

# Trans-boundary Air Pollution

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TERI

Stakeholders meeting, Sept. 24, 2002 at  
CPCB, New Delhi

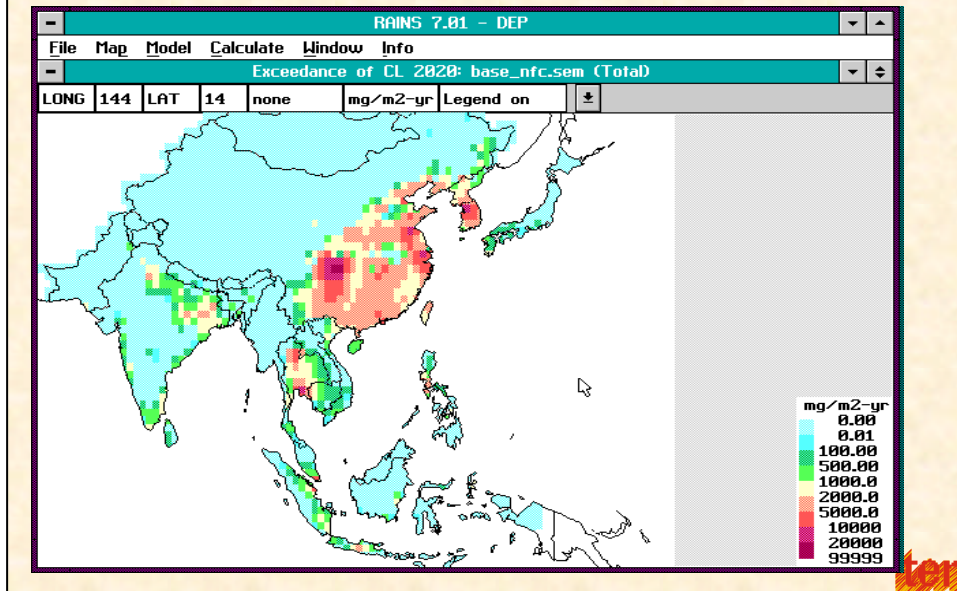


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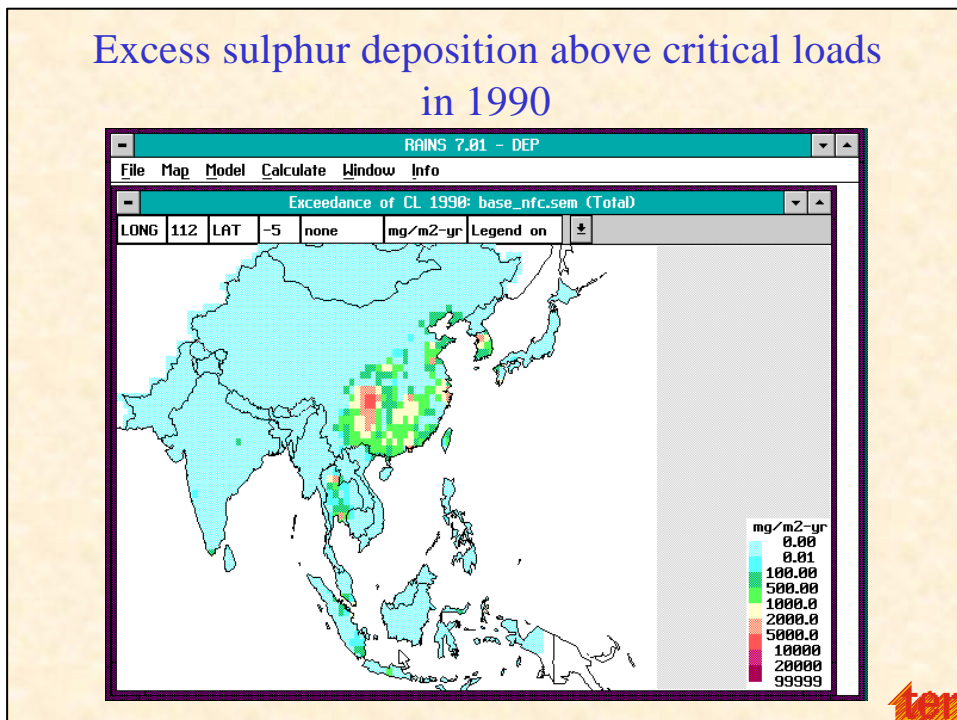
- Acid rain scenario in South-Asia (RAINS-Asia) and INDOEX study
- International agreements to control TAP -  
Male Declaration
- Tackling TAP - An approach



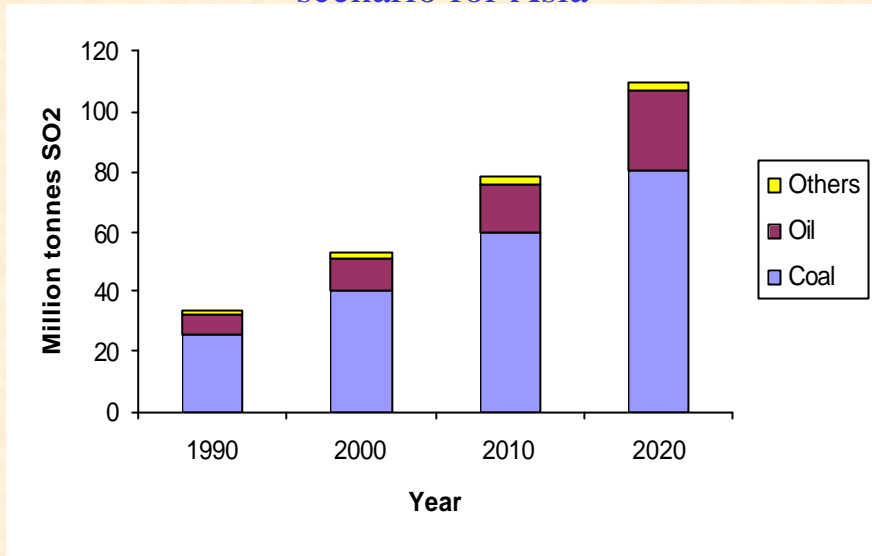
## Excess sulphur deposition above critical loads in 2020 under Business-as-usual scenario



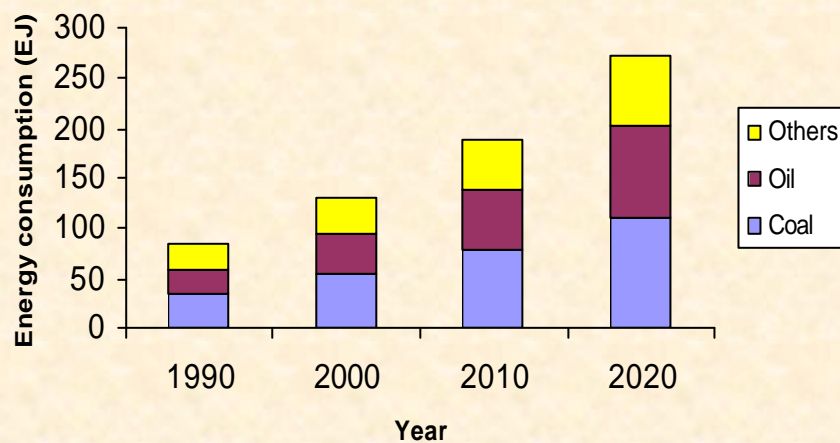
## Excess sulphur deposition above critical loads in 1990



### Sulphur dioxide emissions by fuel under the BAU scenario for Asia



### Energy consumption (EJ) by fuel under the BAU scenario for Asia



## Total SO<sub>2</sub> emissions by region (area sources plus LPS) in 1990 (kt SO<sub>2</sub>)

Country	Region	Emission
Bangladesh	Dhaka	17.0
	Rest of Country	101.0
Bhutan		1.5
India	Andhra Pradesh	388.1
	West Bengal	222.3
	Bihar	363.1
	Bombay	140.7
	Calcutta	39.4
	Delhi	44.6
	East Himalayas: Assam-NE Highlands	66.5
	Gujarat	388.9
	Haryana	101.5
	Karnataka-Goa	134.1
	Kerala	55.2
	Madras	49.5
	Maharashtra-Dadra Nagar-Haveli-Daman-Diu	520.0
	Madhya Pradesh	412.1
	Orissa	190.5
	Punjab-Chandigarh	179.4
	Rajasthan	161.0
	Tamil Nadu-Pondicherry	350.3
	Uttar Pradesh	641.5
	Jammu-Kashmir-Himachal Pradesh	23.2
Nepal		122.3
Pakistan	Karachi	105.1
	Lahore	20.7
	NW Frontier Provinces Baluchistan	102.1
	Punjab	285.1
	Sind	101.1
Sri Lanka		41.9

Source: RAINS-Asia



## Country-to-country source-receptor matrix

The columns represent the source country while the rows represent the receptor country. Shown is the total annual sulfur deposition expressed in tonnes S/yr.

Source/ Receptor	Bangladesh	Bhutan	India	Nepal	Pakistan	Sri Lanka
Bangladesh	1.77E+04	1.27E+00	1.64E+04	1.77E+02	2.30E+02	4.34E-03
Bhutan	3.83E+02	1.63E+02	8.14E+03	4.37E+02	8.65E+01	5.57E-18
India	1.58E+04	7.14E+01	1.06E+06	5.26E+03	1.88E+04	5.49E+02
Nepal	3.22E+02	1.78E+00	4.06E+04	2.21E+04	1.04E+03	1.92E-20
Pakistan	0.00E+00	3.46E-09	1.73E+04	3.97E+00	1.16E+05	0.00E+00
Sri Lanka	6.72E+00	4.99E-07	2.97E+03	5.70E-01	6.63E-01	8.15E+03

**Source:** Foell et.al, December, 1995

(Final report submitted to The World Bank)



## Indian Ocean Experiment (INDOEX)

- Comprehensive field study on how the interaction of pollution and clouds affect solar heating and climate in the region.  
Intensive phase Feb-March, 1999
- Widespread pollution (of the size of US) found over large sections of the region from Arabian sea & Bay of Bengal southward past the equator (upto 5° S).
- Brown haze of pollutants comprising of tiny particles or aerosols (soot, sulphates, nitrates, organic particles, dust and gases such as SO<sub>2</sub>, CO, etc.)
- Fossil fuel/Biomass combustion in Indian subcontinent, China and S. E. Asia contribute to the haze by transporting pollutants along with the winter monsoons.



## INDOEX

- Two important implications:
    - Acid rain
    - Preliminary results indicate that aerosols scatter incoming solar radiation and reduce the amount of energy reaching the Ocean's surface by 10%. May lead to less water evaporation from sea and less rainfall.
- Thus, impacts climatic processes and marine life
- How permanent the cloud is ? Further studies
  - Such events are symptomatic of large-scale pollution transport that occurs in other regions of the Earth



## International agreements to control Trans-boundary Air Pollution

- 1975: negotiations on framework convention began
- Convention on long range transboundary air pollution (LRTAP)
  - Adopted in 1979, came into force in 1983
  - Requires ratifying states to limit or, if possible, to gradually reduce air pollution within their boundaries
  - Extended by 8 protocols; Now has 49 parties
- EMEP protocol
  - Adopted: 1984; in force: 1988
  - Created a trust fund to provide long term financing for the *co-operative programme for monitoring and evaluation of the long range transmission of air pollutants* in Europe.



## International agreements to control Trans-boundary Air Pollution

- First Sulphur protocol
  - Adopted: 1985; in force: 1987
  - Requires ratifying states to reduce their emissions or transboundary fluxes of sulphur at least 30% (from 1980 levels) by the end of 1993
- NO<sub>x</sub> Protocol
  - Adopted: 1988; in force: 1991
  - Requires ratifying states to freeze emissions of nitrogen oxides at 1987 levels by the end of 1994
- VOC protocol
  - Adopted: 1991
  - Requires ratifying states to reduce emissions of VOCs by 30% by the end of 1999



## International agreements to control Trans-boundary Air Pollution

- Second Sulphur protocol
  - Adopted: 1994; in force: 1998, to replace the previous one
  - Effects based approach, the critical load approach - Signatories agreed to reduce the gap between existing and critical loads
  - Differentiation of emission reduction obligation of parties
- 1998: Protocol on heavy metals; not yet in force
- 1998: Protocol on persistent organic compounds; not yet in force
- 1999: Protocol to abate Acidification, Eutrophication, and Ground level Ozone; not yet in force
- The United Nations Economic Commission for Europe (UNECE) has played a significant role in all these agreements



## Male declaration on control and prevention of air pollution and its likely transboundary effects

- Declaration approved on April 22, 1998
- Aims: intergovernmental cooperation to address TAP and consequential impacts
- Sets an institutional framework linking scientific research and policy formulation
- To draw up and implement national and regional action plan and protocols based on fuller understanding of TAP
- India, Pakistan, Bangladesh, Nepal, Sri Lanka, Bhutan, Maldives and Iran



## Tasks undertaken

### Phase I

- Networking: NFP, NIA
- National baseline studies
- National action plans
- Establishment of a Monitoring Committee
  - to develop a technical manual on monitoring TAP



## Tackling TAP: An Approach

- Integration of **Monitoring data** on a sub-regional basis
  - Adequacy of data compiled
    - Pollutants of concern (additional pollutants)
    - SO<sub>x</sub>, NO<sub>x</sub>, Ozone, etc (NO<sub>x</sub> shows significant increase)
  - Compatibility of information collected
    - QA/QC issues
  - Common monitoring protocol (such as EANET technical manual)
  - Adequacy of monitoring network (strengthening in terms of no. of stations/ parameters, frequency)





## Tackling TAP: An Approach

Analysis and refinement of **National emission inventories**

- Comparison of methodologies used for different pollutants
- Aim for a common approach
  - Development of rapid emission inventories for all the countries
  - Use of emission factors
    - First preference: Local emission factors for various activities
    - Else use emission factors such as from WB rapid emission inventory
    - Undertake emission factors development (wherever deemed necessary)
  - Subsequent refinements/ updating of emission inventories
- Transparency in the development of inventory
- Capacity Building



## Tackling TAP: An Approach

Strengthening of **regional modelling capabilities**

- Identification of appropriate tools/ models
- Model acceptability and ownership - focal centre
- Integrated assessment model - effects based approach
- Input data compilation - emissions/meteorology/database on critical loads
- Validation: model prediction vs observed data
- Capacity Building



## Tackling TAP: An Approach

### Strategies to **prevent and minimize air pollution**

- Regional cooperation in cleaner energy sources (hydel, natural gas)
- Fuel quality improvement (eg., reduced S in diesel)
- Improvement in energy efficiency
- Sharing of information and cooperation in adoption of clean process technologies as well as EOP control technologies



## Tackling TAP: An Approach

### Studies on the **impact assessment**

- Damage to human health
- Impacts on crop productivity, forests, etc
- Related economic analysis
- These would assist in formulating appropriate policy response



## Tackling TAP: An Approach

### **Stakeholder involvement and information dissemination**

- Involve relevant stakeholders (besides NFP/NIA)
  - Industry, NGO's, research institutes, media
- Dissemination of tools, methodologies, and data
- Information sharing



## Tackling TAP: An Approach

### **Policy issues**

- Highlight policies followed by national governments in the field of regulation, studies, fiscal measures, etc
- Integrate national reports
  - Include suggestions made regarding preparatory action for agreements/protocols
- Learning by experience: agreements/protocols in other regions of the World
- Decide on an Administrative Structure
  - eg., For convention on LRTAP :Task force and other support groups, working groups (effects/strategies/technology), Executive Body



## Tackling TAP: An Approach

### **Policy issues**

- Financial assistance for tackling TAP: Multilateral (UNEP/SACEP), SIDA, National funds, others
- Scientific process to aid policy making : Leading to signing of Agreement/ Protocol

