APPOLO STUDY CENTRE CHENNAI

APPOLO STUDY CENTRE

FEB WEEKLY TEST – 2

12th - Geography	**Unit -5**	**Cultural and Political Geography**
	Unit – 6	**Geoinformatics**
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12th - Geography
5. Cultural and Political Geography

Introduction

An interesting traditional Chinese custom says that a husband should carry his bride over a pan of burning coals before crossing the threshold of their home as husband and wife. According to tradition, the ritual ensures that the wife will have an easy and successful labour. Fire walking is also performed by some Chinese people as a means to prevent natural disaster'. 'In Cypriot culture, do not give white lilies as they are used at funerals. It is polite to finish everything on your plate. If you have not finished eating, cross your knife and fork on your plate with the fork over the knife'. It indicates you have finished eating by laying your knife and fork parallel across the right side of your plate'. Do you know some interesting custom practiced in our culture?

Culture is the total way of life that characterizes a group of people. There are thousands of cultures existing today and each contributes to global diversity. There are so many ways that people can be culturally different. Specifically, a culture consists of numerous cultural components that vary from one culture group to the other. Some of the cultural parameters are religion, language, architecture, cuisine, technology, music, dress, gender roles, law, education, government, agriculture, economy, sport, values, and many more.

Culture Region

A culture region is a portion of Earth that has common cultural elements and has distinct cultural authority from other regions. Any number of cultural components may be used to define culture regions. A map of world religions, for example, includes a shaded area in South Asia where Hinduism is dominant.

Culture regions differ greatly in size. Some are exceedingly large, like the Islamic culture region that encompasses millions of square km of North Africa and Southwest Asia. Some are very small, like Spanish Harlem, which encompasses about three square km of Manhattan. Many others are of intermediate size, like the Corn Belt, which occupies a portion of the mid-western United States.

Cultural Diffusion

Cultural diffusion is the spread of cultural beliefs and social activities from out group of people to another. Mixing of world culture through different ethnicities, religions and nationalities has only increases with advanced communication, transport and technology.

Cultural Landscape

Cultural Landscapes have been defined by the World Heritage Committee as "cultural properties representing the combined works of nature and of man".

The World Heritage Committee has identified and adopted three categories of cultural landscape. The three categories extracted from the Committee's Operational Guidelines, are as follows:

(i) "A landscape designed and created intentionally by man".
(ii) An "organically evolved landscape" which may be a "relict (or fossil) landscape" or a "continuing landscape";
(iii) An "associative cultural landscape" which may be valued because of the "religious, artistic or cultural associations of the natural element".

Cultural Interaction

Cultural interaction focuses on the relationships that often exist between cultural components that characterize a given community. Different factors interact with each other and give rise to prevalent trait.

What language do you speak? What dress do you wear? What food do you like? What is the structure of the house you live in? For the above question by searching the answer we can learn the culture of a human society.

Culture shapes our identity and influences our behaviours. Culture refers to the sharing language, beliefs, values, norms, behaviors and material objects, which are passed from one generation to the next generation. Cultural geography is the branch of human geography

which deals about the areal organization of various cultural aspects in relation to total environment. Some of the cultural aspects are as follows:

Language

Language plays great force in socialization and historical transmission, which is the primary instrument for transmitting culture. Human can bind any group of people through the network of interaction. Languages are in written or oral form. India (780) has the world's second highest number of languages, after Papua New Guinea (839).

Customs

Custom in law is the established pattern of behavior that can be objectively verified within a particular social setting. A claim can be carried out in defense of what has always been done and accepted by law. It becomes characteristic of the group of people performing the act.
Habit is a similar word which is adopted by an individual and it has been adopted by most of the people of the ethnic group or society.

Norms

Norms refers to attitude and behaviours that are considered normal, typical or average within the group. Cultural norms are the standards we live by. They are the shared expectations and rules that guide behaviour of people within social groups. Cultural norms are learned and reinforced from parents, friends, teachers and others while growing up in a society. Norms often differ across cultures, contributing to cross-cultural misunderstandings.

Values

Values refer to intangible quality or beliefs accepted and endorsed by a society. A culture's values are its ideas about what is good, right, fair, and just. Sociologists disagree, however, on how to conceptualize values. Conflict theory focuses on how values differ between groups within a culture, while functionalism focuses on the shared values within a culture.

Cultural Heritage

Cultural Heritage is an expression of the ways of living developed by a community and passed on from generation to generation, including customs, practices, places, objects, artistic expressions and values. Cultural Heritage is often expressed as either Intangible or Tangible Cultural Heritage. As part of human activity Cultural Heritage produces tangible representations of the value systems, beliefs, traditions and lifestyles. As an essential part of culture as a whole, Cultural Heritage, contains these visible and tangible traces form antiquity to the recent past.

Cultural Heritage types

Cultural Heritage can be distinguished in: Built Environment (Buildings, Townscapes, and Archaeological remains), Natural Environment (Rural landscapes, Coasts and shorelines, agricultural heritage) and Artefacts (Books & Documents, Objects, and Pictures).

Cultural diversity

Cultural diversity refers to having different cultures, respect to each other differences. Cultural diversity is important; because of work place and show increasingly consist of various cultural, racial and ethnic groups. We can learn from one another but first we must have a level of understanding. Cultural diversity exists in many countries around the world, but it can be challenging and, at times, problematic. Through this lesson, you will learn how to define cultural diversity and explore some of the ways in which it influences society.

Cultural Traits

A cultural trait is a characteristic of human action that's acquired by people socially and transmitted via various modes of communication. Cultural traits are things that allow for a part of one culture to be transmitted to another. There are millions of culture traits, a trait can be an object, a technique, a belief or an attitude. Culture traits are interrelated with each other, their collective function forms culture complex.

Cultural Realms of the World

Cultural realm refers to a type of cultural region. Cultural region is a continuous geographical area characterized by cultural homogeneity. It may be classified into three categories as macro, meso and micro region. Cultural realm is classified based on the attitude, religious belief, language, racial group, technological development, etc. There are twelve Cultural realms in the modern world. Let us discuss some of them briefly.

Occidental Realm

Occidental culture is the culture of the European society. It is influenced, to a great extent, by Christianity. It has regional modifications on the basis of varying levels of industrialisation, political and economic thought, colonisation, commercialisation, urbanisation, and development of transport system, land development of social, political and economic institutions.

In many parts of the occidental culture, the impact of non-religious factors, particularly the effect of modernisation, is so great that the religious values are sidelined. Post- industrial Europe is fast emerging as a society where traditional values are nearly abandoned. The occidental culture covers a vast area. It is further divided into six sub-regions considering the impact of regional environment.

(i) West European is the most industrialised and urbanised culture.

(ii) Continental European culture is influenced by different political and economic thoughts, while Christianity remains an important influence.

(iii) Mediterranean Europe includes countries lying to the south of the Alps. It is the region of dominance of Christianity.

(iv)Anglo-American and

(v) Australian cultural realms are practically the offspring's of west European culture. Both are inhabited by migrants from west Europe. There are only some regional differences.

(vi)Latin American culture is very similar to the Mediterranean culture. It is the only region of occidental culture which lies in the tropics and is underdeveloped. It became a part of the occidental culture as a result of conversion of tribes into Christianity. The colonial languages, Spanish and Portuguese, have become the state languages. Regional architecture has been influenced by the Spanish and Portuguese styles. Practically all countries maintain economic, cultural and social ties with the Mediterranean countries.

Islamic Cultural Realm

The Islamic Cultural Realm is influenced by Islamic values. It covers a vast geographical area from Morocco in the west to Pakistan in the east. The population is sparsely distributed due to inhospitable environment. The coasts, river basins and oases have been the cradles of Arabian culture in this realm. The British call it the Middle-East while the Germans call it a region of oriental culture. This cultural realm lies between the traditional Indian culture in the east and the modernised European culture in the west.

Islamic culture is highly orthodox and based on traditional beliefs, the impact of which can be seen in high female illiteracy rates. These countries have very high per capita incomes, but the level of modernisation is very low.

Indie Cultural Realm

Indie Cultural Realm is the culture of the Indian sub-continent. Baker called it a sub-continental culture, while D. Stamp used the term paddy culture. This cultural realm is well-defined; it lies between Himalayas in the north, Indian Ocean in the south and Hindukush Mountains in the west.

This cultural realm is characterized by joint family, village community, caste system, semi-feudal land relations, subsistence agriculture, paddy farming, seasonal climate changes and agricultural season coming at the same time all over the region. The culture of this region is greatly influenced by Vedic values. Though the region is inhabited by various communities, the social system has the hidden impact of Vedic cultural values.

East Asian Culture

This culture is basically a Buddhist culture with regional modifications. True Buddhist culture can be seen in South Korea and Japan. Even these two countries have felt the impact of industrialisation, urbanisation and modernisation. The culture of mainland China has modified the Buddhist system. This culture was adopted after the Second World War.

South-East Asian Culture

It is a transitional culture lying at a place where different cultures have intermingled. Dominance of Buddhism can be seen in Myanmar, Thailand and Vietnam. Influence of

Christianity can be seen in the Philippines and of Indie culture over islands of Indonesia. The Islamic influence is evident in Malaysia and the Indonesian islands. No other region has such peculiarities.

Meso-African Culture

This culture is also known as the Negro culture. It principally includes tropical Africa. Similar cultural systems can be seen among the American Red Indians, Latin American tribes, Australian aboriginals and several tribes of Asia-Pacific region.

Historian Toynbee has used the term 'marginalised culture' for these traditional culture units. Some geographers even include Eskimos under this cultural realm. Thus, it is a widely scattered cultural realm characterised by marginalised and relatively isolated communities.

Major Culture Hearths

Areas from which important culture traits, including ideas, technology, and social structures, are originated.

Folk Culture

Culture traits that are traditional, no longer widely practiced by a large number of people, and generally isolated in small, often rural, areas.

Races

The race is a group of people with more or less permanent distinguishing characteristics. There are skin colour and hair colour to which persons concerned attach certain interpretations. Objectives and scientific classification are the division of mankind in to racial groups should be done on the basis of measurable physical features and qualities inherited from a common ancestor. The important features on the basis of which the races are identified and classified include skin colour, stature, shape of head, face, nose, eye, type of hair, and blood group. Human races are classified in to four broad groups:

1. Negroid, 2. Caucasoid, 3.Mongoloid and 4.Australoid.

HOTS
If human being originated from one point, Africa and spread to rest of the world, how could they become different races?

1. The Negroid

They are usually called as "black race". They have the darkest skin tone than other races, and other common characteristics are the slopped forehead, thick lips, wide nose, and dark hairs. They are living in Sub-Sahara Africa.

2. The Mongoloid

They have the folding eye lids, almond shaped eyes, yellowish skin tone, and V shaped cheeks. Native Americans and Eskimo are also classified as Mongoloid. Compared to the other races, they have the least body hair, least body odour, and smallest limb ratio. Their facial structure is likely to adapt cold mild wind. They are living in East Asia.

3. The Caucasoid

The Caucasoid is known as "white people" characterised by the pointy nose, vertical forehead, pinkish/orange skin tone, visible brow ridge, and colorful eyes/hair. Some believe that their light skin tone is meant to receive more sunlight due to Europe's climate. Some believe that their nose structure is meant to keep the nose moisture from getting dried by the wind. They are living in Europe and Middle East.

4. Australoid Race

They have visible eye ridge, wide nose, curly hair, dark skin tone, and short in height. Some believe that their visible ridge helps them to eat stiff foods. They are living in Australia and Papua New Guinea.

Characteristic of Major Races

Feature	Caucasoid	Monogoloid	Negroid
Skin colour	Pale reddish white to olive brown.	Saffron to yellow brown, reddish brown.	Brown to black brown yellow brown.
Stature	Medium to tall.	Medium tall to medium short	Tall to very short.
Face	Narrow to medium broad, tends to high no prognathism.	Medium broad to very broad malars high and flat tends to medium.	Medium broad to narrow tends to medium high strong prognathism.
Head form	Long-broad and short medium, high-very high	Medium height, predominantly broad.	Predominantly long low height.
Hair colour	Light blonde to dark brown, straight to wavy.	Brown to brown black, straight.	Brown black light curl and wooly.
Body build	Linear to lateral slender to refuge.	Tend to be lateral, some linearity evident.	Tend to be linear and muscular.
Nose	Usually high, narrow to medium broad.	Low to medium form, medium broad.	Low, medium to very broad.
Blood group	more A than B	High in B	High is Rh(D)
Eye	Colour: light blue to dark brown, lateral eye –fold occasional.	Colour: brown to dark brown, medial epicanthic fold very common.	Colour: brown to brown block, vertical eye-fold common.

Ethnicity

Ethnicity is a concept referring to a shared culture and a way of life. This can be reflected in language, religion, material culture such as clothing and cuisine, and cultural products such as music and art. Ethnicity is often a major source of social cohesion and social conflict. The world is home to thousands of different ethnic groups, from the Han Chinese (the largest ethnic group in the world) to the smallest indigenous groups, some of which include only a few dozen people. Almost all of these groups possess a shared history, language, religion, and culture, which provide group members with a common identity.

India is a unique country with great diversity in ethnicities, race, religion, language, culture, cuisine and in every other aspect of the human society. Indian civilization is one of the oldest in the world and primarily consists of the Indo-Aryans of North India and the Dravidians of South India, the people of the Indus Valley Civilization while the former migrated to the country at about 1800 BC. As India has such a diverse cultural demographic, it makes sense that the country is also.

Dravidians

The Dravidian people are any native speakers of the Dravidian languages in the Indian Subcontinent. Almost all the Dravidians live in the southern part of India. The five major ethnic groups of Dravidian people in India are Tamil, Telugu, Kannada, Malayalam, and Tulu.

The ancient Indus Valley civilization in India was believed to have been of Dravidian origin in northern India, but then the Dravidian people were pushed south when the Indo- Aryans came in and the Kuru Kingdom in northern Indian arose. Later South India was dominated by the three Dravidian kingdoms of the Cheras, Cholas, and the Pandyas. These three kingdoms have been shown to sponsor the growth of literature, music, and the arts and to have done extensive trading. The three kingdoms also supported and were tolerant of Buddhism, Jainism, and Hinduism. The major languages spoken by the Dravidian people are Tamil, Telugu, Kannada, Malayalam, and Brahui.

Do you know?

Arabic script Brahui is the only Dravidian language which is not known to have been written in a Brahmi based script, instead, it has been written in the Arabic script since the second half of the 20th century in Iran Pakistan and Afghanistan.

Religion

Religion is not a vague fear or unknown powers not the child of terror, but rather a relation of all the members of a community to a power that has the good of the community at heart and protects its law and moral order. Religion produces a distinct attitude towards life which affects the further development of the society. Indeed most cultural situations show the mutual interaction between religion and socio-economic and politico-cultural factors.

Classification of religion

Religion may be classified based on the belief in god. Monotheistic: the followers of monotheism believe in a single god (Islam, Christianity). Polytheistic: the followers of polytheism believe in many gods (Hinduism). Another classification is on the basis of areas of origin such as Eastern religion, Western religion, far Eastern religion, African religion, Indian religion, etc. Geographers generally classify religions into following;

- Universalizing religions – Christianity, Islam, and Buddhism.
- Ethnic religions – Hinduism, Shintoism (Japan), Chinese faiths, Judaism.
- Tribal or traditional religions – animism, shamanism, secular (non-religious and atheists).

Major religions of the world

Major religions of the world are classified based on the followers. They are Christianity, Islam, Hinduism, Buddhism, and Judaism. Other important religions include Chinese folk religions, Sikhism, Confucianism, Shintoism etc.

Christianity is a universal religion which has the largest number of followers in the world. They are spread in Europe, Anglo America, Latin America, Africa, Asia and Oceania. Its sacred book is "Bible". Islam is the second largest religion of the world. The largest concentration of the Islam is in the South West Asia, Central Asia, South Asia and South East Asia Followed by the North Africa. Shia and Sunni are its two main sects. Its sacred book is Kuran.

Hinduism is the oldest ethnic religion of the world which was founded about 3000 B.C (B.C.E) in India. Today it has over 8 million followers in the world but main concentration is in India and Nepal. Nearly 99 percent of the total Hindu population is concentrated in south Asia. Its sacred books include the Vedas, the Upanishads, the Epics, the Ramayana and Mahabharata, and the Bhagavad Gita. Buddhism is also one of the oldest religions of India which was founded by Lord Buddha around 525 B.C (B.C.E). Its spread in several Asian countries (China, Myanmar, India, Srilanka, japan, Mangolia, Korea and South East Asian countries) due to its liberal philosophy. Its two main sects are Hinayana and Mahayana.

Judaism is the oldest Monotheistic faith which is regarded as the parent of Christianity. It originates 4000 years ago in the Middle East. At present it has about 14 million followers living in U.S.A, Europe and Asia. Chinese religions include two main beliefs called Confucianism and tao-ism. Confucianism was established by Confucious (551-479 B.C (BCE)). Taoism was established by Lao Tse (604-517 B.C (BCE)).

Jainism is also born in India as a reaction to orthodox Hinduism. It was founded by Lord Mahavir who was a Contemporary of Lord Buddha. Its followers are mostly concentrated in India. It is an offshoot of Hinduism which was established in the 15th century by Guru Nanak. It remained confined to Punjab state and has accepted Gurumukhi as its language.

Tribal Religions

Tribal religions are the special forms of ethnic religion. The tribal people are generally in the Neolithic stage of social development. Tribal people are strikingly different and diverse

in their culture, social and economic life. They cherish their own distinct and have maintained a close relationship to the land and natural environment. Most of them live according to their traditions and are engaged in food gathering, hunting, fishing, primitive agriculture etc, there are about 300 million indigenous people worldwide, constituting about four percent of the total population of the world living in more than sixty countries.

Do you know?
The percentage of tribal to total population is as high as over 90 percent in Greenland, 66 percent in Bolivia and 40 percent in Peru. In India share of tribal people to total population is 8.2 percent.

Sometimes the tribal people are being termed as the fourth world. The first – second and third world believed that "the land belongs to the people" whereas the fourth world believes that "the people belongs to the land

Tribal Distribution in world

Some major tribal group of the world particularly who are living and struggling

1. Equatorial Forest region: Pigmy, Semang, Sakai, Boro, Papuan, etc.

2. Grasslands: Masai, Kyrghizs, etc.

3. Tropical deserts: Bedowin, Bushman, Aborigines etc.

4. Mountainous region: Bhotia, gujjar, Naga etc.

5. Monsoon regions: Gonds, Santhals, Todas, Bhils, etc.

6. Arctic cold regions: Eskimo, Lapp, Alute, Chukchi etc.

Pigmies

The pigmies are Negroid people and are also called Negrillos. They are the nearest approximation of human being to animal. They are short stature, flat nosed, wooly haired, long headed and black people. The average height of men and women are found 150cm. So they are also called dwarf. The pigmies are those who live in scattered parts of tropical Central Africa. They are found in many sub-groups in the equatorial forest region of Africa mainly in Congo basin 3ºN and 3ºS latitudes along both sides of the equator. In addition some groups of Pigmies are also found in the forests of Philippines and New Guinea.

Masai

The Masai of east Africa belong to the pastoral society and are known as the best and most typical cattle herders not only of Africa but also of the world. Masai people are tall and slender with ling feet, hands and fingers. Their skin colour ranges from light chocolate to dark brown. They have high and long head, thin face and nose. Their lips are less thick than that of

Negroid people. Masai occupy the interior plateau of the equatorial Africa. The territory of the Masai lies between 1°N and 6°S latitudes and covers all the rift valleys in this region.

Bedouin

In Arabic, Bedouin means desert dwellers. The Bedouins are most important among the tribal of South West-Asia and North Africa. They are pastoral nomads and keep camel, sheep, goats, horse etc. The Bedouins occupy the desert areas of the Arabian Peninsula including Saudi Arabia, Yemen, Oman, Syria and Jordan. The Bedouins belongs to the mixture of Mediterranean and Armenian races. They are medium stature people with long narrow face, prominent nose, dark eyes and hair. Their complexion is wheatish to pale.

Bushman

Bushman is the tribal people of Kalahari Desert in southern Africa who are still engaged in hunting and gathering economics. They are on constant run for both food and water. Their homeland Kalahari Desert lies in Botswana, Namibia and southern Angola. The bushman territory is a wide plateau about 2000 meters above the sea level with sub-tropical climate. The bushman are including in the Negroid stock. They are very short in stature and have long head, short and flat ears, and yellowish brown complexion. On the whole the Negroid characteristics prevail among the Bushman.

Eskimos

Eskimos also called Inuits are tribes of tundra cold region in Canadian northland, Alaska, Greenland and north-eastern Siberian coastal region. The Eskimos are Mongoloid race. The main physical characteristics of the Eskimos are short stature, Flat narrow face, small snub nose, yellow –brown complexion and coarse straight black hair. Hunting and fishing are the main occupations of the Eskimos. They live in igloo and practice hunting way known as Maupak. The Eskimos wear clothes of caribous or reindeers skin and other furs.

Eskimos are migratory by nature and construct ice houses called Igloos. For travelling on ice shield the Eskimos use sledge which is usually built either of whale bone or of wood whichever is available. It is drawn by two or more dogs, caribous or rain deer.

Tribal in India

India is the home to large number of indigenous people, who are still untouched by the lifestyle of the modern world. With more than 84.4 million, India has the largest population of the tribal people in the world. These tribal people also known as the adivasis are the poorest in the country, which are still dependent on haunting, agriculture and fishing. Some of the major tribal groups in India include Gonds, Santhals, Khasis, Angamis, Bhils, Bhutias and Great Andamanese. All these tribal people have their own culture, tradition, language and lifestyle. There are more than 50 tribal groups in India. Most of the tribal belong basically to the Negrito, Australoid and Mongoloid racial stocks.

Bhils

Bhils are popularly known as the bow men of Rajasthan. They are the most widely distributed tribal groups in India. They form the largest tribe of the whole South Asia. Bhils are mainly divided into two main groups the central or pure bills and eastern or Rajput Bhils.

Gonds

The Gonds are the tribal community mostly found in the Gond forests of the central India. They are one of the largest tribal groups in the world. Gonds have been largely influenced by the Hindus and for the long time have been practicing the Hindus culture and traditions.

Santhals

Santhals are the third largest tribe in India. They are mostly found in the states of West Bengal, Bihar, Odisha, Jharkhand and Assam. They belong to the pre- Aryan period and have been the great fighters from the time of the British.

Munda

Munda tribe mainly inhabit in the region of Jharkhand, although they are well spread in the states of West Bengal, Chhattisgarh, Odisha and Bihar. Munda generally means headman of the village. Hunting is the main occupation of the Mundas tribe.

Khasi

Khasi tribe is mainly found in the KhasiJaintia hills in Meghalaya and in the states of Punjab, Uttar Pradesh, Manipur, West Bengal and Jammu and Kashmir. They form the large part of the population in the state of Meghalaya.

Angami

Angami tribe belongs to the extreme north eastern part of the country, in the state of Nagaland. The total population of the Angamis is around 12 million. They are quite popular for their woodcraft and artwork. Sekrenyi is the main festival celebrated among the Angamis in Nagaland.

Bhutia

Bhutia tribes are of the Tibetan origin. They migrated to Sikkim around 16th century. In the northern part of the Sikkim they are known as the Lachenpas and Lachungpas. Bhutias forms 14% of the total population of Sikkim. Losar and Losoong are the main festivals celebrated among the Bhutia tribes.

The Sentinelese tribe, the most dangerous tribe in the world!

Located far into Andaman and Nicobar Islands, the Bay of Bengal in the Indian Ocean,

North Sentinel Island is one of the most isolated places on earth. This remote island is home to the Sentinelese tribe, the most dangerous tribe in the world. The Sentinelese is hunter-gatherers, as agriculture is not known to them. Their diet consists mainly of coconuts and fish that can be found in the shallow waters around their shores. The Sentinelese would be described as Stone Age people. The women wear fibre strings tied around their waists, necks and heads. The men also wear necklaces and headbands, but with a thicker waist belt. The men carry spears, bows and arrows. Sometimes the Sentinelese appeared to make friendly gestures at others they would take the gifts into the forest and then fire arrows at the contact party. The population of North Sentinel Island is estimated at 250 individuals. The Sentinelesedoes not want help from outsiders.

Chenchu

Chenchu inhabit in the Nallamalai hills, which have been the part of the Nagarjuna Segar Tiger Sanctuary for centuries in Andhra Pradesh, India. They are mainly found in the districts of Mahabubnagar, Nalgonda, Praksham, Guntur, and Kurnool.

Great Andamanese

Great Andamanese is the Negrito tribe inhabitant in the Andaman group of Islands. They form the largest population among the other tribes found in these islands. According to the census the population of Great Andamanese is now limited to few individuals.

Tribals in Tamil Nadu

Tribes of Tamil Nadu are concentrated mainly in the district of Nilgiris. Of all the distinct tribes, the Kodas, the Thodas, the Irulas, the Kurumbas and the Badagas form the larger groups, who mainly had a pastoral existence. Other tribes include, Kattunayakan and Paliyan amongst others.

According to census 2011, tribal population in Tamil Nadu is 7, 94,697. There are around 38 tribes and sub-tribes in Tamil Nadu. The tribal people are predominantly farmers and cultivators and they are much dependent on the forest lands.

Toda: Men from the family of the tribes are occupied in milking and grazing their large herds of buffaloes. Their settlements are known as 'Munds'. They do not worship any god and their consciousness is cosmic. They live in Nilgiris. Today, there are about a thousand Todas left.

Badaga: The Badagas belong to the backward class and are not classified as tribal. They are an agricultural community, dwelling in the higher plateau of the Nilgiris district in the state of Tamil Nadu. They are engaged in tea cultivation and potato growing. They form the largest group of tribes and boast a rich oral tradition of Folk tales, songs and poetry. These tribes are Hindu and belong to the Shiva sect.

Kota: The Kotas are mainly concentrated in the Tiruchigadi area in the Nilagiri hills. They are distinguished by their colorful Folk dances and are basically musicians, who play at Badaa funerals. They are mainly engaged in producing handicrafts. These tribes of Tamil

Nadu are expert iron smiths, potters and carpenters. In order to maintain distance and status in society, the Kotas implement elaborate tattoos.

Kurumbas: The Kurumbas tribes of this state inhabit the intermediate valleys and forests in Villages and were known for their black magic and witchcraft in the past. Their way of living today has changed from their original gathering and hunting existence to working in Coffee and Tea plantations as laborers. Kurumbas are perhaps the only main caste in southern India that has a specialized and distinctive Kurumbas Language.

Irula: The Irula tribes of Tamil Nadu occupy the lower slopes and forests at the base of the Nilgiri Hills. They constitute the second largest group of tribes after the Badagas and are similar to the Kurumbas in many ways. This tribe produces honey, fruits, herbs, roots, gum, dyes etc., and trades them with the people in the plains. In the recent times the Irulas help in catching snakes and collect the snake venom.

Paliyan: They are of the food gathering communities of Tamil Nadu. It is believed that the Paliyan originally belonged to the Palani hills. They are distributed in the districts of Madurai, Tanjavour, Pudukkottai, Tirunelveli and Coimbatore.

Language

Language is an identification mark for different cultures. Because language is essential to communication, it strongly influences the sort of political, social and economic we create. As a result, economic and religious system frequently follows patterns of language distribution and political borders quite often parallel linguistic boundaries. In modern times linguistic diffusion has been facilitated by trade, tourism, media and international organizations. It has helped in the development of the linguistic pluralism. The greatest linguistic diversity is attributed to heterogeneous societies.

Do you know?
Tamil is one of the longest-surviving classical languages in the world. The earliest period of Tamil literature, Sangam literature, is dated from 300 BC (BCE) – AD (CE) 300. It has the oldest extant literature among Dravidian languages.

Major linguistic Families of the World

The classification of languages by origin and historical development is known as a genetic classification. The languages which are the descendants of common ancestral language are called proto – language.

G.L. Trage has classified the languages of the world into 7 linguistic phylum and 30 linguistic families. Linguistic families are further classified in to sub families of languages, which denote major languages.

- 1.Indo-European - a. Indo-Iranian, b. Latin or Romantic, c. Germanic, d. Balto – Slavic, e. Celtic, f. Hellenic
- Sino-Tibetan - a. Chinese, b. Tibetan, c. Burman

- Afro-Asiatic – a. Semitic, b. Egyptian, c. Cushitic, d. Chadic
- African – a. Niger – Congo (Atlantic, Voltaic, Benu-Nagar)
  b. Sudanic (Chari-Nile, Saharan,)
  c. Click Languages (Khoisan)
- Ural-Altaic - a. Finno-Igric, b. Turkic, c. Mangolic, d. Tunguzic
- Dravidian- malayo – Polynesian- - a. Dravidian, b. Malayan, c. Melanesian, d. Micronesian, e. Polynesian, f. Austro- Asiatic.
- Palaeo Asiatic- a.Yukaghir

Do you know?
As many as half of the world's 7,000 languages are expected to be extinct by the end of this century; it is estimated that one language dies out every 14 days.

Major Languages of India

India has a rich Linguistic heritage and has heterogeneous ethnic and social groups, which have their own languages and dialects. According to census of India 1961, there were 187 languages spoken by various sections of Indian society. 23 major languages were spoken by about 97 percent population of the country. 22 languages excluding English are mentioned in the eighth schedule of the constitution of India as follows; Kashmiri, Punjabi, Hindi, Urdu, Bengali, Assamese, Guajarati, Marathi, Kannada, Tamil, Telugu, Malayalam, Sindhi, Sanskrit, Oriya, Nepali, Kongani, Manipuri, Bodo, Dogri, Maithili and Santali of these languages, 14 were initially included in the Constitution. Subsequently, Sindhi was added in 1967 by 21st constitutional amendment act; Konkani, Manipuri and Nepali were added in 1992 by 71st Constitutional Amendment Act; and Bodo, Dogri, Maithili and Santali were added in 2003 by 92nd Constitutional Amendment Act. Indian Languages belong mainly to four linguistic families

- Austric – Munda, Mon-Khmer
- Dravidan – Tamil, Telugu, Kannada, Malayalam, Gondi, kurukh, orean, etc.
- Sino- Tibetan- Bodo, Karen, Manipuri, etc.
- Indo - Aryan – Hindi, Urdu, Sans.

Dialect

A distinct linguistic form peculiar to a region or social group but which nevertheless, can be understood by speakers of other forms of the same language. The two main types of dialects are the **geographic dialect,** spoken by the people of the same area or locality, and the **social dialect** used by people of the same social class, educational level or occupational group.

Major dialects in India

More than 40 languages or dialects in India are considered to be endangered and are believed to be heading towards extinction as only a few thousand people speak them officials said.

According to a report of the census Directorate, there are 22 scheduled languages and 100 non –scheduled languages in India. The scheduled languages are 11 from Andaman and

Nicobar, Seven from Manipur and Four from Himachal Pradesh. There are 42 languages spoken by less than 10,000 people. Some other languages also are in endangered position in India.

Major dialects in Tamil Nadu

Tamil is an interesting language with a range of native dialects. The language has several charming improvisations in different regions of the state. Many people are familiar with the old and familiar dialects of Tamil such as Chennai, Coimbatore, Madurai and Tirunelveli

UNESCO'S five levels of language risk:
Safe: Widely spoken
Vulnerable: Not spoken by children outside the home (600 languages)
Definitely endangered: Children not speaking (646 languages)
Severely endangered: Only spoken by oldest generations (527 languages)
Critically endangered: Spoken by only a few members of the oldest generation, often semi-speakers (577 languages)

Political Geography - Concept of Nation and State

Nation

A nation is a group of people who see themselves as a cohesive and coherent unit based on shared cultural or historical criteria. Nations are socially constructed units, not given by nature. Their existence, definition, and members can change dramatically based on circumstances. Nations in some ways can be thought of as "imagined communities" that are bound together by notions of unity that can pivot around religion, ethnic identity, language, cultural practice and so forth.

State

A State is an independent, sovereign government exercising control over a certain spatially defined and bounded area, whose borders are usually clearly defined and internationally recognized by other states.

Do you know?
Vaishali was established as a republic by the 6th century B.C (BCE), prior to the birth of Gautama Buddha in 563 B.C (BCE), making it the world's first republic.

Nation-State

The nation state is a system of organization defined by geography, politics and culture. The nation is cultural identity that is shared by the people, and the state is the governing administration. A nation state must have a shared national identity, physical borders, and a single government.

A nation-state is a political unit with a well-defined territory, inhabited by a people who are well-organised, possess sufficient powers and consider them to be a nation by virtue

of certain binding factors which may be emotional and which are reflected in law and governance.

Frontiers and Boundaries

Frontiers: International frontiers and boundaries separate land, rivers and lakes subject to different sovereignties. In 1900 frontiers had almost disappeared and had been replaced by boundaries that are lines. A Frontier is a politico geographical area, lying beyond defined borders of a political unit into which expansion could take place.

Types of Boundaries

Boundaries can be classified according to their relationship with the cultural landscape. Some boundaries were established prior to the permanent occupation of areas by the present inhabitants. In some cases patterns of settlement were already developing so that the boundary ultimately established has a different relationship to the cultural realities of the area involved. This classification is known as the functional or genetic classification of boundaries.

Different between Frontier and Boundary

Frontier	Boundary
1. Natural	1. Mostly Anthropogenic.
2. Areal Concept	2. Linear Concept.
3. Frontiers have no political dispute.	3. Boundaries vary often disputable by the rival nations.
4. Frontiers generally have mountainous area, desert, marshes, etc. Thus, inhabitable.	4. But boundaries have no such criteria.
5. Frontiers are dynamic.	5. Boundaries are static because once fixed, they hardly change.

Boundaries: A boundary is a line demarcating the recognised limit of an established political unit, administrative region or geographical region e. g a state, country or district.

Do you know?
China has the maximum number of neighbors touching its border. The 14 countries touching its border are: India, Pakistan, Afghanistan, Tajikistan, Kyrgyzstan, Kazakhstan, Mongolia, Russia, North Korea, Vietnam, Laos, Myanmar, Bhutan and Nepal

Do you know?
Canada, the world's second largest country, shares the longest international land border with the United States. The Canada- US land border is 8,893 km long.

Genetic Classification of the boundaries

1. Antecedent Boundaries
The boundaries drawn before the cultural-political realm.

Such boundaries were non-contentious.
E .g, N. Africa and the state boundaries of USA.

2. The Subsequent Boundaries
When the cultural realms are fully developed & political boundaries are contentious.

Such boundaries are irregular or amorphic boundaries.
E.g. the countries of Europe.

3. Superimposed Boundaries
When a political boundary divides a homogenous cultural region and across the boundary the people with similar ethnicity are found.
E.g. Pok

4. Relict Boundaries
Historical boundaries which only exist in the books.

E .g. Persia, the boundary between east & West Germany.

Geopolitics: Global Strategic views

The study of the way a country's size, position, etc, influence its power and its relationships with other countries. Political activity is influenced by the physical features of a country or area of the world. Geo politics is concerned with how geographical factors including territory, population, strategic location, and natural resources endowments as modified by economics and technology affect the relations between states and the struggle forward domination. It is battle between land power and sea power which is going to lead the world continents by one.

Mackinder described the political history of the world as continuous struggle between land and sea powers. According to him, the Columbian era of sea powers, which gave Europe its pivotal position for four centuries is coming to an end. And in the struggle between land and sea powers, the ultimate victory is going to be of one possessing land powers. He divided the earth into 3 tiers.

1) The Heartland - area of interior and Arctic drainage in the Eastern Europe, covered by mountains on three sides and Arctic in north. This is a natural fortress on earth, inaccessible to sea powers.

2) The Inner or Marginal Crescent - area of Europe and Asia adjoining the Heartland and Africa, north of Sahara.

3) The Outer or Insular Crescent - It includes North and South America, Africa (south of Sahara) and Australia. Besides, it also includes the Great Britain and Japan because of their insularity from Eurasia.

According to Mackinder, one with control over Heartland will be in an unstoppable position to rule the world. Heartland, with its agricultural and industrial resources would conquer the inner crescent and Outer crescent would follow later. He conceptualized his theory as:

Who rules East Europe commands the Heartland.

Who rules Heartland commands World Island.

Who rules World Island commands the World.

Mackinder later argued that key to control Heartland lays in Eastern Europe, reflecting a powerful strand of pre and post- Versailles geographical thinking concerning the news to separate the powerful states of Germany and Russia by the creation of 'buffer states'.

Influence - His theory was put to test during the World War II when the Heartland could become the power center of the world if either Germany unites with Russia or China or Japan thrashes Russia. But the shattering defeat of Germany turned Heartland into a power vacuum.

The area highlighted in red is the heartland, blue is rim land and the encircled area is the world island.

The heartland is inaccessible from top because North Sea, Norwegian Sea, Barents Sea, Kara Sea, Laptev Sea, East Siberian Sea are all frozen throughout the year. The hearland is inaccessible from the bottom because of Middle Eastern desert, Iranian Plateau, Himalayas, Plateau's of Tibet and Siberian mountains. This makes heartland immune to any conquests from any other side than Eastern Europe.

The only gateway to the heartland is through Eastern Europe. So, protecting one gateway would be far easier than protecting the whole land. Moreover, the heartland was self-sufficient with most of the resources and wasn't dependent on trade from outside world.

So, Mackinder believed that the one who controls the heartland would be able to control the Rimland and as a result the world-Island, and the one, who rules the world Island, would rule the world. Although this theory made sense at that time (1904), when there was no significant aviation and naval power, it does not make much sense now.

Century Geopolitics of the multipolar world order

To put it succinctly, the unipolar world is characterized by the US' predominant hegemony in a wide variety of spheres, whether exercised directly through unilateral initiatives or indirectly ("Lead From Behind") through its regional and institutional partners. The Multipolar forces in the world are working to replace the US-led international order with

a diversified array of multiple stakeholders in order to bring balance to International Affairs. Importantly, they seek to do this through progressively reforming international institutions such as the UN, IMF, World Bank, and others, as well as creating their own counterparts to some of them like the BRICS New Development Bank or outright forming entirely new and unprecedented organizations like the SCO.

One of the latest proposals has been to broaden the BRICS format through what has now been called the "BRICS-Plus" strategy, which essentially seeks to have each of the five member states encourage multilateral cooperation between each other's respective regional integration organizations. As Russian Valdai Club expert YaroslavLissovolik describes it, this could see Mercosur, the SADC, and the Eurasian Economic Union, SCO, SAARC, and ASEAN all cooperating with one another in changing the world order.

Missile Defense Shield, Prompt Global Strike, and the Naval Race

Thebasis of American control over the world is through economic means as enforced by military ones. In certain cases, though, the US is unable to directly attack its rivals such as Russia and China without suffering unacceptable damage through a nuclear second strike, ergo why Washington is pushing to build anti-missile installations all around Eurasia in order to ring in these Great Powers and diminish their most credible deterrent capability. Complementary with this are the US' space weapons, whether based in this theatre (X37-B and the policy of "Prompt Global Strike") or directed towards it (anti-satellite weapons, whether kinetic such as missiles or non-kinetic like lasers).

Neither the US' missile shields nor its space-related weaponry are sufficient enough for ensuring that the country is defended from submarine-launched ballistic missiles, which form a crucial component of any country's nuclear triad. This explains why there's an ongoing naval race across the world as the US seeks to ensure its dominance in the high seas in the face of rising competition from Russia, China, and others. The global ocean is also important for another reason as well, and this one relates back to the economic basis of American dominance over the world. China depends on the international waterways for the vast majority of its trade, which makes it inordinately vulnerable to any US efforts to block certain chokepoints such as the Strait of Malacca and Suez Canal.

OBOR's Global Reorganization

Understanding the sudden systemic-shaking consequences that any hostile action like this could inflict for China's domestic socio-economic stability, the People's Republic prudently foresaw the need to pioneer ambitious trans-continental trade routes to its crucial European partner, as well as secure the Sea Lines Of Communication (SLOC) along its existing maritime ones in order to safeguard its access to the growing economics of Africa. The latter are exceptionally important nowadays because their growth is expected to allow Beijing to relieve itself of its industrial overproduction so long as it can succeed in building up these marketplaces and stabilizing them. As for the Western Hemisphere, China wants to increase its soft presence here as a means of competing with the US and asymmetrically countering America's moves in the South China Sea.

Altogether, the above stratagem explains the essence of China's One Belt One Road (OBOR) global vision of New Silk Road connectivity, which is designed to transform the world's trading networks so as to facilitate the transition from a unipolar American-led international order to a diversified Multipolar one safeguarded by a host of Great Powers. It also, however, provides the blueprint for how the US will oppose the greatest threat thus far to its worldwide hegemony, as all that Washington has to do is encourage identity-centric Hybrid Wars in the geostrategic transit states along these corridors in order to disrupt, control, or influence them in ways which remove their Multipolar game-changing impact.

Geopolitics and the New World Order

The global elite–leading academics, intellectuals, foreign policy analysts, foundation heads and corporate power brokers, as well as many Western leaders–may largely have forgotten about it. But what we're witnessing now is geography's revenge in the East-West struggle for control of the buffer state of Ukraine, in the post–Arab Spring fracturing of artificial Middle Eastern states into ethnic and sectarian fiefs and in the unprecedented arms race being undertaken by East Asian states as they dispute potentially resource-rich waters. Technology hasn't negated geography it has only made it more precious and claustrophobic.

Whereas the West has come to think about international relations in terms of laws and multinational agreements, most of the rest of the world still thinks in terms of deserts, mountain ranges, all-weather ports and tracts of land and water. The world is back to the maps of elementary school as a starting point for an understanding of history, culture, religion and ethnicity–not to mention power struggles over trade routes and natural resources.

Europe's modern era is supposed to be about the European Union triumphing over the bonds of blood and ethnicity, building a system of laws from Iberia to the Black Sea–and eventually from Lisbon to Moscow. But the E.U.'s long financial crisis has weakened its political influence in Central and Eastern Europe. And while its democratic ideals have been appealing to many in Ukraine, the dictates of geography make it nearly impossible for that nation to reorient itself entirely toward the West.

Russia is still big, and Russia is still autocratic after all it remains a sprawling and insecure land power that has enjoyed no cartographic impediments to invasion from French, Germans, Swedes, Lithuanians and Poles over the course of its history. The southern Crimean Peninsula is still heavily ethnic Russian, and it is the home of Russia's Black Sea fleet, providing Russia's only outlet to the Mediterranean.

In short, Russia will use every geographical and linguistic advantage to weaken Ukraine as a state. Ukraine is simply located too far east, and is too spatially exposed to Russia, for it ever to be in the interests of any government in Moscow–democratic or not–to allow Ukraine's complete alignment with the West.

To live in a world where geography is respected and not ignored is to understand the constraints. Many obstacles simply cannot be overcome. That is why the greatest statesmen work near the edges of what is possible. Geography establishes the broad parameters– only within its bounds doe's human agency have a chance to succeed.

While our foreign policy must be morally based, the analysis behind it must be cold-blooded, with geography as its starting point. In geopolitics, the past never dies and there is no modern world.

6. Geoinformatics

Introduction

Geoinformatics is the integration of remote sensing, Global Navigation Satellite System and Geographic Information System dealing with spatial information. The advent of remote sensing, Global Navigation Satellite System and Geographic Information System has made significant changes in surveying and map making. A basic understanding of these components is crucial for carrying out various types of surveys, navigation, hydrology, disaster management, etc.

Remote sensing

Remote sensing is an integrated discipline encompassing some branches of arts, science and technology of collecting information about the terrestrial objects using camera and sensor system. The field of Remote Sensing and GIS has become exciting with rapidly expanding opportunities. Geoinformatics has three major components namely remote sensing, GIS and GNSS.

Elements of Remote Sensing

1. Energy Source

The primary requirement for remote sensing is to have an energy service, which provides electromagnetic energy to the target of interest. The sun being a major source of energy, radiation and illumination having a sharp power allows capturing reflected light with conventional cameras and films.

2. Radiation and the Atmosphere

The energy is required to illuminate the target. This energy is in the form of Electromagnetic radiation. Electromagnetic radiation is a dynamic form of energy that propagates as wave motion at a velocity in space.

3. Interaction with the target

The interaction of Electromagnetic radiation with the target is important to remote sensing for two main reasons. First, information carried Electromagnetic radiation reflected by the earth's surface is modified while traversing through the atmosphere. Second, the interaction of Electromagnetic radiation with the atmosphere can be used to obtain useful information about the atmosphere itself. The total energy is subjected to modification by the several physical process, scattering, absorption and refraction. Scattering is the re-direction of Electromagnetic radiation by particles suspended in the atmosphere or by large molecules of atmospheric gases. The amount of scattering depends upon the size of the particles and their abundance. The wave length of radiation, depth of the atmosphere through which the energy is travelling. Absorption is the process by which the gas molecules present in the atmosphere strongly absorb the Electromagnetic radiation through the atmosphere in certain spectral bands.

4. Recording of energy by the sensor

After the energy has been scattered by or emitted from the target, we require a sensor (remote not in contact with the target) to collect and record the electromagnetic radiation. A sensor is highly sensitive to all the wave lengths yielding spatially detailed data on absolute brightness. On the basis of the source of electromagnetic energy, the sensor can be classified into two ways. They are active sensor or passive sensor. Active sensor generates and uses its own energy to illuminate the target and records the reflected energy. It operates in the microwave regions of the electromagnetic spectrum. Their wave lengths are longer than 1 mm.

5. Transmission, Reception and Processing

The energy recorded by the sensor has to be transmitted in electronic form, to a receiving and processing station where the data processed into an image. The Image processing methods may be grouped into three functional categories such as Image Restoration, Image Enhancement and Information Extraction.

Image Restoration: Restoration processes are designed to recognize and compensate for errors, noise and geometric distortion introduced into the data during the scanning transmission and recording processes. The objective is to make the image resemble the original scene. Image restoration is relatively simple because the pixels from each band are processed separately.

Image Enhancement: Enhancement is the modification of an image, to alter its impact on viewer. General enhancement distorts the original digital values; therefore enhancement is not done until the restoration processes are completed.

Information extraction: Image restoration and enhancement process utilize computers to provide corrected and improved images for study by human interpreters. The computer makes no decision in these procedures. The human operator must instruct the computer and must evaluate the significance of the extracted information.

6. Interpretation and Analysis

Image interpretation is defined as the act of examining images to identify objects and judge their significance. An interpreter studies remotely sensed data and attempts through logical process to detect, identify, measure and evaluate the significance of environment and cultural object pattern and spatial relationship.

The quality of an image is based on the inherent characteristics of the objects. Further it depends on the following aspects.

- Sensor characteristics
- Season of the year, time of the day when the photo is taken
- Atmospheric effects
- Resolution of the image on scale.
- Image motion etc.

Image interpretation is essential for the efficient and effective use of the data. The elements of image interpretation such as image tone, shape, size, pattern, image texture, shadow and association are helpful to identify the exact target and to analyze.

Classification of remote sensing

On the basis of the sources of electromagnetic energy, the remote sensing can be classified as passive and active remote sensing. In a simple way, we can understand that the passive remote sensing is similar to taking a picture with an ordinary camera where as active remote sensing is analogous to taking picture with camera having built-in flash.

On the basis of the energy source, the active remote sensing generates and uses its own energy to illuminate the target and records the reflected energy whereas the passive remote sensing depend on solar radiation to illuminate the target. On the basis of region of spectrum in which they operate, the active remote sensing operates in the microwave region of the electromagnetic spectrum whereas the passive remote sensing operates in the visible and infrared region of the electromagnetic spectrum. The wave lengths of the active remote sensing are longer than 1 mm whereas the passive remote sensing, the wave length range from 0.4 to 1.0 mm.

Some examples of active sensors are fluorosensor and Synthetic Aperture Radar (SAR). Passive sensors record radiation reflected from the earth's surface. The source of this radiation must come from outside the sensor; in most cases, this is solar energy. Because of this energy requirement, passive solar sensors can only capture data during daylight hours. Active sensors are different from passive sensors. Unlike passive sensors, active sensors require the energy source to come from within the sensor. A laser-beam remote sensing system is an active sensor that sends out a beam of light with a known wavelength and frequency. This beam of light hits the earth and is reflected back to the sensor, which records the time it took for the beam of light to return.

Remote sensing platform

The platform is a stage to mount the camera or sensor to acquire the information about a target under investigation. Based on the altitude above the earth surface, the platform can be classified as Ground borne platform, Air borne platform and Space borne platform.

Ground borne platform

Ground based platforms are used to record detailed information about the surface which is compared with information collected from aircraft or satellite sensors. They are close to the ground. These sensors may be placed on a ladder, scaffolding tall-building, crane etc.

A wide variety of ground based platforms are used in remote sensing. Some of the more common ones are hand held devices, tripods, towers and cranes. Instruments that are ground-based are often used to measure the quantity and quality of light coming from the sun or for close range characterization of objects Permanent ground platforms are typically used

for monitoring atmospheric phenomenon although they are also used for long-term monitoring of terrestrial features.

Air borne platform

Aircrafts are generally used to acquire aerial photographs for photo interpretation and photogrammetric purposes. They are classified into two types. They are

- Low altitude aerial remote sensing
- High altitude aerial remote sensing

Balloon

Balloons are used for remote sensing observation (aerial photography) and nature conservation studies. The first aerial images were acquired with a camera carried aloft by a balloon in 1859. Balloon floats at a constant height of about 30 km.

Drone

Drone is a miniature remotely piloted aircraft. It is designed to fulfill requirements for a low cost platform, with long endurance, moderate payload capacity and capability to operate without a runway or small runway. Drone includes equipment of photography, infrared detection, radar observation and TV surveillance. It uses satellite communication link. An onboard computer controls the payload and stores data from different sensors and instruments. The unique advantage is that it could be accurately located above the area for which data was required and capable to provide both night and day data.

Aircraft

The first known aerial photograph was taken in 1858 by French photographer and balloonist, Gaspar Felix Tournachon, known as "Nadar". In 1855 Special aircraft with cameras and sensors on vibration less platforms are traditionally used to acquire aerial photographs and images of land surface features. While low altitude aerial photography results in large scale images providing detailed information on the terrain, the high altitude smaller scale images offer advantage to cover a larger study area with low spatial resolution.

Space borne platform

The satellites are normally used for the space borne remote sensing. The satellite moves in their orbit. The closed path of a satellite around the earth is called its orbit. These platforms are freely moving in their orbit around the earth and the entire earth or any part of the earth can be covered at specified intervals. The coverage mainly depends on the orbit of the satellite. It is through these space borne platforms, we get the enormous amount of remote sensing data. In space borne remote sensing, sensors are mounted on-board a spacecraft (space shuttle or satellite) orbiting the earth. Space borne remote sensing provides the following advantages:

1. Large area coverage.
2. Frequent and repetitive coverage of an area of interest.
3. Quantitative measurement of ground features using radio metrically calibrated sensors.
4. Semi-automated computerised processing and analysis.
5. Relatively lower cost per unit area of coverage.

Types of satellite orbits

Satellite orbits are designed according to the capacity and objective of the sensors they carry. Depending on their altitude, orientation and rotation relative to the earth satellites can be categorized as

1) Geostationary satellite
2) Polar Orbiting and Sun-Synchronous satellite
3) Spy satellite

Geostationary Satellites

Geostationary Satellite is an equatorial west to east satellite orbiting the earth at an altitude of 35000 km, the altitude at which it makes on revolution in 24 hours. These platforms are covering the same place and give continuous near hemispheric coverage over the same area day and night. These satellites are put in equatorial plane orbiting from west to east. Its coverage is limited to 70°N to 70°S latitudes and one satellite can view one-third globe. These are mainly used for communication and meteorological applications viz. GOES, METEOSAT, INTELSAT, and INSAT satellites. On June 19, 1981 India launched its first geostationary satellite called APPLE. It was an experimental communication satellite launched by the Indian Space Research Organisation (ISRO) with a C-band transponder.

The Ariane Passenger Payload Experiment (APPLE) was ISRO's first indigenous, experimental communication satellite.

Do you know?
India is the only one country which has reached to the mars in its first attempt.

Sun-synchronous satellites

As the satellite orbits the Earth from pole to pole, its east-west position would not change if the Earth did not rotate. However, as seen from the Earth, it seems that the satellite is shifting westward because the Earth is rotating (from west to east) beneath it.

This apparent movement allows the satellite swath to cover a new area with each pass. All the remote sensing resource satellites may be grouped in this category. Few of these satellites are LANDSAT series, SPOT series, IRS series, NOAA SEASAT, TIROS, HCMM, SKYLAB, and SPACE SHUTTLE etc.

Spy satellites

Spy satellites are robotic observational platforms that orbit the Earth in order to image its surface and to record radio signals for military and political purposes. They transmit their data to Earth, where it is interpreted by specialists in centralised, secretive facilities such as the U.S. National Photographic Interpretation Centre in Washington, D.C. Spy satellites have been essential not only to military operations and the formation of national policy but to the verification of arms control treaties such as SALT I, SALT II, etc.

The four basic types of spy satellite are: (1) photo reconnaissance systems that take pictures in visible and infrared light, (2) infrared telescopes designed to detect missile

launches, (3) radars that image sea or land even through cloud cover and in darkness, and (4) signals intelligence (SIGINT) satellites (also termed "ferrets"), which are optimised either for characterising ground-based radar systems or for eavesdropping on communications. Sometimes photo reconnaissance and SIGINT functions are combined in single, massive platforms such as the U.S. Keyhole-series satellites.

Although a number of nations have launched spy satellites, the U.S. and the Soviet Union are responsible for by far the greatest number. The Russian Federation, which inherited most of the Soviet Union's space system after 1991, has been unable to afford the cost of adequately updating its spy satellite network. In contrast, the U.S. has continued to deploy ever-more-sophisticated systems in a steady stream. Thus, the majority of spy satellites in orbit today, including all the most capable units, are U.S.-owned. Early U.S. Spy Satellites: Corona, MIDAS, SAMOS.

Do you know?

The Gaofen 4 is the world's most powerful GEO spy satellite (launched in 2015) which can provide instant coverage of earthquake or typhoon hit areas to support humanitarian relief. It will also allow China to monitor strategic foreign sites such as WMD facilities and naval bases inside its observation box.

Applications of remote sensing

1. Agriculture

The satellites have ability to image individual fields, regions and countries on a frequent revisit cycle. Customers can receive field-based information including crop identification, crop area determination and crop condition monitoring (health and viability). Satellite data are employed in precision agriculture to manage and monitor farming practices at different levels.

2. Forest Management

The forest - fire, sudden deforestation, encroachment of forest- land are recent challenges to the ecologist. It can be easily identified and curbed with the help of remote sensing satellite pictures.

3. Geology

Various fields Remote sensing techniques used in geology are

- Lithological mapping
- Structural mapping
- Geomorphological mapping
- Mineral exploration
- Hydrocarbon exploration
- Sedimentation mapping and monitoring
- Geo-hazard mapping

NASA launches world's lightest satellite designed by 18-year-old Tamil Nadu student.

India once again broke a global space record by launching the world's lightest

satellite weighing a mere 64 grams, called Kalamsat. It was designed and developed not by professional space scientists and engineers, but by 18-year-old Tamil Nadu student RifathSharook and his team. The tiny satellite, named after Abdul Kalam, was flown by a NASA sounding rocket on 22 June, 2017 and Kalamsat was the only Indian payload in the mission. Mission director SrimathyKesan that the total flight time of the rocket was 240 minutes. The satellite, assembled at her T.Nagar residence in Chennai. The satellite was separated from the rocket after spending 125 minutes in the space's micro-gravity environment. Sharook's project, the first to be manufactured via 3D printing, got selected through a competition, 'Cubes in Space', sponsored jointly by NASA and 'I Doodle Learning'. The project aims to take the performance of new technology to space.

4. Oceanography

Satellite remote sensing plays an important role in coastal zone management. There it allows us to locate and regularly monitor various aspects such as bathymetry (the measurement of the depth of water in water bodies), chlorophyll content, suspended sediment concentration, etc.

5. Cartography

Remote sensing aids in extensive surveys that are made from high altitudes to show the urban development, rural development, mountain areas, desserts, etc. which help the cartographers. High-resolution satellite cameras located at altitudes of several hundred kilometers can record details as small as a few meters on the surface of the Earth.

6. Meteorology

The radar system is basically used to collect the weather data. It collects meteorological data from unmanned land/ ocean based Data collection platforms and serves as a communication satellite for rapid exchange of meteorological data among centres and for rapid dissemination of weather forecasts warnings etc, to user agencies.

7. Topography

Topography specifically involves the recording of relief or terrain, the three-dimensional quality of the surface, and the identification of specific landforms. Topographic maps usually portray both natural and manmade features. They show and name works of nature including mountains, valleys, plains, lakes, rivers, and vegetation. They also identify the principal works of man, such as roads, boundaries, transmission lines, and major buildings.

8. Urban Planning

These information systems also offer interpretation of physical (spatial) data with other socio-economic data, and thereby providing an important linkage in the total planning process and making it more effective and meaningful. Digitization of planning base maps has facilitated updating of base maps wherever changes have taken place in terms of land development etc. Superimposition of any two digital maps which are on two different scales is feasible.

Geographic Information System (GIS)

The Geographic information systems have emerged in the past two decades as an essential tool for urban and resource planning and management. It includes the functions of data entry, data display, data management, information retrieval and analysis. While GIS deals with entire geography of the earth including land, ocean and atmosphere, the art, science and technology dealing with the acquisition, storage, processing, production, presentation and dissemination of the earth's information is called the Geoinformatics. It is the popular means of studies in recent decades which cater the real and useful information to the field of Geography, Environmental Studies, Town planning, rural development studies, and Defense and Agricultural promotion.

Generation of the computers

1940 – 1956: First Generation – Vacuum Tubes
1956 – 1963: Second Generation – Transistors
1964 – 1971: Third Generation – Integrated Circuits
1972 – 2010: Fourth Generation – Microprocessors
2010 – Fifth Generation – Artificial Intelligence

Components of GIS

The components of GIS can be broadly classified into five types. They are mentioned below.

A. Hardware

Hardware is Computer on which GIS software runs. Nowadays there are a different ranges of computer, it might be Desktop or server based. ArcGIS Server is server based computer where GIS software runs on network computer or cloud based. For computer to perform well all hardware components must have high capacity. Some of the hardware components are: Motherboard, Hard driver, processor, graphics card, printer and so on. These all component function together to run GIS software smoothly.

B. Software

Next component is GIS software which provides tools to run and edit spatial information. It helps to query, edit, run and display GIS data. It uses RDBMS (Relational Database Management System) to store the data. Few GIS software list: ArcGis, ArcView 3.2, QGIS, SAGA GIS. Software Components: GIS Tools, RDBMS, Query Tools, GUI and Layout.

C. Data

Geographic data and related tabular data can be collected in-house compiled to custom specifications and requirements (or) purchased from a commercial data provider.

A GIS can integrate spatial data with other existing data resources often stored in a corporate data base management System. The data can be broadly classified as

i. Attribute data
ii. Spatial data
iii. Remote sensing data
iv. Global data base.

You will learn in detail about each of the above classification of data in higher studies.

D. People

The GIS technology is used by a huge number of industrialists and agencies to help plan, design, engineer, build and maintain information infrastructures that affects our everyday lives.

E. Methods or Procedures

Methods here refer to well-defined, consistent procedures that are required to produce accurate, reproducible result. A neatly conceived implementation plan and business rules are the models and operating practices are unique to each organization. There is need to properly integrate the sophisticated tool through bringing out well-defined procedures in well documented form into the entire business strategy and operation to make the technology effective. Meta data i.e., (data about the data) is the key for documenting these processes.

Functions of GIS

The functions of GIS describe the steps that have to be taken to implement a GIS. These steps have to be followed in order to obtain a systematic and efficient system. The steps involved are data capture, data storage (GIS Data Models), manipulation and analysis.

Data Capture

The input of data into a GIS can be achieved through many different methods of gathering. For example, aerial photography, scanning, digitizing, GNSS is just a few of the ways a GIS user could obtain data. Digitization: A conversion process which converts paper maps into numerical digits that can be stored in the computer. Digitizing simplifies map data into sets of points, lines or cells that can be stored in the GIS computer. In this stage, digitization is carried out. There are two basic methods of digitization: Manual digitizing & scanning.

Data Storage

Some data is stored such as a map in a drawer, while others, such as digital data, can be as a hardcopy, stored on CD or on your hard drive. Once the data have been digitally compiled, digital map files in the GIS are stored on magnetic or other digital media. Data storage is based on a Generic Data Model that is used to convert map data into a digital form. The two most common types of data models are Raster and Vector. Both types are used to simplify the data shown on a map into a more basic form that can be easily and efficiently stored in the computer.

Data Manipulation

The digital geographical data can be edited, this allows for many attribute to be added, edited, or deleted to the specification of the project. Once data are stored in a GIS, many manipulation options are available to users. These functions are often available in the form of "Toolkits." A toolkit is a set of generic functions that a GIS user can employ to manipulate and analyse geographical data. Toolkits provide processing functions such as data retrieval measuring area and perimeter, overlaying maps, performing map algebra, and reclassifying map data. Data manipulation tools include coordinate change, projections, and edge matching,

which allow a GIS to reconcile irregularities between map layers or adjacent map sheets called Tiles.

Query and Analysis

GIS was used widely in decision making process for the new commission districts. We use population data to help establish an equal representation of population to area for each district. The heart of GIS is the analytical capabilities of the system.

Global Navigation Satellite System (GNSS)

GNSS refers to the collection of the world's global satellite based positioning systems. It includes GPS (United States) GLONASS (Russia) GALILEO (European Union) BEODOU (China) IRNSS (India) QZSS (Japan). GNSS can provide centimeter level accuracy with a low-cost receiver, if an error correction technique is used. GNSS are recognized to be the systems of choice in outdoor environments and, to a great extent, one of the most accurate source of position (and precise timing) information when it is available.

The first satellite navigation system was Transit, a system deployed by the US military in 1960's. Transit's operations were based on the Doppler Effect: the satellites travelled on well-known paths and broadcast their signals on well-known radio frequency. The received frequency will differ slightly from the broadcast frequency because of the movement of the satellite with respect to the receiver. The satellite broad cast signals that contains orbital data (from which the position of the satellite can be calculated) and the precise time, the signals is transmitted. There are multiple constellations of GNSS satellites orbiting the earth. GNSS satellites' orbit situated about 20,000 km above the earth's surface. They are moving very fast, several kilometers per second. The latest generation of GNSS satellites (Block IIF) weight over 1,400 kg.

GNSS system operated in different countries

The following are the Global Navigation satellite Systems:

GPS (United States)

GPS was the first GNSS system. GPS was launched in the late 1970s by the United States Department of Defence. It uses a constellation of 24 satellites, and provides global coverage.

GLONASS (Russia)

The premier Soviet military navigation network was to be comprised of Uragan satellites. At the end of the Cold War, the constellation was unclassified under the name GLONASS -- a Russian abbreviation of Global Navigation Satellite System. Global Navigation Satellite System by Russian Aerospace Defense Forces is a space-based satellite navigation system.

The life style of GNSS satellites 5-7 years and new satellites are to be launched after a specific time interval in order to fill the gap due to ageing satellites. GLONASS proves very

beneficial for Russian territory by 2010. In 2011, restoration of system is improved to enable full global coverage.

GALILEO (European Union)

Galileo is Europe's own global navigation satellite system, providing a highly accurate, guaranteed global positioning service under civilian control. Currently providing Initial Services, Galileo is interoperable with GPS and Glonass, the US and Russian global satellite navigation systems. By offering dual frequency as standard, Galileo is set to deliver real-time positioning accuracy down to the meter range. The Galileo constellation in space will comprise 30 satellites in total. There will be 24 operational satellites, plus 6 spare satellites, circulating in medium Earth orbit on three orbital planes.

BEIDOU (China)

BeiDou Navigation Satellite System (BDS) is a Chinese satellite Navigation system. It consists of two separate satellite constellations. The first BeiDou system is officially called the BeiDou Satellite Navigation Experimental System and also known as BeiDou-1.

On December 27, 2018, Beidou-3 officially began to provide global services. The Beidou-3M/G/I satellites represent the orbital segment of the third phase of the Chinese Beidou navigation system which uses satellites in Medium Earth Orbit and Geosynchronous Orbit and is also known as the Compass Navigation Satellite System.

Japan Aerospace Exploration Agency (QZSS Japan)

QZSS is a regional navigation satellite system that provides service to Japan and the Asia-Oceania region. QZSS (nickname of Michibiki - meaning to 'guide' or 'show the way') QZSS is a Japanese satellite positioning system composed mainly of satellites in quasi-zenith orbits (QZO). However, the term "Quasi-Zenith Satellite (QZS)" can refer to both satellites in QZO and geostationary orbits (GEO). For that reason, the name "QZO satellite" is used when it is necessary to specifically refer to satellites in QZO. Satellite positioning systems use satellite signals to calculate position information. The QZSS is sometimes called the "Japanese GPS."

IRNSS (Indian Regional Navigational Satellite System)

IRNSS is an autonomous regional satellite navigation system being developed by ISRO (Indian Space Research Organization). It is designed to provide geospatial positioning information within the Indian sub-continent. It enables users to map out their location (altitude, longitude and latitude). The objective of developing IRNSS was to cut down India's dependency on foreign navigation satellite systems.

It provides location information service to users in India and the region extending for up to 1,500 km from the Indian boundary. This is the primary service area of IRNSS information service to users in India and the region extending up to 1500 km from Indian boundary.

IRNSS aims to provide the following services:

1. Standard Positioning Service (SPS) for civilian, research & commercial use,

2. Restricted Service (RS) for authorized users. For example in defense, IRNSS is used for ground, aerial and marine navigation, disaster management, mobile phone integration, mapping and visual & voice navigation for drivers, among others.

The battle for the world's fastest supercomputer has a new victor: Summit
According to IBM, Summit is able to achieve 200 peta flops of performance, or 200 quadrillion calculations per second. This power marks a significant gain on Sunway TaihuLight, which performs a still-staggering 87 petaflops. Summit holds more than 10 peta bytes of RAM, and its funding came as part of a $325 million program funded by the United States Department of Energy. Each of Summit's 4,608 nodes holds two IBM Power9 chips that run at 3.1 GHz.

Applications of GNSS

GNSS applications are widely used to get the quick information about a particular field. Some of the commercial applications are Consumers, Transportation, GIS, Machine Control Port Automation, Precision Agriculture, Construction, Marine Mining, Unmanned Vehicles Surveying, Defence, and Aerial Photogrammetry, etc.

Consumer

GNSS technology has been adopted by the consumer market, in an ever-increasing range of products. GNSS receivers are now routinely integrated into smart phones, to support applications that display maps showing the location of and best route to stores and restaurants.

Transportation

In rail transportation, GNSS is used to track the location of locomotives and rail cars, maintenance vehicles and wayside equipment, for display at central monitoring consoles. Knowing the precise location of rail equipment reduces accidents, delays, and operating costs, enhancing safety, track capacity, and customer service. In aviation, GNSS is being used for aircraft navigation from departure, en route, to landing.

Port Automation

Using GNSS, shipping hubs can improve their operating efficiency by tracking the movement and placement of containers about their yards. Many cranes are equipped with GNSS based steering devices that determine the crane's position and keep it travelling in the desired path, improving accuracy and productivity as well as the safety of operators and workers on the ground.

Machine Control

GNSS technology is being integrated into equipment such as bulldozers, excavators, graders, pavers and farm machinery to enhance productivity in the real-time operation of this equipment, and to provide situational awareness information to the equipment operator.

Precision Agriculture

In precision agriculture, GNSS-based applications are used to support farm planning, field mapping, soil sampling, tractor guidance, and crop assessment. More precise application of fertilizers, pesticides and herbicides reduces cost and environmental impact.

Surface Mining

GNSS information is being used to efficiently manage the mining of an ore body and the movement of waste material. GNSS equipment installed on shovels and haul trucks provides position information to a computer-controlled dispatch system to optimally route haul trucks to and from each shovel.

Survey

Using GNSS, it is possible for a single surveyor to accomplish in one day what might have taken a survey crew of three people a week to complete. Determining a new survey position once required measuring distances and bearings from an existing (known) survey point to the new point.

7. Sustainable Development

Introduction

In the last few centuries there has been a drastic change in the lifestyle of man. Agricultural growth, industrialization, urbanization, rapid advancement in science and technology have decreased mortality rates and caused rapid growth of population over the earth. With increase in population there is an increase in the demand for natural resources leading to overuse, of nature and its resources. Nations began to wake up to the fact that the earth's resources are depleting at an alarming rate and that something has to be done to sustain them. This led to develop the world in a sustainable way. Sustainability is supported by four pillars which are cultural vitality, economic health, environmental responsibility and social equity. All nations in the world focus on sustainable development as a major task.

United Nations and Sustainable Development

Sustainability was first featured in the principles adopted by the United Nations Conference on the Human Environment held at Stockholm on 16 June 1972. It was now realized that development needed to be sustainable – it should not only focus on economic and social matters, but also on matters related to the use of natural resources. The United Nations commissioned a group of 22 people from both developed and developing countries to identify long-term environmental strategies for the international community. This World Commission on Environment and Development (WCED), was headed by Gro Harlem Brundtland, then the Prime Minister of Norway. This commission came to be known as the **Brundtland Commission,** which submitted its report, entitled our common future, to the UN in 1987.

The **Brundtland Report** focused on the needs and interests of humans. It was concerned with securing a global equity for future generations by redistributing resources towards poorer nations to encourage their economic growth in order to enable all human beings to achieve their basic needs. The report highlighted the three fundamental components of sustainable development, the environment, the economy, and society, which later became known as **the triple bottom line**.

The 1992 and 2002 Earth Summits held at Rio de Janeiro and Johannesburg were the United Nations Conference on Environment and Development (UNCED), a direct result of the Brundtland Commission. An important achievement of the Rio summit was an agreement on the Climate Change Convention which led to the Kyoto Protocol which you have learned about earlier. The United Nations Conference on Sustainable Development (UNCSD), also known as R**io 2012, Rio+20 or Earth Summit 2012** was the third and recent International conference on sustainable development. It was hosted by Brazil in Rio de Janeiro from 13 to 22 June 2012.

Concept and Goals of Sustainable Development

In 1980 the International Union for the Conservation of Nature introduced the term "sustainable development". Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

A primary goal of sustainable development is to achieve a reasonable and equitably distributed level of economic wellbeing that can be continued for many human generations.

Sustainable Development Goals (SDGs)

In 1992, the UN Conference on Environment and Development published the Earth Charter, which outlined the building of a just, sustainable, and peaceful global society in the 21st century. The action plan was known as 'Agenda 21' for sustainable development.

In September 2015, the United Nations General Assembly formally adopted the "Universal, integrated and transformative" 2030 Agenda for Sustainable Development, a set of 17 Sustainable Development Goals (SDGs). The goals are to be implemented and achieved in every country from the year 2016 to 2030.

Countries adopted a set of goals to end poverty, protect the planet and ensure prosperity for all as part of a new sustainable development agenda. Each goal has specific targets to be achieved over the next 15 years.

For the goals to be reached, everyone needs to do their part: governments, the private sector, civil society and people.

Goal 1: End poverty in all its forms everywhere

One in five people in developing countries still live on less than $1.90 a day, many people risk slipping back into poverty. Economic growth must be inclusive to provide sustainable jobs and promote equality.

Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture

Agriculture, forestry and fisheries can provide nutritious food for all and generate decent incomes, while supporting people-centered rural development and protecting the environment. A profound change of the global food and agriculture system is needed if we are to nourish today's 815 million hungry and the additional 2 billion people expected by 2050.

Goal 3: Ensure healthy lives and promote well-being for all at all ages

Significant strides have been made in increasing life expectancy and reducing some of the common killers associated with child and maternal mortality. Major progress has been made on increasing access to clean water and sanitation, reducing malaria, tuberculosis, polio and the spread of HIV/AIDS.

Goal 4: Ensure inclusive and quality education for all and promote lifelong learning

Major progress has been made towards increasing access to education at all levels and increasing enrolment rates in schools particularly for women and girls. For example, the world has achieved equality in primary education between girls and boys, but few countries have achieved that target at all levels of education.

Goal 5: Achieve gender equality and empower all women and girls

Gender equality is not only a fundamental human right, but a necessary foundation for a peaceful, prosperous and sustainable world.

Goal 6: Ensure access to water and sanitation for all

Clean, accessible water for all is an essential part of the world we want to live in. There is sufficient fresh water on the planet to achieve this. But due to bad economics or poor infrastructure, every year millions of people, most of them children, die from diseases

associated with inadequate water supply, sanitation and hygiene. By 2050, at least one in four people is likely to live in a country affected by chronic or recurring shortages of fresh water.

Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all

Energy is central to nearly every major challenge and opportunity the world faces today. Sustainable energy is opportunity – it transforms lives, economies and the planet.

Goal 8: Promote inclusive and sustainable economic growth, employment and decent work for all

Sustainable economic growth will require societies to create the conditions that allow people to have quality jobs that stimulate the economy while not harming the environment. Job opportunities and decent working conditions are also required for the whole working age population.

Goal 9: Build resilient infrastructure, promote sustainable industrialization and foster innovation

Inclusive and sustainable industrial development is the primary source of income generation, allows for rapid and sustained increases in living standards for all people, and provides the technological solutions to environmentally sound industrialization.

Goal 10: Reduce inequality within and among countries

To reduce inequality, policies should be universal in principle paying attention to the needs of disadvantaged and marginalized populations.

Goal 11: Make cities inclusive, safe, resilient and sustainable

Cities are hubs for ideas, commerce, culture, science, productivity, social development and much more. At their best, cities have enabled people to advance socially and economically Common urban challenges include congestion, lack of funds to provide basic services, a shortage of adequate housing and declining infrastructure.

Goal 12: Ensure sustainable consumption and production patterns

Sustainable consumption and production is about promoting resource and energy efficiency, sustainable infrastructure, and providing access to basic services, green and decent jobs and a better quality of life for all. Its implementation helps to achieve overall development plans, reduce future economic, environmental and social costs, strengthen economic competitiveness and reduce poverty.

Goal 13: Take urgent action to combat climate change and its impacts

Climate change is now affecting every country on every continent. It is disrupting national economies and affecting lives, costing people, communities and countries dearly today and may be even more tomorrow.

Goal 14: Conserve and sustainably use the oceans, seas and marine resources

The world's oceans – their temperature, currents and life – drive global systems that make the earth habitable for humankind. Careful management of this essential global resource is a key feature of a sustainable future.

Goal 15: Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss

Forests cover 30 per cent of the Earth's surface and in addition to providing food security and shelter, forests are key to combating climate change, protecting biodiversity and the homes of the indigenous population. Thirteen million hectares of forests are being lost every year while the persistent degradation of dry lands has led to the desertification of 3.6 billion hectares.

Goal 16: Promote just, peaceful and inclusive societies

This Goal is dedicated to the promotion of peaceful and inclusive societies for sustainable development, the provision of access to justice for all, and building effective, accountable institutions at all levels.

Goal 17: Revitalize the global partnership for sustainable development

A successful sustainable development agenda requires partnerships between governments, the private sector and civil society. These inclusive partnerships built upon principles and values, a shared vision, and shared goals that place people and the planet at the center, are needed at the global, regional, national and local level.

Paris Agreement

To address climate change, countries adopted the Paris Agreement at the COP21 in Paris on 12 December 2015. The Agreement entered into force shortly thereafter, on 4 November 2016. In the agreement, all countries agreed to work to limit global temperature rise to well below 2°C, and given the grave risks, to strive for 1.5°C.

Climate Change and Sustainability

The Earth's climate has changed throughout history. In the last 650,000 years there have been several cycles of glacial and warm periods each lasting thousands or millions of years. Most of these climate changes are attributed to very small variations in earth's orbit that changes the amount of solar energy our planet receives. It is understood that at present the Earth's climate is getting warmer which is referred to as 'Global Warming'. Earth's temperature has gone up about one degree Fahrenheit in the last 100 years. This is a very small change but small changes in earth's temperature can have big effects. Some effects are already happening such as melting of glaciers, rise in the level of oceans, prolonged droughts, excessive rain and floods, etc.

Reasons for Climate change

Burning fossil fuels emits gases into the atmosphere. Burning fossil fuel to provide energy, coupled with the effects of major transportation and deforestation causes a rapid increase in global temperatures. This can change the climate of a place.

Effects of climate change – Scientists had predicted in the past that the result from global climate change are now occurring, loss of sea ice, accelerated sea level rise and longer, more intense heat waves.

1. **Temperatures will continue to rise -** Experts agree that greenhouse gases which trap heat and prevent it from leaving the earth's atmosphere are mostly responsible for the temperature spike.

2. **Frost- free season (and growing season) will lengthen -** it could actually have detrimental effects on the crops we grow. Warmer weather helps pests survive longer which can destroy crops. Rising temperatures are also expected to contribute to a shift in areas which are agriculturally most productive and the crops that grow there.

3. **Changes in precipitation patterns -** The contrast between wet and dry areas will increase globally. In other words, the wet areas will get wetter and the dry areas will get drier.

4. **More droughts and heat waves -** With rising temperatures and shifting rainfall patterns, heat waves and droughts are increasing in frequency and intensity.

5. **Sea level rise -** Scientists have determined that global sea level has been steadily rising since 1900 at a rate of at least 0.1 to 0.25 centimeter per year. Sea level can rise by two different mechanisms with respect to climate change.

6. **Arctic likely to become ice-free -** The Arctic Ocean is expected to become essentially ice free in summer before mid-century.

Response to Climate Change

There are two main responses to climate change.

1. **Mitigation -**Which addresses the root causes of climate change, by reducing greenhouse gas emissions.

2. **Adaptation -** seeks to lower the risks posed by the consequences of climatic changes. Both approaches will be necessary to deal with the global changes that have already been set in motion.

Mitigation measures:

It is important that we learn how to reduce climate change, and put them into practice now, before it is too late.

1. **Cleaner alternative energy sources:** One important way to fight climate change is to reduce our reliance on and usage of fossil fuels, and depend on alternative renewable and greener sources of energy such as wind energy, solar energy, water or hydropower, biomass, and geothermal energy.

2. **Energy saving tips -** we can adopt energy saving tips by investing in more expensive energy-saving appliances like the compact fluorescent light (CFL) bulbs, Air-conditioners, refrigerators etc. Switching off our electrical appliances when not in use.

3. **Green driving tips -** The best strategy to reduce toxic gas emissions is definitely to reduce the use of automobiles. Use public transport, carpooling, use of electricity powered cars or two wheelers can be an alternative.

4. **Reduce - Reuse - Recycle practices -** Reducing, reusing and recycling helps us conserve resources and energy, and reduce pollution and greenhouse gas emissions produced thereby.

5. **Re-forestation -** The cleanest and most efficient remover of carbon dioxide from our atmosphere actually is nothing but green plants and trees. The rate at which we are cutting down our trees and forests to make way for human developments has greatly reduced the earth's ability to remove carbon dioxide from the atmosphere.

6. **Organic farming -** Soils are an important sink for atmospheric carbon dioxide. Nevertheless, deforestation making way for conventional agriculture is increasingly depleting this sink. Sustainable and organic agriculture helps to counteract climate change by restoring soil organic matter content as well as reduce soil erosion and improve soil physical structure. Organic farming uses natural fertilizers and helps maintain crop yields.

Watershed management and its importance

Watershed is a geographical area drained by a stream or a system connecting stream in which water from all over an area flow under gravity to a common drainage channel. A watershed system delivers water through rills, gullies and streams to a larger body of water.

Watershed management is proper utilization of land and water resource for optimum production with minimum hazards to natural resources. It relates to soil and water conservation proper land uses, promote afforestation and sustainable farming practices, conserve farmland and pastureland, maintaining soil fertility, proper management of local water for farming, drainage, construct small dams for flood protection, improving individuals standard of living and thereby promote ecological balance.

Key steps in watershed management

Watershed plans should first identify the characteristics of the watershed and inventory the watershed's natural resources. The first steps in watershed management planning are to:

i. Delineate and map the watershed's boundaries and the smaller drainage basins within the watershed.

ii. Map and prepare an Inventory of resources in the watershed.

iii. Prepare an Inventory and map the natural and manmade drainage systems in the watershed.

iv. Prepare an Inventory and map land use and land cover.

v. Prepare a soil map of the watershed.

vi. Identify areas of erosion, including stream banks and construction sites.
vii. Identify the quality of water resources in the watershed as a baseline; and

viii. Prepare a map and Inventory of pollution sources, both point sources (such as industrial discharge pipes) and nonpoint sources (such as municipal storm water systems, failing septic systems, illicit discharges).

Watershed Management in India:

Watershed development project in the country has been sponsored and implemented by Government of India from early 1970s onwards. Various watershed development programs like Drought Prone Area Program (DPAP), Desert Development Program (DDP), and river Valley Project (RVP), National Watershed Development Project for Rain-fed Areas (NWDPRA) and Integrated Wasteland Development Program (IWDP) were launched subsequently in various hydro-ecological regions. Entire watershed development programs primarily focused on soil conservation and rainwater harvesting during 1980s and before.

Rain Water Harvesting (RWH)

Millions of people throughout the world do not have access to clean water for domestic purposes. In many parts of the world conventional piped water is either absent, unreliable or too expensive. One of the biggest challenges of the 21st century is to overcome the growing water shortage. Rain Water Harvesting (RWH) has thus regained its importance as a valuable alternative or supplementary water resource, along with more conventional water supply technologies. Water shortages can be relieved if rain water harvesting is practiced more widely.

Need for Rain Water Harvesting

i) To overcome the situation of inadequacy of water supply.
ii) The most economical way to increase the ground water table.
iii) To replenish the sub soil of the urban area covered with pavements.
iv) To recharge the underground water table at places where the availability of rain water is higher or to overcome the situation of water logging.
v) Rain water harvesting also improves the quality of underground water through a process called dilution.
vi) To get water for irrigation of greenbelts, farms, gardens, etc.

Rain Water Harvesting Techniques

There are two main techniques of rain water harvestings:

1) Storage of rain water on surface for future use.

2) Recharge to ground water.

The storage of rain water on surface is a traditional technique and structures used were underground tanks, ponds, check dams, weirs, etc. Recharge of ground water is a new concept of rain water harvesting and the structures generally used are: Recharge pits filled with boulders, gravels, and coarse-sand, Wells, Trenches etc.

Environmental Impact Assessment

Every country strives to progress ahead. One aspect of progress is economic development through manufacturing and trading. Every country builds industries which provide employment, serve the consumers' needs and help to generate revenue. The dominant pattern of development that humankind has followed in recent decades has brought about large scale changes in the earth systems. We are already feeling the impact of these changes upon our health, livelihoods and safety. On the other hand, the fruits of development are not equally distributed. Some countries and some communities have a high standard of living, while others are not able to meet their basic needs.

Development projects in the past were undertaken without any consideration about their environmental consequences. As a result rivers and lakes have been polluted, air pollution has reached threatening levels and pilling of domestic and industrial wastes has resulted in land degradation. Industrialization and economic growth provided material comforts but at the same time deteriorated the quality of life.

The Objective of EIA

(i) To identify, predict and evaluate the economic, environmental and social impact of development activities
(ii) To provide information on the environmental consequences for decision making and
(iii) To promote environmentally sound and sustainable development through the identification of appropriate alternatives and mitigation measures.

Steps in the EIA Process

The eight steps of the EIA process:

i) **Screening:** First Stage of EIA, which determines whether the proposed project, requires an EIA and if it does, then the level of assessment required.

ii) **Scoping:** This stage identifies the key impacts that should be investigated. This stage also defines the time limit of the study.

iii) **Impact analysis:** This stage of EIA identifies and predicts the likely environmental and social impact of the proposed project and evaluates the significance.

iv) **Mitigation:** This step in EIA recommends the actions to reduce and avoid the potential adverse environmental consequences of development activities.

v) **Reporting:** This stage presents the result of EIA in a form of a report to the decision-making body and other interested parties.

vi) **Review of EIA:** It examines the adequacy and effectiveness of the EIA report and provides the information necessary for decision –making.

vii) **Decision-making:** It decides whether the project is rejected, approved or needs further change.

viii) **Post monitoring:** This stage comes into play once the project is commissioned. It checks to ensure that the impacts of the project do not exceed the legal standards and implementation of the mitigation measures are in the manner as described in the EIA report.

Environmental Impact Assessment in India

EIA was introduced in India in 1978, with respect to river valley projects. On 27 January 1994, the Union Ministry of Environment and Forests (MEF), Government of India, under the Environmental (Protection) Act 1986, made Environmental Clearance (EC) mandatory for expansion or modernisation or for setting up new projects listed in Schedule 1 of the notification. Since then there have been 12 amendments made in the EIA notification of 1994. Both central and state authorities share the responsibility of EIA's development and management. EIA is now mandatory for 30 categories of projects, and these projects get Environmental Clearance (EC) only after the EIA requirements are fulfilled.

The MoEF recently notified new EIA legislation in September 2006. The notification makes it mandatory for all projects to get environment clearance from the central government under the following categories:

1) Industries
2) Mining
3) Thermal power plants
4) River valley projects
5) Infrastructure and CRZ (Coastal Regulation Zone)
6) Nuclear power projects.

However, the new legislation has entrusted the decision of clearing projects on the state government depending on the size/ capacity of the project. EIA appraises the environmental health and social implications of planned developmental projects. It thus links environment with development. The goal of EIA is to ensure environmentally safe and sustainable development.

Measures for Promotion of Sustainable Development

As discussed earlier, the United Nations 17 Sustainable Development Goals and 169 targets are part of the 2030 Agenda for Sustainable Development adopted by 193 Member States at the UN General Assembly Summit in September 2015, and which came into effect on 1 January 2016. These goals are the result of international consultations that brought national

governments and millions of citizens from across the globe together to negotiate and adopt the global path to sustainable development for the next 15 year.

The SDGs and targets will stimulate action in the following critically important areas: poverty, hunger, education, health and well-being, education, gender equality, water and sanitation, energy, economic growth and decent work, infrastructure, industry and innovation, reducing inequalities, sustainable cities, consumption and production, climate action, ecosystems, peace and justice, and partnership. This agenda recognises that it is not enough to focus on economic growth alone but in creating more equal societies, and a safer and more prosperous planet.

Which countries are achieving the UN Sustainable Development Goals fastest?

The ultimate aim of the Sustainable Development Goals is to end poverty, protect the planet and ensure prosperity for everyone. Each goal has specific targets that need to be met by 2030.

So how close are countries to meeting them? To find out, non-profit organization Bertelsmann Stiftung and the UN Sustainable Development Solutions Network have created a prototype index that measures their performance.

Sweden leads the list, followed by Denmark and Finland. Among the G7 countries, only Germany and France can be found among the top ten performers. The United States ranks 42nd on the Index, while Russia and China rank 62nd and 71st respectively. Also in the top 20 were Canada (13th), the Czech Republic (15th) and Slovenia (17th). Asia-Pacific's top performers Japan, Singapore and Australia rounded off the list at 18th, 19th and 20th, respectively. The SDG Index underlines that despite achieving high percentages, all countries still have their work cut out to close the remaining gap.

India ranks 116 out of 157 nations on a global index that assesses the performance of countries towards achieving the ambitious sustainable development goals (SDGs).

Unit -7
International Economics

"Economies are linked internationally through trade in goods and through financial markets".
- Dornbusch, Fischer and Startz

Introduction:

Thesubject'InternationalEconomics' evolved from a simple theory of international trade was formulated to answer a few basic questions. The subjectfirst originated in Western Europe on account of increasing importance of foreign trade in that part of the world. The contributions of classical economists like Adam Smith, DavidRicardo, F.W. Taussig, Haberler, J.S.Mill and Bela Balassa shaped the subject matter of International Economics.

International Economics studies the entire range of international economic transactions that consist of not only trade in goods and services but also capital flows, technology transfer, the rate of exchange, balance of payments, and issues relating to tariffs, protection, free trade, investment flows, role of fiscal and monetary policies pursued by individual countries.

Meaning of International Economics

International Economics is that branch of economics which is concerned with the exchange of goods and services between two or more countries. Hence the subject matter is mainly related to foreign trade.

In other words, International Economics is a specialized field of Economics which deals with the economic interdependence among countries and studies the effects of such interdependence and the factors that affect it.

Subject Matter of International Economics

The subject matter of International Economics includes large number of segments which are classified into the following parts.

1. **Pure Theory of Trade**

This component explains the causes for foreign trade, composition, direction and volume of trade, determination of the terms of trade and exchange rate, issues related to balance of trade and balance of payments.

2. **Policy Issues**

Under this part, policy issues such as free trade vs. protection, methods of regulating trade, capital and technology flows, use of taxation, subsidies and dumping, exchange control and convertibility, foreign aid, external borrowings and foreign direct

investment, measures of correcting disequilibrium in the balance of payments etc are covered.

3. International Cartels and Trade Blocs

This part deals with the economic integration in the form of international cartels, customs unions, monetary unions, trade blocs, economic unions and the like.It also discusses the operation of Multinational Corporations (MNCs).

4. International Financial and Trade Regulatory Institutions

The financial institutions like International Monetary Fund IMF, IBRD, WTO etc which influence international economic transactions and relations shall also be the part of international economics.

Meaning of Trade

Trade is one of the powerful forces of economic integration. The term 'trade' means exchange of goods, wares or merchandise among people.

Trade is of two types. They are:

a. Internal Trade and
b. International Trade.

Internal Trade

It refers to the exchange of goods and services within the political and geographical boundaries of a nation. It is a trade within a country. This is also known as 'domestic trade' or 'home trade' or 'intra-regional trade'.

International Trade

It refers to the trade or exchange of goods and services between two or more countries. In other words, it is a trade among different countries or trade across political boundaries. It is also called as 'external trade' or 'foreign trade' or 'inter-regional trade'.

Differences between 'Internal Trade' and 'International Trade'

S.No	Internal Trade	International Trade
1.	Trade takes place between different individuals and firms within the same nation.	Trade takes place between different individuals and firms in different countries.
2.	Labour and capital move freely from one region to another.	Labour and capital do not move easily from one nation to another.
3.	There will be free flow of goods and	Goods and services do not easily move from

	services since there are no restrictions.	one country to another since there are a number of restrictions like tariff and quota.
4.	There is only on common currency.	There are different currencies.
5.	The physical and geographical conditions of a country are more or less similar.	There are differences in phusical and geopraphical conditions of the two countries.
6.	Trade and financial regulations are more or less the same.	Trade and financial regulations such as interest rate, trade laws differ between countries.
7.	There is no difference in political affiliations, customs and habits of the people and government policies.	Difference are pronounced in political affiliations, habits and customs of the people and government policies.

Theories of International Trade
The Classical Theory of International Trade

Introduction

Adam Smith (1776) developed the theory of absolute cost advantage. But itwas David Ricardo who formulated as an explicit and precise theory, namely, the theory of comparative cost advantage, which was later improved and refined by the economists like J.S Mill, Cairnes, Bastable,Taussig and Haberler. We shall first discuss the Adam Smith's theory of absolute cost advantage.

Classical Trade Theories		
Mercantilism (pre - 16th century)	**Free Trade theories**	**Free Trade refined**
• Takes an us-versus - them view of trade • Other country's gain is our country's loss	• Absolute Advantage (Adam Smith,1776) • Comparative Advantage (DavidRicardo, 1817) • Specializationof productionand free flow of goods benefit alltrading partner's economies	• Factor - proportions (Heckscher -Ohlin, 1919) • International Product life cycle (Ray Vernon, 1966)

Adam Smith's Theory of Absolute Cost Advantage

Adam Smith argued that all nations can be benefitted when there is free trade and specialization in terms of their absolute cost advantage.

The Theory

According to Adam Smith, the basis of international trade was absolute cost advantage. Trade between two countries would be mutually beneficial when one country produces a commodity at an absolute cost advantage over the other country which in turn produces another commodity at an absolute cost advantage over the first country.

Assumptions

1. There are two countries and two commodities (2 x 2 model).
2. Labour is the only factor of production.
3. Labour units are homogeneous.
4. The cost or price of a commodity is measured by the amount of labour required to produce it.
5. There is no transport cost.

Illustration

Absolute cost advantage theory can be illustrated with the help of the following example.

Absolute Cost Advantage

Country	**India**	**China**
	Output per unit of labour	
Wheat	20	8
Cloths	6	14

From the illustration, it is clear that India has an absolute advantage in the production of wheat over China and China has an absolute advantage in the production of cloth over India. Therefore, India should specialize in the production of wheat and import cloth from China. China should specialize in the productionof cloth and import wheat from India. This kind of trade would be mutually beneficial to both India and China.

Ricardo's Theory of Comparative Cost Advantage

David Ricardo, the British economist in his 'Principles of Political Economy and Taxation' published in 1817, formulated a systematic theory called 'Comparative Cost Theory'. Later it was refined by J.S Mill, Marshall, Taussig and others.

Ricardo demonstrates that the basis of trade is the comparative cost difference. In other words, trade can take place even if the absolute cost difference is absent but there is comparative cost difference.

According to Ricardo, a country can gain from trade when it produces at relatively lower costs. Even when a country enjoys absolute advantage in both goods, the country would specialize in the production and export of those goods which are relatively more

advantageous. Similarly, even when a country has absolute disadvantage in production of both goods, the country would specialize in production and export of the commodity in which it is relatively less disadvantageous.

Assumptions

1. There are only two nations and two commodities (2x2 model)
2. Labour is the only element of cost of production.
3. All laborers are of equal efficiency.
4. Labour is perfectly mobile within the country but perfectly immobile between countries.
5. Production is subject to the law of constant returns.
6. Foreign trade is free from all barriers.
7. No change in technology.
8. No transport cost.
9. Perfect competition.
10. Full employment.
11. No government intervention.

Illustration

Ricardo's theory of comparative cost can be explained with a hypothetical example of production costs of cloth and wheat in America and India.

Comparative Cost Advantage
(Units of labour required to produce one unit)

Country	Cloth	Wheat	Domestic Exchange Ratios
America	100	120	1 wheat = 1.2 cloth
India	90	80	1 wheat = 0.88 cloth

It is evident from the examplethat India has an absolute advantagein production of both cloth and wheat.However, India should concentrate on the production of wheat in which she enjoys a comparative cost advantage. (80/120 < 90/100). For America the comparative cost disadvantage is lesser in cloth production. Hence America will specialize in the production of cloth and export it to India in exchange for wheat. (Any exchange ratio between 0.88 units and 1.2 units of cloth against one unit of wheat represents gain for both the nations). With trade, India can get 1 unit of cloth and 1 unit of wheat by using its 160 labour units. In the absence of trade, for getting this benefit, India will have to use 170 units of labour. America also gains from this trade. With trade, America can get 1 unit of cloth and one unit of wheat by using its 200 units of labour. Otherwise, America will have to use 220 units of labour for getting 1 unit of cloth and 1 unit of wheat.

Criticisms

1. Labour cost is a small portion of the total cost. Hence, theory based on labour cost is unrealistic.
2. Laborers in different countries are not equal in efficiency.

Modern Theory of International Trade
Introduction

The modern theory of international trade was developed by Swedish economist Eli Heckscher and his student Bertil Ohlin in 1919. This model was based on the Ricardian theory of international trade. This theory says that the basis forinternational trade is the difference in factor endowments. It is otherwise called as '**Factor Endowment Theory'.**

Factor endowment model

- Developed by Heckscher and Ohlin
- Countries with a relative factor abundance can specialize and trade
- Abundance of skilled labour → specialization → export → exchange for goods are services produced by countries with abundance of unskilled labour
- **Exports** embody the **abundant factor**
- **Imports** embody the scarce factor
- Assumes a high degree of factor mobility

The Theory

The classical theory argued that the basis for foreign trade was comparative cost difference and it considered only labour factor. But the modern theory of international trade explains the causes for such comparative cost difference. This theory attributes international differences in comparative costs to:

i. Difference in the endowments of factors of production between countries, and
ii. Differences in the factor proportions required in production.

Assumptions

1. There are two countries, two commodities and two factors. (2x2x2 model)
2. Countries differ in factor endowments.
3. Commodities are categorized in terms of factor intensity.
4. Countries use same production technology.
5. Countries have identical demand conditions.
6. There is perfect competition in both product and factor markets in both the countries.

Heckscher – Ohlin (H-O) theorem

H-O theorem	Factor	Exports
" A capital abundant country will export the capital – intensive good, while the labor – abundant country will export the labor – intensive good	Factor proportions model which links exports and imports to factor endowments.	A country exports those commodities produced with relatively large quantities of the country's relatively abundant factor.

Explanation

According to Heckscher - Ohlin, "a capital-abundant country will export the capital – intensive goods, while the labour-abundant country will export the labour-intensive goods". A factor is regarded abundant or scare in relation to the quantum of other factors. A country can be regarded as richly endowed with capital only if the ratio of capital to other factors is higher than other countries.

Illustration

Particulars	India	America
Supply of labour	50	24
Supply of capital	40	30
Capital – Labour Ratio	40/50= 0.8	30/24=1.25

In the above example, even though India has more capital in absolute terms, America is more richly endowed with capital because the ratio of capital in India is 0.8 which is less than that in America where it is 1.25. The following diagram illustrates the pattern of word trade.

Capital abundant country	$\frac{Export\ of\ capital - intensive\ goods}{Exports\ of\ labour - intensive goods}$	Labour abundant country

Limitations

1. Factor endowment of a country may change over time.
2. The efficiency of the same factor (say labour) may differ in the two countries. For example, America may be labour scarce in terms of number of workers. But in terms of efficiency, the total labour may be larger.

9Comparison of Classical Theory and Modern Theory

S.No	Classical Theory of International Trade	Modern Theory of International Trade
1.	The classical theory explains the phenomenon of international trade	The modern theory explains the phenomenon of international trade on the

	on the basis of labour theory of value.	basis of general theory of value.
2.	It present a one factor (labour) model	It presents a multi – factor (labour and capital) model.
3.	It attributes the differences in the comparative costs to differences in the productive efficiency of workers in the two countries.	It attributes the differences in comparative costs to the differences in factor endowments in the two countries.

Gains from International Trade

International trade helps a country to export its surplus goods to other countries and secure a better market for it. Similarly, international trade helps a country to import the goods which cannot be produced at all or can be produced at a higher cost. The gains from international trade may be categorized under four heads.

I. Efficient Production

International trade enables each participatory country to specialize in the production of goods in which it hasabsolute or comparative advantages. International specialization offers the following gains.

1. Better utilization of resources.
2. Concentration in the production of goods in which it has a comparative advantage.
3. Saving in time.
4. Perfection of skills in production.
5. Improvement in the techniques of production.
6. Increased production.
7. Higher standard of living in the trading countries.

II. Equalization of Prices between Countries

International trade may help to equalize prices in all the trading countries.

1. Prices of goods are equalized between the countries (However, in reality it has not happened).
2. The difference is only with regard to the cost of transportation.
3. Prices of factors of production are also equalized (However, in reality it has not happened).

II. Equitable Distribution of Scarce Materials

International trade may help the trading countries to have equitable distribution of scarce resources.

V. General Advantages of International Trade

1. Availability of variety of goods for consumption.
2. Generation of more employment opportunities.
3. Industrialization of backward nations.
4. Improvement in relationship among countries (However, in reality it has not happened).
5. Division of labour and specialization.
6. Expansion in transport facilities.

Terms of Trade

The gains from international trade depend upon the terms of trade which refers to the ratio of export prices to import prices.

Meaning

It is the rate at which the goods of one country are exchanged for goods of another country. It is expressed as the relation between export prices and import prices. Terms of trade improves when average price of exports is higher than average price of imports.

Types of Terms of Trade

The different concepts of terms of trade were classified by Gerald M.Meier into the following three categories:

Terms of Trade related to the Ratio of Exchange between Commodities

Terms of Trade		
Net Barter Terms of Trade - Taussig	Gross Barter Terms of Trade - Taussig	Income Terms of Trade – G.s. Dorrance

1. Net Barter Terms of Trade

This type was developed by Taussig in 1927.The ratio between the prices of exports and of imports is called the "net barter terms of trade'. It is named by Viner as the 'commodity terms of trade'.

It is expressed as:

$$T_n = (P_x / P_m) \times 100$$

Where,

T_n = Net Barter Terms of Trade
P_x = Index number of export prices
P_m = Index number of import prices

This is used to measure the gain from international trade. If 'Tn' is greater than 100, then it is a favorable terms of trade which will mean that for a rupee of export, more of imports can be received by a country.

2. Gross Barter Terms of Trade

This was developed by Taussig in 1927 as an improvement over the net terms of trade. It is an index of relationship between total physical quantity of imports and the total physical quantity of exports.

$$T_q = (Q_m/Q_x) \times 100$$

If for a given quantity of export, more quantity of import can be consumed by a country, then one can say that terms of trade are favorable.

3. Income Terms of Trade

The income terms of trade was given by G.S.Dorrance in 1948. It is the index of the value of exports divided by the price index for imports multiplied by quantity index of experts. In other words, it is the net barter terms of trade of a country multiplied by its exports-volume index.

$$T_y = (P_x/P_m)Q_x$$

Where,

P_x = Price index of exports
P_m = Price index of imports
Q_x = Quantity index of exports

Terms of Trade related to the Interchange between Productive Resources

1. The Single Factoral Terms of Trade

Viner has devised another concept called ''the single factoral terms of trade'' as an improvement upon the commodity terms of trade. It represents the ratio of export-price index to the import-price index adjusted for changes in the productivity of a country's factors in the production of exports. Symbolically, it can be stated as

$$Tf = (Px / Pm) Fx$$

Where, T_f stands for single factoral terms of trade index. F_x stands for productivity in exports (which is measured as the index of cost in terms of quantity of factors of production used per unit of export).

2. Double Factoral Terms of Trade

Viner constructed another index called ''Double factoral terms of Trade''. It is expressed as

$$Tf_f = (P_x / P_m) (F_x / F_m)$$

Which takes into account the productivity in country's exports, as well as the productivity of foreign factors? Here, Fmrepresents import index (which is measured as the index of cost in terms of quantity of factors of production employed per unit of imports).

Balance of Trade Vs Balance of Payments

Balance of Trade and Balance of Payments are two different concepts in the subject of international trade.

Balance of Trade (BOT)

Balance of Trade (BOT) refers to the total value of a country's exports of commodities and total value of imports of commodities. Only export and import of commodities are included in the statement of Balance of Trade of a country. Movements of goods (export and imports of commodities) are also known as 'visible trade', because the movement of commodities between countries can be seen by eyes and felt by hands and can be verified physically by custom authorities of a country.

Favorable BOT

When the total value of commodity exports of a country exceeds the total value of commodity imports of that country, it is said that the country has a 'favorable' balance of trade.

Unfavorable BOT

If total value of commodity exports of a country is less than the total value of commodity imports of that country, that country is said to have an 'unfavorable' balance of trade.

Balance of Payments (BOP)

BoP is a systematic record of a country's economic and financial transactions with the rest of the world over a period of time.

When a payment is received from a foreign country, it is a credit transaction while a payment to a foreign country is a debit transaction. The principal items shown on the credit side are exports of goods and services, transfer receipts in the form of gift etc., from foreigners,

borrowing from abroad, foreign direct investment and official sale of reserve assets including gold to foreign countries and international agencies.

The principal items on the debit side include imports of goods and services, transfer payments to foreigners, lending to foreign countries, investments by residents in foreign countries and official purchase of reserve assets or gold from foreign countries and international agencies.

Components of BOPs

The credit and debit items are shown vertically in the BOP account of a country. Horizontally, they are divided into three categories, i.e.

a. The current account,
b. The capital account and
c. The official settlements account or official reserve assets account.

a. The Current Account: It includes all international trade transactionsof goods and services, international service transactions (i.e. tourism, transportation and royalty fees) and international unilateral transfers (i.e. gifts and foreign aid).

b. The Capital Account: Financial transactions consisting of direct investment and purchases of interest- bearing financial instruments, non- interest bearing demand deposits and gold fall under the capital account.

c. The Official Reserve Assets Account: Official reserve transactions consist of movements of international reserves by governments and official agencies to accommodate imbalances arising from the current and capital accounts. The official reserve assets of a country include its gold stock, holdings of its convertible foreign currencies and Special Drawing Rights (SDRs) and its net position in the International Monetary Fund (IMF).

Credit (Receipts – Debit (Payments) = Balance [Deficit (-), Surplus (+)]

Deficit if Debit > Credit

Balance of Payments Disequilibrium

The BoP is said to be balanced when the receipts (R) and payments (P) are just equal, i.e,

Favorable BoP

When receipts exceed payments, the BoP is said to be favorable. That is,

R / P > 1.

Types BOP Disequilibrium:

There are three main types of BOP Disequilibrium, which are discussed below.

i. Cyclical Disequilibrium,
ii. Secular Disequilibrium,
iii. Structural Disequilibrium.

i. **Cyclical Disequilibrium:** Cyclical disequilibrium occurs because of two reasons. First, two countries may be passing through different phases of business cycle. Secondly, the elasticities of demand may differ between countries.

ii. **Secular Disequilibrium:** The secular or long-run disequilibrium in BOP occurs because of long-run and deep seated changes in an economy as it advances from one stage of growth to another. In the initial stages of development, domestic investment exceeds domestic savings and imports exceed exports, as it happens in India since 1951.

iii. **Structural Disequilibrium:** Structural changes in the economy may also causebalance of payments disequilibrium. Such structural changes include development of alternative sources of supply, development of better substitutes, exhaustion of productive resources or changes in transport routes and costs.

Causes for BoP Disequilibrium

The following are the major causes producing disequilibrium in the balance of payments of a country.

1. **Cyclical Fluctuation:** Cyclical disequilibrium in different countries is caused by their cyclical fluctuations, their phases and magnitude. World trade shrinks during depression while trade flourishes during prosperity

2. **Structural Changes:** Structural disequilibrium is caused by the structural changes brought by huge development and investment programmes in the developing economies. Such economies may have high propensity to import for want of capital for rapid industrialization, while export may not be boosted up to that extent.

3. **Development Expenditure:** Development disequilibrium is caused by rapid economic development which results in income and price effects. The less developed countries in the early stage of development are not self sufficient. Income, savings and investment are abysmally low. They depend upon developed countries for import of commodities, capital and technology. Export potential is low and import intensity is high. So the LDCs suffer from adverse BoP

4. **Consumerism:** Balance of payments position of a country is adversely affected by a huge increase in consumption. This increases the need for imports and decreases the capacity to export.

5. **Demonstration Effect:** Deficit in the balance of payments of developing countries is also caused by demonstration effect which influences the people in UDCs to imitate western styled goods. This will raise the propensity to import causing adverse balance of payments. This is good for the developed countries.

6. **Borrowing:** International borrowing and investment may cause a deficit in the balance of payments. When the international borrowing is heavy, a country's balance of payments will be adverse since it repays loans with interest. Servicing of debt is a huge burden. That is why the UDCs are forced to borrow more.

7. **Technological Backwardness:** Due to technological backwardness, the people (Indians) are unable to use the energy (Solar) available with them. As a result they import huge petroleum products from foreign countries, increasing the trade deficit. 8. Global Politics: The rich countries (Eg. USA) need to sell their weapons to promote their economy and generate employment. Hence, wars between countries (for example Iran and Irag, Pakistan and India) are stimulated In order to win the wars, the poor countries are forced to buy the weapons from weapon – rich countries, usingtheir export earnings and creating trade deficit. Thus UDCs are trapped forever.

Measures to Correct BOP Disequilibrium

There are a number of measures available for correcting the balance of payments disequilibrium. They are divided into two broad groups, namely, (i) automatic correction and (ii) deliberate measures.

I. Automatic Correction

If the market forces of demand and supply are allowed to play freely, equilibrium will be automatically restored in course of time. Under the free exchange rate system, the automatic adjustments of the balance of payments can take place through changes in the variables like price, interest, income and capital flows.

1. Price Adjustments

As a result of foreign exchange outflow from a deficit country to a surplus country, there will be a fall in the money supply in the deficit country and increase in the money supply in the surplus country. This will result in rise in the price in thesurplus country which will encourage imports and discourage exports. Fall in prices in the deficit country will encourage exports and discourage imports, leading to restoration of BoP equilibrium.

2. Interest Rate Adjustments

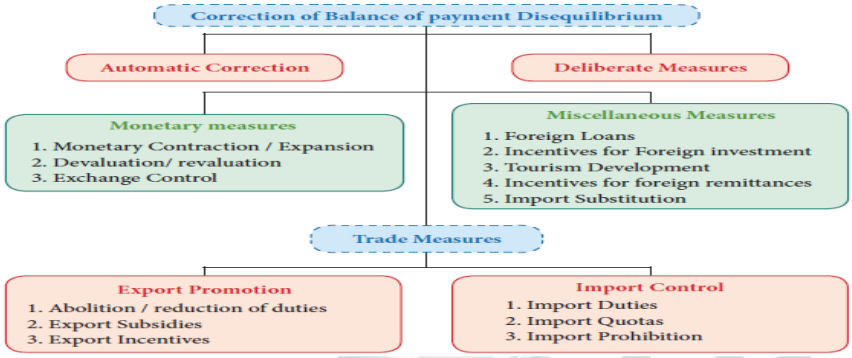
The contraction or expansion of money supply resulting from the BoP deficit or surplus leads to a rise or fall in the interest rates. A rise in interest rate in theto withdraw their funds from abroad and invest in their home country. The opposite happens in the surplus country.

3. Income Adjustments

A nation with payments surplus will experience rising income which will increase imports and thereafter equilibrium is restored in Balance of Payments.

4. Capital Flows

Changes in the interest rate consequent to the BoP disequilibrium will encourage capital flows from the surplus nations to deficit nations helping restoration of the BoP equilibrium.



II. Deliberate Measures

The deliberate measures may be broadly grouped into (a) monetary measures (b) trade measures and (c) miscellaneous measures.

a. Monetary Measures

1. Monetary Contraction

High domestic price level is responsible for high imports and low exports. In order to control inflation, the central monetary authority controls credit. As a result, the prices come down and exports increase. This will help to correct adverse BoP. However, if credit is controlled, investment will decline, production will go down, prices will increase. This is the cause of confusion between government and RBI in India in 2010s.

2. Devaluation

Devaluation means deliberate reduction of the official rate at which domestic currency is exchanged for another currency. In other words, devaluation refers to a reduction in the external value of a currency in the terms of other currencies. For instance, instead of 70 ₹ per US$, making ₹ 80 per US$. A country with fundamental disequilibrium in the balance of payments may devalue its currency in order to stimulate its exports and discourage imports to correct the disequilibrium. Devaluation makes exports cheaper and imports dearer. That means making Indian good cheaper for foreigners and foreign goods costlier for Indians.

3. Exchange Control

Exchange control means the state intervention in the forex market. It is a popular method employed to influence the balance of payments position of a country. Under exchange control, the government or central bank assumes complete control over the foreign exchange reserves and earning of the country. The recipients of foreign exchange, like exporters, are required to surrender foreign exchange to the government / central bank in exchange for domestic currency. By virtue of its control over the use of foreign exchange, the government can control imports. Does it happen in India? Too much of imports control would invite more and more smuggled goods. Smuggling of gold into Indian airports regularly happens, as per the reports in the media.

III. Trade Measures

Trade measures include measures to promote exports and to reduce imports.

1. Export Promotion

Exports may be encouraged by i).reducing or abolishing export duties, ii). providing export subsidy, iii).encouraging export production by giving monetary, fiscal, physical and institutional incentives. (Then local people and domestic industries would suffer)

2. Import Control

Imports may be controlled by i).imposing or enhancing import duties, ii).restricting imports through import quotas, iii).licensing and even prohibiting altogether the import of certain non- essential items. But this would encourage smuggling.

IV. Miscellaneous Measures

In addition to the measures mentioned above, there are a number of other measures that can help make the balance of payments position more favorable, like foreign loans, encouraging foreign investment in the home country, development of tourism to attract foreign tourists, providing incentives to enhance inward remittances and import substitution.

Exchange Rate

Meaning of Foreign Exchange (FOREX)

FOREX refers to foreign currencies. The mechanism through which payments are effected between two countries having different currency systems is called FOREX system . It covers methods of payment, rules and regulations of payment and the institutions facilitating such payments.

Definition of FOREX

"FOREX is the system or process of converting one national currency into another, and of transferring money from one country to another".

Rate of Exchange

The transactions in the exchange market are carried out at exchange rates. It is the external value of domestic currency. Thus, exchange rate may be defined as the price paid in the home currency (say ` 75) for a unit of foreign currency (say 1 US $). It can be quoted in two ways:

1. One unit of foreign money (1 USD) to so many units of the domestic currency (`); or
2. A certain number of units of foreign currency (USD)to one unit of domestic money (` 1)

For instance:

1 U.S Dollar = ` 70 , or ` 1 = U.S.1.42 cents

Definition of Equilibrium Exchange Rate

"The equilibrium exchange rate is that rate, which over a certain period of time, keeps the balance of payments in equilibrium".

- RagnerNurkse

Determination of Equilibrium Exchange Rate

The equilibrium rate of exchange is determined in the foreign exchange market in accordance with the general theory of value, i.e., by the interaction of the forces of demand and supply. Thus, the rate of exchange is determined at the point where demand for forex is equal to the supply of forex.

In the above diagram, Y axis represents exchange rate, that is, value of rupee in terms of dollars. X axis represents demand and supply of forex. E is the point of equilibrium where DD intersects SS. The exchange rate is P2.

Types of Exchange Rate Systems

Broadly, there are two major exchange rate systems, namely, (1) fixed (or pegged) exchange rate system and (2) flexible (or floating) exchange rate system. Managed Floating Exchange Rate system also prevails in some countries (like India).

1. Fixed Exchange Rates

Countries following the fixed exchange rate (also known as stable exchange rate and pegged exchange rate) system agree to keep their currencies at a fixed rate as determined by the Government. Under the gold standard, the value of currencies was fixed in terms of gold.

2. Flexible Exchange Rates

Under the flexible exchange rate (also known as floating exchange rate) system, exchange rates are freely determined in an open market by market forces of demand and supply.

Types of Exchange Rates

Exchange rates are also in the form of (a) Nominal exchange rate (b) Real exchange rate (c) Nominal Effective Exchange Rate (NEER) and (d) Real Effective Exchange Rate (REER)

If 1 US Dollar = ₹ 75,Nominal exchange rate = 75/1 = 75.
This is the bilateral nominal exchange rate.

$$\text{Real Exchange rate} = \frac{eP_f}{P}$$

P = Price levels in India
Pf = Price levels in abroad (say US)
e = nominal exchange rate.
If a pen costs ₹ 50 in India and it costs 5 USD in the US,

$$\text{Real Exchange Rate} = \frac{75 X 5}{50} = 7.5$$

If real exchange rate is equal to 1, the currencies are at purchasing power parity.

It the price of the pen in US is 0.66 USD, then the real exchange rate $\frac{0.66X75}{50}$ then it could be said that the USD and Indian rupee are at purchasing power parity.

NEER and REER are not explained here.

Interested students and teachers can search for them.

Determinants of Exchange Rates

Exchange rates are determined by numerous factors and they are related to the trading relationship between two countries.

1. Differentials in Inflation

Inflation and exchange rates are inversely related. A country with a consistently lower inflation rate exhibits a rising currency value, as its purchasing power increases relative to other currencies.

2. Differentials in Interest Rates

There is a high degree of correlation between interest rates, inflation and exchange rates. Central banks can influence over both inflation and exchange rates by manipulating interest rates. Higher interest rates attract foreign capital and cause the exchange rate to rise and vice versa.

3. Current Account Deficits

A deficit in the current account implies excess of payments over receipts. The country resorts to borrowing capital from foreign sources to make up the deficit. Excess demand for foreign currency lowers a country's exchange rate.

Public Debt

Large public debts are driving out foreign investors, because it leads to inflation. As a result, exchange rate will be lower.

Terms of Trade

A country's terms of trade also determines the exchange rate. If the price of a country's exports rises by a greater rate than that of its imports, its terms of trade will improve. Favorable terms of trade imply greater demand for the country's exports and thus BoP becomes favorable.

Political and Economic Stability

If a nation's political climate is stable and economic performance is good, its currency value will be appreciated by attracting more foreign capital.

Recession

Interest rates are low during the recession phase. This will decrease inflow of foreign capital. As a result, a currency will be depreciated against other currencies, thereby lowering the exchange rate.

Speculation

If a country's currency value is expected to rise, investors will demand more of that currency in order to make a profit in the near future. This results in appreciation of the exchange rate. Beside the above determinants, relative dominance in the global politics and the power to announce economic sanctions over other countries also determine exchange rates.

Foreign Direct Investment (FDI) and Trade

FDI is an important factor in global economy. Foreign trade and FDI are closely related. In developing countries like India, FDI in the natural resource sector, including plantations,

increases trade volume. Foreign production by FDI is useful to substitute foreign trade. FDI is also influenced by the income generated from the trade and regional integration schemes.

FDI is helpful to accelerate the economic growth by facilitating essential imports needed for carrying out development programmes like capital goods, technical know-how, raw materials and other inputs and even scarce consumer goods.

When the export earnings of a country are not sufficient to finance for imports, FDI may be required to fill the trade gap.

FDI is encouraged by the factors such as foreign exchange shortage, desire to create employment and acceleration of the pace of economic development. Many developing countries strongly prefer foreign investment to imports. However, the real impact of FDI on different sections of an economy (say India) may differ. It could be a boon for some as well as bane for others. This may be discussed in the class – room. Large demand for USD, generated by IMF and World Bank policies (FUND – BANK POLICIES), help the USD to gain value continuously. This is one of the hidden agenda of Fund – Bank policies.

Meaning of FDI

FDI means an investment in a foreign country that involves some degree ofcontrol and participation in management. It corresponds to the investment made by a multinational enterprise in a foreign country. It is different from portfolio investment, which is primarily motivated by short term profit and it does not seek management control.

Foreign Portfolio Investment (FPI)means the entry of funds into a nation where foreigners deposit money in a nation's bank or make purchase in the stock and bond markets, sometimes for speculation. FPI is part of capital account of BoP.

Objectives of FDI

FDI has the following objectives.

1. Sales Expansion
2. Acquisition of resources
3. Diversification
4. Minimization of competitive risk.

Foreign Institutional Investment (FII) is an investment in hedge funds, insurance companies, pension funds and mutual funds. Foreign institutional investment is a common term in the financial sector of India. For example, a mutual fund in the United States can make investment in an India-based company.

Advantages of FDI

Foreign investment mostly takes the form of direct investment. Hence, we deal here with the foreign direct investment.

The important advantages of foreign direct investment are the following:

1. FDI may help to increase the investment level and thereby the income and employment in the host country.
2. Direct foreign investment may facilitate transfer of technology to the recipient country.
3. FDI may also bring revenue to the government of host country when it taxes profits of foreign firms or gets royalties from concession agreements.
4. A part of profit from direct foreign investment may be ploughed back into the expansion, modernization or development of related industries.
5. It may kindle a managerial revolution in the recipient country through professional management and sophisticated management techniques.
6. Foreign capital may enable the country to increase its exports and reduce import requirements. And thereby ease BoP disequilibrium.
7. Foreign investment may also help increase competition and break domestic monopolies.
8. If FDI adds more value to output in the recipient country than the return on capital from foreign investment, then the social returns are greater than the private returns on foreign investment.
9. By bringing capital and foreign exchange FDI may help in filling the savings gap and the foreign exchange gap in order to achieve the goal of national economic development.
10. Foreign investments may stimulate domestic enterprise to invest in ancillary industries in collaboration with foreign enterprises.
11. Lastly, FDI flowing into a developing country may also encourage its entrepreneurs to invest in the other LDCs. Firms in India have started investing in Nepal, Uganda, Ethiopia and Kenya and other LDCs while they are still borrowing from abroad. Larger FDI to India comes from a small country (Mauritius).

Disadvantages of FDI

The following criticisms are leveled against foreign direct investment.

1. Private foreign capital tends to flow to the high profit areas rather than to the priority sectors.
2. The technologies brought in by the foreign investor may not be appropriate to the consumption needs, size of the domestic market, resource availabilities, stage of development of the economy, etc.
3. Foreign investment, sometimes, have unfavorable effect on the Balance of Payments of a country because when the drain of foreign exchange by way of royalty, dividend, etc. is more than the investment made by the foreign concerns.
4. Foreign capital sometimes interferes in the national politics.
5. Foreign investors sometimes engage in unfair and unethical trade practices.
6. Foreign investment in some cases leads to the destruction or weakening of small and medium enterprises.

7. Sometimes foreign investment can result in the dangerous situation of minimizing / eliminating competition and the creation of monopolies or oligopolistic structures.
8. Often, there are several costs associated with encouraging foreign investment.

FDI in India

The early 1990s witnessed reforms in the economic policy. This helped to open up Indian markets to FDI. FDI in India has increased over the years. In India, FDI has been advantageous in terms of free flow of capital, improved technology, management expertise and access to international markets.

The major sectors benefited from FDI in India are:

i. financial sector (banking and non-banking)
ii. insurance
iii. telecommunication
iv. hospitality and tourism
v. pharmaceuticals and
vi. software and information technology.

FDI is not permitted in the industrial sectors like

i. Arms and ammunition
ii. atomic energy,
iii. railways,
iv. coal and lignite and
v. mining of iron, manganese, chrome, gypsum, sulphur, gold, diamonds, copper etc.,

FDI inflow in India has increased from $97 million in 1990-91 to $5,535 million in 2004-2005. It amounted to $32,955 million in 2011-2012. UNCTAD's World Investment Report 2018 reveals that FDI to India declined to $40 billion in 2017 from $44 billion in 2016.

CHAPTER – 10

Environmental Economics

"Environmental problems are really social problems…They beginwith the people as the cause and end with people as victims".
–Sir Edmund Hillary

Introduction

Environmental economics (EE) is the study of interactions between human economic activity and the natural environment. EE is the subset of economics that is concerned with the efficient allocation of environmental resources. The environment provides both a direct value as well as raw material intended for economic activity, thus making the environment and the economy interdependent.

EE takes into consideration issues such as the conservation and valuation of natural resources, pollution control, waste management and recycling. Since resources – whether human, natural, or monetary –are finite, these public policies are most effective only when they achieve the maximum possible benefit in the most efficient way.

The key objective of EE is to identify those particular tools or policy alternatives that will move the market towards the most efficient allocation of natural resources.

Meaning of Environment

The term environment has been derived from a French word "Environia" means to surround. Environment means "all the conditions, circumstances, and influences surrounding and affecting the development of an organism or group of organisms". It also means that the complex of physical, chemical and biotic factors that act upon an organism or an ecological community ultimately determine its form and survival.

Meaning of Environmental Economics

It is a different branch of economics that recognizes the value of both the environment and economic activity and makes choices based on those values. The goal is to balance the economic activity and the environmental impacts by taking into account all the costs and benefits. In short, Environmental Economics is an area of economics that studies the financial impact of environmental issues and policies.

Environmental Economics involves theoretical and empirical studies of the economic effects of national or local environmental policies around the world.

Eco System

An ecosystem includes all living things (plants, animals and organisms) in a given area, interacting with each other, and also with their non-living environments (weather, earth, sun,

soil, climate, atmosphere). Ecosystems are the foundations of the Biosphere and they determine the health of the entire earth system.

Linkage between Economy and Environment

Man's life is interconnected with various other living and non-living things. The life also depends on social, political, ethical, philosophical and other aspects of economic system. In fact, the life of human beings is shaped by his living environment. The relationship between the economy and the environment is generally explained in the form of a "Material Balance Model'' developed by AlenKneese and R.V. Ayres. The model considers the total economic process as a physically balanced flow between inputs and outputs. Inputs are bestowed with physical property of energy which is received from the environment. The interdependence of economics and environment is given in the figure10.1 and flow diagram

The first law of thermodynamics, i.e. the law of conservation of matter and energy, emphasizes that in any production system "what goes in must come out". This is known as the Material Balance Approach or Material Balance Principle. The material flow diagram implies that mass inputs must equal mass outputs for every process. Moreover, all resources extracted from the environment eventually become unwanted wastes and pollutants. Production of output by firms from inputs resulting in discharge of solid, liquid and gaseous wastes. Similarly, waste results from consumption activities by households. In short, material and energy are drawn from environment, used for production and consumption activities and returned back to the environment as wastes. In its simple form the Material Balance Approach can be put in form equation.

$$M = G - R_C - R_P + R^r_P + R^r_c = R^d_c + R^d_c$$

Material and Energy Inflow from Natural World (M)	=	Economic Activities of Goods and Service Production (G) -Consumption and Production Residual Discharges from Consumption and Production activities (R_C+R_P) + Recycles from Production and Consumption (R^r_P + R^r_C)	=	Final Residual Discharge from Production and Consumption into Natural World (R^d_C+ R^d_C)

Is it alright? Environment is the supplier of all forms of resources like renewable and non-renewable, and it is also acting as a sink for cleaning up of wastes. Households and firms are connected to environment, and they are interconnected too. Households and firms depend on nature for resources. Both households and firms send out residuals of consumption and production respectively to nature. Nature has the power to assimilate all forms of waste. But this power is conditional. There is a limit for everything. The earth has reached the saturation point and it is unable to cleanup several forms of wastes. Remember, the earth can also non-cooperate.

Environmental Goods

Environmental goods are typically non-market goods, including clear air, clean water, landscape, green transport infrastructure (footpaths, cycle ways, greenways, etc.), public parks, urban parks, rivers, mountains, forests, and beaches. Concerns with environmental goods focus on the effects that the exploitation of ecological systems have on the economy, the well-being of humans and other species, and on the environment.

Environmental Quality

Environmental quality is a set of properties and characteristics of the environment either generalized or local, as they impinge on human beings and other organisms. It is a measure of the condition of an environment relative to the requirements of one or more species and to any human need. Environmental quality has been continuously declining due to capitalistic mode of functioning.

Environment is a pure public good that can be consumed simultaneously by everyone and from which no one can be excluded. A pure public good is one for which consumption is non-revival and from which it is impossible to exclude a consumer. Pure public goods pose a free-rider problem. As a result, resources are depleted. The contribution of the nature to GDP as well as depletion of natural resources are not accounted in the present system of National Income Enumeration.

Externalities and the environment

Introduction

In Environmental Economics, one of the most important market failures is caused by negative externalities arising from production and consumption of goods and services. Externalities are third party effects arising from production and consumption of goods and services for which no appropriate compensation is paid. Externalities occur outside of the market i.e. they affect people not directly involved in the production and consumption of a good or service. They are also known as spill-over effects.

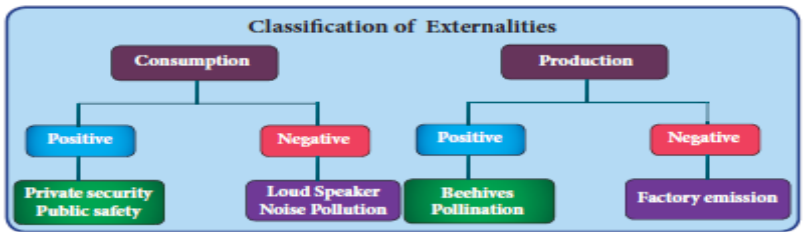
Meaning of Externalities

Externalities refer to external effects or spillover effects resulting from the act of production or consumption on the third parties. Externalities arise due to interdependence between economic units.

Definitions

Externality may be defined as "the cost or benefit imposed by the consumption and production activities of the individuals on the rest of the society not directly involved in these activity and towards which no payment is made".

The externalities arise from both production and consumption activities and their impact could be beneficial or adverse. Beneficial externalities are called "positive externalities" and adverse ones are called "negative externalities".



Positive Consumption Externality

When some residents of a locality hire a private security agency to patrol their area, the other residents of the area also benefit from better security without bearing cost.

Negative Consumption Externality

A person smoking cigarette gets maygives satisfaction to that person, but this act causes hardship (dissatisfaction) to the non-smokers who are driven to passive smoking.

Positive Production Externality

The ideal location for beehives is orchards (first growing fields). While bees make honey, they also help in the pollination of apple blossoms. The benefits accrue to both producers (honey as well as apple). This is called 'reciprocal untraded interdependency.

Suppose training is given for the workers in a company. If those trained workers leave the company to join some other company, the later company gets the benefit of skilled workers without incurring the cost of training.

Negative Production Externality

The emissions and effluents of a factory cause air and water pollution.
Water becomes contaminated and unfit for drinking e.g. Tanneries. The innocent community bears the external cost for which it is not compensated.

Pollution

Meaning

Pollution is the introduction of contaminants into the natural environment that causes adverse change, in the form of killing of life, toxicity of environment, damage to ecosystem and aesthetics of our surrounding.

Types of Pollution

1. Air pollution
2. Water pollution
3. Noise pollution
4. Land pollution

Air Pollution

Definition

"Air pollution is the presence of any solid, liquid, or gaseous substance in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment".

-The Air (Prevention and Control of Pollution) Act, 1981

Types of Air pollution

- **Indoor Air Pollution:** It refers to toxiccontaminants that we encounter in ourdaily lives in our homes, schools andworkplaces. For example, cooking andheating with solid fuels on open firesor traditional stoves results in highlevels of indoor air pollution.

- **Outdoor Air Pollution:** It refers toambient air. The common sources ofoutdoor air pollution are caused bycombustion processes from motorvehicles, solid fuel burning andindustry.

Causes of Air Pollution

1. Vehicle exhaust smoke: Vehicles smokehappens to release high amounts ofCarbon monoxide. Millions of vehiclesare operated every day in cities, eachone leaving behind its own carbonfootprint on the environment.

2. Fossil fuel based power plants:Fossil fuels also present a wider scaleproblem when they are burned forenergy in power plants. Chemicals likesulfur dioxide are released during theburning process, which travel straightinto the atmosphere. These types ofpollutants react with water moleculesto yield something known as acid rain.

3. Exhaust from Industrial Plants and Factories: Heavy machineries located inside big factories and industrial plants also emit pollutants into the air.

4. Construction and Agricultural activities: Potential impacts arising from the construction debris would include dust particles and gaseous emissions from the construction sites. Likewise, using of ammonia for agriculture is a frequent byproduct that happens to be one of the most dangerous gases affecting air.

5. Natural Causes: Earth is one of the biggest polluters itself, through volcanoes, forest fires, and dust storms. They are nature-borne events that dump massive amounts of air pollution into the atmosphere.

6. Household activities: Household activities like cooking, heating and lighting, use of various forms of mosquito repellents, pesticides and chemicals for cleaning at home and use of artificial fragrances are some of the sources that contribute to air pollution.

Effects of Air Pollution

1. Respiratory and heart problems: It creates several respiratory and heart ailments along with cancer. Children are highly vulnerable and exposed to air pollutants and commonly suffer from pneumonia and asthma.

2. Global warming: Increasing temperature in the atmosphere leads to global warming and thereby to increase sea level rise and melting of polar icebergs, displacement and loss of habitat.

3. Acid rain: Harmful gases like nitrogen oxides and sulfur oxides are released into the atmosphere during the burning of fossil fuels. Acid rain causes great damage to human beings, animals and crops.

4. Eutrophication: Eutrophication is a condition where high amount of nitrogen present in some pollutants which adversely affects fish, plants and animal species.

5. Effect on Wildlife: Toxic chemical present in the air can force wildlife species to move to new place and change their habitat.

6. Depletion of Ozone layer: Ozone exists in earth's atmosphere and is responsible for protecting humans from harmful ultraviolet (UV) rays. Earth's ozone layer is depleting due to presence of chlorofluorocarbons and hydro chlorofluorocarbons in the atmosphere.

7. Human Health: Outdoor air pollution is a major cause of death and disease globally. The health effects range from increased hospital admissions and emergency room visits, to increased risk of premature death. An estimated 4.2 billion premature deaths globally are linked to ambient air pollution.

Every day about 93% of theworld's children under the age of 15 (1.8 billion children) breath polluted airthat puts their health and development at serious risk – WHO

Remedial measures to control Air Pollution

1. Establishment of industries away from the towns and cities
2. Increasing the length of the Chimneys in industries

3. Growing more plants and trees
4. Use of non-conventional fuels like Biogas, CNG and LPG.
5. Use of Mass Transit System (Public Transport)

Water Pollution

Definition

"The introduction (directly or indirectly) of substances or energy into the marine environment (including estuaries) results in deleterious effects to living resources, hazards to human health, hindrance to marine activities.

- United Nations, 1971

Types of Water Pollution

i. **Surface water pollution:** Surface water includes natural water found on the earth's surface, like rivers, lakes, lagoons and oceans. Hazardous substances coming into contact with this surface water, dissolving or mixing physically with the water can be called surface water pollution.

ii. **Groundwater pollution:** Groundwater contamination occurs when man-made products such as gasoline, oil and chemicals get into the ground water. In addition, untreated waste from septic tanks, toxic chemicals from underground storage tanks and leaky landfills contaminate groundwater.

iii. **Microbiological pollution:** In many communities around the world, people drink untreated water (straight from a pond,river or stream). Sometimes there is natural pollution caused by micro-organism like viruses and bacteria. This natural pollution causes both aquatic and human illness.

iv. **Oxygen depletion pollution:**When oxygen levels in the water are depleted, relatively harmless aerobic micro-organisms die and anaerobic micro-organisms begin to thrive. Some anaerobic micro-organisms are harmful to people, animals and the environment as they produce harmful toxins such as ammonia and sulfides.

Causes of Water Pollution

Water pollution is caused due to several reasons. Here are the few major causes of water pollution:

1. Discharge of sewage and waste water:

Sewage, garbage and liquid waste of households, agricultural runoff and effluents from factories are discharged into lakes and rivers. These wastes contain harmful chemicals and toxins which make the water poisonous for aquatic animals and plants.

2. Dumping of solid wastes:

The dumping of solid wastes and litters in water bodies cause huge problems.

3. Discharge of industrial sastes: Industrial waste contains pollutants like asbestos, lead, mercury, grease oil and petrochemicals, which are extremely harmful to both people and environment.

4. Oil Spill: Sea water gets polluted due to oil spilled from ships and tankers while travelling. The spilled oil does not dissolve in water and forms a thick sludge polluting the water.

5. Acid rain: Acid rain is pollution of water caused by air pollution. When the acidic particles caused by air pollution in the atmosphere mix with water vapor, it results in acid rain.

6. Global warming: Due to global warming, there is an increase in water temperature as a result aquatic plants and animals are affected.

7. Eutrophication: Eutrophication is an increased level of nutrients in water bodies. This results in bloom of algae in water. It also depletes the oxygen in water which negatively affects fish and other aquatic animal population.

Effects of Water Pollution

Water pollution adversely affects the health and life of man, animals and plants alike. Polluted water is also harmful for agriculture as it adversely affects the crops and the soil fertility. Pollution of sea water damages the oceanic life. The effects can be catastrophic, depending on the kind of chemicals, concentrations of the pollutants. The effects of water pollution are varied and depend on what chemicals are dumped and in which locations. Many water bodies near urban areas are highly polluted. This is the result of both garbage dumped by individuals and dangerous chemicals legally or illegally dumped by manufacturing industries, health centers and markets.

i. **Death of aquatic animals:** The main problem caused by water pollution is that it kills organisms that depend on these water bodies. Dead fish, crabs, birds and sea gulls, dolphins, and many other animals often wind up on beaches, killed by pollutants in their habitat.

ii. **Disruption of food-chains:** Pollution disrupts the natural food chain as well. Pollutants such as lead and cadmium are eaten by tiny animals. Later, these animals are consumed by fish and the food chain continues disrupted at all higher levels.

iii. **Diseases:** The discharge of untreated and under-treated effluent contributes to severe ecological degradation. The indiscriminate human activities such as open defecation, solid waste dumping, discharge of drainage water are responsible for the pathogenic bacteria water-borne diseases like Hepatitis-A, Typhoid, Malaria, Dysentery, Jaundice, Dengue fever, Viral fever and Worm infections.

iv. **Destruction of Ecosystems:** Ecosystems can be severely destroyed by water pollution. Many areas are now being affected by careless human pollution, and this pollution is coming back to hurt humans in many ways.

Remedial measures to control Water Pollution

1. Comprehensive water management plan.
2. Construction of proper storm drains and settling ponds.
3. Maintenance of drain line.
4. Effluent and sewage treatment plant.
5. Regular monitoring of water and waste water.
6. Stringent actions towards illegal dumping of waste into the water bodies.

Noise Pollution
Definition

Noise pollution is unwanted or excessive sound that can have deleterious effects on human health and environmental quality. Noise pollution is commonly generated by many factories. It also comes from highway, railway and airplane traffic and from outdoor construction activities.

-Jerry A. Nathanson and Richard E. Berg, 2018

Types of Noise Pollution

i. Atmospheric Noise: Atmosphericnoise or static is caused by lightingdischarges in thunderstorms andother natural electrical disturbancesoccurring in the atmosphere.

ii. Industrial Noise: Industrial noiserefers to noise that is created in thefactories. Sound becomes noise itbecomes unwanted. Heavy industrieslike ship building, iron and steelhave long been associated with NoiseInduced Hearing Loss (NIHL).

iii. Man made Noise: The main sources ofman-made noise pollution are ships,aircraft, seismic exploration, marineconstruction, drilling and motor boats.

Causes of Noise Pollution

i. Poor urban planning: Improper urbanplanning will cause more nuisancesamong the city travelers.

ii. Sounds from motor vehicles: Soundsfrom motor vehicles can causetemporary hearing loss.

iii. Crackers: Enormous Crackers are usedduring some occasions. Such activitiescreate a very louder noise to the level ofharming the public. Sometimes, theymay even cause deafness to childrenand aged.

iv. Factory machinery: The industrialnoise caused by continuous operationof mills, machines and pneumaticdrills, is unbearable nuisance to theworkers.

Effects of Noise Pollution

a. Hearing Loss: Chronic exposure to noise may cause noise-induced hearing loss. Older people are exposed to significant occupational noise and thereby reduced hearing sensitivity.

b. Damage Physiological and Psychological health: Unwanted noise can damage physiological and psychological health. For example, annoyance and aggression, hypertension, and high stress levels.

c. Cardiovascular effects: High noise levels can contribute to cardiovascular problems and exposure to blood pressure.

d. Detrimental effect on animals and aquatic life: Noise can have a detrimental effect on animals, increasing the risk of death.

e. Effects on wildlife and aquatic animals: It creates hormone imbalance, chronic stress, panic and escape behavior and injury.

Remedial measures to control Noise Pollution

1. Use of noise barriers
2. Newer roadway for surface transport
3. Traffic control
4. Regulating times for heavy vehicles
5. Installations of noise barriers in the work place
6. Regulation of Loudspeakers

Land Pollution
Definition

The land pollution is defined as, "the degradation of land because of the disposal of waste on the land". Any substance (solid, liquid or gaseous) that is discharged, emitted or deposited in the environment in such a way that it alters the environment causes land pollution

-Protection of the Environment Operations Act 1997

Types of Land Pollution

i. Solid waste: It includes all kinds of rubbish like paper, plastic containers, bottles, cans, food, used cars, broken electronic goods, municipal waste and hospital waste.

ii. Pesticides and Fertilizers: Many farming activities engage in the application of fertilizers, pesticides and insecticides for higher crop yield which pollute land.

iii. Deforestation: Humans depend on trees for many things including life. Trees absorb carbon dioxide from the air and release Oxygen, which is needed for life. Forest helps replenish soils and help retain nutrients being washed away. Deforestation is led to land pollution.

Causes of Land Pollution

i. **Deforestation and soil erosion:**

Deforestation carried out to create dry lands is one of the major concerns. Land that is once converted into a dry or barren land, can never be made fertile again, whatever the magnitude of measures to convert it.

ii. Agricultural activities:

With growing human and pet animal population, demand for food has increased considerably. Farmers often use highly toxic fertilizers and pesticides to get rid off insects, fungi and bacteria from their crops. However the overuse of these chemicals, results in contamination and poisoning of land.

iii. **Mining activities:** During extraction and mining activities, several land spaces are created beneath the surface.

iv. **Landfills:** Each household produces tones of garbage each year due to changing economic lifestyle of the people. Garbage like plastic, paper, cloth, wood and hospital waste get accumulated. Items that cannot be recycled become a part of the landfills that cause land pollution.

v. **Industrialization:** Due to increasing consumerism more industries were developed which led to deforestation. Research and development paved the way for modern fertilizers and chemicals that were highly toxic and led to soil contamination.

vi. **Construction activities:** Due to urbanization, large amount of construction activities are taking place. This has resulted in large waste articles like wood, metal, bricks, plastic. These are dumped at the outskirts of urban areas that lead to land pollution.

vii. **Nuclear waste:** The leftover radioactive materials, harmful and toxic chemicals affect human health. They are dumped beneath the earth to avoid any casualty.

Effects of Land Pollution

1. **Soil pollution:** Soil pollution is another form of land pollution, where the upper layer of the soil is damaged. This is caused by the overuse of chemical fertilizers, and pesticides. This leads to loss of fertile land. Pesticides kill not only pests and also human beings.

2. **Health Impact:** The land when contaminated with toxic chemicals and pesticides lead to problem of skin cancer and human respiratory system. The toxic chemicals can reach our body through foods and vegetables.

3. **Cause for Air pollution:** Landfills and waste dumping lead to air pollution. The abnormal toxic substances spread in the atmosphere cause transmit respiratory diseases among the masses.

4. **Effect on wildlife:** The animal kingdom has suffered mostly in the past decades. They face a serious threat with regards to loss of habitat and natural environment. The constant human activity on land is leaving move farther away. Sometimes several species are pushed to the verge of extinction or disappear due to no conducive environment.

Remedial measures to control Land Pollution

1. Making people aware about the concept of a Reduce, Recycle and Reuse
2. Buying biodegradable products
3. Minimizing the usage of pesticides
4. Shifting cultivation 5. Disposing unwanted garbage properly either by burning or by burying under the soil.
5. Minimizing the usage of plastics.

Global Warming

Global warming is the current increase in temperature of the Earth's surface (both land and water) as well as its atmosphere. Average temperatures around the world have risen by 0.75^{o}C (1.4^{o}F) over the last 100 years. About two thirds of this increase has occurred since 1975. Carbon dioxide, methane, Chlorofluoro Carbon, nitrous oxides are the green house gases warming the earth's surface. So it is also called green house effect. The CO2 is the most important of the green house gases contributing to 50% of global warming. The burning of fossil fuel, and other biomass, deforestation result in CO2. In the past, when the Earth experienced increases in temperature it was the result of natural causes but today it is being caused by human activities.

Global warming adversely affects agriculture, horticulture and eco system. Reduced rainfall, higher temperature and increased pest/weed growth hamper farming. Threats to health arise due to increase in disease carrying vectors such as mosquitoes resulting in malaria, dengue fever, encephalitis and yellow fever.

An increase in the global average surface air temperature of such magnitude will bring about alarming changes in rainfall patterns and other climatic conditions, resulting in serious ecological disequilibrium.

Climate Change

The climate change refers to seasonal changes over a long period with respect to the growing accumulation of greenhouse gases in the atmosphere. Recent studies have shown that human activities since the beginning of the industrial revolution have contributed to an increase in the concentration of carbon dioxide in the atmosphere by as much as 40%, from about 280 parts per million in the pre-industrial period, to 402 parts per million in 2016, which in turn has led to global warming.

Several parts of the world have already experienced the warming of coastal waters, high temperatures, a marked change in rainfall patterns, and an increased intensity and frequency of storms. Sea levels and temperatures are expected to be rising.

Acid Rain

Acid rain is one of the consequences of air pollution. It occurs when emissions from factories, cars or heating boilers contact with the water in the atmosphere. These emissions contain nitrogen oxides, sulphur dioxide and sulphur trioxide which when mixed with water becomes sulfurous acid, nitric acid and sulfuric acid. This process also occurs by nature through volcanic eruptions. It can have harmful effects on plants, aquatic animals and infrastructure.

e-Wastes

Electronic waste which is commonly referred as “e-waste” is the new byproduct of the Info Tech society. It is a physical waste in the form of old discarded, end of life electronics. It includes a broad and growing range of electronic devices from large household appliances such as refrigerators, air conditioners, cellular phones, computers and other electronic goods". Similarly, e-waste can be defined as the result when consumer, business and household devices are disposed or sent for re-cycling (example, television, computers, audio-equipments, VCR, DVD, telephone, Fax, Xerox machines, wireless devices, video games, other household electronic equipments).

Solid Waste

Solid Waste is basically discharge of useless and unwarranted materials as a result of human activity. Most commonly, they are composed of solids, semisolids or liquids. Solid wastes consist of the discards of households, hospital refuse, dead animals, debris from construction site, ashes, agricultural wastes and industrial wastes etc. When waste is not removed from the streets nd public places in time it poses severe public-health and hygiene hazards.

Sustainable Development
Meaning

Sustainable development is concernedwith the welfare of not only presentgeneration but also future generation. Itaims at not only satisfying the luxury wantsof the upper class i.e. rich but also the basicnecessities of the poor like food, sanitation,health care, education etc. The presentgeneration should not exhaust the resourcesleft by the past generation, but it should leavethe same for the sake of future generation.This is called inter – enerational equity.

Definitions

"Sustainable development isdevelopment that meets the needs of thepresent without compromising the ability offuture generations to meet their own needs"

-World Commission on Environmentand Development, 1987-

"The alternative approach (tosustainable development) is to focus onnatural capital assets and suggest that theyshould not decline through time."

-Pearce, Markandya and Barbier, 1989-

SustainableDevelopmentGoals (SDGs)

It is crucial toharmonize three coreelements such as economicgrowth, social inclusion and environmentalprotection. A set of 17 goals for the World'sfuture can be achieved before 2030 with three unanimous principles fixed by United Nations such as Universality, Integration and Transformation.

1. End Poverty in all its forms everywhere
2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture
3. Ensure healthy lives and promote wellbeing for all at all ages
4. Ensure inclusive and quality education for all and promote lifelong learning
5. Achieve gender equality and empower women and girls
6. Ensure access to water and sanitation for all
7. Ensure access to affordable, reliable, sustainable and modern energy for all
8. Promote inclusive and sustainable economic growth, employment and decent work for all
9. Build resilient infrastructure, promote sustainable industrialization and foster innovation.
10. Reduce inequality within and among countries
11. Make cities inclusive, safe, resilient and sustainable
12. Ensure sustainable consumption and production pattern
13. Take urgent action to combat climate change and its impacts
14. Conserve and sustainably use the oceans, seas and marine resources
15. Sustainably manage forests, combat desertifi cation, halt and reverse land degradation, halt biodiversity loss

16. Promote just, peaceful and inclusive societies
17. Revitalize the global partnership for sustainable development

Green Initiatives

Today, number of organizations, businesses and people across the globe that are striving for sustainability and more eco-friendly lifestyles is increasing. They are passionate towards protecting the Earth – the only life support system we have. Hence, we should bring about change through political lobbying, citizen action and consumer pressure. And we should take peaceful direct action to protect this fragile planet and promote the solutions for a green and peaceful future. Since the globe warming is a globe problem, the polluters, namely developed countries, should be made to pay for the pollution control efforts.

Organic Farming

Organic farming is a system of agricultural production which relies on animal manure, organic waste, crop rotation, legumes and biological pest control. It avoids use of synthetic fertilizer, pesticides and livestock additives. Organic inputs have certain benefits, such as enriching soil for microbes.

Organic production is a holistic system designed to optimize the productivity and fitness of diverse communities within the agro-ecosystem, including soil organisms, plants, livestock and people. Th e principal goal of organic production is to develop enterprises that are sustainable and harmonious with environment. The general principles of organic farming are:

1. Protect the environment, minimize soil degradation and erosion, decrease pollution, optimize biological productivity and promote a sound state of health.
2. Maintain long-term soil fertility by optimizing conditions for biological activity within the soil
3. Maintain biological diversity within the system
4. Recycle materials and resources to the greatest extent possible within the enterprise
5. Provide attentive care that promotes the health and meets the behavioural needs of livestock
6. Prepare organic products, emphasizing careful processing, and handling methods in order to maintain the organic integrity and vital qualities of the products at all stages of production.
7. Rely on renewable resources in locally organized agricultural systems.

Alkali Farming

Nearly 50 percent of the irrigated land in the arid and semi-arid regions has some degree of soil salinization problems. The occurrence of accumulation of excess salt acid in the root zone, results in a partial or complete loss of soil productivity and such soil is defined as 'Problem (alkali, saline & acid) Soils' and exist mainly in arid and semi-arid regions.

The alkali soils are predominantly located in the Indo-Gangetic plains encompassing States of Punjab, Haryana, Uttar Pradesh, Bihar and partly in States like, Chhattisgarh, Rajasthan, Andhra Pradesh, Gujarat, Maharashtra, Karnataka, Andhra Pradesh, Madhya Pradesh and Tamil Nadu.

Tree Plantation

Trees contribute to their environment by providing oxygen, improving air quality, climate amelioration, conserving water, preserving soil and supporting wildlife. During the process of photosynthesis, trees take in carbon dioxide and produce the oxygen we breathe. So trees are considered to be the lungs of the earth. Natural forests and tree plantations improve the water cycle in diminishing runoff and improving the replenishment of the water table.

Seed Ball

A seed ball (or seed bomb) is a seed that has been wrapped in soil materials, usually a mixture of clay and compost, and then dried. Essentially, the seed is 'pre-planted' and can be sown by depositing the seed ball anywhere suitable for the species, keeping the seed safely until the proper germination window arises. Seed balls are an easy and sustainable way to cultivate plants that provide a larger window of time when the sowing can occur.

UNIT - 9

Economics of Development and Planning

A good plan may fail due to faulty implementation. But a faulty plancannot succeed through good implementation.
"Plan your work for today and every day, then work your plan."
-Margaret Thatcher

Introduction

The concept "development" refers to the structural changes towards betterment. Until the World War II, interest was rarely shown on the problems of the present day third World Countries. After the Second World War, economists started devoting their attention towards analyzing the problems of underdeveloped countries and formulating theories and models of development and growth. The UnderDeveloped Countries (UDCs) wereonce the colonies of England and otherEuropean countries. After becoming freeand independent, there was an awakeningto march towards economic development.

Approaches to EconomicDevelopment

There are two main approaches tothe concept of development viz i) thetraditional approach and ii) the newwelfare oriented approach.

1. Traditional Approach : The traditional approach defines development strictly in economic terms. The increase in GNP is accompanied by decline in share of agriculture in output and employment while those of manufacturing and service sectors increase. It emphasizes the importance of industrialization. It was assumed that growth in GNP per capita would trickle down to people at the bottom.

2. New Welfare oriented Approach: During 1970s, economic development was redefined in terms of reduction of poverty, 'inequality' and unemployment within the context of a growing economy. In this phase, 'Redistribution with Growth' became the popular slogan.

To quote Michael P. Todaro, "Development must, therefore, be conceived as a multidimensional process involving major changes in social structures, popular attitudes and national institutions as well as the acceleration of growth, the reduction of inequality and the eradication of absolute poverty".

Underdevelopment

The UDCs are characterized by predominance of primary sector i.e. agriculture, low per capita income, widespread poverty, wide inequality in distribution of income and wealth, over population, low rate of capital formation, high rate of unemployment, technological backwardness, dualism etc.

Meaning of Underdevelopment

The term underdevelopment refers to that state of an economy where levels of living of masses are extremely low due to very low levels of Percapita income, resulting from low levels of productivity and high growth rate of population.

Economic Growth Vs Economic Development

1. State of Development

Generally speaking, economic development refers to the problems of underdeveloped countries and economic growth to those of developed countries.

2. Nature and Level of Change

Development is a discontinuous and spontaneous change while growth is a gradual and steady change in the long run.

3. Scope of Change

Growth simply means more output. But development refers to efficiency in production i.e. output per unit of input. It also implies changes in composition of output and in allocation of resources, reduction of poverty, inequality and unemployment.

4. Extent of change

Economic development (wider concept than economic growth) is taken to mean growth plus structural change.

Differences between Economic Growth and Economic Development	
Economic Growth	**Economic Development**
Deals with the problems of Developed countries	Deals with the problems of UDCs
Change is gradual and steady	Change is discontinuous and spontaneous
Means more output	Means not only more output but also its composition
Concerns Quantitative aspects i.e. increase in per capita income	Quantitative as well as Qualitative
Narrow	Wider concept Development = Growth + Chang

Measurement of Economic Development

Economic development is measured on the basis of four criteria

- **Gross National Product (GNP):** GNP is the total market value of all final goods and services produced within a nation in a particular year, plus income earned by its citizens (including income of those located abroad), minus income of non-residents located in that country. GNP is one measure of the economic condition of a country, under the assumption that a higher GNP leads to a higher quality of living, all other things being equal.

- **GNP per capita:** This relates to increase in the per capita real income of the economy over the long period. This indicator of economic growth emphasizes that for economic development the rate of increase in real per capita income should be higher than the growth rate of population.

- **Welfare:** Economic development is regarded as a process whereby there is an increase in the consumption of goods and services by individuals. From the welfare perspective, economic development is defined as a sustained improvement in health, literacy and standard of living.

- **Social Indicators:** Social indicators are normally referred to as basic and collective needs of the people. The direct provision of basic needs such as health, education, food, water, sanitation and housing facilities check social backwardness.

Determinants of Economic Development

Economic development is not determined by any single factor. Economic development depends on Economic, Social, Political and Religious factors.

Economic and Non-Economic Factors

Economic Factors

1. Natural Resource: The principal factor affecting the development of an economy is the availability of natural resources. The existence of natural resources in abundance is essential for development. A country deficient in natural resources may not be in a position to develop rapidly. But a country like Japan lacking natural resources imports them and achieve faster rate of economic development with the help of technology. India with larger resources is poor.

2. Capital Formation: Capital formation is the main key to economic growth. Capital formation refers to the net addition to the existing stock of capital goods which are either tangible likeplants and machinery or intangible like health, education and research. Capital formation helps to increase productivity of labour and thereby production and income. It facilitates adoption of advanced techniques of production. It leads to better utilization of natural resources, industrialization and expansion of markets which are essential for economic progress.

3. Size of the Market: Large size of the market would stimulate production, increase employment and raise the National per capita income. That is why developed countries expand their market to other countries through WTO.

4. Structural Change: Structural change refers to change in the occupational structure of the economy. Any economy of the country is generally divided into three basic sectors: Primary sector such as agricultural, animal husbandry, forestry, etc; Secondary sector such as industrial production, constructions and Tertiary sector such as trade, banking and commerce. Any economy which is predominantly agricultural tends to remain backward.

5. Financial System: Financial system implies the existence of an efficient and organized banking system in the country. There should be an organized money market to facilitate easy availability of capital.

6. Marketable Surplus: Marketable surplus refers to the total amount of farm output cultivated by farmers over and above their family consumption needs. This is a surplus that can be sold in the market for earning income. It raises the purchasing power, employment and output in other sectors of the economy. The country as a result will develop because of increase in national income.

7. Foreign Trade: The country which enjoys favorable balance of trade and terms of trade is always developed. It has huge forex reserves and stable exchange rate.

8. Economic System: The countries which adopt free market mechanism (laissez faire) enjoy better growth rate compared to controlled economies. It may be true for some countries, but not for every country.

Non- Economic Factors

'Economic Development has much to do with human endowments, social attitudes, political conditions and historical accidents. Capital is a necessary but not a sufficient condition of progress.
– Ragnar Nurkse.

1. **Human Resources:** Human resource is named as human capital because of its power to increase productivity and thereby national income. There is a circular relationship between human development and economic growth. A healthy, educated and skilled labour force is the most important productive asset. Human capital formation is the process of increasing knowledge, skills and the productive capacity of people. It includes expenditure on health, education and social services. If labour is efficient and skilled, its capacity to contribute to growth will be high. For example Japan and China.

2. **Technical Know-how:** As the scientific and technological knowledge advances, more and more sophisticated techniques steadily raise the productivity levels in all sectors. Schumpeter attributed the cause for economic development to innovation.

3. **Political Freedom:** The process of development is linked with the political freedom. DadabhaiNaoroji explained in his classic work 'Poverty and Un- British Rule in India' that the drain of wealth from India under the British rule was the major cause of the increase in poverty in India.

4. **Social Organization:** People show interest in the development activity only when they feel that the fruits of development will be fairly distributed. Mass participation in development programs is a pre-condition for accelerating the development process. Whenever the defective social organization allows some groups to appropriate the benefits of growth. majority of the poor people do not participate in the process of development. This is called crony capitalism.

5. **Corruption free administration:** Corruption is a negative factor in the growth process. Unless the countries root-out corruption in their administrative system, the crony capitalists and traders will continue to exploit national resources. The tax evasion tends to breed corruption and hamper economic progress.

6. **Desire for development:** The pace of economic growth in any country depends to a great extent on people's desire for development. If in some country, the level of consciousness is low and the general mass of people has accepted poverty as its fate, then there will be little scope for development.

7. **Moral, ethical and social values:** These determine the efficiency of the market, according to Douglas C. North. If people are not honest, market cannot function.

8. **Casino Capitalism:** If People spend larger propotion of their income and time on entertainment liquor and other illegal activities, productive activities may suffer, according to Thomas Piketty.

9. **Patrimonial Capitalism:** If the assets are simply passed on to children from their parents, the children would not work hard, because the children do not know the value of the assets. Hence productivity will be low as per Thomas Piketty.

Vicious Circle of Poverty

There are circular relationships known as the 'vicious circles of poverty' that tend to perpetuate the low level of development in Less Developed Countries (LDCs). Nurkse explains the idea in these words: "It implies a circular constellation of forces tending to act and react upon one another in such a way as to keep a poor country in a state of poverty. For example, a poor man may not have enough to eat; being underfed, his health may be weak; being physically weak, his working capacityis low, which means that he is poor, whichin turn means that he will not have enoughto eat and so on. A situation of this sortrelating to a country as a whole can besummed up in the proposition: "A countyis poor because the country is poor".

The vicious circle of poverty operatesboth on the demand side and the supplyside.

On the supply side, the low level ofreal income means low savings. The lowlevel of saving leads to low investment andto deficiency of capital. The deficiencyof capital, in turn, leads to low levels ofproductivity and back to low income.Thus the vicious circle is complete fromthe supply side.

The demand-side of the viciouscircle is that the low level of real incomeleads to a low level of demand which, inturn, leads to a low rate of investment andhence back to deficiency of capital, lowproductivity and low income.

Breaking the Vicious Circle ofPoverty

The vicious circle of poverty isassociated with low rate of saving andinvestment on the supply side. In UDCs therate of investment and capital formationcan be stepped up without reduction inconsumption. For this, the marginal rateof savings is to be greater than averagerate of savings.

To break the vicious circle onthe demand side, Nurkse suggestedthe strategy of balanced growth. Ifinvestment is made in several industriessimultaneously the workers employed invarious industries will become consumersof each other's products and will createdemand for one another. The balancedgrowth i.e. simultaneous investment inlarge number of industries creates mutualdemand. Thus, through the strategy ofbalanced growth, vicious circle of povertyoperating on the demand side of capitalformation can be broken.

Planning
Meaning

Planning is a technique, a means toan end being the realization of certain pre-determined and well-defined aimsand objectives laid down by a centralplanning authority. The end may be toachieve economic, social, political ormilitary objectives.

Definitions

Economic Planning is "collectivecontrol or suppression of private activitiesof production and exchange".

-Robbins-

"Economic Planning in the widestsense is the deliberate direction by personsin-charge of large resources of economicactivity towards chosen ends".

Dalton-

Economic Planning in India

Consists of economic decisions, schemes formed to meet certain predetermined economic objectives anda road map of directions to achievespecific goals within specific period oftime. The current thinking of economic planning is fairly new, some what rootedin Marxist socialism. In the 20th century, intellectuals, theorists, thinkers fromEurope put forward the idea of state involvement to stop capitalism and the inequality of society.

Soviet Union adopted economicplanning for the first time in 1928that enabled the country to turn intoan industrial superpower. The idea ofeconomic planning was strengthenedduring the Great Depression in 1930s.The outbreak of the World War II alsorequired adequate and suitable planning of economic resources for the effectivemanagement after the effects of post war economy.

After Independence, in 1948, adeclaration of industrial policy was announced. The policy suggestedthe creation of a National Planning Commission and the elaboration of thepolicy of a mixed economic system. OnJanuary 26, 1950, the Constitution cameinto force. In logical order, the Planning Commission was created on March 15,1950 and the plan era began on April 1, 1951 with the launch of the first five yearplan (1951-56). The evolution of planningin India is stated below:

1. Sir M. Vishveshwarya (1934): aprominent engineer and politician madehis first attempt in laying foundationfor economic planning in India in 1934through his book, "Planned Economyof India". It was a 10 year plan.

2. Jawaharlal Nehru (1938): set-up"National Planning Commission" by acommittee but due to the changes in thepolitical era and second World War, itdid not materialize.

3. Bombay Plan (1940): The 8 leadingindustrialists of Bombay presented"Bombay Plan". It was a 15 YearInvestment Plan.

4. S. N Agarwal (1944) gave the "GandhianPlan" focusing on the agricultural andrural economy.

5. M.N. Roy (1945) drafted 'People'sPlan". It was aiming at mechanizationof agricultural production anddistribution by the state only.

6. J.P. Narayan (1950) advocated,"Sarvodaya Plan" which was inspiredby Gandhian Plan and with the idea ofVinobaBhave. It gave importance notonly for agriculture, but encouragedsmall and cottage industries in the plan.

After considering all the plans, inthe same year Planning Commissionwas set up to formulate Five Year Plan inIndia by Jawaharlal Nehru. He was thefirst Chairman of Planning Commission,Government of India.

Case for planning

The economic planning is justifiedon the following grounds.

1. To accelerate and strengthen market

mechanism: The market mechanismworks imperfectly in underdevelopedcountries because of the ignorance andeconomy comprises the non-monetizedsector. The product, factor, moneyand capital markets are not organizedproperly. Therefore the plannedeconomy will be a better substitute forfree economy.

2. To remove unemployment: Capitalbeing scarce and labour beingabundant, the problem of providinggainful employment opportunities toan ever-increasing labour force is adifficult task. The need for planningin underdeveloped countries isfurther stressed by the necessity ofremoving widespread unemploymentand disguised unemployment in sucheconomies.

3. To achieve balanced development: In the absence of sufficient enterpriseand initiative, the planning authorityis the only institution for planning thebalanced development of the economy.For rapid economic development,under developed countries require thedevelopment of the agricultural andindustrial sectors, the establishmentof social and economic overheads, theexpansion of the domestic and foreigntrade sectors in a harmonious way.

i) Development of Agriculture andIndustrial Sectors: The need fordeveloping the agriculture sector alongwith the industrial sector arises fromthe fact that agriculture and industryare interdependent. Reorganization ofagriculture releases surplus labour forcewhich can be absorbed by the industrialsector. Development of agriculture isalso essential to supply the raw materialneeds of the industrial sector.

ii) Development of Infrastructure: Theagriculture and industrial sectorscannot develop in the absence ofeconomic and social overheads. Thebuilding of canals, roads, railways,power stations, etc., is indispensablefor agricultural and industrialdevelopment. Infrastructure involveshuge capital investment long gestationperiod and low rate of return. The statealone can provide strong infrastructuralbases through planning.

iii) Development of Money andCapital Markets: The expansionof the domestic and foreign traderequires not only the developmentof agricultural and industrial sectorsalong with social and economicoverheads but also the existence offinancial institutions. Money andcapital markets are not adequate inunderdeveloped countries. This factoracts as an obstacle to the growth ofindustry and trade. So planning alonecan provide sound money market andcapital market.

4. To remove poverty and inequalities: Planning is the only path open tounderdeveloped countries, for raisingnational and per capita income,reducing inequalities and poverty andincreasing employment opportunities.Has it happened in India in the last 65years?

Hence, Arthur Lewis says, "Planningis more necessary in backward countriesto devise ways and means and to makeconcerted efforts to raise national income"

Case against planning

The failure of market mechanisminvited state intervention in economicactivities through planning. Theprime goals of economic planning arestabilization in developed countriesand growth in LDCs. But the economicplanning also is not free from limitations.It may retard private initiatives, hamperfreedom of choice, involve huge cost ofadministration and stop the automaticadjustment of price mechanism. Thearguments against planning are discussedbelow.

1. Loss of freedom

The absence of freedom in decisionmaking may act as an obstacle foreconomic growth. Regulations andrestrictions are the backbone of a plannedeconomy. The economic freedomcomprises freedom of consumption,freedom of choice of occupation,freedom to produce and the freedomto fix prices for the products. Underplanning, the crucial decisions are madeby the Central Planning Authority. Theconsumers, producers and the workersenjoy no freedom of choice. Therefore,Hayek explains in his book 'Road toSerfdom' that centralized planning leadsto loss of personal freedom and ends ineconomic stagnation. The decisions bythe Government are not always rational.
But, freedom to private producers will bemisused; profit will be given top priority,welfare will be relegated.

2. Elimination of Initiative

Under centralized planning, therewill be no incentive for initiatives and innovations. Planning follows routineprocedure and may cause stagnation ingrowth. The absence of initiatives mayaffect progress in following ways.

a. The absence of private ownership andprofit motive discourages entrepreneursfrom taking bold decisions and risktaking. Attractive profit is the incentivefor searching new ideas, new lines andnew methods. These are missing in aplanned economy.

b. As all enjoy equal reward under plannedeconomy irrespective of their effort,efficiency and productivity, nobody isinterested in undertaking new and riskyventures.

c. The bureaucracy and red tapism whichare the features of planned economy,cripple the initiative as they causeprocedural delay and time loss. Theease of doing business is disrupted. It isbecause of this, even socialist countrieslike Russia and China offer incentivesto private enterprises.

3. High cost of Management

No doubt the fruits of planning suchas industrialization, social justice andregional balance are good. But the costof management of the economic affairsoutweighs the benefits of

planning. Planformulation and implementation involveengagement of an army of staff for datacollection and administration. As Lewisremarks, "The better we try to plan, themore planners we need". Inadequate data, faulty estimations and improper implementation of plans result in wastage of resources and cause either surplus or shortages.

4. Difficulty in advance calculations

Price mechanism provides for the automatic adjustment among price, demand and supply in a Laissez Faire economy. The producers and consumers adjust their supply and demand based on price changes. There is no such mechanism in a planned economy. Advance calculations in a precise manner are impossible to make decisions regarding the consumption and production. It is also very difficult to put the calculations into practice under planning. Excess supplyand excess demand can also happen in the market oriented economy. Infact it has happened in many expitalistic economies, including the US.

The arguments against planning are mostly concerned with centralized and totalitarian planning. The democratic planning, planning by inducement and decentralized planning especially under mixed economies give equal role for private sector and public sector. Planned economy appears to be more efficient operationally than a market economy. So the question is not one of plan or no plan but one of the type of plan. The right mix of market mechanism and state intervention in right proportion will promise accelerated economic growth accompanied by stability and social justice.

Types of planning

Economic planning is a process under which attempts are made to achieve desired targets of economic development within a specified period of time. There are different types of planning which differ in ideology and the procedure in execution

1. Democratic Vs Totalitarian:

Democratic planning implies planning within democracy. People are associated at every step in the formulation and implementation of the plan. A democratic plan is characterized by the widest possible consultations with the various state governments and private enterprises at the stage of preparation. The plan prepared by the Planning Commission is not accepted as such. It can be accepted, rejected or modified by the Parliament of the country.

Under totalitarian planning, there is central control and direction of all economic activities in accordance with a single plan. Consumption, production, exchange, and distribution are all controlled by the state. In authoritarian planning, the planning authority is the supreme body. It decides about the targets, schemes, allocations, methods and procedures of implementation of the plan.

2. Centralized Vs Decentralized:

Under centralized planning, the entire planning process in a country is under a central planning authority. This authority formulates a central plan, fixes objectives, targets and priorities for every sector of the economy. In other words, it is called 'planning from above'

Under decentralized planning local organizations and institutions formulate, adopt, execute and supervise the plan without interference by the central authorities. In other words, it is called 'planning from below'.

3. Planning by Direction Vs Inducement:

Under planning by direction, there is a central authority which plans, directs and orders the execution of the plan in accordance with pre-determined targets and priorities.

Under planning by inducement, the people are induced to act in a certain way through various monetary and fiscal measures. If the planning authority wishes to encourage the production of a commodity, it can give subsidy to the firms. Thus, planning by inducement is able to achieve the same results as under planning by direction but with less sacrifice of individual liberty.

4. Indicative Vs Imperative Planning:

Indicative planning is peculiar to the mixed economies. It has been in practicein France since the Monnet Plan of 1947-50. In a mixed economy, the private sector and the public sector work together. Under this plan, the outline of plan is prepared by the Government. Then it is discussed with the representatives of private management, trade unions, consumer groups, finance institutions and other experts. The essential function of planning is coordination of different economic units. The state provides all types of facilities to the private sector. The private sector is expected to fulfill the targets and priorities. The state does not force the private sector but just indicate the areas of operation and targets to be fulfilled. In short, the planning procedure is soft and flexible.

Under imperative planning, the state is all powerful in preparation and implementation of the plan. Once a plan is drawn up, its implementation is a matter of enforcement. The USSR President Stalin used to say, 'Our plans are our instructions'. There is complete control over the entire resources by the state. There is no consumer sovereignty. The Government policies and procedures are rigid. China and Russia follow imperative planning.

5. Short, Medium and Long term Planning:

Short-term plans are also known as 'controlling plans'. They encompass the period of one year, therefore, they are also known as 'annual plans'. The medium-term plans last for the period of 3 to 7 years. But normally, the medium term plan is made for the period of five years. The medium-term planning is not only related to allocation of financial resources but also physical resources.

Long-term plans last for the periodof 10 to 30 years. They are also known

as 'perspective plans'. The basic philosophybehind long-term planning is to bringstructural changes in the economy.

6. Financial Vs Physical Planning:

Financial planning refers to the techniqueof planning in which resources areallocated in terms of money while physicalplanning pertains to the allocation ofresources in terms of men, materials andmachinery.

7. Functional Vs Structural Planning:

Functional planning refers to thatplanning which seeks to remove economicdifficulties by directing all the planningactivities within the existing economicand social structure.The structural planning refers toa good deal of changes in the socioeconomicframework of the country. Thistype of planning is adopted mostly inunder developed countries.

8. Comprehensive Vs Partial Planning:

General planning which concerns itselfwith the major issues for the wholeeconomy is known as comprehensiveplanning whereas partial planning is toconsider only the few important sectors ofthe economy.

13th August, 2014. The Prime Minister isthe Chairperson of NITI Aayog and UnionMinisters will be Ex-officio members.The Vice- Chairman of the NITI Aayogis the functional head and the first Vice-Chairman was Arvind Panangariya.

Functions of NITI Aayog

1. Cooperative and CompetitiveFederalism: To enable the States to haveactive participation in the formulationof national policy.

2. Shared National Agenda: To evolvea shared vision of national development priorities and strategies with the activeinvolvement of States.

3. Decentralized Planning: To restructurethe planning process into a bottom-upmodel.

4. Vision and Scenario Planning: Todesign medium and long-term strategicframeworks towards India's future.

5. Network of Expertise: To mainstreamexternal ideas and expertise intogovernment policies and programmesthrough a collective participation.

6. Harmonization: To facilitateharmonization of actions across differentlayers of government, especially wheninvolving cross-cutting and overlappingissues across multiple sectors; throughcommunication, coordination,collaboration and convergence amongstall the stakeholders.

7. Conflict Resolution: To provideplatform for mutual consensus to intersectoral,inter-departmental, inter-stateas well as centre-state issues for all speedyexecution of the government programmes.

8. Coordinating Interface with the World: It will act nodal point to harness global expertise and resources coming from International organizations for India's developmental process.

9. Internal Consultancy: It provides internal consultancy to Central and State governments on policy and programmes.

10. Capacity Building: It enables to provide capacity building and technology up-gradation across government, benchmarking with latest global trends and providing managerial and technical know-how.

11. Monitoring and Evaluation: It will monitor the implementation of policies and progammes and evaluate the impacts.

Initiatives like Atal InnovationMission, Ayushmaan Bharat approachtowards water conservation measuresand the draft bill to establish the ational
Medical Commission to replace theMedical Council of India have all beenconceptualized in NITI Aayog.

NITI Aayog is also bringing abouta greater level of accountability. It hasestablished a development monitoring andevaluation office which collects data on theperformance of various ministries.Usingsuch data, the Aayog makes performancebased ranking of states to foster a spiritof competitive federalism. The successof NITI Aayog can be evaluated after asubstantial period of time