

Text Book for

# RPSC-AEn

Rajasthan Public Service Commission-Assistant Engineer

## Main Examination (Paper-2)

for Civil, Electrical and Mechanical Engineering

# SOCIAL ASPECTS OF ENGINEERING

### HIGHLIGHTS

- ✍ As per RPSC-AEn Mains Syllabus.
- ✍ Previous year solved question Papers with detailed solutions.
- ✍ This book is cover State Engineering Service Exams.



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# PREFACE

The book has been designed as per the latest syllabus prescribed for RPSC-AEn (Rajsathan Public Service Commission-Assistant Engineer). RPSC-AEn Mains Examination is conducted by Rajsathan Public Service Commission for the recruitment of Assistant Engineers for government departments. We as a leading publisher in technical books, have made an attempt to provide the complete book covering all the sections of this examination. Each section covered compressively. Topics have arranged as per syllabus of RPSC-AEn Mains. This book will serve the purpose for the student who are preparing for RPSC-AEn Mains Examination. The main objective of this book is to guide the students about the technique of questions asked in the examinations. Every attempt has been made to make this book student friendly.

Even though, enough readings were given for correcting the error and printing mistakes, due to human tendency there could be some minor types in the book. If any such types found, they will be highly appreciated and in corporated in the next edition. Also, Please provide your valuable suggestions at : [engineers.academy.india@gmail.com](mailto:engineers.academy.india@gmail.com)

*Wish you all the best. Have a nice reading.*

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# Syllabus

**Development Processes:** Inter relationship between social, economic, scientific and technological factors for development. Development criteria; gross national product, energy consumption.

Rural economy, poverty, unemployment, exodus to urban areas. Land acquisition act.

**Globalisation of Economy:** World Trade Organization (W.T.O.), trade related Intellectual Property Rights (TRIPS), Quality assurance, ISO certification. 5 'S' Theory, Optimisation of human, capital and material resources.

Financing methods of infrastructure projects-BOT, PPP etc., Case studies of recent projects in Rajasthan-Refinery, IIIT, NHAI Highway, Dedicated Freight Corridor, Metro Rail Project.

Technology for rural and Desert Areas, Characteristic of desert areas, Thar desert, desertification and its control, sand dunes stabilisation.

Rural energy needs, Deforestation, Modern Solar appliances, Challenges in Solar Power and Wind Power Generation and their Connection to Grid.

**Rural industries.** Soil and water conservation, water harvesting, watershed planning. Thermal comfort aspects of housing, transport in rural and desert areas, Drought, Famine and Disaster management.

**PMGSY Project.** Right to Information act-its provisions.

**Technology Assessment and Transfer:** Criteria for assessment and selection of technology, appropriate technology concept, technology transfer and development.

**Human Relations in Industry and Industrial Laws:** Application of social sciences to industry, leadership and supervision, Labour relations, Trade unions, Salient features of Factory Act, Workmen's Compensation Act, Minimum Wages Act. NAREGA project. Motivation. Conflict Management.

**Project Planning, Appraisal and Feasibility:** Techno economic feasibility studies, Project planning and control, Use of CPM and PERT, Fixed and variable cost, IRR (Internal Rate of Return), Cost-benefit ratio, NPV (Net Present Value) Break even analysis, Depreciation, life cycle costing. Software applications in life cycle cost analysis. Project Monitoring by SAP and other softwares.

**Environmental Degradation and Resource Depletion:** Environmental degradation due to energy production, transport, industries, mining and intensive agricultural practices, control of air and water pollution. Hazards of environmental pollution. Health problems, challenges and their remedies due to some industry, textile industry, coal based thermal power plants and refinery cum petrochemical complex in Rajasthan. Challenges and utilisation of industrial by products (Like Flyash) in Rajasthan.

Depletion of natural resources due to population explosion and continuously rising standards of living. Environment impact analysis of projects, green technologies, Concept of sustainable development. National environmental laws. Carbon footprint of technologies, carbon credit system.

Dumping of Radioactive waste-methods and monitoring. Effect on health.

**Development of Science and Technology:** Information technology application in Project Designing, Project evaluation programme, implementation and monitoring.

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# DEVELOPMENT PROCESS

## THEORY

### 1.1 | SOCIAL DEVELOPMENT

Social development is intuitively related with those changes in the system that improves the general well-being it's people.

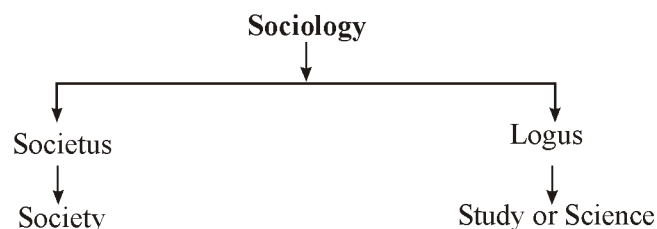
Development is a natural process that is related with an improvement of society. Social development on the other hand, is related with changes in the social environment that curbs this tendency. We sustain that social, economic, institutional and cultural development are related with a balance of power and interest with the population, which promotes the general good over the personal good, thus improving the general well-being the population.

Social development doesn't depend on any political, social or economic ideology. Development is a natural occurrence in the physical world and so it is social development. Societies can either develop remain stationary or regress depending on inhibiting or facilitating internal factors to the system or external factors to the surrounding environment.

### 1.2 | SOCIAL ENGINEERING

"Social Engineering" is not a new term. It comes from the field of social control. Social Engineering can refer to the process of redefining a society or more correctly, engineering society, to achieve some desired outcome.

The term can also refer to the process of attempting to change people's behaviour in a predictable manner, usually in order to have them comply with some new system.



**Example:** (i) Indian Society

(ii) Western Society

Difference in terms of dress, customs and conventions.

**Note:** The process of change in structure of society is called dynamism.

**1.2.1 | SOCIOLOGY**

Sociology is a body of learning about society. It is a description of ways to make society better. It is social ethics, a social philosophy.

A simple definition of sociology here is that it is the study of society and culture. The concepts of "Society and culture" are central in sociology.

**Distinguishing between Society and Culture**

- **Society** : A group of people who lives within some type of boundary territory and who share a common way of life.
- **Culture** : Culture is common way of life shared by a society of group.

**Thus Sociology may be generally defined as a social science that studies such kind of phenomena as:**

- The structure and function of society as a system.
- The nature, complexity and contents of human social behaviour.
- The fundamentals of human social life.
- Interaction of human beings with their external environment.
- The indispensability of social interactions for human development.
- How the social world affects us etc.

**Definition of sociology by different Sociologist**

- George Simmel* Opines that it is a subject which studies human inter-relationship.
- Giddins* is of view that "Sociology is Scientific study of Society."
- Max Weber* has viewed sociology as "Science which attempts imperative understanding of social actions."
- Sorokin* is of the opinion that sociology is a study first of all the relationship and correlation between various classes, second between the social and non social aspects of life and third it studies general characteristic common to all classes of society.
- Ogburn* has said that, "Sociology is concerned with the study of social life and its relations to the factors of culture, natural environment, heredity and group."
- Durkheim* while defining sociology has said that "it is the science of collective representation."

**1.2.2 | DEVELOPMENT PROCESS**

Development means increase in both material and non-material things necessary for existence and improvement of man living on this planet. Man includes all types of species process means ways and methods adopted and a number of input that are required by the society to achieve the development.

The material and quality of life which includes level of education, hygienic conditions of life, social and ethical values are equally important in the process of development.

"Development or Process Means Change"

According to world development report (given by world bank in 1991), a better quality of life in world's poor countries calls for higher income-but it involves much more. It encompasses better education, higher standards of health and nutrition, less poverty, a cleaner environment, more quality of opportunities.



Development is understood in terms of the following :

- Social
- Political
- Economic
- Environmental

Social development, process of growth and development of the capacities of the people and the improvement of society in which they live in order to obtain a better life for all.

Political development, process of increasing rationality, equality, participation and secularization in the political system.

Economic development, discussed in terms of economic growth although economist were aware of non-economic factors.

Development means rising trend of real national income over a long period of time. It means that if the national income of a country which is also called GNP (Gross national product) increases then the country will be materially well off, because the nation shall have more and more things of day to day life upon which standard of the living of the people depends.

If the national income of a country increase say x-₹ crores to y-₹ crores per annum and does not get distributed properly among all the people in a desirable manner then it is not called development, so increase in per capita income that is the income of per person is essentially an index of the development. This system ensure balanced development.

Real development in which increase in the GNP (Gross national product) and distribution simultaneously

- There should be sustainable (For long period of time) development.
- The development should be consistent and persistent. (Continuous increase in real per capita income)
- Output produced should proper ratio of capital goods and consumer goods.

**Example :** What is development process?

**Solution:** Development means change. The term development and growth are one and the same thing. Both can be used interchangeably in the discussion and explanation of this chapter. Development means rising trend of real national income over a long period of time. It means that if the national income of a country which is also called GNP (Gross National Product) increases then the country will be materially well off because the nation shall have more and more things of day to day life upon which the standard of living of the people depends. One thing is worth mentioning here that national income (income of the nation) is the monetary expression of material and non-material things called GNP. Material things are those which can be touched like furniture, machines and a large number of non-material goods like services etc. But this is not the perfect definition of development. A few points mentioned below must necessarily be taken into account with regard to the term development used:

- (i) If the national income of a country increases say from ₹500 crores to ₹1000 crores per annum and does not get distributed properly among all the people in a desirable manner then it is not called development. So increase in per capita income that is the income of per person is essentially an index of the development. This system ensures balanced development.
- (ii) Secondly, an increase in national income and per capita income should be real which means price should be controlled. If the per capita income of people increases and at the same time cost of living index goes up then it will not be called development but stagnation or may be retardation because the standard of living of the people shall remain the same. So far real development is concerned there should be an increase in the GNP and the distribution should be even also.

- (iii) Thirdly, an increase in real per capita income should be over a long period of time as fluctuating change (that is in one year rise and an another year fall) do not constitute real development. There should be sustained development.
- (iv) Fourthly, development should be consistent and persistent. In other words there should be continuous increase in the real per capita income. And this increase should be over a long period of time.
- (v) Lastly, the output so produced constituting GNP should include the proper ratio of capital goods and consumer goods.

Keeping all the above points in view a concise definition of development could be that development or growth means rising trend of real per capita income over a long period of time with controlled cost of living index and population growth with reduction in inequalities of income and ensured increased standard of living and social welfare of people. The basic parameters described with regard to development or growth are life-sustenance (provision of basic needs of people ), self-esteem (feeling of self respect) and freedom.

### **1.2.3 | PARAMETERS (INDEX) OF SOCIAL ECONOMIC DEVELOPMENT**

- I. Increase in real per-capita income :
  - This is national Income divided by Population.
- II. The extent to which national income has increased and what growth rate of this income.
- III. What is the share of National income coming from
  - Primary Sectors
  - Secondary Sectors
  - Tertiary Sectors (Services) of the country.
- IV. Extent of
  - Urbanisation
  - Literacy
  - Education Rate
- V. Extent of infrastructure Facilities such as
  - Transport & Communication
  - Energy
  - Water supply and
  - Electricity etc.
- VI. To what extent application of Science and Technology is made and what is the magnitude of research in the various field.
- VII. What type of man power the country has been able to possess. In other words how many engineers, doctors and professional do a nation has.
- VIII. There should be multi dimensional development and people should have scientific temperament and cultural attitude.

## **1.3 | FACTORS DETERMINING DEVELOPMENT PROCESS**

### **1.3.1 | NATURAL RESOURCES**

This is the principal factors of economic growth and process of development. Land is the main natural resources and includes

- Fertility of land
- Composition
- Minerals
- Water resources
- It's situation
- Forest wealth
- Climate
- Oil resources etc.

Development will be fully if proper utilization of resources done.

Japan is one such country which is deficient in natural resources but is one of the most advanced countries of the world because it has been able to discover new uses for its limited resources.

### **1.3.2 | HUMAN RESOURCES**

Human resources development refers to how many trained, educated and skilled people do we have in our country is an important issue because it is only this resources depends.

Human capital is the process of increasing knowledge, technical know-how, efficiency, skill and other capacity of the people of the country.

### **1.3.3 | CAPITAL FORMATION**

Process of capital formation depends upon existence of real savings, existence of credit financial institutions to mobilize saving and using these saving for investment in capital goods.

The process of capital formation leads to increase national output in a number of ways.

### **1.3.4 | TECHNOLOGICAL FACTORS**

Process of development needs technological changes as the world is developing very fast. Changes in technological factors leads to increased level of labour productivity.

### **1.3.5 | SOCIAL FACTORS/NON-ECONOMIC FACTORS**

This factor includes

- Cultural attitude
- Social values and institutions
- Caste system institutional changes
- Political and administrative changes have much to do with the process of development.

### **1.3.6 | CONTRIBUTION OF SCIENCE AND TECHNOLOGY TOWARDS DEVELOPMENT :**

- Increase productivity qualitatively and quantitatively in both agricultural and industrial sector.
- Upgrading the existing industry to make them domestically attracted as well as export competitive.
- Generation of energy
- Advancement and improvement in defence capabilities
- Exploration and extraction of new natural resources
- Conservation of resources
- Development and growth of human resources including food, cloth, health, sanitation hygienes, nutrition and water supply.
- Reduction in regional imbalance.
- Employment generation and removal of poverty.
- Development of innovation and discoveries.

**1.4 | DEVELOPMENT CRITERIAN**

There are two issues related to development of process.

- Quantitative aspect
- Qualitative aspect

QOL = Quality of Life

PQOL = Quantitative aspect or Physical quality of life.

Balance between the two is necessary for development quality of life (QOL) is quality aspect whereas PQOL is called quantitative aspects.

Quality aspects in terms of numerical expression

- In a schools, colleges, institutions, universities, higher learning centre depends on
  - Number of students acquiring education
  - Teacher imparting education
  - Pass percentage in the field of education
- **In the field of health**
  - Number of medical colleges
  - Hospitals
  - Dispensaries
  - Number of doctors after patients
- **In the field of Production**
  - Number of goods produced both household and producer goods
  - Quality of goods sold
  - Number of machine installed
  - Amount of wages and salaries paid to the workers.

It means if the number of things increase then the country has progressed and developed in terms of physical quantity.

The changes in number from time to time is depicted by tables and graphs so that people understand about the development related to quantitative aspect.

**1.4.1 | MEASUREMENT OF QUALITY OF LIFE (QOL)**

Quality of life is an inclusive concept which covers all aspects of living including material satisfaction of vital needs as well as more transcendental aspects of life such as personal development, self-realisation and a healthy ECO-system.

QOL = Quality of thing produced. [✓]

Number of things produced. [×]

Quality of life give much importance not to numbers alone as mentioned above but the quality of things so produced.

So it is immaterial to think as how many institutions and educational centres have been opened, what matters is the quality of students coming out or passing out from these institutions.

- Are they intelligent
- Disciplined having mental abilities and aptitudes.
- Whether their faculties and talents have been fully developed?

Can they after completion of their education inspire other with their personal qualities.

Similarly in the field of health it does not matter how many doctors do we have but what matters is the qualities of doctors produced.

Such that, quality of life is related to such things as increase in expectancy of life, better food, skill formation etc.

#### **1.4.2 | DETERMINANTS OF QUALITY OF LIFE**

- Health
- Education
- Culture and time use
- Housing
- Environment
- Public Safety
- Employment and Public life
- Income, consumption of wealth
- Social welfare and popular participation

It is concluded that development process needs both quality and quantity to be rationally balanced.

#### **Example : How the Quality of Life can be improved?**

**Ans.:** The quality of life can be improved through

**Individual Efforts :** It means improving physical quality life of individuals living in society.

- By achieving maximum level of literacy.
- By improving individual capacity of work and producing more than total improvement.
- Adequate nutrition, including ready access to uncontaminated water supply.
- Adequate housing.
- Adequate Clothing.
- Access to Prevention and curative medicine.
- Security of life and property and
- Gainful employment.

**Small Group Activities :** Man is a social animal. He is gifted with quality of co-operation with fellow beings to achieve aims of better living.

Small group activities with regards to quality of life includes.

- Organization of food security/production and distribution system.
- Housing scheme.
- Organization of production/distribution system for clothing.
- Organization of network of medical facilities.
- Security and police.
- Employment schemes.
- Mass education covering area of nutrition, water use, child care and health care etc.

**Government Intervention :** State and Central government interference with working system for improving the overall quality of life.

- Firstly, government arranges a number of infrastructural facilities, which producing sector particularly private sector cannot manage and arrange due to financial and resource constraints.
- Secondly, to check adulteration in products and exploitation the intervention reduce in equalities of income and ensure even distribution of income GDP. This is done by using effective fiscal and monetary measures.
- Thirdly, government through public expenditure improves the quality of life.
- Fourthly, planning is a great assets with government for development of culture upon which overall nation's quality of life.

## **1.5 | ROLE OF PLANNING IN DEVELOPMENT**

Planning is a method of making better decisions for the future. It is an important component of development activities. Planning is to act according to decision. All works with planning if well defined, goals and objectives are achieved whether it is an individual firm, professional body, governments, corporate sector or any other unit involved in economics growth, intersectional coordination, social welfare and social relations.

- In India, the idea of planning has been identified more with extensive government control over the economy.
- Since 1951 successive five year plans have been prepared by the planning commission these are development plans.
- Each plan lays down broad targets, energy and transport, industry, health and family welfare, science and technology etc.
- Ours is a mixed economy in which a plans acts as a mean of coordinating actions within the public sector and between the public and private sector.

### **1.5.1 | FEATURES OF PLANNING**

- Planning is goal oriented and seeks to achieve certain objectives and goals, as one plan is linked to subsequent plan.
- Planning is done for future and in order to anticipate future accurately scientific technique of forecasting is used.
- Planning is not merely guess work but involves rational thinking.
- Planning is essentially a process of choosing among alternatives.
- Planning leads to accomplishment of desired objectives at the minimum possible cost.
- Planning is a continuous process - a never ending function due to ever-changing environment of development process.

### **1.5.2 | STEPS IN PLANNING**

Steps involves in development planning are :

- Define and decide clearly the objectives.
- Discover the various sources of action which may be used to achieve the established objectives.
- Collect all relevant information related to it primary and secondary sources. The data, so collected serve the purpose as the basis for development of an alternative course of action.

- The various alternatives are evaluated and compared in terms of their expected cost and benefits. In a socialistic pattern of society and mixed economic system, social welfare instead of profit motive is the main consideration.
- Once the plan is decided the next course of action is to develop details plan.

DPR = Detailed project report.

The DPR refers to policies, procedures, rules, programmes, schedules and budgets etc.

- There after plans are required to be explained to subordinates to enlist their support in the execution of plans.
- Continuous evaluation of plan is essential as it helps to detect short comings or pitfalls. All plans should be renewed from time to time in the light of current circumstances and accordingly necessary action should be taken to keep them updated.

### **1.5.3 | 12<sup>th</sup> FIVE YEAR PLAN (2012-17)**

The Twelfth Plan commenced at a time when the global economy was going through a second financial crisis, precipitated by the sovereign debt problems of the Eurozone which erupted in the last year of the Eleventh Plan. The crisis affected all countries including India. Our growth slowed down to 6.2 percent in 2011-12 and the deceleration continued into the first year of the Twelfth Plan, when the economy is estimated to have grown by only 5 percent. The Twelfth Plan therefore emphasizes that our first priority must be to bring the economy back to rapid growth while ensuring that the growth is both inclusive and sustainable. The broad vision and aspirations which the Twelfth Plan seeks to fulfil are reflected in the *Subtitle: 'Faster, Sustainable, and More Inclusive Growth'*.

Inclusiveness is to be achieved through poverty reduction, promoting group equality and regional balance, reducing inequality, empowering people etc. whereas sustainability includes ensuring environmental sustainability, development of human capital through improved health, education, skill development, nutrition, information technology etc. and development of institutional capabilities, infrastructure like power telecommunication, roads, transport etc.

#### **Monitorable Targets of the Plan :**

Twenty Five core indicators listed below reflect the vision of rapid, sustainable & more Inclusive growth of the twelfth Plan :

##### **(i) Economic Growth**

- Real GDP Growth Rate of 8.0 per cent.
- Agriculture Growth Rate of 4.0 per cent.
- Manufacturing Growth Rate of 10.0 per cent.
- Every State must have an average growth rate in the Twelfth Plan preferably higher than that achieved in the Eleventh Plan.

##### **(ii) Poverty and Employment**

- Head-count ratio of consumption poverty to be reduced by 10 percentage points over the preceding estimates by the end of Twelfth FYP.
- Generate 50 million new work opportunities in the non-farm sector and provide skill certification to equivalent numbers during the Twelfth FYP.

**(iii) Education**

- Mean Years of Schooling to increase to seven years by the end of Twelfth FYP.
- Enhance access to higher education by creating two million additional seats for eachage cohort aligned to the skill needs of the economy.
- Eliminate gender and social gap in school enrolment (that is, between girls andboys, and between SCs, STs, Muslims and the rest of the population) by the end ofTwelfth FYP.

**(iv) Health**

- Reduce Infant mortality rate (IMR) to 25 and Mother mortality rate (MMR) to 1 per 1,000 live births, and improve Child Sex Ratio
- (0–6 years) to 950 by the end of the Twelfth FYP.
- Reduce Total Fertility Rate to 2.1 by the end of Twelfth FYP.
- Reduce under-nutrition among children aged 0–3 years to half of the NFHS-3 levelsby the end of Twelfth FYP.

**(v) Infrastructure, Including Rural Infrastructure**

- Increase investment in infrastructure as a percentage of GDP to 9 per cent by theend of Twelfth FYP.
- Increase the Gross Irrigated Area from 90 million hectare to 103 million hectare bythe end of Twelfth FYP.
- Provide electricity to all villages and reduce AT&C losses to 20 per cent by the endof Twelfth FYP.
- Connect all villages with all-weather roads by the end of Twelfth FYP.
- Upgrade national and state highways to the minimum two-lane standard by the endof Twelfth FYP.
- Complete Eastern and Western Dedicated Freight Corridors by the end of TwelfthFYP.
- Increase rural tele-density to 70 per cent by the end of Twelfth FYP.
- Ensure 50 % of rural population has access to 40 lpcd piped drinking watersupply, and 50 % gram Panchayats achieve Nirmal Gram Status by the end ofTwelfth FYP.

**(vi) Environment and Sustainability**

- Increase green cover (as measured by satellite imagery) by 1 million hectare everyyear during the Twelfth FYP.
- Add 30,000 MW of renewable energy capacity in the Twelfth Plan
- Reduce emission intensity of GDP in line with the target of 20 per cent to 25 percent reduction over 2005 levels by 2020.

**(vii) Service Delivery**

- Provide access to banking services to 90 per cent Indian households by the end ofTwelfth FYP.
- Major subsidies and welfare related beneficiary payments to be shifted to a directcash transfer by the end of the Twelfth Plan, using the Adhar platform with linked bankaccounts.

**Targets for 12<sup>th</sup> Five year Plan for Rajasthan :**

Sector	Target for Twelfth Plan for Rajasthan
Agriculture	3.50%
Industries	8.00%
Services	9.50%
Total Growth Rate	7.70%



The major head-wise proposed allocations are :

Head of Development/Sector	Twelfth Plan Proposed Outlay (2012-17)	Percent to Total Outlay
Agriculture & Allied Services	10977.13	5.57
Rural Development	17738.39	9.00
Special Area Programme	1151.94	0.59
Irrigation and Flood Control	7853.91	3.99
Power	72723.25	36.92
Industry & Minerals	993.52	0.50
Transport	10408.22	5.28
Scientific Services and Research	242.07	0.12
Social & Community Services	69490.58	35.28
Economic Services	3673.83	1.87
General Services	1739.16	0.88
<b>TOTAL</b>	<b>196992.00</b>	<b>100.00</b>

Some Monitorable socio economic parameters are :

Social Indicators	Unit	Twelfth Plan Goals for Rajasthan
Infant Mortality Rate (IMR)	Infant deaths per thousand live births	40
Maternal Mortality Ratio (MMR)	Maternal deaths per lakh live births	200
Total Fertility Rate (TFR)	Birth per Woman	2.5
Malnutrition among Children under 3 years	Percent	25.3
Anemia among women (15 – 49 years)	Percent	24.3
Sex Ratio (0 – 6 years)	Girls per thousand Boys	912
Total Literacy Rate	Percent	79.57
Male Literacy Rate	Percent	91.89
Female Literacy Rate	Percent	66.22

**Recent Changes in Approach :**

With the scrapping of planning commission, the era of five year plans has come to an end. The 12 five year plan was India's last five year plan. The Niti Aayog, which has replaced the planning commission has launched a three year action plan from April 1, 2017. Niti Aayog has also been entrusted the work on the 15 year vision document and a seven year strategy, which would guide the government's development works till 2030.

## **1.6 | RELATIONSHIP BETWEEN ECONOMIC, SOCIAL & SCIENTIFIC FACTORS**

Economic development is not possible without the social change and technology is most necessary factor in the change from the traditional stage to modernization one. This shows that social, economic and scientific factors are all highly interrelated. Modern society is very complex and complicated. Thus, one aspect of development affects the others.

Economic development brings social prosperity, better education, quality food and shelter, etc. In the same way, scientific factors bring about the economic advancement. When the society adopts the latest scientific means of production, then there is economic prosperity and the living standard of the people goes up.

To become a developed country, the underdeveloped countries should accept change as a norm and as a value. The society, its institutions, and the people should be ready to accept change. The customs and traditions of society, the relationship between government and the people, the religions and their sentiments must all be conducive for change, so that social transformation may occur for economic growth.

For example, in India, the use of fertilizers, better seeds, co-operating farming has tended to fail because these techniques are not in conformity with the people's belief systems and activities.

**Example :** Explain Inter-relationship between social, economics, scientific and technological factor for development:

**Solution:** Development is a goal of all nations, and a life necessity for human beings. Strategies for economic development stress the importance of science and technology in accomplishing such goals. We know that there is a strong relationship between science and technology in the context of the economic and social development.

- **Interrelationship between social and economic Development :**

To understand the relationship between social and economic development first we need to understand the meaning of social and economic development.

Economic development is a process in which different sectors of the economy such as agriculture, industry, trade, transport, irrigation, power resources etc. are improving. It is related to the improvement in the economic condition of people and the country as a whole. Expanding activities such as agriculture industry and services help to develop an economy.

On the other hand social development is related to the improvements in health, education, housing, drinking water, etc. and the social status as a whole. Improvement in them may be indirectly related to economic development because if income increases, people can enjoy better health, education, nutritional food and housing. If the people are poor, they can suffer from malnutrition, sickness, illiteracy, homelessness, etc. So, the essence of economic development is the growth of output or real income per head of population.

There is a dispute among different development economists regarding the interrelationship between the social and economic development. Economist such as Zuvekas considered that there is no interrelationship between social development and economic development. According to Zuvekas economic development can occur without social development. But some other economist such as Rostow considered that economic development determines social development and social development precedes economic development. They argued that we need economic development to ensure the well-being of the society and improve standards of living and this improvement in the well-being of society leads to the economic development.

Thus we can say that economic and social development is highly interdependent. Due to the needs of social development the economic development takes place in the society. As well as the economic development leads to the social development.

We know human wants are unlimited and resources available to society are limited. Therefore, To satisfy its wants man tends towards the economic development. This results in an increase in the production of goods and services. This increase in production and introduction of new services and advancement of services leads to the social development or in other terms it leads to the improvement in the living standard of the people.

This standard of living includes various things like safe drinking water; improve sanitation systems, medical facilities, spread of primary education to improve literacy rate, eradication of poverty, balanced transport networks, increase in employment opportunities etc. Thus, the quality of life is the major indicator of economic development. Therefore Economic development and social development are complementary to each other.

We know that environment is a major content of the society. In the traditional opinion, environmental protection and economic development are mutually contradictory, economic growth must be a high environmental cost, and to protect the environment will limit economic growth. At present, with economic development, many environmental concerns arise in today's society. Air, water, and land pollution have been worsening; the environment of wild animals and plants has been seriously damaged, many species are threatened with extinction. Deforestation and over-exploitation of mineral resources give human survival and development a real and more serious potential threat.

Thus we can say that development is the theme of the modern society.

- **Interrelationship between social and scientific and technological development :**

There is co dependence between social development and scientific and technological development. This co dependence or interrelationship has been emerged from the dawn of civilization. Early humans invented wheels and other important tools to make their life simple. After that different kind of intervention are taking place day by day to help the society in different ways. Thus the social needs promoted scientific and technological development and this development also endorsed the social development.

Innovation is the primary driver of technological growth and drives higher living standards. Developments in science and technology are fundamentally changing the way of living of the society, as it puts a vast impact on the society regarding connection, communication and transaction.

Recently developing nations are putting stress on scientific and technological development to fulfill the unlimited wants of society with the help of available limited resources. Investment in research and development promote technological advancement.

If there is a development of society in terms of education, health and skills, the scientific and technological development takes place. These technologies have the power to better the lives of all human beings. For example innovation of vaccination is now helping people to live healthy and productive lives.

For other instance, the combination of computers and the Internet, and mobile devices, has transformed human experience, empowering individuals through access to knowledge and markets, changing the relationship between humans and those in authority, as well as allowing new communities to emerge in virtual worlds that span the globe. So the cellular technology has allowed society to leapfrog the age of fixed line telephony, bringing affordable access to millions of people.

At present advances in science and its resulting technologies, such as global communication, satellite images of Earth, development of meteorology, different ways of exploring oil etc., have irrevocably expanded the space for society. Science is largely responsible for a growing public awareness.

The implementation of technology and scientific development influences the society by changing expectations and realities. The implementation of technology is also influenced by values.

Technology often has a more direct effect on society as it solves practical problems, serves human needs and promotes development. New problems and needs may then arise. Science enlarges or challenges societal views of the world. A scientific explanation of a phenomenon may lead to a technological development that serves a societal need. Conversely, a societal need or want may result in a technological solution, which then leads to a scientific explanation.

Thus we can say that technology has become huge part of society. If there is social development takes place in the society, the society knows more about the development in a technology, and they become able to take advantage of it. Social development make the people enough skilled to use the technology in efficient way. If a man is less skilled, he won't be able use the technology in a proper way and efficiently.

- **Interrelationship between economic and scientific and technological development:**

Science and technology are key drivers to economic development, because technological and scientific revolutions prop up economic advances, improvements in level of production and services.

The technological developments are transforming business practices across the economy, as well as the lives of all who have access to their effects. In the modern world, superior technologies and scientific innovations give rise to robust economies and in a well-functioning, robust economy, economic excess naturally flows into greater use of technology. Moreover, because technology is such an inseparable part of human society, especially in its economic aspects, funding sources for (new) technological endeavors are virtually illimitable.

Adopting appropriate technologies leads directly to higher productivity, which is the key to growth. In the past two centuries, science has been used mainly as a tool for economic expansion. It is now clear that the current consumption of natural resources and increasing stresses on the regional and local environment cannot continue indefinitely without breakdown of the natural support systems that make present civilizations possible. Science, which helped to bring about this situation, now has an over-riding responsibility to help societies make a transition from an obsession with growth to achievement of a dynamically stable and sustainable ecological and economic system.

For example technology unlocks the infrastructure backlogs and integrates the supply chains. The extent to which developing economies emerge as economic powerhouses depends on their ability to grasp and apply insights from science and technology and use them creatively.

Thus at the end we can say that as an engine of development whether it is social or economic, the potential of technology is endless, and it is still largely untapped in India.

## **1.7 | GROSS DOMESTIC PRODUCT : DEVELOPMENT CRITERIAN**

The GDP (Gross Domestic Product) is indicator of economic growth and well being.

GDP (Gross Domestic Product) is total values of all products and services bought and sold, a measure of money changing hands

- The realistic measures of progress is separate costs and benefits.
- The GDP (Gross Domestic Product) has no way of assessing the values of natural resources until they enter the monetary economy or in other words are consumed.
- The GDP (Gross Domestic Product) completely ignores all activities and service that have no price attached to them

Kofi Annan the former Secretary General (SG) of UN defines a developed country is one that allows all its citizens to enjoy a free and healthy life in a safe environment.

**1.7.1 | SUSTAINABLE DEVELOPMENT**

Continuous development over a long period of time without fluctuations in the rising trend of real national income of a country and this is called sustainable development.

If the national income of a country increases in one year but falls in the subsequent year then it is not called economic development of sustainable level.

**1.7.2 | METHODS OF INDEXING QUALITY OF LIFE**

- Increase in real per capita income that is national income divided by population is a generally accepted way of indexing quality of life.
- The extent to which national income has increased and what is the growth rate of this income.
- What is the share of national income coming from the primary, secondary and tertiary sectors of the country.
- What is the extent of urbanization, literacy and education rate.
- How much and to what extent infrastructural facilities have been created. These facilities pertain to transport and communication, energy, water supply and electricity etc.
- To what extent application of science and technology is made and what is the magnitude of research in the various fields.
- What type of man power the country has been able to possess. In other words how many engineers, doctors and professionals does a nation have.
- These should be multi-dimensional development and people should have scientific temperament and cultural attitude.

**1.7.3 | VARIABLES NEEDED TO IMPROVE QUALITY OF LIFE**

- Health
- Education
- Culture
- Housing
- Environment
- Security
- Employment and Working conditions
- Income, consumption, wealth
- Social welfare
- Adequate nutrition

**1.8 | NATIONAL INCOME CONCEPTS**

National income estimates are the most reliable macroeconomic indicators of an economy. Therefore, it is essential for students to be aware of National Income Concepts. Changes in national income measure the rate of growth of the economy.

Similarly, changes in the structure of national income of an economy reflect the changing significance of different sectors. In India, national income, as also per capita income, have been continuously increasing. In more recent years, the rate of growth of national income has accelerated. It indicates that the economy has been growing at a faster rate in recent years than in the past. Along with this, the structure of national income has also undergone a change, the tertiary sector has emerged as the dominant sector of the economy.

The task of preparing national income estimates has been assigned to the Central Statistical Organisation (CSO). The CSO has been producing annual official estimates of national income of India since 1955 and publishing the same in its annual report National Accounts Statistics.

National income accounting comprises of four concepts of calculations- GDP, GNP, NDP, and NNP.

### **1.8.1 | GROSS DOMESTIC PRODUCT (GDP)**

GDP is the market value of goods and services produced within a selected geographic area (usually a country) in a selected interval in time (often a year). In India one year means from 1st April to 31st March of the next year.

GDP calculation includes income of foreigners in a Country but excludes income of those people who are living outside of that country.

### **1.8.2 | NET DOMESTIC PRODUCT (NDP)**

NDP is calculated by deducting the depreciation of plant and Machinery from GDP.

$$\text{NDP} = \text{Gross Domestic Product} - \text{Depreciation}$$

### **1.8.3 | GROSS NATIONAL PRODUCT (GNP)**

GNP is the value of all final goods and services produced by the residents of a country in a financial year (i.e., 1st April to 31st March of the next year in India).

While Calculating GNP, income of foreigners in a country is excluded but income of people who are living outside of that country is included. It is the GDP of a country added with its income from abroad.

$$\text{GNP} = \text{GDP} + X - M$$

Where, X = income of the people of a country who are living outside of the Country

and M = income of the foreigners in a country

- India's GNP is always lower than its GDP.
- This is the national income according to which the IMF ranks nations.
- It allows for knowledge of factors in production behaviour and pattern of an economy's dependence on outside world, nature of human resources internationally, position in world economics.
- It indicates both qualitative as well as quantitative aspects of an economy in a more exhaustive fashion than GDP.

Intermediate products = one production unit purchasing from other for resale

Final product = all goods and services purchased for consumption and investment, and not for resale

Value added = Value of output - Intermediate cost

Gross value added = net value added + depreciation

Indirect tax = all taxes levied on production, finally paid by consumer of buyer Ex - sales tax, excise, customs

Subsidies = Financial help given by the government to the production units for selling the product at lower prices

### **1.8.4 | NET NATIONAL PRODUCT (NNP)**

Net National Product (NNP) in an economy is the GNP after deducting the loss due to depreciation.

$$\text{NNP} = \text{GNP} - \text{Depreciation}$$

**1.8.5 | COMPARISON BETWEEN GDP AND GNP:**

GDP (Gross Domestic Product) and GNP (Gross National Product) measure the size and strength of an economy but are calculated and used in different ways.

*Comparison Chart :*

S. No.	Parameters	GDP	GNP
1.	Stands for	Gross Domestic Product	Gross National Product
2.	Definition	An estimated value of the total worth of a country's production and services, within its boundary, by its nationals and foreigners, calculated over the course on one year.	An estimated value of the total worth of production and services, by citizens of a country, on its land or on foreign land, calculated over the course on one year.
3.	Formula for Calculation	$GDP = \text{consumption} + \text{investment} + (\text{government spending}) + (\text{exports} - \text{imports})$ .	$GNP = GDP + NR$ (Net income inflow from assets abroad or Net Income Receipts) - NP (Net payment outflow to foreign assets).
4.	Uses	Business, Economic Forecasting.	Business, Economic Forecasting.
5.	Application (Context in which these terms are used)	To see the strength of a country's local economy.	To see how the nationals of a country are doing economically.
6.	Layman Usage	Total value of products & Services produced within the territorial boundary of a country.	Total value of Goods and Services produced by all nationals of a country (whether within or outside the country).

**1.9 | ENERGY CONSUMPTION**

It is the Amount of energy consumed in a process or system, or by an organization or society.

**Energy Use:**

Think about how you use energy every day. You wake up to an alarm clock. You take a shower with water warmed by a hot water heater. You listen to music on the radio as you dress. You catch the bus to school. That's just the energy you use before you get to school! Every day, the average Indian uses about as much energy as is stored in about seven gallons of gasoline. Energy use is sometimes called energy consumption.

**Who Uses Energy?**

Energy divides energy users into different categories:

- Residential
- Commercial
- Industrial
- Electric power
- Transportation

These are called the sectors of the economy.

### 1. Residential and Commercial Sectors:

Any place where people live is considered a residential building. Commercial buildings include offices, stores, hospitals, restaurants, and schools. Residential and commercial buildings are often grouped together because they use energy in the same ways—for heating and cooling, lighting, heating water, and operating appliances.

We still heat and cool rooms, and heat hot water. We have more home and office machines than ever. Most of the energy savings have come from improvements in technology and in the ways the equipment is manufactured.

- **Heating and Cooling**

It takes a lot of energy to heat rooms in winter and cool them in summer. Forty-eight percent of the energy used in the average home is for heating and cooling rooms. The three fuels used most often for heating are natural gas, electricity, and heating oil. In the future, we may see more use of renewable energy sources, such as geothermal and solar energy, to heat and cool our homes and workspaces.

- **Lighting:**

Homes and commercial buildings also use energy for lighting. The average home spends five percent of its utility costs on lighting. Schools, stores, and businesses use between 9 and 10 percent of their utility costs for lighting. Most commercial buildings use fluorescent lighting. It costs more to install, but it uses a lot less energy to produce the same amount of light.

Many homes still use the type of light bulb invented by Thomas Edison over 100 years ago. These incandescent bulbs are not very efficient. Only about 10 percent of the electricity they consume is converted into light. The other 90 percent is converted to heat.

Compact fluorescent light bulbs (CFLs) can be used in light fixtures throughout homes. CFLs cost less to use because they last longer and use less energy than incandescent bulbs. Even more efficient than CFLs, light emitting diodes (LEDs) are available. LEDs have become a very affordable option for lighting in homes and businesses, and use even less energy than CFLs. LEDs last 25 times longer than a traditional incandescent, are more durable than the other options available on the market, and have many technical applications.

- **Appliances**

Over the last 100 years, appliances have changed the way we spend our time at home. Government passed the National Appliance Energy Conservation Act, which requires appliances to meet strict energy efficiency standards. As a result of this Act, home appliances have become more energy efficient. Water heaters, refrigerators, clothes washers, and dryers all use much less energy today than they did 25 years ago.

- **Appliance Efficiency Ratings**

When you buy an appliance, you should pay attention to the yellow Energy Guide label on every appliance. This label tells you the Energy Efficiency Ratio (EER) of the appliance. The EER tells how much it costs to operate the appliance.

- **Payback Period**

Whether you buy a furnace, hot water heater, refrigerator, or other home appliance, you must choose the best bargain. Since most high-efficiency systems and appliances cost more than less efficient ones, you have to know how much it will cost to operate the appliance each year and how many years you can expect to use it. The payback period is the amount of time you must use a system or appliance before you begin to benefit from energy savings.



## 2. Industrial Sector

Every industry uses energy, but six energy-intensive industries use most of the energy consumed by the industrial sector. However, advanced technologies allow industries to do more with less energy.

- **Petroleum Refining**

Petroleum can't be used as it comes out of the ground. It must be refined before it can be used. Oil refineries use a lot of energy to convert crude oil into gasoline, diesel fuel, aviation fuel, heating oil, chemicals, and other products. About a quarter of the energy used by the industrial sector is for refining petroleum.

- **Steel Manufacturing**

The steel industry uses energy to turn iron ore and scrap metal into steel. Hundreds of the products we use every day are made of steel. It is a very hard, durable metal and it must be heated to very high temperatures to manufacture it. Producing those high temperatures takes a lot of energy. The cost of energy in the steel industry is 15 percent of the total cost of making the steel. Most of this energy comes from coal and natural gas, or electricity generated from those sources of steel. New technology has made steel stronger so that less steel is needed. Since 1990, the steel industry has reduced its energy consumption by 30 percent per ton. For example, the Willis Tower, formerly the Sears Tower, in Chicago could be built today using 35 percent less steel. The use of recycled steel also saves energy. It requires 75 percent less energy to recycle steel than to make it from iron ore. Today, two-thirds of new steel is made from recycled scrap, making steel the nation's leading recycled product.

- **Aluminum Manufacturing**

Aluminum is a very light-weight, versatile metal. We use aluminum to make soft drink cans, building materials, car parts, and many other products. It takes huge amounts of electricity to make aluminum from bauxite, or aluminum ore. The cost for this energy is about one-third the total cost of manufacturing aluminum. Today, it takes 20 percent less energy to produce a pound of aluminum than it did 20 years ago. Using recycled aluminum requires about 95 percent less energy than converting bauxite into metal.

- **Paper Manufacturing**

Every Country uses enormous amounts of paper every day- newspapers, books, bags, and boxes are all made of paper. Energy is used in every step of paper making. Energy is used to chop, grind, and cook the wood into pulp. More energy is used to roll and dry the pulp into paper. The paper and pulp industry uses 30 percent less fossil fuels today than in the past, mainly because of better technology and increased use of wood waste to generate electricity on-site. Many industries have lowered energy use by using recycled materials. In the paper and pulp industry, it is not always cheaper to use recycled paper because it costs money to collect, sort, and process the waste paper. Recycling has other benefits, though. It reduces the amount of paper in landfills and means fewer trees must be cut.

- **Chemical Manufacturing**

Chemicals are an important part of our lives. We use chemicals in our medicines, cleaning products, fertilizers and plastics, as well as in many of our foods. The U.S. has the world's largest chemical industry. Chemical manufacturing uses almost one-quarter of the energy consumed by the industrial sector. The chemical industry uses energy in two ways. It uses coal, oil, and natural gas to power the machinery to make the chemicals. It also uses petroleum, propane, and natural gas as major sources of hydrocarbons from which the chemicals are made. New technology has increased energy efficiency in the chemical industry by more than 50 percent in the last 35 years.

- **Cement Manufacturing**

New roads and buildings are being built everywhere, every day. We use lots of concrete. Concrete is made from cement, water, and crushed stone. A lot of energy is used in making cement. The process requires extremely high temperatures-up to 1,800 degrees Celsius (3,400°F). Cement plants have reduced their energy consumption by more than one-third using innovative waste-to-energy programs.

### 3. **Transportation Sector**

India is a big country. The transportation sector uses energy supply to move people and goods from one place to another.

- **Automobile**

The Indians love automobiles. We love to drive them. We don't want anyone telling us what kind of car to buy or how much to drive it. Automakers began making cars smaller and lighter. They built smaller and more efficient engines. One reason for the changes was that the government passed laws requiring automobiles to get better gas mileage. With new technologies, cars now travel more miles on each gallon of gas. Today, new passenger cars get an average of 35 miles per gallon. If automakers hadn't made these changes, we would be using 30 percent more fuel than we do today. With the recent fluctuations in fuel prices, however, demand for these big vehicles has dropped somewhat, while demand for hybrids and other fuel efficient vehicles has increased.

- **Commercial Transportation**

Passenger cars and light trucks consume about two-thirds of the fuel we use for transportation. Commercial vehicles consume the rest. These vehicles-trains, trucks, buses, and planes-carry people and products all across this vast country. Commercial vehicles have also become more fuel efficient in the last 40 years.

Trucks use more fuel than any other commercial vehicle. Almost all products are, at some point, transported by truck. Trucks are big and don't get good gas mileage. They usually have diesel engines and can travel farther on a gallon of diesel fuel than they could on a gallon of gasoline.

Trains carry most of the freight between cities. In the last years, trains have improved their fuel efficiency. Trains are lighter and stronger and new locomotives are more efficient.

Airplanes move people and products all over the country. Airlines are twice as efficient today as they were 30 years ago. Fuel is one of the biggest operating costs for airlines. Making planes more energy efficient is very important to airlines. Mass Transit is public transportation for moving people on buses, trains, light rail, and subways. Most mass transit systems were designed to move people around cities or from suburbs to cities. Very few systems move people from suburb to suburb. Most people worry about air pollution from auto exhaust. They also worry about traffic congestion.

## **1.10 | IMPORTANT FACTS OF DEVELOPMENT**

- Development means increase in both material and non-material things necessary for the existence and improvement of men living on this planet, development process assist in increasing the standard living of the people.
- The parameter of the development process includes an increase in the real per capita income the masses in the world.

- Factor determining development processes are
  - (i) Natural Resources
  - (ii) Human Resources
  - (iii) Capital Formation
  - (iv) Technology Transfers
  - (v) Social and Non-economic factors.
- Role of science and Technology is important in the process of development because it provides all types of infrastructure facilities necessary for growth.
- Quality of life include two aspects viz; QOL and PQOL is an inclusive concept which cover all aspects of living including material satisfaction of vital needs whereas PQOL include quantitative requirements.
- Planning is an important component of development activities. Planning helps in making better decisions directed towards development and growth.
- Continuous development over long period of time without the situation in the rising trend of GNP with controlled and checked environmental degradation refer to sustainable development.

**Example: Define Gross National Product (GNP).**

[RPSC AEn-2013 : 2 Marks]

**Solution:** GNP is the value of all Goods and Services made by a country's residents and businesses regardless of production location.

GNP counts the investment made by indian resident and businesses, both inside and outside the country.

$$\text{GNP} = \text{GDP} + \text{Income from abroad.}$$

