

Editorial

Introductory remarks to the special issue –
XXII IUFRO World Congress, 2005 Brisbane – Air pollution
and climate change: A global overview of the
effects on forest vegetation

Public concerns, evidence from research, and increasing scientific knowledge are all driving widespread discussions on air pollution, climate change, and forest health problems. The issue is characterized by multi-causality with different strengths of association. The linkages between air pollutant exposures and plant ecosystem responses have complex inter-relationships as their impacts depend on the environmental pollutants and conditions being considered while influenced by factors such as genetic constitution, age, nutrition and adaptation.

Many air pollutants and greenhouse gases have common sources and diffuse globally, interact in the atmosphere, and jointly affect ecosystems. Thus, air pollution is also part of climate change. While background tropospheric ozone concentrations are expected to further increase, ozone is particularly relevant for the linkages between climate change and air pollution. Climate change, on the one hand, influences ozone concentrations through dynamic and chemical changes in the atmosphere. On the other hand, increasing background ozone concentrations affect climate change because ozone is a potent greenhouse gas itself and indirectly influences the lifetime of other greenhouse gases such as methane. In addition, surface ozone causes the most concern among air pollutants because of its high phytotoxic potential.

On behalf of the IUFRO Research Group 'Impacts of Air Pollution and Climate Change on Forest Ecosystems' (RG 7.01.00), two special sessions were organized investigating this topic at the XXII IUFRO World Congress, held at the Convention Centre in Brisbane, Australia, 8–13 August 2005. This special issue contains a selection of papers from these sessions summarizing the current research on air pollution and climate change. It includes topics on the combined and interactive effects of air pollution and climate change on forests (Bytnerowicz et al.), new diagnostic perspectives by linking stress with macroscopic and microscopic leaf responses (Günthardt-Goerg and Vollenweider), a new flux-based model providing a revised ozone risk assessment on impacts to European forests (Emberson et al.), defense and avoidance of ozone under global change (Tausz et al.), discrimination of species-specific physiological behavior in

relation to ozone air pollution (Bussotti et al.), impacts of elevated CO₂ and nitrogen fertilization on poplar species (Marinari et al.), photosynthetic responses to elevated CO₂ and O₃ in *Quercus ilex* (Paoletti et al.), ozone-induced effects on the forests of central Mexico (de Bauer and Hernández Tejada), and perspectives regarding 50 years of research on effects of tropospheric ozone air pollution on U.S. forests (Karnosky et al.).

There is evidence that effects of air pollutants on forests can be seen as a multi-pollutant, multi-effect problem for forest ecosystems. The impacts on forest ecosystems have been traditionally treated separately for air pollution and climate change. However, the combined effects may significantly differ from a sum of separate effects. Simultaneous addressing of the air pollution and climate change effects on forests is an opportunity for capturing synergies in future research and monitoring (Bytnerowicz et al.). In this special issue, researchers from nine countries, coming from Europe, the United States, Latin America, Asia, and Australia, review the links between air pollution and climate change and their interactive effects. A simultaneous addressing of the air pollution and climate change effects on forests may result in more effective research, management and monitoring as well as better integration of local, national and global environmental policies.

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14 August 2006