

# Impact Studies: Malé Declaration Achievements

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## Background

- Work under the 1998 “Malé Declaration on Control and Prevention of Air Pollution and its Likely Transboundary Effects for South Asia” (Malé Declaration) provides an operational platform for gathering and disseminating reliable information on regional air pollution as a basis for envisaged policy development. Coordination of the programme is facilitated by the Secretariat at the Regional Resource Centre for Asia Pacific (RRC AP), located in Bangkok, Thailand.

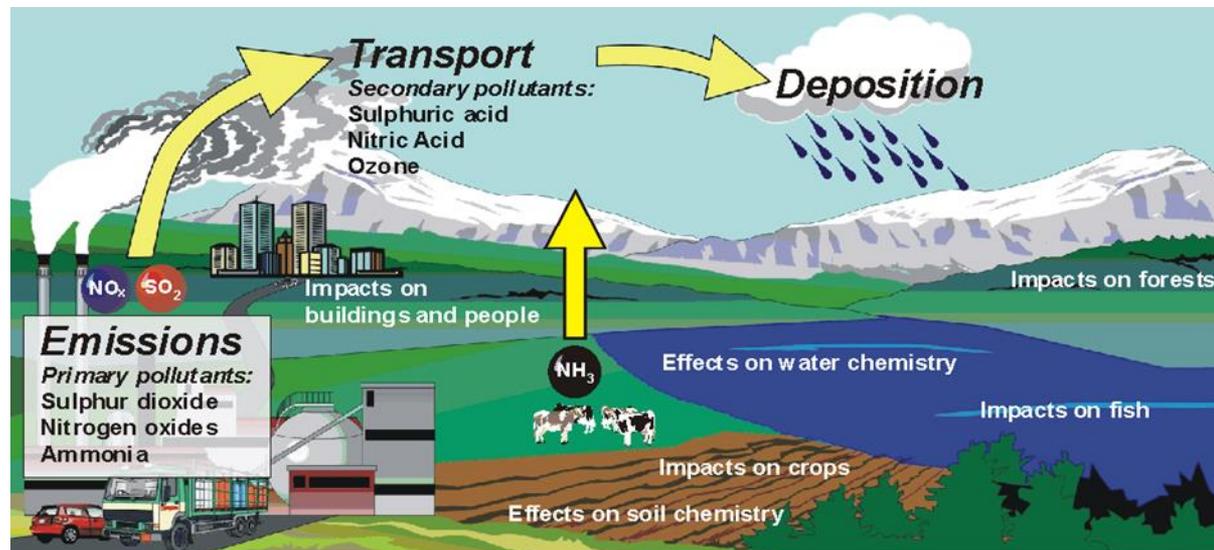
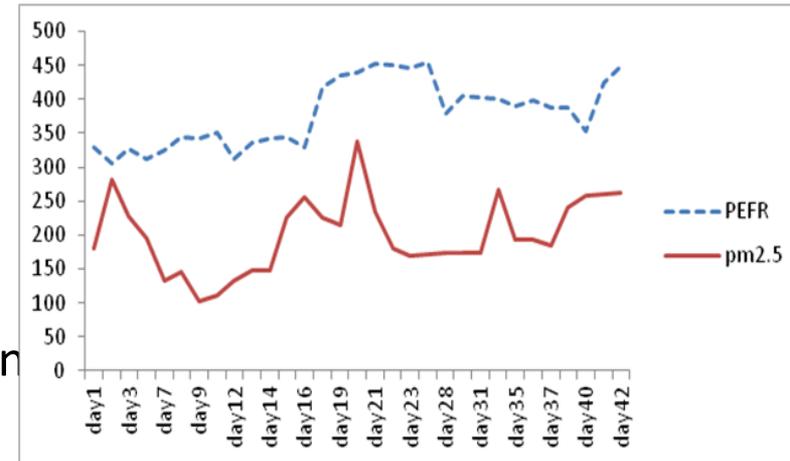


Illustration of the origin and regional transport of air pollution. The secondary pollutants formed from the primary pollutants in the atmosphere can travel large distances making the problem transboundary and requiring international co-operation to solve.

# Human Health Impacts in South Asia

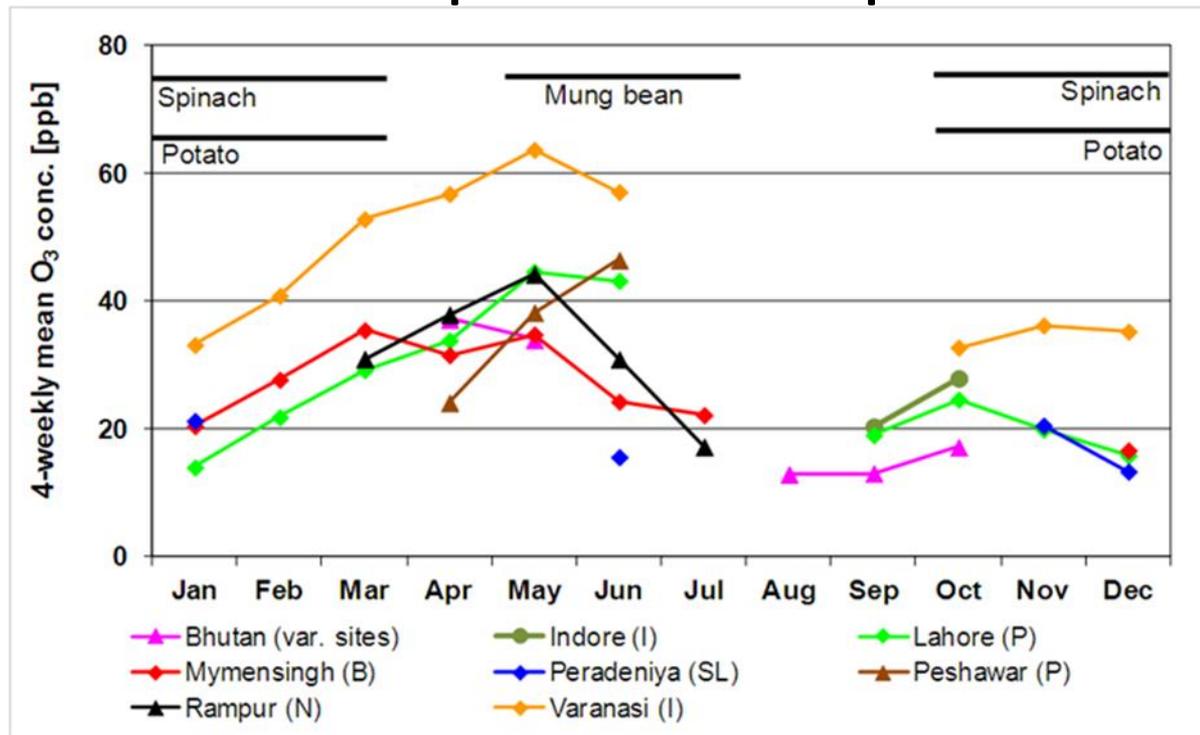
- Successful studies carried the relationship between air pollution (particulate matter (PM)) and the health of school children in **Dhaka, Bangladesh, Kathmandu, Nepal and Islamabad, Pakistan.**
- Regionally, specific data shows that lung function of children is impacted by levels of particulate matter pollution found in Asian cities.
- The Malé Declaration studies are some of the first to have been conducted where **particulate matter concentrations** are at the highest levels found in many large Asian cities.
- The findings of these studies emphasize the **high cost of air pollution to the health** of the community and the need to implement cost-effective measures to reduce emissions of health-damaging air pollutants.



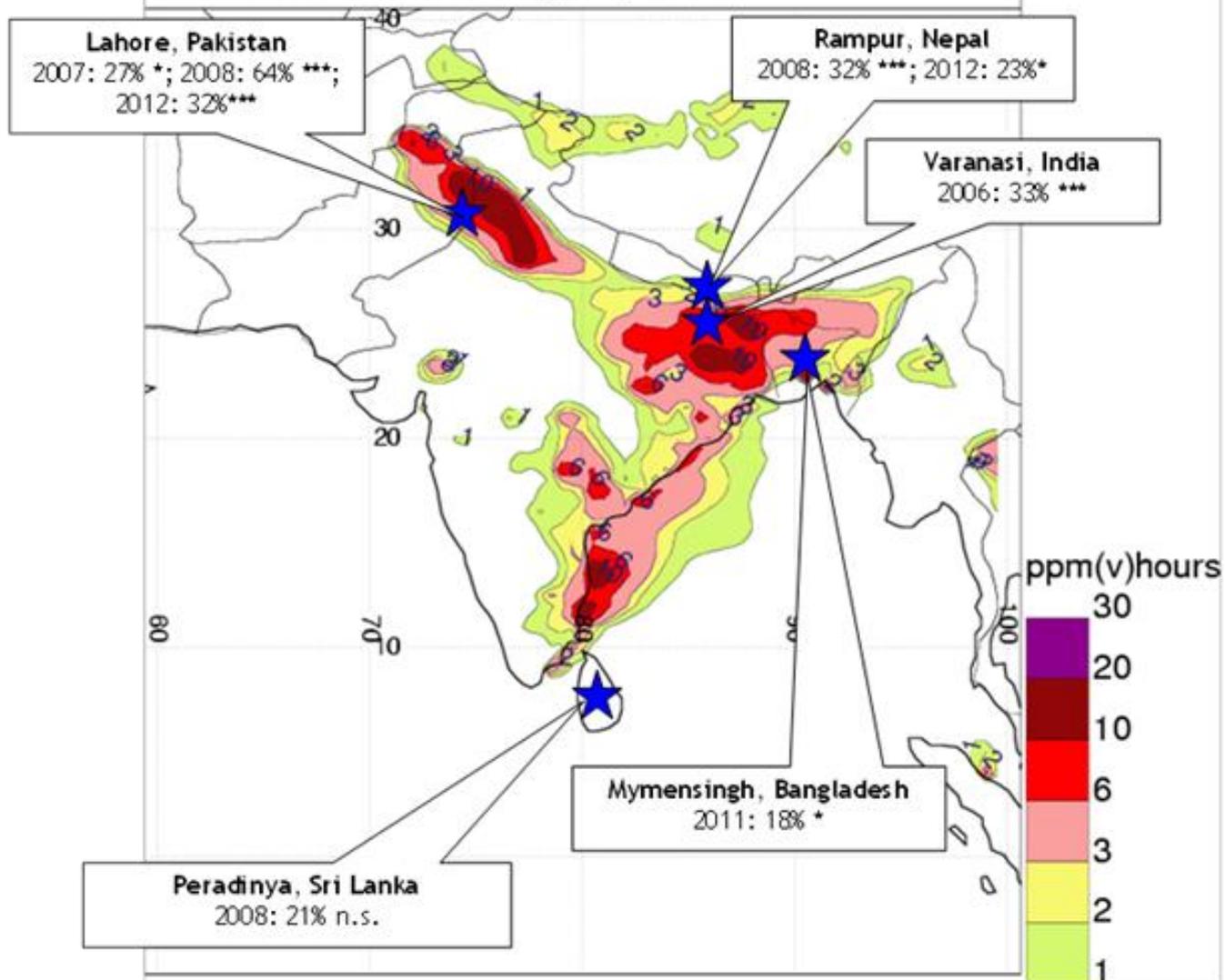
**Figure:** Research Assistant guiding the children to measure the peak expiratory flow rate (PEFR) in Kathmandu, Nepal

# Evidence of wide-spread impacts of ozone on crops in South Asia

- Ambient four-weekly mean O<sub>3</sub> concentrations at various experimental sites across South Asia as monitored with passive samplers

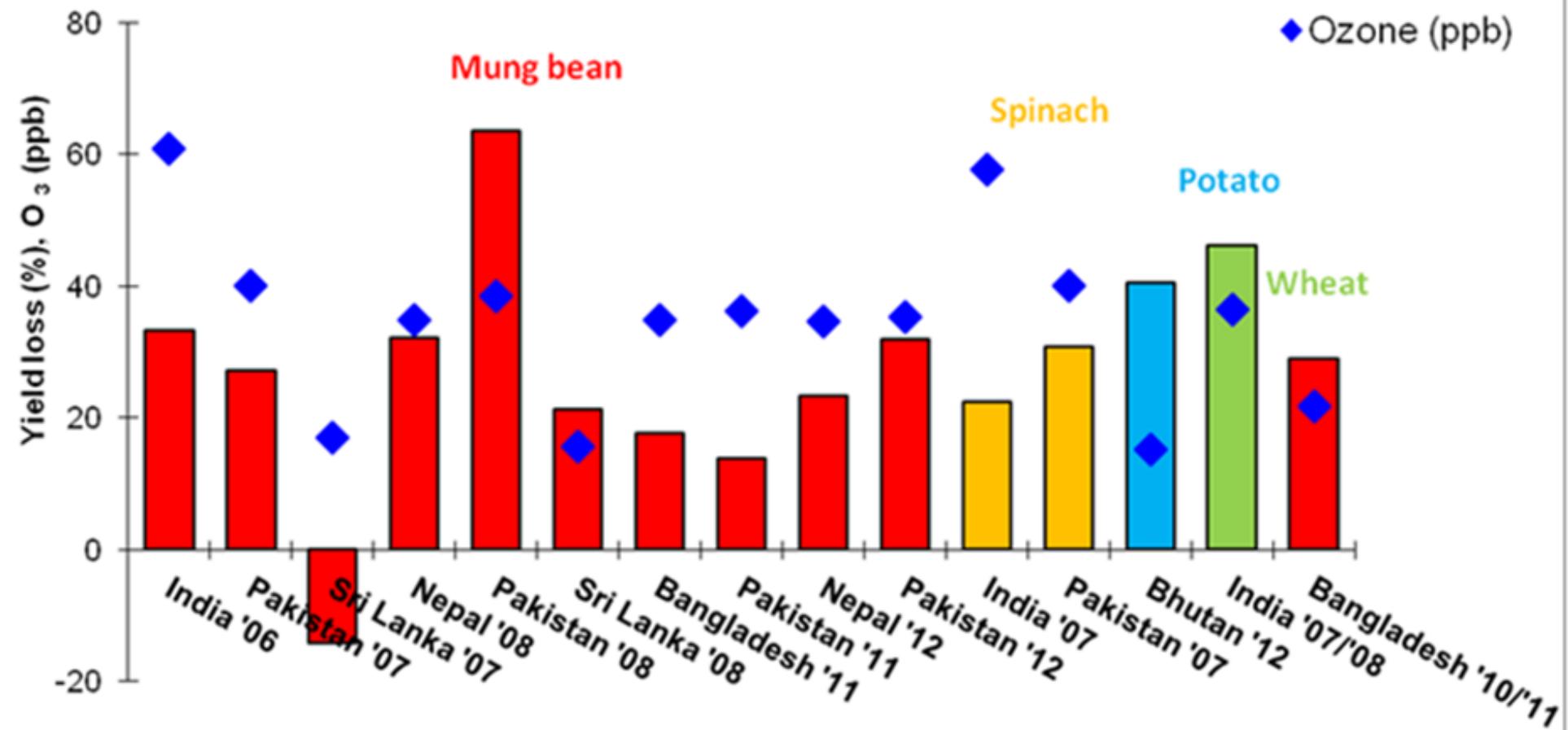


## AOT40 calculated for May-July 2000



The Malé Declaration has produced experimental evidence of effects of air pollutant ozone (O<sub>3</sub>) at ground level on yields of important South Asian crops, such as mung bean, spinach, wheat and potato.

## Ozone-induced yield losses in Malé Declaration countries

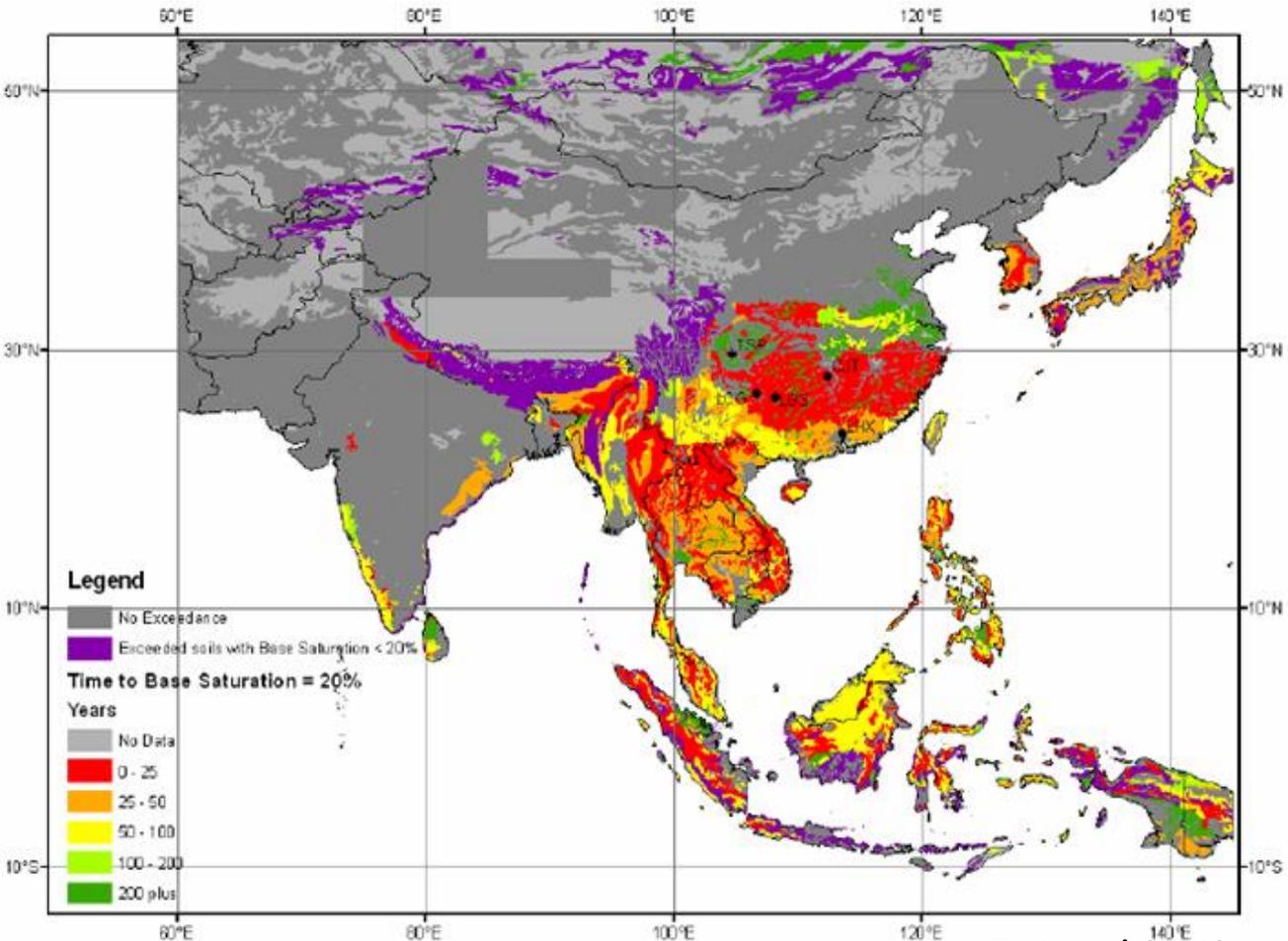


Ozone-induced yield losses for Mung bean, spinach, potato and wheat in various South Asian countries as recorded during field experiments conducted between 2006 and 2012.

# Crop Impacts in South Asia

- New large-scale experimental evidence of effects of air pollutant ozone (O<sub>3</sub>) at ground level
- On yield of important South Asian crops, such as mung bean, spinach, wheat and potato; evidence fits well with modelling-based regional prediction of O<sub>3</sub> concentration fields and the national emission inventory work of the Malé Declaration;
- The Malé Declaration has produced wide-spread evidence of plant-damaging concentration levels of O<sub>3</sub> during main growing seasons of important South Asian crops;
- Standardized risk assessment methodologies have been developed that have been evaluated for their application across the region;

## Acidification and Eutrophication



Eutrophication effects of nitrogen pollution are a greater threat to ecosystem health in South Asia than acidification

# Ecosystem Impacts in South Asia

- Modelling studies and training events under the Malé Declaration have demonstrated that there are limited areas in South Asia which may be at risk from acidification from sulphur and nitrogen pollution such as in the Western Ghats, parts of Sri Lanka and eastern India. In the Himalayan regions of India, Bhutan and Nepal soils that are naturally acidic may also be under pressure from acidifying deposition.
- Modelling results suggest that acidification will not be a major issue compared to other air pollution problems in South Asia but further field research is required to determine the real extent of the problem.
- A potentially greater problem to ecosystems and their biodiversity than acidification in South Asia is eutrophication (excessive input of nitrogen and other nutrients). Nitrogen pollution from the transport, industry and agriculture is linked to health impacts, impacts on ecosystems, crops and climate, as well as the formation of ground-level ozone.
- Despite some progress there is still a need for a comprehensive regional assessment of these issues, especially using studies that have been conducted in South Asia.

**Thank you for your attention!**

