

A Unique Modality for Green Management

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Abstract

Energy economics is the field that studies human utilization of energy resources and energy commodities and the consequences of that utilization. In physical science terminology, “energy” is the capacity for doing work, e.g., lifting, accelerating, or heating material. In economic terminology, “energy” includes all energy commodities and energy resources, commodities or resources that embody significant amounts of physical energy and thus offer the ability to perform work. Energy commodities - e.g., gasoline, diesel fuel, natural gas, propane, coal, or electricity - can be used to provide energy services for human activities, such as lighting, space heating, water heating, cooking, motive power, electronic activity. Energy resources - e.g., crude oil, natural gas, coal, biomass, hydro, uranium, wind, sunlight, or geothermal deposits - can be harvested to produce energy commodities. Energy economics studies forces that lead economic agents - firms, individuals, governments - to supply energy resources, to convert those resources into other useful energy forms, to transport them to the users, to use them, and to dispose of the residuals. It studies roles of alternative market and regulatory structures on these activities, economic distributional impacts, and environmental consequences. It studies economically efficient provision and use of energy commodities and resources and factors that lead away from economic efficiency.

Keywords: Management; R&D Management; Research and Development; Development; Sustainable Development

Introduction

Economic Energy

Energy economics studies energy resources and energy commodities and includes forces motivating firms and consumers to supply, convert, transport, use energy resources, and to dispose of residuals; market structures and regulatory structures; distributional and environmental consequences; economically efficient use. It recognizes:

1. Energy is neither created nor destroyed but can be converted among forms;
2. Energy comes from the physical environment and ultimately returns to it.

Humans harness energy conversion processes to provide energy services. Energy demand is derived from preferences for energy services and depends on properties of conversion

technologies and costs. Energy commodities are economic substitutes. Energy resources are de-pletable or renewable and storable or non-storable. Human energy use is dominantly de-pletable resources, particularly fossil fuels. Market forces may guide a transition back to renewable resources. Inter-temporal optimal de-pletable resource extraction paths include an opportunity cost or rent. World oil prices remain above pre-1973 levels and remain volatile as a result of OPEC market power. Oil supply disruptions of the 1970s led to economic harm. Environmental damages from energy use include climate change from greenhouse gases, primarily carbon dioxide. Environmental costs not incorporated into energy prices (externalities) lead to overuse of energy and motivate policy interventions.

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Today’s challenge of this branch of energy economy is to determine how energy is valued and to find a way to prevent its waste. Its applications are also seen in the discussion of finding the potential and economic justification of using different forms of energy. So, in answer to what is energy economy, it should be said that one of its topics is to examine how energy is supplied.

Energy demand and its challenges. We should focus on another part of economics study which is called energy demand. Although energy supply is an environmental issue, energy demand is a social issue because all countries in the world need energy. To the extent that all the economic models of today’s world are written based on the energy factor. The issues facing this part of energy economy include finding the relationship between energy demand and development, energy demand management systems, and the relationship between economic growth and energy demand. Its applications are also seen when writing the model of economic progress or closing the budget of countries; because one of the key elements in the economic management of countries is energy. Energy markets among the other areas studied in this type of economy are energy markets. The energy market is the scene where energy supply and demand occur. The issues facing the market strongly depend on the type of energy in question. For example, the nuclear energy market completely depends on the political conditions of the supply and demand countries, the regional situation of the countries, and how energy is supplied. This section is used in the discussion of creating a global village and free electricity for all countries, but it faces challenges such as technology transfer, the controlling variables of the global energy market, how to distribute different energies and the contribution of each country in its supply and demand. Energy efficiency is another very important topic in energy economy is the issue of energy efficiency. Energy efficiency generally examines whether the cost of supplying energy is economical or not. For example, with conventional power plants to produce electricity, is it profitable to supply the entire electrical system of a city with solar cells?

One of the most general challenges is the examination of the costs incurred to replace non-renewable energies such as solar and wind energy with renewable energies; If, on the assumption of a country, it is estimated that in the future, due to the reduction of oil, the cost of importing it into the country will be higher than the cost of setting up solar power plants; Therefore, he should be able to plan for energy efficiency and perform this replacement process in the most optimal way possible. Also, one of its most important applications is planning to reduce global warming and replace more efficient energy instead of fossil fuels.

Problems and applications of energy supply to the environment Perhaps one of the biggest challenges facing the energy economy after the risk of running out of non-renewable energies is the environmental issues and challenges of energy supply. We all know that after the industrial revolution, the use of coal as the main source of energy caused irreparable damage to nature. One of its results is the depletion of the ozone layer. Its other disadvantages are the destruction of a large number of animal species, the reduction of forest cover and the drying up of some rivers, which are almost irreparable; so, it is very important that we use an energy source that does not harm the nature.

For this reason, a concept called clean energy has been created, which is one of the other topics that is said in the answer to what is energy economy. Any energy that ultimately leads to damage to nature and is generally renewable is called clean energy. Geothermal energy, wind energy, solar energy, sea wave energy, etc. are among the clean energies that should replace fossil fuels. But this replacement in a way that is optimal is an issue that is studied in energy economy. Economic growth and its impact on energy as energy is a very important and influential factor on the economy, economic growth also has an important impact on the fluctuations of the energy market. One of the very interesting examples that is always studied by economists is the emergence of the economic growth of two countries, India and China, and its effect on the increase in oil prices. After two countries, China and India, experienced strong economic growth in a short period of time, their heavy demand for energy imports caused the price of oil to experience a lot of growth in a short period of time. Economic growth and its impact on energy on the other hand, this increase causes other emerging economic competitors to be left behind from rapid growth and experience lower economic growth; therefore, energy has an undeniable effect on economic growth and also affects energy price changes. One of its applications is to examine the energy market and its impact on the economic growth of different countries and predict the direction of the world's emerging economic powers [11-20].

Engineering Economic

Engineering economics is the application of economic principles and calculations to engineering projects. It is important to all fields of engineering because no matter how technically sound an engineering project is, it will fail if it is not economically feasible. Engineering economic analysis is often applied to various possible designs for an engineering project in order to choose the optimum design, thereby taking into account both technical and economic feasibility. Many basic economic principles may be applied in an engineering economic analysis, depending on their applicability. Time value of money is one such principle with wide applicability. This principle is used to calculate the future value of something given the present value, or the present value given the future value, at a given interest rate. For example, time value of money may be used to calculate how much a project will cost once it is actually completed; annual investments or withdrawals may also be calculated. A cash-flow diagram is often used to aid in the calculation of the time value of money. When comparing costs among two or more possible alternatives, engineering economics may use either present or future worth analysis or annual cost.

Engineering economics is one of the branches of economics and discusses the analytical methods used in cost estimation and determining the value of systems, products and services. This unit is one of the most basic and widely used courses in industrial engineering at the master's level. During the bachelor's course of this field, the concepts of economics were discussed, and in the master's degree, this topic was discussed in a wider

way and using various methods to solve economic problems. Engineering economics is one of the branches of economics and discusses the analytical methods used in cost estimation and value determination of systems, products and services. Success in solving engineering problems often depends on the ability and consideration of both economic and technical factors. Engineers must take responsibility for the economic interpretation of their work. In order to establish the relationship between the technical and economic aspects of engineering work, it is necessary for engineers to master the basic concepts of economic analysis. Engineering economics is a set of techniques that simplify the process of comparison between selectable options based on economic principles. Engineering economics is actually a tool for choosing the best or, in other words, the most economical option among the options before engineers. In other words, engineering economy is the main decision-making tool of engineers in projects. The scientific and technical issues raised during the academic courses of the engineering fields have put different options in front of them to carry out the tasks assigned to the engineers, all of which are applicable from a technical and engineering point of view. However, it is the engineering economy that determines which of the technically applicable options are economically justified and which are not economically justified. In other words, if the technical ability to implement options and engineering projects is a necessary condition for their implementation, their financial ability or "economic justification" will also be a sufficient condition for their implementation. Engineering economics specifically deals with the second category, which is the examination of the economic justification of the options faced by engineers. The need for engineering economics was felt since engineers turned to economic analysis of decisions related to engineering projects. Engineering economics is actually the beating heart of the decision-making process. Decisions discussed in engineering economics include basic elements such as cash flows, time and interest rates. Finally, engineering economics helps to make better and more economical decisions using logical and mathematical methods. Success in solving engineering problems often depends on the ability and consideration of both economic and technical factors. Engineers must take responsibility for the economic interpretation of their work. In order to establish the relationship between the technical and economic aspects of engineering works, it is necessary for engineers to master the basic concepts of economic analysis. In defining what engineering economics is, it will be helpful to know what engineering economics is not. Engineering economics is not a process or method for determining what options are available to choose from. On the contrary, the mission of engineering economics begins exactly after the stage of identifying selectable options. If the best option is really an option that the engineer has not identified as a selectable option, then it is obvious that using all the analytical tools of engineering economics will not lead to the selection of that option. Engineering options typically include items such as purchase cost (initial cost), expected useful life,

annual asset maintenance costs (asset operating and maintenance costs), anticipated increase in resale value (salvage value), and is the interest rate. After collecting relevant statistics, figures and estimates, engineering economics analysis can be a guide to determine the best option from the point of view of economics [21-30].

Economics is the science of allocating scarce resources with unlimited wants and goals in mind. Therefore, scarce resources should be used wisely and effectively at the optimal level so that costs are minimized, and profits are maximized. All decisions in engineering also include possible options and choices. These possible options should be carefully evaluated before implementation. "Engineering Economics" is, in fact, a systematic evaluation of the economic value of solutions presented to engineering problems. That these solutions are economically acceptable and show more benefits than losses in the long run. In simple words, engineering economics is the application of a set of mathematical methods to economically analyze industrial projects in order to choose the most economical project.

History Of Engineering Economics

Engineering economics as a branch of science does not have a long life. Of course, this does not mean ignoring the costs in making engineering decisions in the past. The book "The Economic Theory of Railway Location" by Arthur M. Wellington - a civil engineer - pioneered engineering's interest in economic evaluation. A book titled "Principles of Engineering Economy" was published in 1930 by Eugene Grant. Grant is considered the father of engineering economics. New developments in the field of this science have led to the emergence of new methods in the field of risk assessment, sensitivity, resource conservation and effective use of public funds. What topics are raised in engineering economics?

Among the topics raised in engineering economics, the following can be mentioned.

- Economics of management, performance and growth and profitability of engineering companies
- Examining the trends and issues of engineering economics from a macro perspective
- Engineering products market and demand effects
- Development, marketing and financing of new technologies and engineering products
- Ratio of benefits to expenses

Management Economical

Managerial economics is a branch of economics involving the application of economic methods in the organizational decision-making process. Economics is the study of the production, distribution, and consumption of goods and services. Managerial

economics involves the use of economic theories and principles to make decisions regarding the allocation of scarce resources. It guides managers in making decisions relating to the company's customers, competitors, suppliers, and internal operations. Managers use economic frameworks in order to optimize profits, resource allocation and the overall output of the firm, whilst improving efficiency and minimizing unproductive activities. These frameworks assist organizations to make rational, progressive decisions, by analyzing practical problems at both micro and macroeconomic levels. Managerial decisions involve forecasting (making decisions about the future), which involve levels of risk and uncertainty. However, the assistance of managerial economic techniques aid in informing managers in these decisions [31-40].

Managerial economists define managerial economics in several ways:

1. It is the application of economic theory and methodology in business management practice.
2. Focus on business efficiency.
3. Defined as "combining economic theory with business practice to facilitate management's decision-making and forward-looking planning."
4. Includes the use of an economic mindset to analyze business situations.
5. Described as "a fundamental discipline aimed at understanding and analyzing business decision problems".
6. Is the study of the allocation of available resources by enterprises of other management units in the activities of that unit.
7. Deal almost exclusively with those business situations that can be quantified and handled, or at least quantitatively approximated, in a model.

Economic Management

In fact, it is theories, tools and methods to solve practical problems in a business using economic concepts. In other words, management economics is a combination of economics and management theories. In fact, management economics is the link between theoretical theories and practical work and helps managers make better decisions. Sometimes this term is referred to as business economics, and it is a branch of economics that applies microeconomic analysis to the decision-making methods of businesses or other management units. In this way, management economics is the bridge connecting theoretical economics to practical economics. And it is very far from quantitative techniques such as regression analysis, correlation and differential and integral calculus. If there is a subject in management economics that the majority in which they are unanimous, it is an effort to optimize business decisions according to the company's goals

and the constraints that have been imposed. For example, using operations research, mathematical programming and game theory for strategic decision-making and other computational methods. Management economics refers to the application of economic theory and decision-making science analysis tools and examines how an organization can effectively reach its goals and objectives. In management economics, many aspects of economic theory and analysis tools in different fields of business management are studied together.

Development Economical

Economic Development is programs, policies or activities that seek to improve the economic well-being and quality of life for a community. What "economic development" means to you will depend on the community you live in. Each community has its own opportunities, challenges, and priorities. Your economic development planning must include the people who live and work in the community. Economic development, also known as economic growth or advancement, refers to the generation of wealth that is found in the benefit and advancement of society. It is not only found in isolated development projects, but in the general advancing of the economy with respect to factors like education, resource availability, and living standards. Economic development pertains to the buildout of education systems, recreational parks, and public safety infrastructure. The importance of economic development lies in the wellbeing of the population. The concept of development is a key factor in the decision-making process of sovereign authorities when designing policies. Economic development relies heavily on the efficient allocation of resources (a reason for the slow growth of command economies). Development isn't exclusively found in projects, but also in approaches to economics like how resources are allocated to industries that need those most. The stimulus of trade through policies, laws, and regulations is another measure of promoting economic growth [41-50].

Private sector investment is very important for development, especially in free market economies (consumer-centric economies). In command economies (government-centric) the private sector contributes little to the advancement of the general economy. This is due to how command governments own the means of production, which results in their decisions being most crucial to economic growth. Contrary to command economies, in free market economies, the projects and expansions that private enterprises deem necessary play a key role in the general growth of the whole economy. The private ownership of property and production factors leads to the shrinking influence of the government.

Economic Development

Development economics involves the creation of theories and methods that help determine policies and practices that can be implemented at both the local and international levels. This may involve market incentives or mathematical methods

such as temporal optimization for project analysis or a mixture of both quantitative and qualitative methods. Unlike many other sectors of the economy, the approach of development economics may include social and political factors to design and formulate specific programs. Also, unlike many other areas of economics, there is no consensus on what students should know. However, many scientists believe that development economics has a series of fixed principles. How many questions did they ask themselves to achieve this? If we pay attention to the economic and cultural history of nations, what constant factors will we find in their economic development? Is there a level that a person should follow in economic development apart from choosing values, although the development during this period in every country has had a specific format and has been achieved in different proportions, but a definite and fixed level can be observed and deduced in them. The topic of development economics has been raised more than any other topic in the field of economics.

If we want to introduce development economics as one of the important subjects in the economic field, we must say that it is an important branch of economics whose main subject is the examination and analysis of the development process in low-income and less developed countries, especially third world countries, using multiple methods. . In general, development economics focuses on improving financial, economic and social conditions in developing countries, and with the aim of improving conditions in the world's poorest countries, factors such as health, education, working conditions, domestic and international policies, market conditions, and macroeconomic and microeconomic factors related to It examines the structure of developing economies and domestic and international economic growth. In simpler terms, it studies the transformation of emerging countries into more prosperous countries. Of course, there are several definitions about this branch of economics. The reason for such a wide variety of definitions can be seen as the excessive complexity of development economics. For example, some economists have defined it as a science whose task is to examine the quantitative and qualitative growth of each country in the gross national production. Development economics is the process by which the economic well-being and quality of life of a nation, region, local community or an individual is improved based on targeted goals and objectives. Development economics is a special field of economics that studies the process of growth and development. So that this science is studied and investigated within a country.

Since a country is highly dependent on economic development and growth in its expansion process, development economics can be used in a wide range of ways; but this does not mean the exclusive use of development economics in economic activities. This part of the economy, in the form of theories and methods, is used for policy making and can improve the conditions of a country in a wide range. The improvement of the situation requires changes and reforms in various components and factors

that are possible through the development economy. Paying attention to development has been one of the most important issues from the past until now, that's why economic approaches have been in the center of people's attention and have shown themselves in political and social dimensions. Theorists propose development economics in the form of variables; while no special teaching about development economics has been introduced so far and there is no fixed format for it; some economists propose fixed principles for it.

Green Management

Green management is when a company does its best to minimize processes that harm the environment. This means turning to practices that are environmentally friendly. Some short-run cost-effective benefits are: Improved health. Green management is an approach to organizational management that seeks to reduce the environmental impact of business operations while improving business efficiency and profitability. The focus of green management is on sustainability, and it involves making decisions and taking actions that are environmentally responsible, socially beneficial, and economically viable. This will discuss the concept of green management, its importance, benefits, and challenges, as well as strategies for implementing green management practices in organizations.

The Concept of Green Management

Green management is a proactive approach to managing a business in a way that minimizes the environmental impact of its operations. It involves adopting strategies and practices that reduce waste, conserve energy and natural resources, and minimize pollution. Green management goes beyond simply complying with environmental regulations; it involves taking a leadership role in environmental stewardship and sustainability. Green management practices can be applied in any industry, from manufacturing to retail, hospitality to transportation. Organizations that adopt green management practices can realize a range of benefits, including cost savings, enhanced brand reputation, increased customer loyalty, and improved.

Importance of Green Management

The importance of green management lies in its potential to create a sustainable future for our planet. The need for sustainable business practices has become increasingly urgent in recent years, as the global population continues to grow and consume more resources. Organizations that fail to adopt sustainable practices are likely to face significant risks, including financial losses, reputational damage, and regulatory penalties. In addition to mitigating risk, green management can also create significant business opportunities. The demand for sustainable products and services is growing rapidly, and organizations that can meet this demand are likely to benefit from increased sales and revenue. Moreover, adopting green management practices can lead to

cost savings by reducing waste, energy consumption, and other resource use.

Benefits of Green Management

The benefits of green management can be significant and wide-ranging. Some of the key benefits include:

1. **Cost Savings:** Green management practices can help organizations reduce costs by conserving energy and natural resources, reducing waste, and improving operational efficiency.
2. **Enhanced Brand Reputation:** Organizations that adopt green management practices are often perceived as socially responsible and environmentally conscious, which can enhance their brand reputation and appeal to customers.
3. **Increased Customer Loyalty:** Customers are increasingly aware of the environmental impact of the products and services they consume. Organizations that can demonstrate a commitment to sustainability are more likely to retain loyal customers.
4. **Improved Employee Morale:** Green management can help create a more engaged and motivated workforce by demonstrating a commitment to environmental responsibility and sustainability.
5. **Regulatory Compliance:** Organizations that adopt green management practices are more likely to comply with environmental regulations, reducing the risk of fines, legal action, and reputational damage.

Green management is an essential approach for organizations that want to operate sustainably and responsibly. The benefits of green management can be significant, including cost savings, enhanced brand reputation, and improved employee morale. However, implementing green management practices can also be challenging, and requires a structured approach that includes assessing current environmental impact, setting goals and targets, developing a green management plan, implementing green management practices, monitoring and measuring performance, and communicating and engaging with employees and stakeholders. By following this approach, organizations can create a more sustainable future while achieving their strategic objectives [51-60].

Green Economy

The term green economy was coined for the first time in 1989 by a group of environmental economists in a report titled "Green Economy Plan" to be presented to the UK government. The aforementioned report was prepared in order to provide recommendations to the British government in this regard if there was an agreed definition of the term "sustainable development" and its concepts for measuring economic growth and evaluating policies and projects. In 1991 and 1994, Following the first report, reports titled "Greening the World Economy"

and “Measuring Sustainable Development” were presented. In 2008, the term “green economy” was revived during the debates to find a policy that responds to various global crises. Three related concepts “green economy, green growth and low-carbon development” While the concept of green economy has recently attracted the attention of international communities, green economy policies have been studied for decades by economists and academics, especially in the field of environmental economics and economics. Ecological, has been investigated and analyzed. The green economy policy tools were also discussed during international negotiations, including the UN Sustainable Development Commission. For example, the Rio statement includes the principles of using economic tools and promoting the internalization of environmental costs (principle 16) and limiting unsustainable production and consumption (principle 8). Ten years later, the action plan of Johannesburg identified the need to change the way of production and consumption of societies and proposed the framework of 10-year development plans for sustainable production and consumption.

Principles of Green Economy

1. Green economy is a tool to achieve sustainable development.
2. Green economy should create decent work and green jobs.
3. Green economy includes the efficiency of resources and energy.
4. Green economy respects planetary boundaries and environmental limits.
5. Green economy uses integrated decision making.
6. The process of measuring the green economy is beyond GDP using appropriate indicators and criteria.
7. The green economy is fair and just between countries and within them and between generations.
8. Green economy protects biodiversity and ecosystems.
9. Green economy leads to reduction of poverty, welfare, livelihood, social support and access to essential services.
10. Green economy improves governance and rule of law. Also, green economy inclusive, democratic, it is collaborative, responsive, transparent and stable.
11. Green economy internalizes external aspects (including environmental costs, etc.).

In general, green economy means sustainable economy or environmentally friendly economy. The term green economy was first coined by an economist named Paul Yers in 1989 in a book called A Blueprint for a Green Economy. Traditional economy

is based on economic growth and development, but in green economy, the goal will be sustainable environmental development. The United Nations Environment Program has provided a definition of this concept as “green economy is an economy that results in advanced human welfare and social equality, while reducing environmental risks and ecological deficiencies, leading to economic growth.” There are two perspectives to achieve sustainability in the field of green economy, which are: 1) The improvement of economic conditions should not be limited by environmental concerns, and environmental problems should be completely abandoned. 2) Sustainable economic development must be accompanied by maintaining and improving the quality of the environment. Of course, the second view is correct because ignoring environmental problems threatens the sustainability of the economy in the long run. Environmental sustainability is a process that adjusts environmental interactions with the idea and attitude of preserving the environment based on ideal behavior. Sustainability in the use of the environment requires that humans use natural resources to the extent that these resources can be replaced naturally. Increasing the use of resources and reducing waste is the main goal of sustainable natural resource management. In the green economy, “green energy”, which is based on renewable energy, is trying to replace green energy instead of fossil fuels and to save energy for the time being. Necessity pays. But the high cost of green energy and of course the failure of the market related to the issue of environmental protection and global warming due to the side effects and high costs of research, development and marketing for green energy and the products obtained from it causes factories to and companies show less desire to work and invest in this field. For this reason, green energy and green products need the help of governments to expand. The Renewable Energy Act among European Union countries and the American Recovery and Reinvestment Act of 2009 were passed to help this market. Therefore, jobs that are related to energy production and clean and environmentally friendly products are called green jobs, the owners of these jobs are required to comply with occupational health and safety standards in their respective job units. According to the latest research of the technical and professional organization of the country, about 230 green job titles have been identified, including water resource specialists, technicians and installers of solar energy (heating) devices, carpenters and carpenters, construction workers, managers Construction, agricultural technicians, industry ecologists, electrical engineers and engineering and architecture managers mentioned.

But the criterion that places these jobs in the ranks of the green ones depends on what methods and methods the owners of each of these jobs choose to advance their goals, what their strategies are and what they ultimately achieve. Now, in many countries of the world, training and empowering people in the field of environmental protection along with economic development is considered a key and strategic principle, and they consider the implementation of environmental standards to benefit economic

activity and industrial development. Therefore, it seems that the creation of green economy development solutions in our country can establish a link between industry and environment while curbing environmental crises and unemployment phenomenon. Green jobs reduce energy consumption and produce less and recyclable waste, and therefore help to reduce the cost of many economic enterprises and preserve nature and the environment. The expansion of green jobs while increasing the motivation and improving the productivity of the workforce, development Healthy work environments reduce accidents and create more jobs. Now I want to examine the V&M medal based on different economies such as energy economy, engineering economy, management economy, development economy, especially green economy. According to the above explanations, I realized that no business, if it takes a step towards health and green management, can have the most support for the ecosystem with the nobles of the sciences that were mentioned. Considering the energy economy, I realized that energy supply is one of the The most important issue is energy economy and it is most related to econometrics and energy engineering. Investigating the potential of energy extraction using solar, wind, and geothermal energy methods is one of the main topics of this part of energy economy, because energy is inherently exhaustible, especially oil and gas, which are not only the issue of their exhaustibility, but also the damage they bring to the ecosystem, so the use of energy is required. renewable sources are mentioned here and these sources must be used for energy supply, such as the use of solar cells on the facade of the building, which leads to the reduction of electricity costs, etc. that have the least energy loss;

For example, the use of heavy materials with high thermal capacity, such as concrete, bricks and cement blocks, increases the thermal stability of the building; In other words, when the outside temperature changes, the air inside the house does not get too cold or hot. Also, the use of hollow bricks in the construction of external walls makes these bricks hold more air; Therefore, the thermal capacity of the building increases. Or the use of new materials and insulation, all of which somehow prevent energy loss. We can even consider the clothing of the personnel, for example, clothes with recycled materials that are twice as Let nature return. We have different brands that produce clothes from ocean waste and bottle caps that can be used twice. They are good and environmentally friendly uniforms. Minerals and organic materials and biological resources are also seen in organically produced clothes. The next thing is the discussion of engineering economy, which should be decided to manage project costs and output with the best and highest quality materials, for example, green cleaning products use more natural and organic methods for cleaning. which have much less harm. Other measures that can be taken in order to optimize energy consumption are the use of environmentally friendly lamps, the purchase of low consumption electrical appliances, and connecting heating and cooling devices to the thermostat.

LED lamps are one of the best choices in order to protect the environment because they consume much, much less electricity and in this way the energy consumption of a building can be significantly reduced. One of the most important ways to reduce the energy consumption of buildings and in In line with that, more protection of the environment, intelligentized of buildings. By making buildings smart, energy consumption can be saved to an amazing extent. Of course, it should also be kept in mind that making smart has a high cost, but this cost is actually used to protect the environment and make people's lives easier, which is definitely worth it. There is an approach in architectural design known as organic architecture. This type of architecture establishes a link between the building and its surroundings. The main thinking in relation to this type of architecture is that all people are part of nature and should remain part of it so as not to harm it. The founder of organic architecture is Frank Lloyd Wright. One of the important principles of organic architecture is that the building must be inspired by nature, natural materials and materials should be used in its construction, and any copying should be avoided in its design. One of the most important principles of environmentally friendly houses is saving water. Installing systems that collect rainwater and are used for watering plants and washing is one of the most important measures that can be taken to protect water. The rainwater collection system can also collect a large amount of water from the roof and other paths and reduce the amount of water demand for miscellaneous works. Another solution that is used in this field is installing faucets and automatic shower heads. Installing flush tanks that use less water and automatic washing machines are other practical solutions in the field of reducing water consumption. Green or living roofs are good choices.

The reason why these roofs are suitable is that they are good insulators and because of the growth and cultivation of plants, they clean the air and liven up the environment. Wooden shingle roofs or plank roofs, which are very environmentally friendly, but have a high price. Using recycled materials in the construction of roofs, such as recycled plastics, reduces waste production and is less expensive. In terms of economic management, considering that it plays a significant role in decision-making based on the goals of the collection, when the biggest goal of the collection is to be environmentally friendly, then all the consumables in the collection are intelligently purchased in bulk or ordered to be produced, for example Dishes or clothes and covers of all the utensils, napkins and dishes that are used are all organic and recyclable. In terms of economic development, during which the well-being and quality of a business are considered, it is possible to take a green look at the way of payment in the whole system, that with a credit card, you can use all the facilities of the restaurant, cafe, and center. Massage and the club used, and the exchange for the green and paperless payment method should be done with any kind of valid currency such as pounds and dollars, and considering points such as a free meal plan or sports tips for

people who follow their health plans well through experts and the consultants of the complex are introduced and the development of maximum green space inside and outside the building.

Green management is not a cost, it is saving, green management is not a choice, it is a necessity! All of us humans are responsible for protecting the resources on earth such as water, soil, air, forest, etc. Minimize the environment. The planet we live on is the most important thing we humans have; Therefore, we must properly take care of the resources we have on earth. This is what is referred to as "green management"; In other words, we can say that green management is the effective and efficient use of all material and human resources to control and guide the organization to achieve environmental and planning goals. Just as the provision of appropriate services is considered very important and necessary for all organizations and institutions, attention to the environment and natural resources should also be important and become a part of our culture. Unfortunately, this issue has had very little importance in the past; But these days, due to the fact that the amount of air pollutants has increased a lot and also the production of waste and waste is increasing, the planet is facing a serious danger. Therefore, green management has become important and is no longer considered a choice, but a necessity so that we can provide greenery and life for ourselves and future generations.

Environmental Economics

The total environment includes not just the biosphere of Earth, air, and water, but also human interactions with these things, with nature, and what humans have created as their surroundings. As countries around the world continue to advance economically, they put a strain on the ability of the natural environment to absorb the high level of pollutants that are created as a part of this economic growth. Therefore, solutions need to be found so that the economies of the world can continue to grow, but not at the expense of public goods. In the world of economics, the amount of environmental quality must be considered as limited in supply and therefore is treated as a scarce resource. This is a resource to be protected. One common way to analyze possible outcomes of policy decisions on the scarce resource is to do a cost-benefit analysis. This type of analysis contrasts different options of resource allocation and, based on an evaluation of the expected courses of action and the consequences of these actions, the optimal way to do so in the light of different policy goals can be elicited. Further complicating this analysis are the interrelationships of the various parts of the environment that might be impacted by the chosen course of action. Sometimes, it is almost impossible to predict the various outcomes of a course of action, due to the unexpected consequences and the number of unknowns that are not accounted for in the benefit-cost analysis.

Management of Human Consumption and Impacts

Waste generation, measured in kilograms per person per day. The environmental impact of a community or humankind as a

whole depends both on population and impact per person, which in turn depends in complex ways on what resources are being used, whether or not those resources are renewable, and the scale of the human activity relative to the carrying capacity of the ecosystems involved. Careful resource management can be applied at many scales, from economic sectors like agriculture, manufacturing and industry, to work organizations, the consumption patterns of households and individuals, and the resource demands of individual goods and services. The underlying driver of direct human impacts on the environment is human consumption. This impact is reduced by not only consuming less but also making the full cycle of production, use, and disposal more sustainable. Consumption of goods and services can be analyzed and managed at all scales through the chain of consumption, starting with the effects of individual lifestyle choices and spending patterns, through to the resource demands of specific goods and services, the impacts of economic sectors, through national economies to the global economy. Analysis of consumption patterns relates resource use to the environmental, social and economic impacts at the scale or context under investigation. The ideas of embodied resource use (the total resources needed to produce a product or service), resource intensity, and resource productivity are important tools for understanding the impacts of consumption. Key resource categories relating to human needs are food, energy, raw materials and water.

In 2010, the International Resource Panel published the first global scientific assessment on the impacts of consumption and production. The study found that the most critical impacts are related to ecosystem health, human health and resource depletion. From a production perspective, it found that fossil-fuel combustion processes, agriculture and fisheries have the most important impacts. Meanwhile, from a final consumption perspective, it found that household. Consumption related to mobility, shelter, food, and energy-using products causes the majority of life-cycle impacts of consumption. According to the IPCC Fifth Assessment Report, human consumption, with current policy, by the year 2100 will be seven times bigger than in the year 2010.

Biodiversity and Ecosystem Services

In 2019, a summary for policymakers of the largest, most comprehensive study to date of biodiversity and ecosystem services was published by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. It recommended that human civilization would need a transformative change, including sustainable agriculture, reductions in consumption and waste, fishing quotas and collaborative water management.

Technology

Before flue-gas desulfurization was installed, the air-polluting emissions from this power plant in New Mexico contained excessive amounts of sulfur dioxide. A sewage treatment plant that uses solar energy, located at Santuari de Lluc monastery, Majorca. One

of the core concepts in sustainable development is that technology can be used to assist people to meet their developmental needs. Technology to meet these sustainable development needs is often referred to as appropriate technology, which is an ideological movement (and its manifestations) originally articulated as intermediate technology by the economist E. F. Schumacher in his influential work *Small Is Beautiful* and now covers a wide range of technologies. Both Schumacher and many modern-day proponents of appropriate technology also emphasise the technology as people centered. Today appropriate technology is often developed using open-source principles, which have led to open-source appropriate technology (OSAT) and thus many of the plans of the technology can be freely found on the Internet. OSAT has been proposed as a new model of enabling innovation for sustainable development.

Business

The most broadly accepted criterion for corporate sustainability constitutes a firm's efficient use of natural capital. This eco-efficiency is usually calculated as the economic value added by a firm in relation to its aggregated ecological impact. This idea has been popularized by the World Business Council for Sustainable Development (WBCSD) under the following definition: "Eco-efficiency is achieved by the delivery of competitively priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource intensity throughout the life-cycle to a level at least in line with the earth's carrying capacity" (DeSimone and Popoff, 1997: 47). Similar to the eco-efficiency concept but so far less explored is the second criterion for corporate sustainability. Socio-efficiency describes the relation between a firm's value added and its social impact. Whereas, it can be assumed that most corporate impacts on the environment are negative (apart from rare exceptions such as the planting of trees) this is not true for social impacts. These can be either positive (e.g. corporate giving, creation of employment) or negative (e.g. work accidents, human rights abuses). Both eco-efficiency and socio-efficiency are concerned primarily with increasing economic sustainability. In this process they instrumentalize both natural and social capital aiming to benefit from win-win situations. Some point towards eco-effectiveness, socio-effectiveness, sufficiency, and eco-equity as four criteria that need to be met if sustainable development is to be reached.

Architecture and Construction

In sustainable architecture the recent movements of New Urbanism and New Classical architecture promote a sustainable approach towards construction that appreciates and develops smart growth, architectural tradition and classical design. This in contrast to modernist and International Style architecture, as well as opposing to solitary housing estates and suburban sprawl, with long commuting distances and large ecological footprints. The global design and construction industry is responsible for

approximately 39 percent of greenhouse gas emissions. Green building practices that avoid emissions or capture the carbon already present in the environment, allow for reduced footprint of the construction industry, for example, use of hempcrete, cellulose fiber insulation, and landscaping [61-70].

Sustainable Development

Sustainable development is the overarching paradigm of the United Nations. The concept of sustainable development was described by the 1987 Brundtland Commission Report as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." There are four dimensions to sustainable development - society, environment, culture and economy - which are intertwined, not separate. Sustainability is a paradigm for thinking about the future in which environmental, societal and economic considerations are balanced in the pursuit of an improved quality of life. For example, a prosperous society relies on a healthy environment to provide food and resources, safe drinking water and clean air for its citizens. One might ask, what is the difference between sustainable development and sustainability? Sustainability is often thought of as a long-term goal (i.e. a more sustainable world), while sustainable development refers to the many processes and pathways to achieve it (e.g. sustainable agriculture and forestry, sustainable production and consumption, good government, research and technology transfer, education and training, etc.).

What are the Sustainable Development Goals?

The Sustainable Development Goals (SDGs), also known as the Global Goals, were adopted by the United Nations in 2015 as a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity. The 17 SDGs are integrated—they recognize that action in one area will affect outcomes in others, and that development must balance social, economic and environmental sustainability. Countries have committed to prioritize progress for those who're furthest behind. The SDGs are designed to end poverty, hunger, AIDS, and discrimination against women and girls. The creativity, knowhow, technology and financial resources from all of society is necessary to achieve the SDGs in every context.

Goal 1

No Poverty

Eradicating poverty in all its forms remains one of the greatest challenges facing humanity. While the number of people living in extreme poverty dropped by more than half between 1990 and 2015, too many are still struggling for the most basic human needs. As of 2015, about 736 million people still lived on less than US\$1.90 a day; many lack food, clean drinking water and sanitation. Rapid growth in countries such as China and India has lifted millions out of poverty, but progress has been uneven. Women are more likely to be poor than men because they have less

paid work, education, and own less property. Progress has also been limited in other regions, such as South Asia and sub-Saharan Africa, which account for 80 percent of those living in extreme poverty. New threats brought on by climate change, conflict and food insecurity, mean even more work is needed to bring people out of poverty. The SDGs are a bold commitment to finish what we started, and end poverty in all forms and dimensions by 2030. This involves targeting the most vulnerable, increasing basic resources and services, and supporting communities affected by conflict and climate-related disasters.

Goal 2

Zero Hunger

Unfortunately, extreme hunger and malnutrition remain a huge barrier to development in many countries. There are 821 million people estimated to be chronically undernourished as of 2017, often as a direct consequence of environmental degradation, drought and biodiversity loss. Over 90 million children under five are dangerously underweight. Undernourishment and severe food insecurity appear to be increasing in almost all regions of Africa, as well as in South America. The SDGs aim to end all forms of hunger and malnutrition by 2030, making sure all people- especially children- have sufficient and nutritious food all year. This involves promoting sustainable agricultural, supporting small-scale farmers and equal access to land, technology and markets. It also requires international cooperation to ensure investment in infrastructure and technology to improve agricultural productivity.

Goal 3

Good Health and Well-Being

We have made great progress against several leading causes of death and disease. Life expectancy has increased dramatically; infant and maternal mortality rates have declined, we've turned the tide on HIV and malaria deaths have halved. Good health is essential to sustainable development and the 2030 Agenda reflects the complexity and interconnectedness of the two. It takes into account widening economic and social inequalities, rapid urbanization, threats to the climate and the environment, the continuing burden of HIV and other infectious diseases, and emerging challenges such as noncommunicable diseases. Universal health coverage will be integral to achieving SDG, ending poverty and reducing inequalities. Emerging global health priorities not explicitly included in the SDGs, including antimicrobial resistance, also demand action. But the world is off-track to achieve the health-related SDGs. Progress has been uneven, both between and within countries. There's a 31-year gap between the countries with the shortest and longest life expectancies. And while some countries have made impressive gains, national averages hide that many are being left behind. Multisectoral, rights-based and gender-sensitive approaches are essential to address inequalities and to build good health for all.

Goal 4

Quality Education

Since 2000, there has been enormous progress in achieving the target of universal primary education. The total enrollment rate in developing regions reached 91 percent in 2015, and the worldwide number of children out of school has dropped by almost half. There has also been a dramatic increase in literacy rates, and many more girls are in school than ever before. These are all remarkable successes. Since 2000, there has been enormous progress in achieving the target of universal primary education. The total enrollment rate in developing regions reached 91 percent in 2015, and the worldwide number of children out of school has dropped by almost half. There has also been a dramatic increase in literacy rates, and many more girls are in school than ever before. These are all remarkable successes. Progress has also been tough in some developing regions due to high levels of poverty, armed conflicts and other emergencies. In Western Asia and North Africa, ongoing armed conflict has seen an increase in the number of children out of school. This is a worrying trend. While Sub-Saharan Africa made the greatest progress in primary school enrollment among all developing regions - from 52 percent in 1990, up to 78 percent in 2012 - large disparities still remain. Children from the poorest households are up to four times more likely to be out of school than those of the richest households. Disparities between rural and urban areas also remain high. Achieving inclusive and quality education for all reaffirms the belief that education is one of the most powerful and proven vehicles for sustainable development. This goal ensures that all girls and boys complete free primary and secondary schooling by 2030. It also aims to provide equal access to affordable vocational training, to eliminate gender and wealth disparities, and achieve universal access to a quality higher education.

Goal 5

Gender Equality

Ending all discrimination against women and girls is not only a basic human right, it's crucial for sustainable future; it's proven that empowering women and girls helps economic growth and development. UNDP has made gender equality central to its work and we've seen remarkable progress in the past 20 years. There are more girls in school now compared to 15 years ago, and most regions have reached gender parity in primary education. But although there are more women than ever in the labor market, there are still large inequalities in some regions, with women systematically denied the same work rights as men. Sexual violence and exploitation, the unequal division of unpaid care and domestic work, and discrimination in public office all remain huge barriers. Climate change and disasters continue to have a disproportionate effect on women and children, as do conflict and migration. It is vital to give women equal rights land and property, sexual and reproductive health, and to technology and the internet. Today there are more women in public office

than ever before, but encouraging more women leaders will help achieve greater gender equality.

Goal 6

Clean Water and Sanitation

Water scarcity affects more than 40 percent of people, an alarming figure that is projected to rise as temperatures do. Although 2.1 billion people have improved water sanitation since 1990, dwindling drinking water supplies are affecting every continent. More and more countries are experiencing water stress, and increasing drought and desertification is already worsening these trends. By 2050, it is projected that at least one in four people will suffer recurring water shortages. Safe and affordable drinking water for all by 2030 requires we invest in adequate infrastructure, provide sanitation facilities, and encourage hygiene. Protecting and restoring water-related ecosystems is essential. Ensuring universal safe and affordable drinking water involves reaching over 800 million people who lack basic services and improving accessibility and safety of services for over two billion. In 2015, 4.5 billion people lacked safely managed sanitation services (with adequately disposed or treated excreta) and 2.3 billion lacked even basic sanitation.

Goal 7

Affordable and Clean Energy

Between 2000 and 2018, the number of people with electricity increased from 78 to 90 percent, and the numbers without electricity dipped to 789 million. Yet as the population continues to grow, so will the demand for cheap energy, and an economy reliant on fossil fuels is creating drastic changes to our climate. Investing in solar, wind and thermal power, improving energy productivity, and ensuring energy for all is vital if we are to achieve SDG 7 by 2030. Expanding infrastructure and upgrading technology to provide clean and more efficient energy in all countries will encourage growth and help the environment.

Goal 8

Decent Work and Economic Growth

Over the past 25 years the number of workers living in extreme poverty has declined dramatically, despite the lasting impact of the 2008 economic crisis and global recession. In developing countries, the middle class now makes up more than 34 percent of total employment - a number that has almost tripled between 1991 and 2015. However, as the global economy continues to recover we are seeing slower growth, widening inequalities, and not enough jobs to keep up with a growing labor force. According to the International Labor Organization, more than 204 million people were unemployed in 2015. The SDGs promote sustained economic growth, higher levels of productivity and technological innovation. Encouraging entrepreneurship and job creation are key to this, as are effective measures to eradicate forced labor, slavery and human trafficking. With these targets in mind, the

goal is to achieve full and productive employment, and decent work, for all women and men by 2030.

Goal 9

Industry, Innovation and Infrastructure

Investment in infrastructure and innovation are crucial drivers of economic growth and development. With over half the world population now living in cities, mass transport and renewable energy are becoming ever more important, as are the growth of new industries and information and communication technologies.

Technological progress is also key to finding lasting solutions to both economic and environmental challenges, such as providing new jobs and promoting energy efficiency. Promoting sustainable industries, and investing in scientific research and innovation, are all important ways to facilitate sustainable development. More than 4 billion people still do not have access to the Internet, and 90 percent are from the developing world. Bridging this digital divide is crucial to ensure equal access to information and knowledge, as well as foster innovation and entrepreneurship.

Goal 10

Reduced Inequalities

Income inequality is on the rise. The richest 10 percent have up to 40 percent of global income whereas the poorest 10 percent earn only between 2 to 7 percent. If we take into account population growth inequality in developing countries, inequality has increased by 11 percent. Income inequality has increased in nearly everywhere in recent decades, but at different speeds. It's the lowest in Europe and highest in the Middle East. These widening disparities require sound policies to empower lower income earners, and promote economic inclusion of all regardless of sex, race or ethnicity. Income inequality requires global solutions. This involves improving the regulation and monitoring of financial markets and institutions, encouraging development assistance and foreign direct investment to regions where the need is greatest. Facilitating the safe migration and mobility of people is also key to bridging the widening divide.

Goal 11

Sustainable Cities and Communities

More than half of us live in cities. By 2050, two-thirds of all humanity -6.5 billion people- will be urban. Sustainable development cannot be achieved without significantly transforming the way we build and manage our urban spaces. The rapid growth of cities -a result of rising populations and increasing migration has led to a boom in mega-cities, especially in the developing world, and slums are becoming a more significant feature of urban life. Making cities sustainable means creating career and business opportunities, safe and affordable housing, and building resilient societies and economies. It involves investment in public transport, creating green public spaces, and

improving urban planning and management in participatory and inclusive ways.

Goal 12

Responsible Consumption and Production

Achieving economic growth and sustainable development requires that we urgently reduce our ecological footprint by changing the way we produce and consume goods and resources. Agriculture is the biggest user of water worldwide, and irrigation now claims close to 70 percent of all freshwaters for human use. The efficient management of our shared natural resources, and the way we dispose of toxic waste and pollutants, are important targets to achieve this goal. Encouraging industries, businesses and consumers to recycle and reduce waste is equally important, as is supporting developing countries to move towards more sustainable patterns of consumption by 2030. A large share of the world population is still consuming far too little to meet even their basic needs. Halving the per capita of global food waste at the retailer and consumer levels is also important for creating more efficient production and supply chains. This can help with food security, and shift us towards a more resource efficient economy.

Goal 13

Climate Action

There is no country that is not experiencing the drastic effects of climate change. Greenhouse gas emissions are more than 50 percent higher than in 1990. Global warming is causing long-lasting changes to our climate system, which threatens irreversible consequences if we do not act. The annual average economic losses from climate-related disasters are in the hundreds of billions of dollars. This is not to mention the human impact of geo-physical disasters, which are 91 percent climate-related, and which between 1998 and 2017 killed 1.3 million people and left 4.4 billion injured. The goal aims to mobilize US\$100 billion annually by 2020 to address the needs of developing countries to both adapt to climate change and invest in low-carbon development. Supporting vulnerable regions will directly contribute not only to Goal 13 but also to the other SDGs. These actions must also go hand in hand with efforts to integrate disaster risk measures, sustainable natural resource management, and human security into national development strategies. It is still possible, with strong political will, increased investment, and using existing technology, to limit the increase in global mean temperature to two degrees Celsius above pre-industrial levels, aiming at 1.5°C, but this requires urgent and ambitious collective action.

Goal 14

Life below Water

The world's oceans - their temperature, chemistry, currents and life - drive global systems that make the Earth habitable for

humankind. How we manage this vital resource is essential for humanity as a whole, and to counterbalance the effects of climate change. Over three billion people depend on marine and coastal biodiversity for their livelihoods. However, today we are seeing 30 percent of the world's fish stocks overexploited, reaching below the level at which they can produce sustainable yields. Oceans also absorb about 30 percent of the carbon dioxide produced by humans, and we are seeing a 26 percent rise in ocean acidification since the beginning of the industrial revolution. Marine pollution, an overwhelming majority of which comes from land-based sources, is reaching alarming levels, with an average of 13,000 pieces of plastic litter to be found on every square kilometer of ocean. The SDGs aim to sustainably manage and protect marine and coastal ecosystems from pollution, as well as address the impacts of ocean acidification. Enhancing conservation and the sustainable use of ocean-based resources through international law will also help mitigate some of the challenges facing our oceans.

Goal 15

Life on Land

Human life depends on the earth as much as the ocean for our sustenance and livelihoods. Plant life provides 80 percent of the human diet, and we rely on agriculture as an important economic resource. Forests cover 30 percent of the Earth's surface, provide vital habitats for millions of species, and important sources for clean air and water, as well as being crucial for combating climate change. Every year, 13 million hectares of forests are lost, while the persistent degradation of dry lands has led to the desertification of 3.6 billion hectares, disproportionately affecting poor communities. While 15 percent of land is protected, biodiversity is still at risk. Nearly 7,000 species of animals and plants have been illegally traded. Wildlife trafficking not only erodes biodiversity, but creates insecurity, fuels conflict, and feeds corruption. Urgent action must be taken to reduce the loss of natural habitats and biodiversity which are part of our common heritage and support global food and water security, climate change mitigation and adaptation, and peace and security.

Goal 16

Peace, Justice and Strong Institutions

We cannot hope for sustainable development without peace, stability, human rights and effective governance, based on the rule of law. Yet our world is increasingly divided. Some regions enjoy peace, security and prosperity, while others fall into seemingly endless cycles of conflict and violence. This is not inevitable and must be addressed. Armed violence and insecurity have a destructive impact on a country's development, affecting economic growth, and often resulting in grievances that last for generations. Sexual violence, crime, exploitation and torture are also prevalent where there is conflict, or no rule of law, and

countries must take measures to protect those who are most at risk. The SDGs aim to significantly reduce all forms of violence, and work with governments and communities to end conflict and insecurity. Promoting the rule of law and human rights are key to this process, as is reducing the flow of illicit arms and strengthening the participation of developing countries in the institutions of global governance.

Goal 17

Partnerships for the Goals

The SDGs can only be realized with strong global partnerships and cooperation. Official Development Assistance remained steady but below target, at US\$147 billion in 2017. While humanitarian crises brought on by conflict or natural disasters continue to demand more financial resources and aid. Many countries also require Official Development Assistance to encourage growth and trade. The world is more interconnected than ever. Improving access to technology and knowledge is an important way to share ideas and foster innovation. Coordinating policies to help developing countries manage their debt, as well as promoting investment for the least developed, is vital for sustainable growth and development. The goals aim to enhance North-South and South-South cooperation by supporting national plans to achieve all the targets. Promoting international trade, and helping developing countries increase their exports is all part of achieving a universal rules-based and equitable trading system that is fair and open and benefits all.

What is the importance of sustainable development?

Global goals, such as the Sustainable Development Goals or SDGs, mobilize the global community to achieve them because a specific time frame is defined for these goals. These goals cause the cooperation of stakeholders from different countries and promote innovation and the sharing of expertise and new methods. An example of the effects of these collaborations and mobilizing global resources are achievements in the field of health: reducing child mortality and universal access to health. The Sustainable Development Goals provide a long-term approach to addressing global challenges. The challenges facing many countries of the world and to solve them requires joint cooperation. Due to rapid changes in governments and their policies, most government programs have a relatively short lifespan (4-5 years). Having long-term goals and plans that have been agreed upon by 193 countries will increase the continuity of efforts towards these goals and will strengthen the commitment to accomplish them. Sustainable development goals not only refer to people's well-being, economic development of countries and a better environment, but also provide the tools needed to achieve them and how to make these changes. These goals address the root causes of poverty and inequality. Problems such as weak rule of law, corruption, traditionalism and norms that cause discrimination. Since all these goals are interrelated, without knowing the root causes of

one, the other cannot be achieved.

Renewability and Sustainability

Geothermal power is considered to be renewable because any projected heat extraction is small compared to the Earth's heat content. The Earth has an internal heat content of 1031 joules ($3 \cdot 10^{15}$ TWh), approximately 100 billion times the 2010 worldwide annual energy consumption. About 20% of this is residual heat from planetary accretion; the remainder is attributed to past and current radioactive decay of naturally occurring isotopes. For example, a 5275 m deep borehole in United Downs Deep Geothermal Power Project in Cornwall, England, found granite with very high thorium content, whose radioactive decay is believed to power the high temperature of the rock. Natural heat flows are not in equilibrium, and the planet is slowly cooling down on geologic timescales. Human extraction taps a minute fraction of the natural outflow, often without accelerating it. According to most official descriptions of geothermal energy use, it is currently called renewable and sustainable because it returns an equal volume of water to the area that the heat extraction takes place, but at a somewhat lower temperature. For instance, the water leaving the ground is 300 degrees, and the water returning is 200 degrees, the energy obtained is the difference in heat that is extracted. Current research estimates of impact on the heat loss from the Earth's core are based on a studies done up through 2012. However, if household and industrial uses of this energy source were to expand dramatically over coming years, based on a diminishing fossil fuel supply and a growing world population that is rapidly industrializing requiring additional energy sources, then the estimates on the impact on the Earth's cooling rate would need to be re-evaluated. Geothermal power is also considered to be sustainable thanks to its power to sustain the Earth's intricate ecosystems. By using geothermal sources of energy present generations of humans will not endanger the capability of future generations to use their own resources to the same amount that those energy sources are presently used. Further, due to its low emissions geothermal energy is considered to have excellent potential for mitigation of global warming.

Even though geothermal power is globally sustainable, extraction must still be monitored to avoid local depletion. Over the course of decades, individual wells draw down local temperatures and water levels until a new equilibrium is reached with natural flows. The three oldest sites, at Larderello, Wairakei, and the Geysers have experienced reduced output because of local depletion. Heat and water, in uncertain proportions, were extracted faster than they were replenished. If production is reduced and water is reinjected, these wells could theoretically recover their full potential. Such mitigation strategies have already been implemented at some sites. The long-term sustainability of geothermal energy has been demonstrated at the Lardarello field in Italy since 1913, at the Wairakei field in New Zealand since 1958, and at The Geysers field in California

since 1960. Falling electricity production may be boosted through drilling additional supply boreholes, as at Poihipi and Ohaaki. The Wairakei power station has been running much longer, with its first unit commissioned in November 1958, and it attained its peak generation of 173 MW in 1965, but already the supply of high-pressure steam was faltering, in 1982 being derated to intermediate pressure and the station managing 157 MW. Around the start of the 21st century it was managing about 150 MW, then in 2005 two 8 MW isopentane systems were added, boosting the station's output by about 14 MW. Detailed data are unavailable, being lost due to re-organisations. One such re-organisation in 1996 causes the absence of early data for Poihipi (started 1996), and the gap in 1996/7 for Wairakei and Ohaaki; half-hourly data for Ohaaki's first few months of operation are also missing, as well as for most of Wairakei's history.

Sustainable Development

Sustainable development is an organizing principle for meeting human development goals while also sustaining the ability of natural systems to provide the natural resources and ecosystem services on which the economy and society depend. The desired result is a state of society where living conditions and resources are used to continue to meet human needs without undermining the integrity and stability of the natural system. Sustainable development can be defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. While the modern concept of sustainable development is derived mostly from the 1987 Brundtland Report, it is also rooted in earlier ideas about sustainable forest management and 20th-century environmental concerns. As the concept of sustainable development developed, it has shifted its focus more towards the economic development, social development and environmental protection for future generations. The UN-level Sustainable Development Goals (2015-2030) address the global challenges, including poverty, inequality, climate change, environmental degradation, peace, and justice.

Definition

Sustainable development can be defined as the practice of maintaining productivity by replacing used resources with resources of equal or greater value without degrading or endangering natural biotic systems. Sustainable development binds together concern for the carrying capacity of natural systems with the social, political and economic challenges faced by humanity. Sustainability science is the study of the concepts of sustainable development and environmental science. There is an emphasis on the present generations' responsibility to regenerate, maintain and improve planetary resources for use by future generations.

Development of the concept

Origins

Sustainable development has its roots in ideas about

sustainable forest management, which were developed in Europe during the 17th and 18th centuries. In response to a growing awareness of the depletion of timber resources in England, John Evelyn argued, in his 1662 essay *Sylva* that "sowing and planting of trees had to be regarded as a national duty of every landowner, in order to stop the destructive over-exploitation of natural resources." In 1713, Hans Carl von Carlowitz, a senior mining administrator in the service of Elector Frederick Augustus I of Saxony published *Sylvicultura economica*, a 400-page work on forestry. Building upon the ideas of Evelyn and French minister Jean-Baptiste Colbert, von Carlowitz developed the concept of managing forests for sustained yield. His work influenced others, including Alexander von Humboldt and Georg Ludwig Hartig, eventually leading to the development of the science of forestry. This, in turn, influenced people like Gifford Pinchot, the first head of the US Forest Service, whose approach to forest management was driven by the idea of wise use of resources, and Aldo Leopold whose land ethic was influential in the development of the environmental movement in the 1960s. Following the publication of Rachel Carson's *Silent Spring* in 1962, the developing environmental movement drew attention to the relationship between economic growth and environmental degradation. Kenneth E. Boulding, in his influential 1966 essay *The Economics of the Coming Spaceship Earth*, identified the need for the economic system to fit itself to the ecological system with its limited pools of resources. Another milestone was the 1968 article by Garrett Hardin that popularized the term "tragedy of the commons". One of the first uses of the term sustainable in the contemporary sense was by the Club of Rome in 1972 in its classic report on the *Limits to Growth*, written by a group of scientists led by Dennis and Donella Meadows of the Massachusetts Institute of Technology. Describing the desirable "state of global equilibrium", the authors wrote: "We are searching for a model output that represents a world system that is sustainable without sudden and uncontrolled collapse and capable of satisfying the basic material requirements of all of its people."

In 1980, the International Union for Conservation of Nature published a world conservation strategy that included one of the first references to sustainable development as a global priority and introduced the term "sustainable development". Two years later, the United Nations World Charter for Nature raised five principles of conservation by which human conduct affecting nature is to be guided and judged. In 1987, the United Nations World Commission on Environment and Development released the report *Our Common Future*, commonly called the Brundtland Report. The report included what is now one of the most widely recognized definitions of sustainable development.

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains Within it two key concepts: The concept of 'needs', in particular, the essential needs of the world's poor, to which overriding priority should be given; and The idea of limitations imposed by the state of technology and

social organization on the environment's ability to meet present and future needs. Since the Brundtland Report, the concept of sustainable development has developed beyond the initial intergenerational framework to focus more on the goal of "socially inclusive and environmentally sustainable economic growth". In 1992, the UN Conference on Environment and Development published the Earth Charter, which outlines the building of a just, sustainable, and peaceful global society in the 21st century. The action plan Agenda 21 for sustainable development identified information, integration, and participation as key building blocks to help countries achieve development that recognizes these interdependent pillars. It emphasizes that in sustainable development, everyone is a user and provider of information. It stresses the need to change from old sector-centered ways of doing business to new approaches that involve cross-sectoral co-ordination and the integration of environmental and social concerns into all development processes. Furthermore, Agenda 21 emphasizes that broad public participation in decision making is a fundamental prerequisite for achieving sustainable development.

Under the principles of the United Nations Charter the Millennium Declaration identified principles and treaties on sustainable development, including economic development, social development and environmental protection. Broadly defined, sustainable development is a systems approach to growth and development and to manage natural, produced, and social capital for the welfare of their own and future generations. The term sustainable development as used by the United Nations incorporates both issues associated with land development and broader issues of human development such as education, public health, and standard of living. A 2013 study concluded that sustainability reporting should be reframed through the lens of four interconnected domains: ecology, economics, politics and culture.

Reception

The concept of sustainable development has been, and still is, subject to criticism, including the question of what is to be sustained in sustainable development. It has been argued that there is no such thing as a sustainable use of a non-renewable resource, since any positive rate of exploitation will eventually lead to the exhaustion of earth's finite stock; this perspective renders the Industrial Revolution as a whole unsustainable. The sustainable development debate is based on the assumption that societies need to manage three types of capital (economic, social, and natural), which may be non-substitutable and whose consumption might be irreversible. Leading ecological economist and steady-state theorist Herman Daly, for example, points to the fact that natural capital can not necessarily be substituted by economic capital. While it is possible that we can find ways to replace some natural resources, it is much more unlikely that they will ever be able to replace eco-system services, such as the protection provided by the ozone layer, or the climate stabilizing

function of the Amazonian forest. In fact natural capital, social capital and economic capital are often complementarities. A further obstacle to substitutability lies also in the multi-functionality of many natural resources. Forests, for example, not only provide the raw material for paper but they also maintain biodiversity, regulate water flow, and absorb CO₂.

Requirements

Six interdependent capacities are deemed to be necessary for the successful pursuit of sustainable development. These are the capacities to measure progress towards sustainable development; promote equity within and between generations; adapt to shocks and surprises; transform the system onto more sustainable development pathways; link knowledge with action for sustainability; and to devise governance arrangements that allow people to work together in exercising the other capacities.

Dimensions

Sustainable development can be thought of in terms of three spheres, dimensions, domains or pillars: the environment, the economy and society. The three-sphere framework has also been worded as "economic, environmental and social" or "ecology, economy and equity". This has been expanded by some authors to include a fourth pillar of culture, institutions or governance, or alternatively reconfigured as four domains of the social - ecology, economics, politics and culture, thus bringing economics back inside the social, and treating ecology as the intersection of the social and the natural.

Sustainable Development Goals

The Sustainable Development Goals (SDGs) or Global Goals are a collection of 17 interlinked global goals designed to be a "blueprint to achieve a better and more sustainable future for all". The SDGs were set up in 2015 by the United Nations General Assembly (UN-GA) and are intended to be achieved by the year 2030. They are included in a UN-GA Resolution called the 2030 Agenda or what is colloquially known as Agenda 2030. The SDGs were developed in the Post-2015 Development Agenda as the future global development framework to succeed the Millennium Development Goals which ended in 2015.

What is development?

You might have listed some of the following words: change, consumption, economic development, economic growth, education, entitlements, equality, equity, freedom, gender equity, goals, good governance, Gross Domestic Product (GDP), health, human development, human rights, income, justice, livelihoods, Millennium Development Goals (MDGs), participation, peace, positive change, poverty reduction, process of change, production, progress, reducing vulnerability, responsibilities, self-determination, social development, social inclusion, sustainability, targets, wealth.

Development - A Political Term

A multitude of meanings is attached to the idea of development; the term is complex, contested, ambiguous, and elusive. However, in the simplest terms, development can be defined as bringing about social change that allows people to achieve their human potential. An important point to emphasize is that development is a political term: it has a range of meanings that depend on the context in which the term is used, and it may also be used to reflect and to justify a variety of different agendas held by different people or organizations. The idea of development articulated by the World Bank, for instance, is very different from that promoted by Greenpeace activists. This point has important implications for the task of understanding sustainable development, because much of the confusion about the meaning of the term 'sustainable development' arises because people hold very different ideas about the meaning of 'development' (Adams 2009). Another important point is that development is a process rather than an outcome: it is dynamic in that it involves a change from one state or condition to another. Ideally, such a change is a positive one - an improvement of some sort (for instance, an improvement in maternal health). Furthermore, development is often regarded as something that is done by one group (such as a development agency) to another (such as rural farmers in a developing country). Again, this demonstrates that development is a political process, because it raises questions about who has the power to do what to whom.

Development transforms the environment

But development is not simply about the interactions between human groups; it also involves the natural environment. So, from another point of view, development is about the conversion of natural resources into cultural resources. This conversion has taken place throughout the history of human societies, although the process has generally increased in pace and complexity with time. If we use a system diagram to illustrate - in very general terms - what an economy does, we see that the basic function of an economy is to convert natural resources (in the forms of raw materials and energy) into products and services that are useful to humans. Inevitably, because conversion processes are never totally efficient, some waste is produced which is usually discarded into the environment as various forms of pollution. Therefore, the environment is both a source and a sink in relation to economic processes: it is a source of raw materials and energy and a sink for pollution.

Resources, Energy and Waste

An example of this type of conversion would be the extraction of crude oil from the North Sea, its fractionation and distillation in oil refineries, and its conversion to petroleum or diesel. In turn, those products (petrol and diesel) are converted - through combustion processes - into useful work (such as transportation) whilst the waste products are released into the atmosphere as

greenhouse gases (such as carbon dioxide). If we add together all of the conversion processes that occur, for instance, in a given country, we would have a sense of the total input and output of that national economy. This could be expressed in terms of the total natural resources and energy consumed, the total products and services created and the total pollution generated. (In fact, the total value of the finished products and services created in a given country is expressed using a widely-used measure, the Gross Domestic Product, or GDP.) If we wanted to increase the creation of products and services, in a given economy, we would require more natural resources and energy, and we would also generate more pollution as a by-product.

Economic growth

From this point of view, development means an increase in the size or pace of the economy such that more products and services are produced. Conventionally, a common assumption has been that, if an economy generates more products and services, then humans will enjoy a higher standard of living. The aim of many conventional approaches to development has been to increase the size of the economy (economic growth) in order to increase the output of products and services. Of course, without any change in the fundamental economic processes involved, the production of more products and services will inevitably require more raw materials and energy, and will generate more waste.

Development theory

The emergence of development theory

The use of the term development to refer to national economic growth emerged in the United States beginning in the 1940s and in association with a key American foreign policy concern: how to shape the future of the newly independent states in ways that would ensure that they would not be drawn into the communist Soviet bloc. Motivated by this concern, the United States enlisted its social scientists to study and devise ways of promoting capitalist economic development and political stability in what was termed the developing world. Development theory refers to the research and writing that resulted from this effort.

There are different conceptions of development and, consequently, disparate approaches to the subject. However, all approaches are concerned with the relationship between development and governance. Development is usually seen as crucially determined by structures of governance; governance is interpreted through and shaped by the goal of development. Most development theory equates development with national economic growth and sees the state as its primary agent; consequently, one of its central concerns is to understand and explain the role of the state in development and the nature of government-market relations. Because these explanations relate development outcomes to the extent and form of the state's role in development, there is a close relationship between development

theory and practice. Development theory has changed over time with changes in ideology and the international environment, and, as it changes, so do its conceptions of development and governance and how they are related. Changing conceptions of governance and its relation to development can be traced through the major perspectives on development that have emerged since World War II, as represented by theories of modernization and growth, dependency and world systems theories, the resurgence of neoclassical theory, and an array of newer critical perspectives.

Theories of Modernization and Growth

Development involves innumerable variables, including economic, social, political, gender, cultural, religious, and environmental factors. But though development theory integrates concepts and perspectives from a range of disciplines, it was highly influenced by economic thought from the start. Early theoretical models of development equated development with economic growth and industrialization, and theorists saw countries that had not yet achieved these as being at an earlier or lower stage of development relative to Europe and North America. The most influential proponent of this view was the American economic historian Walt W. Rostow. His 1960 book, *The Stages of Economic Growth: A Non-Communist Manifesto*, elaborated a linear-stages-of-growth model that defined development as a sequence of stages through which all societies must pass. This conception of the nature and process of development became the basic blueprint for modernization theory. This perspective formed the basis of what came to be known as dependency theory. Dependency theory rejects the limited national focus of modernization theory and emphasizes the importance of understanding the complexity of imperialism and its role in shaping postcolonial states. Its main tenet is that the periphery of the international economy is being economically exploited (drained) by the centre. Building on ECLA's perspective, dependency theorists argued that colonialism recast economies in the Third World in a highly specialized export-producing mold, creating fundamental and interrelated structural distortions that have continued to thwart development. Once this reshaping was accomplished, market forces worked to perpetuate the relationship of dominance and exploitation between center and periphery.

During the 1970s there also emerged a perspective that elaborated an account of capitalist exploitation of the periphery from the perspective of the system's core. This theoretical enterprise became known as world systems theory. It typically treats the entire world, at least since the 16th century, as a single capitalist world economy based on an international division of labor among a core that developed originally in northwestern Europe (England, France, Netherlands), a periphery, and a semi periphery consisting of core regions in decline (e.g., Portugal and Spain) or peripheries attempting to improve their relative position in the world economy (e.g., Italy, southern Germany,

and southern France). The division of labor among these regions determined their relationship to each other as well as their type of labor conditions and political system. In the core, strong central governments, extensive bureaucracies, and large mercenary armies enabled the local bourgeoisies to obtain control of international commerce and accumulate capital surpluses from this trade. The periphery, which lacked strong central governments or was controlled by other states, exported raw materials to the core and relied on coercive labor practices. Much of the capital surplus generated by the periphery was expropriated by the core through unequal trade relations. The semi periphery had limited access to international banking and the production of high-cost, high-quality manufactured goods but did not benefit from international trade to the same extent as the core.

Dependency and world systems theories share a common emphasis on global analysis and similar assumptions about the nature of the international system and its impact on national development in different parts of the world, but they tend to emphasize different political dynamics. Dependency theorists tend to focus on the power of transnational classes and class structures in sustaining the global economy, whereas world systems analysts tended to focus on the role of powerful states and the interstate system.

Initially, the logic of these perspectives supported a strategy that came to be known as import-substitution industrialization (ISI). The ISI strategy was to produce internally manufactured goods for the national market instead of importing them from industrialized countries. Its long-run objective was to first achieve greater domestic industrial diversification and then to export previously protected manufactured goods as economies of scale and low labor costs make domestic costs more competitive in the world market. In the 1950s, 1960s, and 1970s, ISI strategies were pursued by countries such as Chile, Peru, Brazil, Mexico, Argentina, Ecuador, India, Pakistan, the Philippines, Indonesia, Nigeria, Ethiopia, Ghana, Zambia, South Korea, Taiwan, and Japan. The strategy ultimately foundered because of the smallness of the domestic market and, according to many structuralist theorists, the role of transnational corporations in this system. These theorists concluded that ISI, carried out in conditions of capitalist relations of production dominated by the economic empires led by the United States, was a recipe for further colonization, domination, and dependency.

Thus, beginning in the 1970s, theorists and practitioners heralded an export-oriented strategy as the way out of dependency. This strategy gives priority to the growth of manufacturing production aimed at world markets and the development of a particular comparative advantage as a basis for success in world trade. The strategy is based on lower wages and levels of domestic consumption (at least initially) to foster competitiveness in world markets, as well as to provide better conditions for foreign

investment and foreign financing of domestic investment. By the 1980s, however, many countries that pursued this strategy ended up with huge foreign indebtedness, causing a dramatic decrease in economic growth. Though the theorization of types of peripheral development and their connection with the international system continued to undergo refinement in the 1980s and 1990s, structural theorists were not able to agree about what would end dependence and how a nondependent growth could be achieved.

The Neoclassical Counterrevolution

In the 1980s a neoclassical (sometimes called neoliberal) counterrevolution in development theory and policy reasserted dominance over structuralist and other schools of thought in much of the world. The emergence of this counterrevolution coincided with the abandonment by the developed countries of social democratic and Keynesian economic policies and, in particular, the policy of controlling capital movements, as well as the post-World War II trading regime. Critics have pointed out that this counterrevolution also coincided with and seemed to offer justification and support for a wave of market-oriented interventions by the World Bank and International Monetary Fund (IMF) and efforts to forge a unified global market regulated only by institutions reflecting the interests of transnational capital. The neoclassical or neoliberal perspective represents a modification and further elaboration of modernization theory. However, in contrast to modernization theory, neoclassical theorists see development as the outcome not of strategic state action but of the action of market forces. The central claim is that failure to develop is primarily the result of too much government intervention and regulation of the economy. Neoclassical theory emphasizes the beneficial role of free markets, open economies, and the privatization of inefficient public enterprises. Its recommended strategy for development is to free markets from state control and regulation, so that capital, goods, and services can have total freedom of movement and there can be greater openness to international trade.

This is the basic blueprint for what has been termed good governance. The notion of good governance has been elaborated, in part, through a component of the neoclassical counterrevolution called new institutionalism. The basic premise of this perspective is that development outcomes depend on institutions such as property rights, price and market structures, money and financial institutions, firms and industrial organizations, and relationships between government and markets. The essence of good governance is to ensure the existence of these institutions and their proper role and functioning, as seen from the perspective of neoliberal theory. According to neoliberal thought, good governance requires freeing the market from state control and regulation; reducing government expenditures for social services like education and health care; maintaining roads, bridges, the water supply, and so forth; and selling state-owned enterprises, goods, and services (including banks, key industries, railroads, toll highways, electricity, schools, and hospitals) to private investors. As evidence

of the soundness of these policy prescriptions for the developing world, proponents point to the experience of four "Asian tigers": South Korea, Taiwan, Singapore, and Hong Kong. These were the most-successful cases of the export-led industrialization strategy adopted by many countries in the 1970s. All were able to achieve economic growth based on export industries with a comparative advantage in cheap but skilled labor. All maintained high rates of domestic savings and investment (with correspondingly lower levels of consumption). However, many people point out that, in contradiction to the market-oriented reforms prescribed by neoliberal theory and its underlying rejection of state intervention, this national development strategy in all the tigers except Hong Kong was planned and executed through the institutions of a centralized authoritarian state.

Critical Perspectives

A number of critical perspectives emerged in the 1970s that highlighted the cultural and ethical dimensions of development. Most prominent among these were the postmodern, postcolonial, and subaltern critiques of Eurocentric conceptions of modernity and development. Postmodern writing challenged grand narratives of the modern era—narratives of the inevitability of progress, the triumph of individuality, and the primacy of scientific truth—as oversimplified, oppressive, or tyrannical. Postcolonial theory focused on the legacy of colonial rule and especially the difficulties faced by former colonial peoples in developing national identity. Working within this general perspective, subaltern studies sought to rethink history from the perspective of the subaltern and, in this way, bring to light and assert the value of alternative experiences and ways. These critiques succeeded in drawing attention to the ethnocentric basis of the idea of what constitutes development and the potential limitations inherent within this development, the tension between universal theories and a diverse developing world, the treatment of gender in conventional development theory, and the political content of economic development strategies as pursued by national governments, encouraged by international institutions and nongovernmental organizations (NGOs), and concealed behind the notion of aid. Eventually, these critiques helped focus attention on the need to broaden the concept of development to include a social development and human security dimension. One notable result has been the United Nations Development Program's conceptualization of human development, which includes the capacity of people to lead long and healthy lives, acquire knowledge, and have access to the resources needed for a decent standard of living.

The notion of human development influenced development theory in at least two ways. First, it clarified the inadequacy of theories that focus on whole nations or societies and that use macroeconomic factors to explain differences in development conditions and to measure development: these theories cannot predict whether the wealth and material well-being generated nationally are widely enough distributed to provide the conditions for human development. Second, the notion of development as

human development reemphasizes the importance of the state. It assigns the state a major role in protecting and advancing sustainable human well-being and argues the need for just the socially oriented state policies that neoliberalism proscribes—policies that improve the access of all people to human resource investments, productive assets, credit facilities, information flows, and physical infrastructure and protect the legitimate interests of producers, consumers, workers, and vulnerable groups in society. Thus, alongside the neoliberal call to dismantle public ownership, state planning, and government regulation of economic activities, there was a perspective that reinvigorated the call for a larger state role in development. These contending perspectives informed political debates about growth and governance and, in particular, what constituted good governance in the global context of development.

Developed Country

A developed country (or industrialized country, high-income country, more economically developed country (MEDC), advanced country) is a sovereign state that has a high quality of life, developed economy and advanced technological infrastructure relative to other less industrialized nations. Most commonly, the criteria for evaluating the degree of economic development are gross domestic product (GDP), gross national product (GNP), the per capita income, level of industrialization, amount of widespread infrastructure and general standard of living. Which criteria are to be used and which countries can be classified as being developed are subjects of debate. A point of reference of US\$20,000 in 2021 USD nominal GDP per capita for the International Monetary Fund (IMF) is a good point of departure, it is a similar level of development to the United States in 1960. Developed countries have generally more advanced post-industrial economies, meaning the service sector provides more wealth than the industrial sector. They are contrasted with developing countries, which are in the process of industrialization or are pre-industrial and almost entirely agrarian, some of which might fall into the category of Least Developed Countries. As of 2015, advanced economies comprise 60.8% of global GDP based on nominal values and 42.9% of global GDP based on purchasing-power parity (PPP) according to the IMF.

Definition and Criteria

Economic criteria have tended to dominate discussions. One such criterion is income per capita; countries with high gross domestic product (GDP) per capita would thus be described as developed countries. Another economic criterion is industrialization; countries in which the tertiary and quaternary sectors of industry dominate would thus be described as developed. More recently another measure, the Human Development Index (HDI), which combines an economic measure, national income, with other measures, indices for life expectancy and education has become prominent. This criterion would define developed countries as those with a very high (HDI) rating. The

index, however, does not take into account several factors, such as the net wealth per capita or the relative quality of goods in a country. This situation tends to lower the ranking for some of the most advanced countries, such as the G7 members and others.

It's difficult to determine how best to quantify the difference between developed and developing countries. Although gross domestic product (GDP) is one of the most well-known values for assessing economic health, several other metrics can also be used to gauge a nation's development. While some have the potential to be more accurate than others, none of them are inherently wrong to use. To further complicate matters, most countries are large, complex entities that can't be neatly categorized. As a result, there are several nations that exhibit characteristics of more than one category. Even the experts have yet to agree on a consistent definition. For instance, the United Nations (UN) classifies countries as either developed economies, economies in transition, or developing economies, although it doesn't specify its basis for applying these groupings other than that they "reflect basic economic country conditions." The International Monetary Fund (IMF), on the other hand, takes several different factors into account when determining whether a nation is an advanced economy, an emerging market and developing economy, or a low-income developing country. The World Bank uses gross national income (GNI) per capita for its measurements, and it has four different categories: high-income economies, upper middle-income economies, lower middle-income economies, and low-income economies. The purpose of this article is to highlight the development status of the 25 largest countries on Earth by GDP. This metric was chosen to better illustrate how nations meeting the traditional criteria for being "wealthy" can still be considered developing. That being said, countries on this list have been categorized according to the UN's standards because its classification system is the closest to our definitions of "developed" and "developing."

What is a Developed Nation?

A nation is typically considered to be "developed" if it meets certain socioeconomic criteria. In some cases, this can be as simple as having a sufficiently developed economy. Where that isn't adequate, other qualifiers can include but are not limited to a country's GDP/GNI per capita, its level of industrialization, its general standard of living, and/or the amount of technological infrastructure it has. These factors are typically interconnected (i.e., the level of available technology can impact the amount of GDP a country is capable of generating, etc.). According to the UN, in 2020, 35 countries were considered "developed." All developed countries were located in either North America, Europe, or "Developed Asia and Pacific."

Developed countries typically share several other characteristics:

- Their birth and death rates are stable. They do not have

very high birth rates because, thanks to quality medical care and high living standards, infant mortality rates are low. Families do not feel the need to have large numbers of children due to the expectation that some will not survive.

- They have more women working. These career-oriented women may have chosen to have smaller families or eschew having children altogether.
- They use a disproportionate amount of the world's resources. In developed countries, more people drive cars, fly on airplanes, and power their homes with electricity and gas. Inhabitants of developing countries often do not have access to technologies that require the use of these resources.
- They have higher levels of debt. Nations with developing economies cannot obtain the kind of seemingly bottomless financing that more developed nations can.

What Is a Developing Country?

A nation is typically considered to still be “developing” if it does not meet the socioeconomic criteria listed above. Simply put, these are most often countries with a lower income, an underdeveloped industrial base, a lower standard of living, and a lack of access to modern technology. As a result, developing nations frequently experience a lack of jobs, food, clean drinking water, education, healthcare, and housing. According to the UN, in 2020, 126 countries were considered “developing.” All developing countries were located in either Africa, Asia, or Latin America and the Caribbean. Development status determines which countries have a right to receive development aid under the rules of a multilateral or bilateral agency, such as the World Trade Organization (WTO). This is likely the primary reason for why there are so many varied definitions of “developed” vs. “developing,” as each organization has different qualifications for what should constitute the latter in order to receive their assistance. This is also why even the terminology is inconsistent, as this binary is often insufficient for categorizing large, complex territories. For instance, the World Bank announced in 2016 that it would no longer be distinguishing between developing countries and developed countries, due to the terms no longer being considered relevant.

Which Countries Have the Highest GDP per Capita?

GDP represents the total monetary or market value of all the finished goods and services produced within a country's borders in a specific time period. The calculation of a nation's GDP encompasses all private and public consumption, government outlays, investments, additions to private inventories, paid-in construction costs, and the foreign balance of trade. While useful for acquiring a snapshot of the world's economic powerhouses, this metric by itself is typically insufficient. Every country is obviously going to have a different population, which means

that looking exclusively at GDP can distort the truth and/or be so obvious as to be meaningless. Of course a nation as large as China, with a total population of 1.4 billion people, would have a larger GDP than a much smaller country like Ireland, with its total population of 4.9 million. GDP per capita is a much more relevant statistic for better illustrating how a hypothetical average citizen might experience a nation's economic output. GDP per capita, a tally of all the goods and services produced in a country in one year (as expressed in U.S. dollars), is a useful metric for distinguishing developed countries from developing ones. GDP per capita is calculated by dividing a country's GDP by its total population. For example, the population of China is approximately 285 times larger than the population of Ireland. Yet the typical Irish person (\$78,779) is nearly eight times richer than their Chinese counterpart (\$10,216.60), despite the fact that their country is so much smaller. The countries with the highest GDP per capita are often those with an unusual concentration of wealth.

What Does HDI Mean?

Another measuring device, the human development index (HDI), was developed by the UN as a metric to assess the social and economic development levels of a given country. HDI quantifies life expectancy, educational attainment, and income into a standardized number between zero and one; the closer to one, the more developed the country. No minimum requirement exists for developed status, but most developed countries have HDIs of 0.8 or higher. The life expectancy aspect of the HDI is calculated at the time of birth, which is equal to zero when life expectancy is 20 and equal to one when life expectancy is 85. Education is measured according to the mean years of schooling for residents of a country and the expected years of schooling that a child has at the average age for starting school. Finally, the metric chosen to represent the standard of living is GNI (gross national income) per capita based on purchasing power parity (PPP). This index is useful for examining the impact of policy choices made by each nation. For example, if two countries have approximately the same GNI per capita but wildly different HDI scores, then it stands to reason that these disparities could stem from policies regarding life expectancy, educational attainment, or another factor unrelated to economic health. It's important to remember no set minimums or maximums exist for these metrics. Economists look at the totality of a country's situation before rendering judgment, and they do not always agree on a country's development status.

Development Status of the Top 25 Countries by GDP

Here is our analysis of the development status of the top 25 countries by GDP as of 2019, organized alphabetically. Of this total, 14 countries are considered “developed,” 10 are considered “developing,” and one is considered “in transition.”

- **Australia**

- GDP (2019): \$1,396.57 billion
- Population (2019): 25.36 million
- GDP per Capita (2019): \$55,057.2
- HDI (2020): 0.944

Australia is a developed country. The Land Down Under has widespread industrialization and provides quality healthcare for the majority of its citizens. Australians also enjoy a higher quality of life than some other countries; according to the Organization for Economic Cooperation and Development (OECD), citizens on average graded their contentment with life as 7.3 out of 10, which is reasonably better than the 6.5 global average. Australia is one of the wealthiest Asia-Pacific nations and has enjoyed over 20 years of economic growth. Australia has a high average life expectancy of 85 years, much of which can be attributed to its excellent healthcare system. The country's infant mortality rate is three per 1,000 live births, one of the lowest rates in the world, as of 2019.

➤ **Belgium**

- GDP (2019): \$533.10 billion
- Population (2019): 11.50 million
- GDP per Capita (2019): \$46,345.4
- HDI (2020): 0.931

Belgium is a developed country. The Kingdom of Belgium is the first among several European countries on this list to have a higher quality of life (6.9 out of 10), life expectancy (81.6 years from birth), and education length (19.8 years of schooling) than the respective worldwide averages. At 69.74%, the services sector accounted for the largest portion of the country's GDP in 2019. Belgium lacks an abundance of natural resources, making it heavily reliant on imports of raw materials. However, given its central geographic location, highly developed transport network, and diversified industrial and commercial base, the country is well suited to act as a major exporter of manufactured goods. As of 2019, the country's average life expectancy was 82 years from birth, while its infant mortality rate was 10 deaths per 1,000 live births.

➤ **Brazil**

- GDP (2019): \$1,839.76 billion
- Population (2019): 211.05 million
- GDP per Capita (2019): \$8,717.2
- HDI (2020): 0.765

Brazil is a developing country. Though it has several characteristics of a developed nation, including the largest

economy in South America or Central America, Brazil is still considered a developing country due to its lower GDP per capita, higher infant mortality rate, and other factors. Its high birth rate, at 14 births per 1,000 people in 2019, is also a common characteristic of a developing country. Several factors contribute to all of these metrics, including lack of clean water; limited access to adequate healthcare, particularly in rural areas; abysmal housing conditions in many regions; and substandard diets. A Brazilian's average life expectancy, at 76 years since birth as of 2019, ranks higher than that of some other developing countries, though it's just barely above the global average of 75 years.

➤ **Canada**

- GDP (2019): \$1,736.42 billion
- Population (2019): 37.59 million
- GDP per Capita (2019): \$46,189.7
- HDI (2020): 0.929

Canada is a developed country. As the 10th-largest world economy on the basis of GDP, Canada has a diverse economic base. It has a wealth of natural resources, including oil, gas, and coal. As such, the country is able to support its own energy needs as well as export natural resources to other countries. In spite of this fact, Canada is also a world leader in the production and use of renewable energy sources, which provide approximately 18.9% of the country's overall energy supply, while moving water specifically accounts for 59.3% of its electricity. Canada's proximity to the United States and a favorable exchange rate have also contributed to a strong manufacturing climate in the country. Canadians enjoy universal healthcare coverage, with all residents having access to free medical care through a government-provided program. As of 2019, the country's average life expectancy was a solid 82 years, while its infant mortality rate was 10 deaths per 1,000 live births.

➤ **China**

- GDP (2019): \$14,279.94 billion
- Population (2019): 1,397.71 million
- GDP per Capita (2019): \$10,216.6
- HDI (2020): 0.761

China is a developing country. Despite having the world's second-largest economy and the single largest military, China is still not classified as a developed country by the criteria of most organizations. In addition to having one of the lowest GDPs per capita on this list, another attribute indicating China is still developing is its dependence on agriculture, although this has been trending downward over time. In 2020, 7.7% of China's overall

GDP was derived from agriculture. As of 2019, China's average life expectancy was 77 years, and its infant mortality rate was 11 per 1,000 live births. Although these rates aren't exceptionally high, they are noticeably worse than most other countries with trillions of dollars in overall wealth.

➤ France

- GDP (2019): \$2,715.52 billion
- Population (2019): 67.05 million
- GDP per Capita (2019): \$40,496.4
- HDI (2020): 0.901

France is a developed country. The French Republic is one of the world's economic powerhouses. As of 2019, France has the seventh-largest economy by GDP. The country benefits from a diverse economy, including tourism, manufacturing, and pharmaceuticals. The French government has partially or fully privatized many prominent companies, though it maintains a strong presence in its power, public transport, and defense sectors. As of 2019, French citizens enjoyed a higher-than-average life expectancy of 83 years since birth and a low infant mortality rate of four deaths per 1,000 live births. The French healthcare system combines universal access to care with a substantial amount of freedom for patients, with surveys showing that citizens are overall satisfied with their country's system. Additionally, in 2020, unemployment in France sat at 8.34% and has been trending downward.

➤ Germany

- GDP (2019): \$3,861.12 billion
- Population (2019): 83.09 million
- GDP per Capita (2019): \$46,467.5
- HDI (2020): 0.947

Germany is a developed country. Driven by its highly skilled labor force, Germany is Europe's strongest economy, and it is the fourth-largest economy in the world. The nation is known for delivering world-class quality products, including machinery, motor vehicles, electronics, and pharmaceuticals. In 2019, Germany was second only to China as the world's largest surplus economy, with its exported products exceeding its imported products. As of 2019, Germany had a life expectancy of 81 years since birth as well as an infant mortality rate of only three deaths per 1,000 live births. German citizens enjoy access to universal healthcare coverage. All Germans must belong to a not-for-profit sickness fund that covers most necessary medical procedures and medications. Just 0.3% of Germany's population reported an unmet need for medical care in 2017.

➤ India

- GDP (2019): \$2,868.93 billion
- Population (2019): 1,366.42 million
- GDP per Capita (2019): \$2,099.
- HDI (2020): 0.645

India is a developing country. Although India is an exceptionally wealthy country (ranked fifth in terms of overall GDP), like China, its high population results in a rather low GDP per capita. The Republic of India is considered both a newly industrialized nation and one of the fastest developing countries on Earth. However, the country continues to struggle with issues like widespread poverty, poor water and sanitation, and overpopulation. India hosts a diverse economy, ranging from traditional farming to contemporary agriculture, and handicrafts to a wide range of industrial products. Thanks to a large and well-educated English-speaking population, India is a major exporter of IT services, business outsourcing services, and software workers. As of 2019, India had a life expectancy of 70 years since birth as well as an infant mortality rate of 28 deaths per 1,000 live births.

➤ Indonesia

- GDP (2019): \$1,119.19 billion
- Population (2019): 270.62 million
- GDP per Capita (2019): \$4,135.6
- HDI (2020): 0.718

Indonesia is a developing country. The Republic of Indonesia is the world's most populous Muslim-majority country and Southeast Asia's largest economy. The nation's key exports include rubber, animal and vegetable fat, mineral fuels, machinery, electrical machinery, and mechanical appliance parts. A unique aspect of Indonesia's quality of life is that the country lies within the Pacific Ring of Fire, which is responsible for 90% of earthquakes and has 75% of the world's active volcanos. In addition to natural disaster hazards, the nation also faces challenges more common to developing countries, with 24 million Indonesians lacking safe water, 38 million lacking access to improved sanitation facilities, and 19.4 million being unable to meet their dietary requirements. As of 2019, Indonesia had a life expectancy of 72 years since birth, as well as an infant mortality rate of 20 deaths per 1,000 live births.

➤ Italy

- GDP (2019): \$2,003.58 billion
- Population (2019): 60.30 million
- GDP per Capita (2019): \$33,225.6
- HDI (2020): 0.892

Italy is a developed country. Italy's manufacturing industry is

very well developed, and it is ranked seventh on Earth according to the World Economic Forum. In particular, Italy is known for producing high-quality luxury products, such as fashion accessories, expensive cars, and food products. Nearly 71% of Italy's more than 25 million workers are employed in the services sector, while just over 3.5% work in agriculture, which is a strong indicator that this nation is developed. Italy alone accounts for approximately 2.28% of the planet's entire wealth, ranked eighth in the world for overall GDP. The present-day commercial banking industry had its beginning in Italy, and today the nation's largest financial services company, Intesa Sanpaolo, is regularly ranked on the Fortune 500 list. As of 2019, the country's average life expectancy was 83 years from birth, while its infant mortality rate was 7 deaths per 1,000 live births.

➤ **Japan**

- GDP (2019): \$5,081.77 billion
- Population (2019): 126.26 million
- GDP per Capita (2019): \$40,246.9
- HDI (2020): 0.919

Japan is a developed country. Despite its smaller size compared to other economically healthy countries, such as Germany or France, Japan is the third wealthiest nation on Earth in terms of overall GDP. More than 72% of the nation's workforce was in the services sector in 2019, while just over 3% was in agriculture. The archipelago is heavily dependent on imports of natural resources, and it is the world's largest net buyer of food products, the largest importer of liquefied natural gas (LNG), and the third-largest coal importer. As of 2019, Japan has an average life expectancy of 84 years from birth and an exceptionally low infant mortality rate of just two deaths per 1,000 live births.

➤ **Mexico**

- GDP (2019): \$1,268.87 billion
- Population (2019): 127.57 million
- GDP per Capita (2019): \$9,946
- HDI (2020): 0.779

Mexico is a developing country. Mexico's development status is despite the fact that it exceeds the majority of its peers in the developing world on most economic and quality-of-life metrics. In fact, as of 2019, Mexico's economy wasn't heavily reliant on agriculture, at just 3.47%, while its services and industry sectors were much larger. Various other factors come close to, but don't quite hit, acceptable levels for developed-nation status. A life expectancy of 75 years since birth, as of 2019, ranks Mexico higher than most developing countries, but it still falls below its North American neighbors. The story is the same for the infant mortality rate, which was 12 per 1,000 live births that same year.

In addition, Mexico is plagued by large swaths of poverty, lack of quality healthcare, and limited access to clean water.

➤ **The Netherlands**

- GDP (2019): \$907.05 billion
- Population (2019): 17.34 million
- GDP per Capita (2019): \$52,295
- HDI (2020): 0.944

The Netherlands is a developed country. This nation demonstrates relative strength across all the metrics and combines a robust economy with a high standard of living for the majority of its residents. In 2017, the Dutch were the fifth lowest population at risk of poverty or social exclusion in the European Union. As of 2019, the Netherlands had a life expectancy of 82 years since birth as well as an infant mortality rate of four deaths per 1,000 live births. According to the OECD, the Netherlands fares well in providing its citizens with the tools necessary to build a high quality of life. Although the country is below average in environmental quality, the health and life expectancy for residents are in line with other developed countries. The Netherlands also ranks very highly in terms of work/life balance, with fewer than 0.4% of residents reporting that they work long hours in comparison with the global average of 11%.

➤ **Nigeria**

- GDP (2019): \$448.12 billion
- Population (2019): 200.96 million
- GDP per Capita (2019): \$2,229.9
- HDI (2020): 0.539

Nigeria is a developing country. The Federal Republic of Nigeria's GDP is far too low, as are the country's living standards, for it to be considered a developed nation. Despite having the largest economy in Africa, industrialization in Nigeria lags behind most other major economies. The country also suffers from a low literacy rate -at roughly 62% as of 2018- and an overburdened healthcare system. Poverty is widespread, at a rate of 40.1% in 2019, and large swaths of the country lack access to clean water. In 2019, the infant mortality rate in Nigeria was a high 74 per 1,000 live births, while the life expectancy rate was a low 55 years since birth.

➤ **Poland**

- GDP (2019): \$595.86 billion
- Population (2019): 37.96 million
- GDP per Capita (2019): \$15,694.7
- HDI (2020): 0.88

Poland is a developed country. The Republic of Poland, as of 2019, is the sixth largest country in the EU by GDP. A Soviet satellite state until 1989, the country has nearly completed its transformation into a democratic and market-oriented economy. Thanks to its strong economy, Poland is expected to quickly rebound once the COVID-19 pandemic comes to an end. Like many developed nations, Poland offers both free healthcare and higher education for its citizens. As of 2019, the country's infant mortality rate was just four per 1,000 live births, while the life expectancy rate was 78 years since birth. The country also has 16 properties recognized on the UNESCO World Heritage List, only one of which isn't a cultural site.

➤ **Russia**

- GDP (2019): \$1,699.88 billion
- Population (2019): 144.41 million
- GDP per Capita (2019): \$11,585
- HDI (2020): 0.824

Russia is a country in transition. Russia is not currently classified as a developed country, though it once reigned alongside the United States as a world superpower. The country's economy fell apart with the 1991 implosion of the Soviet Union. Recently, low oil prices, the cost of Russia's illegal annexation of Crimea, and efforts to bolster its military have strained the country's finances. Poverty is widespread (at 13% of population, the majority of whom are children) and living standards are low (with Russian citizens on average giving it a 5.8 out of 10). As is typical of a non-developed country, the exportation of natural resources fuels much of Russia's economy. Russia is borderline at best on most developed-country metrics. Its infant mortality rate is five per 1,000, while life expectancy is 73 years since birth, below the global average of 75.

➤ **Saudi Arabia**

- GDP (2019): \$792.97 billion
- Population (2019): 34.27 million
- GDP per Capita (2019): \$23,139.8
- HDI (2020): 0.854

Saudi Arabia is a developing country. On a purely monetary level, the Kingdom of Saudi Arabia is rather successful when compared to other developing countries. It was the largest economy in the Middle East in terms of GDP in 2019; however, its economy lacks diversification. Over 85% of government revenue is derived from oil exports, making Saudi Arabia the world's largest exporter of petroleum. Additionally, according to a 2020 Amnesty International report, the government has been heavily criticized for numerous human rights abuses, with nearly all known Saudi

Arabian human rights defenders within the country having been detained or imprisoned. As of 2021, three women's rights activists have been conditionally released and remain subject to restrictions on traveling and speaking freely. As of 2019, Saudi Arabians had an average life expectancy of 75 years since birth as well as an infant mortality rate of six deaths per 1,000 live births.

➤ **South Korea**

- GDP (2019): \$1,646.74 billion
- Population (2019): 51.71 million
- GDP per Capita (2019): \$31,846.2
- HDI (2020): 0.916

South Korea is a developing country. The country has a strong GDP and offers its citizens widespread access to quality healthcare and higher education. Following several decades of rapid economic growth and global integration, the Republic of Korea has become a high-technology and industrialized nation, with its most important sectors being electronics, telecommunications, automobile production, chemicals, shipbuilding, and steel. That said, the country is reliant on exports and is currently facing other major challenges, such as an aging population and low worker productivity. Life expectancy in 2019 was an impressive 83 years since birth. The infant mortality rate was rather low that same year, at just three per 1,000 live births.

➤ **Spain**

- GDP (2019): \$1,393.49 billion
- Population (2019): 47.13 million
- GDP per Capita (2019): \$29,564.7
- HDI (2020): 0.904

Spain is a developed country. Nearly all organizations that analyze development status classify Spain as such. The country has a strong GDP, a literacy rate of nearly 100%, and a healthcare system that's one of the best in the world. Since returning to a democratic system in 1975, Spain has become the Eurozone's fourth-largest economy, with a diverse assortment of industries including manufacturing, financial services, pharmaceuticals, textiles and apparel, footwear, chemicals, and tourism. Spain's infant mortality and life expectancy numbers are excellent; an estimated three infants died per 1,000 live births in 2019, and the average Spaniard lived to be 83 years from birth during the same year.

➤ **Sweden**

- GDP (2019): \$530.88 billion
- Population (2019): 10.28 million

- GDP per Capita (2019): \$51,648
- HDI (2020): 0.945

Sweden is a developed country. Sweden is one of the most highly developed post-industrial societies in the world. Sweden's life expectancy-now at nearly 83 years since birth-increased by eight years between 1980 and 2019, while infant mortality has dropped from seven deaths per 1,000 live births to two during the same period. Although Sweden has the highest income tax rate in the world, the country is also known for having a high quality of life and a low unemployment rate of roughly 9% in 2021. Additionally, Swedish citizens have free access to healthcare and higher education. The average Swede enjoys nearly 20 years of education. As a society, Sweden places great importance on environmental sustainability as well.

➤ **Switzerland**

- GDP (2019): \$703.08 billion
- Population (2019): 8.57 million
- GDP per Capita (2019): \$81,989.4
- HDI (2020): 0.955

Switzerland is a developed country. According to the World Bank, of countries listed for 2019, Switzerland had the fourth highest GDP per capita and the highest of any country on this list. This can be attributed to the country's highly skilled labor force, which helps compensate for its smaller population. The country's largest economic sectors are financial services, precision manufacturing, metals, pharmaceuticals, chemicals, and electronics. Switzerland has a universal healthcare system while also preserving a private marketplace. As of 2019, the country's average life expectancy was an excellent 84 years, while its infant mortality rate was an unusually high 10 per 1,000 live births.

➤ **Thailand**

- GDP (2019): \$543.55 billion
- Population (2019): 69.62 million
- GDP per Capita (2019): \$7,806.7
- HDI (2020): 0.777

Thailand is a developing country. The Kingdom of Thailand is the second-largest economy in Southeast Asia. Thailand has a free-market economy, with a relatively well-developed infrastructure. About two-thirds of the country's GDP is derived from exports of electronics, agricultural commodities, automobiles and parts, processed foods, and other goods. Over the last four decades, the country has moved from a low-income to an upper-income country by making substantial progress in social and economic

development. Since becoming a constitutional monarchy in 1932, it has experienced 19 military coups. More recently, pro-democracy protests have been ongoing since Feb. 2020.

➤ **Turkey**

- GDP (2019): \$761.42 billion
- Population (2019): 83.43 million
- GDP per Capita (2019): \$9,126.6
- HDI (2020): 0.82

Turkey is a developing country. Turkey is perhaps the best example of a country that straddles the line between developed and developing. In the past, the UN has classified it as a developed country. Today, most groups, including Turkey itself, agree on the country's status as a developing nation. Confounding the issue is Turkey's GDP, infant mortality rate, and life expectancy, all of which hover in the gray area. Its infant mortality rate at 28 per 1,000 live births, as of 2019, is lower than some other developing countries, but it's still notably high. Conversely, the country's life expectancy of 72 years from birth is higher than in some places, but below the global average of 75.

➤ **United Kingdom**

- GDP (2019): \$2,829.11 billion
- Population (2019): 66.84 million
- GDP per Capita (2019): \$42,328.9
- HDI (2020): 0.932

The United Kingdom is a developed country. The United Kingdom of Great Britain and Northern Ireland was the sixth largest country by GDP in 2019, with Great Britain being the first industrialized country in history. GDP growth is heavily reliant on the services sector, particularly banking, insurance, and business services, whereas large oil and natural gas reserves are shrinking. In 2016, British citizens voted in favor of departing from the European Union—a decision that became known as Brexit. The U.K. formally left the EU on Jan. 31, 2020, although there wasn't a proper trade agreement between the two entities until a provisional one was approved by the European Parliament on April 28, 2021. As of 2019, the country's average life expectancy was a solid 81 years, while its infant mortality rate was an unusually high 11 per 1,000 live births.

➤ **United States**

- GDP (2019): \$21,433.23 billion
- Population (2019): 328.24 million
- GDP per Capita (2019): \$65,297.5

- HDI (2020): 0.926

The United States is a developed country. As of 2019, the United States was the wealthiest country on Earth in terms of total GDP, which is nearly 16% of the world's entire wealth. The U.S. is both the largest goods importer and the second-largest exporter, making it the world's largest trading nation. Additionally, as of 2021, America has the third-largest military in terms of personnel- second only to India. However, despite its wealth and high HDI score, the U.S. has also been heavily criticized for traits more commonly seen in developing nations, such as it being the only developed country without universal healthcare, having a poverty rate higher than any other industrialized nation, and its infrastructure being in severe need of repair and overhaul. As of 2019, the country's average life expectancy was 79 years from birth, while its infant mortality rate was 11 deaths per 1,000 live births.

Developing Countries

A developing country is a sovereign state with a less developed industrial base and a lower Human Development Index (HDI) relative to other countries. However, this definition is not universally agreed upon. There is also no clear agreement on which countries fit this category. The term low and middle-income country (LMIC) is often used interchangeably but refers only to the economy of the countries. The World Bank classifies the world's economies into four groups, based on gross national income per capita: high, upper-middle, lower-middle, and low income countries. Least developed countries, landlocked developing countries and Small Island developing states are all sub-groupings of developing countries. Countries on the other end of the spectrum are usually referred to as high-income countries or developed countries. There are controversies over this term's use, which some feel perpetuates an outdated concept of "us" and "them". In 2015, the World Bank declared that the "developing/developed world categorization" is becoming less relevant and that they will phase out the use of that descriptor. Instead, their reports will present data aggregations for regions and income groups. The term "Global South" is used by some as an alternative term to developing countries [71-80].

Developing countries tend to have some characteristics in common often due to their histories or geographies. For example, with regards to health risks, they commonly have: low levels of access to safe drinking water, sanitation and hygiene; energy poverty; high levels of pollution (e.g. air pollution, indoor air pollution, water pollution); high proportion of people with tropical and infectious diseases (neglected tropical diseases); a high number of road traffic accidents; and generally poor infrastructure. Often, there is also widespread poverty, high crime rates, low education levels, inadequate access to family planning services, many informal settlements, and corruption at all government levels, and political instability. Global warming

(climate change) is expected to impact developing countries more than wealthier countries, as most of them have a high "climate vulnerability". Development aid or development cooperation is financial aid given by foreign governments and other agencies to support developing countries' economic, environmental, social, and political development. The Sustainable Development Goals by the United Nations were set up to overcome many of these problems.

Many developed countries were only seen to have "developed" from the Industrial Age which preceded the age of colonialism, which robbed the wealth of countries such as India during the British colonization of India during Europe's rivalry for conquest of the world. France was also a rival in this quest for colonialism, colonizing other countries for nearly a stretch of around 400 years from Africa, Middle East, Asia to North America which it regarded as 'possessions' of the French empire. Other examples include Japan's colonization of East Asia in its quest for "Greater East Asian Co-Prosperty Sphere", which was later deemed to be an imperialist and fascist front by the Japanese for Japanese expansionism. It is commonly argued that developed countries or colonizer countries sought to bring civilization, but the opposite often happened instead, such as in instances of genocide, examples including the genocide of Australian Aborigines, the original inhabitants of Australia. Other countries' gain in industrialization and wealth also happened as a result from policies which robbed the wealth of others, such as the Jews being robbed of their wealth during the Holocaust, or other means of gaining wealth that resulted from war such as Switzerland shoring of Nazi gold. Additionally, some countries involvement in proxy wars such as South Korea's involvement in Vietnam secured it \$558 million in 1966, \$745 million in 1967, and \$993 million in 1968 (this was close to 20 percent of total Korean earnings in 1967-68) in earnings for siding with American forces, propelling it from one of the poorest countries in the world to one of the richest countries on Earth due to what was regarded as undue gains. Developing countries on the other hand, were victims of these acts of brutality and were often the recipients of poverty, disease and decreased living conditions that occurred afterwards.

Measure and Concept of Development

Development can be measured by economic or human factors. Developing countries are, in general, countries that have not achieved a significant degree of industrialization relative to their populations, and have, in most cases, a medium to low standard of living. There is an association between low income and high population growth. The development of a country is measured with statistical indices such as income per capita (per person), gross domestic product per capita, life expectancy, the rate of literacy, freedom index and others. The UN has developed the Human Development Index (HDI), a compound indicator of some of the above statistics, to gauge the level of human

development for countries where data is available. The UN had set Millennium Development Goals from a blueprint developed by all of the world's countries and leading development institutions, in order to evaluate growth. These goals ended in 2015, to be superseded by the Sustainable Development Goals. The concept of the developing nation is found, under one term or another, in numerous theoretical systems having diverse orientations - for example, theories of decolonization, liberation theology, Marxism, anti-imperialism, modernization, social change and political economy. Another important indicator is the sectoral changes that have occurred since the stage of development of the country. On an average, countries with a 50% contribution from the secondary sector (manufacturing) have grown substantially. Similarly countries with a tertiary sector stronghold also see a greater rate of economic development.

Criticisms and Related Terms

There is criticism for using the term "developing country". The term could imply inferiority of this kind of country compared with a developed country. It could assume a desire to develop along the traditional Western model of economic development which a few countries, such as Cuba and Bhutan, choose not to follow. Alternative measurements such as gross national happiness have been suggested as important indicators. One of the early criticisms that questioned the use of the terms "developing" and "underdeveloped" countries, was voiced in 1973 by prominent historian and academic Walter Rodney who compared the economic, social and political parameters between the United States and countries in Africa and Asia. There is "no established convention" for defining "developing country". According to economist and sustainable development expert Jeffrey Sachs, the current divide between the developed and developing world is largely a phenomenon of the 20th century. The late global health expert Hans Rosling has argued against the terms, calling the concept "outdated" since the terms are used under the prerequisite that the world is divided in rich and poor countries, while the fact is that the vast majority of countries are middle-income. Given the lack of a clear definition, sustainability expert Mathis Wackernagel and founder of Global Footprint Network, emphasizes that the binary labeling of countries is "neither descriptive nor explanatory". Wackernagel and Rosling both argue that in reality, there are not two types of countries, but over 200 countries, all faced with the same laws of nature, yet each with unique features. The term "developing" refers to a current situation and not a changing dynamic or expected direction of development. Since the late 1990s, countries identified by the UN as developing countries tended to demonstrate higher growth rates than those in the developed countries category.

To moderate the euphemistic aspect of the word "developing", international organizations have started to use the term less economically developed country for the poorest nations - which

can, in no sense, be regarded as developing. This highlights that the standard of living across the entire developing world varies greatly. In 2015, the World Bank declared that the "developing / developed world categorization" is becoming less relevant, due to worldwide improvements in indices such as child mortality rates, fertility rates and extreme poverty rates. In the 2016 edition of its World Development Indicators (WDI), the World Bank made a decision to no longer distinguish between "developed" and "developing" countries in the presentation of its data, considering the two-category distinction outdated. Accordingly, World Bank is phasing out use of that descriptor. Instead, the reports by World Bank (such as the WDI and the Global Monitoring Report) now include data aggregations for the whole world, for regions, and for income groups - but not for the "developing world".

Third World

Over the past few decades since the fall of the Soviet Union and the end of the Cold War, the term Third World has been used interchangeably with developing countries, but the concept has become outdated in recent years as it no longer represents the current political or economic state of the world. The three-world model arose during the Cold War to define countries aligned with NATO (the First World), the Communist Bloc (the Second World, although this term was less used), or neither (the Third World). Strictly speaking, "Third World" was a political, rather than an economic, grouping.

Global South

The term "Global South" began to be used more widely since about 2004. It can also include poorer "southern" regions of wealthy "northern" countries. The Global South refers to these countries' "interconnected histories of colonialism, neo-imperialism, and differential economic and social change through which large inequalities in living standards, life expectancy, and access to resources are maintained".

Associated Theories

The term "developing countries" has many research theories associated with it (in chronological order): Modernization theory - to explain the process of modernization within societies Dependency theory - the notion that resources flow from a "periphery" of poor and underdeveloped states to a "core" of wealthy states, enriching the latter at the expense of the former Development theory - a collection of theories about how desirable change in society is best achieved. Post-Development theory holds that the whole concept and practice of development is a reflection of Western-Northern hegemony over the rest of the world.

Common characteristics

Government, Politics and Administration

Many developing countries have only attained full self-

determination and democracy after the second half of the 20th century. Many were governed by an imperial European power until decolonization. Political systems in developing countries are diverse, but most states had established some form of democratic governments by the early 21st century, with varying degrees of success and political liberty. The inhabitants of developing countries were introduced to democratic systems later and more abruptly than their Northern counterparts and were sometimes targeted by governmental and non-governmental efforts to encourage participation. ‘Effective citizenship’ is defined by sociologist Patrick Heller as: “closing [the] gap between formal legal rights in the civil and political arena, and the actual capability to meaningfully practice those rights”. Beyond citizenship, the study of the politics of cross-border mobility in developing countries has also shed valuable light in migration debates, seen as a corrective to the traditional focus on developed countries. Some political scientists identify a ‘typology of nationalizing, developmental, and neoliberal migration management regimes’ across developing countries.

Advantages and Disadvantages of Renewable Energy

Why is Renewable Energy Important?

We’re now facing unprecedented heatwaves, polluted air, and unbelievable health issues caused by fossil fuels. In Addition to this issue, fossil fuels are about to run out if we continue to burn

them uncontrollably.

Renewable energy sources are our best chance to stop the current trend and make the world a better place to live. Therefore, governments are thinking of using renewable sources of energy to generate electric power. As a result, there is increasing usage of renewable energy for generating electricity in all countries. For example, the share of renewable energy in global electricity generation was increased to 29% in 2020. This is a success compared with a 27% share in electricity generation in 2019. Some advanced countries such as the UK have aimed for 100% renewable cities by 2050. Currently, around 43% of the UK’s electricity is generated by renewables. In spite of many obstacles in the way towards 100% renewable energy, there are promising advantages to using renewable technologies. Overall, the advantages of using renewable energy sources outweigh the disadvantages. Although the initial cost of establishing a network of renewable technologies might be higher, over time, the expenses will be offset. Considering the lateral influencers of using renewable energy, postponing the process of shifting toward 100% renewable is not a wise course of action. Wind, geothermal, solar, hydro, tidal, hydrogen, and other renewable technologies are a widely popular source of energy throughout the world today. Countries, corporations, and individuals are adopting renewables for a number of great benefits. In this article, we’ll dive into some of the advantages and disadvantages of renewable energy Table 1.

Table 1: Advantages and disadvantages of renewable energy.

Advantages	Disadvantages
Renewable energy won’t run out	Renewable energy has high upfront costs
Renewable energy has lower maintenance requirements	Renewable energy is intermittent
Renewables save money	Renewables have limited storage capabilities
Renewable energy has numerous environmental benefits	Renewable energy sources have geographic limitations
Renewables lower reliance on foreign energy sources	Renewables aren’t always 100% carbon-free
Renewable energy leads to cleaner water and air	
Renewable energy creates jobs	
Renewable energy can cut down on waste	

Advantages of Renewable Energy

Renewable energy has multiple advantages over fossil fuels. Here are some of the top benefits of going green:

- Renewable energy won’t run out
- Renewable energy has lower maintenance requirements
- Renewables save money
- Renewable energy has numerous environmental benefits
- Renewables lower reliance on foreign energy sources

- Renewable energy leads to cleaner water and air
- Renewable energy creates jobs
- Renewable energy can cut down on waste

Renewable energy won’t run out

Renewable energy technologies use resources straight from the environment to generate power. These energy sources include sunshine, wind, tides, and biomass, to name some of the more popular options. Renewable resources won’t run out, which cannot be said for many types of fossil fuels - as we use fossil fuel resources, they will be increasingly difficult to obtain, likely driving up both the cost and environmental impact of extraction.

Maintenance Requirements are Lower for Renewable Energy

In most cases, renewable energy technologies require less overall maintenance than generators that use traditional fuel sources. This is because generating technology like solar panels and wind turbines either have few or no moving parts or don't rely on flammable, combustible fuel sources to operate. Fewer maintenance requirements translate to more time and money saved.

Renewables Save Money

Using renewable energy can help you save money long term. Not only will you save on maintenance costs, but on operating costs as well. When you're using a technology that generates power from the sun, wind, steam, or natural processes, you don't have to pay to refuel. The amount of money you will save using renewable energy can vary depending on a number of factors, including the technology itself. In most cases, transitioning to renewable energy means anywhere from hundreds to thousands of dollars in savings find out how much you can save by switching to solar energy.

Renewable Energy Has Numerous Environmental Benefits

Renewable energy generation sources emit little to no greenhouse gases or pollutants into the air. This means a smaller carbon footprint and an overall positive impact on the natural environment. During the combustion process, fossil fuels emit high amounts of greenhouse gases, which have been proven to exacerbate the rise of global temperatures and frequency of extreme weather events. The use of fossil fuels not only emits greenhouse gases but other harmful pollutants as well that lead to respiratory and cardiac health issues. With renewable energy, you're helping decrease the prevalence of these pollutants and contributing to an overall healthier atmosphere.

Renewables Lower Reliance on Foreign Energy Sources

With renewable energy technologies, you can produce energy locally. The more renewable energy you're using for your power needs, the less you'll rely on imported energy, and the more you'll contribute to U.S. energy independence as a whole. Renewable energy sources can help us minimize the geo-political risks associated with fossil fuels, from trade disputes to political instability to pricing wars, all of which are often rooted in access to oil.

Renewable Energy Leads to Cleaner Water and Air

When you burn fossil fuels to generate electricity, it contaminates the air and water we use. For example, coal power stations release high volumes of carbon dioxide and nitrous oxide, as well as harmful toxins like mercury, lead, and sulfur dioxide. Health problems from ingesting these elements can be dangerous, and even fatal in some cases. Investing in renewable energy is a great way to work against these risks, as renewables have a far

lower negative impact on our air and water. The use of fossil fuels not only emits greenhouse gases but other harmful pollutants as well that lead to respiratory and cardiac health issues. With renewable energy, you're helping decrease the prevalence of these pollutants and contributing to an overall healthier environment.

Renewable energy creates new jobs

While the U.S. shifts its focus to combat global warming, we're setting ambitious carbon-reduction goals that require labor to get the job done. Today, the renewable energy sector employs three times as many people as fossil fuels do in the U.S. That number is expected to rise over the next few years-and as a plus, these jobs tend to pay above average wages, making it a very attractive career option and an overall economic boom.

Renewable Energy Can Help Solve Our Waste Problem

Specifically, biomass energy can offer a big benefit in this way. Biomass generators consume used organic products like vegetable oil, corn and soybean byproducts, and even algae to generate energy. Because of this, using biomass as an energy source can reduce the amount of waste that goes into landfills, which helps cut down on carbon emissions and environmental contamination.

Disadvantages of Renewable Energy

Renewable energy has many benefits, but it's not always sunny when it comes to renewable energy. Here are some disadvantages to using renewables over traditional fuel sources:

- Renewable energy has high upfront costs
- Renewable energy is intermittent
- Renewables have storage capabilities
- Renewable energy sources have geographic limitations
- Renewables aren't always 100% carbon-free

Higher Upfront Cost

While you can save money by using renewable energy, the technologies are typically more expensive upfront than traditional energy generators. To combat this, there are often financial incentives, such as tax credits and rebates, available to help alleviate your initial costs of renewable technology.

Intermittency

Though renewable energy resources are available around the world, many of these resources aren't available 24/7, year-round. Some days may be windier than others, the sun doesn't shine at night, and droughts may occur for periods of time. There can be unpredictable weather events that disrupt these technologies. Fossil fuels are not intermittent and can be turned on or off at any given time. Wondering if you should make the switch to renewables? Find out if an energy source like solar power is a good fit for you.

Storage Capabilities

Because of the intermittency of some renewable energy sources, there's a high need for energy storage. While there are storage technologies available today, they can be expensive, especially for large-scale renewable energy plants. It's worth noting that energy storage capacity is growing as the technology progresses, and batteries are becoming more affordable as time goes on.

Geographic Limitations

The United States has a diverse geography with varying climates, topographies, vegetation, and more. This creates a beautiful melting pot of landscapes but also means that there are some geographies that are more suitable for renewable technologies than others. For example, a large farm with open space may be a great place for a residential wind turbine or a solar energy system, while a townhome in a city covered in shade from taller buildings wouldn't be able to reap the benefits of either technology on their property. If your property isn't suitable for a personal renewable energy technology, there are other options. If you're interested in solar but don't have a sunny property, you can often still benefit from renewable energy by purchasing green power or enrolling in a community solar option.

Not 100% Carbon-Free

Although solar panels and other forms of renewable energy drastically reduce carbon emissions, these resources aren't always completely clean. The manufacturing, transportation, and installation of renewable energy, like wind turbines, can create a carbon footprint since they're usually produced in factories that are powered by fossil fuels - not to mention the diesel and gasoline needed to fuel the transport trucks. As the U.S. becomes more and more electrified - from solar panels on factories, to electric transport trucks - carbon emissions associated with solar will continue to decrease.

Supply Chain Constraints

Renewables must have an effective distribution network created to transfer the energy where it's needed on a large scale. These networks need non-renewable energies to be generated, which offsets the benefits of renewable energy for a bit until it's paid back. Additionally, politics can play a factor in installing renewable energy if it's not a priority among local governments.

Renewable Energy Has More Benefits Than Drawbacks

When it comes to renewable energy, the positives outweigh the negatives. Transitioning to renewables on a personal, corporate, or governmental level will not only help you save money but also promote a cleaner, healthier environment for the future. Installing solar panels is one of the easiest ways to go green. By signing up on the Energy Sage Solar Marketplace, you can compare multiple quotes from local, pre-screened installers to see what solar

costs and savings for your property. The quotes will also include estimates of the amount of carbon dioxide emissions you will offset over 20 years, and what this equates to in both trees planted and gallons of gasoline burned.

Renewability and Sustainability

Geothermal power is considered to be renewable because any projected heat extraction is small compared to the Earth's heat content. The Earth has an internal heat content of 1031 joules (3·10¹⁵ TWh), approximately 100 billion times the 2010 worldwide annual energy consumption. About 20% of this is residual heat from planetary accretion; the remainder is attributed to past and current radioactive decay of naturally occurring isotopes. For example, a 5275 m deep borehole in United Downs Deep Geothermal Power Project in Cornwall, England, found granite with very high thorium content, whose radioactive decay is believed to power the high temperature of the rock. Natural heat flows are not in equilibrium, and the planet is slowly cooling down on geologic timescales. Human extraction taps a minute fraction of the natural outflow, often without accelerating it. According to most official descriptions of geothermal energy use, it is currently called renewable and sustainable because it returns an equal volume of water to the area that the heat extraction takes place, but at a somewhat lower temperature. For instance, the water leaving the ground is 300 degrees, and the water returning is 200 degrees, the energy obtained is the difference in heat that is extracted. Current research estimates of impact on the heat loss from the Earth's core are based on a studies done up through 2012. However, if household and industrial uses of this energy source were to expand dramatically over coming years, based on a diminishing fossil fuel supply and a growing world population that is rapidly industrializing requiring additional energy sources, then the estimates on the impact on the Earth's cooling rate would need to be re-evaluated.

Geothermal power is also considered to be sustainable thanks to its power to sustain the Earth's intricate ecosystems. By using geothermal sources of energy present generations of humans will not endanger the capability of future generations to use their own resources to the same amount that those energy sources are presently used. Further, due to its low emissions geothermal energy is considered to have excellent potential for mitigation of global warming. Even though geothermal power is globally sustainable, extraction must still be monitored to avoid local depletion. Over the course of decades, individual wells draw down local temperatures and water levels until a new equilibrium is reached with natural flows. The three oldest sites, at Larderello, Wairakei, and the Geysers have experienced reduced output because of local depletion. Heat and water, in uncertain proportions, were extracted faster than they were replenished. If production is reduced and water is reinjected, these wells could theoretically recover their full potential. Such mitigation strategies have already been implemented at some sites. The long-

term sustainability of geothermal energy has been demonstrated at the Lardarello field in Italy since 1913, at the Wairakei field in New Zealand since 1958, and at The Geysers field in California since 1960.

Falling electricity production may be boosted through drilling additional supply boreholes, as at Poihipi and Ohaaki. The Wairakei power station has been running much longer, with its first unit commissioned in November 1958, and it attained its peak generation of 173 MW in 1965, but already the supply of high-pressure steam was faltering, in 1982 being derated to

intermediate pressure and the station managing 157 MW. Around the start of the 21st century it was managing about 150 MW, then in 2005 two 8 MW isopentane systems were added, boosting the station's output by about 14 MW. Detailed data are unavailable, being lost due to re-organisations. One such re-organisation in 1996 causes the absence of early data for Poihipi (started 1996), and the gap in 1996/7 for Wairakei and Ohaaki; half-hourly data for Ohaaki's first few months of operation are also missing, as well as for most of Wairakei's history Figure 1.

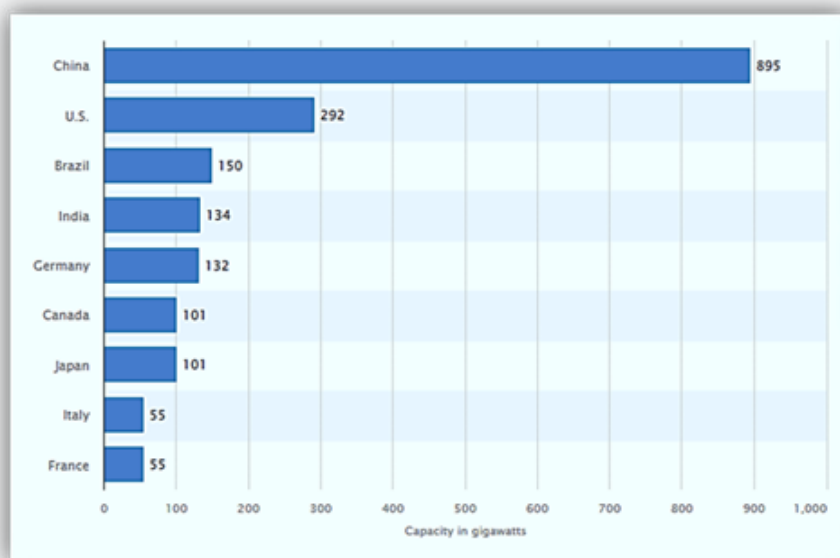


Figure 1: I will end this book and this chapter of the book with just this image, so that years later (around 2035), based on real and accurate statistics, you will see that these same countries will be the pioneers of world economy and politics!

What is my future vision? In my opinion, what factors should a manager consider in management? How can a manager manage? What characteristics should a manager have? In my opinion, a manager should plan his organization well, and to form a good team in human resources, we need certain characteristics to proceed according to a protocol. Enters the organization with psychological tests, and places each person in their appropriate position so that both that person feels satisfied and grows and the organization benefits from that person's presence. In fact, I think an organization depends on several factors to maintain And its survival requires that one is human resources and the other is constant updating of the company's goals and training to other personnel in different positions. If I want to talk about the characteristics of a good manager here, it is that a manager must have factors such as patience and determination, eloquence, ability to plan, having a vision for more sales, human organization,

creativity, understanding of personnel, need identification. Customers in line with the type of business, strong relationships with all customers, especially regular customers, the art of paying special attention to special guests, flexibility towards personnel and customers as long as there is no damage to the organization.

In the end, a modern manager in any field should consider other characteristics related to the universe in addition to the goals of the organization, regulations, laws, and human resources, so that the next generations will have a healthy method without harming the universe. Or manage several organizations in order to advance new management methods in all areas to a new way of thinking that minimizes various damages, both psychological and ecosystem. Grow so as not to harm the organization. It is a mission to return this position, which should be a good example for other people in all areas.

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