

Unit – III: Economic Geography: Definition, Nature and Scope - Natural resources: Water, Forests, Soil – Distribution and conservation - Energy resources: Coal, Petroleum, Atomic and Hydal Power.

Economic Geography

Definition

Economic Geography is the study of the spatial variation of human economic activities – production, consumption, and exchange, with emphasis on resource endowments, international trade and commerce, population growth, settlements, development, interaction and interdependencies, and regional supply and demand.

Economic Geography has taken a variety of approaches to many different subjects' matters, including but not limited to the place of industries, economic agglomeration, transportation, economic development, real estate, gentrification, ethnic economies, gendered economies, core periphery theory, the economics of urban form, the relationship between environment and economy and globalization.

Economists, such as Paul Krugman and Jeffery Sachs have also analysed many traits related to economic geography. Krugman has gone so far as to call his application of spatial thinking in international trade theory the “new economic geography”, which directly competes with an approach within disciplines of geography that is also called new economic geography.

Economic geography is sometimes approached as a branch of anthropogeography that focuses on regional system of human economic activity. Study may focus on production, exchange, distribution and consumption of item of economic activity. Allowing parameter of space time and item to vary, a geographer may also examine the flow of material, commodity, population and information from different parts of the economic activity system.

Thematically economic geography can be divided into these sub disciplines:-

1. Geography of Agriculture
2. Geography of Industries
3. Geography of International Trade

4. Geography of Resources
5. Geography of Transport & Communications
6. Geography of Finance.

With the rise of the New Economy, economic inequalities are rising spatially. The new economy generally characterized by Globalization, rising of Information and Communication Technology, growth of knowledge goods, feminization has enabled economic geographers to study social and spatial division caused by the arising of New Economy including the emerging digital divide.

RESOURCES

By Johnstown: A concept used to denote sources of human satisfaction wealth of strength. Labour, entrepreneurial skills, investment funds, fixed capital assets, technology, knowledge, social stability and cultural and physical and physical attribute may be referred to as the resources of the county.

Resources are anything that has utility and adds value to your life. Air, water, food, plants, animals, minerals, metals, and everything else that exists in nature and has utility to mankind is a 'Resource'. The value of each such resource depends on its utility and other factors. For example, metals are gold, silver, copper or bronze have economic value; i.e. they can be exchanged for money. However, mountains, rivers, sea or forests are also resources but they do not have economic value.

NATURAL RESOURCES

Natural Resources are the resources which we find in nature, they are God gift on earth this are the material, which living organism can take from nature for sustaining their life or any components of the natural environment that can be utilized by man to promote his welfare. Scope of natural resources are differ from physical geography in that it has a greater focus on studying intangible surrounding human activity and its more receptive to qualitative research methodologies. Development nations are those which are less dependent on natural resources for wealth, due to their greater reliance on infrastructure capital for production. Political corruption can negatively impact the national economy because time is spent giving bribes or other economically unproductive acts instead of the generation of ownership over specific plots of land that have proven to yield natural resources.

Renewable & Non-renewable

Renewable resources are almost all elements of nature which can renew them. For e.g. sunlight, wind, water, forests and likewise. While, non-renewable resources, are limited in their quantity. Like fossil fuels and minerals. Though these resources take millions of years to form, they would eventually get over within our lifetime if we use continuously.

Biotic & Abiotic

Any life form that lives within nature is a Biotic Resource, like humans, animals, plants, etc. In contrast, an abiotic resource is that which is available in nature but has no life; like metals, rocks, and stones. Both biotic and abiotic resources can be renewable or non-renewable.

Man-Made Resources

When humans use natural things to make something new that provides utility and value to our lives, it is called human-made resources. For instance, when we use metals, wood, cement, sand, and solar energy to make buildings, machinery, vehicles, bridges, roads, etc. they become man-made resources. Likewise, technology is also a man-made resource. Manmade resources are mostly renewable. One can re-build a building or fixed a broken machine.

Resources Utilization:

Water: water is the most important resources on the earth , only 20% of water of water is useful for human being ,rest water salted , water is used for domestic purpose for irrigation livestock, sea transportation etc.

Land and soil: land and soil resources fulfil the basic requirement of human being because for vegetation, livestock, irrigation for human being depends upon the soil resources only.

Vegetation: This includes forest, graaland,herbs, liching etc from inhuman greets food, raw material, wood from trees, which is useful for human being and for animals hearing so this beneficial for both the resources.

Animal: man and animal had always shared good relationship human being is dependent upon the animals for milk products for that human being keep the animals at their place which also help them in irrigation, fishing business, on this this is very commercial and also help in increasing of economic.

Problems Associated With Natural Resources

1. The unequal consumption of natural resources A major part of natural resources today are consumed in the technologically advanced or 'developed' world, usually termed 'the west'. The 'developing nations' of 'the east', including India and China, also over use many resources because of their greater human population. However, the consumption of resources per capita (per individual) of the developed countries is up to 50 times greater than in most developing countries. Advanced countries produce over 75% of global industrial waste and greenhouse gases.

2. Planning land use Land is a major resource, needed for not only for food production and animal husbandry, but also for industry and growing human settlements. These forms of intensive land use are frequently extended at the cost of 'wild lands', our remaining forests, grasslands, wetlands and deserts. This demands for a pragmatic policy that analyses the land allocation for different uses.

3. The need for sustainable lifestyles Human standard of living and the health of the ecosystem are indicators of sustainable use of resources in any country or region. Ironically, both are not in concurrence with each other. Increasing the level of one, usually leads to degradation of other. Development policies should be formulated to strike a balance between the two.

SOIL RESOURCES

THE SOIL ORDERS

Soil is one of the natural resources on which all human being depends, because all the farmers depends on soil for economic and all the vegetation depends upon soil and top layer of soil is very fertile, which keep on changing through erosion. Soil also has an order and each order have different characteristics in each type.

Orders The orders are based on soil properties as they present in soil - degree of horizon, presence and ordering of diagnostic horizons, play a critical role in determining the order into which a given soil falls. The actual classification is done on the basis of the appearance of the soil in the field.

Presented here is a collection of images and descriptions of examples of each of the soil orders. Each order has at least one example. Additionally, some of the order descriptions also include images of the landscape containing the soil. Along with each image is a brief description. The order in which the examples are presented and described is the same as that presented in the lecture. The least developed soils described first and proceed toward the most weathered soils. Several orders which do not fit the pedogenic sequence logically are included. Through the orders in sequence, examining soil profiles and order descriptions on which you wish to spend extra time

Inceptisols

Inceptisols represent the earliest horizon development. Small amounts of organic matter that darken the topmost horizon may be all that characterizes the inceptisol. Weathering is minimal, and amounts of weather minerals in the profile are high.

Mollisols (oll - soft, refers to the high amount of organic material)

It contain high amount of organic material typically form under grassland vegetation, especially in ustic or udic moisture regimes. These soils dominate the prairies of the central U.S. The order is characterized by the presence of a mollic epipedon, a dark, organic rich layer at the surface. The mollic epipedon is usually thick

Alfisols Alfisols are intermediate in maturity between mollisols or spodosols and ultisols. Often, alfisols are found in co-occurrence with mollisols. These soils are more highly weathered than mollisols, and generally have less weatherable material remaining. The % Base Saturation is lower than a mollisol, and the soils are often acidic. Horizons are usually seen, but are not as distinct as in the less-weathered counterparts.

Ultisols the Ultisols are the most highly weathered of the temperate zone soils. They are characterized by a thin or absent A horizon, with a thick, strongly expressed B. The soils are deep and productive if well-managed. The soils are often very red or yellow-red and are the dominant soil of the southeastern U.S. Oxisols The oxisols are the highly weathered soils of the tropics. They appear very much like the ultisols, but they have lost most of the weatherable materials. Silicates are usually present as quartz, and the dominant colloids are Fe, Al oxides and hydroxides. The latter material is called laterite and the soils have been classically known as lateritic soils.

Spodosols (spodos - wood ash) Spodosols are the product of a high degree of podsolization. These soils are typical of both coniferous and deciduous forests in cooler climates. (In warm humid areas, the leaching removal of soil materials is too rapid to allow strong profile development). The profile is characterized by a thin A overlying a well-developed E horizon, which is the most visible feature of the spodosol. The diagnostic spodic horizon is what defines the spodosol, however. The spodic horizon is a zone of accumulation that contains high levels of Fe (and often Al) sesquioxide. Formerly referred to as the B2ir, or B2hir when organic matter also accumulates, the newer designation is Bs and Bhs, respectively. In the pedogenic chronosequence, soils forming under forests would have a spodosol instead of a mollisol in the sequence, with the other orders being similar.

Vertisols (invert) Vertisols are soils which contain a high proportion of expanding lattice clays. As a result, these soils tend to swell when they are wet and shrink upon drying. When the soils shrink they often crack open. The cracks can be quite large and deep. Soil from the top of the profile can fall into these cracks, hence the concept of "invert" - top falling to bottom

Aridisols (arid - dry) Aridisols are soils that have developed in very dry conditions. They often show the effects of extreme wetting and drying with a great deal of water-related evidence near the surface, but little if any alteration in the subsoil.

Histosols (histos - tissue) Histosols are organic soils. They have > 20% organic matter to a depth of 1 foot or more. Usually, the soils have a much higher (often nearly 100%) organic matter content. The soils are categorized based on the degree of decomposition of the organic matter present. They generally form in either cool climates or very wet (waterlogged) areas (often a combination of both). These soils are often associated with bogs or drained swamps

Andisols (and - refers to volcanic) Andisols are dominated by short-range-order minerals. These soils comprise weakly weathered soils with a high content of volcanic glass, as well as more strongly weathered soils. The content of volcanic glass is a central characteristic used in defining andic soil properties.

Gelisols The central concept of Gelisols is that of soils that have permafrost within 100 cm of the soil surface and/or have gelic materials (mineral or organic soil materials that have evidence of cryoturbation (frost churning) and/or ice segregation in the active layer (seasonal

thaw layer) and/or the upper part of the permafrost within 100 cm of the soil surface and have permafrost within 200 cm.

GLOBAL SOIL REGIONS

There are 5 main types of natural soil erosion:

1. Sheet erosion by water;
2. Wind erosion;
3. Rill erosion – happens with heavy rains and usually creates small's rills over hillsides;
4. Gully erosion – when water runoff removes soil along drainage lines
5. Ephemeral erosion that occurs in natural depressions.

Causes and Impacts of Soil Erosion

1. Deforestation for Agriculture Is One of the Top Causes of Soil Erosion
2. Soil Erosion is Also Caused by Overgrazing, Which Causes Floods too
3. Agrochemicals Cause Soil Erosion and Degradation
4. Construction and Recreational Activities

Soil Conservation

1. Stopping Soil Erosion via Sustainable Farming Practices
2. Protecting the Soil by Planting Windbreaks
3. Stone Walls to Prevent Soil Erosion
4. Reforestation Helps Protect Soils
5. Conservation Tillage and Soil Erosion

FOREST RESOURCES

There are various type of forest in world according to climate, features of forest depends upon the climate because different type climate is found in different region. Further there are types of forest:

Forest Resources

Forest is important renewable resources. Forest vary in composition and diversity and can contribute substantially to the economic development of any country .Plants along with trees cover large areas, produce variety of products and provide food for living organisms, and also important to save the environment. It is estimated that about 30% of world area is covered by forest whereas 26% by pastures. Among all continents, Africa has largest forested area (33%) followed by Latin America (25%), whereas in North America forest cover is only 11%. Asia and former USSR has 14% area under forest. European countries have only 3% area under forest cover. India's Forest Cover accounts for 20.6% of the total geographical area of the country as of 2005.

Significance and economic importance of forests Forest can provide prosperity of human being and to the nations. Important uses of forest can be classified as under

Commercial values]

- Forests are main source of many commercial products such as wood, timber, pulpwood etc. About 1.5 billion people depend upon fuel wood as an energy source. Timber obtained from the forest can used to make plywood, board, doors and windows, furniture, and agriculture implements and sports goods. Timber is also a raw material for preparation of paper, rayon and film.
- Forest can provide food , fibre, edible oils and drugs.
- Forest lands are also used for agriculture and grazing.
- Forest is important source of development of dams, recreation and mining.

Life and economy of tribal

Forest provide food, medicine and other products needed for tribal people and play a vital role in the life and economy of tribes living in the forest.

Ecological uses

Forests are habitat to all wild animals, plants and support millions of species. They help in reducing global warming caused by greenhouse gases and produces oxygen upon photosynthesis. Forest can act as pollution purifier by absorbing toxic gases. Forest not only helps in soil conservation but also helps to regulate the hydrological cycle.

Aesthetic values

All over the world people appreciate the beauty and tranquillity of the forest because forests have a greatest aesthetic value. Forest provides opportunity for recreation and ecosystem research.

Forest conservation and management

Forest is one of the most valuable resources and thus needs to be conserved.

To conserve forest, following steps should be taken.

Conservation of forest is a national problem, thus it should be tackled with perfect coordination between concerned government departments.

- People should be made aware of importance of forest and involved in forest conservation activities.
- The cutting of trees in the forests for timber should be stopped.
- A forestation programmes should be launched
- Grasslands should be regenerated.
- Forest conservation Act should be strictly implemented to check deforestation.
- Awards should be instituted for the deserving.

Types of Forest

1. Equatorial Moist Evergreen or Rainforest

(a) South American Amazonia basin:

This region is confined between Amazon River in the east to the foothills of the Andes in the west and Orinoco river basin in the north to Mardira River in the south.

(b) Equatorial Africa:

Mostly occur in Equatorial Africa including Zaire and Congo.

(c) Asia:

Some parts of Western India and Sri Lanka.

(d) South-East Asia:

Found in Indonesia, Malaysia, and Philippines etc.

Climatic Characteristics:

Rainfall:

(i) Convectional rainfall occur almost every-day. Mean annual rainfall exceeds 200 cm. No wellmarked dry season is visible throughout the year.

(ii) Temperature:

(ii) Average daily and annual temperature is very high, around 30°C. The range of temperature is very low.

(iii) Relative humidity:

(iii) Very high throughout the year, varies between 80-90%. Several valuable trees are found in tropical rainforest. Important among these are: Mahogany, iron wood, teak, ebony, rubber, palm, deodar, Brazil nut, bamboo and cane etc. Trees are evergreen hardwood type. Selva of Equatorial America is so dense that, light cannot penetrate it.

Major characteristic features are:

- (i) Different plant species grow together.
- (ii) Trees are sky-high and epiphytes are common.
- (iii) Light cannot penetrate into the lower strata full of undergrowth.
- (iv) Due to the presence of trees of different height, several canopies also develop.
- (v) Foliage is leathery in texture.
- (vi) Parasites, saprophytes, climbers grow luxuriantly.

Economic Importance

- a. The uses of forest resources in different economic activities are:
- b. Teak and Mahogany are widely used in furniture industry.
- c. Wood collected from forest is used as fuel.
- d. Tagua nut is used for button-making.
- e. Barasu is an important raw material to produce soap and margarin.
- f. The milky juice of zopota tree is chickle which is converted to chewing gum.

- g. Wild rubber can be collected from rubber trees.
- h. Balata gathered from this forest is used for cable-making and other industrial purpose.
- i. Babassu palm nut is used in paint industry.
- j. Cohune nuts for perfume manufacturing,
- k. Toquilla palm for hat making.
- l. Quinine, camphor, tannin are other important raw materials for drug industry.

2. Tropical Deciduous

Forest In tropical monsoon region where rainfall is seasonal and a definite dry season exists, these deciduous and semi-evergreen forests are prevalent. Unlike Equatorial region, here variations of trees in different regions are much more.

This type of vegetation occurs in:

- (a) India, Myanmar (Burma), Indonesia, Thailand, Laos, Cambodia, South China, Philippines etc.
- (b) Northern Australia.
- (c) Margins of tropical rainforest in Africa.
- (d) Central South America.

Climatic Characteristics:

(a) Temperature:

Average temperature of the year is higher, ranging between 25°- 32°C. Lowest temperature in winter is around 10°C. Trees shed their leaves in winter.

(b) Rainfall:

Average annual rainfall is very high, ranging level 100-250 cm. Most of it occurs in rainy season. This rainfall encourages trees of luxuriant growth.

(c) Relative humidity:

During rainy season range 80- 90%. .

Major Tree Species:

Among the valuable trees, notable are: mahogany, ebony, ironwood, teak, greenheart, logwood, sal, gamur, sissu, acacia catechu, palash, haldu, chapeas, margose (neem) etc.

Characteristics of Vegetation:

- (i) Most of the trees are broadleaved and provide hardwood variety.
- (ii) Trees are so heavy that in most cases they do not float in water.
- (iii) Several layers are visible in forest, according to height of the trees. Trees with height of 50 meters to 10 meters are common.
- (iv) Wide variety of climbers, creepers, parasites, epiphytes and saprophytes are common.
- (v) No dominance of single species — as trees are intermingled with one another.
- (vi) Thick undergrowth of shrubs, bushes and bamboos are common.
- (vii) Swampy, marshy areas exhibit mangrove forests, e.g. Sundarban in West Bengal.

Economic Importance:

Compared to Equatorial forest, economic importance of monsoon forest is far more:

- (i) Presence of valuable species like sal, teak, mahogany etc.
- (ii) This forest is more accessible than equatorial forest.
- (iii) Improved communication network.
- (iv) Good market and capital inflow.

3. Mediterranean

Forests Primarily found in the Mediterranean climate within 35°-45° North and South of the equator. It is a peculiar climo-floral development found in several areas:

- (a) Adjacent regions of Mediterranean coast, extending east- west over 2,500 kms covering countries like Portugal, Spain, France, Italy, Albania, Greece, Turkey etc.
- (b) California in U.S.A. of N. America.
- (c) Central Chile of S. America.
- (d) S-E and southern parts of Australia.

(e) Cape region of South Africa.

This type of vegetation covers an area of nearly 80 million hectares of land.

Climatic Characteristics:

(a) Temperature:

Average annual temperature varies between 18° – 25°C. Winters receive moderate temperature while summer months remain hot.

(b) Rainfall:

The peculiar climatic characteristics of Mediterranean climate is manifested by its winter rainfall. The region receives much of its rainfall during winter, summer months remain dry and rainless. Average annual rainfall varies between 50-100 cm.

(c) Humidity:

This is the only region on earth where winter months remain humid while summer months are dry.

Characteristics of Vegetation

Winter rainfall and dry summer separates Mediterranean vegetation from all other vegetation type. Lush green winter and pale brown summer is typical. Though much of the original vegetation has long been destroyed due to ruthless human interference.

Present vegetation can be classified into three broad groups:

(a) Mediterranean Evergreen vegetation = Oak, Cork, Eucalyptus, Redwood etc.

(b) Evergreen Coniferous Forest = Pine including Aleppo Pine and Stone Pine, Fir, Cypress etc.

c) Mediterranean Scrub and Bush = Laurel, Myrtle, Lavender, Rose-merry etc.. It is called Maquis in France, Machia in Italy, Chapparel in California (U.S.A.) and Mallea-scrub in Australia.

Economic Importance:

a. Large trees are rare.-Trees are isolated.-So lumbering industry is limited.

b. The barks of cork and oak are used to produce caps of the bottles.

c. Lavender and rose-merry trees produce perfumes.

d. Olive oil is extracted from olive trees.

e. Wine is produced from grapes

4. Temperate Broad-leaved Deciduous and Mixed Forest

Location:

In the eastern side of the continents, in warm temperate region, this forest is located in

(i) South China.

(ii) South Japan.

(iv) South Africa.

(v) South-East Australia.

(vi) South Brazil. Climatic

Climatic Characteristics:

1. Rainfall all the year, minimum annual temperature over 10°C.

2. Due to heavy rainfall, evenly distributed throughout the year, trees are evergreen, broadleaved and hard-wood type. Major Species:

a. Koebrack in South-East Brazil.

b. Deodar.

c. Eucalyptus.

5. Major Species:

a. Koebrack in South-East Brazil.

b. Deodar.

c. Eucalyptus.

5. Warm Temperate Broad-leaved Deciduous Forest Location: In warm temperate region, where temperature remains above 6°C at least 6 months of the year. This forest developed in central and north-west China, Korea, Japan, New Zealand and Tasmania.

Characteristics

1. Trees shed their leaves during spring.
2. No layer in the leaves.

Major Species:

Elm, Beach, Maple, Walnut etc.

Economic Importance:

- a. As same type of trees are concentrated in different regions, wood collection is easier.
- b. Wood transportation is also easier.
- c. As there is very little undergrowth, collection of forest product is much easier.

6. Coniferous Forest.

Location:

In both the hemisphere 50°-70° latitude, this forest extends through Europe, Asia and North America in Northern hemisphere and Chile, Argentina and New Zealand in Southern hemisphere.

In Switzerland, Sweden, Norway and Finland in Europe; North Japan, North China in Asia; C.I.S. in Eurasia and Canada. In North America this coniferous forest is known as Taiga.

35% of the total global forest extending over 1,200 million hectares is included in the coniferous forest

Climatic Characteristics:

The winter temperature remains very low. Sometimes it goes below -10°C. Winter experiences heavy snowfall, summer very low snowfall. Annual rainfall varies between 30-50 cm. 5°C isotherm line demarcates its northern limit while 10°C isotherm line delimits its southern limit in summer.

The major climatic characteristics are:

- (i) Prolonged winter.
- (ii) Mild short summer.
- (iii) Scanty rainfall

Major Species:

The major tree species in coniferous forest are:

- (i) Pine
- (ii) Fir
- (iii) Birch
- (iv) Spruce
- (v) Willow
- (vi) Lirch
- (vii) Aspen
- (viii) Alder
- (ix) Douglas. Pines and Firs are of different varieties — White pine, Red pine, Scot pine, Douglas Fir, Bolson etc

Economic Importance:

The major economic utilization of the coniferous forests can be grouped into several industries:

Match-box industry:

This industry has only developed in coniferous forest where softwood is available. Sweden, Denmark, Norway, Canada are the forerunners in match-box industry.

Paper industry:

Economically this is the largest industry developed in coniferous forests. Softwood is favourable for the preparation of principal raw material, i.e. paper pulp, for paper manufacturing. Almost 93% of the pulp is manufactured from coniferous softwood.

Rayon & Synthetic Textile industry:

Synthetic textile and rayon requires cellulose. Cellulose is obtained from coniferous trees.

Other industries:

Depending on various raw materials obtained from Coniferous forest, a host of other industries has developed in this region. Important among these are cardboard, different boxes, boat and ship materials and different chemical products.

Water resources

The world's water exists naturally in different forms and locations: in the air, on the surface, below the ground, and in the oceans.

Freshwater accounts for only 2.5% of the Earth's water, and most of it is frozen in **glaciers** and **ice caps**. The remaining unfrozen fresh-water is mainly found as **groundwater**, with only a small fraction present above ground or in the air.

Looking at how water moves through the Earth's **water cycle** helps we understand how it interacts with the environment and how much is available for human use.

2.1 **Precipitation** – rain, snow, dew etc. – plays the key role in renewing water resources and in defining local climatic conditions and **biodiversity**. Depending on the local conditions, precipitation may feed rivers and lakes, replenish **groundwater**, or return to the air by evaporation.



[Water cycle](#)

2.2 **Glaciers** store water as snow and ice, releasing varying amounts of water into local streams depending on the season. But many are shrinking as a result of **climate change**. **River basins** are a useful “natural unit” for the management of water resources and many of them are shared by more than one country. The largest river basins include the Amazon and Congo Zaire basins. River flows can vary greatly from one season to the next and from one climatic region to another. Because lakes store large amounts of water, they can reduce seasonal differences in how much water flows in rivers and streams.

Wetlands – including swamps, bogs, marshes, and lagoons – cover 6% of the world's land surface and play a key role in local **ecosystems** and water resources. Many of them have been destroyed, but the remaining wetlands can still play an important role in preventing floods

and promoting river flows. 2.3 Of the **freshwater** which is not frozen, almost all is found below the surface as groundwater . Generally of high quality, groundwater is being withdrawn mostly to supply drinking water and support farming in dry climates. The resource is considered renewable as long as groundwater is not withdrawn faster than nature can replenish it, but in many dry regions the groundwater does not renew itself or only very slowly. Few countries measure the quality of groundwater or the rate at which it is being exploited. This makes it difficult to manage.

Water resources are sources of water that are useful or potentially useful to humans.

It is important because it is needed for life to exist.

Many uses of water include agricultural, industrial, household, recreational and environmental activities.

Virtually all of these human uses require fresh water.

Only 2.5% of water on the Earth is fresh water, and over two thirds of this is frozen in glaciers and polar ice caps.

Water demand already exceeds supply in many parts of the world, and many more areas are expected to experience this imbalance in the near future.

It is estimated that 70% of world-wide water use is for irrigation in agriculture.

Climate change will have significant impacts on water resources around the world because of the close connections between the climate and hydrologic cycle.

Due to the expanding human population competition for water is growing such that many of the world's major aquifers are becoming depleted.

Many pollutants threaten water supplies, but the most widespread, especially in underdeveloped countries, is the discharge of raw sewage into natural waters.

Research will always be needed to identify and evaluate the impacts of alternative paths toward this future, and the trade-offs that will be inevitable given our multiple, and not always compatible, dreams or goals. But clearly translating research results in ways that make them policy relevant is also needed. Research results presented in WRR papers, for example, need to be “translated” into language that shows their relevance to policy makers,

and indeed the public. It has to be written in a way that motivates, entertains and informs in a manner that they can understand.

Researchers from many disciplines will work together in the future. They would do well to be inspired by the Vision of the American Society of Civil Engineers whose members see them as:

“Entrusted by society to create a sustainable world and enhance the global quality of life, civil engineers serve competently, collaboratively, and ethically as

1. master planners, designers, constructors, and operators of society's economic and social engine—the built environment;
2. stewards of the natural environment and its resources;
3. innovators and integrators of ideas and technology across the public, private, and academic sectors;
4. managers of risk and uncertainty caused by natural events, accidents, and other threats; and
5. leaders in discussions and decisions shaping public environmental and infrastructure policy.”

The fundamental issue facing everyone is how to reconcile our desires for all of us on this globe to have a good life with the constraints imposed by the availability of a renewable, but limited, water resource.

Mineral

A naturally occurring substance that has a definite chemical composition is a mineral. Minerals are not evenly distributed over space. They are concentrated in a particular area or rock formations. Some minerals are found in areas which are not easily accessible such as the Arctic Ocean bed and Antarctica. Minerals are formed in different types of geological environments, under varying conditions. They are created by natural processes without any human interference. They can be identified on the basis of their physical properties such as colour, density, hardness and chemical property such as solubility.

Power resources

Power resources means the sources of energy available to us needed for driving machineries in industries, fuel in the transport sector, provide light and heat for domestic and industrial use.

Power Resources Sunny's mother begins her day by switching on the geyser. She irons Sunny's school uniform before waking him up. She then rushes to the kitchen to prepare a glass of orange juice for him in the blender. "Sunny, have you finished taking bath? Come and have your breakfast", calls out mother while preparing breakfast on the gas stove for Sunny. While going to school Sunny forgets to switch off lights and fans. When mother switches them off she thinks that life in the cities may be more comfortable, but its dependency on more and more gadgets all of which consume energy has led to a wide gap between the demand and the supply. With the advent of science and technology the life styles are changing very fast. Power or energy plays a vital role in our lives. We also need power for industry, agriculture, transport, communication and defence. Power resources may be broadly categorised as conventional and non-conventional resources

Coal

This is the most abundantly found fossil fuel. It is used as a domestic fuel, in industries such as iron and steel, steam engines and to generate electricity. Electricity from coal is called thermal power. The coal which we are using today was formed millions of years ago when giant ferns and swamps got buried under the layers of earth. Coal is therefore referred to as Buried Sunshine. The leading coal producers of the world are China, USA, Germany, Russia, South Africa and France. The coal producing areas of India are Raniganj, Jharia, Dhanbad and Bokaro in Jharkhand.

Petroleum

The petrol that keeps your car running as well as the oil that keeps your cycle from squeaking, both began as a thick black liquid called Petroleum. It is found between the layers of rocks and is drilled from oil fields located in off-shore and coastal areas. This is then sent to refineries which process the crude oil and produce a variety of products like diesel, petrol, kerosene, wax, plastics and lubricants. Petroleum and its derivatives are called Black Gold as they are very valuable. The chief petroleum producing countries are Iran, Iraq, Saudi Arabia and Qatar. The other major producers are USA, Russia, Venezuela, and Algeria. The leading

producers in India are Digboi in Assam, Bombay High in Mumbai and the deltas of Krishna and Godavari rivers.

Natural gas

Natural gas is found with petroleum deposits and is released when crude oil is brought to the surface. It can be used as a domestic and industrial fuel. Russia, Norway, UK and the Netherlands are the major producers of natural gas. In India Jaisalmer, Krishna Godavari delta, Tripura and some areas off shore in Mumbai have natural gas resources. Very few countries in the world have sufficient natural gas reserves of their own. The sharp increase in our consumption of fossil fuels has led to their depletion at an alarming rate. The toxic pollutants released from burning these fuels are also a cause for concern. Unchecked burning of fossil fuel is like an unchecked dripping tap which will eventually run dry. This has led to the tapping of various nonconventional sources of energy that are cleaner alternatives to fossil fuels.

Hydel Power

Hydel Power Rain water or river water stored in dams is made to fall from heights. The falling water flows through pipes inside the dam over turbine blades placed at the bottom of the dam. The moving blades then turn the generator to produce electricity. This is called hydroelectricity. The water discharged after the generation of electricity is used for irrigation. One fourth of the world's electricity is produced by hydel power. The leading producers of hydel power in the world are Paraguay, Norway, Brazil, and China. Some important hydel power stations in India are Bhakra Nangal, Gandhi Sagar, Nagarjunsagar and Damodar valley projects

Nuclear Power

Nuclear power is obtained from energy stored in the nuclei of atoms of naturally occurring radioactive elements like uranium and thorium. These fuels undergo nuclear fission in nuclear reactors and emit power. The greatest producers of nuclear power are USA and Europe. In India Rajasthan and Jharkhand have large deposits of Uranium. Thorium is found in large quantities in the Monozite sands of Kerala. The nuclear power stations in India are located in Kalpakkam in Tamilnadu, Tarapur in Maharashtra, Ranapratap Sagar near Kota in Rajasthan, Narora in Uttar Pradesh and Kaiga in Karnataka

