a potential opportunity for ensuring ozone impacts to biodiversity are included within the activities.

**(b) How it affects the attainment of the objectives of the Convention (citing relevant articles);**

On the basis of the analysis that has been undertaken in the Royal Society report we conclude that impacts to biodiversity are likely now and in the future. This is likely to make achievement of the *conservation of biological diversity* objective more difficult. Furthermore, as ozone has direct and indirect radiative forcing effects on the climate system future increases in concentration will contribute to climate change and in this respect have an impact to biodiversity.

Ground level ozone impacts to biodiversity are also relevant to Articles 6, 7, 12 14 of the Convention.

*Article 6:* In our report we strongly recommend that ground level ozone (and other air quality) policies are better integrated with other policy areas, in particular with biodiversity and climate change. For example, the CBD could work with the UNECE, EU, WMO, US EPA and the clean air networks to ensure that the work necessary to evaluate and manage ozone impacts to biodiversity is undertaken, particularly as capacity is built in the developing regions.

*Articles 7 and 12*: As already mentioned there is very little work being done to evaluate or manage the impacts of ozone to biodiversity. In our view this is a major gap and one which the CBD is well placed to address under Article 7(c) and 12 (b) and (c).

*Article 14* is also relevant because as yet the impacts of ozone on biodiversity are not routinely considered in impact assessments.

**(c) Thematic programmes of work and/or cross-cutting issues that could contribute to the resolution of the issue;**

As the work programmes and cross-cutting issues are defined none currently contribute to resolving the issue of ozone impacts to biodiversity. However, work on ozone and other pollutants could fall into the future work of the agricultural, dry and sub-humid lands, forest, island and mountain biodiversity programmes. It could also fall into the 2010 biodiversity target, biodiversity for development, climate change and biodiversity, ecosystem approach, and global strategy for plant conservation cross-cutting areas of work.

**(d) Work already under way by relevant organizations addressing the issue; and**

As previously stated we are not aware of any organisations looking specifically at the ecological or biodiversity impacts of biodiversity. The UNECE Convention on Long-Range Transboundary Air Pollution working group on effects has done a great deal of work on developing methods and models for assessing the impacts of ozone on forests and vegetation, but this has been primarily focused on species of commercial value. We are aware that York University in the UK along with the Stockholm Environment Institute has undertaken an evaluation of the impacts of ozone on nature conservation in the UK (JNCC 2007).

The WMO Global Atmosphere Watch monitoring programme includes a co-ordinated global network of observing stations and provides data for scientific assessments relating to atmospheric impacts on the environment. The emphasis of this work is on greenhouse gases including ozone, and ultraviolet radiation.

UNEP runs the ozone secretariat although this is primarily focused on stratospheric ozone.

Regional networks are in place in Africa (APINA), Asia, the Caribbean, and Latin America (Clean Air Initiatives) to manage air quality, although these are not specifically targeted at reducing ozone. The ASEAN agreement on transboundary haze, and the Malé Declaration on control and prevention of air pollution and its likely transboundary effects for South Asia, are also relevant.

**(e) Credible sources of information, preferably from peer-reviewed articles;**

Please refer to the Royal Society (2008) report for a full literature review (enclosed). The presentations delivered during a workshop on this issue are available along with volumes of the evidence received in response to our call for evidence. Please see our website: http://royalsociety.org/page.asp?id=8049

Other credible sources of information include:

The UNECE Convention on Long-Range Transport of Air Pollutants, including the working group on effects, EMEP, and the Hemispheric Transport of Air Pollutants (HTAP) projects.

The EU Joint Research Centre, CAFÉ Strategy and ACCENT Network http://www.accent-network.org/

The US EPA criteria documents: http://www.epa.gov/ttn/naaqs/standards/ozone/s_o3_cr.html

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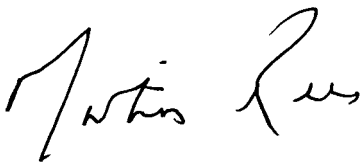

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