Environmental Impacts
Part 1

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Overview of the Presentation

Try to answer the following questions

- What are problems with natural environment?
- How human activities pollute the natural environment?
- Why we pollute the environment?
- How is harmful polluted environment?
- What are strategies and polices to reduce the environmental impacts?

What are problems with natural environment?

The Endangered Environment (1/3)

The natural environment is a resource. This resource is in excessive use as the cost of depleting or damaging it is not taken into account.

Chimneys throw out noxious gases into atmosphere

____ acid rain, greenhouse effect, etc.

The Endangered Environment (2/3)

- Factories dump toxic wastes into water bodies ___damage to marine life and vegetation

- Green revolution depends upon fertilizers, irrigation and pesticides
  ____ excess nitrogen in underground water, lakes poisoned with pesticides, aquifers overused.

The Endangered Environment (3/3)

- forests cleared for habitation , industrial logs & firewood
  ____ parched soil, drought.
- automobiles pump poison into atmosphere
  ____ greenhouse effect, excessive Lead in atmosphere
- unbridled energy consumption
  ____ oil tanker spills, erosion of large areas by coal mining

How human activities pollute the natural environment?

Some Environmental Burdens due to Human Activities (1/3)

Burden	Quantity (tonnes/ year)	Share of human disruption by			
		Commercial Energy Supply and Use	Traditional Energy Supply and Use	Agriculture	Others
Oil added to water	2,000,000	44% (petroleum harvesting, processing and transport)	negligible	negligible	56%(Disposal of oil wastes, including motor oil changes)
Lead emissions to atmosphere	216,000	41% (fossil fuel burning, including additives)	negligible	negligible	59%(metal processing, manufacturing, refuse burning)

Source: World Energy Assessment: Energy and Challenges of Sustainability (WEC/UNDP), 2000.

Some Environmental Burdens due to Human Activities (2/3)

Burden	Quantity (tonnes/ year)	Share of human disruption by			
		Commercial Energy Supply and Use	Traditional Energy Supply and Use	Agriculture	Others
CO_2 flows to atmosphere	7.5 billion (Carbon)	75% (fossil fuel burning)	3% (net deforestation for fuelwood)	15% (net deforestation for land clearing)	15% (net deforestation for lumber, cement, manufacturing)
Non-methane hydrocarbon to atmosphere	120 million	35% (fossil fuel processing and burning)	5% (traditional fuel burning)	40% (burning of agricultural wastes)	20% (refuse burning)

Source: World Energy Assessment: Energy and Challenges of Sustainability (WEC/UNDP), 2000.

Some Environmental Burdens due to Human Activities (3/3)

Burden	Quantity (tonnes/ year)	Share of human disruption by			
		Commercial Energy Supply and Use	Traditional Energy Supply and Use	Agriculture	Others
Sulphur Emissions to atmosphere	83.7 million (sulphur)	85% (fossil fuel burning)	0.5% (traditional fuel burning)	1% (burning of agricultural wastes)	13%(smelting, refuse burning)
Particulate emissions to atmosphere	372 million	35% (fossil fuel burning)	10% (traditional fuel burning)	40% (burning of agricultural wastes)	15% (smelting, non-agricultural land clearing, refuse burning)

Source: World Energy Assessment: Energy and Challenges of Sustainability (WEC/UNDP), 2000

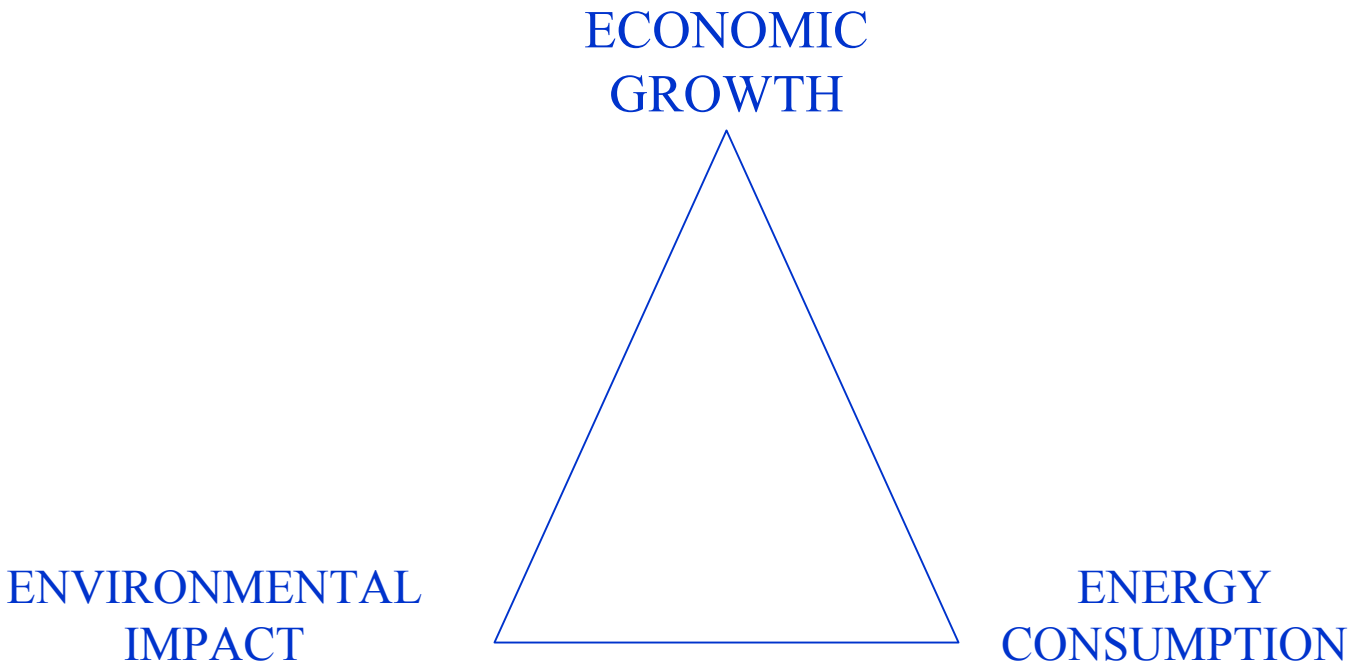
Share of Commercial Energy Supply and Use in total Environmental Burdens

- 41% of lead emissions to atmosphere
- 44% of oil added to water
- 85% of sulphur emissions to atmosphere
- 35% of particulate emission to atmosphere
- 35% of non-methane hydrocarbon emission to atmosphere
- 75% of CO_2 flow to atmosphere

Source: World Energy Assessment: Energy and Challenges of Sustainability (WEC/UNDP), September 2000

Why we pollute the environment?

Economic Growth



Use of Technology

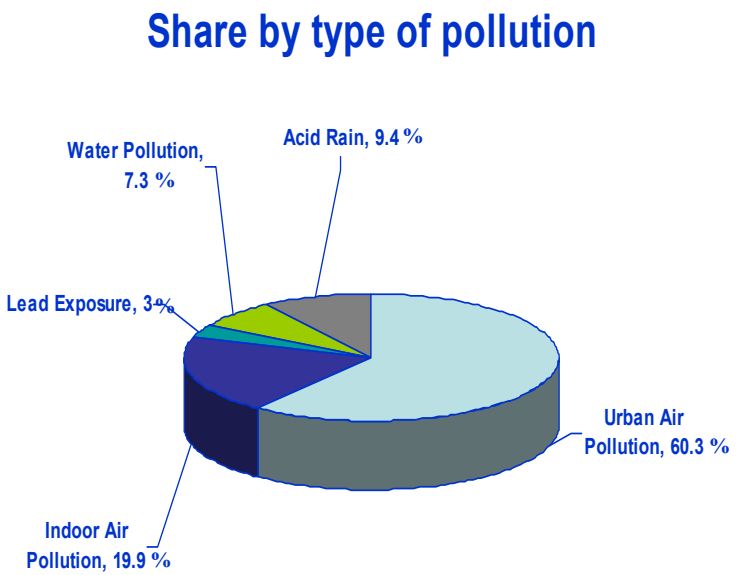
Technology has made life longer, healthier and easier for human beings but technological activities have also damaged the natural environment

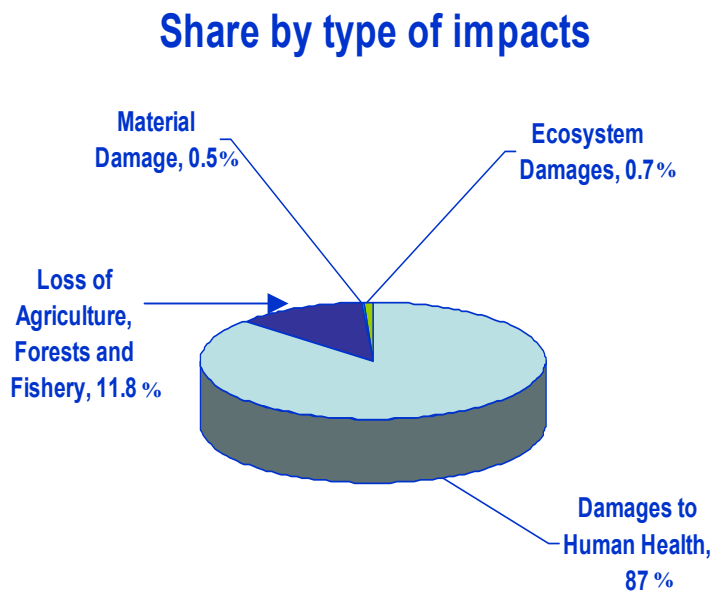
How harmful is polluted environment?

Polluted Environment Damages to:

- Human health
- Man made materials
- Agricultural crops
- Forests
- Ecosystem
- ……..

Damage costs of air and water pollution in China (World Bank's estimates for mid 1990s)





Source: IAEA-TC-1093, 1999

Valuation Methods for the Health Effects of Pollution

Valuation Methods	Example
Human Capital	Earnings foregone due to premature death as a result of exposure to air or water pollution
Cost of Illness	Lost workdays plus out-of-pocket costs (medical and other) due to health effects of pollution
Preventive/Mitigative Expenditure	Purchase of bottled water to avert health effects of polluted water. Installation of air conditioners to avert air pollution in the residence.
Wage Differential	Value of reduction of risk to health implicit in the difference in otherwise similar occupations.
Contingent Valuation	Direct questioning to provide a value for a potential change in air quality or health.

Health Effects of Common Air Pollutants

Pollutant	Health Effect
Particulate matter; sulfur dioxide	Increase respiratory morbidity among adults and children, increase mortality among elderly and the chronically ill, decrease lung function
Ozone*	Eye, nose and throat irritation, chest tightness, cough, shortness of breath
Nitrogen oxides	Increase risk of respiratory disease, particularly, in children under 12 years old
Lead	Impaired neurological development; high blood pressure

* Troposphere Ozone formed from interaction among hydrocarbons, nitrogen oxides and light.

Source : Pollution Prevention and Abatement Handbook, The World Bank 1998

Environmental Concerns are of Various Levels

Local

- Urban smog (NOx, hydrocarbon, ….)
- Deforestation (reservoir of hydro projects,…)
- Radiation exposure (nuclear fuel cycle, coal fired power plants ..)

……..

Regional

- Acid Rain/Deposition (SO_2 , NO_x)
- Induced Seismic Activity (Reservoir of hydro projects)
- Danger to Marine Life (Oil spills in sea, releases of low level radioactive wastes by NPP, releases of hot water by power plants)
- Radioactive release in major nuclear accidents

……..

Global

- Greenhouse effect leading to global warming(CO_2 , CH_4 ….), impacts of C-14, H-3, etc. ….

Any solution to this dilemma?

Strategies and Policies for Reduction of Environmental Impacts

Strategies and Policies for Energy Sector to Reduce Environmental Impacts

- Sending accurate pricing signals including phasing out subsides to conventional energy resources
- Encouraging greater energy efficiency
- Development and diffusions to wider markets for sustainable energy technologies
- Provision of an improved legislative frame work and environmental law enforcement
- Adding costs of environmental damages to energy prices (internalizing externalities)

Example of improvement in legislative frame work

The annual benefits of applying WHO standards to Jakarta

Saving of:

Premature mortality	1200
Hospital admissions	2000
Emergency room visits	40,600
Restricted activity days	6,330,000
Lower respiratory illness	104,000
Asthma attacks	464,000
Respiratory symptoms	31,000,000
Chronic bronchitis	9,600

Source : Pollution Prevention and Abatement Handbook, The World Bank, 1998.

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Externality ?

An externality (also called external cost) exists when the following conditions prevail

- An activity by one agent causes a loss of welfare to another agent.
- The loss or welfare is uncompensated

Externality in Energy Sector

Externalities of energy are the costs imposed on society and the environment that are not accounted for by the producers and consumers of energy i.e that are not included in the market price. They include physical damage to human health, the natural environment as well as impacts on recreation amenity, aesthetics and other contributors to individual utility.

Thank You

Next

- Mr. Uros : Brief description of methodologies (IPA..), previous studies, comparing of results
- Mr. Tomsic Application of external costs in energy planning

Why to internalize the externalities?

To price emissions so that decision makers can take environmental costs into account when deciding on how to control emissions.

Approaches to Estimation of Externality

Two broad approaches:

- **The control cost (or abatement cost) approach and**
- **The damage cost approach.**

Approaches to Externality Estimation

- The abatement cost method relies on the assumption that actual environmental regulations are close to optimal and reflect the so-called revealed preferences of environmental regulators and eventually society.

- The abatement cost can be regarded as a proxy of the damage cost and thus, the externality to be valued.

Approaches to Externality Estimation

The damage function approach:

- Estimation of the emissions and other environmental stresses specific to the technology and fuel being investigated;
- Estimation of changes in the relevant measures of environmental quality as functions of the emissions;
- Estimation of the physical effects of changes in environmental quality on the relevant receptors;
- Application of unit values to convert physical effects to monetary damages for each endpoint; and
- Aggregation of damages across all receptors and endpoints.