ENVIRONMENTAL HEALTH IN ASIA AND THE PACIFIC

WHO PROGRAMME

World Health Organization
Hisashi Ogawa 2006

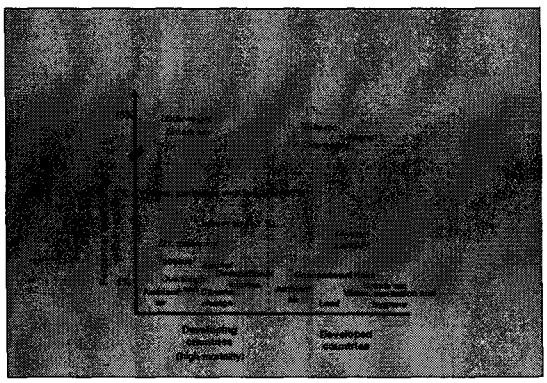
Global Challenges – Magnitudes of Environmental Health Risks

- Environmental health risks - unsafe water, sanitation and hygiene, indoor and outdoor air pollution, chemicals, wastes, housing risks, recreational environment, water resources management, land use and built environment, community risks, noise, radiation, occupation, man-made climate change and ecosystem changes
- They attribute to 13.3 million deaths (23% of total deaths) and 353.6 million DALYs (24% of total DALYs) worldwide in 2002

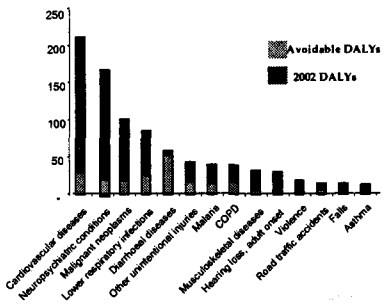
Environmental risks and related diseases

- Outdoor air pollution (respiratory infections, selected cardiopulmonary causes, lung cancer)
- Indoor air pollution from solid fuel use (COPD, lower respiratory infections, lung cancer)
- Lead (mild mental retardation, cadiovascular diseases)
- Water, sanitation and hygiene (diarrhoeal diseases, trachoma, schistosomiasis, ascariasis, trichuriasis, hookworm disease)
- Climate change (diarrhoeal diseases, malaria, selected unintentional injuries, protein-energy malnutrition)
- Selected occupational factors (unintentional injuries, noise-induced hearing loss, cancers, asthma, COPD, low back pain)

Roughly one quarter of the global burden of disease is linked to environmental factors

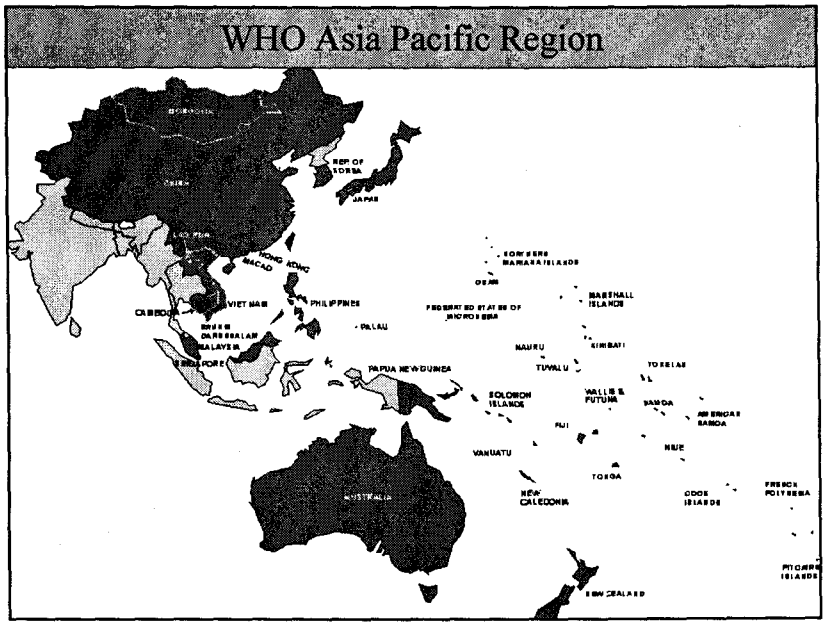


Well-defined, cost-effective environmental interventions can significantly reduce the BoD



Global Framework for Action

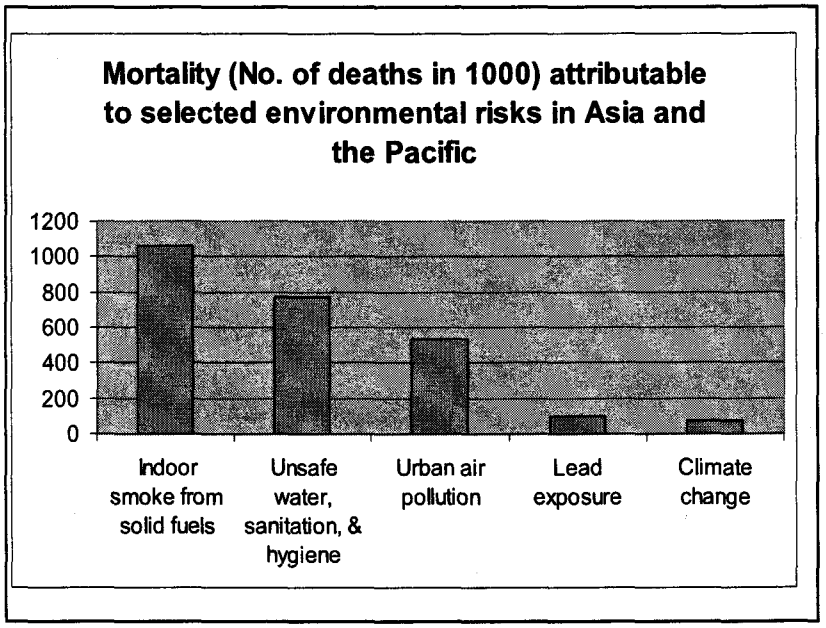
- Global framework for action to reduce environmental risks to health provided by:
  - Agenda 21, 1992
  - Millennium Development Goals, 2000
  - Johannesburg Plan of Implementation, 2002
  - Various International Conventions (chemicals, wastes, climate change, ecosystem, etc.)

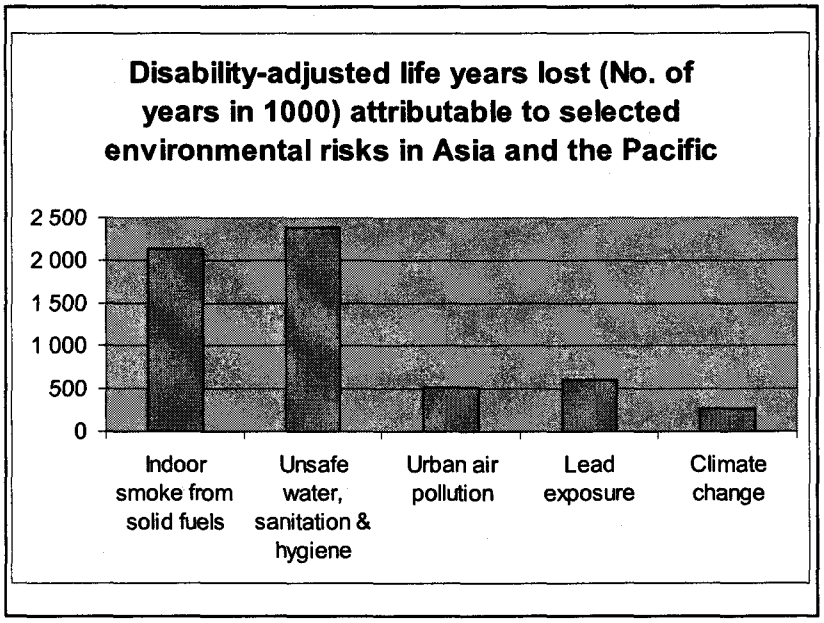


Regional Issues and Challenges

- Environmental health risks attribute to 6.6 million deaths (or 18,000 deaths per day). About 25% of total deaths in the Region.

  About 50% of global deaths attributable to environmental risk factors.
- In terms of DALYs, 164 million DALYs (24% of total DALYs in the Region; 46% of global DALYs attributable to environmental factors)
- Over 90% of such deaths and DALYs occurs in developing countries of the Region.


Mortality (No. of deaths in 1000) attributable to selected environmental risks in Asia and the Pacific
1200
1000
800
600
400
200
0
Indoor smoke from solid fuels
Unsafe water, sanitation, & hygiene
Urban air pollution
Lead exposure
Climate change

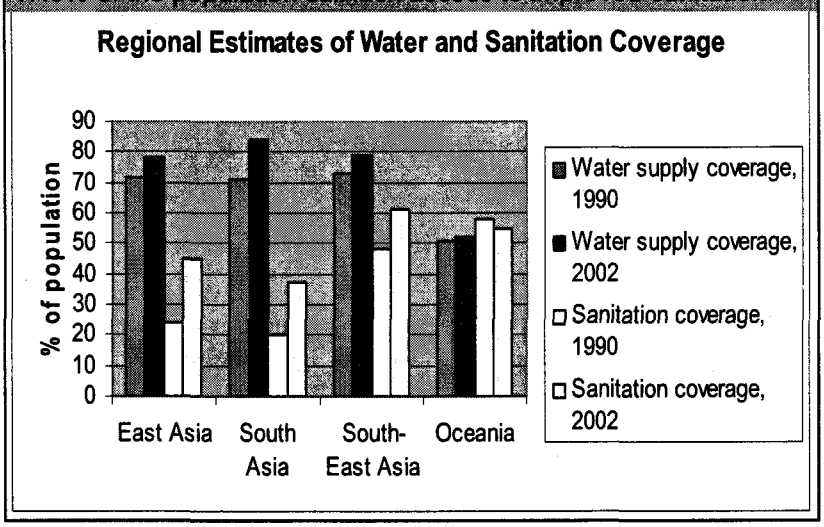

Disability-adjusted life years lost (No. of years in 1000) attributable to selected environmental risks in Asia and the Pacific
2 500
2 000
1 500
1 000
500
0
Indoor smoke from solid fuels
Unsafe water, sanitation & hygiene
Urban air pollution
Lead exposure
Climate change

Different environmental health risks in different settings

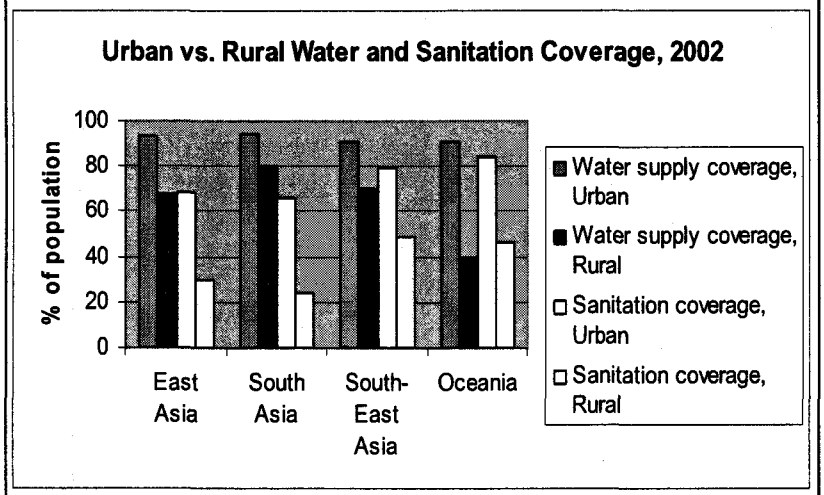
- Indoor smoke from solid fuels in poor rural and underserved urban settings
- Urban air pollution in rapidly developing and urbanizing countries
- Unsafe water and poor sanitation in poor rural and undeserved urban settings

Water, Sanitation and Hygiene

675 million people, or 18.5% of the total population still lack access to improved sources of drinking water. 2 billion people, or 47.5% of the population still lack access to improved sanitation.

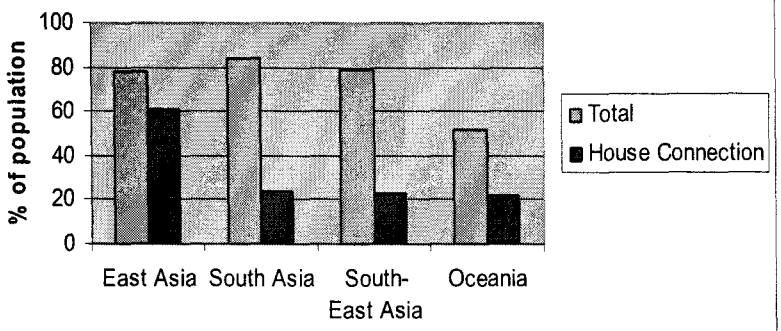


Disparities in coverage between and urban and rural populations



Household Connection to Water Sources is still limited in the Region

Access to Improved Water Sources: Total vs. House Connection, 2002



Service coverage may not be an accurate indicator for safety

- The importance of hygiene (water sources at community/household level can be contaminated with pathogens by unhygienic behaviour)
- Chemical hazards in drinking water (naturally occurring arsenic and flouride in groundwater; mining, industrial and agricultural chemical discharges to surface and groundwater)

WHO Programme

- Ensure safe drinking water quality, improved sanitation and hygiene
  - National standards based on WHO guidelines
  - Drinking water quality monitoring and surveillance
  - Water safety plans
  - Household treatment of drinking water
  - Sanitation improvement
  - Hygienic behaviour promotion
  - Assessment of Burden of Disease

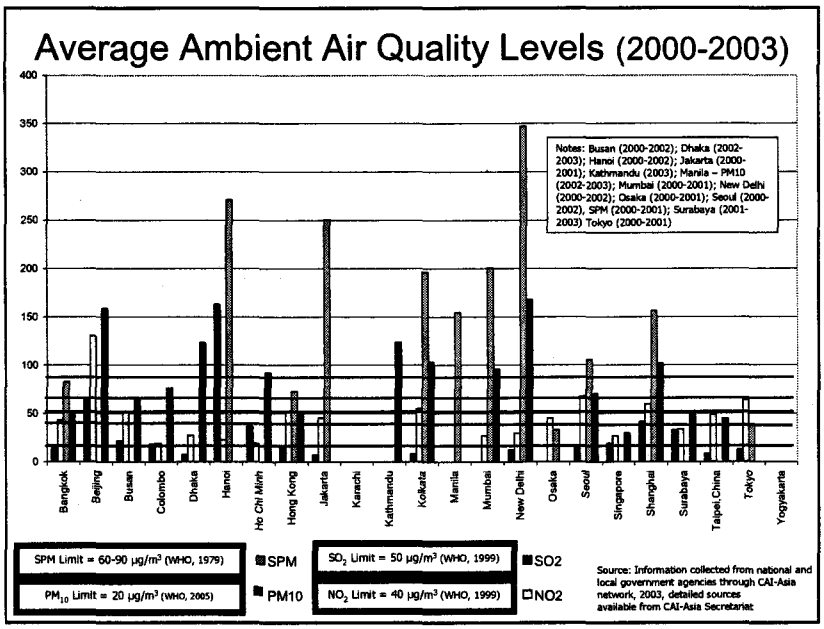
WHO collaborates with:

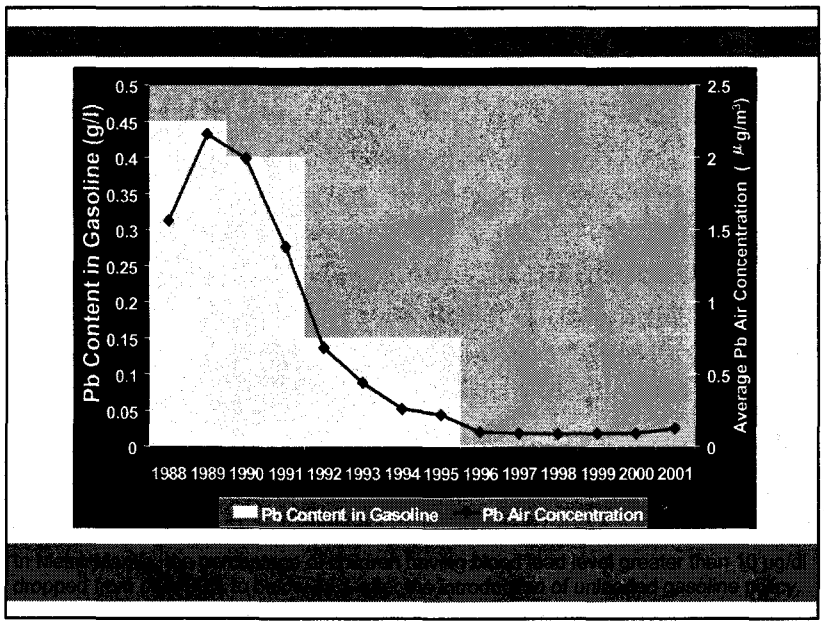
- The World Bank Water and Sanitation Programme, UNICEF, AusAID and JICA to support Asian countries
- SOPAC, AusAID, NZAID and NZMOH to support Pacific island countries

Outdoor and Indoor Air Quality

Over a half a million deaths are attributable to urban air pollution

- 97% of such deaths occur in developing countries
- Increased industrial activities, energy consumption, and motorization in developing countries have contributed to ambient air quality deterioration
- Motor vehicle emissions become a major factor in urban air pollution. Often 50-80% of urban air pollution is from vehicular emissions


Average Ambient Air Quality Levels (2000-2003)
400
350
300
250
200
150
100
50
0
Notes: Busan (2000-2002); Dhaka (2002-2003); Hanoi (2000-2002); Jakarta (2000-2001); Kathmandu (2003); Manila – PM10 (2002-2003); Mumbai (2000-2001); New Delhi (2000-2002); Osaka (2000-2001); Seoul (2000-2002), SPM (2000-2001); Surabaya (2001-2003) Tokyo (2000-2001)
Bangkok
Beijing
Busan
Colombo
Dhaka
Hanoi
Ho Chi Minh
Hong Kong
Jakarta
Karachi
Kathmandu
Kolkata
Manila
Mumbai
New Delhi
Osaka
Seoul
Singapore
Shanghai
Surabaya
Taipei,China
Tokyo
Yogyakarta
SPM Limit = 60-90 µg/m³ (WHO, 1979)
PM10 Limit = 20 µg/m³ (WHO, 2005)
SPM
PM10
SO2 Limit = 50 µg/m³ (WHO, 1999)
NO2 Limit = 40 µg/m³ (WHO, 1999)
SO2
NO2
Source: Information collected from national and local government agencies through CAI-Asia network, 2003, detailed sources available from CAI-Asia Secretariat


Pb Content in Gasoline (g/l)
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Average Pb Air Concentration (µg/m³)
2.5
2
1.5
1
0.5
0
1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001
Pb Content in Gasoline
Pb Air Concentration

No of air pollution epidemiological studies in the region has increased recently (138 published papers in the last 23 years) – Health Effects Institute, 2004

Summary of Estimates of Percent Change in Health Outcomes for Every 10 μg/m³ Increase of Exposure

Health Outcome	Pollutant	Fixed-Effects Estimate, % change (95% CI)	Random-Effects Estimate, % change (95% CI)
All-Cause Mortality	PM_{10}	0.41 (0.25; 0.56)	0.46 (0.23; 0.76)
	TSP	0.20 (0.14; 0.26)	0.20 (0.14; 0.26)
	SO_2	0.35 (0.26; 0.45)	0.52 (0.30; 0.74)
Respiratory Admissions	NO_2	0.28 (0.09; 0.47)	0.95 (-0.05; 1.94)
	SO_2	0.07 (-0.28; 0.41)	0.16 (-0.46; 0.77)

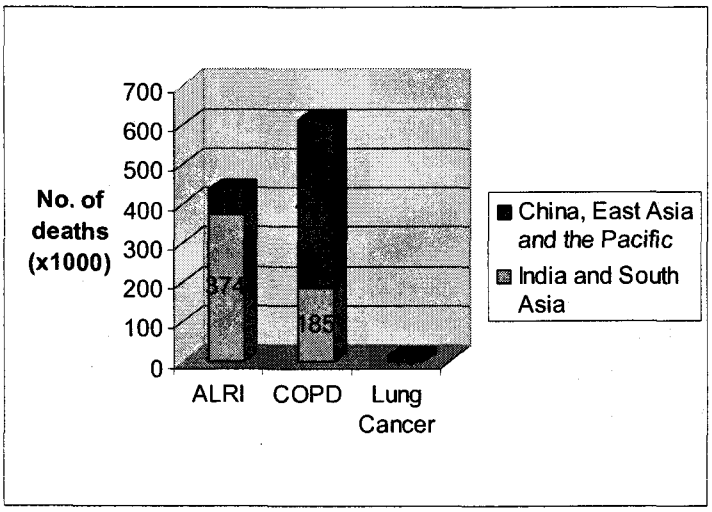
Over one million deaths are attributable to indoor smoke

- Main solid fuels used are biomass fuels (e.g. wood charcoal, dung, agricultural residues) and coal for domestic cooking and heating.
- Majority of households using these fuels are in poor rural communities, burn them in inefficient stoves, often in kitchens that are poorly ventilated, resulting in very high exposures.

Proportion of Population Using Solid Fuels in the Region – Report on MDG Indicator No. 27, 2005

Country/Territory	Proportion of *population using* solid fuels	Country/Territory	Proportion of *population using* solid fuels
Australia	<5%	Nepal	80%
Bangladesh	88%	New Zealand	<5%
Cambodia	>95%	Papua New Guinea	90%
China	80%	Philippines	47%
Fiji	40%	Republic of Korea	<5%
Guam	<5%	Samoa	70%
India	74%	Singapore	<5%
Indonesia	72%	Solomon Islands	95%
Japan	<5%	Thailand	72%
Lao PDR	>95%	Tonga	56%
Malaysia	<5%	Vanuatu	79%
Mongolia	51%	Viet Nam	70%
Myanmar	95%		

Estimated Mortality from ALRI, COPD and Lung Cancer attributable to Indoor Smoke from Solid Fuels



Transboundary Air Pollution

- Dust and Sand Storm over North East Asia
- Forest fire induced Haze over South East Asia
- Atmospheric Brown Cloud over South and South East Asia

WHO Programme

- Support the assessment of health impacts of outdoor and indoor (and transboundary) air pollution
- Provide training and capacity building in air quality management (e.g. regional training programmes on urban air and indoor air quality management)
- Provide evidence of effective management measures and advocate to energy, transport, industry and agriculture sectors for adoption of these measures

WHO collaborates with:

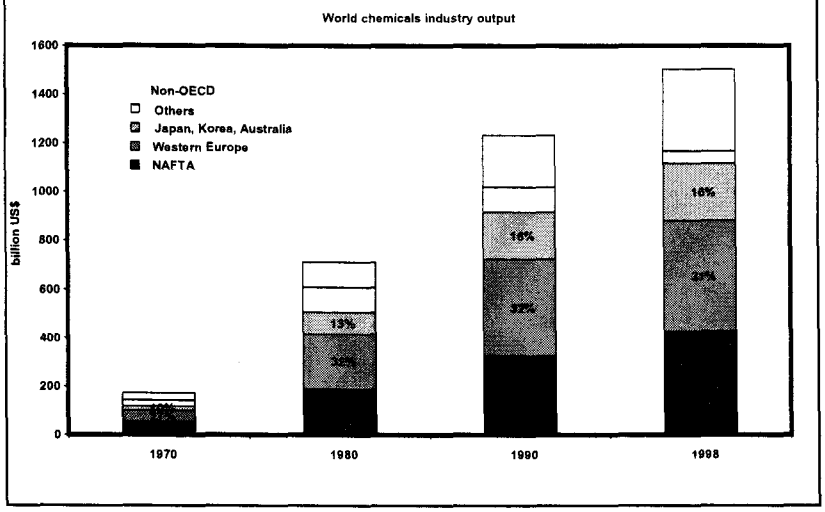
- The Clean Air Initiative for Asian Cities and the Health Effects Institute (its Public Health and Air Pollution in Asia project – PAPA) in urban air pollution in Asia
- The Partnership for Clean Indoor Air in indoor air pollution in Asia
- UNCRD in urban transport policies (including health issues such as air pollution, noise, traffic injuries, non-motorized transport – bicycling and walking for physical activity) in Asia

Chemical Safety

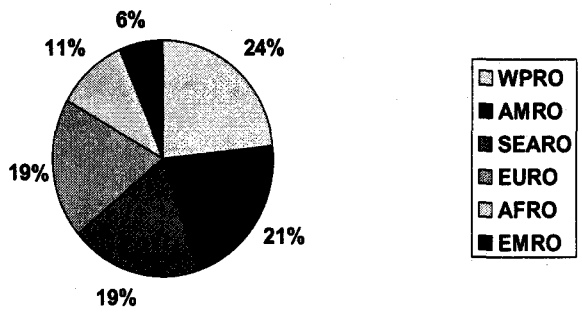
Managing chemicals

- 135,000 deaths in Asia and the Pacific are due to poisoning by chemicals, pharmaceuticals, and animal and plant toxins. 43% of global poisoning deaths.
- Over 100,000 existing chemicals, 1/3 of which are actually used in industry, agriculture and households
- Unnecessary exposure to a toxic chemical could occur at production, storage, transport (including import and export), use and disposal. Lifecycle management (cradle to grave)

Chemicals production



Chemical events by region – 2004
Asia and the Pacific - 43% of total



International Conventions and Countries that Ratified Them

- Montreal Protocol on Sustances that Deplete the Ozone Layer – 37 countries (97%)
- Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade – 15 countries (39%)
- Stockholm Convention on Persistent Organic Pollutants – 24 countries (63%)
- Basel Convention on the Transboundary Movement of Hazardous Wastes – 26 countries (68%)

IFCS and SAICM

- Intergovernmental Forum on Chemical Safety (IFCS) – established after the Rio Summit, involving GOs, IGOs and NGOs
- Strategic Approach to International Chemicals Management (SAICM) – proposed at the Johannesburg Summit and adopted at the Dubai Conference, February 2006
- Others – International Programme on Chemical Safety - IPCS (WHO, ILO, UNEP); Interorganizational Programme for the Sound Management of Chemicals - IOMC (WHO, FAO, ILO,OECD, UNEP, UNIDO, UNITAR)

WHO Programme

- Support country inputs (particularly the health sector inputs) to the various international conventions and programmes
- Strengthen human resources and institutional capacity in:
  - Provision of chemical information and poison control
  - Prevention and management of chemical emergencies
  - Development of chemical safety legislation

Country	Number	City
Australia	5	Brisbane, Canberra, Melbourne, Perth, Sydney
Cambodia	1	Phnom Penh
China	2	Beijing, Hong Kong
India	4	Ahmedabad, Cochin, Chennai, New Delhi
Indonesia	3	Bandung, Jakarta, Surabaya
Japan	2	Osaka, Tsukuba
Malaysia	1	Penang
Mongolia	1	Ulaanbaatar
Nepal	1	Kathmandu
New Zealand	1	Dunedin
Philippines	1	Manila
Singapore	1	Singapore
Sri Lanka	1	Colombo
Thailand	1	Bangkok
Viet Nam	2	Hadong, Hanoi

Solid and Health-care Wastes

The problems

- Increasing waste generation rates due to increased economic activity - Household solid waste generation rates are 0.7 to 1.0 kg/person/day, and increasing in developing countries
- Health-care waste generation – 1.0-1.5 kg/bed/day in a large hospital, 0.3 kg/bed/day in a small hospital. 80-85% is general, non-hazardous waste, but often not segregated – need to deal with them as hazardous
- Diminishing disposal areas and improper disposal management due to urban expansion and lack of resources
- Solid waste un-collected, and open dumping with open burning, contaminating air and water

Hazards in Solid Waste

- Waste content
  - Biological - fecal matter; blood; animal flesh
  - Chemical - toxic chemicals; heavy metals
  - Physical - pressurized containers; explosives
- Ergonomic factors
  - Loading operation; vibration
- Accidents and safety
  - Landfill slide; fires; vehicle accidents; noise

Populations at Risk

- Occupational Health Risks
  - Formal sector
  - Informal sector
- Public/Environmental Health Risks
  - Those living near treatment/disposal facilities
  - Those living away from treatment/disposal facilities

Health of Scavengers (Waste Pickers)

- Tuberculosis, bronchitis, asthma, pneumonia, dysentery, parasites and malnutrition are the most commonly experienced health problems
- In Metro Manila, 40% of scavengers had skin disease and 70% upper respiratory disease
- Higher birth defects and infant mortality among waste picker families

Air Pollution Pathway Diseases

- Allergic pulmonary disease (exposure to bio-aerosol, e.g. microorganisms and their metabolites and toxins)
- Non-allergic pulmonary disease (dust, particulate matter)
- Elevated heavy metals (Pb, Hg, Cd)
- Headaches and mood disorders (landfill gas, CO, low oxygen)
- Cancer (carcinogenic chemicals)

Cancer Elevation in Residents

- Landfill in Canada - 1.3 to 1.8 times greater cancer risk within 4 km radius
- Multiple landfills in New York State - 4 times greater bladder cancer and leukemia risk within 0.5 km radius
- Multiple incinerators in UK - 1.4 times greater liver cancer risk within 2 km radius

Direct Contact Pathway Diseases

- Parasitic infections:
  - 98% among children waste pickers in Manila
  - 97% among waste pickers in Olinda, Brazil
  - 92% among waste pickers in Calcutta, India
  - 65% among waste pickers in Bangkok
- HIV and hepatitis infections:
  - HIV infection risk for waste workers is 0.3%
  - Heptitis B infection risk for waste workers is 3% or more (both in USA)

Vector Pathway Diseases

- Dengue fever (mosquitoes)
- Leptospirosis and Hanta virus (rats)
- Cholera (water fleas - copepods)
- Enteric bacteria (flies)

Animal Feeding Pathway Diseases

- Diseases from eating undercooked meat of animals in contact with solid waste
  - Trichinosis increases where pigs feed on solid waste containing whipworm
  - Taeniasis increase where pigs and cows feed on solid waste with human and animal fecal matter containing tapeworm

Health Implications

- Pathogens and hazardous chemicals in solid waste are transmitted through various pathways (air, water, direct contact, vector, animal feeding)
- These health risks are higher in developing countries than in developed countries
- Occupational health risks are higher than public/environmental health risks, and informal sector workers (waste pickers) are exposed to highest risks
- Unsafe injection practices among health workers cause 6.5-13 million HBV, 2-3.9 million HCV and 17,000-35,000 HIV infections in the Region.

WHO Programme

- Support for national policy development
  - Legislation, regulations, technical guidelines for solid and health-care waste management
  - National action plan
- Capacity building
  - Waste data collection and analysis
  - Situation analysis
  - Training in solid and health-care waste management

Climate Change

Global warming - projections

Global mean surface temperature will rise by 1.4° - 5.8° C. Warming will be greatest over land areas, and at high latitudes.

The projected rate of warming is greater than anything humans have experienced in the last 10,000 years.

The frequency of weather extremes is likely to change leading to an increased risk of floods and drought

Fewer cold spells but more heat waves are expected.

The frequency and intensity of El Niño may be affected.

Global mean sea level is projected to rise by 9 – 88 cm by the year 2100

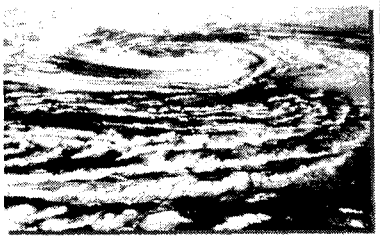
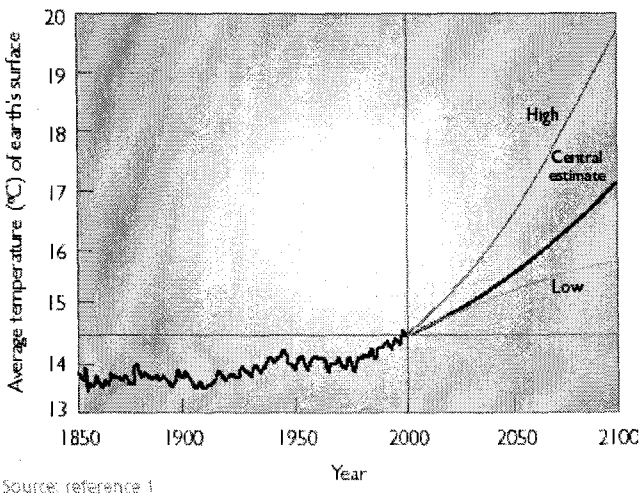
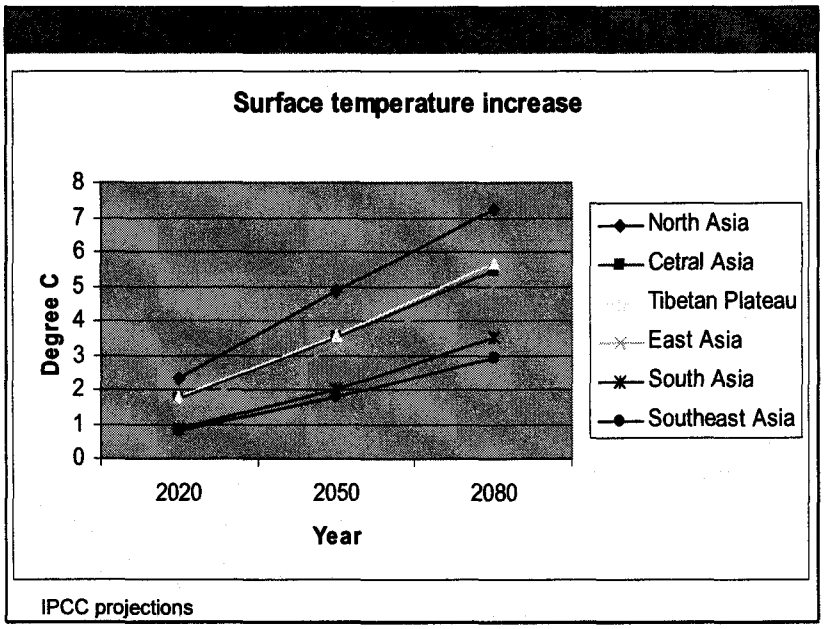


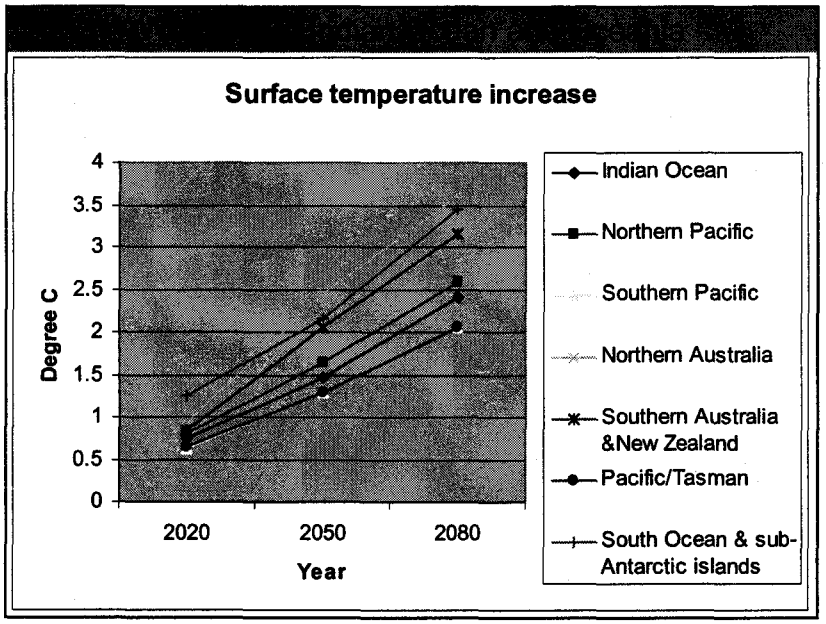
Figure 1.2 Global temperature record, since instrumental recording began in 1860, and projection to 2100, according to the IPCC



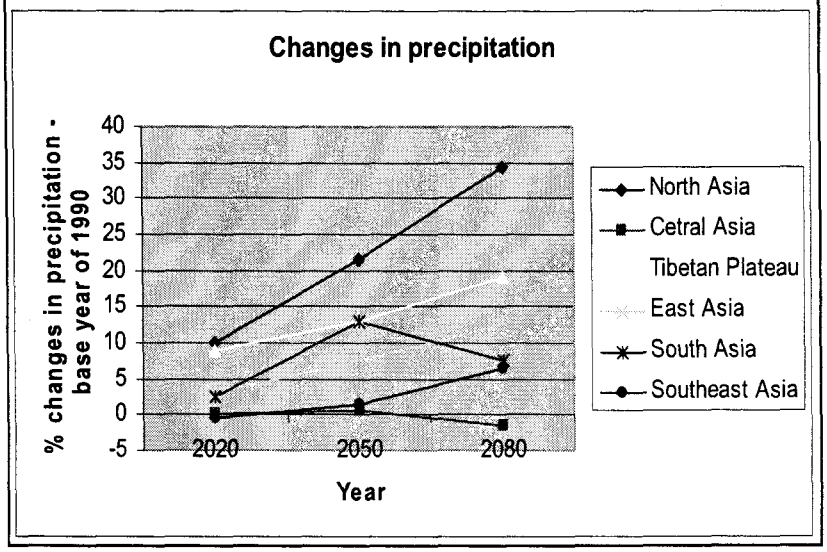
Source: reference 1



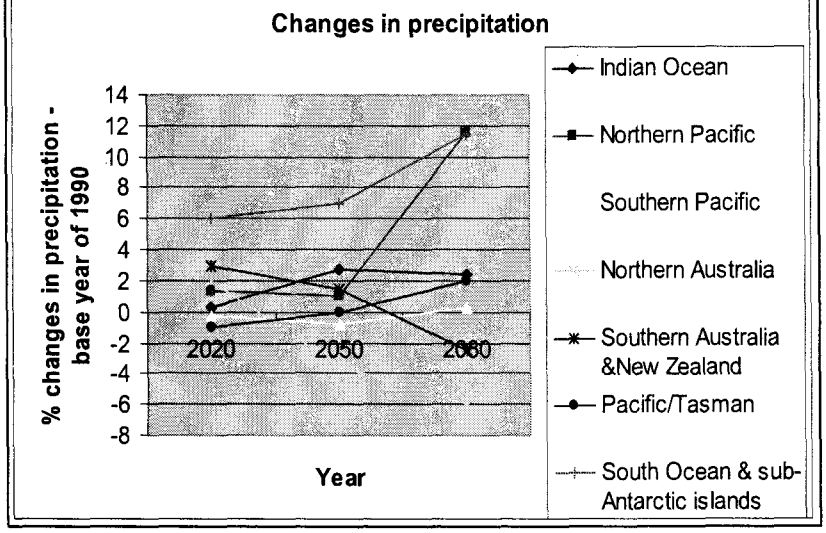
IPCC projections



Projected changes in precipitation in Asia

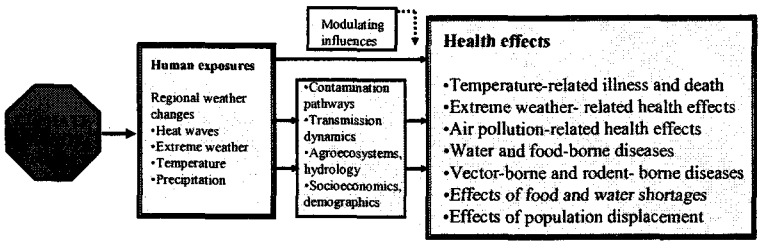


Projected changes in precipitation in Indian Ocean and Oceania



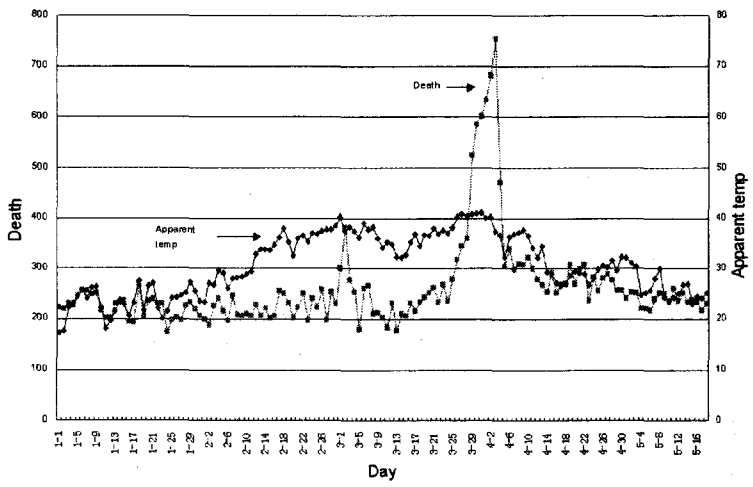
77,000 deaths and 2.7 million DALYs are attributable to climate change in Asia and the Pacific

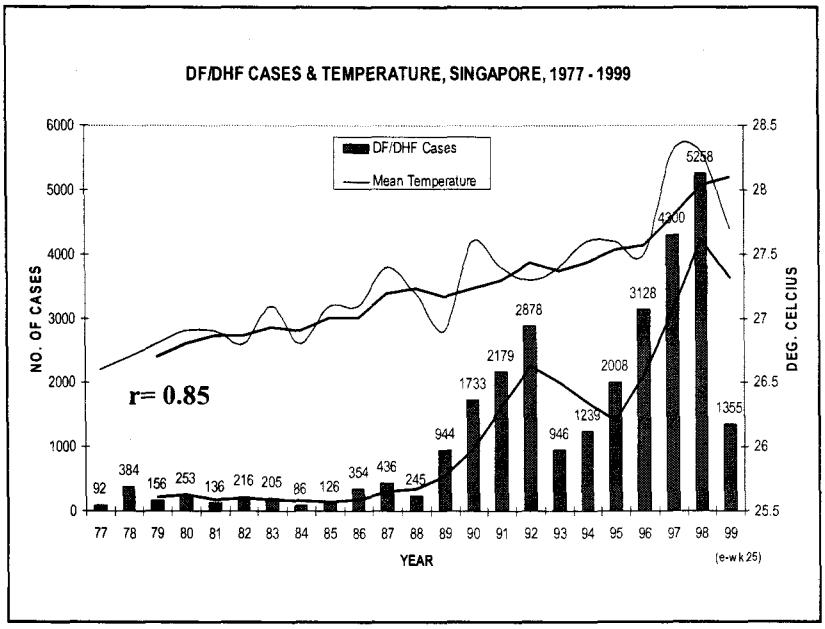
Most expected impacts will be adverse but some will be beneficial. Expectations are not for novel processes, but rather **changes in frequency or severity of familiar health risks**



Pathways by which climate change may affect health. Based on Patz et al, 2000

Temperature and Mortality in Shanghai in the summer of 1998





International mechanisms and mitigation strategies

- UN Framework Convention on Climate Change, 1992 – Stabilization of GHG concentrations in the atmosphere – 36 countries (95%) ratified
- Kyoto Protocol, 1997 – Reducing GHG emissions – 33 countries (87%) ratified
- Intergovernmental Panel on Climate Change (IPCC), 1988 – UNEP/WMO
- Inter-Agency Committee on the Climate Agenda (IACCA)
- Inter-Agency Network on Climate and Human Health, 1998 – UNEP/WHO/WMO

Adaptation strategies

- Development and application of **technologies and infrastructure** to adapt to climate change – urban design, agricultural practice, water resources (flood control, water supply and sanitation facilities), health-care, etc.
- Development and strengthening of **information and skills** to reduce health impacts– extreme weather forecast and early warning system for outbreaks of diseases; preparedness and response for such outbreaks, disease surveillance and monitoring, etc.

WHO Programme

- Support the assessment of health impacts of climate change – Urban heat-related illness in China
- Regional workshops on health impacts of climate change and variability – Pacific region
- National assessment of health impacts of climate change and development of adaptation strategy – China and Fiji

Regional Initiative on Environmental Health

WHO Regional Strategy

- Strengthen national capacity in environmental health risk assessment and management
- Enhance cooperation between health and environment sectors, and their cooperation with other socio-economic sectors in solving problems
- Promote inter-country cooperation in solving common and transboundary environmental health problems

Process taking place for the Regional Initiative (1)

- First High-Level Meeting on Health and Environment in ASEAN and East Asian Countries, Nov. 2004
  - National level
    - Coordination Mechanism (Technical Working Group)
    - Environmental Health Country Profile (EHCP) and Data Sheet
    - National Environmental Action Plan (NEHAP)
    - Regular National Forum
  - Regional Level
    - Convening of the Regional Forum at ministerial level in 2006
    - Establishment of a task force to prepare for the Regional Forum

Process taking place for the Regional Initiative (2)

- Task Force established, Feb. 2005
  - First meeting, end Mar. 2005
    - Concept note
    - Road map to the Regional Forum, 2006
  - Letters to Ministers of Health and Environment, June 2005
  - Second meeting, end Sep. 2005
    - Draft Charter of the Regional Forum
- RCM session on environmental health with resolution, September 2005
- Second High-Level Meeting (12-13 Dec. 2005)
  - back-to-back with Scientific Conference (8-11 Dec.) and 3rd Task Force meeting (13 Dec. p.m.)
  - Discussion on draft charter
  - Letters to Ministers of Health and Environment, February 2006

Draft charter

- Ministerial Regional Forum every 3 years
- Secretariat – WHO and UNEP
- Thematic Working Groups (TWGs) on 6 priorities for 2006-2009:
  - Air quality
  - Water supply, hygiene and sanitation
  - Solid and hazardous waste
  - Toxic chemicals and hazardous substances
  - Climate change, ozone layer depletion and ecosystem changes
  - Contingency planning, preparedness and response in environmental health emergencies
- Chairs of TWGs are from government agencies/institutions and form the Advisory Board for the Regional Forum

Process taking place for the Regional Initiative (3)

- National action
  - Coordination mechanism
    - Existing mechanism (e.g. Interagency Committee on Environmental Health)
    - New mechanism
  - National Forum, 2005 and revision of EHCP and development of NEHAP
    - Lao PDR (Jul.), Mongolia (Aug.), China (Nov.), Viet Nam (Nov.), Philippines (Nov.), Cambodia (Dec.)

Forthcoming Actions

- National level
  - Countries submit comments on the draft charter and the nomination of institutions/agencies for the various TWGs
  - Continue to develop NEHAP and implementation of projects on priority EH areas
- Regional level
  - Forming of TWGs on regional priorities and selection of chairs
  - Meeting of Advisory Board composed of chairs of TWGs – mid 2006
  - First Regional Forum, November/December 2006

Poster

- Atmospheric Environment
- Aquatic Environment
- Environmental Toxicology
- Hygiene and Environment
- Industrial Health