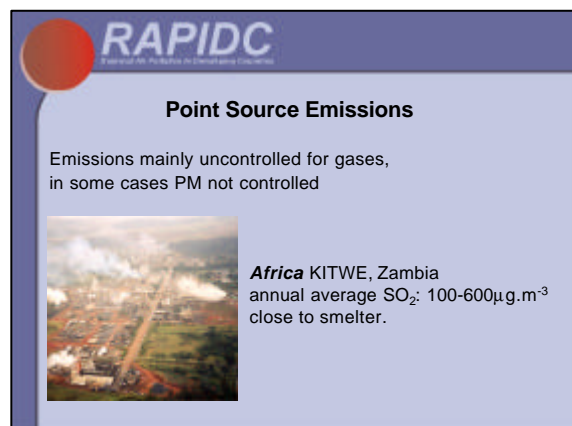


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### Urban pollution in Asia - in excess of current European concentrations

Chongqing, China, SO<sub>2</sub> (mg.m<sup>-3</sup>)

Year	Range of daily average values	Annual Average
1996	16 - 1711	321
1998	16 - 576	183
2000	1 - 613	156



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### Air Pollution and Health

- Globally more than 1200 million people are exposed to excessive outdoor SO<sub>2</sub> concentrations and more than 1400 million to excessive particulates

Health Benefits to Children from Air Pollution Reduction in Hong Kong

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Particles less than 10 microns (PM<sub>10</sub>) are classified as respirable dust

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### Urban Particulate Matter

Particulate matter one of the major air pollution causes of mortality and morbidity

PM<sub>10</sub> and PM<sub>2.5</sub> used to characterise exposure

About 62 million people live in these cities in India

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### Some of the WHO-recommended Dose-response Relationships for PM<sub>10</sub> and health impacts

PM linked to excess mortality – shortening lifespans by many years

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### Economic Implications of Health Impacts

Nations do not have adequate data to evaluate full extent and cost of health impacts

Other priorities lead to lack of action to tackle air pollution

High social costs of premature death and impact on quality of life


Some attempts to calculate costs incurred (e.g. URBAIR)

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### Economic Implications of Health Impacts – results from the URBAIR project

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Health is damaged by transboundary air pollution



More than 8000 people were admitted to hospital in Malaysia due to Indonesian fires in September 1997

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# AIR POLLUTION IMPACTS ON CROPS





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## Impacts on Crops and Forests

### VISIBLE INJURY

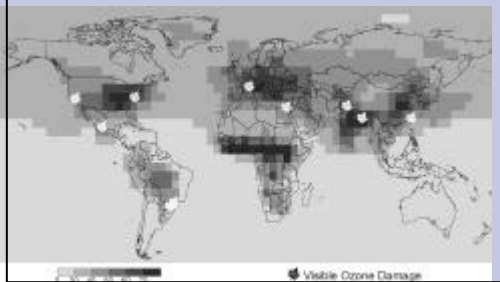
Ozone induced injury on clover and white pine

Ozone induced injury to muskmelon and peach trees in the Mediterranean region

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### Reported visible ozone injury to vegetation



Maximum mean growing season O<sub>3</sub> concentrations for 1990  
 Emberson *et al.* (2000)

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### Invisible Injury: as shown by filtration experiments

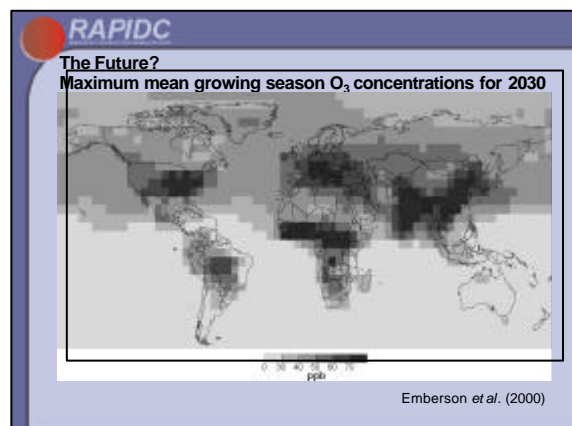
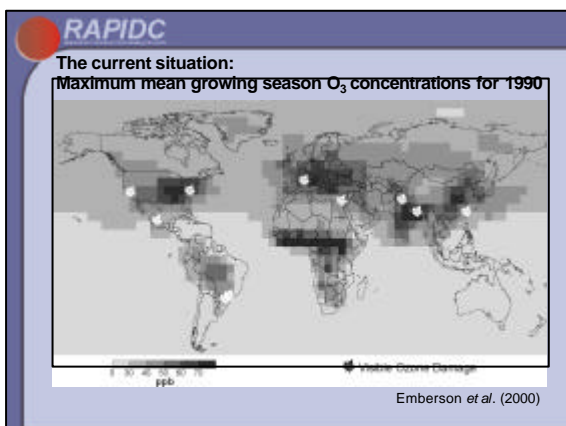
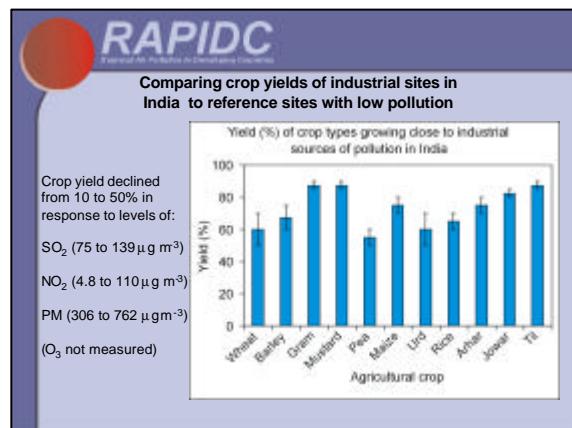
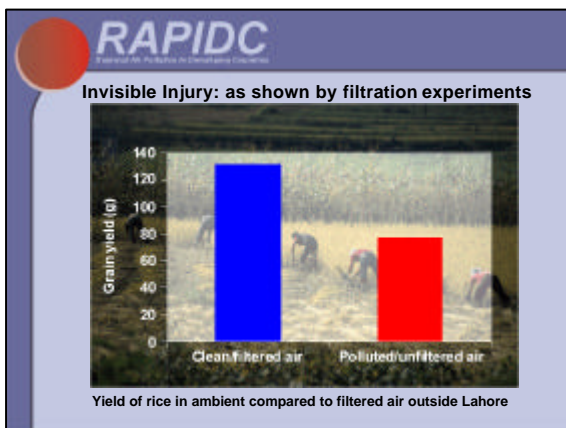
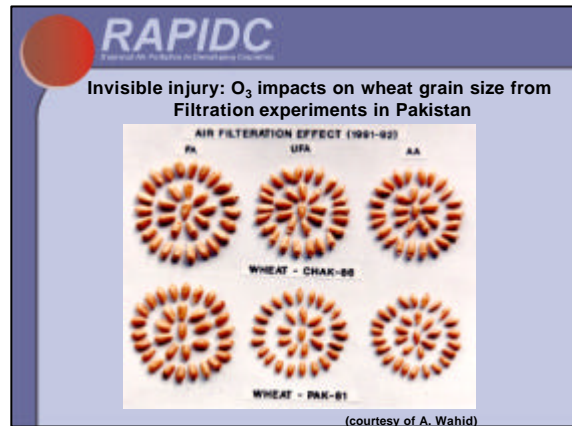
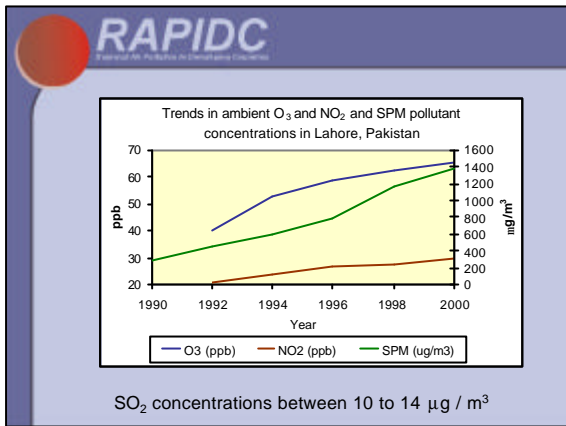


O<sub>3</sub> injury to wheat whole plant growth, Pakistan (courtesy of A. Wahid)

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### Open Top Chamber Facilities. Lahore, Pakistan





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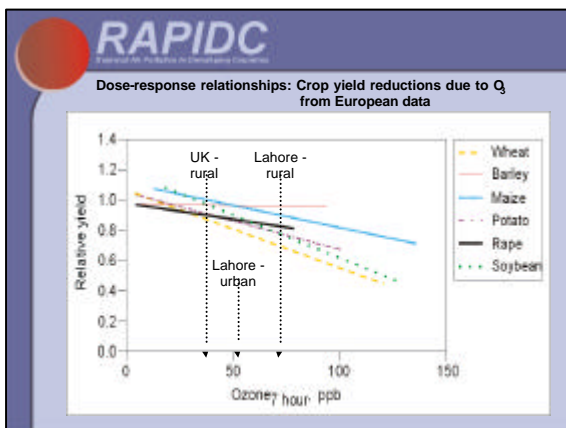
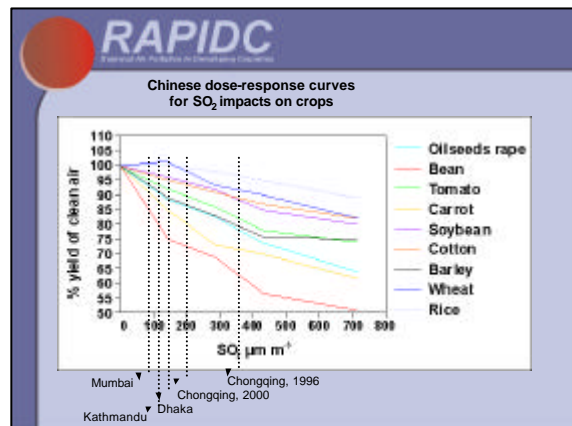
### Air Pollution Impacts on Livelihoods in Asia

High urban Air Pollution affects Peri-Urban / Urban agriculture by:

- Decreasing crop quantity (yield reductions)
- Crop quality (decrease in nutritional quality)
- Visible damage to edible portions of crop
- Accumulation of toxic chemicals (e.g. heavy metals)

**↓**

**Vulnerable social groups disproportionately affected by air pollution**



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### Asian Air Pollution Network for Impacts on Crops and Forests

To study the **biological, social and economic** impacts of air pollution on vegetation across Asia by:

- Establishing standardised Protocols
- Performing observational and experimental studies
- Establishing dose-response relationships
- Estimating reductions in productivity of agricultural crops and forests
- Establishing the social and economic consequences

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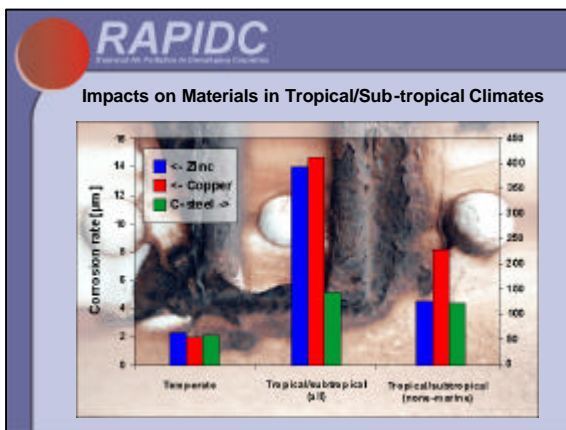
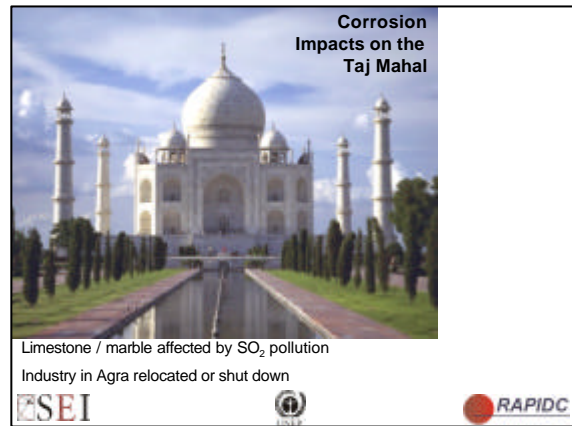
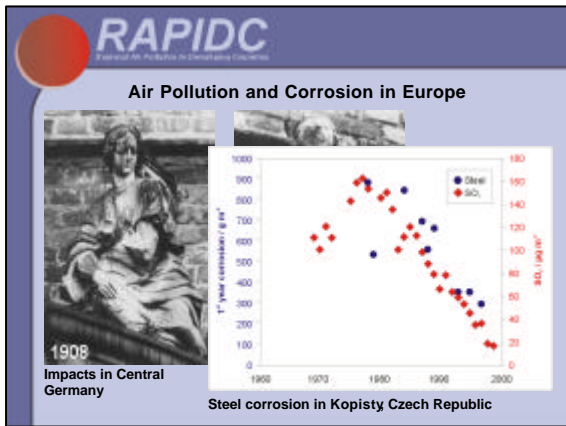
### Asian Air Pollution Network : Current Extent

Asian Air Pollution Vegetation Effects Network (AAPVEN)

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## AIR POLLUTION IMPACTS ON CORROSION

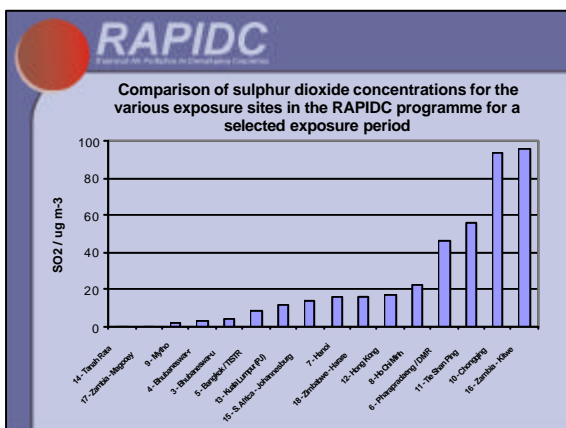


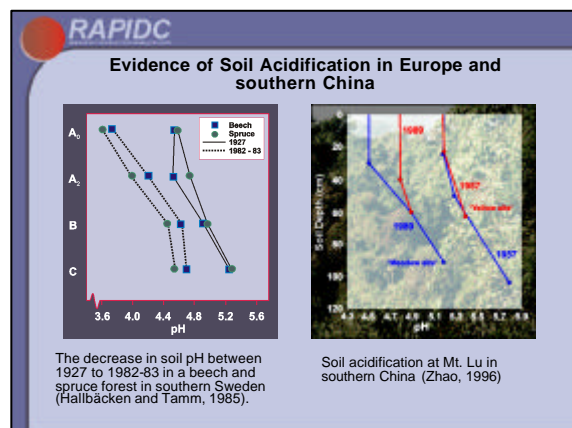
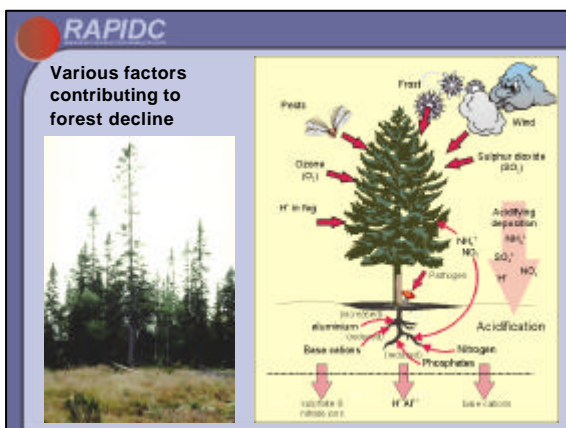
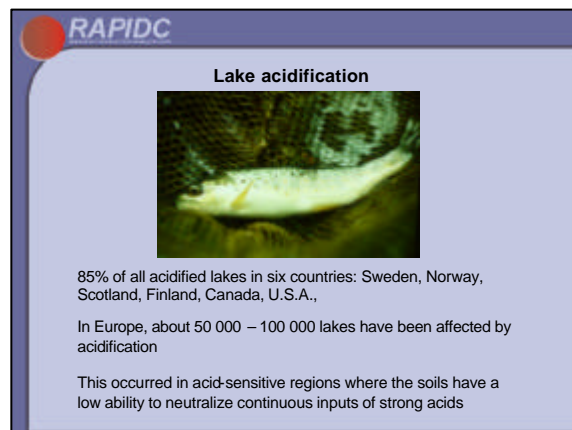
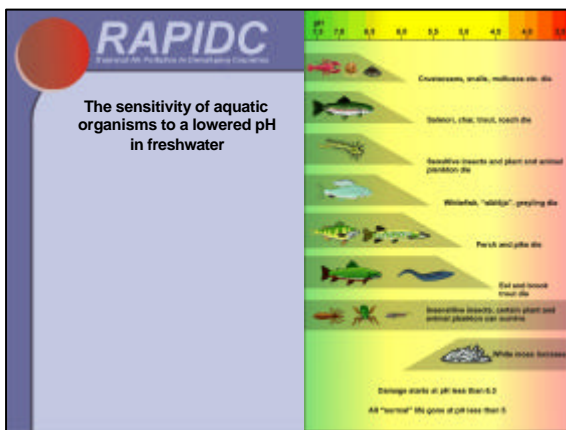
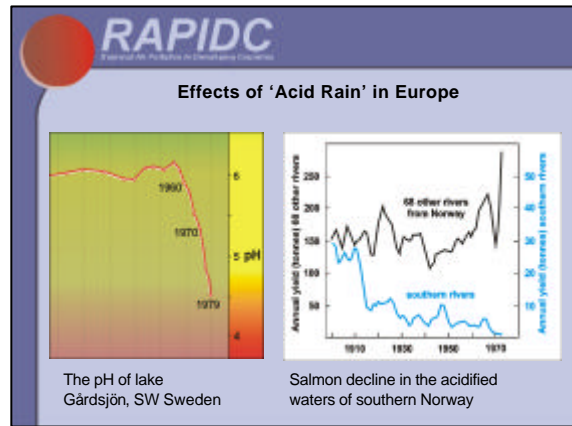
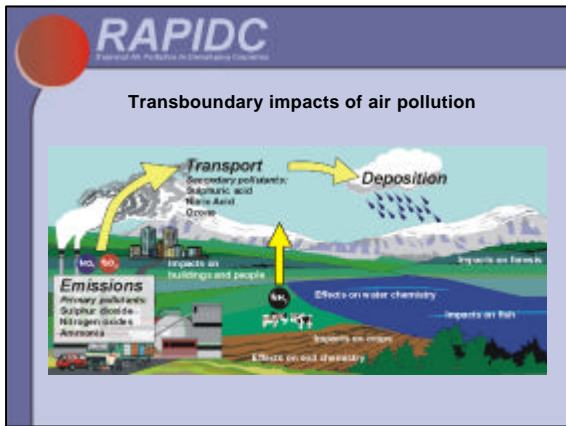
**RAPIDC Corrosion Impact Activities in Asia/Africa**

No	Country	Location	Type
1	India	Jamshedpur	Urban
2	India	Hydrabad, Kolkata	Urban
3	India	Bombay	Urban
4	India	Bombay	Plant
5	Thailand	Bangkok	Urban
6	Thailand	Phonchanong	Industrial
7	Malaysia	Kuala Lumpur	Urban
8	Malaysia	Malacca	Urban
9	Malaysia	Penang	Urban
10	China	Chongqing	Urban
11	China	Yan Shan (Pip)	Plant
12	China	Harbin	Urban
13	Malaysia	Kuala Lumpur	Urban
14	Malaysia	Ipoh	Plant
15	South Africa	Johannesburg	Urban
16	Zambia	Kilim	Urban/Industrial
17	Zambia	Kapangwa	Plant/Industrial
18	Zimbabwe	Harare	Urban

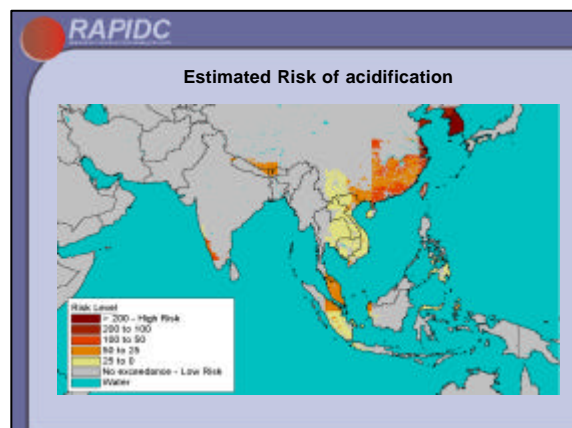
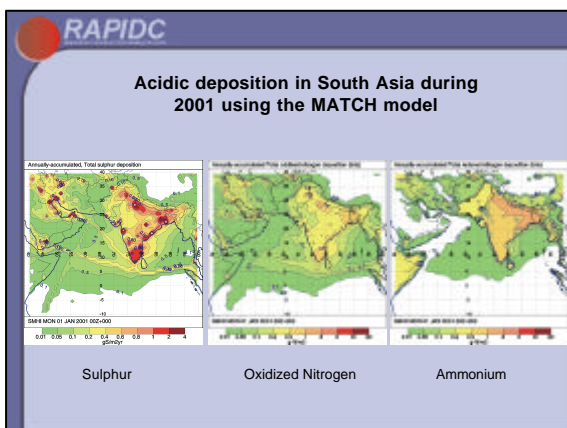
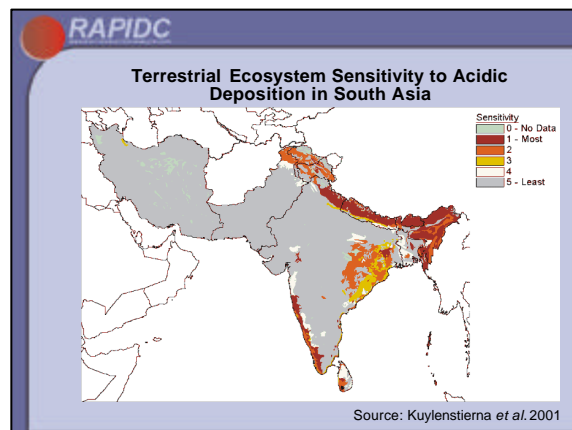
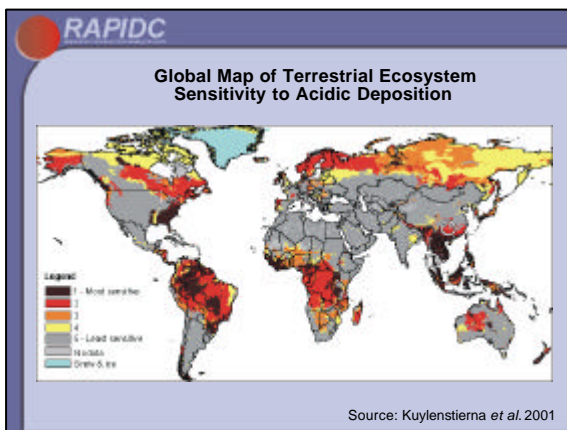
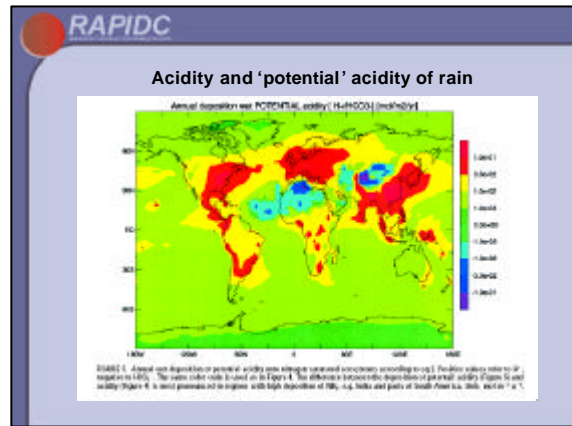
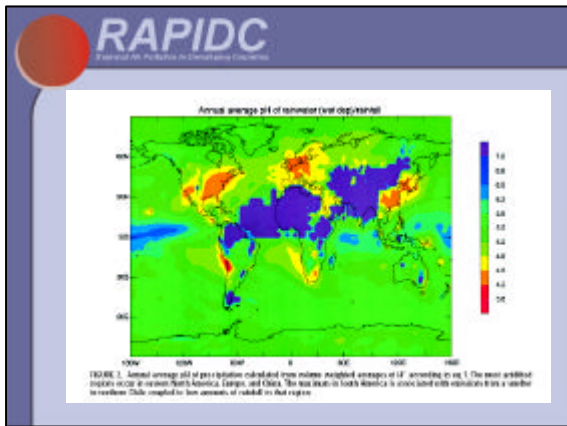
Exposures to develop the dose-response relationships for standard materials relevant to tropical and subtropical conditions

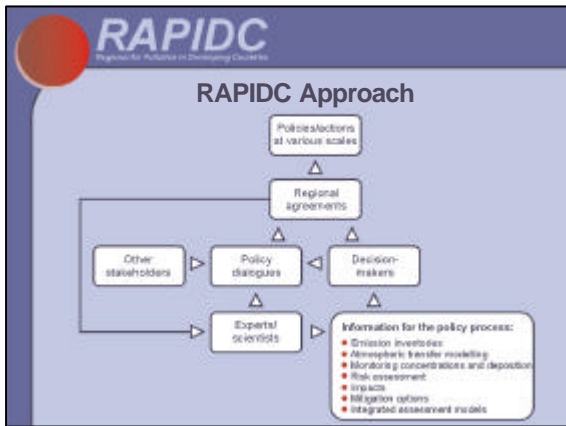
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### Summary

- Air pollution affects health of poor people disproportionately. Indoor air pollution is a poorly quantified problem
- Crop yield losses will be felt more acutely by poor people. The extent is poorly quantified
- corrosion, health impacts, crop yield losses and have significant, but poorly quantified economic consequences
- Acidification could be a problem in South Asia, but impacts not yet seen