#### **HUMAN GEOGRAPHY**

# **EMERGENCE OF MAN**

The evolution of man from simple life forms through apes to the present day human beings can be studied from various sources ranging from comparative bio-physiological studies of man and other mammals to the study of fossils of ancestors of present day human beings.

Man belongs to the Order Primate having a relatively large brain, a grasping hand with nails and stereoscopic eyesight which has been developed at the expense of his sense of smell. Other primates include tree shrews, lemurs, monkey and apes (chimpanzees, orangutans and gorillas). Man shows the closest affinity, among all primates, to the apes by virtue of his unique ability to develop culture. The study of fossils wrong with remains of tools and other artifacts tells us a lot about the physiology, environment and the way of life of our ancestors.

Biologically, man is related to the apes and diverged form a common ancestral species which, not nearly specialized lived both upon the ground and on trees during the Tertiary era (around 65 million years ago). The tertiary era witnessed the Alpine orogeny and the emergence of mammals. Apes, on the whole, have become arboreal and vegetarian. By being able to move from one tree to another on higher branches, they have attained security from terrestrial predators like tiger lion, leopard and they can also pluck fruits and edible forest products from trees at any height. They are essentially quadrupeds, generally having prehensile tails. Man having become a biped with an erect posture, has no use for a tail. His feet are fully adapted for a brisk walk. His hand with an opposable thumb is a highly controlled organ with a precise grip. This enabled man to develop and use a variety of tools.

The adoption of an erect posture has been accompanied by an enlargement of the brain especially of the frontal lobe which is the seat of function of a higher intellectual level. Lowe jaw has become elongated because of the diet consisting mainly of cooked food. Freer and more delicately controlled movements of the jaw, face and tongue have enabled man to develop the faculty of speech.

The change of habitat from trees to the ground added animal flesh to a diet which was originally vegetarian. The final stage f evolution as a separate species (Homo sapiens) took place mainly during the later Pleistocene period. This was also the period of drastic climatic changes. As savannas, grasslands and steppes became more extensive towards the close of the Pleistocene period, ape-man ranged in the outer regions of the tropics and in sub-tropical latitudes of Asia, Africa and Europe. This is vindicated by fragments of skulls and bones which have been found in China, central and Western Europe as well as in Africa. But man's survival instincts enabled him to survive near the equator also, as some of the most significant remains have been recovered in Java. The ability of man to use fire and make tools, which could be used for skinning of animals, enabled him to survive in colder climates.

During the inter-glacial periods when climate became milder, the early hominids spread even into higher latitudes, because their remains have been found in regions like Europe and northern China. Similarly, during the glacial period's, the hominids moved to tropical and subtropical areas. By the time the last of the glacial periods came, man was able to survive in more rigorous climates by retreating into caves and using animal skins and fire. Among the best known of these early species was the Neanderthal man with larger bones and more powerful muscles than the modern man, but having a more primitive skull, a massive and protruding jaw, a receding forehead and a prominent bony ridge above the eyes. The Neanderthal appears to have evolved as a separate species north of the Tertiary mountain belt of Europe and Asia. The remains have been found in northern China as well as in Europe.

Mankind, thus, appears to have evolved south of the mountain zone in Eurasia and to have lived in India, Java, western and southern Asia and northern Africa. It seems that Neanderthaloids and more modern species lived together in Europe and south-western Asia during the latter part of the last glaciations. Although the more specialized Neanderthals have not survived as a species, some of their physical characteristics have been identified in present day Europeans. Some authorities believe that the Neanderthals of eastern Asia have contributed to the Mongoloid peoples.

## THE RACES OF MANKIND

Race has been defined as "a biological grouping within the human species, distinguished or classified according to genetically transmitted differences". The race as an expression has been used in different context, viz. culture, tradition, language and nationality. These are not scientific criteria, since they are neither biological nor inherited.

There has been some difference of opinion regarding the origin of different races. One school of thought argues that racial differences existed from the very beginning, while another school of thought believes that different r\aces developed from one single ancestral species.

The scientific classification of human racial types is based on certain combinations of fixed, inherited, as far as possible measurable and visually identifiable traits, such as head shape, eye shape and colour, skin colour, stature, blood groups etc. These traits represent morphological, biological and genetical aspects. With the inclusion of more and more traits, the number of combinations increases and the analysis becomes more complex.

There is no single way of classifying mankind into biological races. In the past, physical characteristics, such as skin colour and hair type, were used to delineate three to five biological races (Caucasoid, Negroid and Mongoloid and later, Austrloid and American Indian). More subtle techniques, taking into account blood types and hereditary diseases well as terrain barriers, result in classifications that may include as many as eight or nine geographical race. Although difference of opinion exists regarding terminology and the exact classification, the following divisions are generally accepted:

- 1. Caucasoid (Eruopean)
- 2. Negrodi (Afican)
- 3. Mongoloid (Asistic or Oriental)
- 4. Indic (Hindu)
- 5. Australoid (Australian aboriginals)
- 6. Polynesians / Melanesioan / Micronesian (sometimes, these three are classified as the Oceanic)

Generally speaking, the spatial distribution and concentration of these races is Caucasoids in Europe, Mongoloids in Asia and Negroids in Africa. But these races are not limited, in spatial extent, to these areas only. For instance, the Caucasoid race is also found along the northern belt of Africa, Turkey and from Iran to Baluchistan and India. The Mongoloid race is mainly found in the central, eastern and south-eastern parts of Asia and the western parts of the Americas (Red Indians etc.), Arctic region (Eskimos in Canada, Grreenland and Yakuts in Siberia). In other worlds, the Mongoloids are clustering around the Pacific and the Arctic Oceans. The Negroids are mainly concentrated in the south of Sahara desert in Africa, but they are also found in Indonesia (pygmy group), Papua New Guinea and Melanesia. The Australoids, a mixture of Negroids and Dravidians (south India), are largely concentrated in Australia, especially in the north and west.

# PHYSICAL CHARACTERISTICS OF MAJOR RACIAL GROUPS

- 1. SKIN COLOUR The Caucasoids have pale reddish white to olive brown skin colour. Among the Mongoloids, the skin colour ranges between saffron to yellow brown, while some individuals have reddish brown skin colour. The Negroids have brown to brown-black or yellow-brown skin colour.
- **2. STATURE** The Caucasoids have a medium to tall sature, while the Mongoloids are medium tall to medium short and Negroids, tall to very short.
- **3. HEAD FORM** Among the Caucasoids, head is generally long to broad and short and medium high to very high. Among the Mongoloids, head is predominantly broad and medium high, while it is predominately long and low to medium high among Negroids.
- **4. FACE** It is narrow to medium broad and tends to be high with no prognathism, among the Caucasoids. Among the Mongoloids, it is medium broad to very broad and medium high. The face is medium broad to narrow and tends towards medium high with strong prognathism among Negroids.
- **5. HAIR** Among the Caucasoids, hair colour is light brown to dark brown, texture is fine to medium and the form is straight to wavy. The body hair among the Caucasoids is moderate to profuse. Among the Mongoloids, the colour of hair is brown to brown black, texture is coarse, and form is straight and body hair sparse. Among the negroids, hair colour is brown black, texture is coarse, form is wooly or frizzly and body hair, spares.

- 6. EYE the colour of eyes, among the caucasoids, is light blue to dark brown while the lateral eye-fold is occasional. Among the mongoloids, the eye colour is brown to dark brown and the medial epicanthic fold is very common. Among the Negroids, eye colour is brown to brown black and vertical eye-fold is common.
- **7. NOSE** among the caucasoids, the nasal bridge is usually high and the form, narrow to medium broad. The nasal bridge, among the mongoloids, is usually low to medium and the form, medium broad. Among the negroids, the nasal bridge is usually low and the form, medium broad to very broad.
- **8. BODY SHAPE** among the caucasoids, it is linear to lateral and slender to rugged. Among the mongoloids, it tends to be lateral with some linearity and among the negroids, the body shape is lateral and muscular.
- **9. BLOOD GROUP among** the caucasoids, frequency of A is more than that of B, while the mongoloids have more B than A and the negroids have both A and B.

#### **CULTURAL EVOLUTION OF MAN**

Culture is a collective term for the traits acquired by man, living in a society, in order to a particular environment. These traits include knowledge, belief, art, morals, law, customs, religion and any other capability acquired as a member of the society.

Culture is a unique feaure of man's evolutionary process and he has modified his culture as a tool. Because of this unique feature, thehuman evolution has been moe repaid than that of other species. Thus, the biological and cultural eveolutions have progressed simulateously, complementing each other in the process. Culture eveolved mainly though the second half of Pliocene and first three-quarters of Pleistocene period. Evolution of culture a made possible the following developments:

Dispersal of human beings across the earth's surface.

Adaptation to nearly all of biotic and physical situations by man.

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Growth in number to reach a population of 5 million around 10,000 years ago. Based on technology of stone tools, the various stages in cultural eveolution of man are ferferred to as Old Stone Age, the middle stone age and the new Stone Age. The main features of these stages are discussed below.

**PALAEOLITHIC AGE** This age dates back to a period two million years ago. During this age, successive glaciations alternated with milder climatic conditions. Plants, animals and humans tried to adapt to these climatic extremes and those, which could not.became extinct. Speech was evolved and mastered by humans along with tools and fire, thus completing "the tripod of coulture". Speech made communication and exchange of information, ideas and experiences possible. Man could now innovate and reorganize. Man started amking tools using stone, bones and wood and adopted hunting and gathering as the main economic activites. The eartliest critieria for occupation of an area were access to source of warter, least effort and continuous food supply and security.

A revolutionary development, during this period, was the discovery and control of fire which made possible movement to higher latitudes, keeping the animals away, storage of animal flesh, cecurity from predators and from fellow beings and the origin of a religious cult which centred areond fire. The progress on the dulcural from was slow during the arly Pleistocene, while there rapid advances from a period on million years agfo onwards. Another feature which evolved during theis age was gender-based division of labour and sharing offood.

Thus, during the Palaeolithic age, man evolved from am unspecialized food gatherer (Homo habilis) to s specialized hunter-gatherer (advanced species of Homo sapiens).

**MESOLITHIC AGE** this age lasted from 11,000 to 9,000 year ago. This age is characterized by the end of the last of the major cdeglaciations and replenishement ofwater bodies by aquatic life. This age also marked the

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beginning of Holocene period or "the stage of incipient food productin". Man had become a specialized food gatherer by now. Man also adopted the techniques for preservation and storage of food surpluses, thus reducing the "starvation periods". Tools became more refined and specialized.

**NEOLITHIC AGE** This period is characterize by grinding and polishing of stone, beginning of agriculture, a settled lifestyle, pottery, domestication of animals and a more purposeful and intensive manipulation of biotic environment. Three main sities of early agriuclature are the Middle-East, Meso and Andean America and South-East Asia. There was greater regional spread of tool types and advancements were made in food preservation and storage. The animals for food were hunted outside, but were brought to the camp site and consumed there. From various sites, remains of wheat, barley, peas, lentil, and skeletal remains of cattle and pigs have been found.

#### **BEGINNINGS O FCIVILISATION**

The early civilizations appeared in the uplands which had adequate amounts of rainfall to support agriculture of the local inhabitants. Gradually, with increase in population, the communities moved to the lowlands, where the river valleys offered natural sites for settlement, agriculture and domestication of animals. The early rive valley civilizations came up around the rivers Nile, Tigris and Euphrates Indus, etc. the agricultural advances were represented by development of water management techniques like canals, bunds, ditches, etc. Pottery and weaving ahd already developed.

Around 3500B.C, metallurgy came into existence with the use of copper, silver, gold and, later, bronze and iron. Around 3000 B.C., the use of wheel for v ehicles and sail for hsips made easier the transportation of greater loads. During the second millennium, domestication of horse started in grasslands of the central Asian steppes. In the meantime, agricultural surpluses gave rise to urban centres. Further intellectual progress was reflected in writing, mathematics, astronomy and development for calendar. The economic,

scientific and technological advancement led to further social, political and intellectual progress.

It was around 1500 B.C. that iron began to be used. This was a landmark as it increased agricultural productivity and made possible the clearing of forests for purposes of settlement and agriculture. Also, more effective weapons could be made which made warare and important element of political life during this period.

The modern technological revolution began with the Industrial Revolution during the ast two centrueis and new way of life arose out of it. The Industrial Revolution increased productivity, transformed patterns of organization, sparked new theories of economic managementand stimulated political thought regariding distribution of wealth. Communication, gransportation and sources of energy in manifold forms gave people a freedom they had never imagined possible.

The most significant advances in recent decades have been in the field of transport and communication and include railways, air trnaport, oceantransport, telephone, raido, televiosn, computers, satellite communication, internet, fax etc. Apart from this, advancements in tapping of various sources of energy, non renewable of renewable, have been tremendous.

Cultures vary in how they utilize technolgocial advances. Japan has developed a dense railway web and its road traffic is also increasing rapidly. Countries, where economic development began to accelerate only two or three decades ago, may never acquire a completely developed railway system. More probably, roads complemented by air routes will serve most of their needs.

Similarly, agriculture has been completely transformed by scientific and technological advancements which include the bio-technological revoltion involving advanced knowledge of genentics, improved high-yielding and disease resistant varieties of seeds, crop rotation methods, increased use of chemical fertilizers, extensive mechanized operations nd scientific forestry.

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But regional disparities in development exist. As a result, primitive techniques and cultures co-exist with modern and compelx one. With increased communication compared to the ancient times, these differences are being obliterated fast.

#### MAJOR CULTURAL REALMS OF THE WORLD

A cultural realm is a geographical region where cultural traits maintain homogeneity. The cultural tgraits are supposed to be the product of regional geographicalcircumstgances. It is, thus, regional geography which has become the basis of the delineation of cultural realms in the orld. Ratzel's concept of cultural landscape provided encouragement to geographers for cultura regionalization.

Blache and Spencer are other geographers who considered the study of dcultural relams as an important part of human geography. Apart from the geographers, histroieans, anthropologists and sociologists have also tried to regionaslise the world into cultural realms. The variables of culture include the economic organization, social customs, traditional values, dietary habits, dress patterns, language anduniformity in physical characteristics. On the basis o ftheses variables, various cultural realms can be identified.

Brock Webb tried to estarblish the dominance of a particular phenomenon over the evolution of cultural landscape. He found that the impact of religious values is tremendous over the etire cultural system. Allover the world, human beliefs, day-to-day activities and even dress patterns, food habits andsocial values are influenced by religious messages. To many geographers, religious messages are also influenced by regainal geography. A cultural religious investigation reveals that the duvlture of a particular region becomes ineffective once the religious impact is withdrawn.

Considering these phenomena, Brock Webb divided the world into four major and two minor cultural realms. The major cultural relams are

Occidental Realm

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Islamic Realm Indian Realm

East Indian Realm

And the monor cultural realms are

South-East Asian Realm

Meso-African oer Negro African Realm.

# **OCCIDENTAL REALM**

Occidental culture is the culture of European society. It is influenced to a great extent by Christianity. It has regional modifications on the basis fof varying levels of industrialization, political and economic thought, colonization, commercialization, urbanization, and development of transport system, development of social, political and economic institutions. In many parts of the occidental culture, the impact of non-religious factors, particulararly the effect of modernization is so great trhat the religious values are sidelined. Post-industrial Europe is fact merging as a society whee traditional values ae nearly abandoned. The occidental culture covers a vast area. It is further divided into six sub-regions considering the impact of regional environment.

West European is the most industrialized and urbanized culture.

- **Continental European culture** is influence by different political and economic thoughts, while Christianity remains an important influence.
- **Mediterranean Europe** includes countries lying to the south of the Alps. It is the region of dominance of Christianity. To many geographers, the deep-rooted traditional social system is the principal cause of ilimited economic development in countries like Spain, Portugal and southern Italy, compared to adopted necessary changes in their social systems.
- **Anglo-American and Australian cultural realms** are practically the off springs of west European culture. Both ar inhabited by migrants from west Europe. There are only some regional differences.

Latin American culture is very similar to the Meiterraneanculture. It is the only region of occidental cultgure 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 colonical languages, Spanish and Portuguese, have become the state languages. Regional architecture has been influenced by the Spanish and Portuguese styles. Pracically all countries maintain economic, cultural andsocial ties with the Mediterranean countries.

#### ISLAMIC CULTURAL REALM

The culture, here, 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 Indianculture in the east and the modernized 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 modernization is very low.

#### INDIC CULTURAL REALM

This is the culture of the Indian sub-continent. Baker called it a sub-feudal land relations, subsistence agriculture, paddy farming, seasonal climate changes and agricultural season coming at the same time allover 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 modeifications. True Buddhist culture can be seen in South Korea and Japan. Even these two countries have felt the impact of instrialisation, urbanization and modernization.

The culture of mainland China has modified the Buddhist system. This culture was adopted after the Second Word War.

#### SOUTH-EAST ASIAN CULTURE

It is a transitiaonal 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 Philippines, of Indic culture over islands of Indonesia, and the Islamic influence is eveident in Malaysia and the Indonesian islands. No other region has such peculiarities.

#### **MESO-AFRICAN CULTURE**

This culture is alos known as the Negro culture. It principally includes tropical Africa. Similar cultural systems can be seen among the Ameicanm Red Indians, Latin American tribes of Asia-Pacific region. Historian Toynbee has used the term 'marginalised culture' for these traditional culture units. Some geographers even invlude Eskimos under this cultural realm. Thus, it is a widely scattered cultural realm characterized by marginalized and relatively isolated communities.

#### **INTERNATIONAL MIGRANTIONS- PAST AND PRESENT**

International migration is one of the most important phenomena of human geography. A true form of migration is the permanent shift of residence. It can be seasonal as well as temporary. When the place of residence changes crossing the international boundary, it is intenational migration. The cause leading to migration can be put under push and pull factors.

The **push factors** operate at the soruce region and include increase in size of population, destabilizing land raltions, unemploykent, poverty, food shortage, religious and social oppression, recurring droughts and floods, insecurity, political tensions, etc.

The **pull factors**, on the othe hand, operate at the destination or the host country. These factors include better employment opportunities, better living

conditions and favourable economic and political conditions. Migration, when seen in totality, is a function of both the pull and push factors.

#### **THEORIES ON MIGRATION**

Accounding to thefunctionlists, international migrations take place voluntarily in response to spatial inequalities in the distribution of physical and human resources. The neo-marxists on the othr hand see international migration as coercive labour migration which is a manifestation of dependency that prmotes underdevelopment inm the periphery and overdevelopment at the core. They consider the movement of labour from less developed peripheries to the cores as ah exploitation of labour in capitalistic system. Whereas this neo-Marxist theory suffersfrom rigidity, the functionlists view of migration seems optimistic. The international migrations in the past have taken place for both these reasons, i.e. for attaining equilibrium between the physical and human resources (e.g. the Trns-Atlantic European movement) and also for exploiting the unemployed to serve the interests of the capitalists (slave trade from Africa).

Inter-regional migrations have been taking place since pre-historic times. At that stage, the concept of political boundaries did not exist, so only the migrations sicne the colonial period may be considered as true international migrations. The study of international migration may broadly be divided into past and present migrastions. The past trend in migration includes migrations occurring upto 1960. Some geographers and sociologists consider it only upto the end of Second World War. The decade of the 1950s is taken as the transitional phase in the history of international migration. But clearly, the post -1960 migration is, structurally, qualitatively and spatially, a different one in comparison to the earlier trends.

**PAST MIGRATIONS** The European overseas expansion, of the 17<sup>th</sup> centuary and after, perhaps constitutes the world's largest human transplantation. The new discoveries, through adventurous voyages, enhanced the possibilities of exploiting the new world while simultaneously relievingnorth-westen Europe

Courtesy : Saidai Manithaneyam

from the acute pressure of population upon its dwindling resource. Such migations took place to two different distinations.

- One comprised the sparsely populated tropical and sub-tropical coastlands, which wer easily accessible and possessed the potential for production of extotic crops because oftheir warm, humid climates. Consequently, comerical production of cotton, sugar, tobacco, coffee, tea, spices, indigo, rice etc. started in coastlands of America from Virginia to Brazil. With increase in intensity of agricultural operations, need for cheap labour arose. Thus, slave trade from Africa started. Also, labour was supplied by British and Dutch colonies in Asia.
- The second destination comprised the temperate grasslands and woodlands which were also sparsely populated. These attracted European settlers who moved into temperate zones of America, Austrialia and New Zealand. This constituted the most important migratory movement of human history involving about one-fifth of Europe's total population. It was only from 1820 to 1930 that the movement assumed really large proportions.

The two World Wars gave rise to forced migrations. The most important characteristic of forced migration is that the normal selectivity in migration process.

- Over one million Russians were stranded in adjacent parts of Europe as a result of the 1917 Revoltuion.
- Over 3, 00,000 Americans fled from persecution associated with the Turkish nationalism in the 1920s.
- More than a million Jewish refugees left Germany in the 1930s to escape Nazi persecution.
- About 18 million people in central and Eastern Europe crossed international frontiers through flight, transfer or exchange of population is three years following the Second World War

In 1947, emergence of Pakistan in the Indian sub-continent forced about million people to move from one part of the sub altitude regions and wet tropical lands (e.g. the Amazon Basin

## FACTORS RESPONSIBLE FOR UNEVEN DISTRIBUTION

- **Historical** For instance, the sites of early civilizations have been generally crosded (Indus and Gango Valleys) because they got settled early.
- **Physical/Natural** These factors include climate, terrain, natural resources and space relationships.
- **Cultural** These include social attitudes, stages of economic development and political organization.
- **Demongraphic** These include the regional differences in fertility, mortality rates and migration trends.

## ECUMENE AND NON-ECUMENE REGIIONS

The permanentely inhabited lands are referred to as the **ecumene**, while the uninhabited, intermittently or sparsely inhanbited lands are referred to as the **non-ecumene**. The boundaries of these regions are not distinct but diffuse into each other. The major limiting factors are climate, drainage, soil, rough terrain, wild vegetation, altitude and the degree of proneness to disease.

Although, the Antarctic ice caps and Greenland represent complete, continuous non-ecumene, most of the non-ecumene is in form of unoccupied, isolated and intermittently occupied regions of varying sizr and is confied to desert wastes, cold barren, high mountains, swamps and primitive forests of tropics and sub Arctics. About 60% of the world's total area could be referred to as ecumene.

# **MAJOR ECUMENE REGIONS**

Four major clusters or ecumene account for 75% of the world's total population.

1. East Asia (China, Japan) is the largest ecumene and a sub-tropical region accounting for 25% of the world's total populations.

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- 2. South Asia (India and neighbous) ranks second. It is a tropical region accounting for 25% of the word's population. This is a regiona having premodern subsistence economy which is predominantly agricultural. The population distribution is determined by agricultural potential of the land food supply. Poverty, malnutrition and low levels of living are common. Birth rates are high, death rates are low but not like the developed countries. Therefore hih growth rates prevail. This regions account for only 20% of the world's resources.
- 3. Formers USSR, a mid-latitude region, accounts for 20% of the total population.
- 4. North America accounts for 5% of the totalpopulation. It is a highly industrialized region with specialized pockets and generally high standards of living thoughout.

**MAJOR NON-ECUMENE REGIONS** These include, generally, the cold, dry and hot-wet lands. Main features of these regions and future prospects for habitation are discussed below.

- **Cold, High-Latitude Lands** These include the ice caps of Antarctica, Greenland, Tundra region of North America and Eurasia and the Arcitc and sub-Arctic cold deserts. The main limitations of these regions are long sunless periods, extreme cold temperatures, and almost no vegetation. Only towards the southern margins, somehabitation possible. Future prospects for settlement in this region are bleak due to severity of climate.
- **Dry Lands** These are characterized by deficiency of water, low precipitation, sparse vegetation, unreliable yields. These lands are intermittently occupied by nomadic groups with dense populations only in a few oases. These regions recently winessed expansion of population with development of irrigation techniques. This is also possible in future, but at high costs.
- **Hot-Wet lands** These regions show abundance of climatic energy in form of solar energy and precipitation which cause luxuriant vegetation growth that

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can support large populations. The wet tropics of the old world are better populated than thaose of the new world. Nearly 20% of the new world wet tropics can be brought under habitation with suitable landuse.

Thus, only the wet tropics show prospects of dense population concentrations in decades to come.

#### THE POPULATIONGROWTH PATTERNS

In early periodsof human existence, the number of deaths generally neutralized the number of births. High mortality necessitated high fertility to assure survival of mankind. The world's population is estimated to be around 8 million at the advent of agriculture around 8000 B.C., Subsequently; the improvement in food supply permitted the births to exceed the daths by a modest margin. The population continued to grow at a veryslow rate for a long peiod and is estimated to have reached 800 million by the dawn ofmodern era, i.e. mid-eighteenth century. After that, the population started showing rapid increase for the following reasons-

Man's increasing controld over nature.

Industrial Revolution increased tremendously the supporting capacity of areas.

Decline in mortality rates and widening gap between the birth rates and death rates.

Consequently, by the mid-twentieth century, the world population reached 2.5 billion. By 1988, the population reached the 5 billion mark. Thus, while it had taken the world more than one million years to reach the one billion marks in 1808, the nxt billion was added in just 120 years (1928). The third billion was added in 32 years (1960), the fourth billion came in just 15 years and the fifth billion marks was reached in 1988, i.e. just in 13 years.

Till 1950, the growth rates were much higher in the developed world (North America, Europe and Japan) than in the developing world (Asia, Africa and Latin America). For instance, during 1750 to 1850 and 1850 to 1950, the growth rates were 0.6% and 0.9% respectively for the developed coutries and

0.4% and 0.6% respectively for the developing countries. But between 1950 and 1970, the growth rates in the developing world and the developed world were 2.2% and 1.1% respectively, implying almost a 400% increase in the growth rates of the developing world.

The increase in world population during the last three decades has been greater then the world's totals population at the beginning of the present century, about 80% of the increase taking place in the developing world. This was due to the widenting gap between mortality rates and the birth rates in countries with a wide population base because ofbetter health facilities and greater food security.

Africa has the highest annual growth rate at 3% followed by Latin America (2.3%), Asia (1.7%), Oceania (1.5%), former USSR (0.9%), USA (0.9%) and Europe (0.3%). Within these continents, there are differences. For instance, northern and western Europe show lower rates (0.1%) than eastern and southern Europe (0.6%) and in Asia, west Asia had highest rates (2.9%), while east Asia recorded the lowest rates (1.1%).

The regional pattern of growth rates reveals that the entire Europe (including Russia), japan, U.S.A. and New Zealand have agrowth rate ofless than 1% per annum. These are highly industrialized countires which completed the demographic transition by the early decaded of the 20<sup>th</sup> century.

The countries of China, India, Bhutan, Sri Lanka, Vietnam and Indonesia (Asia); Australia; Argentina, Chile, Guyana (Latin America); Gabon, Sierra Leone, Gambia (Africa) and Canada (North America) recorded and estimated growth rate of 1% to 2% for the years 1980-85. The developed countries mentioned here, like Australia and Canada completed their demorgraphic transition about 50 years ago. The inclusion of Asistic giants like India, China and Indonesia indicates a downwards trend in growth rates of these countires which is further related to decline in fertility rates. If the decline in their fertility

continues for some more time, it may bring considerable changes in total demorgraphic scenario of the world.

The rest of the world covering almost the entire Africa, West Asia, norther South America, central America and the countries of south east Asia recorded a high growth rate of more then 3% per annum. This was because of their continued high levels of fertility while their mortality rates had registered significant decline since long. But these countries had very high fertility rates to begin with and persistently low levels of socio-economic development. Thus, naturally, the efforts to control population should be focused in these two areas.

#### **DEMOGRAPHIC TRANSTITION**

The theory of demorgraphic transition was put forward by W.S. Thompson (1929) and Frank W. Notestein who based their arguments on fertility and mortality trends in Europe, America and Australia.

According to this theory, when a society transforms into a literate, industrialized and predominantly urban one from an illiterate and rural-agrarian society, a particular direction of demographic change can be traced. The theory outlines three basic hypotheses:

the decline in mortality rate comes before the decline in fertility rate.

The fertility rate actually declines to match mortality rate.

Socio-economic transformation of a society is commensurate with its demographic transformation.

The theory predicts conspicuous transition stage:

Stage I High and fluctuating birth and death rates and slow population growth.

Stage II High birth rates and declining death rates and rapid population growth.

**Stage III** Declining birth rates and low death rates and declining rate of population growth.

Stage IV Low birth and death rates and declining rate of population growth.

**Stage V** Birth and death rates approximately equal, which, in time, will result in zero population growth.

In the first stage, both fertility and mortality rates are high, in the range of 35 per 1000. But the mortality pattern is erratic due to prevalence of eqpidemics and variable food supply. This results in stable and slowly growing population. This stage mainly occurs in agrarian societies with low or moderate population density, societies where the productivity is low, life expectancy is low, large family size is the norm, underdeveloped agriculture is the main economic activity,low levels of urbanization and technological development prevail and low levels ofliteracy are experienced. Nearly all the countries of the world were at this stage, but now now to find a country at this stage of demographic transition seems improbable, because the data on fertility and mortality in such a region would be inadequate or lacking. Also, there is little chance that such a region would have remained totally unaffected by expansion in medical facilities. For these reasons, the first stage has also been called the Pre-Industrial or Pre-Modern stage.

The second stage is characterized by high but gradually declining fertility rates (at around 30 per 1000) and a drastically reduced mortality rate of over 15 per 1000. The expansion in health facilities and food security reduces death rates. But, because education has not reached sufficient levels, birth rates are still high. By the end of the second stage, fertility rates are still high. By the end of the second stage, fertility rates start declining gradually and mortality rates start declining sharply. The population now increases at declining rates. Most of the less developed countries of the world are passing though the explosive stage of demographic transition. These contries include India, Pakistan, Bangladesh, Nepal and Indonesia.

In the final stage, both death rates and birth rates are declining appreciably. As a result, population is either stable or growing slowly. At this stage, the population has become highly industrialized andurbaised technological development is satisfactory and arr deliberate attempts at rates prevail. This stage is evident in Anglo-America, west Europe, Australia, New Zealand, Japan etc.

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**CRITICISM** Loschky and Wildcose have criticized the theory, arguing that the theory is neither productive, nor are its stages sequentialand definite. Also, the role of man's technical innovationsshould not be underrated, particularly in the field of medicine which can arrest the rate of mortality.

The theory, despite its shortcomings, does provide a generalized macro-level framework within which different situational contexts can be placed in order to comprehend the demographic processes in that particular country. Also, scope should be left to take into account the fact that the present conditions are different from those prevailing 100 years ago in Europe.

# WORLD POPULATION PROBLEMS

Because of differences in their social, economic and cultural systems, the problems of developing and developed countries relating to population differ.

# **POPULATIONPROBLEMS OF DEVELOPING COUNTRIES**

- **LOW LEVELS OF TECHNOLOGICAL DEVELOPMENT** This is directly linked to low productivity levels in countries like India, Pakistan, China, Myanmmar, Nepal, Indonesia, Malaysia, Philippines etc. Low productivity means slow growth which is the root cause of rapid population growth in these countries.
- LOW POPULATION LEVELS This is the strange case with many countries having abundant natural resources which lie untapped for want of human resources. These countries in clued Brazil, Colombia, Peru, Zaire, Russian Siberia, Kazhakhastan, Uzbekistan, Turkmnistan, Krighistan and Tazhikistan.
- **DISPROPTIONATE SHARE OF YOUNG POPULATION this** is because of improved health facilities. This younger section puts tremendous pressure on a comparatively small working population.
- LACK OF DIVERSIFICATION OF ECONOMY lack of development of secondry and tertiary sectors leaves limited employment opportunities for the skilled and the educated that move to more developed towns or to foreign

countries in search of better job opportunities. This results in a distorted demographic structure in both the countries.

- **UNDER-NOURISHMENT AND LACK OF HYGIENE** low standards of living and poor living condition are responsible for this. As a result, incidence of diseases is high leading to high rates of moprtality, especially among children and pregnant mothers.
- **INEFFIEIENT AGRICULTURAL SECTOR** The developing countries are characterized by agrarian based subsistence production. Traditional and obsolete methods and implements for cultivation, lack of capital for investment, fragmented holdings and semi-feudal tenancy relations make the base of this type feconomy very weak.
- **WEAK INDUSTRIAL BASE** Lack of capital, outdated technology and inadequate akilled manpower have resulted in a weak industrial base in most of the developed countries. This has prevented any substantial improvement in living standards of populations of these countries.
- **TRADITION-BOUND SOCIETIES** Inward looking attitudes restrict flow of awareness regarding birth control, family planning etc. Caste system inhibits social mobility in societies like India.
- **UNDERPOPULATED POCKETS** These may exist either within populated countries or as separate countries. This type of situation, especially in the first case, leads to rural-urban disparity. Also, it becomes uneconomical to invest in physical and social infrastructure in such countries. Any investment in agriculture or in industry involves long gestation periods in such poskets. Industry faces the problem of sthortage of skilled manpower and insufficient market, even if high standards of living prevail.
- **UNFAVOURABLE PHYSICAL CONDITIONS** Many underpopulated countries have hostile climatic or topographical conditions. Such conditions obstruct development and it is both difficult and expensive to overcome these problems.

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#### **POPULATION PROBLEMS OF DEVELOPED COUNTRIES**

The developed countries are characterized by high levels of industrialization and urbanization, high per capita incomes, dependence of a major part of the worforce on secondary and tertiary acitivties, an efficient and productive agricultgrual sector. The problems faced by these countries, I relation to population, are discussed below.

- **HIGH PROPORTION OF OLD AGE POPULATION** this happens because oflow death rates and high rates of life expectancy. As a result a large section of population is above sixty years of age and is dependent on the relatively small workforce. Also, financial problems arise on account of pensions, healthservices, etc.
- **SHORTAGE OF LABOUR** As standards of education improve, the children remain longe at school and join the workforce later. This implies slow expansion of the workforce. As a result, many countries of Europe face shortage of labour. High wage rates disrupt the overall economic pattern.
- **OUTMIGRATION TO TOWNS** Search for better living conditions leads to distorted demographic structures, especially inrural areas, and neglect of the agricultural sector.
- **CONGESTION IN TOWNS** As towns expand, the pressure on civic amenities, trnsprot, housing etc. increase. Pollution and social social tensions lead to heart disease, breathing problems, lung and skin problems etc.
- **GROWTH OF SLUMS** Unregulated growth of urban centres leads to growth of slums which create many social and environmental problems. The highly productive agricultural land is encroached by urban houses, roads and industries.

Thus, the developing and the developed countries share many of the problems related to population. But, the problems of low populationdeveloping countries and the high population developing countries differ substantially.

Courtesy : Saidai Manithaneyam

# SUPPLEMENTARY INFORMATION I.CONSEQUENCES OF MIGRATION

The major conseuquences of migration are listed below.

**Demographic Consequences** As a consequence of internal migration, changes in population distribution take place wherea international migration induces changes in totoal numbers as well as population composition. Areas from where people migrate witness depleting number of young age group whereas the receiveing areas reveal extremely high proportion of young age group. The major cities located in the developing countries of the world like Algiers, Ougadougou, Addis Ababa, La Paz, Delhi Kuala Lumpur reveal this trend. Even in the developed coutries like the USA, California receives huge influx of young age group migrants due to the opportunities in information technology offered by the Silicon Valley.

Migration may be sex-selective in certain cases. In the Himalayan belt (Tehri-Garhwal) and Kerala in India male selective migration takes place because of the prevailing unemployment situation in those regions.

**Economic Consequences** It is rather difficult to measure the economic consequences of migration because of the problem of evaluation Loss of migrants may slow down the pace of resource development in the region from where people tend to migrate. However, an increasing trend of migratin rduces the pressure of population in a depressed region. The crisis of manpower is solved by such flows of labour in the developed (reciving) regions. Moreover, the backward regions are benefited by an invisible flow of capital from the developed regions. The countries of Central America, viz., EI Salvador, invisible incomes which constitue a lion's share of the GDP of those countries. The scenario is also common particularly in the developing countries of the world where such inter-regional flow of ioncome is seen within a country. For example, the immigrant workers from Bihar send capital from resource-rich states lke Punjab and Maharashtra to their home state. The

continued influx of migrants from Bangladesh to India estimated tohave cost India more than one thousand cropre rupees (expenditure) per annum.

Nowadays, the developed countries have started relying on the highly skilled labour force of the Third World countries for their further advancement. For example, the recent decision of the German government to allow Indian It professionals to work in Germany proves the positive economic role of migrant labour in the development of country's economy. The decision of the USA to invite Jewish migrants to settle in the USA in the first half of the 20<sup>th</sup> century proved to be a shot in the arm for the United States, because of the Jewish community's contribution in the scientific advancement of the country.

**Political Consequences** Migrants are often a vital factor in deciding the political future of a country. Even in a developed democracy like the USA, the minority ethnic groups – the Asians, Afro-Americans, and Hispanies – constitute and important vote bank for the political parties. The presence of such migrants can even decide the future course for bilateral relations between the receiving and the sending countries.

**Environmental Consequences** Influx of migrants puts tremendous pressure on the existing environment of a region. Due to increased man-land ratio it becomes difficult to manage a sustainable development of a region. Continued migration may cause paucity of resources even in a resource-rich region.

# **II. CONCEPT OF OVERPOPULATION**

The termn 'overpopulation' means too great a population for a given region to support. There may be two causes:

population growth exceeds the existing resorce base;

Existing resources have been depleted.

Some authors distinguish absolute over population (where the absolute limit of production has been attained but standards ofliving remain low) from relative overpopulation (where present production does not support the population but the production can be augmented).

The situation of overpopulation displays the following socio-economic characteristics: high unemployment, low incomes, low standards of living, high population density, malnutrition and famine.

Malthus, for the first time, identified the problems related to overpopulation. Later on, the Neo-Malthusians also viewed overpopulation as a major problem. Marxists artgue that overpopulation is the result of the mal-distribution of resources. Nowadays, some western geographers view overpopulation as the cause of pollution and the increasing migration from the countryside in the western countries of Europe and North America. Ovepopulation strikes the lower strata of the society he hardest particularly in developing countries such as India, Nepal, Myanmar etc.

Overpopulation may occur either at national level or at regainal level. Regional overpopulation when found in rural areas is attributed to

rapid increase of rural population,

skewed distribution of agricultural land,

agricultural mechanization,

lack of development of non-agricultural sector,

low agricultural yield

lack of social development, and

Non- resilience of the agricultural sector.

# **III. OPTIMUM POPULATION**

Optimum population has been defined as that size of population enabling per capita output of the maximum orders accompanied by the highest possible standards of living under a given set of economic and technological conditions. Therefore, optimum population lies between two extremes, i.e., overpopulation and underpopulation, although the size of optimum population is not sacrosanct. It is a theoretically perfect situation difficult to estimate or define. The Penguin Dictionary of Geography characterizes optimum population as a situation when the number of individuals can be accommodated in an area to the maximum advantage of each individual. Thus optimum population yields highest quality of life, which means each person has access to adequate food, water, energy and air of highest quality, adequate medical care, recreational facitlities and cultural outlets. In other words, optimum populationpermits the highest per capita output; therefore the marginal productivity exceeds the averge productivity whereby the rates of growth of total production are the highest.

# **IV. UNDERPOPULATION**

Underpopulation exists when a populationis too small, therefore unable to fully utilize the available resource endowments. Underpopulation is also charcterisd by a situation where the available resources are capable of supporting a much larger population with no rductionin living standards. The situation is found in regions of low technical development such as equatorial Congo, Amazon River basin or the rich Prairie region of North America. Relative underpopulation is more commonthen absolute underpopulation. Indeed, absolute underpopulation is rately sen and may be found in completely secluded societies where the degree of replacement of population is less than unity. Relative underpopulation is more visible, whereas in backward contries, underpopulation is linked tohigh moratality rate.

# **V. HUMAN DEVELOPMENT INDICATORS**

Development necessarily involves change. Over time, in the economic context, the term has evolved, and it has now come to mean much more than change on a purely material level.

Traditionally, development and economic growth have been considered synonymous, indicating the capacity of a country's economy, which had remained static for some time, to generate and sustain an annual increase in its gross national product at rates of about 5 to 7 per centor more. Alternatively, economic development has been measured in terms of the rates of growth of per capita GNP, thus taking into account the ability of a nation to increase its output at a rate faster than rthe growth rate of its population. The economic well-being of a population is generally measured by the levels and rates of growth of 'real' per capita GNP (i.e., monetary growth of per capita GNP adjusted for inflation). By 'economic wellbeing' would be meant how much the average citizen can consume and invest in terms of real goods and services.

Faster economic growth, i.e., more production of goods and services, would, it was believed, inevitably and ultimately eradicate poverty, through the 'trickle down' effect. The rapid gains in GNP would either create jobs and other economic opportunities or the necessary conditionsfor a wider distribution of economic and social benefits of growth. So it was more important to concentrate on the 'growth' of the economy.

Also a part of traditionalthinking we the tendency to view economic development in terms of the planned alteration of the structure of production and employment so that the share of agriculture in both declines even as that of manufacturing and services sectors increases. Rapid industrialization thus became pivotal to development strategies at the coast of agricultural and rural development.

From the 1950s to the 1970s, development was seen, thus, as a purely economic phenomenon.

What was actually experienced by a large number of Third World countries in 1950s and 1960s brought about a rethinking on the maning of development? In this period it was seen that these countries achieved the growth targets set by the United Nations (UN) but there was no change in the standard of living of the masses. This could not surely signify 'development'. An increasing number of economists and policymakers started calling for the 'development of GNP' and the elevation of social indicators to measure development. In other words, during the

1970s economic development came to be redefined in terms of reduction or elimination of poverty, inequality and unemployment within the context of a growing economy. Development should, it was felt, have the goal of redistributing the income from growth. Dudley Seers posed three of these have declined fromhigh levels, then, beyond doubt, the country concerned had seen a period of development. If one or two or all three of these centralproblems have been growingworse, "it would be strange tocallthe result 'development' even if per capita income doubled". This assertion merely reflected the hard reality- a number of developing countries experienced high rates of growth of per capita income during the 1960s and 1970s but showed no improvement, rather an actual decline, in employment, equality and the real incomes of the bottom 40 percent of their populations. By the earlier definition of 'growth', these countries were 'developing', but from thepoint of view of poverty, equality and employment, they were not. In the 1980s GNP growth rates turned negative for many less developed countries and the governments, aced with the problem of mounting foreign debts, were forced with theproblem of mounting foreign debts, were forced to cut back on their already limited social and economic programmes.

Significantly enough, while during the 1980s, the World Bank championed "economic growth" as the goal of development, its World Development Report of 1991 said that improving the quality of life of the poor was the real challenge of development. And 'quality fo life' for the poor countries meant much more than a higher income; it meant better education, better health and nutrition, cleaner environment, greater equality of opportunity, a richer cultural life. Thus income distribution was not enough; the goal of development was to see that all human beings were provided with the basic necessities of life as well as an opportunity for a 'rich and vaired life'.

Michael Todaro trhus redefines development as a multidimentional process involving the reorganization and reorientation of entire economic and social systems. In addition to improvements in incomes and output, it typically involves

radical changes in institutional, social and administrative structures as well as in popular attitudes and, in many cases, evencustoms and beliefs. Finally, although development is usually defined in a national context, its widespread realization may necessitate fundamental changes of the international economic and social system as well.

Three Core Values of Development According to Denis Goulet, at least three basic components or core values seve as a conceptual basis and practical guideline for understanding the 'inner' meaning of development. These core values are life sustenance, self-esteem and freedom representing common goals sought by all individuals and societies.

Life sustenance The life-sustaining basic human needs include food, l shelter, health and protection. When any oone of these is in critically short supply or absent, a condition of abnsolute 'underdevelopment' exists. Therefore, a major objective of development must be to raise people out of primary poverty and to provide basic needs simulataneously.

**Self-esteem** Self-esteem is concerned with the feeling of self-respect and independence. No country can be regarded as fully developed if it is exploited by others and does not have the power and influence to conduct itself on equal terms in its relation with other countries. Developing countries seek development for selfesteem. They aid toeradicate the feeling of dominance and dependence that is associated with inferior economic status.

**Freedom** Freedom refers to a fundamental sense of emancipation from alienating material conditions of life and from social servitude to nature, ignorance, other people, misery, institutions and dogmatic beliefs. W. Arthur lewis stressed the relationship between economic growth and freedom from servitude whenhe concluded that "the advantage of economic growth is not that wealth increases happiness, but that it increases the range of human choices". Wealth can enable people to gain greater control over nature and their physical environment (e.g.,

through the production of food, clothing and shelter) than they would have manged if they remained poor.

Towards a New Definition Amartya Sen toohas viewed development in tems of the expansion of 'entitlements' and 'capabilities', the former giving life sustenance and self-esteem; the latter, freedom. The focus and stress on expanding entitlements and capabilities forall people is a natural extension of the change in development, thinking away fro maximization of growth towards concern with the structure of production and consumption and distribution of income.

If we try to anser the question, 'development for what?', we may say that development has occurred when there has been an improvement infulfillment of basic needs, when economic progress has contributed to a greater sense of selfesteem for the country and its inhabitants, and when material advancement has expanded people's entitlements and capabilities.

Extensively quoting Michael P.Todaro, we may say "that development is both a physical reality and a state of mind in which society has, through some combination of social, economic, and institutional processes, secured the means for obtaining a better life. Whatever the specific components of this better life, development in all societies must have al least the following three objectives:

- To increase the abilability and widen the distribution of basic life-sustaining goods such as food, shelter, health and protection.
- To raise levels of living including, in addition to higher incomes, the provision of more jobs, better education and greater attention to cultural and humanistic values, all of whichwill serve not only to enchance material well-beingbut also to generate greater indicidual and national self-esteem.
- To expand the range of economic and social choices available to individuals and nations by feeing them from servitude and dependence not only in relation to other people and nation-states but also to the forces of ignorance and human misery.

We may therefore reformaulate andbraden Professor Seers' questions about the meaning of development as follows:

- Have general levels of living within a nation risen to the point tht there has been lessening of absolute provery (i.e., deprivation of life-sustaining goods) and of inequality in income distribution, as well as improvements in the level of employment and the nature and quality of educationa, ehealth and othe social and cultural services?
- Has economic progress enhanced individual and group esteem both internally vis-à-vis one another and externally vis-à-vis other nation nd regions?
- Finally, has economic progress expanded the range ofhuman choice and freed people from external dependence and internal servitude to other people and institution, rather than merley substituting one from of dependence?

If for a given nation the answer to eachof the above three question is yes, then clearly that ation has undergone development.if the first question (which is equivalent to Seers' three questions) can be answered affirmatively but the other two remain negative, then the country may properly be designated a s" economically more developed" yet it remains underdeveloped in a more fundamental sense. In this context, it is more appropriate to refer to the rich nations of the world as economically developed and reserve judgement as to whether or not they are actually developed to more thoroughgoing social, political and cultural analysis. To paraphrase Seers, if the second and third of these central questions evoke negative responses (i.e., if people feel less self-esteem, respect, or dignity and/or if their freedom to choose has been constrained), then even if the provision oflife-sustaining goods and improvements in levels of living are occurring, it would be misleading to call the result developmentg".

# **MEASURES OF DEVELOPMENT**

Measuring 'development' depends on what you understand by the term. If you take it in purely economic term, s as the traditional view did, and then the GNP per capita is the measure for assessing development.

A major objection to its use is the failure to include non-narketed (and, therefore, nonpriced) subsistence production (for instance, wheat which farmers produce for their own consumption) and much of a housewife's workd and other welfare and income distribution considerations. As a result, there have been numerous attempts to remedy these defects and to create a composite indicator of development.

Basically, indicators of development can be calssiffied in tow groups those that measure development in terms of normal' pattern of interaction among social economic and political factors and those that measure development in terms of the quality of life'.

In 1970, a study was conducted by the United Nations research Institue on Social Development (UNRISED). The study attempted to select the most appropriate indicators of development and conducted an analysis of the relationship between these indicators at different levels of development. The result of the study was the construction of a composite social development index. The new index consisted of 16 core indicators (9 social indicators and 7 economic indicators) and was found to correlate more highly with individual social and economic indicators than did per capita GNP. The rankings of some countries under the development index differed from their per capita GNP rankings. It was also found that the development index correlated more closely with per capita GNP in the case of developed countries than in the case of developing ones.

Another study was made by Adelman and Morris to seek a measure of development by analyzing the pattern of interaction among social, economic and political fctors. They classified 74 developing countries on the basis of 41 variables. The method of factor analysis was used to examine the

interdependence between social and political variables and thelevel of economic development. Thye found numerous correlations between certain key variables and economic development.

A Major criticism of these studies was that they sought to measure development in terms of structural change in the country rather than human welfare. There is also the implicit assumption that developing countries must develop along the lines of the developed countries.

Further, there is an undue emphasis on measuring inputs (such as number of doctors per 1000 population or enrolment of figures in school) rather than on outputs (such as life expectancy, literacy) which are the actual lbjectives of development.

In response to these criticisms, further studies were conducted to develop composite indicators to measure development in terms of meeting the basic needs of the majority of the population f a country or in tems of "quality of life". This led to the development of a new index.

It was in 1979 that Morris D. Morris developed a single composite index using three indicators-life expectancy at age one, infant mortality and literacy. For each indicator, the performance of a coungry is rated on a scale of 1 to 100, where 1 reresents the "worst" performance and 100 the "best" performance. In case of life expectancy, the upper limit of 100 was assigned to 77 years and the lower limit of 1 was assigned to 28 years. Similarly, for infant mortality, the upper limit was set at 9 p er 1000 and the lower limit at 229 pr 1000. Literacy rates, measured as percentages 1 to 100, provided their own direct scale. Once a country's performance in life expectancy, infant mortality and literacy has been rated on a scale of 1 to 100, the composite index- the **physical quality of life index**(PQLI)- for the country is calculate by averaging the three ratings, giving equal weightage to each.

A study conducted in early 1980s found that countries with low per capita GNP tended to have low PQLI s and countries with high percapita GNPs tended

Courtesy : Saidai Manithaneyam

to have high pQLIs although the correlation between GNP and PQLI was not substantially close. Ther were also some countries with high per capita GNP but very low PQLIs.

On the surface, PQLI seems to be free of the basic problems associated with GNP as a measure of development. It aims at incorporating welfare considerations by measuring the ehnds of development in forms of quality of lif. It also incorporates distributional characteristics since a country cannot achieve high national averages of life expectancy, infant mortality and literacy unless majorities of its population are receiving the benefits of progress in each of these areas. Moreover, like GNP, this simple measure can be used to make inter-country comparisons as data on these indicators is easily available.

A major criticism of the PQLI, however, is that it fails to include many othr social and pshychological characteristics suggested by the term 'quality of life'-human rights, justice, and security and so on. The index has also been criticized on the grounds of lacking a rationale is giving equal weights to all the tree indicators and the possibility that measures such as life expectancy and infant mortality reflect practically the same phenomenon.

To overcome the limitations of PQLI and other indicators, the **Human development index (HDI)** was developed. The indes was pioneered by the Pakistani economist, the late pMahbub-ul-Haq, in partnership with the Indian economist. Prof. Amartya Sen, and is being annually worked out by the United Nations Development Programme (UNDP) since 1990.

The UNDP has defomed human development as "a process of enlarging people's choices". This depends not only on income but alos on other social indicators such as life expectancy, education, literacy and healthprovisions.

The HDI is based on three vairbles:

Life expectancy at birth
Educational attainment measured by a combination of adult literacy (twothirds weight)and combined primary, secondary and tertiary school enrolemnt ratios (one-third weight).

Per capita income (ability to buy basic goods and services).

The HDI, unlike other indices which measure absolute level, ranks countries in relation to each other. For example, for life expectancy the current minimum value is 37,2 years in Sierra Leone, and the maximum desirable value is 80 years in Japan (1997 figures). The index takes the progress made from the minimum towards the maximum. The distrance traveled is expressed in percentage terms. A clear picture emerges of the wide disparities that exist in the levels of human development between the developing and the developed countries. The same exercise is repeated in repect of the other two components of the index. The distance traveled in each case is thenused as the basis for combining the three devices, and this gives a common denominator to rank countries on a uniform scale.

The weight assigned to income tapers off sharply beyond the threshold income regarded as ufficent for human survival. In other words, as the income goes beyond the cut-off point, it becomes increasingly less important, the assumption being that the rise in income beyond a certain point issubject to diminishing returns. As a consequence, the other two indicators gain importance in determining the final index.

The human development indicators may be defined as some selected indices which throw lifht on iter- and intra-contry variations in socioeconomic andpolitical well-being. Thus it is possible for geographers to suty regional disparity with the help of these indices.

HDR 2000 the indicators used in the Human Development Report (HDR) 2000 which refer to the year, 1998, ar discussed below.

Life expectancy at birth The recent data was obtained from the world Population Prospects (UN 1998) prepared by the United Nations Population Division or

UNPD. The UNPD gets population estimates and projections on a biannual basis from population censuses. The census data is than supplemented with information from national survey data. The 1998 revision made by the UNPD has incorporated the demographic impact of deadly diseases like HIV/ AIDS because of its widespread impact on the changes in the lfie expectancy in sub-Saharan Africa as well as other parts of the world. This has propted the UNPD to consider migration factor in data collection.

The estimates of life expectancy on the HDI puplished by the UNPD were derived from linerar interpolation based on five-year averages.

- Adult literacy The data presented in the HDR 2000 are fesh estimates and are derived form UNESCO's Febrary 2000 assessment of literacy. The UNESCO estimates have incorporated the UNPD population estimates and literacy data gathered by national census agencies.
- **Gross primary, secondary and tertary enrolment** the 1998 data is derived from primary estimates from UNESCO. Gross enrolment ratios are derived from dividing the number of enrolled children in every level of schooling bny the total number of children in the age group corresponding to that leve. UNESCO estimates ar unabailable for 13 countries listed in the main statistical tables. So estimates made by the Human Development Report Offices have been used.

Gross enrolemtn ratios do not reveal the reality due to differences in the age range corresponding to the levelsofeducation and differences that exist in different countries regarding the duration of schooling. There are genuine problems in relation to the use of net enrolment data (for which data exists forsingle years of age) because very few contries produce net enrolemtn data.

#### **4.GDP per capita (PPP US\$)**

The data used in the HDR 2000 are obtained from the World Bank and are based on the surveys conducted by the latest International Comparion Programme (ICP) covering 118 countries. The year 1996 has been taken as the base year was one by considering relative price movements over time between each country and the base country, the United States. In the case of those countries not covered by the World Bank, PPP estimates were calculated by Alan Heston and Robert Summers (1999) of the University of Pennsylvania.

Methodology and Presentation of the Human development Indicators In HDR 2000, countries have been classified in four ways, viz., in major world aggregates, by region, by human developmentlevel and by income.

HDR 2000 has replaced the term "industrialized countries' by Organisation for Economic Cooperation and Development (OECD). The other groups are all developing countries, Easrtern Europe and the CIS. These global groups are held to be "mutually exclusive". A total fo 174 countries are included in the classification of the world.

In regional classifications, developing countries are categorized into the following regions: Arab states, East Asia, Latin America and the Caribeean (Mexico included), South Asia, South East Asia and the Pacific, Southern Europe and Sub-Saharan Africa. The regional classifications are consistent with the classification done by the Regional Bureauz of UNDP. The United Nations has added one more classification, viz., least developed countries.

On the basis of the levels of human development, all countries are divided into three cluster: hitgh human development for which the HDI value is 0.800 or above, medium human development for which the HDI is 0.500 to 0.799 and low human development if the HDI is less than 0.500.

The World Bank has also classified all countries on the basis of income (valid through July 2000): high income countries having GNP per capita of \$9,361 or more (in 1998), middle income if GNP per capita varies from \$761 to \$9,360 and low income if GNP per capita is less than \$760.

**Change in Indicators** The indicators used in HDI in HDR 1999 were life expectancy at birth, adult literacy rate, combined first, second and third level gross

enrolment ratio, real GDP per capita, life expectancy index and GDP index. HDR 2000 has made some changes in the indicators of HDI; for instance, the combined first, second and third level gross enrolment ratio ha been enlarged tocover combined primary, secondary and tgetiary groos enrolemnt ratio, the term, real GDP per capita (PPP\$), is replace by the term, GDP oer capita (PPP\$).

In terms of HDI, 174 countries of the world have beeb divided into countries having high human development, medium human development and lowhuman development. According to HDR 2000, Canada occupies the first rank (HDI value 1998 is 0.935), followed by Norway (HDI value 1998 is 0.934) and the USA (DAI value 1998 is 0.929).

Since 1990 the HDR has been evolving newer and better composite indices for measurement fothe different facets of human development for 174 UN members –countries of the world.

The HDR has beeb using HDI since 1990. The purpose of construction of the HDI is to measure average achievement in basic human development with the help of a single composte index. The HDI is the basis of ranking 174 countries which easily signifies the postion of a country in terms of human resources development.

HDR 1995 introduced the gender-related development index (GDI) and the gender empowerment measure (GEM). These are composite measures, among which the former takes into account the same dimensions and variables a theHDI; however, the emphasis is placed on the existing inequality between men and women. The later, i.e., GEM, shows gener ineauality in economic as well as political opportunitites.

The human poverty index (HPI) was introduced for the first itme by HDR 1997. It measures deprivations in basic dimensions of human development.

**Human Development Trends 1975 to 1998** Study of the HDI from 1975 to 1998 is possible only for 101 countries because of unavailability of data.

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Although almost all countries have improved in terms of providing the basic capabilities to their people between 1975 and 1998, some countries have made faster progress than others. The differences are the result of a combination offactors-both internal as well as external.

Zambia of Sub-Saharan Africa is the only country in the world which ahs slipped from its 1975 position vis-avis HDI 1998 due to reduced life expectancy cuased by HIV/AIDS. Similarly, six countries belonging to Sub-Sagarab Africa, viz., Botswana, Burundi, Congo, the Democratic Republic of he Congo, Kenya and Zimbabwe have experienced a fall in the HDI rankings from 1985 to 1998 due to the attack of HIV/AIDS which has reduced the lfie expectancy of thir people.

Countries like the Central African Republic, Namibia and South Africa experienced a decline in HDI rank between 1990 and 1998 due to the HIV/AIDS factor.

Uganda is the only country in Africa to have improved its position after 1990. The HDI value of Uganda decline between 1985 and 1990 due to HIV/AIDS but a significant improvement was made between 1990 and 1998.

The HDI rank of six countries located in Eastern Europe and the CIS, viz., Armenia, Belarus, Lithuania, Kazakhstan, Tajikistan, Ukraine and Uzbekistan, have witnessed decline in the HDI rank between 1990 and 1998. The Phenomena is mainly due to economic stagnation/recession in these countries. The decline of Tajikistan may also be attribuited to socio-political conflicts in the country.

**Human Poverty Index (HPI)** HPI is a multi-dimensional measure of povery, It ecompasses vour basic dimensions of long healthy life, Knowledge, economic provisioning and social inclusion. HPI-1 is used tomeasure human poverty in developing countries. The inclusion of variables in the HPI-1 like the percentage of people born today and not expected to survive till 40 years of age shows the dimensionof deprivation in a long and halthy life. The inclusion of adult literacy rate shows deprivation in knowledge and depriviation in economic provisioning issuggested by the percentage of people who lack accesss to healthj

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care facilities and sage water and the percentage of under-five children who are moderately or severly under weight.

According to HDR 2000, developing countries suffer from lack of data and absence of a suitable indicator which pose a sbottlenecks for presenting the true scenario of human deprivation.

Further, for economic provisioning indeveloping countries, public provisioning palys and important role than private income. The lack of access to health care facilities, and widespread malnutrition can be explained by low level of income in these countries where about eighty percent of private income is spend on food.

HPI-2 is used for measuringhuman poverty. The deprivation in a long and healthy life is measured by the percentage of people born today and not expected to live till 60 years of age; the adult functional illiteracy ragte measures deprivation is knowledge; the indidence of income poverty measures deprivation ineconomic provisioning (because private income constitutes the lion's share in economic provisioning); and long-term unemployment measures deprivation in social inclusion.

For HPI-1, the values range from 3.9 percent in Uruguay to 64.7 percent in Niger. Nine countries have a comparatively better position as their values are restricted within 10 percent. These countries include Bahrain, Chile, Costa Rica, Cuba, Fiji, Jordan, Panama, Trinidad and Tobago, and Uruguay. HPI-1 exceeds 33 percent in 23 countries suggestingthat more thanone theird people suffer from human deprivation. Countries like Burkina Faso, the Central African Republic, Ethiopia, Guinea-Bissau, Mali Mazambique, Nepal and Niger have HPI-1 level more than 50 percent. These countries are the worst sufferers of human deprivation.

The geographical distribution of human development is more ore less equitable in countries having a relatively low HPI-1 for a given HDI value and vice versa.

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HPI-2 was calculated for only 18 developed industrialized countries. Norway has the lowest human poverty level at 7.3 percent followed by Sweden and the Netherlands at 7.6 percent and 8.2 percent respectively. Countries like the USA, Ireland and the United Kingdom have very high human poverty level, i.e., 15.8 percen, 15 percent and 14.6 percent, respectively.

It is paradoxical that some rich countries like Ireland, the UK and the USA have more than 20 percent funcational illiteracy whereas more than17percent people in the USA and more than 10 percent people in Australia, Canada, Italy, Japan tand the UK are income poor.

High HDI value does not necessarily mean low human deprivation. For example, Sweden and the UK have almost similar HDI values 0.926 and 0.918 respectively- but the HPI-2 value of Sweden is 7.6 percent comp-ared to the Uk's 14.6 percent.

**Disparities within Countries** If the HDI and JPI value are considered separately for rural and urban areas, it will be seen that urban areas reveal more progress in human development and less human deprivation. For example, in 1996, HPI-1 in rural Uganda was 43 percent compared to 21 percent in urban Uganda. The 1999 HDI value for Swaziland reveals rural HDI at 0.525 as compared to the urban HDI at 0.812.

Disparity also exists between regions. Qinghai of China, for example is more backward than Shanghai fi theHDI and HPI values are taken into consideration. Qinghai's HDI value is only three-fifths that of Sanghai. Further examples of regional disparity are found in Venezuela where the1996 data in the Federal District shows life expectancy of 72 years in comparison to 64 years in Amacuro province.

Data for the last ten years as shows deisparities which exist between various ethnic and language groups. The 1995-96 HDI values for Guatemala suggest different developmental status for different ethnic groups. For example, the four principal Mayan communities of Guatemala viz., Kakchike, Mam, K'ice and

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Q'eqchi and HDI values (1995-96) 0.419, 0.368, 0.366 and 0.356 respectively. So these HDI values were only 60-70 percent of the overall HDI values for Guatemala (0.596). Similarly, in South Africa in 1995 the rate of unemployment among blacks was 29 percent in contrast to 4 percent among whites. The 1998 data for Namibia suggests that HPI-1 if the San-speaking group was about 60 percent but HPI-1 was only 10 percent for the English and German speaking groups.

A coursory look at the GDI value as a whole reveals that the GDI value is generally lower than the HDI value. This indicates the existence of gender inequality in almost every contry. Out of 143 countries, 30 countries have a GDI value below 0.500 which is tenstimoney to the fact that severe gender deprivation occurs in these countries. It is interesting that the GDI rank is found tobe higher thanthe HDI rank in 55 countries which suggests better position of women because of low gender deprivation. However, some countries like industrialized and economically developed Denmark, France and New Zealand, the former socialist countries of eastern Europe and the CIS such as Hungary, Poland, Estonia and developing countries like Sri Lanka, Thailand and Jamaica show a steady improvement in the GDI ranks compared to their HDI ranks. So, it can be concluded that the achievement of gender equality is possible despite different income and developmental levels in different countries of the world. The gender deprivation also occurs within a country. For example, the district of Anuradhapura in Sri Lanka has a GDI value of 0.558 which is one-and-a-half times of another district, Puttalam.

The gender empowerment measure highlights opportunities available to women in terms of economic nd political participation and decision-making freedom. The three top countries of Norway (0.825), Iceland (0.802) and Sweden (0.794) offer tremendous opportunities for providing basic capabilities to women for their empowerment. It is noteworthy that out of the top five countries in the GEM ranking, four countries belong to Scandinavia.

The lowest GEM values are observed in the dominat Islamic countrieof Niger (0.119), Jordan (0.220) and Egypt (0.274) because of various rfestrictions imposed on women in these countries. It is disappointing that only 2 out of 70 countries have a GEM value more than 0.800 whereas 39 countries record a GEM value exceeding 0.500 and 31 countries have GEM value less than 0.500. It is paradoxical that the performance of some developing countries in providing gender equality is better than that of evenmuch wealthier industrialized countries. For example, Spain and Portugal lag far behind developing countries like the Bahamas and Barbados. The performance of Venezuela is better than Ireland's. Similarly Costa Rica and Trinidad and Tobago are in a better positioning GEM ranking than a developed Italy. Even the positions of EI Salvador, the Dominican Republic and Mexico in GEM ranking are higher than Greece and Japan.

Regional disparities are also found within a country itself. For example, gender disparities are found between two provinces of Lima and Gjamarca in Peru.

# **INDIA: HUMAN FACE**

# **GENESIS OF ETHNIC AND RACIAL DIVERSITIES**

The amazing civersity of ethnic and racial characteristics evident in India has its roots in the manner thesub-continent has been peopled. Human groups with different ethnic backgrounds have entered the region at different points of time. Their in-migration, their settlement in India an later movments within the country have led to a high degree of intermingling between the various ethnic anc cultural streams.

Geography has played a significant role in the process of in-migration. The mighty Himalayas in the north and north-east, the vast expanse of sea in the east, south and south-west and the harsh desert in a part of the western frontiers have allowed the migration into the region mainly through the Himalayan pases in the north-west. A part of it took palce through passes in the hills of the north-east.

After entering this region, the migrant population moved along river valleys, some of them evem settling in the valleys on their way. The hilly and forested tracts, on the other hand, have been most unacttractive areas from the point of view of settled agriculture and the indigenous groups inhabiting them have remained comparatively undisturbed. They have also, in some cases, served as areas of refuge for the ethnic groups ousted from the river basins by later migrants. It is in these otherwise isolated regions that the earliest racial groups have survived till today. These enclaves have nurtured the most primitive forms of culture and have generally discouraged cultural change as the contacts with the outside world have always been limited.

It is interesting to note that the main centres of population today like the Ganga valley and the delta are by and large devoid of any evidence of the existence of Early Man. This may be due to the unfavourable conditions prevailing in these areas during the pleisotcene time.

# **DISTRIBUTION OF RACIAL GROUPS**

Following Dr. B.S. Guha's racial classification of the Indian population, six major tub-types can be identified.

The Negritos The Proto-Australoids The Mongoloids Palaeo-Mongoloids long-headed type broad-headed type ii) Tibeto-Mongoloids The Mediterraneans Palaeo – Mediterraneans Mediterraneans Orientals

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The Western broad-headed people or Brachcephas

Alpinoids

Dinarics

Armenoids

The Nordics

These racial divisions are identified on the basis of the superficial differences amonghuman beings, such as the colour ofskin, stature andbuiold of the body, the form of the head and the face, the formation of nose, lips and the forehead and the colour and form of eyes and hair. These physical differences between racial stocks are not in any way indicators of mental and physical potentialities and owe their origin to variationin environmental factors in which early evlution took place.

The main physical characteristics of different ethnic groups are briefly discussed below:

#### **1. THE NEGRITOS**

They are probably the earliest arrivals into India, but later incursions of a more group of the Proto-Australoids completely wiped out the evidence of their presence in any region of India today. Some tibal groups such as Kadars, Poligar,s Irulas an some of the tribes from Rajmahal hills and Andaans reveal some affinity with the Negrito stock.

The members of this ethnic stock are characterized by short stature, dark skin colour, bulbous forehead, broad flat nose, slightly everted and thick lips and frizzly hair.

# 2. THE PROTO-AUSTRALOIDS

They are the second oldest racial group in India and probably came soon after the Negritos. They, along with the Mediterraneans, are believed to be the builders of the Indua Valley Civilisation as their skeletons have been discovered from the burial grounds both at Mohenjodara and Harappa. This racial stock in Idia is represented by tribal groups such as Oraons, Munds, Snthals, Chenchus, Kurumbas, Bhils and Kols.

The members of this racial stock physically differ from the Negritos mainly in the absence of woolly hair.

# **3. THE MONGOLOIDS**

The Mongoloid raical stock is mainly concentrated in the Himalayan borderlan, particularly in Ladakh, Sikkim, Arunachal Pradesh and other parts of north eastern India. Their original homeland was China from where they were pushed southward into the Malaya peninsula and Indonesia and infiltrated into India through the passes in the northern or eastern mountains.

The Mongoloid racial stock in India is divided into two types-the Palaeo-Mongoloids and the Tibeto-Mongoloids. The Palaeo-Mongoloids are further differentiated into broad-headed and long-headed sub-types. They live mostly along the fringes of the Himalayas, being especially numerous among the tribal population of Assam and the Myanmar border. The Tibeto Mongoloids, supposed to have come from Tibet, mostly live in Bhutan and Sikkim, as well as in the orthwestern Himalayan nd Trans Himalayan regions.

# **4. THE MEDITERRANEANS**

This raical stock in India has been drawn from south-west Asia. It is from this region that during the third and the second millennium BC the Mediterrnean race gradually spread over the surrounding areas. Those who entered India belonged to different, though related, types of the Mediterranean stock. They who entered India belonged to different, through related, types of the Mediterranean stock. They fall into three distinct groups: palaeo-Mediterranean, Mediterranean and the so-called Oriental type. They are all long-headed and they came to India with a fairly high level of civilization. They are also believed to be the bearers of the earliest from of Hinduism into India. The first and the most ancient of these Mediterrandean races entering India have been termed as the palaeo-Mediterraneans. They were medium-statured, darkskinned, slightly built and long-healded people. It seems probable that these people introduced early agriculture in north-western India. They were, however, dislodged from thei original homelands by subsequent streams of migrationand pushed into central and southern India. The Palaeo-Mediterranean stock, together with other sub-types, today forms the bulks of the population of southern India and a considerable protaion of the population forthern India. This ethnic stock is represented by the Tamil nd Telugu Brahmins and the Nairs of southern India.

The Mediterraneans, the mainstreamof this racial stock, entered India a little later. They were the builders of the Indus Valley Civilisation along with the Proto-Australoids, and introduced the first metal or bronxze cultures in India roughtly between 2,500 and 1,500 BC. They were, however, pushed out of their homeland in the Indus Valley by fresh incursions from the northwest and were driven to the Ganga plain and perhaps even further south beyond the Vindhyas. Today, they constitue thebulk of the population of the ower castes throughout northen India, and are also represented by the Namboodiri brahminsand brahminsof Allahabad and Bengal.

The so-called Oriental sub-type came much later. They have a much restricted distribution then theotehr two sub-types. They are represented by Punjabi 'khatris' and Rajasthani 'banias' among others. Physically they are similar to the Mediterraneans, but are characterized by a long and convex nose.

# 5. THE WESTERN BRACHYCHEPHALS OR THE BROAD-HEADED TYPES

These groups consist of the three main types:

i) Alpinoids represented by Gujarati Babnias, Kathis of Kathiawar and Kayasthas of Bengal.

ii)Dinaric represented by population of Begal, Orissa and Coorg (Karnataka)

iii) Armenoids represented by Parsis, Bengali Vaidyas and Kayasthas.

Member of this racial stock cam to India along thre main routes, passing through-

Baluchistan, Sind, Kathiawar, Gujarat, Maharashtra, Karnataka and Tamil Nadu.

The Ganga valley and the delta.

Chitral, Gilgit, parts of Kashmir and Nepal.

# **6. THE NORDICS**

They were thelast to migrate into India. The Aryan speaking Nordics were long-headed and fair complexioned, with well dev eloped noses and strongly built bodies. They entered India some timeduring the second millennuium BC.

The main concentration of these peopleis is the north-western part of the country. They were a predominant type in the North-Western Frontier Provience of Pakistan, Punjab, Haryana and Rajastah. They are mostly represented among the upper castes of northern India, particularly in Punjab.

# A CRITICAL ANALYSIS OF THE ETHNIC DIVERSITY

A scientific analysis of the different ethnic types in India reveals the following facts.

1. Although diversity is quite pronounced, it cannot be over-emphasised.

2. A long drawn process of continuous contacr, intermixing and later modifications have created a broad ethnic uniformity. The apparent radial similarities and differences are only indicators of some past association with a certainracial stock.

3. Despite the tremendous diversity one can say that there exists a physicl type which is typically India. All South Asians whether they belong to Pakistan, India, Bangladesh or Sri Lanka carry tis stamp of distinction.

# **TIBAL AREAS AND THEIR PROBLEMS**

The nation of a tribe in Idnia is determined primarily by the political ad administrative consideration of uplifting a section of the Indian people which have been relatively remotely situated in the hills an forests and which is backward in terms of the indices of development. The Scheduled Tribes have been identified in terms of the two parameters of relative isolation and backwardness.

In a recent survey conducted by the Anthropological Survey of India under the 'people of India Project', 461 tribal communities have beeb identified all over the country, out of which 174 are sub-groups. According to the 1991 census, the population of Scheduled Tribes in the country stands at 6, 77, 58,380, and constitutes about 8% of the total population. They are spread over all states except Chandigarh, Delhi and Pondicherry. Nearly 93% of the tribal population has a ruralbase. The highest percentage of Scheduled Tribe population in a state with respect of the total Scheduled Tribe population of th country has been recorded in Madhya Pradesh (22.73 percent), followed by Maharashtra (10.80 percent), Orissa (10.38 percent) and Bihar (9.77 percent). More than 50 percent of the total Scheduled Tribe population lives in these four states. The lowest percentage of Scheduled Tribe population is in Goa.

The size of the tribal communities varies between just three and seven million. Among the largest are the Gond (74,49,193), Bhil(73,67,973), Santhal (42,60,842), Mina (20,87,075) and Oran (18,71,995). A few tribes such as the Haisa Tangsa, Hotang Tangsa and Katin Tangsa reported a population of only one in the 1981 census. Tribes like the Bondo, Jambo karka and Kongbo have been two to ten persons while the Andamanese, including all sub-groups are the Jarawas (31), Chaimal (18), Onges (97), Arandan (236) and Kochuvelan (53).

From the point of view of distribution oand diversity of the tribal population, India can be dived into seven zones.

**1. NORTH ZONE** This zone covers Himachal Pradesh, Punjab, sub-Himalayan uttar Pradesh, Bihar. The prominent tribes her are khasa, Tharu, Bhoksa, Bhotias, Gujjars and the Jaunsaris. Khasas are a polyandrous tribe. Botias make carpets and are involved in the Indo-China border trade. The Gujjars are a pastoral tribe.

2. NOTH-EASTERN ZONE This zone includes the seven north-eastern states, and the major tribal groups here are Nagas, Khasi, Garo, Mishing, Miri, Karbi and

the Apatanis. Ecological degradation because of shifting cultivation and inaccessibility due to lack of communication facilities are two major problems of these tribes. Because of a high degree of isolation, the tribes of this sector have not really shard history with the mainstream Indians andhave instead shared history with the heighbouring communities. This explains why there is an element of hostility of these tribes with the mainstream. These tribes mainly belong to the Mongoloid stock which gives them a distinct ehnic identity. These tribes have a very high rate of literacy and conversions to Christianity, mainly because of the missionary activities during the colonial rule. Among the more advanced tribes of this region are the Khasis, Garo and Miri.

**3. CENTRAL ZONE** This zone, which has the maximum tribal concentration, stretches from southern Madhya Pradesh to south Bihar across northern Orissa. The major tribes lying in this zone are the Santhals, Ho, Baiga, Abhujmaria, Muria, Munda and Bihar. The major problems faced by the tribes of this region are land alienation, indebtedness, exploitation of tribal girls by contractors' ndofficials leading to psychological and sexual trauma. This zone also shows a greate impact of Hinduism.

Among the tribes of this region, the Santhals have discovered a script of their own, called Ole Chiki. Baigas are a prominent shifting cultivation tribe. Birhors are a very backward tribe of this region and because of extreme backwardness and no secure means of livelihood, they are threatened with extinction.

**4. SOUTERN ZONE** This region comprises the Nilgiris together with the adjoining hilly regions inAndhra Pradesh and Karnataka which are the homeland of probably the smallest, the most backward and the most isolated tribal communities on the mainland. Among the prominent tribes of this zone are the Toda, Koya, Chenchu and Allars. Todas are apastroal people who practice buffalow herding. Allars are cave dwellers, who also live on tree tops. Chenchus are a very backward tibe who survive mainly on hunting-gathering.

The major problems of the tribes of the southern region are shifting cultivation, economic bacwarness, and isolation, lack of communication and threat of extiction languages.

**5. EASTERN ZONE** This zone includes West Bengal, Orissa and part of Orissa and tribes such as Paraja, Kondhs, Bondas, Bhumiji, Gadabas, Bhuinyas and Saoras. During the last century, the Kondhs were known for their rituals of human sacrifice (which was banned by the Brtitsh). Saoras are known for their magical expertise. The major problems of the tribes of eastern zone are economic bacwarness, exploitation by forest officials and contractors, and land alienation, prevalence of diseases and displacement due to industrial projects.

**6. WESTERN ZONE** This zone includes Rajasthan and Gujarat and tribes such as the Bhils, Garasiya and Meenas. The Bhils are regarded as a violdent tribe. They are good archers and claim to have formed the major chunk of Rana Pratap's army. The Meenas are a very advanced and well educated tribe.

7. ISLAND REGION This zone includes Andaman and Nicobar Islands, Lakshadweep and Daman and Diu. These tribes include the Great Andamanese, Sentinelese, Jarwas, Onges, Nicobaris and Shampen. Some of these tribes are extremely backward and ar struggling tocome out of the sone age mode of livelihood. Most of these tribes are classified as minor tribes which face the threat of extinction. The government tried to integrate someof these tribes with the mainstream, but the construction of the naval dockyard at Port Blair exposed the tribes to the outside world, leadingto a loss of identity for tribals who got distintegrated into a diaspora. This region is a priority area in tribal administration and the emphasis is on slow and the emphasis is on slow and gradual change. Apart from the problem of surviva, prevalence of diseases and malnutrition are some other problems of the tribes of this region.

In general, the problems of the Indian tribes can be dicussed under the following heads.

# **1. LOSS OF CONTROL OVER NATURAL RESOURCES**

Before the coming of the British, the tribal enjoyed unhindered rights of ownership and management over natural resources like land, forests, wildlife, water, soil, fish etc. With the advent of industrialization in India and the discovery of mineral another resources in tribal inhabited areas, these pockets were thrown open to outsiders and state control replaced tribal controls. Thus began the story of unending miseries for the tribal. With the impetus to the development process after independence, pressure on land and forests increased. This resulted in loss of ownership rights over land, owing to chronic indebtedness, unscrupulous landlord, moneylenders, contractors and officials. With the concepts of protected forests and national forests gaining currency, the tribal felt themselves uprooted from their cultural moorings and with no secure means of livelihood.

# **2.LACK OF EDUCATION**

According to the 1991 census, nearly 70% of the tribals are illiterates. Although it cannot be denied that education can ac as the instrument for betterment of the tribal ensuring greater participation for them in the developmentprocess, stillthere arfe certain factors which inhibit the tribal taking to education. These factors include tribal superstitions and prejudices, extreme poverty, nomadic lifestyle of certaintribes, lack of interest in alien subjects taught through an alien language anda lack of suitable teacher and other facilities in the tribal areas.

# **3.DISPLACEMENT AND REHABILITATION**

After independence, the focus of the development process was on heavy industries and the core sector. As a result huge steel plants, power projects and large dams came up-most of them in the tribal inhabited areas. The mining activities were also accelerated in these areas. Acquisition of tribal land by the government for these projects led to large scale displacement of the tribal population. The tribal pocket of Ghhotanagpur rgion, Orissa, West Bengal and Madhya Pradesh suffered the most. The cash compensation provided by the government was frittered away on wasteful expenditure. No settlements wee provided for the diplaced tribal within the industrial areas, who were forced to live

in peripheries in slums or to migrate to adjoing states to work as unskilled workers in conditions of poverty. The migration of these tribals to the urban areas causes pshychological problems for them as they are not able to adjust well to the urban life-style and values.

#### 4. PROBLEMS OF HEALTH AND NUTRITION

Because of economic backwardness and insecure livelihood, the tribal face health problems, such as prevalence of diseases like malaria, cholers, tuberculosis, diarrhea and jaundice and problems associated with malnutrition like iron deficiency, ananemia, high infant mortality rates, low levels of life expectancy etc.

#### **5. GENDER ISSUES**

The degradation of the natural environment, particulararly through the destruction of forests and a rapidly shrinking resource base has had its impact on the status of women. The opening of the tribal belts to mining, industries and commercialization has exposed triabl men and women to the ruthless operations of the market economy, giving rise to consumerismand to commoditization of women.

# 6. EROSION OF IDENTITY

Increasingly, the traditional institutions and laws of tribals are coming into conflict with moderninstitutions which create apprehensions among the tribal about preserving their identity. Extijction of tribal dialects and languages isanother cause of concern as it indicates an erosion of tribal identity in certain areas.

# ROLE OF LANGUAGE, RELIGION AND CULTURE INFORMATION OF REGIONS

Language and religion are different aspects of culture which generally evolve within a geographically identifiable regional context. This enables these elemtns to impart certain cultural identities. India is a grand mosaic of such regional cultures which derive their sustenance from different languages, dialects, religious practices, economic institutions, living habits etc. Let us examine the role of language, religion and culture in theformation of regions.

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#### LANGUAGE

The reasons for a high degree of diversity in Idnian languages and dialects can be traced to the intermingling in India, of heterogenous ethnic groups drawn from the neighbouring regions of Asia. Initially, these languages and dialects developed indifferent regions of the country in a state of isolation. There is a broad social integration among all the speakers of a certain language. The language and the dialect thus play a significant role in difining the elements of regionl identity. After independence, the linguistic reorganization of states has given a new political meaning to the geographical pattern of the linguistic distribution in the country.

There were 187 languages spoken by different sections of our society. Of these, 94 are spoken by less than 10,000 persons each and 23 languages together account for 97% of the total population of the country. About a dozen major languages constitute the principal linguistic regions. These laguages are Kashmiri, Punnjabi, Hindi, Bangla, Assanese, Oriya, Gujarati, Marathi, Kannada, Telugu, Tamil and Malyalam. These twelve ligusistic regions generally correspond with the states of the Indian Union. But the statge boundaries do not always correspond with the linguistic boundaries. In fact, the linguistic boundary in itself is not a line but a zone of transition over which one language gradually loses its dominance and gives way to the other.

The languages spoken by the people of India belong to the four language families-

#### **1. AUSTRIC FAMILY (NISHADA)**

Spoken by 1.38% of total Indian population, this family included mainly tibal languages and dialects of the central tribal belt, Mhasi and Jainita hills of Meghalaya, and Nicobar islands in the Bay of Bengal. The Austric languages are spoken by 6.2 million people in India. The largest single group is that of Santhali speakers, who alone account for more than half of this total.

# 2. SINO-TIBETAN FAMILY (KIRATA)

The languages and ialects of this group are spoken by the tribal groups of the north-east and of the Himalayan and suib-Himalayan region of the north and north-west, and account for 0.85% of Indian population. Major languages of this group are Tibetan, Balti, Ladakhi, Lahuli, Sherpa, Sikkim Bhutia, Chamba, Knanauri, Lepcha of the Tibeto-Himalayan region; Aka, Dafla, Abor, Miri, Mishmi and Mishing of north-Assam or the Arunachal region; Bodo/Boro, Naga, Kachin, Kukichin, Manipuri, Garo, Tripuri, Mikir and Lushai of the Assam-Myanmarese branch.

**3. DRAVIDIAN FAMILY (DRAVIDA)** Of the total population of India, 20% speak languages and dialects belonging to theDravidian family. Languages of this family are concentrated in the plateau region and the adjoing coastal plains. Telugu is spoken in Andhra Pradesh; Tamil in Tamil Nadu; Kannada in Karnataka and Malayalam in Kerala. Some tribal groups also speck Dravidian languages like Gonds and Oraons. Some minor languages and dialects belonging to the Dravidian family are Tulu, Kurgi, Yerukala, Kui, Pariji and Khond. The Dravidian languages are less diverse than the other language families of India. The major language goups such as Tamil, Telugu, Kannada and Malayalm themselves account for 96% of the total population of the Dravidian speakers.

# 4. INDO-ARYAN FAMILY (ARYAN)

Nearly 73% of the Indian population speaks languages and dialects of this family. Although these languages are mainly concentrated in the plains of India their domain extends over the peninsular plateau also, reaching as far south as the Konkan coast.

The central part of this regions hashindi as thepricipal language. Hindi is spoken by the majority of people in India. Hindi is spoken in Uttar Pradesh Madhya Pradesh, Bihar, Rajasthan, Haryana, Himachal Pradesh and Delhi. A major concentration of theUrudu speakers is found in Uttar Pradesh, Bihar, Delhi, Andhra Pradesh and Karnataka. Kachchhi and Sindhi are mainly concentrated in western India. Marathi is the most important language of the southern group, such

as Oria, Bangla and Assamese are spoken in eastern India. The languages of the central group are confined to Punjab, Rajasthan and Gujarat. The Himalayan and sub-Himalayan areas are inhabited by speakers of the various forms of Pahari and Nepali which belong to the northern group of the Indo-Aryan languages.

#### **UNIFYING INFLUENCES**

A number of unifying influences have been active over this vast linguistic diversity and because of these forces of social integration; a common all-India vocabulary has evolved. The main role in this process of integration has been played by Sanskrit, Persian and English-all three serving as the state languages at one or the other stage of our history. Sanskrit exercised a binding role between the Indo-Aryan languages themselves on the one hand and the Indo-Aryan and the Dravidian, on the othr. During the medieval period, Persian influenced the indigenous languages, particularly Marathi, Kannada, Telugu, Tamil and Bangla. Englishhas played asimilar role in modern times. Both Hindi and Urudu have made a significant contribution to the process of linguistic integrationin Idnia in the recent Past. Hindustani films, for example, are understood in all parts of the country.

#### RELIGION

An insight into the religious compostion of the India population helps us understand regional distribution of various cultures. Hinduism is the religion of the majority of the people in Indi. But, it has interesting regional forms and each cultural region displays its own distinguishing traits. Hinduism evolved from the early pre-Veduc Hindu religion which incorporated elemtnsof tribal faith. India witnessed successive penetrationsby other religions which were embraced by the Indians from time to time. Christianity was the first to appear on the west coast of India in the very first centural of the Christian eta. Islam came with theArab trader sto the west coast of India. Buddhism was once the major religion of the land, but today it is confined to a few pockets only. Sikhism was theast to appear on the scene. Apart from these four major religions other faiths, such as Jainism, Judaism and Zoroastranism are also represented.

In 1991, the Hindus numbered 67.26 crores and accounted for 82.41% of the total population. Excepting theperipheral areas likethe west coast, Jammu and Kashmire, Punjab and the north-east where Islam, Sikhism and Christianity dominate respectively, Hindus remain the dominat religious group everywhere.

In 1991, the Muslims numbered 9.5 crores and accounted for 11.67% of thetotal population. The major areas of Muslim concentration are situated in the Kashmir valley, parts of upper Ganga basin (districts of Rampur, Bijnor, Moradabad, Bareilly, Pilibhit, Saharanpur, Muzafarnagar, Meerut and Ghaziabad), a number of districts in West Bengal and Bihar, a few pockets in Haryana, Rajastha, Gujart, Madhya Pradesh, Andhra Pradesh and Kerala.

In 1991, the Christians numbered 1.89 crores and accounted for 2.32% of thetoal population. Of these, one-third lives in the state of Kerala alone. Other pockets with significant concentration of the Christians are goa, several tribal districts of Orissa and Bihar, megalayas, Nagaland, and Mizoram. Several districts of Uttar Pradesh and Punjab have small Christian populations. Gurdaspur with 6.3% of its population being Christian is a significant example.

The Sikhs numbered 1.63 crores in 1991 and accounted for 2% of the total population of India. While there is no part in India where Sikhs are not represented, their major concentration is seen in the states of Punjab and neighbouring districts of Haryana. Minor pockets of Sikh concentration are found in the Terai region of Uttar Pradesh, Gananagar, Alwar and Charatpur districts of Rajasthan and Delhi.

India has bout 63 lakh Buddhists (0.77%) 34 lakh Jains (0.41%) and about 75,000 Parsis. Of the total Buddhists of India, 83.6 percent live in Maharashtra alone. These are neo-Buddhists who coverted to Buddhism under Dr Ambedkar. The main pockets of traditional Buddshism, however, lie in Ladakh, Himachal Pradesh, Sikkim, Arunachal Pradesh and Tripura. The Jains are mainly

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concentrated in Maharashtra, Rajasthan and Gujarat. The Jains are maily concentrated in the urban areas. The Parsis are the smallest religious group. They are mostly concentrated in wetern parts of India.

#### **CULTURE**

Culture is the sum total of expressions of lifestyle of a population which is expressed through tangible and intangible forms, such as architecture, dance, music, painting, dress patterns, food habits, social institutions and practices, value systems etc. A culture can be said to be the observable expression of existence of a region. Because of relative geographical isolation of a region and because of a particular micro-climate and economy of a region, the people living there evolve a certain region. The gives rise to different cultures in different regions, which, of course, interact with each other on the basis of mutual give and take.

It is because of the above mentioned factors that regional cultures, such as Malwa, Bundelkhan, Awadh, Bhojpuri, Deccan, Gujarati, Konkani etc., have emerged. These cultures have given rise to different architectural styles Deravida, Nagara, Hoysala, Malwa, Chola, Bengali etc; different painting styles – Rajasthani, Pahari, hill paintings, cave paintings etc; different dance forms- Bharatnatyam, Kathakali, Kuchipudi, Garba, Bhangra; different folk theatre forms Nautanki, Naach, Tamasha, Pandvani, Laavani, Harikatha, Jatra etc.; different music styles and so on.

Thus, it can be said that culture does give a region a distinct identity or outer appearance and to that extent helps information of regions.

#### HISTORICAL PERSPECTIVE ON UNITY IN DIVERSITY

A unique feature of the Indian civilization has been a complex interplay of elemtns of diversity and the uinderlying bonds of unity which becomes all the more evident when seen in the regional context. Thus, in the social geography of India, there appears to be a symbiotic relationship between centripetal and centrifugal forces, producing a delicate balance of unity in diversity. The

centrifugal forces were generated by the requirements of different eco systems and man's interaction within them, leading to regionally specific responses to varying landscapes. The trnashuman Gujjar hedsman in the Pir Panjal, theMoplah fisherman of the Malabar coast, the Maratha peasant of the black cotton soild belt, the Jhum cultivator of the humid north-east, the steel worker of chhatisgarh-all in their own way, have and are coming to terms with their specific ecosystems. The centripetal forces, on the other hand, were relased by the horizontal spread of techniques and other socio-economic and cultural traits.

The centripetal forces wee unleashed by successive waves of immigration into the subcontinent from surrounding territories, the different routes of the dispersal of these into this vast land and the consequent concentration of diverse thnic elemens in different regions. Three important regional concentrations may be idlentifies-north-west, north-east and the costline of southern India. Apart from these, the river valleys provided fetile grounds for human settlements. As a result, the basins of the Peincipal Rivers -Indus, Ganga, Yamuna, Godavari, Krishna, Cauveri and Brahmaputra attracted human settlements quite early in history. On the periphery of thse basins lay the relatively less attractive or relatively isolated areas as they were hilly, forested or dry and were away from the main lines of communication within the country. Sind, Mewar, Kathiawar, the upper Brahmaputra valley, coastal Orissa and Bundlekhand may be included in this category. There were other areas in the interior of the subcontinent or in the bordering mountain rim which were least attractive for agriculture or which were least attractive for agriculture or were isolated to a high degree. They have been charcterised by a high degree of stagnation due to persistence of earlier forms of culture largely unaffected by the winds of change which swept over the areas of perennial attraction. The Western Ghats, the Aravillis, the Vindhyan region of central India, Chhotanagpur plateau, hilly tracts of Orissa, Shillong plateau and the bordering Assam hills belong to this category. These areas happen to coincide with the belts of tirbla concentration in the country.

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But, this social diversity emanating from the regional diversity has been based on and sustained by an underlying unity which has grown with time. The factors that have led to the strengthening of this underlying unity of the social ethos in India are discussed below.

#### **1. MONSOONAL RHYTHM OF SEASONS**

The all pervasive nature of the monsoon-inspite of the many regional variations – has provided the natural base for a certain degree of uniformity in man-nature interaction throughout the length and breadth of the country.

#### 2. INTER-REGIONAL GIVE AND TAKE

A process of cultural fusion has been activated by the evergrowing give and take through inter regional contacts. The most important of all these integrative forces in the basal matrix of Indian culture was provided by the spatial spread of Dedic and Puranic traditions during the ancient period itself from the Indo-Gangetic plains south, north and eastwards. The Sanskrit language provided strong bonds of cultural unity among the religions and the intellectual elite in the country as a whole. A similar role was played by Persian and English in the later periods of history. Also, the preachings of Bhakti and Sufi saints in rural India left an indelible print on the cultura ethos of India. It is because of these integrative forces that one finds such apparently diverse traditions as those associated with Hindusim and Islam getting intertwined so intricately into a composite matix as relected in Kabirbani, the Taj Mahal, the Ragg Darbari or the Kangra miniatures.

# 3. INTER-REGIONAL ECONOMIC AND ADMINISTRATIVE LINKAGES

The British brought about political and administrative unity of the country, although to serve their own interests. This was achieved by providing a unified market throughout the country once the whole country came under one administration, introduction of railways and other modern means of communication; introduction of a unified administrative and judicial machinery

etc. The requirements of the economy generated inter district and inter-regional migrations, especially from rural to urban areas. These linkages were modified and improved upon after independence through the system of federal polity and institutions such as local level democratic bodies, planned economic operations further expansion of the modern infrastructure and further development of a unified economic and financial market.

To have an insight into the interaction of these centripetal and centrifugal forces, a histrorica view of these processes is required.

#### THE HISTORICAL PERSPECTIVE

The emergence of the sixteen magajanpadas by the 6<sup>th</sup> centuryBC provides the basal stratum of the Indian regionals structure. The extablishment of the Magadh Empire as the first all-India empire during the 6<sup>th</sup> century BC activated development of inter-regional communication and the horizontal spread fof entripetal tendencies. The fall of th eMagadh empire led to apriod of p[olitical fragmentation and the resurgence of of centrifugal tendencies which were arrested for some time during the Gupta period in 4<sup>th</sup> and 5<sup>th</sup> centuries AD. A long period of stagnation from 8<sup>th</sup> to the 14<sup>th</sup> centuries Ad followed, although this period saw evolution of regional cultures and anguages.

The coming in of the Pathans, Iraians and the Central Asiaans during the medieval period accelerated the inteplay betwe the centripetal and centrifugal trends. For instance, the Bughal Suba, Sarkar and the Pargana were based on the hierarchy of regional identities. The process of empire-building strengthened the centripetal tendencies.

The British disrupted the indigenous regional structure to serve their own ends. For this purpose, a port-oriented centrifugal transport network was imposed on the Idian soil, which fragmented the haome market. The historically evolved regions were fragmented by artifical differentiation between princely India and the rest of the country. Similarly, unnatural 'mixtures' were created which broke cultural indentities and amalgamated amny parts into the unit. The princely state of

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Hyderabad, for example, was made up of slices from Maharashtra, Andhra Pradesh and Karnataka.

Because of these factors, the freee India inherited a fragmented regional structure. The national movement before independence and the linguistic reorganization of states after independence met this challenge of correcting the distortions effectively. Thus, from the sixteen mahajanpadas of trhe 6<sup>th</sup> century BC to the linguistic states of our own times, it is a historical continuum in geographically differentiated space.

# POPULATION-DISTRIBUTION, DENSITY AND GROWHT

The studies concerning population distribution and density bassume sitgnificance forless developed countries, because in their case the forces of demorgraphic transition have a direct bearing on the direction and pace of the process of development.

# SALIENT FEATURES OF INDIAN DEMOGRAPHY

The striking features of Indian demography ar as follows:

# **Population too large for Area**

While being one of the most populour counties of the world, occupying the second place after China and accountingfor 16% of the world population, India, however accounts for only 2.42% of the total world area.

# **Overwhelming Proportion of Rural**

Population About 74% of the populationlives in rural areas. This indicates a massive depence on agriculture and other rural industries.

# **Fast Rate of Population Growth**

Although the averge annual exponential growth rate for the 1981-91 decade has dropped to 2.14% from 2.22% in 1971-81, it still remains very high. The cities or twons have registered even a higher growth. This has happened because the urban centres have expandeed in area and have encroached upon the surrounding villages, as people continue to pour tinto urban centres in search of jobs and better living.

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#### **Declining Proportion of Women**

India's population is by and large male-dominated. The proportion of women has been declining all throught the twentieth century. This may be attributed more to the sociological factors which explain the low preference for the female child in the family. In the absence of proper a tention, the female child falls an easy prey to diseases casued by under-nutrition. A large number of women also die during child-birth.

#### **High Percentage of Non-workers**

Only 36% of ourpopulation can be classified as worker-this includes the population below 15 years lo(i.e., child labour), otherwise this figure would have been even lower. While 52.5% of the males are workers, only 20% of females work. In advanced countries, females account for as much as 40% of the workforce, reaching nearly the 50% mark in countries like Denmark, Finland, USA and Japan. In Idnia, thus a high percentage of below 15years population (nearly 36% of the total) and low rates oflabour participation among women are responsible for a high percentage of the non-working population.

#### **Lop-sided Age Structure**

About onehlaf of our population is less than 20 years of age. Such a large population of youth has its own social, economic and politicalimplications.

#### **Ethnic diversity**

Apart from the problems associated with its size, the problem of ethnic diversity with its size, the problem of thnic diversity with shich the country was characterized has also divested the Indian society of social cohesion which has affected thepace of soico-economic advancement of the country adversely. Above all, the concentration of religious minorities in the strategically located peripheral areas is also not without its social, economic and political implications.

#### **ASPECTS OF SPATIAL DISTRIBUTION**

India's population, according to the 1991 ensus is 846.30 million (439.23 millionmales and 407.07 million females). This includes the projected population of 7.72 million of Jammu and Kashmir. However the spatial distribution of population within the country is highly uneven. These contrasts are obvious even at the level of states and are further sharpened at the level of districts.

The 1991 census wa not held in J&K.The population projections of J&K as on March 1, 1991 made by the StandingCommittee of Experts onpopulation Projection (October 1989) is given.

Uttar Pradeshas the largest population followed by Bihar, Maharashtra, West Bengal and Andhra Pradesh in the same order. These five states together share among themselves more than one-half of the country's population. More than onefourth of our people live in two states of Uttar Pradesh and Bihar alone. Uttar Pradesh has more people than the two largest states of Madhya Pradesh and Rajasthan. The three southern states of Kerala, Karnataka and Tamil Nadu together have just as many people as Uttar Pradesh alone. In fact, more people live in Delhi than in the state of Jammu and Kashmir or in allthe union territories put together.

The unevennature ofth distribution of population becomes more evident when we try to find out as towhat proportion of India's population lives in each state of the Indian Union. This may be described as the 'Index of Concentration'. This index is 16.44% for Uttar Pradesh, 0.14% for Nagaland, 0.21% for Meghalaya and 0.91 for Jammu and Kashmir. The highly corwded state of West Bengal accommodates 8.04% of the country's population, while the shares of the agriculturally developed states of Punjab and Haryana are 2.40% and 1.94% respectively.

A closer examination of the census data shows that the states of the Indian Union have an unequal shjare not only in populationbut also inarea. In fact, it seems that there is little relationship between area and population. Whiel Madhya

Pradesh is the larges tstate and account for about 14% of the toal area of the country; it accommodates only 7.82% of the population. The two large states of Rajasthan and Andhra Pradesh together have 19% of the country's area butonly 13% of its population.

#### SEX RATIO

In any study ofhe population, the analysis of the sex composition plays a vital role. The sex composition of the populationisaffected by the differentials in the population is affected by the differential in tehmortality conditions of males and females, sex selective migration and the sex ratio at birth.

Sex ratio is defined as the number of females per 1000 males. In India, it has generally been adverse to women. The ratio has also declined over the years except in 1981 when it slightly improved to 934 from 930. In 1991, it fell by seven points to be at 927 per thousand males. But Kerala represented a dofferent spectrum. The state has higher number of females than males, 1,036 females for thousand males.

In the Indian context, a sex ratio of 950 and above canbe considered as favourable to females. The states and union territories coming under this category besides kerla are Himachal Pradesh (976), Andhra Pradesh (972), Goa (967), Karnataka (960), Manipur (958), Orissa (971), Tamil Nadu (974), Dara and Nagar Haveli (952), Daman and Diu (969) and Pondicherry (979). Chandigarh accounted for the lowest number of females (790) per thousand males. For the trends of decline of the sex-ratio during revious decades.

Census year	Sex Ratio
1901	972
1911	964
1921	955
1931	950

# **SEX RATIO (1901-1991)**

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1941	945
1951	046
1961	941
1971	930
1981	934
1991	927

If we consider the sex ratio in context of specific regins, the overall picture is gloomy except for the south and western coastal areas, the Uttarakhand hill districts of Uttar Pradesh anda pocket of four districts in Himachal Pradesh along with sizeable pocket of underdeveloped areas in Madhya Pradesh and the south western coastal district of Orissa. These areas in Madhya Pradesh and Orissa are largely on female lives, conferring on them corresponding social equity and status.

#### AGE STRUCTURE

Age structure refers to the composition of a nation by different age groups. There are three types of age structures, viz. i) the West European type in which childrenconstitue less than 30 percent, and 15percent of the population are old; ii) the North American type wher 35-40 percent of the population are children and 10percent, old people; and iii) the Brazilian type with 45-55 percent of the population being children, andold people constituting only 4-8 percent of the total population. The type of age structure has a direct influence on the future of a nation, since both extremes, i.e., old age dependencies as well as young age dependency prove to be a severe burden on the economy of a country.

There are different methods of analyzing age composition.

#### Age Pyramids

Also known as age and sex pyramid, the method is commonly used. The age pyramid on its vertical axis represents age group at a regular intervalof, say, 5 years, starting from 0 to 5 and ending according to the age structure of the

population under study. The horizontal azis represents the total population or populations of males and females separately. Under normal situatins, the number of persons in each successive year is less than the numbe in the preceding year; therefore the age composition represents the sape of a pyramid. The developing countries, charactrised by high birth rate and high death rate, have a broad-base pyramid, while the developed countries in the last stage of demographic trnsition have a narrow-base age pyramid.

#### ii) Age groups

The population categoriesed into various age groups allows geographers to dra regional comparisonson choropleth maps. In general, the population is divided into three braod age groups: a) the young, (b) the adults, c) the old. The most popular standardized break point is 15 to 60. So, three broad age groups emerge: 0-14; 15-59, 60 and above.

# iii)Age indices

Such ratios are calculated with the help fo three age groups on a broad basis, e.g. ratio between the aged and the adults, the young and the aged and so on. Therefore numerous such ratios exist. The ratio betgwenthe adults and the young plus aged is called dependency ratio.

# **DEPENDENCY RATIO**

The dependency ratio is computed by dividing the number of childrenplus old people by the number of adults and multiplyingit by hundred. It is mainly governed by the age structure of the population. The Oxford Dictionary of Geography defines dependency ratio as the ratio between the number of pople in a population between the ages of 15 and 64 and the dependent population: children (0-14) and elderly people (65 and over). Dependency ratio quantifies the ratio between the economically active population and the dependent population. The age-limits for dependency ratio are arbitrary in different countries of the world. Generally developing countries are characterized by higher dependency ratios owing to higher population growth and lack of employment opportunities, mainly.

As per the 1991 census, the total number of persons in age group 0-14 and 60+ were 369.05 million. Such a huge population is dependent on 464.83 million people of India. The national average of dependency ratio is 794 persons. Taking the overall scenario into consideration, the North Indian states reveal a very high dependency ratio compared to the states of South India. The lower Ganga plains of Utta Pradesh and adjoint Bihar have extremely high depency ration (900-974) . Accourding to the 1991 census, the lowest ragen (674 and below) of dependency ratio is found in Kerala and Tamil Nadu; Goa and Andaman & Nicobar Islands witness a dependency ratio of less than 674 674. As per state/union territory level, the highest value is found in Bihar (907) followed by Uttar Pradesh (905) whereas Goa has the lowest dependency ratio (556).

# **DENSITY OF POPULATION**

A ratio of population to area may be a better measure of variation in the distribution of population. One such measure is the 'density of population', expressed as number of people per unit area, for example, a square kilometer or a hectare. However, it is a crude measure, and is referred tp as the 'arithmetic density'. It is crude because the entire area of a country or a state is taken into consideration while calculating the dentsity. In fact, the population lives only in the selected areas which are productive, rich in natural resources and accessible to man. The hilly and thr rugged terrain, swampy, marshy and forested tracts as well s the areas covered by water bodies are just not suited for human habitation. Because of the limitation of the arithmetic density, densities are sometimes calculated for thr rural population or agricultural population. In calculating the dentsity, a cultivated area is considered. A ratio of population to cultivated area is described in France as 'physiological density'. This measure of density gives us an idea as to how many people are dependent on eachnectare of cultivated land. It is a highly

meaningful index, particularly for countries whose economies are largely dependent on agriculture.

The analysis of population density of the country discussed her is, however, based on the 'arithmetic density'-defined as the number of persons per square kilometer. The population density has gone up from 216 in 1981 to 267 persons in 1991 (excluding Assam and Jammu and Kashmir). In 1901, it was 77 persons. Thus, it implies an addition of 51 persons per square kilometer for the country. This addition in a short span of ten years is really alarming.

From among the various states, West Bengal occupied the first rank with the highest density of 767 persons per sq km. It was followed by Kerlala (749), Bihar (497), Uttar Pradesh (473), Tamil Nadu (429), Punjab (403), Haryana (372), Goa (316) and Assam (286) in this order. Thus Kerala drifted to the second position during 1981-91 in terms of population density mainly due to it scontrolled growth of population. Howeve, these nine states had a density highe than the national average of 267. At the other end of the scale was Arunachal Pradesh which, among various states, had the lowest density of only 10 persons per sq km. there were eight states in the country which had a density less than 100 person's pe sq km. These states included Mizoram (33), Sikkim (57), Nagaland (73), Jammu and Kashmir (76), Meghalaya (78), Manipur (82) and Himachal Pradesh (92). Thus, the states having low density were either the hill states or had a large proportion of mountainous areas.

As regards the union territories, with the exception of Andman and Nicobar islands (34), all the union territories had a highe density than the national average of 267. Delhi, with a density of 6352 persons per sq km was the most densely populated region of the country. The unions territories are mostly highly urbanized andhence display a high degree of population concentration. The sparsely populated territory of Andaman and Nicobar Islands consists of a large number of widely spread, poorly connected islands which are located at a great distance from the mainland.

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The ten most densely populated districts of the country include Calcutta, Chennai, Greater Mumbai, Hyderabad, Delhi, Chandigarh, Mahe, haora, Kanpur Nagar and Bangalore in this order. These districts together account for 5% of the country's totalpopulation, but, on an averge, have a density of 5,791 persons / sq km. It all the districts in the country are arranged in a descending order in terms of their density and average quartile values of densities are calculated, the following are abserved:

- Each quartile has 107 districts (excluding the districts of Jammu and Kashmir and Assam for which data are not yet available).
- The first quartile districts (having densities above 522) account for 36% of the country's population and cover 12% of the country's area. On an average, these districts together have a density of 844 persons /sq km.
- The districts in the second quartile (having densities between 271 and 522) account for 28% of the country's population and 20% of its area. These districts together have an average density of 383 persons.
- The wide gap in densities between the first and the second quartiles ignifies a high degree of variability in population density from one region to another.
- The third quartile districts (densities between 155 to 2700 account for about 25% of the country's population and 3% of its area. The average density for these districts works out to be 204.
- The districts in the fourth quartile have densities below 155 and accommodate 11% of the country's population. These districts account for as much as 35% of the country's area with an averge density of 83.

# SALIENT FEATURES OF REGIONAL PATTERN OF POPULATION DENSITY

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- The regional pattern of population density in the country has not undergone any signififcant change during 1981-1991 except for an upward shift in the density values.
- The Indo-Gangetic plain contines to be the largest contiguous area of unberarbly high density of population.
- Although the peninsular India has comparatively lower density values, the coastal areas deisplay high densities that are fairly comparable with those of the Indo-Gangetic plains.
- The mountainous areas of the north-east and north-west display densities of the lowest order.
- With an average density of 267 persons/sq km, India is considered to be one of the highly densely populated countries of the world. An important feature of the Indian population is that the population density has been consistently increasing since 1921. In 1981, the average density was 216 persons/sq km, and inearlier censuses of 1951, 1961 and 1971 the value was 117, 142 and 177 persons/sq km respectively. In 1921, the population density was 81 persons / sq km only. It is thus clear that with every successive census, the growth of population results in greater crowdiness. The reason is that while the population increases continuously, the area cannot be expanded. The dependence on agriculture continues to be very high. It is natural to be so since the economy is not diversifying. Thus, thehigh rural densities cannot be reduced, since populationis not getting diverted to non-agricultural occupations.
- On the face of it, variations in the density of population appear tohave been caused by factors such as relief, climate, water supply, soil fertility and agricultural productivity. However, it will be wrong to suppose that all variations in the density of population are caused by naturl and engironmental factors alone. The influence of these factors is greater in some regions than inotehrs. For instance, relief, altitude and temperature

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exercise a great influence on the distribution of population in the hilly regions of Jammu and Kashmire, Himachal Pradesh and the north-east. In reality, these are the social, economicl, demographic, political and historical factors which ave an important role to play in the spatial distribution of population density.

## **GROWTH OF POPULATION**

The human population remains changing all the itme. If conditions are favourable, food supplies are adequate a regular andthere are no natural calamities, thepopulation tends to increase with passage of time. On the other hand, if the conditions are adverse, food supplies are short of the requirements and calamities such as drought, floods and epidemics commonly occur, the populationis likely to delcline. Moreover, people remain on the move all the time. It is, therefore, obvious that there will be a change in population between two points in time if there are more births thn deaths in a given population or an addition has been made to the population due to migration. In this situation, the population will register an increase. On the other hand, if the deaths are in excess of births and there is no net addition through migration, the population will decline over time.

A growth in population implies a change between two given points in time. The net change in population betweentwo points in time is expressed inpercentage andis described as the 'growth rate of population'. Growth may be 'negative' if the population declines over time; it may be positive, it there is an increase of populationbetweentwo points in time. The growth rate of population is casued by two factors- natural increase (which is an outcome of the excess of births over deaths) and migration.the natural increase may be high but if people migrate out of the territory inlarge umbers, the population will decrease.

The population of India as recorded at each decennial census fro 1901 has grown steadily except for a decrese during 1911-21. In absolute terms, the country's population has increased by 162.97 million during the decade 1981-91.

An encouraging feature revealed by the provisional results is the decline in growth rate of population in the last decade compared to 1971-81. It marginally decreased from 24.66% recorded in 11981 to 23.85% during 1981-91.

In most states, the growth rate declined during the decade. However Andhra Pradesh, Arunachal Pradesh, Madhya Pradesh, Maharashtra, Nagaland, Tripura, West Bengal, Daman and Diu, Lakshadweep and Pondicherry, which account for one-third of the country's population, recorded increase ingrowth rate. Nagaland recorded the highest growth rate of 56.08% while Kerala the lowest of 14.32%.

## **CAUSES OF RAPID POPULATION GRWTH**

The main reasons why population grwth is rapid are as follows:

#### High Birth Rates and Declining Death

According to the 1991 census, birth rate in India was 30.5, while the death rate was 9.4. As a result, the survival rate has been increasing. To arrest this trend, the birth rates will hve to be brought down further.

#### 2. near Universal Incidence of Mariage

According to one survery, in the 40-44 years age group, the percentage of women who never married was merely 0.55%. Because of universal marriage of women, the number of childrenborn per couple is very large.

#### 3. Early Marriage of Girls

The survey also revealed that 44% of the women is 15-19 years age-group and 90% in the 20-24 years age group are married. This implies more chances of bearing children for women in the early reproductive years-thus leading to high birth rates.

#### 4. Economic backwardness

Because of a high percentage of rural population and a high incidence of rural poverty more children considered a resource. A high infant mortality rate alos encourages the poor to produce more children.

#### 5. Climatic Factors

The tropical climate makes for early puberty and conservative social institutions lead to an earlymarriage of women.

## LITERACY

Education is a key factor in socio-economic development. A reasonable level of literacy achieves the following objectives.

It increases the receptivity of the population to modern ideas and improved techniques and enlarges their mental horizon.

It promotes increased participation f citizens in the affairs of the country.

it results in greater awareness of available opportunities and mobility of labour.

- It produces skilled and trained personnel needed by economy and society.
- It promotes science and technology and, even more importantly, a scientific outlook.

It generates national and development consciousness.

For the prupose of census, a person is deemed as literate if he or she can read and write any language, with understanding. In the 1991 census, the question on literacy was canvassed only for population aged seven years and above, unlike earlier censuses which took into account population of five years and above for this purpose.

The final results reveal that there has been an increase in literacy in the country. The literacy rate, according to the 1991 census, is 52.21% (64.13% for males and 39.29% for females). Kerala retained its position by being on top with a 89.81% literacy rate in the country. Bihar stood at the bottom with a literacy rate of 38.48% with Rajasthan with a percentage of 20.44% as compared to 54.99% among the males.

The average literacy rates, however, conceal many sharp inequalities. First, and quite glaring, is the wide difference between rural and urban areas. Secondly,

there is large difference between males and females. Female literacy rate was 25% below that of the male literacy rate in 1991. Thirdly, there are enormous inter-state differences in literacy rates. In 1991, Kerala stood at one end with the overall literacy rate of 89.81% (male: 96.62%, female: 86.17%) and Rajasthan at theother with 38.55% (male: 54.99%, female: 20.44%). The maximum difference – that between Kerala's urban male population and Rajasthan's rural female population was 84%.

One straight forward meassage from these trends is that, if India continues at the present rate of growth of literacy, it will keep on adding to the number of illiterates. Earlier extimtes by such a reputed source as the World Bank had suggested that if India continued at present rates, by 2000 AD, it would have the rather dubious distinction of being the home of more thanhalf the illiterate population in the world.

## **IMPLEICATIONS OF LOW LITERACY RATES**

Such a poor performance has, of course, many serious implications. There is enough evidence now to show that high literacy rates-especially high female literacy rates-are associated with low rates of population growth. Kerala is an outstanding example where high (especially female) literacy rates have gone hand is hand not only with low rates of growth of population, but with superior performance I terms of a number of health indicators, such as infant marotality rates, death rates of growth of population, but with superior performance in ters of a number of health indicators, such as infant mortality rates, death rates, sex ratio and so on. In sharp contrast, abysmally low rural female literacy rates are associated with both high population growth rates and poorer performance in terms of health indicators –as the case of Bihar, Rajasthan, Utrtar Pradesh and Madhya Pradesh demonstrates.

## **PERFORMANCE OF STATES IN LITTERACY**

ACY From the analysis of the performance of states in literacy fruing the last decade, the following points emerge-

- Only three states kerala, Tamil Nadu and Maharashtra have crossed the 50% marks in female literacy rates.
- Haryana has shown the greatest improvement in terms of ovrall as well as female literacy rates.

Bihar shows the least progress inmae, female and total literacy rates.

- Male-Female literacy fifferentials have narrowed in all states except Rajasthan. While this is encouraging, the pattern of decline is not. Thus, the states which perform the worst in terms of literacy rates –Bihar, Rajasthan, Madhya Pradesh, uttar Pradesh and Andhra Pradesh – are also the ones which have recoreded minimum improvement in the matter of male-female differenctials.
- The states which have shown significant decline in male-female literacy differential are also the ones which have consistely had above average literacy rates for all categories-persons, males and females.
- Male-famale differential are comparatively low in the three regions inhabited predominatly by tribal- Meghalaya, Mizoram and Nagaland.

## **MEASURE TO ARREST LOW LITERACY RATES**

The states with low literacy rates tend to have low enrolment-retention rates amonggirls which depress the overall figures forthese states. The most vulnerable classes (especially for girls) for non-starter and drop-outs are Scheduled Castes, Scheduled Tribes, those living in remote and backward areas and the children of recent migrants to towns. Thus, socio-economic compulsions, rather than nonavilability of schools, are mainly responsible for the children keeping out of schools. The programmes like mid-day meals, free books, uniforms and stationaery have had limited impact. The following steps are suggested to ensure full enrolment of the 6-14 hear ago group-

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Lag in enrolment of girls be removed.

Overall enrolment percentage in educationally backward states is brought to the national level.

Innovative measures are evolved to check the drop-out rates.

Quality, relevance and effectiveness of primary education are improved.

To improve literacy levels among children, the government launched 'Operation Blackboard' in 1987-88 which, according to the current norms, aims at equipping each primary and upper primary school with three reasonably large, all weather rooks; at least three teacher per school, one of them being a lady teacher; separate tilets for boys and girls; adequate learning and teaching material such as maps, charts, toys and toold for work experience.

The government also provides non-formal education facilities for the children in tribal, hilly, desert and remote areas and in urban slums, where quite a number of children work.

To attain higher levels of literacy among the adult population, the National Adult Education Programme was tkane up in 1978. the Sixth Plan set the target of reaching 100% literacy in the 15-35 years age group. In 1988, a National Literacy Misssion was launched to impart functional literacy to the adult population in 15-35 years age group. The National Literacy Mission Campagins are area-specific, time-bound, volunteer based, cost-effective and outcome oriented. These campaigns also aim at universal enrolment and retention of children, small family norms, immunization, maternity protection, communal harmony and environment protection. The Mission Campaigns aim to cover 345 districts by the end of the 8<sup>th</sup> Plan.

# POPULATION BROBLEMS AND POLICIES PROBLEMS ASSOCIATED WITH HIGH POPULATION GRWOTH

The large population of India and its continued growth at an annual rate well above 2% has created many problems;

#### **Scope for Decline in Death Rates**

With ever increasing provision of health services, there is a scope for further decline of the death rates. If the birth rates do not show similar declines, the population growth rates will go further up.

#### Tendency for Rise in Proportion of Women in the Reproductive Age

According to the 1991 census, 36% of the population is below 15 years. Women in this age group will contribute to the reproductive age section in future. This will lead to increase inoverall birth rates due to an ever expanding reproductive age group.

#### High Birth Rate Depresses Per Capita Income

Income During 1950-51 to 1990-91 period, the national income rose by 223% (average annual rate-4.21%), but the per capita income rose by 52.8% only (average annual rate -2.23%). This is because the population rose by 223% (averge annual rate -2.14%) during this period. Low rates of per capita income mean low rates of savings and of investments which depress the growth of national income as a whole.

#### High Birth Rates a Strain on Monther's Health and Norms Activity

This results in lower productivity of the population.

## High Population Growth Means increased Pressure on Land

As the total area of the country is fixed, the rapid growth of populationhas increased pressure onland, especially cultivableland. In India, only 46% of the total land is available for agricultural purposes, while 70% of the population depnds on agricultural land is responsible for high unemployment rates among rural people.

#### **Inter-Regional Migration**

Rapid population growth causes migration of people from denser regions like Kerala and West Bengal to less dense regions. This causes increased demands

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for infrastructure and civic amenities in areas which receive migrating populations.

#### **Environemntal Implications**

Because of growth of population, there is an increased demand for food, clothing, shelter, industrial and consumer goods. This creates pressure onnatural resources and leads to increased use of fertilizers, pesticides, irrigation measures, machines, power etc. This coupled with rapid deforestation to clear land for human settlement, growing slums, poor sanitation, soil erosion, air and water pollution causes a great strain on our natural resources and gives way to an unsustainable mode of development. Growing concerns on environmental degradation are related to high levels of population growth.

Incressing Pressure on Civic Amentities and the Social Problems Because of high population growth rates, and migrations in searchof employment to urban areas, there is immense of employment to urban areas, there is immense pressure on public facilities like transport, hospitals, educational institutions, water supply, electricity, sanitation etc. Because of growing socio-economic disparities and large floating populations in urban areas, social problems arise, such as crime agaist women and the elderly, drug absue, child delinquency, vulgar consumerism etc. Similarly, high rates of enemployment among youth, rising prices and demands for higher wages are other problems associated with high rates of population growth.

## INDIA AND THE DEMOGRAPHIC TANSITION

India entered the second stage of demographic transition mainly after 1951 when the death rates ceclined while the birth rates were stillhigh. But the Indian situation showed slight deviation from the industrialized countries. In India, the decline in death rates occurred before there was a change in the basic economic structure or the consequent rise in living standards. Thus, there is no guarantee that a fall in birth rates will occur automatically. There is a high probability that in absence of deliberate efforts, it will not be so.

According to the projection of the Standing Committeee of planning Commisssion of Population Projects, from 1986-91 onwards, the birth rates will decline faster than the death rates, thus the growth rate will show a steady decline. According to theses projections, the following trends will fp;;pw

	19986-91	2006 AD
Birth Rate	30.9%	23%
Death Rate	10.8%	7.8%
Decadal Growth Rate	20.1%	15.2%
Annual Grwth Rate	2.01%	1.52

## **INDIA'S POPULATION POLICY**

Although family palnning efforts in India started as early as 1953, it was accorded high priority only after the 1961 census which showed a population growth muchhigher than was expected. Following are the highlights of India's population Policy-

## **Policy Emphasis on Reducing Birth**

The policy emphasizes on broad-based targeting and laying down of firm demographic targets.

## A Voluntary and Comprehensive Family Planning Programme

The objective of population control is to be achieved by persuation. Family Planning is viewed as an integral part of the national effort for betterment of the life of the people. The family planning programme is integrated with the health of family, especially that of women and children.

## **Targets for Reducing Population Growth**

Annual Growth Birth Rate

1981-86	2.1%	33.2 per 1000
1986-90	1.9%	29.7 per 1000
1990-95	1.74%	26.7 per 1000
1996-2000	1.53 %	23.7 per 1000

#### 4. Methods for Reducing Birth Rates- CafetariaApproach

This means introducing a wide range of direct and indirect methods to select from, such as IUD, sterilization, condoms, oral pills, raising the marriage age and social pressures etc. for bringing drownthe birth rate.

#### 5. Incentives for population control methods

These incentives include cash incentives, advance salary increment, 'green card' schemes which give preferences in housing, education and government services.

#### 6. **Propagation and Education**

Population study has been included as a subject in schools and adult education programmes. Special steps are being taken to reach the target groups, backward areas and the urban slums.

## **Organisational and Research Efforts**

This is a 100% centrally funded area, implemented by the states. Under this, training institutes are created which train the workers and medical personnel. Research is being undertaking in the field of demography, communications, reproductive bilogy and fertility control.

## GOVERNMENT MEASURES TO CONTROL POPULATION THROUGH SUCCESSIVE PLANS

India realized the interrelationship between population and development from the very beginning of its development planning. The First Five Year Plan, which was launched in 1951, clearly spelt out this linkage. The plan document stated – the higher the rate of populationgrowth, the larger the efforts needed to raise per capita living standards.

India launched its national family welfare programme as a part of its First Five Year Plan. During the first tow plans, the achievements were limited. The health infrastructure, which formed thedelivery system for the family planning programme, was still developing. The choice of the contraceptives was limited to a few barrier and chemical methods, and natural methods like the rhythm medthod and coitus interrruptus. Sterilisation for males and females was still not a popular contraceptive choice.

The 1961 census showed that the population growth rate in India between 1951 and 1961 had gone up to 2% per suumn as compared to only 1.2% during the previous decade. During the Third Plan period (1961-66), the pace of development of helath infrastructure was therefore stepped up. The programme got a tremendous boost with the creation of a separte department of Family Planning in the Helath Ministry in 1966. An extension approach was adopted, as aginst the 'clinic apprach' of the previous two plans, to increase the outreach of services and improve awareness and knowledge about family palnning among the masses.

The 1971 census was alarming as it showed an all-time high rate ofpopulation growth in the country. Several important policy decisions were taken and action initiated to give the family planning programme greater thrust and a new direction. Maternal and child health services were made part of the programme. During the Sixth Five Plan, population control was specifically mentioned as one of the plan objectives, and integrated in the twenty-point programme.

A landmark in the population policy of the country was a draft statement on Population Policy, issued in the Parliament in 1976, expressing the government's determination to control population growth. Increasing the legal age of marriage (from 15 to 18 years for girls and from 18 to 21 years for boys), freezing the population central assistance to states for development were some important

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decisions taken by the government following the 1976 draft population policy statement.

After the Seventh Plan (1985-90) was finalized, a revised strategy was adopted for the family planning programme. It emphasized on increasing th eminimum age for marriage of women, making them literate, enhancing their status by increased economic and employment opportunityies, improving the health of mothers and children, greater coordination and linkages with poverty alleviation programmes and greater involvement of the NGOs in the family palnning programmes.

Human Development was adopted as the ultimate goal of the Eighth Five Year Plan. Population control was listed as one of the priorities.

#### **POPULATION CONTROL DURING THE EIGHTH PALN**

The Eighth Plan undertook a different approach and there was a complete shift towards indirect measures. The main components of this new approach are listed below-

- Shift in the empasis from the Couple Proection Rate to lowering of the birth rates. Inter-state variations have been taken into account.
- Better performance on the population front by the states to ensure larger share of central assistance.
- Non-governmental organizations and the community leaders to be involved in population cotrl programmes
- Emphasis on improving the social status of women through poverty alleviation, employkent generation, greater participationin Panchayat institutions etc.

Improvement of basic inputs – information, education and communication.

Improving training and infrastructure.

Taking up measures to reduce infant mortality and maternal mortality rates, such as Mother and Child Health Care Scheme, Integrated Child Development Service, Child Survival and Safe Motherhood Scheme and mid-day meal scheme etc.

Taking up population study as a subject in school and adult education.

## **NATIONAL POPULATION POLICY 2000**

The National Health Policy of 1983 emphasised the need for "securing the small family norm, through volountary efforts and moving towards the goal of population stabilization". While adopting the helath policy, Parliament emphasized theneed for a separate National Population Policy.

The National Development Council (NDC) appointed a Committee onpopulation with Mr Karunakaran as chairman. The Karunakaran Report (Report of the NDC committee on Population) endorsed by the NDC in 1993 proposed the formulation of a National Population Policy to take a 'long term holistic view of development, population growth and environmental protection" and to "suggest policies and guidelines (for) formulation of programmes" and "monitoring mechanism with short, medium and long term perspectives and goals" (Planning Commission, 1992). It was argued that though the earlier policy statement of 1976 and 1977 were placed on the table, parliament never realy discussed or adopted them. Specifically, it was recommended that "a National Policy of Population should be formaulated by the Governemtn and adopted by Parliament".

An expert goup headed by Dr. M.S. Swaminathan was asked to prepare a draft of a nationa population policy that would be discussed by the Cabinet and then by Parliament. A draft National PopulationPolicy by the expert group headed by Dr.Swaminathan was submitted during May 1994. It was anticipated that a national population policy approved by the National Development Council and the Parliament would help produce a broad political consensus.

Another round of counsultations was held during 1998, and another draft National Population Policy was finalized and placed before the Cabinet in March, 1999. The Cabinet appointed a group of minsters (headed by Deputy Chairman,

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Planning cCommission) to examine the draft policy. The group fo ministers consulted with a cross-section of experts from among academia, public health professionals, demographers, social scientists, and women's representatives. The group of ministers finalized a draft population policy. The Cabinet finally gave its approval to a revised policy in 2000.

## **POLICY FEATURES**

The NPP 2000 provides a policy framework for advancing goals and prioritizing strategies during the next decade to meet the reproductive and child health needs of the people of India and to achieve net replacement level, which is otherwise called reduced total fertility rate (TFR), by 2010.

The immediate objective of the policy is to address the needs for contraception, health-care infrastructure, health-personnel and integrated service delivery; the medium-term objective is to bring the total fertility rate to replacement levels-two children per couple-by 2010 by a vigorous implementation of 'sectroal strategies'; and the long-term objective is to achieve a stable population by 2045.

The policy lays doen certain "promotional and motivational measures" and "incentives" to achieve its objectives. The promotional and motivational measures include linking of the disbursement of the cash awards under the Rural Development Deaprtment's maternity benefit scheme to compliance with the antenatal chekup, institutional delivery by trained birth attendant, registration of birth and BCG immunization; provision of health insurance scheme for couples below the poverty lines, who undergo sterilization with not more than two living children; and a special reward for those who marry after the legal age of marriage, register their marriage, have the first child after the mother reaches the age of 21, accept the small family norm and adopt a terminal method after the birth of the second child. The incentives include strengthening of the facilities for safe abortion, rewards for panchayats and zila parishads for exemplary performance in universalizing the small family norm, s achieving reductions in infant mortality and promoting literacy with completion primary schooling and provision of crèches and chi9ld-care centres in rural areas and urban slums to promote participation of women in paid employment.

The policy further envisages stricter enforcement of the Child Marriage Restraint Act and the Pre-Natal Diagnostic Techniques Acts, setting up fo a technology mission within the Department of Family Welfare to provide focused attention for accelerating performance instates which currently have below averge sociodemographic indicators. It is based upon the need to simultaneously address issues of child survival, maternal health and contraception, while increasing outreachand coverage of a comprehensive package of reproductive and child helath services by government, industry and the voluntary non-government sector, "working in partnership".

The policy envisages the setting up of a high-powered 'national commission' on population, chaired by the prime minister, to monitor and guide palnning and implementation of the policy. The panel would consist of chief ministers of all states and union territories as members; besides central ministers in charge of the Department of Family Welfare another concerned central ministries and departments, and reputed demographers, public helath professionals and the representatives of NGOs.

In addition, it envisages setting up of a coordination cell within the Planning commission for inter-sectoral coordination between ministries as also creation of state-level commissions on population chaired by the chief ministers.

## INDIA'S STATUS VIS-À-VIS HUMAN DEVELOPMENT INDICATORS

According to the Human Development Report (HDR) 2000, India moved up four notches from 132 ranks to 128; it had made the noteworthy transition from the low to the medium human development range in the last reportr itself (i.e. HDR 1999). The country's overall human development index (HDI) has been assessed at 0.563 as against a maximum possible figure of one, which means shortfall in human development of 43.7 percent. Significantly India's HDI value has gone up steadily over the years from 0.405 in 1975 to 0.431 in 1980 to 0.470 in 1985, 0.510 in 1990 and to 0.563 in 1998. This increase has been made possible by an increase in GDP per capita from \$222 in 1975 to \$331 in 1990, and \$444 in 1998 (all inconstant 1995 purchasing power prices) as well as improvement in various other indicators. As far as the HDI rakings in the SAARC region is concerned, India is behind Sri Lanka (at 84<sup>th</sup> position) and the Maldives (89<sup>th</sup>), but ahead of Bangladesh (146<sup>th</sup>), Bhutan (142<sup>nd</sup>), Nepal (144<sup>th</sup>) and Pakistan (135<sup>th</sup>). India's status as regards some of the indicators is as follow:

- **Life Expectancy** India's life expectancy at birth has increased from 50.3 years during 1970-75 to 62.6 years in 1995-2000.
- **Infant Mortality** The infant mortality rate (per 1000 live births ) has come down from 130 in 1970 to 69 in 1998, accompanied by a corresponding reduction in the under-five mortality rate from 206 to 105.
- **Poverty** The report has rated India amongst the notable countries that have made 'spectacular progresses in reducing poverty levels. India has reduced poverty level from 54 percent in 1974 to 39 percent in 1994.
- **Literacy** India's adult literacy level in 1998 was 55.7% the figures for females and males being 43.5% and 67.1% respectively.
- **Helath Profile** The helath profile of the country is disturbing. A total 41, 00,000 people below the age of 50 are alleged to be susceptible to HIV/AIDS. In 1997, India had 275 cases of malaria per 1000 people as

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compared to 163 inThailand. About 25% of the population is without access to proper healthcare.

**Education** India has failed in its endeavour to provide universal primary education says the UNDP and quotes the findings of a survey that 30 percent of all children in 1992-in the 6 to 14 years age group-or about 59 million children were out of school.

The country's Constitution has failed to make mandatory primary education a right for all citizens. The report also says that resources are not a critical constraint since countries with similar constraints, sucu as China, have legal guarantees for this right. India's public expenditure on education is 3.2% of its GNP. This is low when compared to other Asian countries, such as Thailand which spends 4.8 percent.

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Citing findings from a 1996 survey, the report concluded that most of the actors- parents, government, community and the media failed in their obligations leading to a collective social failure which could not just be corrected by new policies but also by local community solutions.

The facilities provided by the government are dismal. Only 92 percent of the rural population had a primary school within 1 km distance. This figure tumbled drastically for middle and secondary schools as just 49 percent of rural population had access to these within 1km. the number of teachers too was woefully inadequate with 12 percent primary schools having only one teacher.

The survey is critical of the media which failed to report on the neglect of basic education, as in a year the lion's share of articles expounded on foreign investment, trade and defence as compared to education.

#### **Gender Development**

India was ranked at 108 out of 143 countries on the Gender Development Index. The reservation of 33 percent seats for women in panchayats is cited as a plus point for India. As a result, more than one million women have been elected to the three-tier panchayats, indicating that women are now finding a space and voice in the hitherto male-dominated decision-making structures. Social norms and traditional attitudes, however, continue to impede their access to education. Surveys show how girls are discriminated against, and those living in rural areas and belonging to the scheduled castes and tribes are even more vulnerable.

## **INDIA- RESOURCES**

## LAND RESOURCES

India's vast and diverse size is the most important resource. About 43% of the land area, which is plain, provides opportunity for cultivation. The mountainous areas, caccounting for about 30% of the surface area of the country, are storehouses of natural resources; they are also important for their scenic beauty and ecological aspects. The plateau area covers about 27% of the total area. It has plateau area covers about 27% of the total area. It has resources besides forests and arable lands. The mountains and plateaus also have fertile river valleys offering favourable locaiotions for human concentration.

## **Favourable features**

- India is endowed with a long crop-growing season except in the mountainous regions- this has made our land more valuable from the point of view of crop and natural vegetation.
- A long crop-growing season also means a wide variety of crops.

The vast landmass of the country is endowed with a diversity of soils owing of difference in geomorphology, climate, vegetation and topography. Each soil type has its characteristics, suitable for different economic purposes.

There is a large reservoir of surface water in perennial rivers.

## **UNFAVOURABLE FEATURES**

- Availability of moisture is a restraining factor. The moisture supply through monsoon rainfall is concentrated during three four months.
- The rainy season is also the summer season, when the temperatures are generally high. This results in a loss of moisture through evaporation. Also, higher intensity of rainfall induces higher run-off and flooding in the rivers. A large area of the country gets inadequate or deficient rainfall.

The uneven distribution of rainfall also deficient rainfall.

Almost all the soil types of the country are deficient in either organic matter or moisture or both.

In view of the spatial as well as temporal variations of rainfall, irrigationis the only sources of assured water supply for stable yields from cultivation.

## PATTERN OF LAND UTILISATION

The total effective area of the country, according to the village papers in 304.6 million hectares. It is put to different categories of landuse, as discussed below:-

- NET SHOWN AREA This accounts for 141 million hectares or 46% of the total area. Since 1950, the net sown area has shown an increase of around 20%.
- 2. FORESTS At 64 million hgectares, the forests account for 20% of the total area and have increased from the 1950 figure of 14.2% of total reported areas.
- **3. FALLOW LANDS** This category has witnessed a reduction in area and with 25 million hectares, it accounts for 8% of the total area, as against 9.9%

during 1950. Thus, the net sown area and fallowlands account for 54% of the total reported areas, which show the extent of the cultivable land.

- 4. **CULTURABLE WASTELAND** It has shown a dcrease from 8% in 1950 to 5% at present and accounts for 16 million hectares. Uttar Pradesh has the largest percentage of this category of land.
- 5. **NON-AGRICULTURAL USE** the area under this category, with 16 million hectares, accounts for 5% of the total area.
- 6. **THREE CROPS, PASTURES AND GRASS LANDS** The rest of the area is put under this category and has witnessed a decrease since 1950.

## THE PROBLEM OF LAND DEGRADATION

The precious resource of land isunder the threat of degradation for reasons most of which are unfortunately man-made. Some of the aspects of land degradation are discussed below:

- LOSS OF FERTILITY BY MISMAN-AGEMENT Man, in his urge to derive the maximum yield to satisfy vast needs of a rapidly growing population, has been resorting to various scientific inputs like irrigation, fertilizers,pesticides et. At the same time, unscientific cropping practices are sometimes followed. For instance, at some stretches of Western Ghats, commercial tuber crops like potatoes and ginger are grown on slopes, after clearing the forests. These unscientific farming practices and an excessive use of inputs result in problems like soil erosion,loss of natural nutrients, water logging and salinity and contamination of ground and surface water.
- **SOILD EROSION** This is the process by which the top soil is detached from land and either washed away by water, ice or sea waves or blown away by wind. An area of around 80 mHa is exposed to the threat of soil erosion, while 43 mHa is actually affected.
- **SALINITY/ALKALINITY** This problem occurs in areas of temporary water surplus and high temperatures. Due to over-irrigationor high rainfall, the

moisture percolates down and dissolves the underground salts in it. During the dry period, this solution comes to the surface by capillary action. The water gets evaporated, leaving behind a crust of salts of sodium, magnesium and calcium which has a fluororscent appearance. This salt layer plays havoc with the fertility of top soil and renders vast stretches of useful land infertile. This problem is particularly serious in areas with assured irrigation in Punjab haryana, Uttar Pradesh, western Maharashtra, Bihar and northern Rajasthan (the Indira Gandhi Canal command area). Such lands are kwown by local naes, such as reh, kallar, usar, chopan et. An area of around 6mHa sufers from the problem of salinity/alkalinity.

- **WATERLOGGING** This happens when the water table gets saturated for various reasons over irrigation, seepage from canals, inadequate drainage or presenceof a hard pan below. The land under waterlogged conditions can be used neither for agriculture nor for human settlements. In dry areas, waterlogging leads to salinity and alkalinity. This menace can be tackled by adopting scientific norms for amount or irrigation, checking seepage from canals by proper lining and providing adequate drainage through field channels.
- **FLOODS AND DROUGHTS** Both these hazards have the harmfuleffect of limiting the use of good soil. One ragging aspect of floods is that each year a new area is affected.
- **DESERTIFICATION** Advancement of sand from the desert to the adjoining regions iscalled desertification. The sand covers fertile soil and affects its fertility. This problem is particulararly serious in areas adjoining the Thar Desert in Rajasthan. The affected areas liein the states of Punjab, Haryana, Delhi, Madhya Pradesh and the Aravallis in Rajasthan.

## **MEASURE TO CHECK LAND DEGRADATION**

Around 145 million hectares area of the country is in need of conservation. The decline of natural fetility canbe checked by applying controlled amounts of chemical fertilizers. In general, improved agricultura practices in different regions need to be adopted. Tillage on higher slopes should be avoided, while contour ploughing on the slopes proneto erosion may help in maintaining the soil depth. Planting of shelter belts and stubble mulching help in conserving the soils in desert regions. The ravines and gulleys should be plugged to prevent headward erosion. The pressure of livestock on pastures in hilly, desrt and plateau regions has to be rduced in order to avoid overgrazing, such as in Jammu and Kashmir, Himachal Pradesh, Rajasthan and Karnataka.

## LAND RESOURCES AND FOODGRAIN REQUIREMENTS

The landuse pattern shows large spatial variation. While the net sown area in Punjab and Haryana is as high as 84% and 82% respectively of their total areas, it accounts for only 3.1% in Mizoram, 6.3% in Manipur and 8.6% in Meghalaya. The states lying in the north have recorded higher cropping intensity.

The cropping pattern of the country is dominated by foodgrains which occupy larger proportion of the gross cropped area in comparsonto non-foodgrains.But the pattern has witnessed a marginal decline. The share of food grains in 1950-51 was 76.7% which has come down to around 67% of the gross cropped area now. But the foodgrain production has increased due to expansion of the irrigated area. Therefore, it is not the expansion of the net sown area, but the increase inproduction per unit area which is responsible for higher agricultural production.

About one-third of thenet sown area in the country is irrigated. The increasing pressure of population on the abrable land will necessitate a higher level of intensifictin of agriculture with the help of adequate inputs of irrigatin, high yielding values of seeds nd intensive use of fertilizers.

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## MINERAL RESORUCES

India's mineral resources are auffciently rich and varied toprovide the country with the necessary base for industrial development. The position is particualrarly advandtageous inmetallic minerls of the ferrous goup, including the ores of iron, manganese, chromite and titanium. India's reserves of unclear energy minerals, mic and bauxite also are rated among the largest in the world. The country is not only self-sufficient in the production of these minerals, but also exports large quantities every year.

The situation is also satifactory in coal, feldspar, fluoride, limestone, colomite, gypsum, precious and semi-precious stones and gold. India's reserves and its production of petroleum, however, are very inadequate. The non-ferrous metallic minerals icluding the ores ofcropper, lead and zinc, tin, graphite, tungsten and mercury; and the minerals required by the chemical industry, which include sulphu, potash and rock phosphate, are also not present in adequate quantities.

## **ASPECTS OF SPATIAL DISTRIBUTION**

Mineral resources have an extremely uneven distribution in India. Over 97% of the country's total coal reserves are located in the valleys of Son, Damondar, Mahanadi and Godavari. Almost the entire reserves of petroleum, discovered so far, lie in few sedimentary basins of Gujarat, Assam and in the continental shelf off the Mharshtra coast. Mot of the depsits of iron ore are locted in the Archaen rocks of Bihar, Orissa, Madha Pradesh, Karnataka and Tamil Nadu; of chromite in Orissa and Karnataka; of bauxite in Bihar, Madhya Pradesh and Gujarat; of manganesh in Madhya Pradesh, orissa and Maharashtra; and of copper, lead and zinc ores in Bihar and Rajasthan. Almost the entire deposits ofmica are found in Bihar, Andhra Pradesh and Gujarat. Karnataka accounts for the entire gold deposits. Most of the reserves of minor minerals including gypsum, steatite, rock phosphate and precious stones are located in Rajasthan. The ilmenite beach sands of the Kerala coast

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contain most of the reserves ofnuclear nergy minerals. Meghalaya possesses most of the reserves of sillimanite, Bihar of kyanite and Orissa of dolomite.

On the whole it can be said that with few exceptin,s the penisnsular rocks to the east of a line from Mangalore to Kanpur contain most of the reserves of coal, metallic minerals. Sedimentary rocks on the western and eastern flanks of the peninsular formations in Gujarat and Assam have most of the petroleum reserves. Rajasthan, with the rock systems of the peninsula, has reserves of many nonferrous minerals. Outside this area, the states including Jammu and Kashmir, Punjab, Himachal Pradesh, Haryana, Uttar Pradesh and Gangetic West Bengal are very pooor in mineral resources.

# SURVEY OF MINERAL RESOURCES-FUEL, METALLIC AND NON-METALLIC RESOURCES

#### **FUEL RESOURCES**

Accounting for nearly 87% of the country's mineral resources, the mineral fuels including coal, lignite, petroleum, natural gas and nuclear nergy minerals constitute an important group of minerals in India's economy. These minerals contribute nearly two-thirds of the country's total installed capacity in electrical power. Petroleum as a fel provides power to road vehicles, aeroplanes and diesel locomotives. A number of industries like fertilizer, organic chemicals and sysnthetic fibres depend upon coal and petroleum for ra materials.

#### COAL

It is the main mineral resource of India, and the country, with its production of approximately 270 million tones (1995-96), is the fourth largest producer of coal in the world. Coal accounts for 67% of the total commercial energy produced in India. Coal reserves are of three types-

#### **Gondwana and Tertiary**

These resources amount to 192 billion tones and are expected to last 600 years. Of the Gondwana reserves, Bihar accounts for 45%, West Bengal for

24%, Nadhya Pradesh for 20% and Andhra Pradesh, Orissa and Maharashtra for the rest. The tertiary resources are spread over Assam, Arunachal Pracesh, Nagaland and Meghalaya.

### **Prime Coking Reserves**

These reserves total up to 5.3 billion tonnes.

## **Lignite Reserves**

These resources amount to 6.5 million tones and are spread over Tamil Nadu, Rajastha, Gujarat, Kerala, Pondicherry and Jammu and Kashmir. The lignite orbrown coal production is entirely a post-independence phenomenon. It is used mostly in pit-head stations, because of its low calorific value.

Major Coal Fields The statewise list of major coal field is given below.

West Bengal: Raniganj

Bihar: Jharia, Bokakro, Giridih, Karanpura, Ramgarh

Madhya Pradesh: Singrauli, Korba, Pench valley.

Orissa: Talcher, Himgiri

Andhra Pradesh: Kantapalli, Singareni

Tamil Nadu: Neyveli (lignite).

Assaam: Namchik-Namphuk, Makum, Najira, Janji

Megalaya: Umralong, Darrangiri

## **CURRENT LEVEL OF UTILISATION**

Nearly 63% of the coal produced in India is used in electricity generation and the rest is used in coke oven plats for producing hard coke for iron and steel industry, fertilizer plants, railways, brick kilns and in cement industry.

## **PROBLEMS OF UTILISATION OF COAL RSSERVES**

The Indian coal reserves, although nearly inexhaustible, are generally of low grade. But coking reserves are present in limited amounts. As a result, the domestic iron andsteel industry (which requires these as a raw material) has to import its requirements of coking coal.

- The concentration of coal resources in one corner of the country only means higher costs of transportation to other parts of the country. For instance, 80% of the coal comes from Jharia and Raniganj alone.
- There are disturbing tends of growing pit-head stocks- amounting to more than 20% of the production, on account of transportation problems. This part of theproduction is not available for consumption.
- The Indian coal is characterized by high ash content andlow calorific value. High ash content means incurring transportation costs for the inert material, amounting to 20%-30% of the total production. It also leads tolarge ash dumps at the thermal power stations, which are an environmental hazard.
- Roof collapse, flooding, presence of poisonous gases andlack of oxygen and light in mines are factors that lead to low productivity in underground mines. These mines employ 80% of labour force, but contribute just 30% of output.

#### **FUTURE PROSPECTS**

In the mid-1950s, coal accounted for 48% of thetotal commercial energy, but slumped to a level of 30% in 1960, with oil contributing 47% and electricity 23%. But coal regained its prime position oafter the oil crisis of 1973. Presently, coal contributes nearly 67% in terms of commercial energy, although it was surpassed by oil in value terms in 1982. Because of the limited oil reserves of the country (expected to last only next 30 to 35years) and unlimited coal reserves, coal will find prominent place I the energy sector in future. Already, some trends are visible, new technologies, such as 'Fluidised Bed Combustion' at pithead stations to produce power from low-grade coal are being used and coal-based super thermal power stations with capacities between 12 lakh MW and 20 lakh IW are coming up. The Centre for Scientific and Industrial Research (CSIR) has made the following technological achievements in the coal sector-

clean coal technology;

environment friendly 'beehive coke oven' for making metallurgical coke

from low-grade coal;

low temperature carbonization technology for making smokeless domestic fuel;

gasification of coal.

## LIGNITE

Development of lignite or the brown coal is completely a post-independence development. Ligtnite has low energy contenet thanthe balck coal. This disadvantage is offset when this coal is used by thermal power plants with fuel cost proportionately high to the overall coast-which are located near mines, called 'pithead stations'.

The Neyveli Lignite Corporation (Tamil Nadu) is the largest producer with a production of 13 MT (in 1992-93) with small quantities produced inGujarat. In 1995-96, the country produced about 22.1 MT of lignite. Most of the Neyveli lignite is used in the 1440 MW thermal power stationlocated near the mines. Part of the lignite is used to make briquettes for domestic consumption. Use of lignite as a raw material for nitrogenous fertilizers proved to be failure.

# 2. PETROLEUM OR MINERAL OIL (THE POST-INDEPENDENCE DEVELOPMENT)

In 1950-51, the production of cude oild India was 0.3 MT, at Digboi in Assam. The western oil monopolies had created an impression that India had no significant oil resources. But more positive signals were received from the friendly sources. In 1959, through an act of Parliament, the Oild and Natural Gas Commission (ONGC) were created to take over the activities of the Oil and Natural Gas Directorate (set up in 1956). The ONGC struck oil in Ankaleshwar in Gujarat, oil reserves in Assam. The oil India Limited company; it became a fully central government owned enterprise in 1981. It operates in Assam, Arunachal Pradesh, Orissa, Rajasthan and offshore areas of Mahanadi Basin and the Andaman

islands. The OIL struck oil in Arunachal Pradesh in 1987-88 and discovered more oil fields in Assam.

Till 1970, the entire crude oil production expansion was based on the new oil reserves in Gujarat and further oil reserves discovered in Assam. But, the discovery and development of offshore oil resources in the Bombay High Basin in the 1970s changed the oil situation. The curde production rose from alevel of 11.7 MT in 1979 -80 to 29 MT in 1984-85, to cope with the second oil crisis of 1979. Of this 29 MT, 20 MT came from the offshore sources and only 9MT from the oneshor sources. The curde production reached an alltime high level of 34 MT in 1989-90 (15.75 MT from offshore, 11 MT from onshore sources). The ONGC produced 91% of thetotal crude outrput (entire offshore protion and a major protionofthe onshore output from Cambay and upper Assam). Rest was produced by the OIL from Assam. The total curde oil production during 1996-97 stood at 32.9 MT.

#### A Survey of Major Oil Fields:

The minieral oil resources of India are distributed in three important basins.

- Upper Assam or the Naharkatia-Moran, Region: Major oil wells in this region are digboi, Naharkatia, Moran, Lakwa, Sibsagar and Rudrasagar.
- Bombay High: This is an offshore source, lying 167 km to the north-west of Mumbai.
- Cambay Basin: This basin lies in the state of Gujarat and Major oil-wells are Ankaleshwar, Kosamba, Kalol, Dhalka, Mahesana, Nawagam and Sobhasan.

There are cetain areas with known reserves of mineral oil, but where commercial production is not carried out. These areas include

Rajasthan

Cauveri basin

Krishna-Godavari basin

- Andaman Islands
- Foothills of Bengal Himalayas

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Ganga valley

Tripura-Nagaland fold belt

Then, there are some prospective regions, where the geological structure favours presence ofoild reserves. These areas include-

Kachchh-Saurashtra region in Gujarat

Kerala-Konkan region

Mahanadi basin

Some recently discovered oil-fields include-

South Heera, Neelam, Gandhar Phase II, Panna and Mukta in the Bombay High basin

Ravva oild field in the offshore of Krishna Godavari basin

Cauveri basin

Arunachal Pradesh

Andamans.

#### **CURRENT UTILISATION AND FUTURE PROSPECTS**

The demand for petroleum products intehcountry has risen from a modes tlevel of 3.3MT in 1950-51 to 65.5 MT in 1994095. the demand was expected to be around 79 MT by the end of 1996 and reach 102 MT by the year 2002 A.D. To meet this demand, the domestic refining capcity stands at 57.4 million metric tones per annum at the end of 1995, compared to just 0.2 MT in 1950-51. The thirteen fefineries are located at Digboi, Nunmati and Bongaigaon in Assam; Barauni in Bihar; Haldia in West Bengal; Vishakapatnam in Andhra Pradesh; Madras and Paangudi in Tamil Nadu; Cochin in Kerala ; Trombay in Maharashtra; Bombay High off the Maharashtra cost; Koyali in Gujart; and Mathura in Uttar Pradesh.

The largest of these refineries in the one in Koyali near Vadodara with a capacity of 9.5MT and the smallest at Nunmati near Guwahati, with a capacity of 0.85 MT. To meet the domestic demand of petroleum products at 65.5 MT,

the country had to import 41.3 MT of petroleum products – estimated at a value of Rs. 17,838 crore.

Thus, the domestic production is short of the requirements both in cude oil and in petroleum products i.e., LPG, kerosene, high speed diesel oil and lubricants.

#### **GOVERNMENT STRATEGY TO INCREASE REFINING CAPACITY**

Expansion and debottlenecking of the existing refineries.

Setting up three refineries in the public sector (with a total capacity of 12MT per year); three grassroots refineries (each with annual capacity of 6MT); seven refineries in tehprivate secotr (with total annual capacity of 47 MT).

Close monitoring to eliminate time and cost overruns.

# MAJOR PLANKS OF GVERNMENT STRATEGY FOR OIL CONSERVATION

Improving energy efficenty of refineries.

Increasing fuel efficiency in the tansprot sector.

Introduction of Compressed Natural Gas (CNG) as fuel in the road transport sector.

Upgradation of lubricants.

Replacement of inefficient bioiler and furnace and promotion of fuel efficient equipment and practices in the industrial sector.

Rectifciation of irrigationpumsets in the irrigation sector.

- Promotion and development of fuelefficient kerosene and LPG stoves and hurricane lanterns in domestic sector.
- Launching of multi-media awareness campaigns and imparting of education and training to various target groups of oil users.

## **RECENT DEVELOPMENTS IN OIL AND NATURAL GAS SECTOR**

Against the target of adding 1325 MT of recoverable reserves during the Eighth Plan, only about 43MT were added in the first year. Also, production from existing fields is likely to reach its peak by 1996-97, after which there will be

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stagnation in the production levels. As a result, the deman-supply gap will become unmanageably large. To rectify this situation, several steps have been taken by the government. Some of these measures are as follows.

Bids have been invited for private participation in the exploration activity.

- Joint ventures are to be formed between the two national oil companies ONGC Ltd., and OIL and the foreign and Indian companies under the Joint Venture Exploration Programme.
- Already dsiscovered medium and small sized oil and gas fields have been offered for development to private companies for accelerating production.

Bids have also been invited from companies to carry out speculative surveys.

- The oil and Natural Gas Commission has been converted into a public limited company under the name of Oil and Natural Gas Corporation Limited. This has been done to release the resource cruch and impart greater autonomy to the corporation.
- A parallel marketing system, incorporating LPG, kerosene and diesel has been started with aims to improve supplies, reduce fiscal burden on account of subsidized petroleum products andtobring the distribution network in line with liberalized economic policies.

#### **III. NATURAL GAS**

This source of energy has been developed in the country especially in the last two decades. At present, natural gas is being used mainly in the core sector as an important primary source of energy in the thermal power plants, and as an important feedstock or raw material in fertilizer and petrochemical plants.

Natural gas is produced in two ways as an associated gas along with crude production and as a free gas from exclusive gas fields. About half the forecast production is in the form of free gas.

## **DISTRIBUTION OF FREE GAS RESOURCES**

Natural gas in the free form is derived from the following regions.

- 1. The largest reserves come from the offshore south-basin free gas fields in the Bombay basin.
- 2. Cambay basin in Gujarat
- 3. Tripura
- 4. Cauveri offshore basin in Tamil Nadu
- 5. Andhra Pradesh
- 6. Tanot in Jaisalmer district of Rajasthan

## LEVEL OF UTILISATION AND FUTURE PROSPECTS

The production of natural gas in 1996-97 was about 22.8 billion cubic metres. By the turn of the century, as much natural gas is likely to be produced as crude oil. A special authority, the Gas Authority of India Limited (GAIL) was set up in 1984 to utilize natural gas and to plan and construct pipelines for movement of gas, oil and petroleum products. GAIL has constructed the H-B-J Pipeline which is 1700 km long and runs from Hazirea on west coast, through Bijaipur in Madhya Pradesh to Jagdishpur in Uttar Pradesh. This gas is to be used of fertilizer production in Bijaipur, Sawai Madhopur, Jagdishpur, Shahjahnapur, Aonla and Dabrala.

Besides being used in the thermal power and fertilizer plants, natural gas is also expected to be used as a primary source of energy for other industries and so a domestic fuel. This way, it will lower the import bill and bridge the supply demand gap to the extent it can substitute the middle distillates, like LPG, kerosene and high speed diesel. A major constraint in full utilization of the natural gas reserves is that a protion of the gas produced is to be flared out. The flaring of natural gas is currently down to around 5 percent.

**Why Flaring of Gas has to be resorted to?** Natural gas has tobe flared because of i) A lack of required compressin and transportaion facilities;

ii) Certain technical requiremtns of operational safety;

iii) Availability of gas from isolated pools whch cannot be economically connected to the transportation network; and,

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#### iv) non-lifting of gas by consumers.

The ONGC and OIL have initiated a number of measures, including the Gas Flaring Reduction Project, to reduce flaring to the barest minimum.

#### **METALLIC RESORUCES – FERROUS GROUP**

Accounting for about three-fourths of the total value of the production of metallic minerals, ferrous minerals constitute the most important mineral group after the fuel minerals. India's position is almost enviable in the reserves of these minerals, and the country exports substantial quantities of these, besides meeting the internal demand fully. These minerals provide a strong base for development of metallurgical industries, particularly because the other requirements of the industry, namely, refractory minerals and coking coal, are also available in close proximity and in adequate quantity.

Iron ore, manganese and chromite are three important ferrous-metallic minerals.

#### **IRONE ORE**

India is one of the best endowed countries in the magnitude and quality of iron ores. The country possesses over 20% of the world's total reserves of the Comonwealth of Indepndent States (CIS). The quality of the Indian ores is very high. Iron ores, including lumps, fines and concentrates, account for nearly two-thirds of the total value of metallic minerals produced in the country. In 1996-97, India produced about 65.1 MT of iron ore.

#### Distribution

The total reserves of the haematite or the 'red ores' in India are 9.6 billion tones and o fthe magnetite or the 'black ores' amount to 3.1 billion tones. Besides these, small quantities of ilmenite and limonite ores are also found. Most of these reserves are concentrated in the peninsular region.

#### **Bihar-Orissa Belt:**

In Orissa, iron ore is found in the Gurumahisani and the Badampahar group of mines in the Mayurbhanj district and in Keonjha and Sundergarh district. In

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Bihar, iron ore is found in the Barajamda group of mines covering, apart from the Singbhum district, the adjoining Keonjhar and Mayurbhanj districts.

#### Madhya Pradesh- Mahrashtra (Durg- Bastar- Chandrapur Belt):

In this region, iron ore is found in Dallirajhara in Durg district and Bailadila inBastar district (both in Madhya Pradesh) and in the Lohara – Pipalgaon – Surajagarh region of eastern Maharashtra.

#### Karnataka:

Here, iron ore is found in the Bellary-Chitradurga- Chikmaglur-Tumkur bet. Magnetite, which is extracted from the Dharwar and Cuddapah rocks, is found in Kudremuksh.

#### **Tamil Nadu:**

Here, iron ore is found in the Salem – Tiruchirapalli – North Arcot belt.

#### Kerala:

In Kerala, ironore is found in Kozikode.

#### Maharashtra-Goa:

This belt includes the state of Goa and Ratnagiri district of Maharashtra.

#### **Rajasthan:**

A rich tract has been discovered her in the Jaisalmer district.

## 2. Manganese

India is the world's third largest producer of manganese ore, next only to the CIS and South Africa. Its reserves are estimated at 176 MT, of which 29 MT is proved. A part of the manganese ore produced about 1.8 MT of manganese ore.

Manganese ore is an important ingredient in the amnufacture of iron and steel, and it is the basic raw material for manufacturing ferromanganese alloy. These industries together account for over 84% of the total quantity of manganese ore consumed in India. Manganesedioixe is used for the manufacture of dry batteries; sulphide of manganese for manganese salts which are used in photography, leather and match industries. Chloride of manganese is used to cottontextile industry as bronze dye. Pyrolusite is used for glazed pottery and for making coloured bricks.

## DISTRIBUTION

Like iron ore, manganeseore also is foundmainly in the peninsular region. A statewise pattern of distribution of manganese ore is discussed below:

#### Orissa:

The gandite deposits occur in the Keonjhar and Sundergarh district; the Kodurite and Khndolite deposits in the Koraput and Kalahandi districts; the Lateritic deposits in Bolangir and Sambalpur districts.

#### **Bihar:**

Here, manganese is found in Singhbhum district.

#### Karnataka:

Here, the manganese ore is found in the districts of Bellary, Chitradurga, Shimoga, Tumkur and north Kanara.

#### Madhya Pradesh:

In Madhya Pradesh, manganese is found in Balaghat and Chhindwara.

## Maharashtra:

Bhandara and Nagpur in Maharashtra have manganese ore deposits.

## Andhra Pradesh:

Here, manganese ore reserves are found inSrikakulam and Visakhapatnam.

## **Gujarat:**

Vadodara and Panchmahal have the deposits

## **Rajasthan:**

Banswara alone has manganese ore deposits.

## **2. CHROMITE**

Chromite is the most important ore for producing chromium metal. It is widely used in metallurgical, refractory and chemicalindustries. Ferro-chrome, an alloy of iron and chromite, is used for the manufacture of non-abrasive and non-

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corrosive special steels. Chromium and nickel form the base for the manufacture of stainless steel. As chrome bricks are resistant to corrosion and can withstand high temperature, they form neutral refractories used for lining furnaces. Chromite is also used for manufacturing chromates and bichromates, which in turn are extensively used as disinfectants and in tanning, dying, pigment, ceramic, glass and several other industries.

## **PRODUCTION AND DISTRIBTION**

Total recoverable reserves of chromite are estimated at 8.8 MT. Deposits of economic significance occur in Andhra Pradesh, Bihar, Karnataka, Maharashtra, Manipur, Orissa and Tamil Nadu. However, refractory grde reserves of chromite are very meager. During 1995-96, the country produced a total of 1.6 MT of chromite ore.

## **METALLIC RESOURCES- NON FERROUS GROUP**

Unlike in the case of ferrous minerals, India's position, both in reserves and production of non-ferrous metallic minerls, except in bausite, is not satisfactory, and the country depends for these mainly on foreign supplies, procured at huge costs. These minerals, which include copper, bauxite, lead and zinc, gold and silver, play a vital role in a number of metallurgical, engineering, electrical and other industries and have, therefore, an important role in the industrial development of the country. Given below is a survey of some of the important non-ferrous metallic minerals.

**Copper** copper is one of those non-ferrous metals in which India is crtically deficient and has, therefore, to depend largely on foreign supplies. The contry produces only 30% of its copper required indigenously, the rest is imported. The recoverable ores of copper in the country are estimated at 325 MT with 1% metal content. Copper, being malleable, ductile and a good conductor, is used mainly in electrical cables, electronics industry and the chemical industry. In 1995-96, India produced about 4.7 Mt of copper ore.

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## Distribution

The statewise distribution of occurrence of copper reserves is given below

#### **Bihar:**

The Singhbhum district of Bihar has the largest copper ore reserves in Asia. Other districts having copper or reserves are Hazaribagh, Santhal Parganas, Gaya and Palamau.

## **Rajasthan:**

Here, copper is mined in the Khetri belt which includes the Singhana area in Jhunjhunu district and Kho-Dariba area in the Alwar district. Besides these, copper is alos mined in Delwara-kerovli in Daripur and Aguncha-Rampur in Bhilwara.

## Madhya Pradesh:

Here, copper is found in Balaghat and recently, reserves have been discovered in Malanjkhand also.

## Andhra Pradesh:

Here, copper is found in Khammam, Guntur and Kurnool.

#### Karnataka:

In Karnataka, copper is found in Chitradurga and Hassan.

## Maharashtra:

Chandrapur in Maharashtra has copper reserves

## **2. BAUXITE**

India's reserves of bauxite(the ore from which the aluminium metal is produced), estimated at 2.5 billion tones, are considered to be adequate to keep the country self-sufficient for many years to come, if the present pace of development in aluminium and other bauxite consuming industries is to continue. In fact, the country exports a sizeable quantity of bauzite after meeting the ideigenous requirements.

Aluminium is mainly used in aluminium refractrories, aircraft, automobile industry and the chemical industry. Although extraction of aluminium is a pwerintensive process, aluminium is fast replacing steel in industries. In 1995-96, India produced ablout 5.4 MT of bauxite ore

## DISTRIBUTION

The bauxite deposits are mainly spread over the Eastern Ghats. A statewise survey of bauxite reserves is given below.

## Madhya Pradesh:

Nearly 30% of the country's production of bauxite comes from Madhya Pradesh. Bauxite deposits here are found in Amarkantak plateau in Shahdot district, Maikala hills and the plateau region of Sarguja-Bilaspur-Raigarh-Katni.,

#### **Bihar:**

In Biahr, bauxite deposits occur in Ranchi and Palamau.

#### Gujarat:

Here, bauxite is found in Jamnagar, Kaira, Sabarkantha, Surat and Kachchh.

#### Karnataka:

In Karnataka, bauxite reserves are found in Belgaum.

#### Maharashtra:

Kolaba, Kolhapur and Ratnagiri in Maharashtra have copper reserves.

#### Tamil Nadu:

Here, bauxite is found in Salem, Nilgiri, Combatore and Madurai.

#### **Uttar Pradesh:**

Bauxite is extracted in Uttar Pradesh in Banda.

#### Jammu and Kashmir:

Here, high grade bauxite deposite are found in poonch and Udhampur.

## **3. LEAD AND ZINC**

Almost the entire production of zinc and lead ores in India comes from the sulphide ores called sphalerite (for zinc) and galena (for lead). They occur in association, enclosed either among the crystalline schists or as veins and pockets in the Pre-cambraian rocks. The ores also contain small quantities of copper, gold,

silver and vanadium. Total recoverable reserves (all grades) of lead and zinc ores are 198.5 MT comprising metal content of 2,390 thousand tones of lead and 9,866 thousands tones of zinc metal. In 1995-96, India produced 60,479 tonnes of lead concentrate and 2, 85,381 tonnes of zinc concentrate. The reserves and productior of led and zinc ores in India, thus, is not adequate to meet the domestic demand.

## DISTRIBUTION

Given below is a statewise survey of lead and zinc resources in the country.

## **Rajasthan:**

Here, lead and zinc are extracted from the zawar mines in Udaipur district and from Anguncha-Rampura in Bhilwara district. In these mines, silver ore is also extracted.

## Andhra Pradesh:

Cuddapah district has the reserves.

## **Gujarat:**

Here, lead and zinc are extracted from Banakantha, Vadodara, Panchmahal and Surat.

Lead and zinc reserves also occur in Meghalaya and Sikkim.

# 4. GOLD

Gold serves as the most vital element in international banking and over 90% of the world's total gold production is used in the nonetary system. In India, almost the entire production of this metal from the Kolar gold fields is sold to the Reserve Bank of India. A small quantity produced at the Hutti mines is rleased for industrial purposes through the State Bank of India. A large quantity of gold is used in the country for the manufacture of jewellery, dentistry and decorative articles. Total gold metal ore reserves are estimated at 17.6 lakh tones. In 1995-96, India produced 2,373 kg of gold ore and 1639 kg of gold metal.

## DISTRIBUTION

There are three important gold fields in the country.

Kolar gold fields in Kolar district(Karnataka) Hutti gold fields in Raichur district(Karnataka) Ramgiri gold field ihn Anantpur district(Andhra Pradesh)

## NON-METALLIC MINERAL RESOURCES

A large number of non-metallic minerals are found in India, through only a few ofthese are important from the productionpoint of view. Among the important non-metallic minerals are mica, sulpur, salt, dolomite, syanite, sillimanite, gypsum, apatite, phosphate and steatite. They are used in a variety of industries in which cement, fertilizers, refractories and electricals are emportant. Mica, kyanite and sillimanite figure significantly in the country's mineral export. Given below is a brief survEy of three of the important non-metallic minerals –mica sulphur and salt.

#### 1. MICA

Due to its excellent di-electric strength, low power loss factor, insulating properties and resistance to high voltage, mica is one of the indispensable minerals used in electric and electronic industries. India is the leading producer of sheet mica and almost the whole of it is exported; India accounts for 60% of the world trade. International demand however has fallen because of mica substitutes like plastics and synthetics gaining importance. This has led to a decline in production of mica over recent decades. In 1995-96, India produced about 1,761 tonnes of crude mica.

#### **Bihar:**

Here, mica is extracted from the Gaya-Hazaribagh belt, with Koderma contributing a large part of the country's total production.

#### **Rajasthan:**

Here, mica is mined in the Beawar, Ajmer belt, Banswara – Dungarpur belt, bhilwara, Tonk and Kaunthal in Udaipur.

#### Andhra Pradesh:

Here, mica is extracted from Nellore in Gudur district.

# 2. SULPHUR

The elemental sulphur does not occur in large quanitities, but iron pyrite, a sulphide of iron, can serve as a source of iron and occurs extensively. Sulphur is a valuable ineral. It is used for the manufacture of sulphuric acid which finds application in basic industries like heavy chemicals, fertilizers, steel, rayan, petroleum etc. Elemental sulphur is used in the manufacture of explosives, matches, insecticides, fungicides and for vulcanizing rubber. In 1995-96, India produced abour 19,240 tonnes of sulphur.

# DISTRIBUTION

Sulphur is extracted from Shahbad in Bihar and in some parts of Karnataka and Rajasthan.

## 3. SALT

Common slat or sodium chloride is either mined from massive deposits or produced by solar evaporation from sea water, brine springs, wells, salt pans in lakes of arid regions of Rajasthan. Nearly 70% of the total consumption of salt in the country is accounted for by edible uses; manufacturing of soda ash, caustic soda and heavy chemicals account for 28%. Other important users include paper, textile, juite, oil refining, fish curing, ice manufactguring, and dyestuff, water softening, tanning, steel and explosive industries.

# DISTRIBUTION

Salt is produced mainly in Rann of Kuchchh in Gujarat, coastal areas of Maharashtra and Tamil Nadu and from the salt lakes of Rajaesthan, namely, Sambhar, Didwana, Pachpadra and Lunkaransar etc.

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## WATER RESOURCES

India is rich in water resources; it is endowed with a network of great rivers and vast alluvial basins to hold groundwater. Conditions, however, vary widely from region to region. Whereas there are some chronically drought affected areas, there are others which are frequently subjected to damage by floods. On the whole, under the pressure of rapid population growth, the available resources of water are being developed and depleted at a fast rate. This situation seriously underlines the need for taking up integrated palns for water utilization and conservation for every agro-ecological area to meet the increasing demans of irrigation, water harvesting, human and livestock consumption, expanding industry, hydro-electric power generation, recreation, navigation etc.

Water is a precious resource which is indivisible and, therefore, its utilisation as to be planned for the basin as a whole. Water as a resource is not evenly distributed over time and space. Considering the importance of water as a resource, the National Water Resources Council adopted the National Water policy on Sepember 9, 1987.

## **THE NATIONAL WATER POLICY, 1987**

The salient features of this policy are as follows.

- 1. An integrated and multi-disciplinary approach has been recommended for planning, formation and implemtation of projects.
- 2. Higest priority has been assigned to drinking water, followed by irrigation, hydel power, navigation, industrial and other uses.
- 3. The quality of surface and groundwater should be monitored.
- 4. In the flood management sector, the need for having a Master Plan for flood control and management for each flood-prone basinthrough sound watershed management has been recognized; and the establishement of extensive network for flood forecasting has been recommended.

5. Minimisation o ferosion of land by sea and rivers by adopting cost-effective measures has been sought.

## SOURCE OF WATER

Water resources are divisible into two distinct categories- the surface water resources and the groundwater resources. Each of these categories is a part of the earth's water circulatory system, called the hydrological cycle, and is ultimately derived from precipitation (rainfall and snow). The two categories are interdependent, and frequently the loss of one is the gain of the other. The different sources of water are discussed below.

## **1. RAINFALL**

On an aveage, India receives about 118cm of rainfall, which is an important source of moisture supply to theplants and surface run-off. A large proportion of the water resources of India is located in those regins which lie in the zone having a mean annual rainfall of 100cm. Rainfall is also the major source of the recharge of underground aquifers. The underground aquifers are generally brackish in the regions with scanty rainfall. For example, there are a number of areas in western Rajasthan where the water from wells is very brackish and which cannot be used even for irrigation.

The rainfall pattern shows great spatial and temporal variation. Over the Khasi hills in Meghalaya, rainfall may reach 1100 cm in one year, while inparts ofwestern Rajasthan, it may be less than 10cm in one year. About 80% of the rainfall received in India comes during the four-month monsoon period from June to October. The total rainfall on the Indian Territory is estimated to be about 3, 700, 4000 million cubic metres (168 million hectare metres). Of this quantity, abour one-third is lost due to evaporation, about 22% is lost through seepage and the rest runs off into the river systems. The total volume of run-off is about 1,645,000 million cubic metres or 76 million hectare metres, representing abour

44% of total rainfall. Of the water that seeps into the ground, only about 333,500 million cubic metres (16 million hectare metres) recharges the groundwater.

## **2. SURFACE FLOW**

The surface water resources contribute to the groundwaterrecharge in various ways-

by influent recharge from the streams;

by seepage from natural lakes, ponds etc;

by seepage from artificial storage reservoirs, cannal systems etc., and

by return flow from irrigation. Rivers are fed by rain as well as by melting of snow. This water is harnessed by damming the rivers. Many multipurpose projects have been started after independence.

Dr. K.L. Rao has classified river basins into three categories on the basis of their size.

- Major rivers are those having a catchment area of over 20,000 sq km each. These include Indus, Ganga, Brahmaputra, Sabarmati, Mahi, Narmada, Tapti, Subarnarekha, Brahmani, Mahanadi, Godavari, Krishna, Pennar and Cauveri. These rivers carry 85% of the total run off of the country.
- **Medium rivers** are those having a catchment area 2000 sq km to 20,000 sq km each. There are 44 rivers in this category. They contribute 7% of the total run-off.
- **Minor rivers** are those having a catchment area of less than 2000 sq km each. There are a large number of such streams. They account for 8% of the total run-off.

In view of the uneven distribution of rainfall, river regimes show wide variations in volume of water discharge. The Himalayan Rivers are perennial as they are fed by melting of snow and Springs.Large Rivers of the peninsula are perennial, as they originate in regions of heavy rainfall, such as Sahyadris or theChhotanagpur plateau. Most of the samller rives are nonperennial. Even in the perennial rivers, the volume of water in the dry season reduces to a low level.

The total surface water resources in India are estimated at 16.7 crore hectares metres, out of this 6.6 crore hectares metres is available for irrigation. The major thrust, after independence, has been towards increasing the storage capacity. From a level of 14 billion cubic metres in 1947, the storage capacity at present has increased to 190 billion cubic metres. This represents 27% of the usable quantity of surface water resources in India.

#### **3. GROUND WATER**

Groundwater is another important source of water and is more ubiquitaously abailable. This wate is available through dug-wells, tube-wells and other devices of lifting water. It is estimated that 43 million hectares metres per year groundwater is available in India, out of which 36 millionhectare metres is available for irrigation and 7 million hectare metres is available for drinking pruposes. About 90% of the available groundwater is associated with the unconsolidated rock formations of the north Indian plains. It shows that the peninsular part of the country is not well placed as far as groundwater resources are concerned.

#### **UTILISATION OF WATER RESOURCES**

Agriculture is a major claimant of water as the assured supply of water through irrigation reduces its dependence on rainfall which is highly variable and unreliable. Concerted efforts were made after independence to utilize the water resources for agricultural purposes by developing the irrigation facilities under different plan periods. Various irrigation projects and hydel power projects created since independence, these projects have been identified below.

 Bhakra- Nangal 2. Pong Reservoir 3. Harike Project 4. Ramganga 5. Sarda Sagar 6. Kosi 7. Chandan Reservoir 8. Rihand Dam 9.Damodar Valley Project-four dams – Tilaiya, Maitha, Konar, and Panchet 10. Mayrakshi 11.

**Dream Dare Win** 

Courtesy : Saidai Manithaneyam

Kangsabati 12. Ganchisagar Reservoir 13. Jawahar Sagar Reservoir 14. Ranapratap Sagar Reservoir 15. Bhander Canal Matatila Project 16. Kakrapar 17. Ukai Reservoir 18. Kukadi 19. Ghod 20. Purna 21. Poochampad 22. Nizamsagar 23. Pus 24. Bagh 25. Itiadah 26. Nagarjuna Sagar 27. Khadagvasala 28. Koyna reservoir 29. Warna 30. Ghatprabha-I 31. Ghatprabha-II 32. Malprabha 33. Bhadra 34. Krishnaraja Sagar 35. Mettur Dam 36. Malampuzha 37. Periyar Valley 38. Hirakud 39. Mahi –I 40. Banas (Daniwala) 41. Hathimathi 42. Mahi-II(kadana) 43. Shetrunji 44. Rajasthan Canal 45. Dulhasti (under construction).

The irrigfationpotential in the country in 1950-51 was 22.6 mHa, which has increased 89.44 mHa in 1995-96. The maximum realizable potential has been estimated at 113.5 mHa, which islikely to be attained by the year 2010 A.D. It is possible to attain a potential of 148 mHa if a nationalist view of water resources is adopted and modern technology is used. However, even if the maximum realizable potential of 113.5 mHa is attained, around 43.25% of thegross cropped area will remain unirrigated. Also, the irrigation potential, which remains to be tapped, falls mostly under major and medium irrigation projects. This means that the creation of irrigationpotential in future is going to be capital – extensive and increasingly difficult. This underlines the need to conserve and better manage our precious water resources.

There is a large variation in the extent and intensity of irrigation in the country. While in Punjab, Haryana, western Uttar Pradesh and delta areas of Andhra Pradesh and Tamil Nadu, the proportion of net irrigated area of net sown are is more than 60%, there are areas like Rajasthan, Madhya Pradesh, Marathwada, Vidarbha, Rayalseema and Karnataka where this share is very low. Ladksh district of Jammu and Kashmire is cold desrt and suffers from acute water shortage.

The supplying of dirinking water to rural and urband population is another important aspect of utilization of water resources. Accelerated Rura Water

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Supply Programme (ARWSP) and National Mission on Drinking Water (NMDW) have been launched in 1986, identifies 1.62 lakh villages in 1985 with no source of dinking water. By 1992, 1.58 villages had been covered. At the beginning of the Eigth Plan, 2968 villages were yet be supplied with drinking water. During 1992-93, 2218 villages were covered, 750 villages ramianed to be covered.

# PROBLEMS IN FULL UTILISATION OF WATER RESOURCES

- 1. A large protion of water resources is lost through run-off and evaporation losses.
- 2. Over-irrigation leads to the deterioration of soils. Salinity and alkalinity are the outcomes of misuse of water.
- 3. Though industry uses less water than agriculture does, it pollutes the sources. Leather, textile processing, paper and chemical industries are among the major culprits. Some 10,000 acres of agricultural alnd have been lost in North Arcot Ambedkar district in Tamil Nadu, a major leather processing belt.
- 4. Flooding causes damage to life and property in one-eighth area of the country, which has been declared as flood-prone.

## **MEASURES REQUIRED FOR CONSERVATION OF WATER**

- 1. Water conservation methods, such as leak detection, recycling, evaporation control and desalination, can conserve water to cater to one-fifth of the demand.
- 2. Evaporation can be controlled by spreading monomolecular chemical films on tanks and small reservoirs.
- 3. Minimisation of fresh water consumption and use of recycled water are most effective for water conservation in industries.
- 4. A more rational tariff structure and regulation of water supply will prevent wastage of water inirrigation.

- 5. For better flood management, the whole watershed should be treated as one unit.
- 6. Water intensive crops sould be avoided in dry areas to save them from waterlogging and salination.

## **BIOTIC RESOURCES**

Biotic resources refer to the plant and animal resources. Here we will discuss the forest resources and livestock resources which are important from the economic point of view.

## FOREST RESOURCES

The country has an area of 75.23 million hectares notified as forests, of which 40.6 million hectares is classified as reserved and 21.5 million hectares as protected forest. Unclassified forest area is spread over 13.1 million hectares. About 19.47% of the total geographical area of the country is under actural forest cover. The declared aim in different policy documents is to achieve a forest cover of 33% of the total area of the country, of which 60% must be maintained in hilly areas and about 20% in the plain areas.

## **DIVERSITY OF FOREST RESOURCES**

The latitudinal extent of India has ensured a great variety of vegetation tuypes from south to north and west to east. There is also great regional diversity in the foliage cover. Thus, one hectare of forest cover in desert area Rajasthan may not be comparable to one hectare offorest cover in hilly areas of Kashmir, Assam or Kerala.

The western slopes of Western Chats, which get more rain, have evergreen forests. These have also suffered over-utilisation. Kerala and Assam have tropically wet evergreen forests. In the drier parts of central India, Gujarat and Rajasthan the vegetal cover ranges from tropical deciduous trees to thorny bushes. There is altitudinal change in vegetation in the Himalayas. While the valley bottom has broad-leaved deciduous trees, the conifers extend towards the higher slopes. Generally, thick forest cover is either confined to inaccessible areas or in the areas of low density of populationin the country. The monsoon forests, comprising tropicaldeciduous vetetation, extendbetween the rainfall zone of 100cm and 200cm. they have some of the economically valuable tree species. The North Indian Plains extending from Punjab to West Bengal are devoid of forest cover due to higher pressure of population and extension of cultivated land. The higher altitudes in Uttar Pradesh, Himachal Pradesh and Jammu and Kashmir are the main regions growing conifers, particulararly deodar, pines and firs. Broad leaved sal and teak trees provide valuable timber. These trees occur in the terais of Himalayas. Karnataka has sandalwood forests. The mangrove forests are found along the coasts abounding in delta areas. Sundarbans is known for Sundari trees.

Grasslands are found on the uplands where forest has been cleared-as in parts of Kashmir, Himachal Pradesh and Uttar Pradesh hills. In lowlands, the frasslands are found in the Indo Gangetic plains and in Assam. In India, permanent pastures and grazing lands account for 3.8% of the reporting areas of the country. If the fallow lands and culturable wastelands are also included in the pasture area, it covers about 16.4% Also; there are certain riverine grasses like Bhabhar grass in Terai area and emephant grass in Punjab. Grasslands are generally associated with good varieties of cattle like Gir, Hissar and Sahiwal, and buffaloes like Murrah and Mahesana.

#### **UNEVEN DISTRIBUTION OF FORESTS**

The distribution of forest areas over various states is higly uneven. The proportion of forest land varies from 11% in the northwest to about 44% in the central region. Forests are ost scarece in the areas where they are most needed, as in the densely populated n intensely cultivated Indo-Gangetic Plains. In states with similar condition, like Uttar Pradesh, Punjab, Haryaa and Bihar, the amount of cowdung used as fuel is probably the highest inIndia, due to nbon-availability of fuelwood.

## LOW PRODUCTIVITY OF FORESTS

The annual per hectare productivity of Indian forests is very low-7.5 c.ft compared with 145 c.ft. in France, 92.5 c.ft. in Japan and 18 c.ft. in the USA. That explains why in spite of forests occupying 23% of the total land surface fo the country, the contribution of forestry and logging to net national product is barely about 2%.

## **REASONS FOR LOW PRODUCTIVITY OF FORESTS**

India has been unable to properly and suitably exploit its forest resources. The reasons for this are many and mainly include:

- i) Difficulty in exploitation due to eneven distribution and inaccessibility.
- Uncontrolled felling withour regenerating the forest cover through compensatory forestry;
- iii) Vast areas of unclassed forests awaiting rehabilitation;
- iv) Lack of proper tansport and infrasturcure facilities;
- v) Over-utilisation due to unregulated grazing
- vi) Depletion of forests though fire;
- vii) Poor and unscientific methods of felling, fashioning and seasoning;
- viii) Unscientific economic activities likeslash and burnmanner of agriculture which destroy the fragile forest cover of slopes;
- ix) Reliance on static conservancy, i.e., natural growth, rather than regenerating through afforestation;
- x) Lack of information on forest resources and inadequate research facilities;
- xi) Degradation of forest covers due to industrial and irrigation projects, illegal felling or 'poaching' etc.

## REMEDIES

Forests are a renewable resource and their conservation needs to be given top priority. The following measures are suggested forfull utilisation of the forest potential in India without depleting this precious resource.

- Adoption of intensive development schemes includingthe palntingof quick growing trees on suitable sites and high yielding species – indigenous or exotic – in compact bloacks, insuitable locations.
- 2. Selection of high yielding areas.
- 3. Introduction of improved techniques of logging and extraction.
- 4. Development of forest communications for openingthe hitherto inaccessible areas.
- 5. Increased use of preservative andseasoning processes by establishing preservation plants and seasoning kilns in the heart of the forest area.
- 6. Linking of forest programmes with the schemes of industrial development.
- 7. Protecting forests from depleting forces, like forest fires, and adopting quarantine measures, air dusting and spraying.
- 8. Undertaking a reliable inventory of forest resources, their extent, location, volume. Composition, standing wood volume, rate of growth and the quantities of various products, the costs at which these could be procured by the industries, statistics of removal, employment opportunities, tradeprospects and consumption of forest products.

## **INACCESSIBILITYOF FORESTS**

Quite a large proportion of Indian forests, though valuable, cannot be utilized properly because of their inaccessibility. That is why, although the forest area is a little less than half of the cultivated area, the contribution of the forestry sector to the net national product is less than 1% as compared to 29% of agriculture.

## **ECONOMIC BENEFITS OF FORESTS**

These benefits can be indirect or direct. Among the indirect benefits, the most important is the capacity of forests to influence rain producing mechanisms. Forests make the micro-climate of an area more equable and moderate. Forests check the flow of surface water during rains and their root systems trp the rainwater and channel it intounderwater streams. This water reemerges in the form of surface water in rivers, lakes, springs, ponds etc. Also, this water is absorbed by the plant anatomy andpart of it gets evaporated to rejoain the atomospheric hydro logical cycle. Thus, they act as nature's giant sponges. Root systems of forests bind the soil together and thus check woil erosion. This way, the forests check occurrence of floods. Also, by reducing the velocity of air currents, they protect the adjoinging fields against cold and dry winds and also provide cool shade to cattle, game, birds and humans. Also, if the agricultural fields are closer to the forests, there is a lesser chance for pests to grow in numbers because of presence of a large numbr of predators. Finally, forest itself is theproduces of new soil, for it is the decayed leaf litter which, over the centuries, becomes soil. The forest keeps producing fresh soil and the pest problem is contained to a large extent.

Forests also contribute directly to the nation's economy by making available a number of useful products. The major products include timber, pulp, charcoal wood, firewood, round wood and matchwood.Timber, an important produce, is largely derived from the forests of Madhya Pradesh, Orissa, Karnataka, Uttar Pradesh, Assam and Jammu and Kashmir. Two – thirds of the total firewood is derived from Uttar Pradesh, Maharashtra, Karnataka andMadhya Pradesh alone. The minor forest products include cane, bamboo, many types of grasses (Sabai, elephant and bhabhar used for makingpaper; munj, Kans, bansi, sarkanda used for making thatch), fodder, tendu leaves, lac, resins, gums, tanning and dying material etc. Andhra Pradesh, Tamil Nadu, Rajasthan, Madhaya Pradesh, Bihar andAssam account for more than 70% of bamboo production. The various grasses and fodder are obtained from northern India including Maharashtra. Madhya Pradesh and Orissa are leading producers of tendu leaves.

## LIVESTOCK RESOURCES

Animal husbandry is an auxiliary activity of Indain agriculture. The Indian farmer in all parts of the country depends on animals for draughtpower. Animals

provide the much needed manure. The milch animals like cows, buffaloes and goats are reared to provide additional income to the household. Animal rearing is especially advantageous for economically weaker rural households. Animal products like meat, milk, eggs etc., are cheap sources of proteins. Animals also help the rural industry by providing raw materials like hides, skins, bones, bristles, wool etc. the gross value of output from this sector has been estimated at 26% of the value of total agricultural output.

According to the results of livestock census of 1992, the country has about 204.5 million cattle, 83.5 million buffaloes, 50.8 million sheep, 115.3 million goats, 12.8 millionpigs and 3 million pack animals. India possesses 26 good breeds of tropical cattle and six breeds of buffaloes. India's cattle are well known in the world for their qualitities of hardiness, endurance and resistance to tropical animal diseases, especially tick-born and protozoan infections. But, the Indian cattle and buffaloes have milk yields much below the world standards.

#### CATTLE

India is the home of some important cattle breed, for example Kankrej, Rathi, Sahiwal, Gir, Tharparkar and Kangayam. Nagori breed of Rajasthan is famous as draught cattle. Betrer breeds of cattle are founding low rainfall areas of Rajasthan, Punjab, Haryana, Gujarat, Andhra Pradesh, Karnataka and Tamil Nadu.

### **BUFFALOES**

Buffaloes are important milch animal in India. Seventy-five percent of the total buffalo population consists of females which show that these are reared of milk. They are also used for draught in humid and high rainfall regions of West Bengal, Assam, Orissa and Kerala and are used to plough the flooded fields. Haryana and Punjab are well known for their murrah breed of buffaloes. The areas with high rainfall and rice as the dominant crop have higher proportion of the male buffalo population.

#### SHEEP

Sheep are reared for mat as well as wool. Sheep are more mumerous in Andhra Pradesh ad Tamil Nadu, but their wool is short stapled and inferior to the wool from the sheep reared in north-western India. The Marwari breed of sheep, found in Rajasthan, gives good qualityu of wool. Sheep flocks are also reared by the nomadic graziers in the Himalayas, such as Bakerwars of Jammu and Kashmir and Goddis of Himachal Pradesh. In order to improve the breeds of sheep, the Central Sheep Breeding Farm has been established in Hissar.

## GOATS

Goats are found inlarge number as compared to sheep. Goat is the poor man's cow. These are found inlarge numbers in the north Indian plains and the hills. Sheep and goats provide ready cash to the shepherds as they can be sold at the time of need. As such the shephereds like to increase the size of their flock which in turn puts pressure on the pastures and grazing land.

## **BEASTS OF BURDEDN**

Horses, ponies and mules are used in the hilly terrainfor carrying human being and materials. Camels are the main beasts' ofburden in arid and semi-arid regions. Yaks are used in ladkh and Himachal Pradesh.

The Indian livestockpopulation hs the potential to yield much higher economic returns than what it is giving at present, but unscientific and unhygienic conditions of production, shortage of nutritious fodder, harsh climatic condition, lack of proper storage and marketing facilities etc., are certain hindrances in the way.

Seven Centra Cattle Breeding Farms- at Suratgah (Rajasthan), Dhamrod (Gujarat), Alamadhi (Tamil Nadu), Chilplima and Simliguda (Orissa), Andeshnagar (Uttar Pradesh), ad Hessarghatta (Karnataka) are engaged in scientific cattle breeding programmes and progeny testing of selected breeds of indigenous as well as exotic cattle and buffaloes.

## MARINE RESOURCES

Marine resources broadely include the fish resources other resources derived from sea. Fisheries play an important role in the economy of India. It helps in augmenting food supply, generating employment, raising the nutritional level and earning foreign exchange.

India ranks seventh in fish production in the world and is the second largest producer of inland fishes both from culture and capture fisheries. With a long coastline of 7,517 km, 20.2 lakh sq km of Exclusive Economic Zone (EEZ), 2.5mHa of ponda and tanks, 1.30 mHa of lakes, 2.09 mha of reservoirs, 1.23 mHa of brackish water areas, there is a high potential for both marine and inland fisheries. In India's EEZ, it has been estimated that the potential marine fish resources amount to 3.9 MT, o fwhich 2.5 MT are available within the 50m depth zone. Although most of the fishing operations were restricted to this zone in the Eighties, fishing upto a depth of 80-100 m isbeing undertaken by eventraditional and small mechanized boats for the last five to six years. Though the development o ffisheries in India cannot be compared with that inJapan and Norway, it has shown significant growth over time. The total fish production in 1996097 was estimated at 53.5 lakh tones of which 29.7 lakh tones came from marine fisheries and 23.8 lakh tonnes from inland fisheries. Gujarat, kerala, Maharashtra and Tamil Nadu are the major states that contribute to India's marine fish catches. Croakers, sardine oil, peneaid prawns, Bombya duck, mackerel, nonpeneaid prawns, anchovies, perches, cat fish, sharks/rays / skates, squids and cuttle fish are the major contributores to arine landings. Important fishing centres along India's west and east coasts.

To realize the full potential of 3.9 MT, fishing has to be diversified into offshore and deep-sea areas well beyond 75m to the limits of our EEZ of 2.02 million sq km. Resources beyoung 50 m depth are astimated as 1.4 MT. Of these, the commercially important varieties comprise tuna, spear fish, sword fish, sword fish, barracudas, thread-fin bream, bull's eye, deep sea shark, lobster, squid and cuttle fish.

# IMPEDIMENTS IN FULL UTILISATION OF FISHERY RESOURCES

Following are the impediments in realizing thefull potential of fisheries.

- 1. Lack of resource specific specialized craft and gear to tap offshore and deepsea resources in the contry.
- 2. The capital intensive nature of deep sea fishing, since good fishing grounds are far away from the coast.
- 3. Uncertain market demand for capital intensive resources.
- 4. Depletion of resources due to overexploitation in the inshore waters.
- Threat to fish resources because of damage to the marine and the rivrine eco systems; these threats are due to indiscriminate and excessive trasling;

discardingo fby-catch by shrimp trawlers;

construction of dams and industrial projects;

Drainage of untreated industrial and municipal waste into fishing grounds.

- 6. Spoilage of fish due to lack of proper storage facilities, unhygienic handling and processing facilities.
- 7. Encroachment of deep sea fishing vessels into coastal waters.

## **DEVELOPMENT OF MARINE FISHERIES**

Apart from four major fishing harbours, viz. Cochin, Chennai, Vishakhapatnam and Roychowk, 26 major fishing harbours and 99 fish landing centres have been constructed to provide landing and berthing facilities to fishing craft. The construction of two major fishing harbours at Sassoon Dock in Mumbai and at Paradip is nearing completion. The government is providing subsidy to poor fishermen for motorizing their traditional craft which increases area and frequency of opration with consequent increases in catch and earning of fishermen.

## **DEVELOPMENT OF INLAND FISHERIES**

In recognistion of the important role of incland fisheries ihn overall production of fish, the government has been implementing an important programme in inland sector since the fifth Plan, viz. Development of Freshwater Aquaculture through Fish Farmers' Development Agencies(FFDAs) A network of 414 FFDAs is functioning now.

## DEVELOPMENT OF BRACKISH WATER AQUACULTURE

The objective of this scheme is to utilize the country's vast brackish water area for fish prawn culture. So far, projects covering an area of 15,000 hectares have been sanctioned. A pilot project for the construction five pilot prawn farms and five pawn hatcheries taken up during the Seventh Plan with UNDP assistace was completed. Thirty-eight Brackish-Water Fish Farmers' development Agencies (BFDAs) are functioning in the coastal areas of the country at present. These provide a package of technical, financial and extension support to shrimp farmers.

## **OTHER MARINE RESOURCES**

These include oil andnatural gas, sea weeds, salts and mineral resources. The major contribution to India's crude oil production comes from the offshore fields. India ha also obtained permission tomine manganese nodules from an area of 15,000 sq km in the Indian Ocean. The oceans are the resources for future.

# MAN AND ENVIRONMENT-ECOLOGICAL PROBLEMS AND THEIR MANAGEMENT

In this section, a detailed survey is being given which covers theentire gamut of the concept of Sustainable Development as viewed in the India context. Following this, a detailed discussion on the issue of soil and moisture conservation is being given with special focus on the problem of soil erosion. Finally, a set of case studies has been compiled to put these concepts and issues in proper perspective.

## SOIL EROSION

Soil erosion is a process of detachment and transportation of soil by natural agencies of water and wind.

## FACTORS INFLUENCING SOIL EROSION

There are many factors which influence the process of soil erosion; these are discussed below;

#### 1. Rainfall

Precipitation is the most forceful factor causing erosion. Erosion is dependent on the amount, duration, intensity and frequency of rainfall. By the action of dashing rain drops on soil, soil granules are loosened, detached and separated into fine particles. Erosion is greater where the rainfall is not only heavy, but concentrated over shor periods.

#### 2. Slope of Topography

The slope accelerates erosion as it increases the velocity of the flowing water.

#### **3. Vegetation**

The vegetative cover propects the soil from thebeating and dispersing action of the raindrops by forming a canopy over the soil surface. Vegetation also acts as a mechanical obstruction to flowing water, thus reducing its erisive ppotential. The plant roots helt inbuilding a better structure. They aid in opening the soil and thereby accelerating water absorption and reducing surface run-off.

#### 4. Tillage

The infiltration and permeability of the soil is improved by the practice of proper tillage and thereby reducing the chance of erosion. But excesss tilling exposes the soil to erosion, especially by wind.

#### 5. Nature of the Soil

Erodability of the soil is influenced by the nature of the soil, particularly its texture, structure, organic matter, amounts and kinds of slats present, presence of hard pan in the soil and presence of high water table.

#### 6. Soil Moisture

The presence of high water table checks the infiltration and permeability, thus allowing more flow of water on the surface, andgreater erosion. At the same time, long continuous rainless periods cause loosening of soil and thus expose the soil and thus expose the soil to erosion by wind.

#### 7. Wind Velocity

Stronger winds have greater erosive potential, thus wind velocity is directly proportional tointensity of erosion.

## **TYPES OF EROSION BY WATER**

Following are the types of soil erosion caused by water.

#### 1. Splash Erosion

This type of erosion occurs when the falling raindrops splash on the soil, and beat the bare soil into flowing mud.

#### 2. Sheet Erosion

This occurs when woil is removed uniformly in a thin layer from the entire surface area. Movement of soil by splash erosion is the primary cause ofsheet erosion.

#### **3. Rill Erosion**

This type of erosion takes place when the run-off water, laden with soil flowing along the slopes, forms fingerlike channels. Rill erosion is an intermediate stage between sheet erosion and gulley erosion.

#### 4. Overgrazing

A surplus of livestock population in our contry is a big strain on grasses and fodder. The tread of cattle hardens the soil and prevents new shoots from

emerging. Overgrazing by goats is a serious problem in certain stretches of the Aravalis and in Punjab and Himachal hills. The goats not only pullo ff leaves andbranches, but they also uproot grass, as opposed to sheep, which only nibble the top shoots.

# 5. Diversion in Natural Drainage Channels by Railway Embankments and Roads

Railway tracks and roads have had to be constructed in such a manner that they are at a higher level than the surrounding area. But sometimes, road and rail embankments come in the way ofnatural drainage channels. This causes wterlogging on one side and water loss on the other side of embankments. All thse factors contribute to erosion in one way or the other.

#### 6. Lack of Proper Surface Drainage

Because of proper drainage, waterlogging occurs in low lying areas which loosens the top-soil and makes it prone to erosion.

#### 7. Denuding Forest Fires

These fires, sometimes natural but often man-made, are very destructive. As a result of these, the forest cover is lost forever and soil is exposed to erosion.

## **EFFECTS OF WOIL EROSION**

#### 1. Loss of Soil

The top-soil is ost by erosion which is the most fetile section, having evolved over centuries of soil-forming processes. Due to formation of gullies and ravines, valuable agricultural lands are lost.

#### 2. Harmful Effects of Erosion on Organic Matter and Soil Structure

Erosion o fupper layer of soil decreases the content of organic matter and as other nutrients. As a result, the soil structure gets impoverished.

#### 3. Decline in Soil Capacity

When the soil is removed bodily from field, both potential and available plant foodalong with mineral material is carried away. As erosion progresses, the compact soil of low infilatration capacity is approached. The ability of the land to supply moisture for plant growth is reduced and the benefidal activity of microorganisms lessened. Due to these bad effects the yields are lowered.

#### 4. Deposition of Sand and Gravel on Agricultural Lands

The wind-borne sand en-croaches the areable lands and makes them unfertile. Crops are damaged due to sand storms.

#### **5. Flooding of Streams**

Soil erosion in catchment areas of streams due to deforestation another destructive activities leads to silting of streams and reservoirs. This reduces the capacityof these water bodies to carry large volumes of water, as they occur during the rainy season. This way the streams are more prone to flooding. One such example is Brahmaputra River which as been exposed to siltation because of largescale deforestation in the hills, and the floods in Brahmaputra valley have become an annual phenomenon now.

## MAGNITUDE OF THE PROBLEM IN INDIA

In India, nearly 80 mHa area is exposed to the threat of soil erosion, and 43 mHa area is actually affected. In states like Madhya Pradesh, Rajastha, maharashra and Punjab, upto 15% of the total land suffers from soil erosion. It is reported that theannual loss of fertility by erosion is 20 times faster than what is lost by growing crops. Each year, 10,000 hectare area is exposed to erosion. Nearly 145 mHa area in India is in need of conservationmeasures.

## SOME GLARING EXAPLES OF SOIL EROSION

#### 1. Nilgiris

Potato cultivation on steep slope without proper terracing has caused widespread erosion here.

#### 2. Gullies or Ravines

Because of gully erosion, nearly 10 mHa area is affected. These gulleys are known by different names-khars in Gujarat, Maharashtra and Karnataka; ravines in Madhya Pradesh, Uttar Pradeh and Rajasthan along Yamuna and Chambal;kotar lands inGujarat and chos(the rainly season torrents) and landslides in Hoshiarpur in the Shivaliks.

## 3. Regions of Low and Uncertain Rainfall

Extensive regions of low and uncertain rainfall, forming parts of Punjab, Madhya Pradesh, Maharashtra, Andhra Pradesh and Karnataka, are characterized by scanty, ill distributed and highly erosive rains, undulating topography, high wind velocity and generally shallow soils. Thje period fo heavy downpours from Augaust to October is the period of the heaviest erosion in these regions.

#### 4. Desertification of Rajasthan

Wind erosion, coupled with loss of surface cover in the Aravalis has made the challendge of halting the march of desrt in Rajasthan, one of the most vital ecological problems facing the country today.

#### 5. Coastal Erosion

An extreme example of soil erosion is to be seen is sand movement from the coast in the Saurashtra region of Gujarat, where the once flourishing ports are now covered with advancing sand-dunes.

## METHODS TO CHECK WOIL EROSION

These measures are a part of the overall strategy to conseve soil and wate. These measures can be biological or mechanical.

## **Biological Measures**

#### 1. Improving the Existing Surface Cover

This can be done by resorting to cover cropping by growing groundnut or berseem (a fodder crop) or through grasslands development by growing grasses like dub, kudzu, pans and dinanath.

## 2. Strip Cropping

This practice consists of growing erosion-permitting crops (Jowar, bajra, maize) in alternate strips with erosin checking close-growing crops(grasses, pulses). The erosion checking strips check (grasses, pulses). The erosion checking strips check and hold the flowing water and soil.

#### **3. Crop Rotation**

This refers to growing of two or more different crops in sequence in a field formaintaining the soil fetility. Continuous growing of clean-cultivated crops (e.g., tobacco) causes more eosion. A good rotation should include densely planted small grains, spreading legume which may check soil erosion.

#### 4. Stubble Muching

This means leaving crop residue or vegetative litter on th eland as a surface protection agaist erosion and for conserving moisture by favouring infiltration and reducing evaporation.

#### **5. Using Organic Manures**

Organic manures like cowdung, greenmanure, farmyard manure etc., improve the soilstructure. Granular and crumby structures increase infiltration and permeability in the soil and conserve soil moisture.

Other measure include checking overgrazingl, reducing surplus cattle, stopping shifting curtivation and taking preventive measures against forest fires.

#### MECHANICAL MEASURES

#### **1.** Contour Tillage

On sloping lands, all tillage operations should be done at right angles to theslpe of the land. This way, each furrow intercepts the flowing water and allows it to soak into the soil.

#### 2. Contour Bunding

The idea is to break to the land ito smaller, more level compartments by constructing mechanical structures of suitable size alon gcontours. Each bund, thus, holds the rainwater within each compartment.

#### **3.** Terracing

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On seeper slopes, terraces or flat platforms are constructed in steps in a series along the slope. This way water is retained on each terrace which can be used to raise crops.

#### 4. Construcing Proper Drainage Channels and Plugging the Gullies

#### 5. Basin Listing

This refers to scooping out small basins at regular intervals onslopes which help in checking the run-off and in conservation of water.

#### 6. Water Harvesting

This refers to trapping or channeling of water into low-lying areas. This helps in checking the run-off and also acts as a flood control measure.

#### 7. Scientific Slope Management

The cropping activity on slopes should be taken up as per the nature of slope. If the slope is between 1:4 and 1:7, proper farming can be done; if more, pastures should be developed; if still more, forestry oprations can be undertaken; if it is still greater, then terracing is required before any cropping activity can be done.

# **INDIA: AGRICULTURE**

#### THE INFRASTRUCURE

#### **RLE OF INFRASTRUCTURAL FACTORS**

Agricultural development is influenced by environmental, infrastructura, institutional and political factors. Infrastructural factors mainly include irrigatin, power supply, chemical or organic fertilizers, improved seeds etc. These factors have a specific role to play bothat the micro and the macro levels. The infrastructural factors are a function, particulararly of the physical environment. This advantage has been put to the maximum use in India's agricultural development after independence. The First Five Year Plan (1951-56) was almost an agricultural plan with agriculture and allied activites claiming a 46% share in

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the total outlay. The Green Revoultion programme, which began in the 1960s, was centred around the development of infrastructural factors only.

## POST-INDEPENDENCE ACHIEVEMNTS OF INDIAN

## AGRICULTURE

- The compound growth rate inagricultural production during the period 1949-50 to 1995-96 is 2.67% per annum.
- The production of foodgrains increased significantly from 54.92 milliontonnes in 1949. 50 to 199.3 million tonnes in 1996-97 and an anticipated 194.1 million tonnes in 1997-98.
- 3. The per capita net availability of foodgrains went up to a level of 528.77 grams per day in 1996-97 compared to 395 grams in the early fifties.
- 4. Considering the post-Green Revolution period i.e., 1967-68 to 1997-98, the compound growth rate in foodgrains production is assessed at aroud 2.60% per annum. The production of foodgraind during this period increased from 95 million tonnes to an anticipated 194.1 million tonnes.
- 5. The cropping pattern ha undergone perceptible changes and non-traditional crops like summer moong, soyabean, summer groundnut, sunflower etc. are gradually gaining importance. In order to utilize the scarce resources optimally, the short duration varieties have been introduced to use the residual moisture abilable from post-kharif and post-rabi cultivation.
- 6. In terms of gross fertilizer consumption, India ranks foruth in the world after the USA, former USSR and China. India also has the largest acreage under irrigation.
- 7. The country has the largest area in the world under pulse crops.
- 8. In the field of cotton, India is the first to evolve a cotton hybrid.
- Today, the agricultural sector provides livelihood to about 64% of the labour force; contributes nearly 27.4% of the Gross Domestic Product; accounts for a sizeable share of total value of the country's exports, and

supplies the bulk of wage goods required by the non-agricultural sector and raw material for a large section of the industry.

These achievements are well explained by infrastructural factors, themost curcial of which is irrigation.

## **IRRIGATION**

India's irrigation potential has increased from 22.6 million hectares (mHa) in 1950-51 to about 91.79 mHa (provisional figure) at the end of the Eighth Plan (1992-97). India has the largest acreage under irrigation, and also the largest acreage under cannal irrigation. The regions of permanent irrigation have become the regions ofGreen Revolution. Pubjab, Haryana, western Uttar Pradesh and the Krishan-Godavari delta are four such regions. Punjab, which has 99% of its gross cropped area under irrigation, has emerged as the leading agricultural state with second largest wheat production (accounting for 23% of the national total), the largest cotton production (16% of the national total). It has the maximum yield per hectare in rice, wheat and cotton Punjab produces more rice than Orissa, Bihar, Madhya Pradesh, Assa, North-East; these regions, although, are environmentally more suited for rice cultivation, lack adequate irrigation facilities.

## **ROLE OF IRRIGATION**

- Irrigation brings about an increase in the gross cropped area by increasing the net sown area in rainfall scarcity areas and by facilitating multiple cropping.
- 2. The normal monsoon is adequate only over one-third of the country-thus, irrigation becomes a necessity in the rest of the country. Even in the adequate rainfall areas, a late onset or an early withdrawal can prove disastrous for the crop. Then, irrigation is required for rabi (winter crop) especially wheat. Additional water is also required for most crops during the

growth period to maximize yields. Thus, irrigation is essential to overcome spatial and temporal variation of rainfall.

- 3. Irrigation has the effect of increasing the yield by almost 100% compared to unirrigated areas.
- 4. Irrigation also stabilizes yields in face of uncertain rainfall. Also, because of increasing use of the costly inputs like fertilizers, seeds, pesticides etc., which give opimum results only when adequate moisture level is maintained, failure to supply moisture during the growing period could imply wastage of valuable investment.

## SPATIAL PATERN OF IRRIGATION INTENSITY

#### 1.States with net irrigated area as 60% or above of the net sown area

These are Punjab, Haryaa, wester Uttar Pradesh, Krishan-Godavari delta and the Cauveri delta continuing upto Chennai. These are the areas of Green Revolution.

#### 2.State with net irrigated area as 30% to 60% of the net sown area

These regions include the rest of Ganga plains, Kashmir valley parts of western Maharashtra, east cost including West Bengal.

#### 3.States with net irrigated area as below 15% of the net sown area

These regions include the west coast excluding Kerala, the whole of interior peninsula, southern Bihar, Madhya Pradesh, interiorAndhra Pradesh, Karnataka, plains of Rajasthan and Gujarat, and the North-East.

Thus, there is inadequate irrigation in the arid and semi-arid regions and the high rainfall regions of the North-East.

## SOURCES OF IRRIGATION

Natural water is available either as surface water which moves through gravity in rivers, lakes, ponds and canals; or as groundwater which is lifted through dug wells or tube-wells using animal power or diesel or electricity. Various sources of irrigation are specific to the physical environment of the region and each one has its own peculiar characteristics. Three major sources of irrigation in India-wells, canals and tanks- are discussed below.

Wells account for 46% of the total irrigation, having relegated the canals as the source of irrigation to the second plce. Water from wells, which is groundwater, has to be lifted up using animal power or with the help of the Persian wheel, charsa (moat), dhingley (lever), electrified pumps or oild engines. Irrigation from wells is suitable for areas with permeable rock structure which allows accretion of groundwater though percolation. A level topography with alluvial soil makes it easier to dig wells, and also the rewards from the irrigated lands, in terms of the yield, are inspiring. No wells are, thus, to be seen in the rugged Himalayan region or in states like Assam. Water in the wells of dry becomes saline, which is good neither for drinking purposes nor for irrigation. The menace of salinity can be checked by locating the wells near the cannals, ponds or in the lowlands where water collects during rainy season. The states with 50% or more of the irrigated area under wells and tube-wells are Punjab, Uttar Pradesh, Rajasthan, Gujarat, and Maharashtra. Madhya Pradesh and Tamil Nadu also have a sizeable area under well irrigation.

The major changes in respect of wll irrigation during the last few decades include change from dug-wells to tube-wells and large scale replacement of animal poer with commercial power (electricity or diesel) for lifting water. Tamil Nadu has the largest number of electrified pumpsets. Now, waterpumps running on solar energy are also being encouraged.

**Canals** account for 39% of total irrigation capacity in India. Canals use the surface water which moves with the force o fgravity Canal irrigation is possible in areas which are extensive plains and are drained by well distributed perennial rivers, such as the northern plains, costal plains, deltas (where even the distributaries can act as canals), and the broad valleys of the peninsula.

Inundation canals are those which are taken out without constructing dams or 'bunds' and get water only when the main stream is flooded-thus, they have

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limited validity. Now, the efforts are on to convert them to perennial systems. The post-independence period saw the construction of canals as a part of th multipurpose projects, e.g., Bhakra-Nangal (Punjab), Damodar Valley (Bihar and West Bengal) and the Nagarjunasagar (Karnataka) projects.

The initial cost of constructing canals is high but once constructed, the operational cost is minimum, which makes them a cheap source of irrigation in the long run. Canal irrigation is important in Punjab, Haryana, western, coastal Orissa and coastal Andhra Pradesh. The canals are almost absent I the hilly states like Kerala and the North-East.

The detrimental effects of cannal irrigation, however, make canals a problematic source. Overflooding of canals, coupled with the absence of lining of canal beds leads to the seepage of water into adjoining water tables; and if the water table is close to the surface, to salinisation of soil cover through capillary action. The saturation of water table leads to waterlogging and subsequently to the swamping of land, leaving is unsuitable for sultivation or habitation. Waterlogging and salination have left 6 million hectares area as waste, a third o fit lying in the northern plains.

Scientifc water management practices are requird to overcome such effects. Drip-irrigation and sprinlers are two such methods. The command Areas Development Programme has efficientand scientific water management as one of the objectives.

**Tanks** account for around 8% of total irrigation potential. They are suitable for areas with impermeable rock structure andwith slightly undulating topography, where the rainfall is highly seasonal. Such conditions are found in the peninsular region, in the states of Tamil Nadu, Karnataka, Andhra Pradesh, and kerala, parts of Madhya Pradesh, Orissa and West Bengal. Here, the rainwater is collected in excavated tanks or in natural depressions (in northern region, predominantly the former type and in the peninsular region, the latter type), by construction of bunds, dams or without them. The stored water is then 142 taken to fields through channels during the dry season. The tank irrigation system suffers from certain drawbacks- it renders vast fertile lands, adjoining the tanks, as useless; large and shallow watermass permits enough evaporation to result in a considerable loss of water. Also, tanks are not a very dependable source or irrigation, like cnals, since they depend on rains for water to be stored and are not a perennial source. The importance of tanks, as a source of irrigation, is on the decline.

## **CURRENT POTENTIAL AND FUTURE PROSPECTS**

The maximum realisableirrigation potential in India has been estimated at 113.5 mHa, which is targeted to be reached by the year 2010 A.D. Of theis potential, 73.5 mHa will be from furface water resources (58.5 mHa from mjor and medium resources and only 15 mHa from minor resources) and 40 mHa from the groundwater resources(all from minor resources). It amy be possible to raise the maximum potential to 148 mHa provided the polices are based on a broad-minded and nationalist view, and make use of the technologicladvances, suc as i) inter-basin transfers; ii) largescale lifting of water from rivers and streams through pumping iii) modrnisation of irrigation methods.

Since the maximum grosscropped area that canbe possibly attained is estimated at 200 of 113.5 mHa is actually relised, it would imply oly 56.75% of the cultivated area under irrigation, leaving 43.25 % (86.5 mha out of 200 mHa) as rainfed. This analysis underlines the need for full and efficient use of the country's irrigation resources.

#### **PRESENT SCENARIO**

The country's irrigation potential created area has increased from 22.6 mha in the pre-plan period (1950-51) to abour 87.06 mHa at theendof 1994-95; comprising 32.27 mHa under major and medium irrigation projects and 54.79 mHa in minor irrigation schemes. The anticipated irrigation potential creatred by the end of 1996-97 is 89.3 mHa; comprising 32.8 mHa under major and medium projects, and 56.5 mHa undr minor irrigation schemes.

Already, full utilisationhas been achieved in the Cauveri basin, and inmany areas completion of groundwater utilization has resulted in the lowering of water tables and drying of wells. States like Tamil nadu have accomplished 95% utilization of irrigation potential, while states like Nagaland, Arunachal Pradesh have used only a fraction. Thus, it is evident that wile most of the monor irrigation potential has been tapped (54.79 mha out of 55 mHa), almost 40% of the major and medium irrigation potential remains to be tpped, which means that irrigation development in future would be difficult and expensive. This is because the major and medium irrigation projects are more difficult to implement.

# DIFFICULTIES IN IMPLEMENTING BIG IRRIGATION PROJECTS

- 1. Capital costs of big irrigationprojects are high, makingtheir progress subject to availability of resources.
- 2. Investments ar Impy, i.e., they have to be incurred in big amounts. This makes tham vulnerable to 'leakages'.
- 3. Big irrigation projects have long gestation periods. Even on completion of projects, the water does not reach to eintended beneficiaries for lack of fieldwork to supply the water.
- 4. Since complex engineering works are required, the big irrigation projects place heavy demands on the available supples of cement and steel.
- 5. Big irrigation projects result in submergence of large areas, oftenincludinghumand settlement, thus resulting inlargescale displacement of population. Thus, these schemes involve the attendant problems of rehabilitating and compensating the project-affected people.
- 6. Big irrigation projects or dams have often been criticized for the harmful consequences on the environemntand ecological balance. Big dams submerge large forested areas and sometimes fertile culturable lands. Without compensatory forestry, the loss of trees distrurbs theecological balance of an area. Also, lack of adequate soil conservation measures in the catchment area result in silting of reservoirs, which reduces the capacity and life of these reservoirs, and has the effect or reducing the efficiency of the project.
- 7. Due to political compulsions, the scarce resources are distributed over a number of projects, which leads to inefficiency in terms of time and cost overruns.
- 8. Since a substantial part of irrigation potential is concentrated in the Himalayan region, which also happens to be a seismically sensitive zone, big irrigation projects in this region have to take into account the concerns regarding safety.
- 9. Delay is alos caused by the time takenby the farmers to switch ovr to irrigation-based frming practices.

## PRROBLEMS WITH EXISTING IRRIGATION POTENTIAL 1.LARGE UNUTILISED IRRIGATION POTENTIAL

Underutilisatin of the irrigation potential, particuly under major and medium irrigation projects, continues to perisist. At te end of 1996-97, the likely utilization was 80.7 mHa, against the created potential of 89.3 mHa. This leaves a gap of 8.6 mHa of unutilized potential (4.4 mHa in major and medium, and 4.2 mHa in monor irrigatin). This gap is mainly attributed to-

delays involved in development of on farm works, namely, construction offield channels, and leveling (where land is uneven) and adopted of the 'warebandi' system (network of distributaries and minors over a command area for rational supply of water).

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 Time taken by farmer sto switch over to the new cropping patternfrom dry farming to irrigated farming –which may involve new crops and new methods.

A centrally sponsored Command Area Development Programme was initiated in 1974-75 to bridge the gap between the potential created andthat which isbeing utilized. It envisaged, inte Ali

\* development of non-form wroks;

- \* trals, demonstratin and training of farmers;
- \* adoption of suitable cropping patterns.

#### 2. WASTAGE OF IRRIGATION WATER

This includes wastage through over-irrigation, through seepage from cannals due to inadequate lining o fcanal beds and sides and improper balance between ground and surface water resources. Wastage of water can be checked byl

- ensuring proper trariff structures and their strict compliance to control over-irrigation;
- undertaking proper lining of canals to check seepage;
- Giving proper taining to the farmers for efficient use of irrigation facilities;

Co-ordinating irrigation from various modes-canals, tans, wells etc.

#### **3.INTER-CROP DISPARITY**

While all cereals hve 38% of their cropped area under irrigation and commercial crops like cotton have 31.4% of their area under irrigation, nutritionally important crops like pulses nd oilseeds have only 9.2% and 20% of their cropped area under irrigation.

#### 4.COMMERCIAL LOSSES BY STATE GOVERNMENTS

Since the irrigation rates charged by states do not even cover the operational costs of the irrigation schemes, let along any interest receipts onth einvested capital, there are few incentives for the states to invest in irrigation. Similrly, the

state electricity boards supply electricity at subsidized rates for rigation purposes incurring heavy losses in the process.

The user cost issure, it is clear, can no longer be brushed aside. The irrigation charges structure should reflect the scarce nature of the resources, and should at least recover the annual maintenance and operational expenses and a part of the fixed costs. At the same time, the process of rationalization should give due regard to the small and marginal farmers.

### **IRRIGATION IN THE EIGHTH PLAN**

Strengthening of infrastructure is one of the mainobjectives of the English Plan. The mainelements of strategy for the irrigation secotor include-

- 1. Giving priority to the completion of on going projects.
- 2. Laying emphasis on minor irrigation shemes under the 'special Foodgrains Production Programme'. Considering their shorter gestation lags and lower investment, costs, minor irrigation schemes ar being given special thrust in the eastern sector because of the advantageous water table levels there.
- 3. Ensuring speedy transition to irrigated agriculture and optimum water use through the Command Area Development Programme.
- 4. Installation of sprinkler and drip irrigation systems in water scarce and the droughtprone areas.
- 5. Rationalisation of water tariff structures.

## POWER

Agriculture contributes nearly 27.4% to the national incomebut consumes only 15% of power. Industry alone consumes 62% of power. Availability of power has a direct bearing on agricultural development. States like Punjab and Haryana, which consume 30% and 40% respectively of their power in the agricultural sector, ar agriculturally most developed. Uttar Pradesh, Rajastha, Maharashtra and Tamil Nadu consume one-fourth of their power in the agricultural sec tor and are agriculturally moderately developed. Gujarat, Karnataka, Andhra Pradesh, Bihar

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and West Bengal use 10% to 20% of their power in the agricultural sector, and thus, the agricultural development in these states is at a low profile. On the other hand, states like Assam, Manipur, Orissa, Himachal Pradesh, which use less than 5% of their power in agriculture, are agriculturally the most backwad states.

Power is required in irrigation and agricultural operations such as both onfield and postharvest, processing, storage etc. Power improves not only agricultural productivity, but alos processing and storage.

Punjab and Haryana were able to develop their agricultural potential only after they got power from the Bhakra-Nangal project. Similarly, power development helped the agricultural developmentin the balck soil region of Maharashtra, Karnataka and Tamil Nadu.

The Rural Electrification Corporation was set up in 1969 to finance the schemes for rural exlectification. In 1956, only 7290 villages (accounting for merely 1.25% of all the 5.70 lakh villages) ere electrified. By March 1995, 4, 97,796 villages had been electrified (accounting for 85.8% of thetotal villages in the total villages on the country), and 10.7 million pumpsets had been energized.

Tamil Nadu has the maximum number of energized pupsets. Other states with sizeable numbers of nergised pumpsets are Punjab, Haryana, western Utar Pradesh and Gujarat. State governments charge subsidized rates to encourage energy-based farming practices. Rural electrification has also been included in the Twenty-Point Programme.

### **FERTILISERS**

After independence, efforts were directed towads fuller and more efficient use of the traditional sources of manners, such as i) use fo cow dung as anure, rather than as fuel; ii) more effective arrangements for farmyard mnure; iii) use of bones and other animal products as anure; iv) green manure from trees along fields bunds; v) production of compost from urban solid waster; vi) silt from canal or tank beds; vii) undertaking urban seqage utilisationschemes; viii) working out efficient crop rotation, including use of legumes for atmospheric nitrogen fixation; ix) fallowing of land ofr sometime to enable it regain fetility.

However, theuse of chemical fetilisers has become icresingly inevitable for the following reasons.

- 1. Because of the scarcity of fuelwood, cow dung is used as fuel.
- 2. With trees also becoming scarce, green manure is not readily available.
- 3. Because of the growing pressure on land to feed a fast-multiplying population, fallowing of land is not a viable option.
- 4. The need for higher foodgrains production, through increase in cropped area by multiple cropping and raising higher yields, can oly be fulfilled by the use of chemical fertilizers.
- 5. Fertilisers give best results when applied to the irrigated alnd. Thus, expansion of irrigationhas also promoted the use of fertilizers.
- 6. The High Yielding Varieties of seeds being increasingly used after the 1960s give optimum results when supplemented with fertilizers.

Thus, the use of chemical fertilizers has been as key element of the green Revolution strategy to enhance agricultural productivity. Most spectacular results have eben seen in production of wheat and rice.

## **IMPACT OF USE OF FERTILISERS**

By a conservative estimate, the increased use of chemical estimate, the increased use of chemical fertilizers is responsible for 70% of the overall agricultural growth. For every one tonne fertilizers used, the foodgrains production goes up by 8 to 10 tonnes. The regions haveing higher consumption of fertilizers have superior agricultural development. Given below is the relationship between fetiliser consumption and yield perhectare ofrice in four states.

State	Per Hectare Consumption	Per Hectare Yield of Rice
	Of fetilisers(kg)	(kg)
Punjab	129	4500

Tamil Nadu	100	2500
Bihar	30	1000
Manipur	9	700

India has increased its consumption chemical fertilizers from 65,000 tonnes in 1951 to an estimated 14.93 million tonnes in 1996-97 and the consumption is growing at over 9% per annum. The government provided subsidies worth Rs 6093 crore during 1996-97 to encourage the use of fetilisers. During the second phase of the Green Revolution, it is envisaged to supply fertilizers to the small and marginal farmers at prescribed rates in small packets.

The consumption in an appropriate mix (ratio) of three prmary nutrients- nitrogen (N), phosphate (p) and potash (k), is essential for increasing the crop yields. The ideal NPK ratio aggregated for the country as a whole is 4:2:1 but the current all-India NPK consumption ratios do not conform to the ideal norms. The NPK ratio which was almost at an ideal level prior to the decontrol of phosphatic and potassic fertilizers in August 1992, witnessed steep deviation after decontrol. But, this ratio hs since started improving and may improve further, once the price distortions arising from reltively low price of the nitrogenous fertilizers get corrected.

#### FACTORS CONSTRINING USE OF FERTILISERS

Even in regions nd crops using the high yielding variety seeds, less thn recommended doses of fertilizers are being used, because fo the following reasons.

More then half the cropped area of the country, being rainfed, can only absorb limited amounts of fertilizers.

Supplies of fetiisers are insufficient, not available at the right time, in the right form and within easy reach.

Promotional measures and demonstration have not been adequate.

Small and mariginal farmers cannot affort costly fertilizers.

Inadequate soil testing facilities mean that the farmers lack sufficient knowledge regarding exact soil deificiency.

Many farmers consider the use of fertilizers as risky.

The potassic fertilizers ar entirely imported. There is no domestic production for lack of potassic mineral reserves. In case of the the phosphatic fertilizers, the domestic production is based on imported rockphsophate or pshophoric acid because the domestic reserves fo rock phosphate are limited and inferior in quality. This explains the costly nature of chemical fertilizers.

# GOVERNMENT MEASURES TO REMOVE BOTTLENECKS IN USE OF FERTILISERS

- 1. The subsidies provided on Diammonium Phophate (DAP), Single Super Phosphate andMuriate of Potash (MOP), to the tune of Rs 5400 crore, have been an important instrument to encourage the use of fertilizers.
- During the Seventh Plan, a National Programme was started topromote the use of fertilizers in low consumption rainfed areas by opening additional retail outlets; demonstrations and training programmes; opening more soil testing laboratories.
- 3. The base of irrigation and proper water management isbeing broadened.
- 4. Recently, the custom duty on the import of phosphoric acid (the main intermediate in DAP) was abolished.
- 5. Credit facilities are being extended to newer areas to enable more nd more farmers to take up the use of chemical fertilizers.
- 6. The custom duty on import of capital goods related to fertilise plants and thie modernization has been aboilished.

7. Use of organic manures and biofertilisers is being encouraged, considering the costly nature of chemical fertilizers. Organic manures are naturally occurring material containing nutrients required by plants, such as cattle dung, farmyard manure, rural or urban composts, green manure, sewage sludge, biogas clurry and wate-waters etc. Biofertilisers are microorganisms which either fix atmospheric nitrogen or increase the solubility and accessibility of other nutrients, particularly phosphate. They augment nitrogen supplies and to a lesser extent increase phaosphate availability. The most important biofertilisers are the nitrogen fixers, such as rhizobia, azospirillum, blur-green algae (cyanobacteria) and the BGA-azolla association. Rhizobia fix nitrogen in symbiosis with legumes, such as oilseeds and pulses. Blue-green algae (BGA) and azolla augment nitrogen supplies for rice. The typical amounts of nitrogencontributed by BGA and a single harvest of azolla are 20-30kg/hectare. The use of BGAA as a fertilizer has made some headway in Tamil Nadu. The potential of organic waste in rural areas in 635 million tonnes, while only 25 million tonnes of it's used as fertilizers. In urban regions, these figures are 16 million tonnes and 7 million tonnes respectively.

#### SEED

The high yielding varieties (HYV) of seeds have brought about considerable imporvemnt in agro-economics all over the world called 'biorevolution'. The HYVs came to India with the GreenRevolutin and have increased the productivity by around 10% to 20%. The use of improved seeds forms a major element in agricultural strategy. Introduced in 1967-68 on a major scale, the use of HYV seeds has risen from near zero level in 1950 to 65 lakh quintals in 1994-95, covering an area of 71.3 mHa (40% of the gross cropped area). Results have been most impressive in foodgrains. Wheat has 90.7% of its area, amounting to 23.2 mHa under HYV seeds Smilarly rice has 74.6% (31 mHa)

and coarse cereals have 56.5 %( around 17 mHa) of their area under HYV seeds. Now, HYN seeds are alos being introduced for sugarncaen, cotton and groundnut. The cotton and sugarcane production boom in Punjab is largely due to theuse of High yielding Varieties of seeds.

## **INTER-CROP DISPARITY**

It is clear from the above data that coare cereals have not been able to reach the levels attained by rice and wheat in terms of the use of HYV seeds. The weak performance of coarse cereals in explained by the following reasons-

lack of suitable varieties for different agro-climatic regions;

vulnerability of existing varieties to pests and diseases;

lack of assured irrigation in rainfed areas, where most of the coarse cereals are grown.

Fertilizers are ot being used to the recommended levels in coarse cereals regions; Practical difficulties in multiplication nd distribution.

## **REGIONAL DISPARITY**

Regional disparity in use of HYV seeds is alos reflected in agricultural production. For instance, the agriculturally developed states Punjab and Haryana have 88% and 75% respectively of their area under HYV seeds, while Assam with 15% cropped area under HYV seeds and Orissa (12%) are dependent on the Centre for their food reuirements, despite being gifted with the fertile plainsof Brahmaputra and Mhandadi.

## GOVERNMENT MEASURES TO PROMOTE THE USE OF HYV SEEDS

- 1. A three-tiered organizational structure has been created for the production and dissemination of improved seeds
  - i) **Breeder seeds** The Indian Council for Agricultural Research organizes breedingof these seeds in agricultural universities and research institutes.

- Foundation Seeds From breeder seeds, foundation seeds ar produced by the National Seeds Corporation, the State Farms Corporation of Indi and the State Seeds Corporations.
- iii) **Certified Seeds** These seeds are those which are then released forcommercial production

Since 1978, the National Seeds Corporation has been operating a buffe stock to offset the harmful consequences of natural calamities, such as floods, droughts and crop diseases. And since 1988, the State Seeds Corporations have been allowed to maintain the buffer stocks of coarse grains, oilseeds and pulses.

- 2. All over the country, Seed Testing Labs, and Seed Certification Agencies have been opened.
- Besides foodgrains, seeds for commercial crops are also being developed, for instance HYV seeds for cotton are Hybrid-4 (for Gujarat), MCU-5 and Varalakshami (for Tamil Nadu).
- 4. The central government introduced a new policy on seed development in 1988, with emphasis on 9) import of quality seeds of coarse cereals, pulses, oilseeds, vetetables, flowers to facilitate upgradation of seeds and the planitn material; these seeds have beenfully exempted from customes duty, ii) incentives tothedomestic industry for self-reliance andprovision of preshipment credit for 180 days at concessional reates.
- The National Seeds Project, Phase III was launched in March 1990 with World Bank aid for strengthening the public and the private sectors in seeds. This phase ended on June 30, 1996.

### **DRAWBACKS OF HYV SEEDS**

1. These seeds are sensitive to the physical environment in which they are used.

2.Because of loss of diversity caused by widespread use of seeds from common sources, many diseases have crept in.

3. These seeds give optimum performance only when accompanied with costly inputs like fertilizers and irrigation.

4.Regional disparities in agricultural development have surfaced because of these seeds.

5.Inter-crop disparities have also appeared. For instance, improved seeds have been used in case of foodgrains (rice, wheat, jowar, bajra, maize) and commercial crops(cotton, groundnut, sugarcane, potato) but oilseeds and puses have been largely ignored.

Developing, multiplying, testing and dissemination of improved seeds is a slow process nd extension services have not been able to keep pace with the reuirements of Indian agriculture.

# THE INSTITUTIONAL FACTORS-LAND HOLDINGS, TENURE, CONSOLIDATION, LAND REFORMS

The term institutional factors refer to the particular system under which land is owned and managed. The ownership and management have a direct bearing on agricultural productivity and efficiency. The goveremtn has given emphsis on, besides technological advancement, institutional advancement through land reforms. A land reforms package broadly involved following components-

- i) abolition of intermediaries,
- ii) tenancy reforms (i.e., providing security of tenure),
- iii) ceiling and redistributin,
- iv) consolidation
- v) Updating of land records.

## **TENANCY REFORMS-ABOILITION OF INTERMEDIATRIES**

During the British rule, the land tenure system was characterized by feudal production relations, and different land tenure systems prevailed in different part of the country. The **zamindari system** or the 'malguzari' system prevailed in Punjab.

The **ryotwari system** covered the rest of the country's area under direct British rule.

Ryots (owner-cultivator or occupancy tenants with permanent and heritable right, subject to the payment of rent) had no direct contact with the government. The zamindars or their agents were content with receiveing fixed rents and mde no efforts to improve the infrastructure or the conditions or ryots. The tenats, on the other hand, had neither the means nor any incentive to invest because land was not owned by them. This led to stagnation in agriculture- the mainstary of the country's economy.

After independence, by abolishing zamindari, the intermediary deadwood was removed, and the government. Around twocrore ryots wre covered this way. Folowing this, a section of substantial owner-cultivators emerged with characteristics of capitalist farmers. Now, profit, and not rent collection, became the primary incentive. This, coupled with political unity and stability and a unified market, engcouraged commercial farming involving increased use of modern inputs like irrigation, fetilsers, improved seeds, pesticides etc. This trend has been visible more in Punjab, Haryana, western uttar Pradesh, coastal Andhra Pradesh, Gujarat and Tamil nadu. Had other parts of the country shown similar growth, the non-farm sector would have grown more vigorously.

Thus tenancy reforms, by conferring ownership rights and providing security of tenure, by abolishing 'benami' ownership, have brought stability to agricultural activity.

## **CEILING AND REDISTRIBUTION**

A major policy orientation in the post-independence planning process has been social progress along with economicdevelopment. Removal of intermediaries is not solution for unequal distributin of land assets and the problemoflandlessness. More thanalf the land holdings are of the size less than one hectare while the average size for India as a whole is 1.6 hectare (1991). Thus the next step in theprocess of land reforms was the fixation of ceilings and redistribution of the surplus land.

A large number ofalnd ceiling laws were passed by various states during Secondand third plans. These lawa applied the ceiling critieria taking into account the quality of lands, family size, levelofirrigation etc., and provided exemptin to certain categories ofland. Fresh guidelines regarding redistribution of the surplus land were issued by the Centre to the states. Enactments included in the Ninth Schedule to the Constitution are conferred immunity from legal challengeon the ground that they violate the Fundamental Rights vide Article 31B of the Constitution. In the past, whenever it was found that progressive legislation conceived in the interest of the public was being imperiled by litigation, recourse was taken to the Ninth Schedule. So far, 249 land land laws have been included in the Ninth Schedule, out of which 27 reform laws were included vide Constitution (78<sup>th</sup> Amendment) Act, 1995.

The total area, so far declared surplus under the programme of distribution of Ceiling Surplus Land is 30.34 lakh hectar, out of which possession has been taken of 26.64 lakh hectare, a total area of 21.06 lakh hectare. A total area of 21.06 lakh hectare has been distributed to 51.47 lakh hectare has been distributed to 51.47 lakh beficiareies fo whom 36% belong to the Scheduled Castes and 14% belong to the Scheduled Tribes. A sizeable chunk of the redistributed land lies int eh states of West Bengal, Kerala and Karnataka.

But, despite these measures for land reforms, the problem of 'benami' ownership remains. Moreover most of the land distributed under land reforms is of inferior quality. Also, a totalof 15 lakh acres land is still locked in litigation The value fo Gini Coefficient was 7.2 in 1960-61, but in 1980-81, it wa 7.1, which indicated concentration of land holdings. These are disturbing tends.

### **CONSLIDATION OF HOLDINGS**

#### **Dream Dare Win**

With an average land holdingsize of 1.6 hectares in 1991, further fragmentation of holdings is a serious problem. Fragmentation occurs on account of distribution within the family after the father's death or due to sale, mortgage, gift etc. Fragmentation leads to the following problems.

- 1. Difficulty is experienced in introduction of modrn inputs and techniques. Small size makes costly investments uneconomic. Mechanisation offarming operations is not possible is small plots. Also, soil improvement and crop protection measures are effective only when taken up in the whole region.
- 2. Precious land is wasted in fending etc.
- 3. Small plots in the neighbourhood of each other give rise to land disputes and lead to litigation.

The remedy for these problems has been sought in consolidation of holdings. This means that all the plots of a landholder, situated in different parts of the village, are brought together in one or two compact blocks. This is done by firs tpooling all land in the village andthen dividing it among the land-owners in such a way that they receive compact blocks. For this purpose, all land is reduced, on the basis of its quality and situation, to standard grade. Every owner gets, out of the common pool, land in proportion to that contributed by him in terms of the standard grde. So far, 62.97 mHa (more thanone-third of the fross cropped area) have been sonsolidated. Bulk of this work has been done inMaharashtra, Uttar Pradesh, Haryana, Punjab, Bihar and Orissa.

Thus, consolidation creates favourable conditions not only for on-farm investment, but also for capitalist farming, that is, for cultivation of a substantial scale, employing hired labour. Consolidation of holdings has contributed in no small way to the agricultural development of states like Punjab and Haryana.

The slow progress of consolidation of holdings over large parts of the country is accounted for by several factors.