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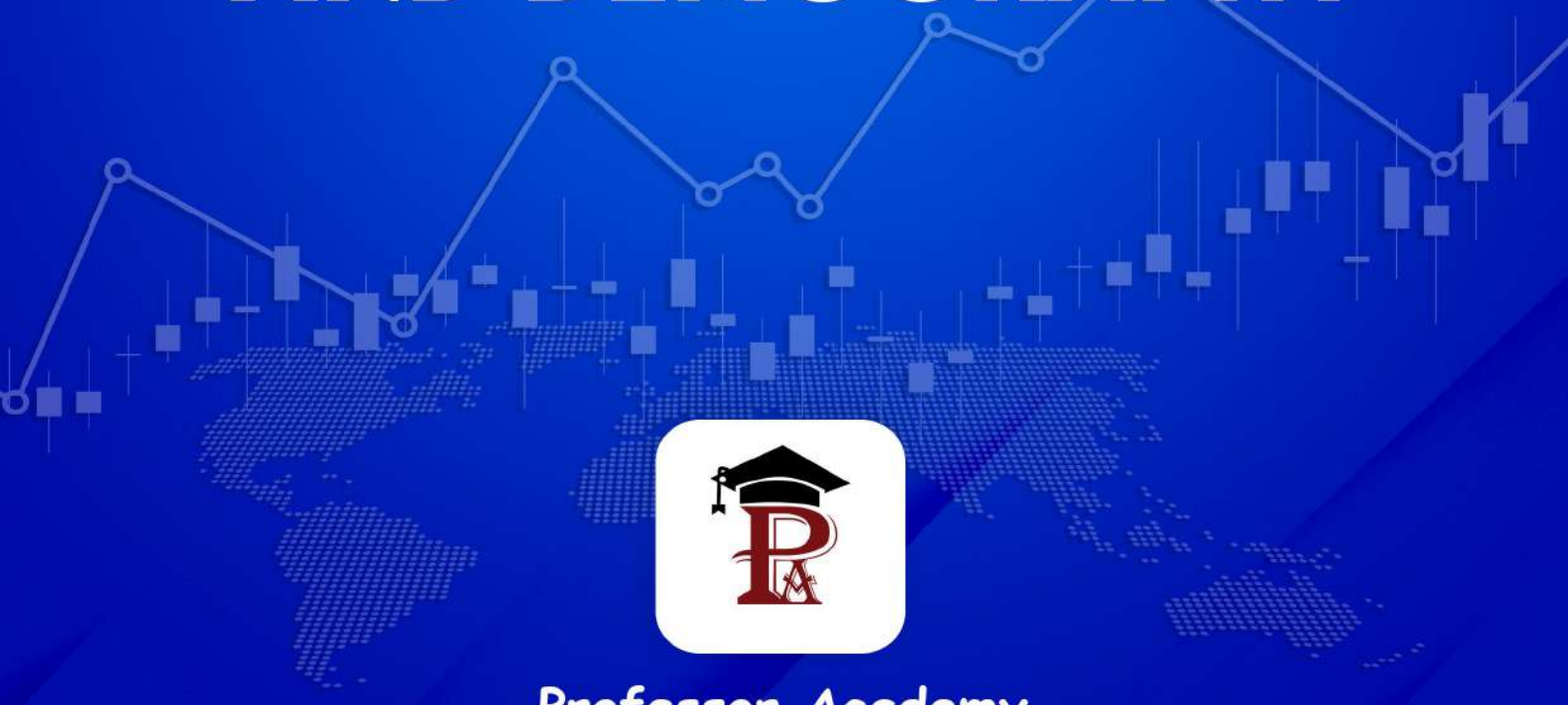
ENVIRONMENTAL ECONOMICS AND DEMOGRAPHY



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UNIT - VII

ENVIRONMENTAL ECONOMICS AND DEMOGRAPHY

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ENVIRONMENTAL ECONOMICS AND DEMOGRAPHY

SYLLABUS

ENVIRONMENTAL ECONOMICS AND DEMOGRAPHY

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I. ENVIRONMENT AS A PUBLIC GOOD

BASIC CONCEPTS OF ENVIRONMENT

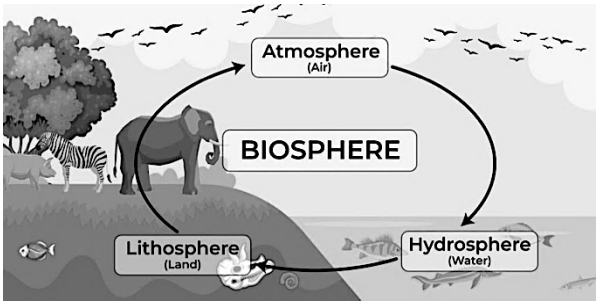
ENVIRONMENT

The environment is the natural component in which **biotic (living) and abiotic (non-living** like climate, weather , lighting etc) **factors interact** among themselves and with each other.

The term 'environment' originates from the **French word 'environ'** or 'environner' meaning **'around'**. 'round-about', 'to surround' or 'to encompass'.

Based on the physical characteristics and state, abiotic / physical environment is sub – divided into three broad categories

1. Lithosphere (solid earth)
2. Hydrosphere (water component) and
3. Atmosphere (gas)



BIOSPHERE

The biosphere is the biological component (**supporting life**) of the earth which includes the lithosphere, hydrosphere and atmosphere.

The biosphere includes all living organisms, together with the dead organic matter produced by them.

HABITAT Vs. ENVIRONMENT

Habitat is the **physical environment in which an organism lives**. (It is like address of an organism). Many habitats makes up an environment.

A habitat always has life in it, while environment does not necessarily have life in it. All habitats are environments, but all environments are not habitats.

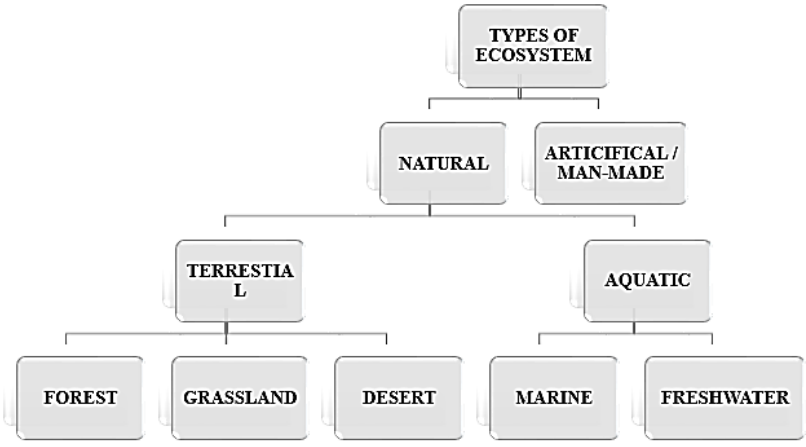
ECOSYSTEM

An ecosystem can be visualized as a **functional unit of nature**, where living organisms interact among themselves and also with their physical environment.

Ecosystem can be of any size but usually encompasses specific and limited species.

Ecosystem may be terrestrial or aquatic ecosystem.

An environment is a group of ecosystems, whereas a Habitat is a part of ecosystem.



ECOLOGY

Ecology is the **study of interactions between organisms and the surroundings** occurring within an ecosystem or environment.

The term Ecology is derived from two **Greek** words, 'Oikos' meaning 'home' and 'logos' meaning 'study'

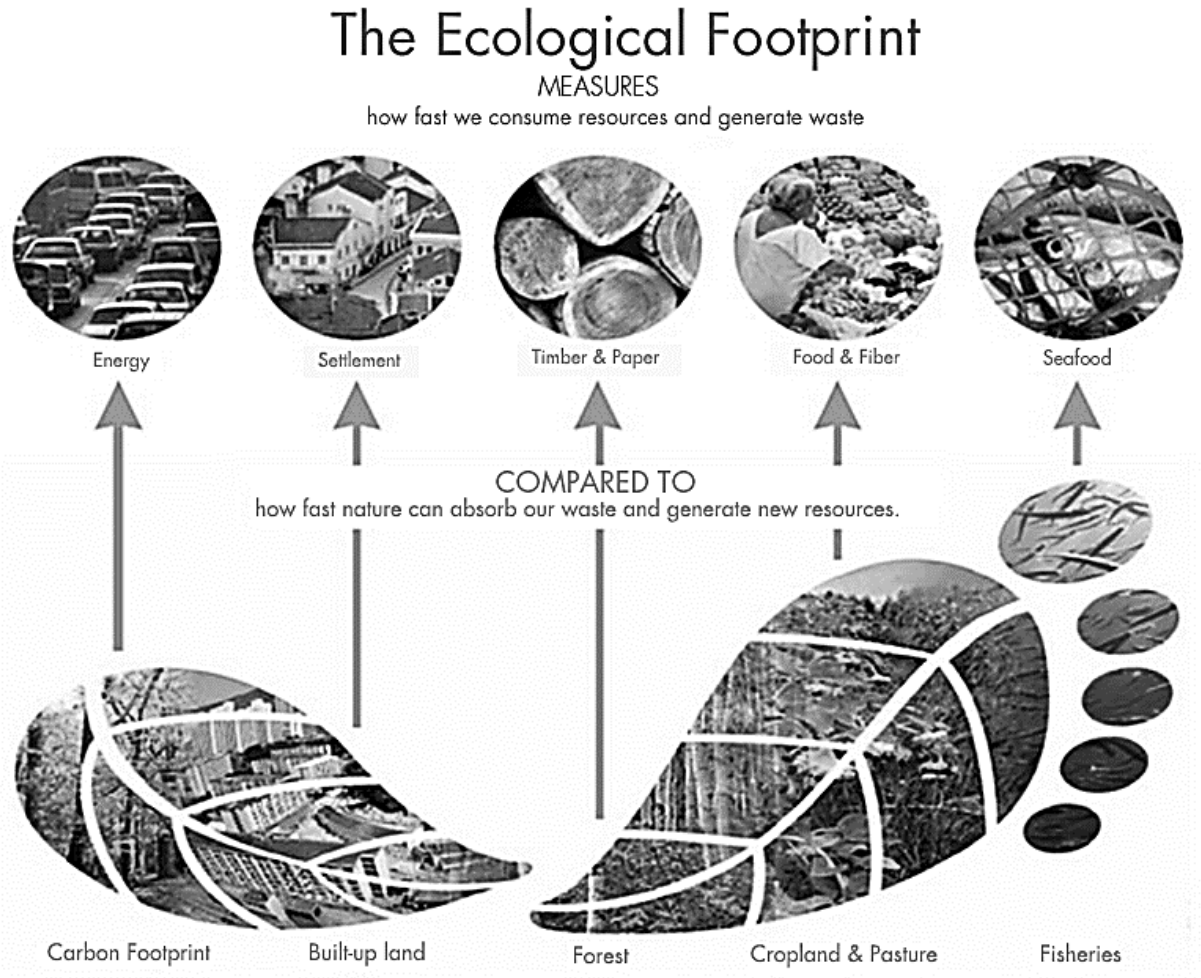
ECOLOGICAL FOOTPRINT

The Ecological Footprint measures **how fast we consume resources and generate waste compared to how fast nature can absorb our waste and generate resources.**

The Ecological Footprint tracks the use of productive surface areas. Typically these areas are: cropland, grazing land, fishing grounds, built-up land, forest area, and carbon demand on land.

It calculates the **environmental impact of human activities** in terms of the amount of biologically productive land and water needed to produce the resources consumed and to absorb the waste generated.

The ecological footprint is typically expressed in global hectares (gha) per person, allowing for comparisons across different regions and populations.



ECOLOGICAL DUMPING

Ecological dumping is a practice where **countries or companies export goods to other countries while disregarding environmental standards** that would typically be enforced in their own jurisdiction.

The term 'ecological dumping' characterises a situation in which the environmental standards in one country are lower than those in other countries.

By undercutting the environmental standards of other countries, a government reduces the production costs of domestic firms.

A classic example of ecological dumping is when industrialized countries export hazardous waste to developing countries where environmental regulations are weaker. This practice results in environmental degradation and health hazards in the recipient countries.

ENVIRONMENTAL ECONOMICS

Environmental economics is the study of the cost-effective allocation, use, and protection of the world's natural resources.

Economics, broadly speaking, is the study of how humans produce and consume goods and services. Environmental economics focuses on how they use and manage finite resources in a manner that serves the population while meeting concerns about environmental impact.

Environmental economics is a **discipline of economics that studies the economic effects of environmental policies.** Its main focus is on the efficient allocation of environmental and natural resources and how alternative environmental policies deal with environmental damage, such as air pollution, water quality, toxic substances, solid waste, and global warming.

FEATURES OF ENVIRONMENTAL ECONOMICS AS A FIELD OF STUDY

1. **Interdisciplinary Approach:** Combines economics with environmental sciences to address complex issues.
2. **Resource Management:** Focuses on the sustainable use of natural resources.
3. **Valuation of Environmental Goods:** Assigns monetary values to non-market goods like clean air and biodiversity.
4. **Market Failure:** Addresses issues like externalities where market prices don't reflect full social and environmental costs.
5. **Cost-Benefit Analysis:** Compares costs and benefits of environmental policies to determine net impact.
6. **Policy Design:** Evaluates and designs effective environmental policies and regulations.
7. **Sustainability:** Emphasizes balancing economic development with ecological preservation.
8. **Climate Change:** Studies economic impacts of climate change and proposes mitigation strategies.
9. **Equity:** Considers the distributional effects of environmental policies on different social groups.
10. **Economic Incentives:** Explores the use of tools like taxes and subsidies to promote eco-friendly behaviors.

PUBLIC GOODS

Pure public goods are by definition **non-excludable and non-rival.**

Non-excludability means, **no agent can be excluded from the consumption of that public good** once it is provided. As a consequence it is difficult or impossible to charge people for using that non-excludable good. These goods can be enjoyed without direct payment. Best example would be National Defence.

Non-rivalry means **consumption of a public good by an agent does not reduces its availability to the other agents.** Accordingly, at any given level of production, the marginal cost of providing it to the additional consumer is zero. For example, consider the use of highway (uncongested). Once the highway is functional and open for public use, if there are 100 cars running on it, there is no additional cost of providing the highway to 101st car. Hence an uncongested highway is a non-rivalrous good.

Other Characteristics of Public Goods

Non-Diminishability

When one consumer uses a public good, the **stock available to others does not diminish**.

For example, enjoying a beautiful sunset doesn't reduce its availability for others.

Non-Rejectability

Once a **public good is supplied**, it **cannot be rejected** by beneficiaries.

For instance, national defense protects all citizens regardless of individual preferences.

Zero Marginal Cost

Once a public good is provided, the **marginal cost of supplying an additional individual is zero**.

For example, the cost of adding one more person to benefit from street lighting is negligible once the lights are installed.

ENVIRONMENT AS PUBLIC GOODS

Pure public goods have two defining features.

One is **'non rivalry,'** meaning that one person's enjoyment of a good does not diminish the ability of other people to enjoy the same good.

The other is **'non excludability,'** meaning that people cannot be prevented from enjoying the good.

Air quality is an important environmental example of a public good. Under most circumstances, one person's breathing of fresh air does not reduce air quality for others to enjoy, and people cannot be prevented from breathing the air.

Many environmental resources are characterized as public goods, including water quality, open space, biodiversity, and a stable climate.

FREE –RIDER PROBLEM

The free-rider problem **occurs in the case of non-excludable goods**, where individuals tend to use public goods without paying for them. Public goods are provided **when the sum of marginal benefits equals the marginal cost of provision**. However, **individuals often undervalue their marginal benefits to reduce their payments,** leading to free-riding. If everyone free-rides, the market for public goods fails as the sum of marginal benefits falls below the marginal cost, resulting in no provision of the public good.

In environmental protection, individuals and firms face free-riding incentives, leading to the need for policies that limit pollution, restrict resource exploitation, or create incentives to protect environmental quality. Environmental policies are considered economically efficient if societal benefits exceed the costs. Social cost-benefit analysis is used to determine this, but special techniques are often required to estimate the economic benefits or costs of environmental public goods due to the lack of directly observable prices. For example, improving air quality has clear benefits, but these benefits must be quantified through valuing the environment.

MAJOR INTERNATIONAL AGREEMENTS/EFFORTS

UNITED NATIONS CONFERENCE ON THE HUMAN ENVIRONMENT (1972)

The United Nations Conference on the Human Environment was **first held in Stockholm, Sweden, in 1972**. It marked the emergence of international environmental law.

Stockholm Declaration - It is also known as **The Declaration on the Human Environment**. It set out the principles for various international environmental issues, natural resource management, pollution prevention and the relationship between the environment and development.

UNITED NATIONS ENVIRONMENT PROGRAMME (UNEP) OR UN ENVIRONMENT

UNEP is an **agency of the United Nations**. It coordinates the UN's environmental activities. It assists developing countries in implementing environmentally sound policies and practices.

It was founded as **a result of the United Nations Conference on the Human Environment 1972.**

It has overall responsibility for environmental problems among United Nations agencies. Addressing climate change or combating desertification, are overseen by other UN organizations, like the UNFCCC and the United Nations Convention to Combat Desertification.

UNEP's activities cover a wide range of issues regarding the atmosphere, marine and terrestrial ecosystems, environmental governance and green economy.

UNFCCC: UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE

UNFCCC stands for United Nations Framework Convention on Climate Change.

The Convention has near universal membership (198 Parties) and is the **parent treaty of the 2015 Paris Agreement.**

The main aim of the Paris Agreement is to keep the global average temperature rise this century as close as possible to 1.5 degrees Celsius above pre-industrial levels.

The UNFCCC is also the **parent treaty of the 1997 Kyoto Protocol**. The ultimate objective of all three agreements under the UNFCCC is to stabilize greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous human interference with the climate system, in a time frame which allows ecosystems to adapt naturally and enables sustainable development.

The secretariat was established in 1992 when countries adopted the UNFCCC. The original secretariat was in Geneva. Since 1996, the secretariat has been located in Bonn, Germany

UNFCCC is negotiated at the **Earth Summit 1992.**

Objective of UNFCCC: Stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous consequences.

Treaty is considered **legally non-binding** on greenhouse gas emissions for individual countries.

CONFERENCE OF PARTIES (COP)

The Conference of the Parties (COP) is the **supreme decision-making body of the UNFCCC**.

All States that are Parties to the Convention are represented at the COP, where they review the implementation of the Convention and take necessary decisions to promote its effective implementation.

The COP meets every year, unless the Parties decide otherwise. The first COP meeting was held in Berlin, Germany in March, 1995. The COP meets in Bonn, the seat of the secretariat, unless a Party offers to host the session. Just as the COP Presidency rotates among the five recognized UN regions - that is, Africa, Asia, Latin America and the Caribbean, Central and Eastern Europe and Western Europe and Others – there is a tendency for the venue of the COP to also shift among these groups.

LOCATION	SESSION	CONFERENCE
Belem, Brazil	**COP 30**	**UN Climate Change Conference Belem - November 2025**
Baku, Azerbaijan	**COP 29**	**UN Climate Change Conference Baku - November 2024**
Dubai, United Arab Emirates	COP 28	UN Climate Change Conference - United Arab Emirates
Sharm el-Sheikh, Egypt	COP 27	Sharm el-Sheikh Climate Change Conference - November 2022
Glasgow, United Kingdom	COP 26	Glasgow Climate Change Conference – October-November 2021
Madrid, Spain	COP 25	UN Climate Change Conference - December 2019
Katowice, Poland	COP 24	Katowice Climate Change Conference – December 2018
Bonn, Germany	COP 23	UN Climate Change Conference - November 2017
Marrakech, Morocco	COP 22	Marrakech Climate Change Conference - November 2016
Paris, France	COP 21	Paris Climate Change Conference - November 2015
Lima, Peru	COP 20	Lima Climate Change Conference - December 2014
Warsaw, Poland	COP 19	Warsaw Climate Change Conference - November 2013
Doha, Qatar	COP 18	Doha Climate Change Conference - November 2012
Durban, South Africa	COP 17	Durban Climate Change Conference - November 2011
Cancun, Mexico	COP 16	Cancún Climate Change Conference - November 2010
Copenhagen, Denmark	COP 15	Copenhagen Climate Change Conference - December 2009
Poznan, Poland	COP 14	Poznan Climate Change Conference - December 2008
Bali, Indonesia	COP 13	Bali Climate Change Conference - December 2007
Nairobi, Kenya	COP 12	Nairobi Climate Change Conference - November 2006
Montreal, Canada	COP 11	Montreal Climate Change Conference - December 2005
Buenos Aires, Argentina	COP 10	Buenos Aires Climate Change Conference - December 2004
Milan, Italy	COP 9	Milan Climate Change Conference - December 2003
New Delhi, India	**COP 8**	**New Delhi Climate Change Conference - October 2002**
Marrakech, Morocco	COP 7	Marrakech Climate Change Conference - October 2001
Bonn, Germany	COP 6-2	Bonn Climate Change Conference - July 2001
The Hague, Netherlands	COP 6	The Hague Climate Change Conference - November 2000
Bonn, Germany	COP 5	Bonn Climate Change Conference - October 1999
Buenos Aires, Argentina	COP 4	Buenos Aires Climate Change Conference - November 1998
Kyoto, Japan	COP 3	Kyoto Climate Change Conference - December 1997
Geneva, Switzerland	COP 2	Geneva Climate Conference, July 1996
Berlin, Germany	COP 1	Berlin Climate Conference, March-April 1995

UNCED OR EARTH SUMMIT 1992, RIO DE JANEIRO BRAZIL OR RIO SUMMIT

Earth Summit 1992 is also known as **The United Nations Conference on Environment and Development (UNCED).**

Earth Summit 1992 succeeded in raising public awareness of the need to integrate environment and development. 190 countries pledged their commitment to achieve by 2010, a significant reduction in the current rate of biodiversity loss at global, regional and local levels.

As a follow-up, the World Summit on Sustainable Development (Rio+10) was held in 2002 in Johannesburg, South Africa.

In 2012, the United Nations Conference on Sustainable Development was also held in Rio and is also commonly called Rio+20 or Rio Earth Summit 2012.

The issues touched included:

i. checking production of toxic components, such as lead in gasoline, or poisonous waste including radioactive chemicals,
ii. alternative sources of energy to replace the use of fossil fuels,
iii. new reliance on public transportation systems in order to reduce vehicle emissions, congestion in cities,
iv. the health problems caused by polluted air and smoke, and
v. the growing usage and limited supply of water.

The Earth Summit resulted in the following documents:

i. Rio Declaration: principles intended to guide countries in future sustainable development.
ii. Agenda 21: non-binding action plan of the United Nations with regard to sustainable development.
iii. Forest Principles: Non-legally binding document on Conservation and Sustainable Development of All Types of Forests.

Earth Summit 1992 (Rio de Janeiro) = UN Conference on Environment and Development (UNCED)

Earth Summit 2002 (Johannesburg) = World Summit on Sustainable Development (WSSD)

Earth Summit 2012 (Rio de Janeiro) = UN Conference on Sustainable Development (UNCSD)

PARIS AGREEMENT

The Paris Agreement is a **legally binding international treaty on climate change**. It was adopted by 196 Parties at the UN Climate Change Conference (COP21) in Paris, France, on 12 December 2015. It entered into force on 4 November 2016.

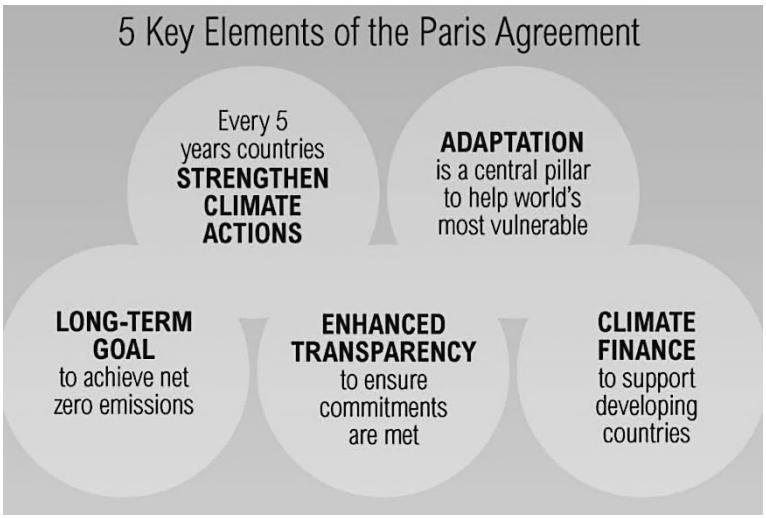
Its overarching goal is to hold **"the increase in the global average temperature to well below 2°C above pre-industrial levels" and pursue efforts "to limit the temperature increase to 1.5°C above pre-industrial levels."**

However, in recent years, world leaders have stressed the need to limit global warming to 1.5°C by the end of this century.

That's because the UN's Intergovernmental Panel on Climate Change indicates that crossing the 1.5°C threshold risks unleashing far more severe climate change impacts, including more frequent and severe droughts, heatwaves and rainfall.

To limit global warming to 1.5°C, greenhouse gas emissions must peak before 2025 at the latest and decline 43% by 2030.

The Paris Agreement is a landmark in the multilateral climate change process because, for the first time, a binding agreement brings all nations together to combat climate change and adapt to its effects.



The Paris Agreement works on a **five-year cycle** of increasingly ambitious climate action -- or, ratcheting up -- carried out by countries. Since 2020, countries have been submitting their national climate action plans, known as **nationally determined contributions (NDCs)**. Each successive NDC is meant to reflect an increasingly higher degree of ambition compared to the previous version.

In their NDCs, countries communicate actions they will take to reduce their greenhouse gas emissions in order to reach the goals of the Paris Agreement. Countries also communicate in their NDCs actions they will take to build resilience to adapt to the impacts of climate change.

INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC)

IPCC is a scientific intergovernmental body under the auspices of the **United Nations**. It was first established in **1988** by two United Nations organizations, the **World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP).**

Membership of the IPCC is open to all members of the WMO and UNEP.

The IPCC produces reports that support the UNFCCC. IPCC reports cover all relevant information to understand the risk of human-induced climate change, its potential impacts and options for adaptation and mitigation.

The IPCC does not carry out its own original research. Thousands of scientists and other experts contribute on a voluntary basis.

The 2007 Nobel Peace Prize was shared, in two equal parts, between the IPCC and an American Environmentalist.

The aims of the IPCC are to assess scientific information relevant to:

(I) Human-induced climate change,

(II) The impacts of human-induced climate change, and

(III) Options for adaptation and mitigation.

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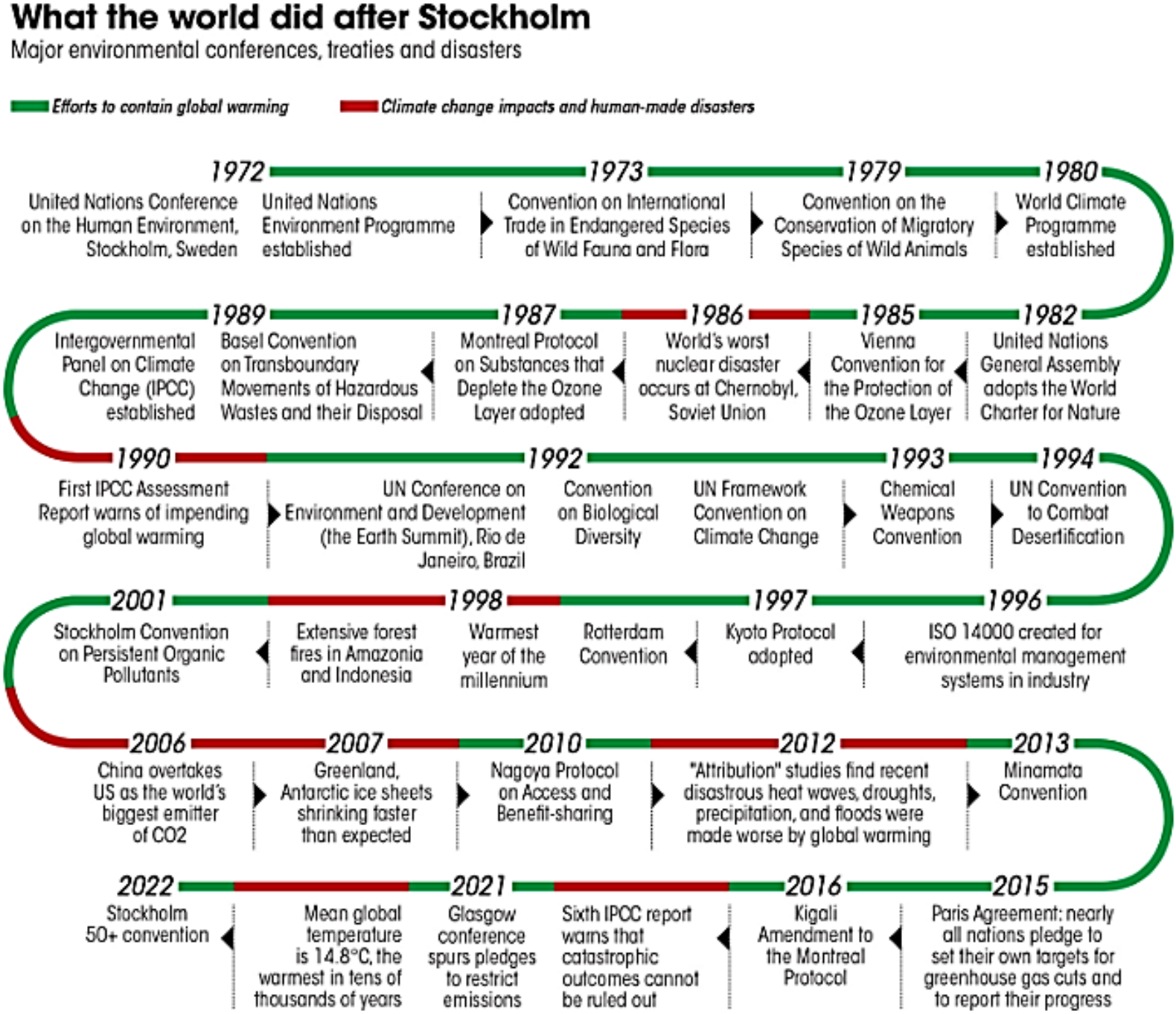


INDIA'S ENVIRONMENTAL POLICY

Two international conferences-one at Stockholm in 1972 and another at Rio de Janerio in 1992 on Environment and Development have influenced environmental policies in India.

The Constitution of India provides a number of Directive Principles of State Policy. Until 1976 environment protection did not appear anywhere in the Constitution. However, in the 42nd amendment of the Constitution in 1976, certain environmental provisions were introduced.

Article 48A was added to the Directive Principles of State Policy and stated ***"The state shall endeavor to protect and improve the natural environment and safeguard the forests and wildlife in the country."***

The Article 51 A (g) of Fundamental Duties states that ***"It shall be the duty of every citizen in India to protect and improve the natural environment including forests, lakes rivers and wildlife and to have a compassion for living creatures".***

The National Council for Environmental Planning and Policy was set up in 1972, which was later evolved as Ministry of Environment and Forest in 1985.

INDEPENDENCE TO THE STOCKHOLM CONFERENCE (1947 – 1972)

During this period legislations were existing to control felling of trees, destruction of forests, unplanned town growth etc.

Following Acts were in place:

a. The Factories Act, 1948

The Factories Act, 1948 provides that the liquid effluents, gases and fumes generated during a manufacturing process should be treated before their final disposal to minimise the adverse effects.

During this period stress on economic development was greater and environmental considerations took a back seat in policy making.

b. The Mines and Minerals (Regulation and Development) Act, 1957

POST STOCKHOLM CONFERENCE TO BHOPAL DISASTER (1972-1984)

However, the Stockholm Conference on Environment and Development had largely influenced on environmental policy making leading to an amendment of the Constitution, followed by important legislations such as the

i. Water (Prevention and Control of Pollution) Act, 1974 and
ii. Air (Prevention and Control of Pollution) Act, 1981 and
iii. Creation of institutions such as Central and State Pollution Control Boards for implementing the provisions of the Acts.

ENVIRONMENT (PROTECTION) ACT OF 1986

In the **wake of the Bhopal tragedy**, the government of India enacted the Environment Act of 1986.

The purpose of the Act is to **implement the decisions of the United Nations Conference on the Human Environment of 1972.**

The decisions relate to the protection and improvement of the human environment and the prevention of hazards to human beings, other living creatures, plants and property.

The Act is an "umbrella" for legislations designed to provide a framework for Central Government, coordination of the activities of various central and state authorities established under previous Acts, such as the Water Act and the Air Act.

In this Act, main emphasis is given to "Environment", defined to include water, air and land and the inter-relationships which exist among water, air and land and human beings and other living creatures, plants, micro-organisms and property.

EPA empowers the Central Government to establish authorities charged with the mandate of preventing environmental pollution in all its forms and to tackle specific environmental problems that are peculiar to different parts of the country.

EPA also empower the Government to:

i. Plan and execute a nation-wide programme for the prevention, control and abatement of environmental pollution.
ii. Lay down standards for the quality of the environment in its various aspects like emission or discharge of environmental pollutants from various sources.

The Central government as per the Act has the power to direct:

i. The closure, prohibition or regulation of any industry, operation or process.
ii. The stoppage or regulation of the supply of electricity or water or any other service.

NATIONAL ACTION PLAN ON CLIMATE CHANGE (NAPCC)

The National Action Plan on Climate change was formally **launched on June 30th, 2008**. The NAPCC identifies measures that promote development objectives while also yielding co-benefits for addressing climate change effectively.

The Principles of NAPCC are:

i. Protecting the poor through an inclusive and sustainable development strategy, sensitive to climate change
ii. Achieving national growth and poverty alleviation objectives while ensuring ecological sustainability
iii. Efficient and cost-effective strategies for end-use demand-side management
iv. Extensive and accelerated deployment of appropriate technologies for adaptation and mitigation
v. New and innovative market, regulatory, and voluntary mechanisms for sustainable development
vi. Effective implementation through unique linkages – with civil society, LGUs, and public-private partnerships

NATIONAL MISSIONS UNDER NAPCC

The National Action Plan on Climate Change (NAPCC) has eight National Missions to address climate change.

1. National Solar Mission (NSM) – 2010 - Ministry of New and Renewable Energy

2. National Mission for Enhanced Energy Efficiency (NMEEE) – 2011 - Bureau of Energy Efficiency (BEE) under the aegis of Ministry of Power.

3. National Mission for a Green India (GIM) – 2014- Ministry of Environment and Forests

4. National Mission on Sustainable Habitat (NMSH) – 2010 -Ministry of Urban Development

5. National Water Mission (NWM) – 2011 - Ministry of Jal Shakti

6. National Mission for Sustainable Agriculture – 2014-2015 - Ministry of Agriculture & Farmers Welfare

7. National Mission for Sustaining Himalayan Eco systems – 2010 (APPROVAL 2014) -Department of Science & Technology, Ministry of Science & Technology

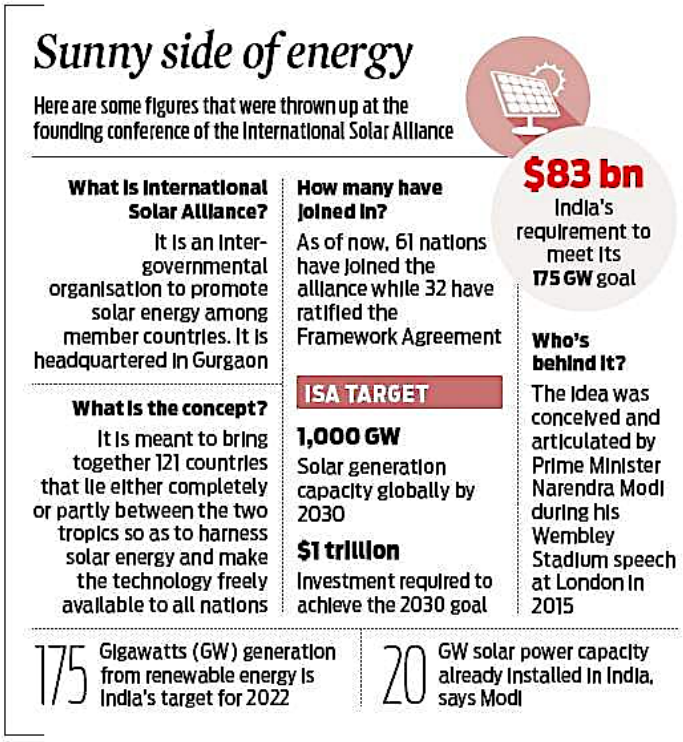
8. National Mission on Strategic Knowledge for Climate Change (NMSKCC) – 2010-2011-Department of Science & Technology, Ministry of Science & Technology

LiFE MISSION (Lifestyle for Environment)

The Lifestyle for Environment (LiFE) Mission is an **India-led global mass movement that aims to nudge individuals and communities towards adopting sustainable lifestyles and practices** to protect and preserve the environment. It was launched by Prime Minister Narendra Modi at **COP26 in Glasgow** in November 2021.

LiFE promotes "mindful and deliberate utilization" instead of "mindless and destructive consumption." It encourages individuals to make small but significant changes in their daily lives, such as saving energy and water,

reducing waste, and adopting sustainable food systems. The mission emphasizes that collective action by individuals can make a significant impact on addressing climate change and environmental degradation.



INTERNATIONAL SOLAR ALLIANCE (ISA)

The ISA was conceived as a **joint effort by India and France** to mobilize efforts against climate change through deployment of solar energy solutions. It was conceptualized on the sidelines of **the 21st Conference of Parties (COP21)** to the United Nations Framework Convention on Climate Change (UNFCCC) held in Paris in 2015.

With the amendment of its Framework Agreement in 2020, all member states of the United Nations are now eligible to join the ISA. At present, **116 countries are signatories** to the ISA Framework Agreement, of which 94 countries have submitted the necessary instruments of ratification to become full members of the ISA.

ISA's objective is to **scale up solar energy, reduce the cost of solar power generation through aggregation of demand for solar finance, technologies, innovation, research and development, and capacity building.**

The ISA strives to **develop and deploy cost-effective** and transformational energy solutions powered by the sun to help member countries develop low-carbon growth trajectories, with particular focus on delivering impact in countries categorized as Least Developed Countries (LDCs) and the Small Island Developing States (SIDS).

Being a global platform, ISA's partnerships with multilateral development banks (MDBs), development financial institutions (DFIs), private and public sector organizations, civil society and other international institutions is key to delivering the change its seeks to see in the world going ahead.

The ISA is guided by its '**Towards 1000' strategy** which aims to mobilise **USD 1,000 billions of investments in solar energy solutions by 2030**, while delivering **energy access to 1,000 million people using clean energy solution**s and resulting in **installation of 1,000 GW of solar energy capacity**. This would help **mitigate global solar emissions to the tune of 1,000 million tons of CO2 every year.**

Vision: Let us together make the sun brighter.

Mission: Every home no matter how far away, will have a light at home

International Solar Alliance is the First International and Inter-Governmental Organization have Headquarters in India (**Gurugram, Haryana**) with United Nations as Strategic Partner.

Official language- Hindi, French, English

UN DECADES RELATED TO ENVIRONMENT

2021-2030 – United Nations Decade on Ecosystem Restoration
2014-2024 – United Nations Decade of Sustainable Energy for All
2011-2020 - United Nations Decade on Biodiversity
2011 – 2020 - United Nations Decade for Deserts and the Fight against Desertification

IMPORTANT DAYS RELATED TO ENVIRONMENT

1. World Wetlands Day - February 2
2. World Wildlife Day - March 3
3. International Day of Forests - March 21
4. World Water Day - March 22
5. Earth Day - April 22
6. International Day for Biological Diversity – May 22
7. World Environment Day - June 5
8. World Oceans Day - June 8
9. International Day for the Preservation of the Ozone Layer - September 16
10. World Habitat Day - First Monday of October

SOME IMPORTANT WORKS RELATED TO ENVIRONMENT AND POPULATION

1. **Rachel Carson** is famous for her work ***Silent Spring***, which brought attention to environmental issues.
2. **Kenneth Boulding** authored ***The Economics of Coming Spaceship Earth***, focusing on sustainable economic growth.
3. **G. Hardin** is known for the concept of the ***Tragedy of Commons***, describing the overuse of shared resources.
4. **Partha Dasgupta** is recognized for his work on the ***Economics of Biodiversity***, which addresses the economic implications of biodiversity loss.
5. **Paul R. Ehrlich** - ***The Population Bomb***: Ehrlich's work brought attention to the potential consequences of rapid population growth on the environment and resources.
6. **E.F. Schumacher** - ***Small is Beautiful***: Schumacher's book advocates for sustainable development and emphasizes the importance of local economies and appropriate technology.
7. **Amartya Sen** - ***Development as Freedom***: Sen's work focuses on the relationship between development and human capabilities, highlighting the importance of freedom and social opportunities in sustainable development.
8. **Elinor Ostrom** - ***Governing the Commons*:** Ostrom's research demonstrates how communities can effectively manage common resources through collective action, challenging the inevitability of the "tragedy of the commons."

LET'S RECALL	
ENVIRONMENT	The natural component where biotic (living) and abiotic (non-living) factors interact
BIOSPHERE	The life-supporting biological component, encompassing parts of the lithosphere, hydrosphere, and atmosphere. Includes all living organisms and dead organic matter.
HABITAT	Habitat is the physical environment where an organism lives (like an address).
	Many habitats make up an environment.
	All habitats are environments, but not all environments are habitats.
ECOSYSTEM	A functional unit of nature where organisms interact with each other and their physical environment (Terrestrial or Aquatic)

ECOLOGY	The study of interactions between organisms and their surroundings within an ecosystem or environment.
ECOLOGICAL FOOTPRINT	Measures resource consumption and waste generation compared to nature's ability to absorb waste and regenerate resources.
ECOLOGICAL DUMPING	Exporting goods while disregarding environmental standards enforced in the exporting country
ENVIRONMENTAL ECONOMICS	Study of cost-effective allocation, use, and protection of natural resources.
PUBLIC GOODS	Non-excludable (cannot prevent use) and non-rivalrous (one person's use doesn't diminish availability for others)
FREE-RIDER PROBLEM	Individuals use public goods without paying, leading to under-provision.
MAJOR INTERNATIONAL AGREEMENTS/EFFORTS	
UN Conference on the Human Environment (1972, Stockholm): Birth of international environmental law. Stockholm Declaration.	**UN Environment Programme (UNEP):** Coordinates UN environmental activities.
UN Framework Convention on Climate Change (UNFCCC): Parent treaty of the Paris Agreement and Kyoto Protocol. Aims to stabilize greenhouse gas concentrations.	**Conference of Parties (COP):** Supreme decision-making body of UNFCCC. Meets annually.
Earth Summit (1992, Rio): Focused on integrating environment and development.	**Paris Agreement (2015):** Legally binding treaty on climate change. Aims to limit warming to well below 2°C, preferably 1.5°C.
Intergovernmental Panel on Climate Change (IPCC): Assesses climate change science, impacts, and mitigation options.	
INDIA's ENVIRONMENTAL POLICY	
Influenced by Stockholm and Rio conferences	Environment (Protection) Act (1986): Umbrella legislation after enacted after Bhopal tradegy
NATIONAL ACTION PLAN ON CLIMATE CHANGE (NAPCC): EIGHT NATIONAL MISSIONS	
1. National Solar Mission (NSM)	5. National Water Mission (NWM)
2. National Mission for Enhanced Energy Efficiency (NMEEE)	6. National Mission for Sustainable Agriculture
3. National Mission for a Green India (GIM)	7. National Mission for Sustaining Himalayan Eco systems
4. National Mission on Sustainable Habitat (NMSH)	8. National Mission on Strategic Knowledge for Climate Change (NMSKCC)
Life Mission: Promotes sustainable lifestyles.	**International Solar Alliance (ISA):** Aims to scale up solar energy. Headquarters in India.

PRACTICE QUESTIONS

1. Match List - I with List - II.

List-I	List-II
a. Elinor Ostrom	**I. Tragedy of the commons**
b. Johan Rockstrom	**II. Integrating climate change into long-run macro-economic analysis**
c. Garrett Flardin	**III. Boundaries of Earth's Life-support**
d. William Nordhaus	**IV. Analysis of economic governance, especially the commons**

Choose the correct answer from the options given below: (UGC NET June 2024 cancelled exam)

A. a-III, b-IV, c-I, d-II

B. a-IV, b-III, c-II, d-I

C. a-IV, b-III, c-I, d-II

D. a-III, b-IV, c-II, d-I

2. Which of the following criterion is used to judge the performance of instruments for environmental policy? (UGC NET Dec 2022)

A. Ensuring that for each firm, the marginal abatement cost is equal to the marginal damage from pollution

B. Achieving equality of marginal abatement costs across polluters

C. Minimising the total cost of the externality to the society

D. All of the above

3. Match List I with List II

List I (Summit/protocol)	List II (Year)
a. Montreal Protocol	**I. 1992**
b. Rio Summit	**II. 2015**
c. Kyoto Protocol	**III. 1987**
d. Paris Agreement	**IV. 1997**

A. a-III, b-I, c-IV, d-II

B. a-III, b-I, c-II, d-IV

C. a-I, b-III, c-II, d-IV

D. a-IV, b-II, c-I, d-III

4. Which of the following are core missions of National Action Plan on Climate change?

a. National Solar Mission

b. National Mission on Desert

c. National Water Mission

d. National Mission for Sustainable agriculture

Choose the correct answer from the options given below:

A. a, b and c only

B. b, c and d only

C. a, c and d only

D. c, d and e only

5. Given below are two statements:

Statement I: International Solar Alliance (ISA) is an alliance of countries most of which lie between tropic of cancer and pole.

Statement II: Presently, ISA is headed by India.

In the light of the above statements, choose the most appropriate answer from the options given below.

A. Both Statement I and Statement II are correct.

B. Both Statement I and Statement II are incorrect.

C. Statement I is correct but Statement II is incorrect.

D. Statement I is incorrect but Statement II is correct.

6. International Solar Alliance (ISA) has its head quarter in

A. United States

B. Switzerland

C. India

D. France

7. National Solar Mission, one of the missions of National Action Plan on Climate Change (NAPC) was launched in the year.

A. 2009 B. 2010 C. 2011 D. 2012

8. How many national missions are there in the National Action Plan on climate change?

A. 6 B. 7 C. 8 D. 9

9. Match List-I with List-II:

List-I	List-II
(a)World Environment Day	**(i) 11th July**
(b) World Wildlife Day	**(ii) 5th June**
(c) World Water Day	**(iii) 3rd March**
(d) World Population Day	**(iv) 22nd March**

A. (a)-(i); (b)-(ii); (c)-(iii); (d)-(iv)

B. (a)-(iii); (b)-(i); (c)-(iv); (d)-(ii)

C. (a)-(iv); (b)-(iii); (c)-(ii); (d)-(i)

D. (a)-(ii); (b)-(iii); (c)-(iv); (d)-(i)

10. The Free-rider problem arises

A. When goods are congestible.

B. When goods are of a rival nature.

C. When number of beneficiaries is large and exclusion of any one of them is impossible.

D. When goods are available freely but on a first cum first serve basis till stocks last.

11. Consider the following statements regarding public good

(a) Public good is nonexclusive

(b) Public good is national defense

(c) Public good is rival

(d) Public good provides benefits to people at non-zero marginal cost

(e) Public good creates inefficiency in consumption

A. (a) and (b) only

B. (b) and (c) only

C. (c) and (d) only

D. (d) and (e) only

12. The Supreme Decision making body of UNFCCC is

A. United Nations General Assembly

B. Conference of the Parties (COP)

C. United Nations Environment Programme (UNEP)

D. Intergovernmental Panel on Climate Change (IPCC)

13. _____ is the study of interactions between organisms and the surroundings occurring within an ecosystem or environment.

A. Environment B. Ecology

C. Ecosystem D. Botany

14. The book "Silent Spring" was written by

A. Aldo Leopold

B. Rachel Carson

C. John Muir

D. E.O. Wilson

15. Once a public good is provided, the marginal cost of supplying an additional individual is ___ .

A. Always positive and increasing

B. Always negative

C. Zero

D. Equal to the average cost of production

ANSWER KEY

1. C	2. D	3. A	4. C	5. A
6. C	7. B	8. C	9. D	10. C
11. A	12. B	13. C	14. B	15. C

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II. MARKET FAILURES AND COASE THEOREM

MARKET FAILURE

Market failure arises when the **outcome of an economic transaction is not completely efficient**, meaning that all costs and benefits related to the transaction are not limited to the buyer and the seller in the transaction.

Individual consumers will often purchase goods with an environmental component to make up for their inability to directly purchase environmental goods, thus revealing the value they hold for certain aspects of environmental quality.

In the case of environmental goods, markets often fail to produce an efficient result, because it is rare that any one individual can incur the full benefit, as well as the cost, of a particular level of environmental quality.

That is because **environmental goods commonly suffer from the presence of externalities** (that is, consequences that no one pays for) or a lack of property rights.

Demand Side Market Failure: Consumers are not willing to pay proportionate price for the utilization of good/services. Pure air, Tree Plantation, Waste disposal

Supply Side Market failure: Producers are not willing to pay the external cost of production. Polythene bags, disposal of chemical waste in rivers

EXTERNALITIES

When individuals or firms impose costs or benefits on others for which the market assigns no price, then an externality exists.

There are two types of externalities, negative and positive

NEGATIVE EXTERNALITY

Negative externalities arise when an **individual or firm does not bear the costs of the harm it imposes** .

Example: Pollution

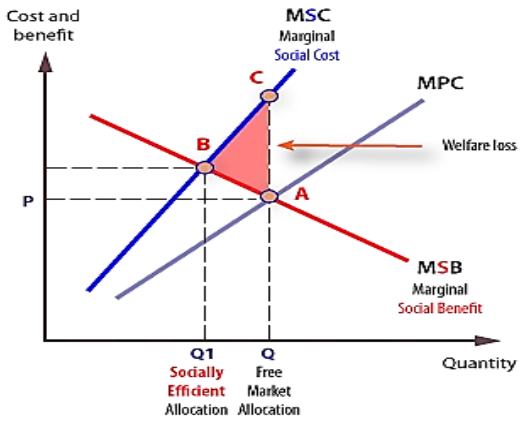
1. Cars entering congested freeways impose time costs on other drivers, as all cars slow down as a result.

2. More the waste the steel plant dumps into the river lesser the amount of clean water available for fish breeding and consequently lower will be the output of the fishermen.

As a result, in the presence of negative externality there is **over-generation of the activity** causing negative externality

Socially optimal equilibrium (SO): This is the point where the **marginal social cost curve (MSC) intersects the demand curve**. This represents the **ideal production level** where the total cost to society, including the externality, is minimized.

The triangle between the market equilibrium (E) and the socially optimal equilibrium (SO) represents the **deadweight loss**. This is the **excess cost to society due to the negative externality**. Firms only consider their private costs (reflected in the supply curve), leading to overproduction and a higher social cost than necessary.



The curve labeled "MSC" is the marginal social cost curve. It increases as the quantity produced increases. This means that the negative externality gets worse as more is produced.

The curve labeled "MSB" is the marginal social benefit curve. It is assumed to be decreasing as the quantity produced increases. This means that the benefit to society of each additional unit produced goes down.

POSITIVE EXTERNALITY

Positive externalities arise when an **individual or firm provides benefits for which it is not compensated.**

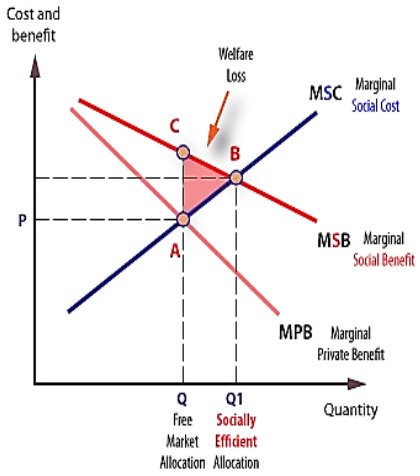
Examples:

1. People who get vaccinations against a communicable disease reduce other people's chances of getting the disease.

2. People who maintain their property well may create benefits for their neighbours by creating a more pleasing neighbourhood and increasing property values.

In the presence of positive externality, agents creating it **fail to recognise the additional benefits** generated by the activity and hence **under-generate it.**

The existence of a positive externality means that **marginal social benefit is greater than marginal private benefit.**



By consuming only quantity Q, marginal social benefit is above marginal social cost, and more of the good should be consumed.

At Q, the marginal social cost is A (Q – A), and the private benefit is also A (Q – A) but the marginal social benefit is C (Q – C).

Therefore, if only Q is consumed, there is an opportunity cost to society, which is represented by the area of welfare loss, A, C, B.

The marginal private benefit (MPB) curve depicts the additional benefit a consumer receives from consuming one more unit of the good or service. As with most demand curves, it slopes downward, indicating that the extra benefit decreases with each additional unit consumed.

TYPES OF NEGATIVE AND POSITIVE EXTERNALITIES

NEGATIVE EXTERNALITIES ORIGINATING IN CONSUMPTION

When an individual's consumption reduces the well-being of others who are not compensated by the individual.

Negative consumption externalities **lead to over consumption.**

(i) Using a car instead of public transport increases congestion and pollution for others;

(ii) Noise pollution from a neighbor playing loud music

NEGATIVE EXTERNALITIES ORIGINATING IN PRODUCTION

When a firm's production reduces the well-being of others who are not compensated by the firm.

Negative production externalities **lead to over production.**

(i) A Chemical factory releasing effluents in a river hurting a downstream fishery;

(ii) Noise generated at an airport affecting the resident of a residential colony

POSITIVE EXTERNALITIES ORIGINATING IN PRODUCTION

When a firm's production increases the well-being of others but the firm is not compensated by those others.

Positive production externalities lead to **under production.**

(i) An apiary (where bees are reared) helping with pollination in a nearby orchard;

(ii) An orchard improving the quality of honey produced in a nearby apiary

POSITIVE EXTERNALITIES ORIGNATING IN CONSUMPTION

When an individual's consumption increases the well-being of others but the individual is not compensated by those others.

Positive consumption externalities lead to **under consumption.**

(i) using jute/cloth bag instead of plastic bag reduces generation of waste and releases pressure on public amenities for all;

(ii) Getting vaccination against an infectious disease reducing the probability of spreading infection

GREEN HOUSE GAS EXTERNALITY

When free markets do not maximise society's welfare, they are said to 'fail' and policy intervention may be needed to correct them. Many economists have described climate change as an example of a market failure – though in fact a number of distinct market failures have been identified.

The core one is the so-called 'greenhouse-gas externality'. Greenhouse gas emissions are a side-effect of economically valuable activities.

Most of the impacts of emissions do not fall on those conducting the activities – instead they fall on future generations or people living in developing countries, for example – so those responsible for the emissions do not pay the cost.

The adverse effects of greenhouse gases are therefore 'external' to the market, which means there is usually only an ethical – rather than an economic – incentive for businesses and consumers to reduce their emissions. As a result, the market fails by over-producing greenhouse gases.

The greenhouse gas externality is accompanied by a number of other market failures, including those arising from a lack of information about how to reduce emissions, network effects and a lack of innovation incentives. These call for a package of interventions including, but not restricted to, a price on carbon, according to economists concerned about climate change.

For example, new networks are likely to be important in several areas of low-carbon energy supply – such as the 'smart' electricity grid and electric vehicle charging points. But such networks can be difficult to establish through market forces alone, because in the early days of a network the benefits may be very limited, despite the potentially huge benefits that can be achieved once the network reaches a critical mass.

COMMON PROPERTY

Another reason as to why markets fail with environmental goods is that most environmental goods are **open access, or common property,** which leads to the potential overuse of these goods—a phenomenon referred to as the **tragedy of commons**. People overuse common property because they do not bear the full costs of their actions (i.e., the costs of their actions on others).

For example, highways that tend to be highly congested during the rush hours; or pollution from factories that treat the airshed as everyone's property for waste disposal.

In all instances, **when one person consumes the good, the marginal cost to others of consuming that good increases.** To illustrate the point, consider the case of a fishery. The fish are valuable, but it takes effort to catch them. The effort is inversely proportional to the number (or density) of fish in the water. A person will engage in fishing as long as it is profitable.

MARKET FAILURE – CORRECTIVE MEASURES

Some of the corrective measures of market failure includes

1. Command and control
2. Coase Theorem
3. Pigovian Tax
4. Permit Markets

(I) Command and control

Command and control is a type of environmental regulation that allows policy makers to specifically regulate both the amount and the process by which a firm should maintain the quality of the environment.

This form of environmental regulation is very common and allows **policy makers to regulate goods where a market-based approach is either not possible** or not likely to be popular.

Examples:

a) **Emission standards:** Setting maximum allowable levels of pollutants from factories or vehicles.
b) **Technology mandates:** Requiring specific technologies to be used (e.g., catalytic converters in cars).
c) **Bans:** Prohibiting the production or use of certain substances (e.g., DDT).
d) **Zoning regulations:** Controlling land use to minimize environmental impacts.

This method can be effective in achieving specific environmental targets, particularly when dealing with dangerous pollutants or urgent situations and it is relatively simple to understand and implement.

At the same time this method is inflexible and inefficient and doesn't always encourage innovation beyond compliance and is not the most cost-effective approach.

(II) COASE THEOREM

The **Coase Theorem** states that if **transaction costs are negligible and property rights are clearly defined,** private parties can negotiate to resolve externalities efficiently. This results in the optimal allocation of resources, irrespective of who initially owns the rights.

This theorem was given by **Ronald. H. Coase a Nobel laureate in the year 1991**. **(The Problem of Social Cost (1960))**

Ronald Coase proposes that **well-defined property rights can overcome the problems of externalities**, because many environmental problems arise from poorly defined, or a lack of, property rights.

Assuming that **property rights are held by the polluter** and that **transaction costs are zero**, the Coase theorem states that a **polluter and a victim can reach a mutually beneficial bargain** if the damage from pollution is higher than the polluter's net return from the sale of the good generating the pollution. In this case, a payment from the affected party to the polluter would reduce the pollution.

Assumptions Of The Coase Theorem

a) Everyone has perfect information

b) Consumers and Producers are price takers
c) There is cost less court system for enforcing agreements
d) Consumers maximize utility and producers maximize profit
e) There are no incomes or wealth effects
f) No transaction costs

In Coase Theorem, the **optimal environmental allocation is independent of the distribution of property rights**.

In practice of course, for a property rights approach to work right certain pre requisites need be fulfilled, essentially four main,

(i) Property rights must be well defined, enforceable, and transferable.

(ii) Transaction costs should be at a minimum

(iii) There must be a reasonably efficient and competitive system for interested parties to come together and negotiate about how these environmental property rights will be used.

(iv) There must be a complete set of markets so those private owners may capture all social values associated with the use an environmental asset.

The Coase theorem states that the most efficient solution to resolving interdependent uses of the environment, including pollution cases, is a bargaining process among relevant property holders.

If property rights are given to polluters, victims can pay them not to pollute, creating a market-like solution akin to a scheme for payments for ecosystem services.

Alternatively, if property rights are given to the victims, the polluters may compensate the victim or buy the right to pollute. Thus, the cost of the negotiated outcome is shared between the parties without any external intervention

The creation of a market in the Coase solution internalizes externalities; however, it does not necessarily bring pollution to a zero level. In addition, obviously it cannot be applied to externalities affecting future generations or other species.

The Coasian bargaining approach is an attractive one to some as an economy may be able to achieve Pareto-efficient resource allocation (that is, no individuals can be made better off without making someone else worse off) without pervasive government regulation.

Moreover, Coasian bargaining solutions can be particularly interesting for international externalities, since there is no supranational environmental protection agency with the necessary authority to impose abatement directives or pollution taxes.

Limitations

1. Coasian bargaining requires initial property rights assigned by the government, which can be influenced by special interest groups and rent-seeking.
2. Many environmental externalities are indirect, cumulative, and uncertain, making legal enforcement and bargaining costly and inefficient.
3. Future generations are not present in current bargains, complicating long-term environmental issues.
4. Environmental issues involving many people, like car emissions or climate change, make negotiation difficult and expensive.
5. Aggregating interests, legal fees, and enforcement costs can hinder private bargaining, even with clear property rights.

6. Individuals may not participate in negotiations, expecting others to bear the costs, undermining the bargaining process.
7. High transaction costs and large numbers of participants rule out Coasian solutions for many environmental externalities.

(III) PIGOVIAN TAX

In **1920 British economist Arthur C. Pigou** developed a taxation method for dealing with the goods suffering from externalities. His idea, now known as the Pigouvian tax, is to force producers to pay a tax equal to the external damage caused by their production decisions in order to allow the market to take into consideration the full costs associated with the taxed goods.

This process is often referred to as **internalizing an externality**. Of course, because the amount of the tax must equal the value of the external environmental damage in order to correct for market inefficiencies.

Under the Pigouvian tax, people would face the true cost of generating pollution.

This in turn encourage the creator of the negative externality to reduce the emissions from production by investing in pollution control equipments, changing their transport modes, etc. in order to escape Pigouvian tax.

Example: A carbon tax is a classic example of a Pigovian tax. It is levied on the carbon content of fossil fuels to reduce carbon dioxide emissions, which contribute to climate change. By making it more expensive to emit carbon dioxide, firms and consumers are incentivized to shift towards cleaner energy sources and technologies.

Advantages of Pigovian Taxes

i. **Cost-Effective:** They encourage polluters to find the most efficient way to reduce their negative impact.
ii. **Flexibility:** They allow polluters to choose the best approach for them (reduce production, adopt cleaner technology, or pay the tax).
iii. **Revenue Generation:** The tax revenue collected can be used to:
   a) Offset the harm caused by the externality (e.g., environmental cleanup).
   b) Fund other environmental programs.
   c) Reduce other taxes (e.g., income taxes).

Challenges and Considerations

i. **Determining the External Cost:** Accurately measuring the external cost of the activity can be challenging, as it often involves complex and difficult-to-quantify environmental and social impacts.
ii. **Political Opposition:** Pigovian taxes can be politically unpopular, as they increase costs for businesses and consumers.
iii. **Regressive Impact:** If not designed carefully, they can disproportionately affect low-income groups.
iv. **Implementation Issues:** Monitoring and enforcing the tax can be complex, especially for diffuse sources of pollution.

(IV) PERMIT MARKET

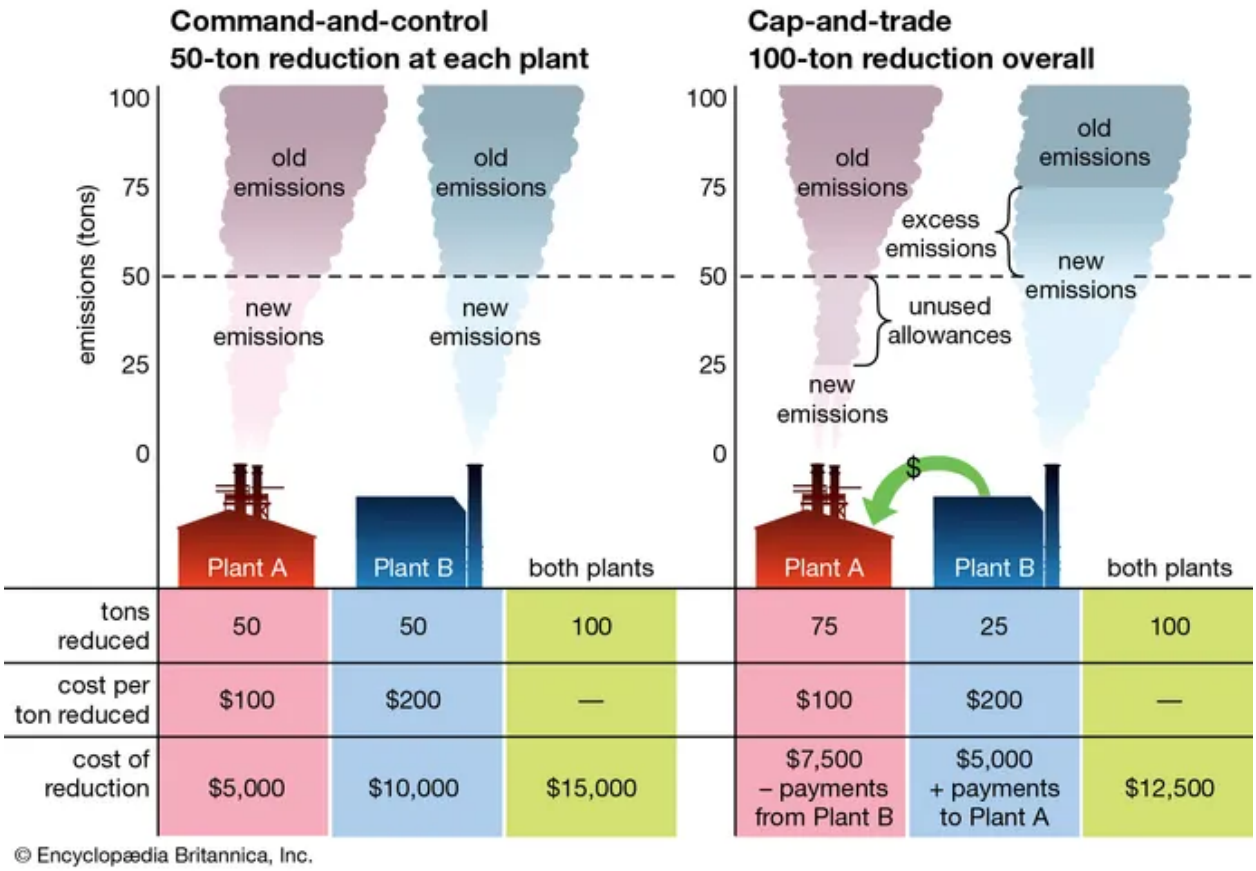
The concept of using a permit market to control pollution levels was first developed by **Canadian economist John Dales and American economist Thomas Crocker in the 1960s.**

Through this method, **pollution permits are issued to firms in an industry** where a reduction in emissions is desired.

The permits give each firm the **right to produce emissions according to the number of permits it holds.**

However, the total number of permits issued is limited to the amount of pollution that is allowed throughout the industry.

This means that some firms will not be able to pollute as much as they would like, and they will be forced to either reduce emissions or purchase permits from another firm in the industry



Working of Permit System

1. **Setting the Cap:** The regulatory authority (government or international body) sets a cap on the total amount of a specific pollutant that can be emitted over a given period. This cap is the cornerstone of the system, guaranteeing that the overall environmental goal will be achieved.
2. **Issuing Permits:** Permits are created, each allowing the holder to emit a specific quantity of the pollutant (e.g., one ton of CO2). These permits are typically allocated to polluting entities (e.g., factories, power plants), often based on their historical emissions or some other criteria.
3. **Trading:** This is the key element. Entities that can reduce their emissions at a low cost can sell their excess permits to entities that face higher costs of reduction. A market emerges where permits are bought and sold, establishing a price for the right to pollute.
4. **Compliance:** At the end of the compliance period, each entity must surrender enough permits to cover its actual emissions. Those who do not have enough permits must either buy them from others or face penalties.

The trading mechanism ensures that pollution reduction is achieved at the lowest possible cost. Entities that can reduce emissions cheaply will do so and sell their extra permits, making a profit. Entities that face high reduction costs will buy permits, as this is cheaper than reducing emissions themselves. In equilibrium, the marginal cost of abatement is equalized across all participants, minimizing the overall cost of achieving the cap.

Example: EU Emissions Trading System (EU ETS) is the **world's largest cap-and-trade system**, covering greenhouse gas emissions from various sectors across Europe.

Did You Know?

In 2019, Gujarat launched the world's first market for trading in particulate matter emissions, specifically in the city of Surat. This initiative, known as the Emission Trading Scheme (ETS), allows industries to buy and sell permits for emitting particulate matter, a significant air pollutant

Advantages of Permit Markets

1. **Cost-Effectiveness:** Achieves environmental goals at the lowest possible cost to society.
2. **Flexibility:** Allows polluters to choose the most cost-effective way to reduce their emissions.
3. **Incentive for Innovation:** Encourages the development and adoption of cleaner technologies, as reducing emissions below the allocated permits allows entities to sell excess permits for profit.
4. **Environmental Certainty:** The cap provides certainty that the overall emissions target will be met.

Disadvantages and Challenges

1. **Initial Allocation:** The initial allocation of permits can be controversial and have distributional consequences.
2. **Monitoring and Enforcement:** Requires robust systems to track emissions and ensure compliance.
3. **Market Volatility:** The price of permits can fluctuate, creating uncertainty for businesses.
4. **Hot Spots:** If permits are concentrated in certain areas, localized pollution "hot spots" can occur.
5. **Complexity:** Designing and implementing a successful permit market can be complex, requiring careful consideration of various factors.

Legislative Measures in India

The **Energy Conservation (Amendment) Bill, 2022**, **empowers the central government to specify a carbon credits trading scheme.** Under this scheme, carbon credit certificates will be issued to companies or individuals who reduce their carbon emissions. These certificates will be tradeable, allowing for a market-based approach to achieving emission reduction targets.

Virtual Resources

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LET'S RECALL	
Market Failure	Inefficient economic outcomes where costs/benefits aren't limited to buyer/seller.
	Common with environmental goods due to externalities and lack of property rights.
Demand-Side Market Failure	Consumers unwilling to pay for public goods (clean air).
Supply-Side Market Failure	Producers don't pay external costs (pollution).
Externalities	Costs or benefits imposed on others without market price.
NEGATIVE EXTERNALITY	Cost imposed on a third party
	Over generation of activity
POSITIVE EXTERNALITY	Benefits provided without compensation (vaccinations).
	Under-generation of activity.
Greenhouse Gas Externality	Emissions have unpriced impacts on future generations, leading to overproduction
Common Property/Tragedy of the Commons	Overuse of open-access resources (fisheries, highways) due to lack of individual cost bearing.
Market Failure Corrective Measures	
Command and Control	Regulations on pollution amounts/processes (emission standards, bans)
COASE THEOREM	If transaction costs are low and property rights are clear, private parties can negotiate efficient solutions to externalities.
Pigovian Tax	Tax equal to external cost, internalizing the externality
Permit Market (Cap-and-Trade)	A cap is set on total emissions, and permits are issued and traded

PRACTICE QUESTION

1. According to Ronald Coase, which of the following statements is correct for pollution control

A. Providing property rights to polluters and pollutees

B. Providing property rights to the legal institutions

C. Providing property rights to the state

D. Providing property rights to Trade Unions

2. The Coase theorem asserts that

A. Environmental problems arise from state failure to eliminate market imperfections
B. If property rights are defined clearly, markets will produce efficient outcomes
C. Transactions costs associated with environment problems are negligible
D. all of the above are correct

3. Which of the following scholars believes that if society defines property rights clearly, then markets will produce efficient outcomes such that people will pay for negative externalities they impose on others.

A. Lester Brown
B. Ronald Coase
C. Herman Daly
D. Robert Solow

4. Which of the following conditions violate the assumptions necessary for the applicability of the Coase theorem?

(i) There are a large number of people affected

(ii) There are only two people affected

(iii) The damages are small

(iv) At least one of the parties has no wealth

Choose the correct code:

A. (i) and (iii) only

B. (i) and (iv) only

C. (ii) and (iii) only

D. (ii) and (iv) only

5. According to the Coase Theorem

A. one should always award pollution rights to the victim
B. one should always award pollution rights to the poorest party
C. the state should decide how resources should be used
D. if transactions costs are very small the pattern of resource usage will not depend on who has the property right to use the resource in question

6. The Coase theorem tells us that in the presence of external costs in production,

A. the government must intervene in the market to assure that the efficient level of output is produced.

B. then under certain conditions, private parties can arrive at the efficient solution without government involvement.

C. private parties can negotiate to produce the good at a level where marginal willingness to pay for the good by consumers is zero.

D. private parties can never arrive at the efficient solution.

7. The Coase theorem result does not apply if

A. There is a significant externality between two parties.
B. The court system vigorously enforces all contracts.
C. Transaction costs make negotiating difficult.
D. Both parties understand the externality fully

8. The "tragedy of the commons" refers to

A. the absence of incentives to prevent the overuse of a common resource that arises when its users have no incentive to conserve it and use it sustainably.

B. The inability of lower income groups to achieve a higher level of education.

C. The tendency for bureaucrats to maximize their budget.

D. The acceptance of deplorable working conditions by those who lack the human capital to obtain a better job.

9. The absence of incentives to prevent the overuse of a common resource that arises when its users have no incentive to conserve it and use it sustainably is referred to as

A. Sustainable production.

B. Rational ignorance.

C. The tragedy of the commons.

D. Irrational production.

10. Smoking tobacco creates a _____ externality.

A. Positive consumption

B. Negative consumption

C. Negative production

D. Positive production

11. Air pollution generated by a paper mill factory is an example of a

A. Negative production externality.
B. Positive consumption externality.
C. Negative consumption externality.
D. Positive production externality.

12. Which one of the following is a means of coping with a negative externality?

A. Emission subsidies
B. Pigouvian taxes
C. Vouchers
D. Patents

13. The core market failure related to climate change is known as

A. Carbon footprint

B. Greenhouse-gas externality

C. Renewable energy deficit

D. Fossil fuel dependency

14. The greenhouse gas externality is accompanied by market failures arising from

A. Overproduction of goods

B. Lack of information about how to reduce emissions

C. Excessive government intervention

D. High consumer demand

15. Match List I with List II

List I	List II
(a) Negative consumption externality	**(i) Discharging effluents**
(b) Negative production externality	**(ii) Setting up an apiary**
(c) Positive consumption externality	**(iii) Playing loud music through speakers**
(d) Positive production externality	**(iv) Use of Jute bags instead of plastic bags**

Choose the correct option:

A. (a) – (iii); (b) – (i); (c) – (iv); (d) – (ii)

B. (a) – (i); (b) – (ii); (c) – (iii); (d) – (iv)

C. (a) – (ii); (b) – (i); (c) – (iii); (d) – (iv)

D. (a) – (iv); (b) – (iii); (c) – (ii); (d) – (i)

Answer key

1. A	2. B	3. B	4. B	5. D
6. B	7. C	8. A	9. C	10. B
11. A	12. B	13. B	14. B	15. A

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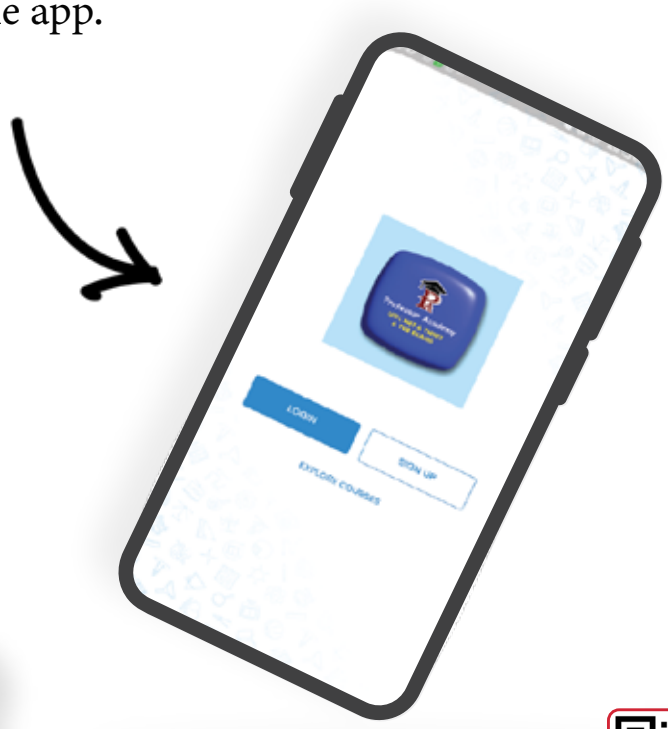

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III. COST BENEFIT ANALYSIS AND COMPENSATION CRITERIA

Cost-Benefit Analysis (CBA) is a technique used to **evaluate the economic efficiency of environmental policies** or projects by comparing their costs and benefits.

Cost-benefit analysis (CBA) is a tool used to determine the worth of a project, programme or policy. It is used to assist in making judgments and appraising available options.

The goal is to determine whether the benefits outweigh the costs, ensuring that resources are allocated efficiently.

IMPORTANCE OF COST-BENEFIT ANALYSIS

1. Cost-benefit analysis (CBA) is a **decision-making tool** that helps assess choices, providing information to decision-makers, especially when allocating scarce resources.
2. CBA analyzes whether a policy's implementation increases social welfare by focusing on efficiency.
3. CBA is not simply an analysis of public expenditures and revenues. It assesses the social value effects of both public and private decisions.
4. CBA considers all gains and losses from the perspective of all individuals within society, termed social benefits and costs.
5. Because many policies use scarce resources (finite resources with alternative uses), evaluating their efficiency against alternatives is crucial. CBA facilitates this evaluation.

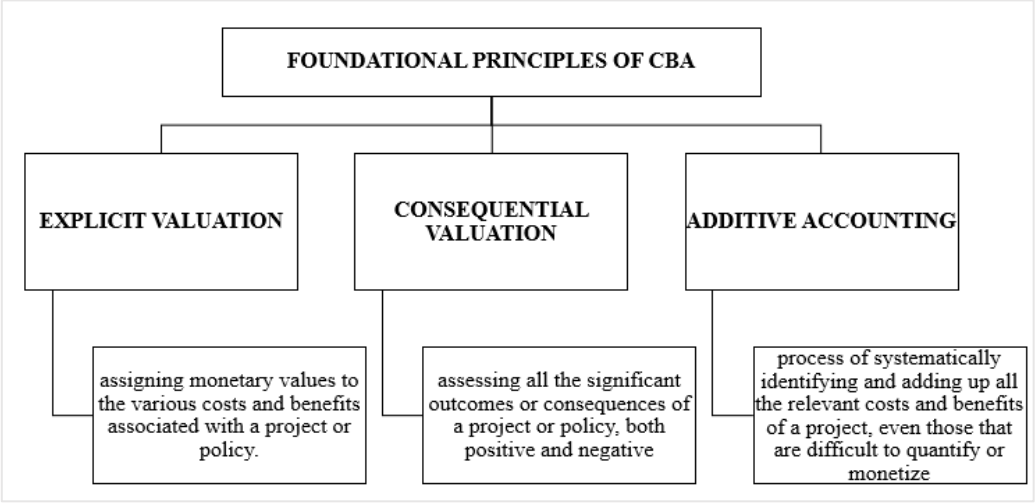
KEY PRINCIPLES OF CBA

1. Given the focus on efficiency, CBA is relevant for those decisions (government or private) which
    (a) involve the use of scarce resources, and
    (b) generate "good" and/or "bad" consequences for social welfare.
2. While CBA measures a policy's efficiency, decision-makers must balance this with other goals.
3. Analysts must explain CBA's focus on efficiency and any trade-offs.
4. CBA is a "**with and without" analysis**. The analyst should first develop the baseline scenario (i.e., what would happen without the policy) and then identify and calculate incremental benefits and incremental costs by comparing consequences "with" the policy to those "without" the policy.
5. **Incremental benefits = (benefits with policy) – (benefits without the policy);**
6. **Incremental costs = (costs with the policy) – (costs without the policy).**
7. Analysts identify all policy consequences affecting social welfare, then determine the economic value of real changes (resource quantity/quality or individual satisfaction) representing benefits and costs.

FOUNDATIONAL PRINCIPLES OF COST-BENEFIT ANALYSIS

The foundational principles of Cost-Benefit Analysis include:

a) Explicit Valuation,
b) Consequential Valuation
c) Additive Accounting



(A) EXPLICIT VALUATION

In Cost-Benefit Analysis (CBA), explicit valuation refers to the **process of assigning monetary values to the various costs and benefits associated with a project or policy.**

The demand of explicit valuation is the first general condition imposed as a foundational principle.

Explication can be simply defined as the act of explaining and interpreting things. Public decisions have more need for explicitness than private choices or personal actions.

The first step is to comprehensively identify all the potential costs and benefits of the project or policy. This includes both direct and indirect impacts, as well as tangible and intangible factors.

Costs might include construction expenses, environmental damage, or social disruption. Benefits could be increased revenue, improved health outcomes, or enhanced quality of life.

Once the costs and benefits are identified, the next step is to assign monetary values to them. This can be challenging, especially for intangible factors like environmental quality or social well-being.

Challenges of Explicit Valuation

i. Monetizing intangible impacts can be difficult and controversial. There may not be readily available market data or agreed-upon methods for assigning values to things like environmental quality or social equity.
ii. Value judgments are often involved in the valuation process, which can lead to disagreements and biases.

Importance of Explicit Valuation

i. Despite the challenges, explicit valuation is essential for CBA because it allows for a systematic and consistent comparison of different options.
ii. It provides decision-makers with valuable information about the relative costs and benefits of different choices, helping them to make more informed decisions.
iii. Explicit valuation also promotes transparency and accountability by making the assumptions and judgments underlying the analysis clear.

Example: Consider a proposal to build a new highway. Explicit valuation would involve:

i. Estimating the construction costs using market prices for labor, materials, and equipment.
ii. Assessing the environmental costs by estimating the value of lost habitat or increased pollution.

iii. Calculating the benefits by estimating the value of reduced travel time, increased economic activity, and improved access to services.

By assigning monetary values to these costs and benefits, decision-makers can compare the overall costs and benefits of the highway project and decide whether it is worthwhile.

(B) CONSEQUENTIAL VALUATION

A second basic principle of cost-benefit analysis relates to the use of consequential evaluation. **Costs and benefits are evaluated in this approach by looking at the consequences of the respective decisions.**

Consequential evaluation focuses on assessing all the significant outcomes or consequences of a project or policy, both positive and negative. It's about taking a broad view and considering the ripple effects, not just the immediate and obvious impacts.

Broadly, consequential evaluation allows the relevant consequences to include not only such things as happiness or the fulfillment of desire on which utilitarians tend to concentrate, but also whether certain actions have been performed or particular rights have been violated.

Importance of Consequential Valuation

i. By considering all the consequences, decision-makers get a more complete picture of the potential impacts of a project or policy. This leads to better-informed and more robust decisions.
ii. Projects or policies can have unintended consequences that are not immediately apparent. Consequential evaluation helps to identify these potential problems early on, allowing for adjustments or mitigation measures.
iii. By considering distributional impacts, consequential evaluation helps to ensure that projects and policies are fair and equitable, and that no group is disproportionately burdened with costs.
iv. A thorough consequential evaluation makes the CBA process more transparent and accountable, as all the relevant factors are clearly identified and considered.

Challenges of Consequential Evaluation

i. Identifying and evaluating all the consequences can be complex and time-consuming, especially for large-scale projects or policies.
ii. Predicting future consequences can be challenging, and there is often uncertainty about the magnitude and timing of impacts.
iii. Monetizing intangible factors can be difficult and controversial, leading to potential biases or inaccuracies in the analysis.

Example: Consider a proposal to build a new highway. Consequential valuation would involve

i. Direct: Reduced travel time, increased costs for some (e.g., land acquisition), construction jobs.
ii. Indirect: Economic growth (new businesses, jobs, increased property values), environmental changes (deforestation, pollution, altered water flow), social changes (migration, access to services, lifestyle changes), land use changes (development), distributional impacts (winners and losers), long-term effects (potentially unsustainable development). Pr@fess@r Ac.ademy

(C) ADDITIVE ACCOUNTING

Additive accounting in Cost-Benefit Analysis (CBA) refers to the **process of systematically identifying and adding up all the relevant costs and benefits of a project,** even those that are difficult to quantify or monetize. It ensures that no significant impact is overlooked, even if it's not easily expressed in monetary terms.

Importance of Additive Accounting

i. Considers all impacts (quantifiable/non-quantifiable) for a nuanced understanding.
ii. Informs robust decisions by weighing all impacts.
iii. Explicitly considers all impacts for open, accountable decisions.
iv. Holds decision-makers responsible for all consequences.

Challenges of Additive Accounting

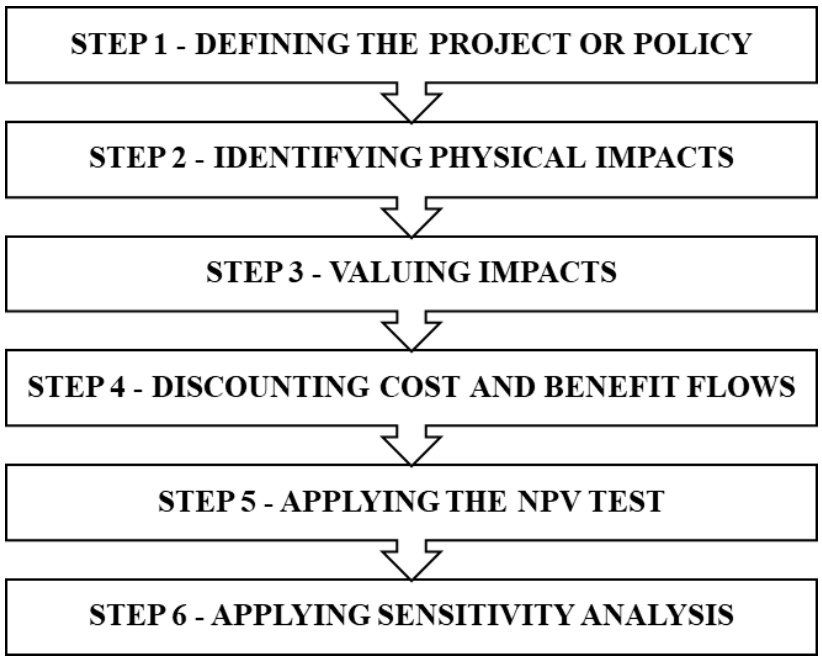
i. Identifying all impacts can be time-consuming.
ii. Intangible impact valuation can be subjective.
iii. Data may be unavailable for some impacts.
iv. Presenting mixed quantitative/qualitative data can be difficult.

Example: A new highway's impacts are identified (direct/indirect, tangible/intangible):

Costs: Construction, environmental mitigation, deforestation, pollution, social disruption.

Benefits: Reduced travel time, increased accessibility, construction jobs, economic growth, improved access to services.

Impacts are quantified/monetized where possible (e.g., construction costs) or described qualitatively (e.g., biodiversity loss). All impacts, even non-monetized ones, are included in the analysis, giving decision-makers a complete picture for informed, holistic decision-making.



STEPS IN COST BENEFIT ANALYSIS

STEP 1 - Defining the Project or Policy:

Identify the choice to be analyzed.

Determine the specific aspects of welfare to be considered and the relevant time period for the analysis.

STEP 2 - Identifying Physical Impacts:

Assess and quantify the potential physical impacts of the project or policy.

Analyze the implications of these outcomes on social and economic factors.

STEP 3 - Valuing Impacts:

Measure the impact of actions or inactions in terms of marginal social cost or benefit.

STEP 4 - Discounting Cost and Benefit Flows:

Recognize that benefits are more valuable the sooner they are received.

Use a discount rate to translate future values into present values, reflecting the time value of money.

(The primary concept of Discounting Cost is that a cost or benefit that occurs in the future is worth less than the same cost or benefit occurring today. Therefore, future costs and benefits need to be discounted to present values to make meaningful comparisons)

STEP 5 - Applying the Net Present Value (NPV) Test:

Calculate NPV as the sum of discounted benefits minus the sum of discounted costs.

Accept the project if NPV > 0, meaning benefits outweigh costs.

(NPV calculates the difference between the present value of benefits and the present value of costs over a specific time period, taking into account the time value of money)

STEP 6 - Applying Sensitivity Analysis:

Recalculate NPV when key parameters change to identify sensitivity.

Review common parameters such as the discount rate, quantities and qualities of inputs/outputs, and project lifespan.

(Sensitivity analysis is a method of assessing how changes to input variables affect output variables)

ADVANTAGES OF CBA

1. **Unified Measurement:**
   CBA allows diverse impacts to be measured using a common unit (often monetary), making it easier to compare disparate options.
2. **Resource Allocation:**

It helps prioritize projects and direct limited funding and resources to where they'll have the greatest positive impact by identifying options with the highest net benefit.

3. **Preference Consideration:**
   CBA takes into account both the direction (positive or negative) and the intensity of preferences, providing a more nuanced understanding of stakeholder values.
4. **Strategic Planning:**
   CBA supports strategic planning by offering insights into the financial implications of various projects and initiatives, enabling more informed long-term decisions.
5. **Environmental Valuation:**
   It allows for the assessment of both the economic value of environmental protection and the opportunity cost of environmental protection measures, facilitating balanced decision-making.
6. **Risk Management:**
   By considering potential costs and benefits, CBA helps identify and manage risks associated with different options, leading to more robust choices.
7. **Enhanced Communication:**
   The results of a CBA can be easily communicated to stakeholders, fostering transparency and facilitating understanding and buy-in for decisions

COMPENSATION CRITERIA

COMPENSATION CRITERIA

Compensation Criteria are **guidelines used to determine the amount and nature of compensation for those adversely affected by environmental policies or projects.** The aim is to ensure fairness and justice in the distribution of costs and benefits.

ASSUMPTIONS OF COMPENSATION CRITERIA

i. The satisfaction of an individual is independent of others and she is the best judge of her welfare.
ii. There exist no externalities of consumption and production.
iii. The tastes of individuals remain constant.
iv. The problems of production and exchange can be separated from those of distribution. Compensation principle accepts the levels of social welfare to be a function of the production. Thus, it ignores the effects of change in distribution on social welfare.
v. Utility can be measured ordinally and interpersonal comparisons of utilities are not possible.

MAJOR CRITERIONS

A. Pareto Improvement Criterion

B. Kaldor-Hicks Compensation Criterion

A. PARETO IMPROVEMENT CRITERION

The most well-known normative criterion, proposed **by Italian economist Vilfredo Pareto**, to judge whether a social change is **'welfare improving' is derived from the notion of Pareto efficiency**

This criterion refers to **economic efficiency which can be objectively measured**.

According to this criterion any change **that makes at least one individual better-off and no one worse-off is an improvement in social welfare.** Conversely, a change that makes no one better-off and at least one worse-off is a decrease in social welfare.

The criterion can be stated in a somewhat different way: a situation in which it is impossible to make anyone better-off without making someone worse-off is said to be Pareto-optimal or Pareto-efficient.

For the attainment of a Pareto-efficient situation in an economy three marginal conditions must be satisfied:

(a) Efficiency of distribution of commodities among consumers (efficiency in exchange);

(b) Efficiency of the allocation of factors among firms (efficiency of production);

(c) Efficiency in the allocation of factors among commodities (efficiency in the product-mix, or composition of output)

Technically,

1. The $MRS_{x,y}$ between any two goods be equal for all consumers.

2. The $MRTS_{LK}$ between any two inputs be equal in the production of all commodities.

3. The $MRPT_{x,y}$ be equal to the $MRS_{x,y}$ for any two goods.

1. Marginal Rate of Substitution ($MRS_{x,y}$)

The MRS between any two goods (x and y) must be equal for all consumers. MRS is the rate at which a consumer is willing to substitute one good for another while maintaining the same level of utility (satisfaction).

For Pareto optimality, the MRSx,y (how much of good y a consumer is willing to give up to get one more unit of good x, while staying equally satisfied) must be the same for all consumers. This ensures that resources are allocated efficiently and that all consumers are deriving the same satisfaction from their consumption choices.

2. Marginal Rate of Technical Substitution ($MRTS_{LK}$)

The MRTS between any two inputs (L and K) must be equal in the production of all commodities. MRTS is the rate at which one input (labor, L) can be substituted for another input (capital, K) in the production process while keeping the output level constant.

For Pareto optimality, the $MRTS_{LK}$ (how much of capital can be substituted for labor in production) must be the same across all firms and commodities. This ensures that inputs are used in the most efficient way possible in production, minimizing costs and maximizing output.

3. Marginal Rate of Product Transformation ($MRPT_{x,y}$)

The MRPT between any two goods (x and y) must be equal to the MRS between those same two goods. MRPT is the rate at which one good (x) can be transformed into another good (y) in production.

For Pareto optimality, the $MRPT_{x,y}$ (how much of good y can be produced by sacrificing one unit of good x in production) must be equal to the $MRS_{x,y}$ (the rate at which consumers are willing to substitute good y for good x). This ensures that the allocation of resources between production and consumption is efficient, as the trade-offs in production align with consumer preferences.

The Pareto criterion faces limitations because it cannot evaluate changes that make some individuals better off and others worse off. Since most government policies result in benefits for some and harm for others, the strict Pareto criterion has limited applicability in real-world situations. Moreover, achieving a Pareto-optimal situation does not guarantee the maximization of social welfare.

B. KALDOR-HICKS COMPENSATION TEST

An alternative criterion of judging whether an allocation was "preferable" to another was proposed by **Nicholas Kaldor in his article, 'Welfare Propositions of Economics and Interpersonal Comparison of Utility',** published in The Economic Journal, September, **1939.**

Kaldor's Welfare Criterion

According to Kaldor's welfare criterion, **if a certain change in economic organisation or policy makes some people better off and others worse off, then that change will increase social welfare, if those who gain from the reorganisation could compensate the losers and still be better off than before.**

In other words, an allocation is preferred if the "gainer" can compensate the "loser" for her loss of utility with a lump-sum transfer, and still achieve a net gain in utility.

Hicks Criterion

John Hicks complemented Kaldor's view by stating that a change is an improvement if the losers cannot bribe the gainers to prevent the change.

Hicks presented the criterion from the loser's point of view, while Kaldor formulated it from the gainer's perspective.

Unified Criterion

Despite their different perspectives, Kaldor and Hicks' criteria are fundamentally the same and are collectively known as the Kaldor-Hicks Compensation Criteria. Essentially, a change is considered an improvement if:

i. **The gainers can compensate the losers and still have a net gain in utility.**

ii. **The losers cannot profitably bribe the gainers to avoid the change.**

This criterion provides a more flexible approach to evaluating changes in economic organization or policy, compared to the strict Pareto criterion, and it is particularly useful in real-world situations where changes often benefit some individuals and harm others.

The **Kaldor-Hicks compensation test** checks if the total social benefits of a change are greater than the total social costs.

The **actual compensation doesn't need to happen.**

Even hypothetically, if the compensation were made, everyone would be at least as well off as before, and some would be better off. This creates a Pareto improvement, where the change benefits everyone overall.

ASSUMPTIONS OF KALDOR-HICKS COMPENSATION PRINCIPLE

1. An individual himself is the best judge of his satisfaction which is independent of the satisfaction of others.

2. There is constancy of the tastes of the individuals.

3. There can be ordinal measurement of utility.

4. The inter-personal comparisons of utilities are not possible.

5. There is an absence of externalities in production and consumption.

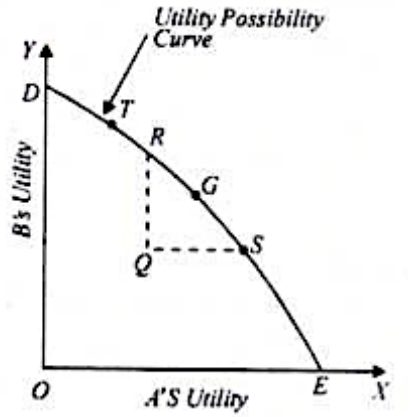


Fig. 41.1. *Kaldor-Hicks Criterion Explained with Utility Possibility Curve*

ILLUSTRATION OF KALDO-HICKS COMPENSATION PRINCIPLE

The **utility possibility curve is used to illustrate the Kaldor-Hicks compensation principle**. It shows the different combinations of utilities that can be achieved by different individuals or groups, helping to identify potential Pareto improvements where the winners could theoretically compensate the losers.

CRITICISMS

1. This criterion implicitly assumes that marginal utility of money is the same for all the individuals in the society.
2. It suggested potential compensation rather than actual compensation.
3. It evaluates the gains and losses due to an economic change in money terms. The real value of gains and losses have been overlooked.
4. It ignores the existing distribution of income of the community.

Kaldor-Hicks Inconsistency

The Kaldor-Hicks criterion, while useful, can lead to inconsistent rankings. This is the core of Scitovsky's Paradox. It's possible that, according to Kaldor-Hicks, state B is "better" than state A (because the gainers in moving to B could compensate the losers). However, it's also possible that, after moving to state B, the Kaldor-Hicks criterion would then say that state A is "better" than state B (because the "gainers" in moving back to A could compensate the "losers"). This circularity is the paradox.

The paradox arises because the Kaldor-Hicks criterion focuses on potential compensation, not actual. It doesn't consider how the distribution of resources changes with each move. The ability to compensate depends on the initial allocation of resources, and this allocation changes as we move between states.

Scitovsky's Solution: The Double Criterion

Scitovsky's Double Criterion is designed **to eliminate this inconsistency**. It adds a "reversal test" to the Kaldor-Hicks test. For a change from state A to state B to be considered an improvement, both of the following conditions must be met:

i. **Kaldor-Hicks Test:** The gainers in moving from A to B could compensate the losers and still be better off.
ii. **Reversal Test (Non-Fulfillment):** The losers in moving from A to B cannot bribe the gainers to stay in A. This is the crucial addition.

A move is only considered an improvement if the gainers could compensate the losers, and the losers cannot then bribe the gainers to reverse the move.

Scitovsky's Double Criterion provides a more robust way to evaluate changes in social welfare, avoiding the inconsistencies that can arise with the basic Kaldor-Hicks approach. It ensures that if a move is considered an improvement, a subsequent reversal of that move won't also be considered an improvement. This makes it a more reliable tool for policy analysis, although it still shares some of the underlying limitations of the Kaldor-Hicks framework (e.g., reliance on potential compensation).

LET'S RECALL	
COST-BENEFIT ANALYSIS (CBA)	Evaluates the economic efficiency of policies/projects by comparing costs and benefits.
	Determines if benefits outweigh costs for efficient resource allocation.
	Decision-making tool for resource allocation.
	Analyzes if a policy increases social welfare.
KEY PRINCIPLES OF CBA	Focus on efficiency for decisions involving scarce resources and social welfare impacts.
	Balance efficiency with other goals.
	"With and without" analysis: Incremental benefits/costs.
	Identify and value all policy consequences affecting social welfare.
FOUNDATIONAL PRINCIPLES	**Explicit Valuation:** Assigning monetary values to all costs and benefits (tangible and intangible).
	Consequential Valuation: Assessing ***all*** significant outcomes (positive and negative), direct and indirect.
	Additive Accounting: Identifying and adding ***all*** relevant costs and benefits, even non-monetized ones.
STEPS IN CBA	
1. Define the project/policy.	
2. Identify physical impacts.	
3. Value impacts (marginal social cost/benefit).	
4. Discount costs and benefits (present value).	
5. Apply Net Present Value (NPV) test (NPV > 0 = accept).	
6. Apply sensitivity analysis (how changes in key parameters affect NPV).	
COMPENSATION CRITERIA	
Guidelines for compensation for those adversely affected by policies/projects.	
MAJOR CRITERIA	
PARETO IMPROVEMENT	Any change that makes at least one individual better-off and no one worse-off is an improvement in social welfare.
	Conversely, a change that makes no one better-off and at least one worse-off is a decrease in social welfare.
KALDOR-HICKS	Change is an improvement if gainers could compensate losers and still be better off, or losers cannot bribe gainers to prevent the change.
SCITOVSKY'S DOUBLE CRITERION	Adds a reversal test to Kaldor-Hicks.
	A change is an improvement only if gainers could compensate losers and losers cannot then bribe gainers to reverse the change

PRACTICE QUESTIONS

1. Consider the following statements about consequential Valuation
(i) It is one of the foundational principles of Cost-Benefit Analysis
(ii) Costs and benefits are evaluated based on the consequence of the respective decisions
(iii) It takes into account happiness, fulfillment of desire and non-violation of rights
Which of the above statement is/are correct?
A. (i) and (ii) only B. (ii) only
C. (ii) and (iii) only D. (i), (ii) and (iii)

2. Which is incorrect about Cost-Benefit Analysis (CBA)?
A. It is decision making tool designed to provide information
B. It focuses on efficiency and sees whether social welfare is improved
C. It is a type of analysis of public expenditure
D. It assess the social value effects of public decisions

3. What is the first step in conducting a Cost-Benefit Analysis (CBA)?
A. Calculating incremental benefits
B. Developing the baseline scenario
C. Identifying scarce resources
D. Comparing total costs and benefits

4. Which criterion refers to economic efficiency which can be objectively measured
A. 'Cardinalist' criterion
B. Bentham's criterion
C. the Pareto-optimality criterion
D. the Kaldor-Hicks 'compensation criterion'

5. Kaldor-Hick's compensation principle can be explained with the help of
A. Utility possibility curve B. Indifference curve
C. Equal product curve D. Kuznet's curve

6. Which of the following statements is true about the potential compensation in the Kaldor-Hick's criterion?
A. The compensation must actually take place.
B. The compensation is only theoretical and need not be transacted.
C. The compensation ensures equal distribution of resources.
D. The compensation is based on market prices.

7. If there is a hypothetical compensation as per Kaldor and Hicks, which among the following holds true
(i) Doesn't imply fairness
(ii) Always leads to fairness
(iii) Evaluation criteria ignores the distributional equity
(iv) Distributional equity is the primary criteria
Choose the correct code:
A. (i) and (iii) only B. (i) and (iv) only
C. (ii) and (iii) only D. (ii) and (iv) only

8. Which among the following is not an assumption of Kaldor-Hicks Compensation Principle?
A. There is constancy of the tastes of the individuals.
B. There can be ordinal measurement of utility.
C. The inter-personal comparisons of utilities are not possible.
D. There is a presence of externalities in production and consumption.

9. The inconsistency of which one of the following criteria is labelled as Scitovsky Paradox?
A. Little criterion B. Pareto criterion
C. Bergson criterion D. Kaldor-Hicks criterion

10. Which of the following is the first step in CBA when analyzing a policy?
A. Valuation in monetary units of social costs and benefits
B. Identification of the policy's positive and negative social consequences
C. Application of the appropriate decision criterion
D. Ignoring social consequences

ANSWER KEY

1. D	2. C	3. B	4. C	5. A
6. B	7. A	8. D	9. D	10. B

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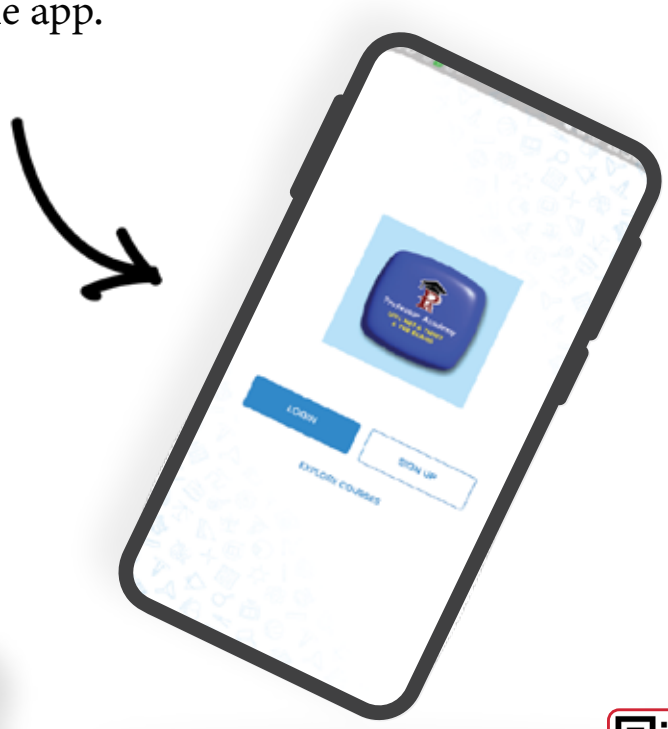

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