

## Study Material: Economics for Engineers

### Subject Code: (18HSS03): Syllabus (2019 onwards)

#### What Is Economics?

Economics is a social science concerned with the production, distribution, and consumption of goods and services. It studies how individuals, businesses, governments, and nations make choices on allocating resources to satisfy their wants and needs, trying to determine how these groups should organize and coordinate efforts to achieve maximum output.

Economics can generally be broken down into macroeconomics, which concentrates on the behavior of the aggregate economy, and microeconomics, which focuses on individual consumers and businesses.

#### Nature and Scope of Economics

The continuous growth in the subject matter of economics has led to divergent views about a scope of economics. It includes Subject matter of Economics, Economics is a science or an Art, or is it a Positive or Normative science.

#### Subject Matter of Economics

The subject matter of economics is the study of grounds of material interests or as the science of wealth. Men who are sensible beings and take action under the active social, legal and institutional group. It eliminates the performance, manners of socially objectionable and uncharacteristic persons like misers, thieves etc. It consists of the study of the exertion of consumption, production, exchange and distribution of wealth, as well as the fortitude of the values of goods and services the amount of employment and the determinants of fiscal development. Further it comprises the study of grounds of poverty, unemployment, under employment, inflation etc. and actions for their elimination. In short what, how, how much to produce and how to distribute it.

#### Economics as a Science

Economics is a science since its laws have widespread soundness such as the law of diminishing returns, the law of diminishing marginal utility, the law of demand etc. It is called as a science since its self-remedial nature. It goes on amendments in the dawn of new specifics based on interpretations. Hence Economics is a science like any

other science that has its own generalizations, theories or laws of economics which traces out a casual relationship between two or more phenomena.

### **Economics as an Art**

The practical application of scientific techniques is the Art of Economics. Some economists consider economics as a science and art while few others as science and applied science. It is considered as newest of science and oldest of arts and the queen of all the social sciences.

### **Economics as a Positive Science**

As per the nineteenth century experts, economics is a positive science. Since it seeks to explain what has actually happened but not what is ought to happen. According to J.N.Keynes, Positive science is defined as "A body of systematised knowledge concerning what ought to be and concerned with the ideal as distinguished from the actual."

### **Normative Economics**

With contrast to the Positive Science, Normative Science deals with the "what is ought to happen" cases. That is predictions of future economic development with regards to the present conditions are discussed in this. The postulations on which economic laws, theories or principles are based relate to man and his problems. If we attempt to test and forecast fiscal actions on their basis the subjectivity elements always penetrates. Therefore, the laws of economics are at best propensities.

### **Conclusion**

Economics is concerned with human well-being as well as ethical values. It is science and an art, since the scientific principles are applied practically. It is both positive and normative science since the actual happening and the future happenings are dealt. Hence the scope and nature of economics deals in with all the above as explained by the economists.

### **The Basic Economic Problem – Scarcity and Choice**

**Scarcity**, or limited resources, is one of the most basic economic problems we face. We run into scarcity because while resources are limited, we are a society with unlimited wants. Therefore, we have to choose. We have to make trade-offs. We have to efficiently allocate resources. We have to do those things because resources are limited and cannot meet our own unlimited demands.

Without scarcity, the science of economics would not exist. **Economics** is the study of production, distribution, and consumption of goods and services. If society did not have to make choices about what to produce, distribute, and consume, the study of those actions would be relatively boring. Society would produce, distribute, and consume an infinite amount of everything to satisfy the unlimited wants and needs of humans. Everyone would get everything they wanted, and it would all be free. But we all know that is not the case. The decisions and trade-offs society makes due to scarcity is what economists study. Why certain decisions made and what are is the next best alternative that was forgone?

### **Marginal Analysis? What it is?**

Marginal analysis is an examination of the additional benefits of an activity compared to the additional costs incurred by that same activity. Companies use marginal analysis as a decision-making tool to help them maximize their potential profits. Marginal refers to the focus on the cost or benefit of the *next* unit or individual, for example, the cost to produce one more widget or the profit earned by adding one more worker.

### **Opportunity Cost ( next best alternative) / shadow cost**

When economists refer to the “opportunity cost” of a resource, they mean the value of the next-highest-valued alternative use of that resource. If, for example, you spend time and money going to a movie, you cannot spend that time at home reading a book, and you cannot spend the money on something else. If your next-best alternative to seeing the movie is reading the book, then the opportunity cost of seeing the movie is the money spent plus the pleasure you forgo by not reading the book.

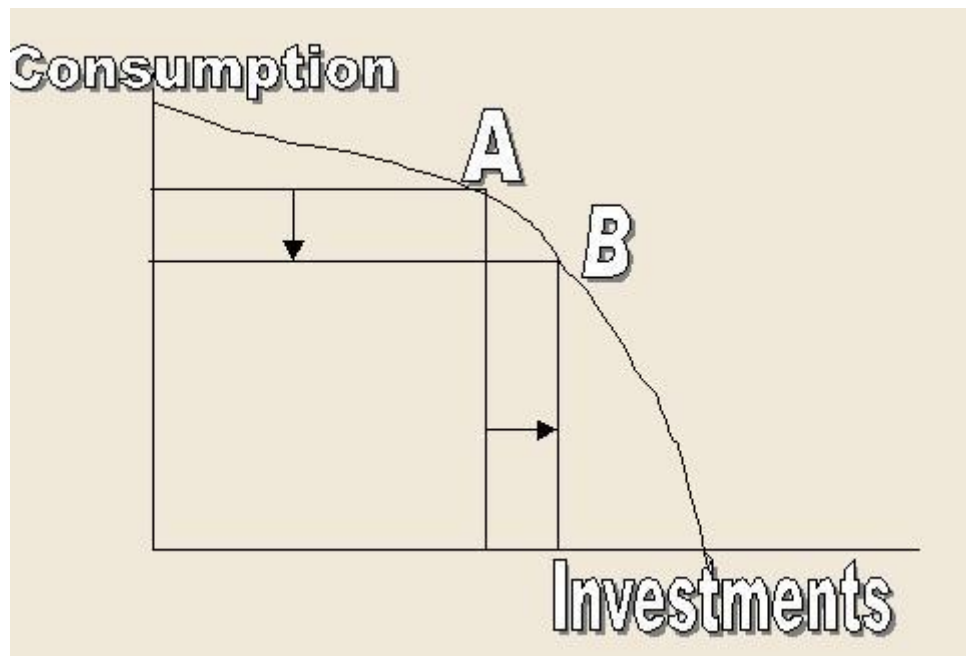
The word “opportunity” in “opportunity cost” is actually redundant. The cost of using something is already the value of the highest-valued alternative use. But as contract lawyers and airplane pilots know, redundancy can be a virtue. In this case, its virtue is to remind us that the cost of using a resource arises from the value of what it could be used for instead.

### **Production Possibility Curves / Frontier (PPC/PPF)**

The production possibility curves are a hypothetical representation of the amount of two different goods that can be obtained by shifting resources from the production of one, to the production of the other. The curve is used to describe a society’s choice between two different goods. Figure 1, shows the two goods as consumption and investment. Investment goods are goods that are involved in the production of further consumption goods. They include physical capital such as machines, buildings, roads etc. and human investments such as education and training. The sums of all investments make up the capital stock of a society. To show the point where all resources were used to produce consumption goods, one should move straight up the

vertical axes to the curve. To show the point where all resources were used to produce investment goods, one should move straight on the horizontal axes to the curve. Both points are extreme and unrealistic. Both points A and B represented more realistic combinations, with point A showing more consumption and less investment, while point B shows more investment and less consumption.

**Figure 1.**



The production possibility curve of figure 1., shows the trade off in production between investments and consumption goods. Any two categories of different goods could be chosen. What they are is arbitrary. The curve is used to show during a specific period, what could be produced of the combination of the two goods, if all resources are fully employed, while technology and institutions do not change. Given those conditions, societies output potential is realized anywhere on the curve (which is called the production possibility curve's frontier). Unemployed resources (labor, capital, physical resources) of any kind would result in an inefficient production level, and would be shown as a point to the left, or inside the curve. By definition all point to the right or outside of the production possibility curve (frontier) are impossible, given the limits of resources and technology.

## **PPF/PPC and Opportunity Cost**

This hypothetical curve shows how much of consumption must be given up to increase investments (the movement from A to B). This demonstrates the important economic concept of Opportunity Cost, which is the cost of anything (such as an investment in a new road), in terms of what has to be given up. This is the general concept of cost in economics. For the individual, these costs could be financial, but they could include a individual's time and other intangibles. For society the production possibility curve shows opportunity cost only on the curve itself. If society found itself inside the curve, for instance, during a recession (where all resources are not being utilized), then a movement out to the production possibility curve has no real opportunity cost. The unemployed resources are just being utilized (unemployed labor going back to work).

Opportunity cost is different than accounting cost, and unfortunately is not so easily calculated. Opportunity cost has a subjective element. For instance, to determine the opportunity cost of a new highway, includes the obvious cost of materials, of labor, of land, (these are the easily determined accounting cost), but there are also intangible cost, such as the cost to the community of the disruption involved with new construction, and the change in the communities effected by the highway. Also there may be costs connected to increase pollution (with health effects), increased noise, and an increase in general unattractiveness. These cost are real, but are difficult to both measure and evaluate. Putting a dollar value on these cost adds a subjective element to the evaluation. As a result sometimes they are ignored.

Economist are often asked to make cost/benefit studies of economic projects, to help determine their overall value. But because of the intangibles, and subjective nature of both benefits and opportunity costs, no definitive answer can be given. The studies should be viewed only as one input into the decision process, and not as definitive

## **Externalities, Welfare Economics**

### **Externalities and Social Welfare:**

We know that perfect competition leads to a Pareto-optimal general equilibrium. We also assumed together with usual assumptions of perfect competition that there were no externalities of production and consumption. We first explain the nature of externalities and then show how they prevent the attainment of a Pareto-optimal position by leading to divergences between private and social costs and benefits.

We assume that the firms contribute to the development of the local communities' recreational facilities, such as parks and schools, in order to improve the overall living

conditions and output of their work force. If these facilities are available to the general public there will be divergence between the private marginal benefits (PMB) and the social marginal benefits (SMB).

**This difference is called a favorable externality of production.**

Now consider an unfavorable externality of production that may result from the expansion of an industry, namely, smoke nuisance. Suppose that, as the industry grows, the air becomes increasingly polluted with smoke from the factory chimneys.

People in the community not only suffer discomfort because of the smoke, but also pay higher cleaning and laundry bills. In terms of social welfare, we must take into account these additional costs, in which case  $MSC > MPC$ .

There are also consumption externalities which distort the social optimum. A favourable consumption externality would occur if the consumption pattern of an individual results in benefits to others. For example, if it is worth for me to put money into a public record player to hear a record, the  $SMB > PMB$  to the extent that other people enjoy at my expenditure.

This indicates that the overall benefit derived from the expenditure is underestimated. And an unfavorable externality of consumption would occur if I decide to try out my new power lawn mower at seven o'clock Sunday morning and disturb my sleeping neighbors. The term 'market failure' refers to the failure of perfectly competitive markets to attain a Pareto optimality because of externalities. The market failure occurs because the market does not automatically charge prices to the external effects of using the resources. A good example is air pollution. People may have to pay higher costs because of pollution which the market does not take into account. Thus, there is a divergence between private costs and social costs.

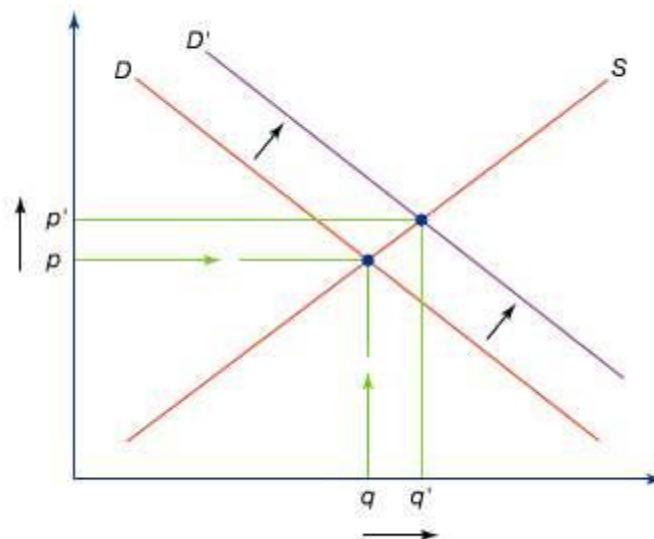
## **Demand and Supply Analysis**

**Supply and demand**, in economics, relationship between the quantity of a commodity that producers wish to sell at various prices and the quantity that consumers wish to buy. It is the main model of price determination used in economic theory. The price of a commodity is determined by the interaction of supply and demand in a market. The resulting price is referred to as the equilibrium price and represents an agreement

between producers and consumers of the good. In equilibrium the quantity of a good supplied by producers equals the quantity demanded by consumers

**Demand curve**, in economics, a graphic representation of the relationship between product price and the quantity of the product demanded. It is drawn with price on the vertical axis of the graph and quantity demanded on the horizontal axis. With few exceptions, the demand curve is delineated as sloping downward from left to right because price and quantity demanded are inversely related (i.e., the lower the price of a product, the higher the demand or number of sales). This relationship is contingent on certain *ceteris paribus* (other things equal) conditions remaining constant. Such conditions include the number of consumers in the market, consumer tastes or preferences, prices of substitute goods, consumer price expectations, and personal income. A change in one or more of these conditions causes a change in demand, which is reflected by a shift in the location of the demand curve. A shift to the left indicates a decrease in demand, while a movement to the right an increase. *Compares* supply curve.

**A shift in demand**



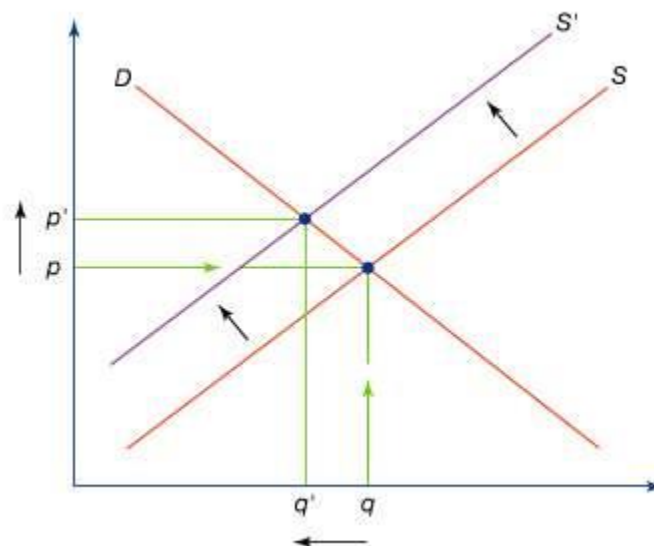
© 2013 Encyclopædia Britannica, Inc.

The quantity of a commodity that is supplied in the market depends not only on the price obtainable for the commodity but also on potentially many other factors, such as the prices of substitute products, the production technology, and the availability and cost of labour and other factors of production. In basic economic analysis, analyzing supply involves looking at the relationship between various prices and the quantity potentially offered by producers at each price, again holding constant all other factors that could influence the price. Those price-quantity combinations may be plotted



on a curve, known as a supply curve, with price represented on the vertical axis and quantity represented on the horizontal axis. A supply curve is usually upward-sloping, reflecting the willingness of producers to sell more of the commodity they produce in a market with higher prices. Any change in non-price factors would cause a shift in the supply curve, whereas changes in the price of the commodity can be traced along a fixed supply curve.

**A shift in supply**



© 2013 Encyclopædia Britannica, Inc.

## Market Equilibrium

It is the function of a market to equate demand and supply through the price mechanism. If buyers wish to purchase more of a good than is available at the prevailing price, they will tend to bid the price up. If they wish to purchase less than is available at the prevailing price, suppliers will bid prices down. Thus, there is a tendency to move toward the equilibrium price. That tendency is known as the market mechanism, and the resulting balance between supply and demand is called a market equilibrium.

As the price rises, the quantity offered usually increases, and the willingness of consumers to buy a good normally declines, but those changes are not necessarily proportional. The measure of the responsiveness of supply and demand to changes in price is called the price elasticity of supply or demand, calculated as the ratio of the percentage change in quantity supplied or demanded to the percentage change in price.



Thus, if the price of a commodity decreases by 10 percent and sales of the commodity consequently increase by 20 percent, then the price elasticity of demand for that commodity is said to be 2.

## Elasticity

In economics, elasticity is the measurement of the proportional change of an economic variable in response to a change in another. It shows how easy it is for the supplier and consumer to change their behavior and substitute another good, the strength of an incentive over choices per the relative opportunity cost.

### Types of Elasticity of Demand

1. Price elasticity
2. Income elasticity
3. Cross elasticity
4. Elasticity is =1, less than one, more than one, in elastic and infinity.

### Types of Elasticity of Supply

1. Price elasticity
2. Income elasticity
3. Cross elasticity
4. Elasticity is =1, less than one, more than one, in elastic and infinity

## Markets Morphology

1. **Perfect Competition**: large number of buyer and sellers producing homogenous product: not-real
2. **Imperfect Competition**: perfect market with product differentiation
3. **Monopoly**: single seller or producer with no competition in the market
4. **Monopolistic**: market with monopolist but competition among them
5. **Oligopoly**: a few seller market- real world market
6. **Duopoly**: two producer
7. **Bilateral Monopoly**: single producer face single buyer in the market
8. **Discriminating Monopoly**: differences in price for homogeneous product: real world market

## Understanding the Circular Flow Model in Economics

The economy can be thought of as two cycles moving in opposite directions. In one direction, we see goods and services flowing from individuals to businesses and back again. This represents the fact that, as workers, we go to work to make things

people want or provide a service that people need. In the opposite direction, we see money flowing from businesses to households and back again. This represents the money we pay for the things we want with the income from the work that we do.

The key takeaway is that both cycles are needed to make the economy work. When we buy things, we give up money for the things we want. When we go to work we make things in exchange for money. The circular flow model attempts to distill the idea outlined above and show the flow of money and goods and services in a capitalist economy.

### What Is the Circular Flow Model?

The circular flow model is an economic model that shows the flow of money through the economy. The most common form of this model shows the circular flow of income between the household sector and the business sector. Between the two are the product market and the resource market.

Households need goods and services, which businesses provide to them through the product market. In order to produce goods and services, businesses need resources. Members of households provide labor to businesses through the resource market. Businesses turn those resources into goods and services.

### The 4 Factors of Production

There are four types of resources, known as factors of production. Each factor of production has a unique type of payment associated with it, called factor payments.

1. **Labor:** These are workers. Payment for labor is called “wages.”
2. **Land:** This is not just land to rent or own, but is more broadly defined as natural resources. Payment for land is called “rent.”
3. **Capital:** This is the money used to buy tools used by the labor to form the land (natural resources) into a good. Payment for capital is called “[interest](#).”
4. **Entrepreneurs/ Organization:** The people who put the other three together. Payment to entrepreneurs is called “profit.”

### Costs, Revenue, and Consumer Spending

In the simple circular flow model of the free market, money flows in the opposite direction. When households need a good or service, money flows from them to the product market (this is called consumer spending). The product market needs goods to provide to households, so it buys them from businesses (this is called revenue). The businesses need to be able to make those goods and services to provide to the product market, so they buy resources from the resource market (this

is called cost). And finally, the resource market needs to buy resources from the households in the form of paying workers or renting land (this is called income). Consumer spending → Revenue → Cost → Income.

### The 3 Factors That Aren't in the Circular Flow Model

While the basic circular flow matrix explains basic supply and demand in a simplistic economic vacuum, this model doesn't take into account factors like:

#### 1. Government Sector

Government is an important factor since it both injects money into the flow and also takes money out of it (called "leakage").

##### **Government Spending**

The government buys things from the product market, like garbage trucks or aircraft carriers, and it also buys things from the resource market, like teachers or fuel. Payments the government makes to both the resource market and the product market are called "government spending." The government uses those goods, services, and resources to provide things for the overall economy, like education, roads, and protection—these are called "public goods." Government spending can also be a public good, in the form of subsidies to businesses (as a way to promote them to manufacture more of a specific type of good) and welfare to households (as a way to help alleviate poverty).

**Taxes (Sales, Income, Property, and others):** There are multiple ways the government spends money and hands money out in this circular flow model, but the government is also a cause of leakage—it takes money through taxes. The government taxes households and businesses in the form of income taxes and sales taxes. Because of this leakage, the government is able to inject money into the economy in other ways.

#### 2. Financial institutions (banks)

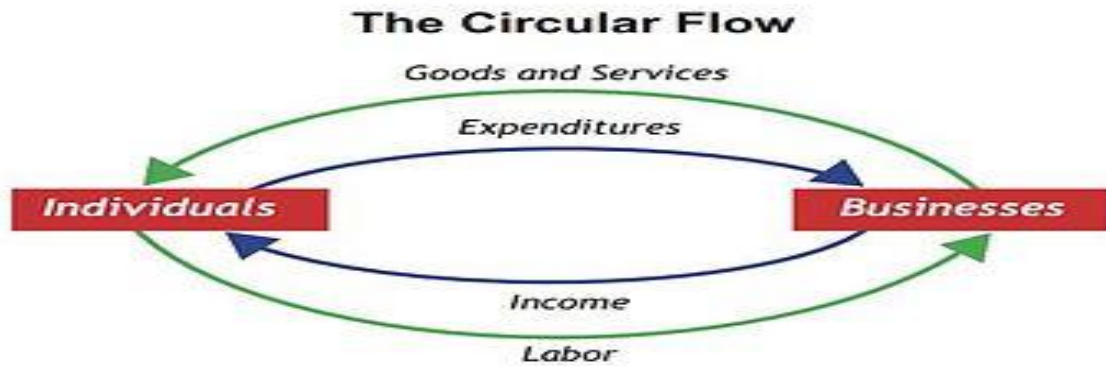
Financial institutions are the source of another leakage, through household and business savings. This is money that would have otherwise flowed into the economy that is taken out semi-permanently. The financial sector injects money into the economy through investment and loans, which can help both the household sector and business sector.

#### 3. Foreign Sector (Imports and exports with other countries)

The foreign sector typically injects and leaks goods rather than money. Goods flow into the circular flow model in the form of imports, and flow out of the model in the form of exports. While a model with just the household sector and the business sector, with the product and resource market acting between the two, is the most simple version of the circular flow model, it does not provide a complete picture of the economy. Once the government, financial institutions, and the foreign sector are

all added into the model, we get a more entire and accurate model of the economic system as a whole.

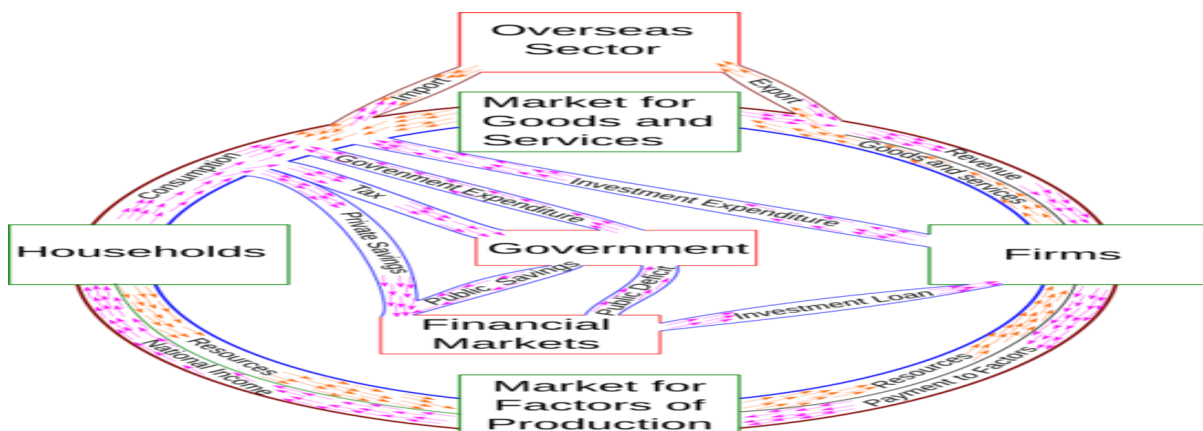
## TWO SECTOR MODEL



## THREE SECTOR MODEL



## THE FOUR SECTOR MODEL



## Concepts of National Income –Basics Macro-Economic Concepts:

One of the most important concepts of macroeconomics is income and output. The national output is the total amount of all goods and services produced in a country during a specific period. And when production units or organizations sell everything they produce, they generate an equal amount of income. Hence, we can measure output by calculating the total income from the sale of all goods and services.

**GDP:-**In relation to macroeconomics, economists usually measure national income or output by gross domestic product or GDP. By measuring GDP, economists can understand the market swings and changes. They can identify what measures to take to improve the GDP of the country. With technological advances, capital increase, and acquisition of state-of-art equipment, production units and organizations can increase national output and income. However, income and output can be affected by the recession and other market factors.

**GNP:-**Gross national product (GNP) is the total final output produced with inputs owned by the residents of a country during a year, starting with GNP, Gross national product (GNP) is the total final output produced with inputs owned by the residents of a country during a year.

**NI:-** National Income refers to the money value of all goods and services produced in a country during a financial year. In other words the final outcome of all the economic activities of the nation during a period of one year, valued in terms of money is called as a national income.

**DI:-** Disposable Income, it is also known as disposable personal Income (DPI). It is the amount of money that households have available for spending and saving after income taxes have been accounted for. It is the total earnings a household makes that are available to save or spend after taxes have been paid.

### What is Disposable Income

Disposable income, also known as disposable personal income (DPI), is the amount of money that households have available for spending and saving after income taxes have been accounted for. Disposable personal income is often monitored as one of the many key economic indicators used to gauge the overall state of the economy.

### Green GDP

The **green gross domestic product (green GDP or GGDP)** is an index of economic growth with the environmental consequences of that growth factored into a country's conventional GDP. Green GDP monetizes the loss of biodiversity, and accounts for

costs caused by climate change. Some environmental experts prefer physical indicators (such as "waste per capita" or "carbon dioxide emissions per year"), which may be aggregated to indices such as the "Sustainable Development Index".

### **Calculation of Green GDP ( G-GDP):**

Calculating green GDP requires that net natural capital consumption, including resource depletion, environmental degradation, and protective and restorative environmental initiatives, be subtracted from traditional GDP. Some early calculations of green GDP take into account one or two but not all environmental adjustments. These calculations can also be applied to net domestic product (NDP), which deducts the depreciation of produced capital from GDP. In each case, it is necessary to convert the resource activity into a monetary value, since it is in this manner that indicators are generally expressed in national accounts.

---