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The Role of Water Resources in Socio-Economic Development

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Abstract: ***Water is an essential component of our economics and is at the centre of economic and social development. It is vital to maintain health, grow food, manage the environment and create jobs. There is a close link between water and economic growth of country. Lack of water is a barrier to sustainable socio-economic development, lack of development is a barrier to solving water problems. Water can affect basic human well being and the productivity, scarcity of water, lack of collection and distribution systems can lead to extraordinary consumption of energy in gathering daily water needs. Domestic water supply serves as a basic component of welfare in its role as a direct consumer commodity, it also functions as an element of socio-economic infrastructure. Water contributes to a wide variety of natural productive process, including directly productive activities such as food production and manufacturing operations and as an element of basic economic infrastructure. Employment in the water sector remains relatively limited; the potential growth for jobs in water sector is particularly changes from region to region. The water resources are limited in India, but growing demand of water due to increasing population, urbanization and industrialization. India's multidimensional water development has contributed significantly to the promotion of the country's economic growth. Water resources development can contribute to economic growth during both construction and operational stages.***

Keywords: Water Resources, Economic development, Employment, Human development, Urbanization

I. INTRODUCTION

Water has always plays a central role in human societies. Water is a basic essential to all worlds' inhabitants. Water is a key driver of sustainable growth and development, water is quite literally a source of life and prosperity. Water is complex economic good. Water permeates all aspects of life on Earth. Like the air we breathe, water sustains human, animal and plant life. It provides vital services for human health, livelihoods and well-being and contributes to economic growth and sustainability of ecosystems. Water is an essential component of our economics and is at the centre of economic and social development. It is vital to maintain health, grow food, manage the environment and create jobs. It is impossible to overstate our dependence on water. Water, because it has so many different uses in everyday's life is hard to analyze in terms of economic development. Yet there are some lessons to drawn on the role of water in economics of every type. Health has shown to be dependent on a good supply of clean water. It is needed for almost all industries, for agriculture, for animal rearing and for much service activities.

Managing water as an economic good is an important way of achieving efficient and equitable economic growth of economy. Better access to clean water, sanitation services and water management creates tremendous strategy for economic growth of country. There is a close link between water and economic growth of country. Good management of water resources brings more certainty and efficiency in productivity across economic sectors and contributes to the health of nation. Water is a critical part of most environmental services on which our ecosystems depend. Water requires optimal management to control scarcity and competition for use due to population growth, increasing demand, climate change and declining water supplies. India like many other parts of the world is in the process of implementing market based water supply reforms to attain equity and efficiency. In India, investment in water resources management, multipurpose hydraulic infrastructure and irrigation have contributed significantly in economic growth. Community water supply takes priority over other water purpose worldwide. Investment in water and sanitation systems in developing economics brings a multitude of economic and social benefits. Water is very important in our national economic welfare.

II. OBJECTIVES OF STUDY

Availability & uses of water resources in world
To study the relationship between water resources and economic growth

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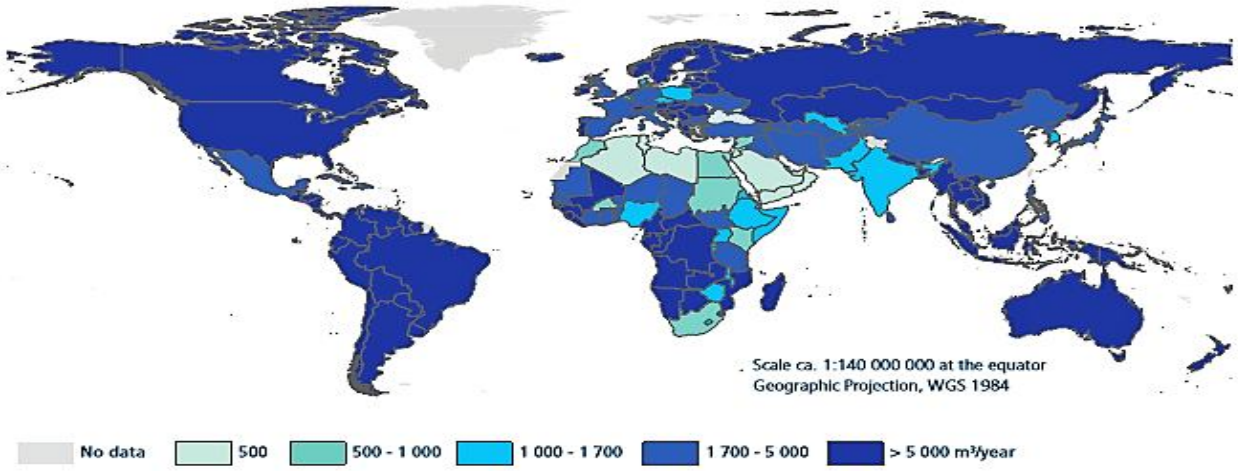
A. The Global Perspective on Water

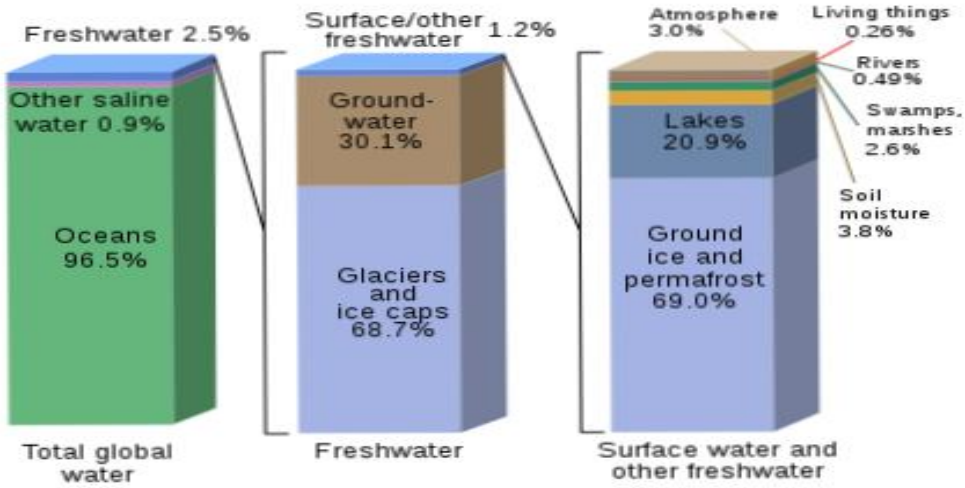
1) State of freshwater resource: The world's freshwater resources renewed through a continuous cycle of evaporation, precipitation and runoff – commonly referred to as the water cycle – that dictates their distribution and availability over time and space. There are different ways of defineing and measuring water scarcity and/or water stress. The best-known indicator of national water scarcity is per capita renewable water per year, where threshold values used to distinguish between different levels of water stress (Falkenmark and Widstrand, 1992). An area or country is under regular water stress when renewable water supplies drop below 1,700 m^3 per capita per year. Populations face chronic water scarcity when water supplies drop below 1,000 m per capita per year and absolute scarcity below 500 m^3 per capita per year. Using these thresholds, significant disparities exist between countries as shown below:

Figure.1. Total Renewable Water Resources (Cubic Meters Per Capita per Year), 2014



Source: The Global Perspective on Water, the United Nations Report 2016

Figure 2 Water Supply of the World



Source: Department of the Interior, Geological Survey, UNO, 2016

Water resources are sources of water that are potentially useful. Uses of water include agricultural, industrial, recreational and environmental activities. The majority of human uses require fresh water. 97% of the water on the Earth is salt water and only three percent is fresh water; slightly over two thirds of this is frozen in glaciers and polar ice caps. The remaining unfrozen fresh water found mainly as groundwater, with only a small fraction present above ground or in the air.

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Fresh water is a renewable resource, yet the world's supply of groundwater is steadily decreasing, with depletion occurring most prominently in Asia, South America and North America, although it is still unclear how much natural renewal balances this usage, and whether ecosystems are threatened.

B. Water and Economic Development at the National Level: General Principles

The wealth of economics most often measured at the national level in term of Gross National Product, as index of the monetary rating of the economy often expressed as GNP per capita. There are also good measures of the water resources of nations. The human development index (HDI) of the United Nations Development Programs attempts to express wealth in a broader context, a ranking involving many social and economic factors. The key role, water plays in human development well accepted by all nations. Human Development however should consider as an important contributor to the adequate management of water resources. The win-win situation can only achieved if the link between the two aspects understood and if this understanding is relates into integrated policies and programs. The term development indicates the progress, but the concept of Human Development used to focus on the ends rather than the means to achieve it. The real objective of development is to create an environment in which people have the possibility to enjoy a healthy and long life. Water is the basic and most important component of Human Development.

The statistics for the wealth of nations in comparison with water or water availability there is generally weak correlation between the two factors.

USA, one of the world's richest countries in per capita GNP, is also one of the richest countries in terms of water availability, but water poor Germany and Japan also have a high per capita GNP. Whether Russia has low per capita GNP, but water availability is very high as compare to other selected countries shown in table. Water scare countries like China, India and Bangladesh also have low per capita income as compare to other selected countries.

Table 1

GNP, Human Development Index & Water Resources In Selected Countries			
COUNTRY	GNP/CAPITA[1] U.S. $ (RANKING)	HDI[2] (RANKING)	WATER RESOURCES PER CAPITA[3] M^3 (RANKING)
USA	55980 (19)	0.915 (8)	8886 (54)
GERMANY	45940 (32)	0.916 (6)	1321 (118)
JAPAN	38840 (47)	0.891 (20)	3382 (80)
RUSSIA	11450 (90)	0.798 (50)	29988 (21)
CHINA	7930 (105)	0.727 (90)	2061 (104)
INDIA	1600 (178)	0,609 (130)	1116 (127)
BANGLADESH	1190 (189)	0.570 (142)	660 (146)

In HDI rankings, there is a general correspondence with GNP per capita and water resources relationship, but also some difference. The USA, Russia and Japan have high level of water resources and high Human Development Index, whereas Germany has high Human Development index and low index of water availability. At the lower end of table China, India and Bangladesh are poor in wealth indices as well as in water availability resources. But this lack of clear relationship questioning of statistics because in so many ways we know that sufficient, good quality, water is a critical part of the well being of people and economic growth. Water is a component of all stages of human activity. In some cases, it can substitute for but only rarely is it replaced. Early development of civilized society heavily influence by water availability. The beginning of industrial revolution predicted on waterpower and a regular water supply for industrial processing and today the location of nuclear power plants is in part a function of water for cooling process. In a parallel sense the viability and longevity of our fast growing worldwide network of cities is heavily dependent on access to eonomically sustainable sources of water. Lack of water is a barrier to sustainable socio-economic development, lack of

1) World Development Indicators Database, World Bank, 1 February 2017
2) Human Development Report, UNDP, 14 December 2015
3) Food & Agriculture Organizations, AQUASTAT Database, 28 December 2014

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development is a barrier to solving water problems. Because water integrates so many aspects of life, it must given prime considerations of water, decisions about allocations for socio-economic activities and the prevention of natural resource capital.[4]

C. Water Resources as a Bottleneck to Growth

There are some conditions, which can cause water to be a bottleneck to the growth process in economy. Some of the main conditions are as under:

1) When water inputs into important production process fixed in relation to output
2) When water supply are fixed or only capable of slow and costly expansion
3) When supplies are rigidly allocated among uses over time
4) When water is a controlling factor in human wealth and productivity

Water is a fixed coefficient of the sort expressed in an input-output model, i.e. nothing can be substitutes for water nor can increases in efficiency be found to permit production to proceed with less water.[5] Water can affect basic human well being and the productivity, scarcity of water, lack of collection and distribution systems can lead to extraordinary consumption of energy in gathering daily water needs.[6] It is less clear that under what conditions an improvement in water resources will lead to a significant improvement in productivity.

D. Water as Domestic Commodity

The most fundamental role of water in socio-economic development is its use for domestic purpose; use for drinking, personal hygiene and other domestic purposes constitutes a primary component of economic and social welfare for developing world.[7] Improvement in water Supply is the most important individual factor in controlling diseases and improving living conditions. The extent of health benefits is therefore likely to increase when water supply improvements combined with other programs, including public education designed to modify behavior in such areas hygiene.[8] Domestic water supply serves as a basic component of welfare in its role as a direct consumer commodity, it also functions as an element of socio-economic infrastructure. Existence of an adequate domestic water supply is a factor of community stability than can affect the success of many of the other components of development. The capacity of a city to support its population and economic activity related to adequacy of water supply. The success of all economic activities depends on a variety of other factors as well, but water supply inadequacy can be significant constraint.

E. Water as an Input to Productive Process

The water as an input to productive process has a variety of dimensions since most productive activities involve water use. As a fundamental level, water contributes to a wide variety of natural productive process, including directly productive activities such as food production and manufacturing operations and as an element of basic economic infrastructure. It also encompasses functions as power supply and transportation. The major role of water resources in productive process in an economy is as:

1) Natural Productive Process
2) Agricultural Production
3) Industrial Production
4) Electricity Production
5) Water Disposal

F. Water as an Element of Psychological Welfare

Water also includes intangible contributions to economic welfare. These intangible contributions may take the form of satisfaction of spiritual needs as in the case of religiously significant waters or through the provisions of amenity values that add a psychological welfare.[9] Amenity values arises in connection with manmade water bodies such as reservoirs, whether intentionally developed for

1) Granahan, Mc. 1997. Urban water–Towards Health & Sustainability, Stockhlom Environmental Institute Sweeden
2) Kelso,M. & Martin, D. “Water Supplies & Economic Growth”, A Case Study Of America, 1973
3) White, G. & Bradley, D. “Drawers of Water: Domestic use of Water “. 1972.
4) Biswas, Asit, K. “Editors introduction”, United Nations water Conference: Summary & Main Development Vol. 2. Oxford Pergamon Press, 1975 pp ix-xii
5) Feachem, Richard, “Domestic Water Supplies Health & Poverty: A Brief Review, Oxford Pergamon Press 1978 pp 351-362
6) Linsely, Ray K. “Water Resources & Economic Development Toronto”, Lexington Books, 1993 pp 177-184

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amenity value or for other purposes, manmade lakes generally posses significant amenity value that can become a factor in economic development.

G. Water Resources and Jobs

Employment in the water sector remains relatively limited; the potential growth for jobs in water sector is particularly changes from region to region. There are some areas of world, where water sector is a significant provider of employment. The major eight and natural resource dependent industries, which provide greater jobs opportunities in any economy, are:

1) Agriculture
2) Forestry
3) Fisheries
4) Energy
5) Resource Intensive Manufacturing
6) Recycling
7) Building
8) Transport

Half of the global workforce is employ in these eight industries. Over one billion people are employed in the fisheries, agriculture and forestry sectors alone. 95% of world jobs in agriculture sector, 30% jobs in the industry sector and 10% jobs in the services sector are heavily dependent on water resources availability. About 1.35 billion jobs i.e. 42% of the world's total active force are likely to be heavily water dependent. 5% jobs in agriculture sector, 60% jobs in industry sector and 30% jobs in the services sector are moderately dependent on water i.e. 36% of world's total active force. This means that 78% of the jobs constituting the global workforce are water dependent.[10]

H. Water Resources and India

The water resources are limited in India, but growing demand of water due to increasing population, urbanization and industrialization: India is facing water stress. In water resources, due to contamination of treatment facility it is often difficult to get safe drinking water. India currently stores only 6% of its annual rainfall or 253 cubic meters, while developed nations store 250% of annual rainfall water. Nearly 15% of food production is being produced using ground water resources in India.[11] India's multidimensional water development has contributed significantly to the promotion of the country's economic growth. Rapid growth of irrigation and hydropower generation in last decade accelerates the economic growth of country. In India only 33% population have access to clean drinking water. The problem is mostly contributed to a lack of government planning and extreme amounts of human wants.

I. Negative Role of Water under Natural Conditions

Water, as it naturally occurs and moves through the phases of the hydrologic cycle, has potential to constrain socio-economic development in several ways. Significant constraints arise from natural fluctuations in water availability. These constraints are as:

1) Shortage caused by natural fluctuations in supply
2) Flooding, Transmission of diseases
3) Inadequate natural drainage

J. Facts & Figures Related to Water Resources

1) 85% of the world population lies in the driest half of the Earth.
2) 783 Million People do not have access to clean water and almost 2.5 billion do not have access to adequate sanitation.
3) Water availability is expected to decrease by 50% in many regions by 2030.
4) Water for irrigation and food production constitutes one of the greatest pressures on freshwater resources.
5) Agriculture accounts for 70% of global freshwater withdrawals and up to 90% in some fast growing economics like India, China etc.
6) 90% of wastewater in developing countries flow untreated into rivers, lakes and highly productive coastal zones threatening health, food security and access to safe drinking and bathing water.

7) "The United Nations World Water Development Report", Water and Jobs Facts & Figures 2016 pp 5-8
8) Brown, Lester R. "India's problem is Water not Population". Los Angles Times. 19 November 2016., pp 6-7

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9) Only 0.5% of the world's water resources are available to provide for the freshwater needs of earth's ecosystem and population.
10) In India 21% of the country, diseases are water related.

III. CONCLUSION

Water resource development as a mechanism for stimulating economic growth arises from that all economic activities requires at least a limited supply. Many nations have employed water development as a primary mechanism to expand frontiers and stimulate economic growth to underdeveloped regions. Water resources development can contribute to economic growth during both construction and operational stages. Since many water projects are large public works under takings, construction create employment opportunities and therefore may be used to address conditions of high unemployment. Project construction may generate significant economic activity through a variety of direct and indirect effects. Expansion of water availability, particularly in the form of reservoirs, has substantial potential to stimulate growth in economic activity associated with recreation due to significant role of water in many recreational activities. Water supply enhancement also stimulates a wide range of industrial activities and growth in agricultural production. Water resources development attracts private investment in economic activity.[12] The potential for water development to stimulate economic growth exists in all nations, the manner in which water resources considerations are incorporated into growth process is different among alternative political system. In case of India, water resource development is owned by public sector, major decisions concerning water resource development and economic growth are made by government. Water, energy and food are intrinsically linked: water is needed to produce energy; energy is needed to deliver the water needed for food production. 1 U.S. $ invested in water/sanitation returns in 8 U.S. $ of economic growth.

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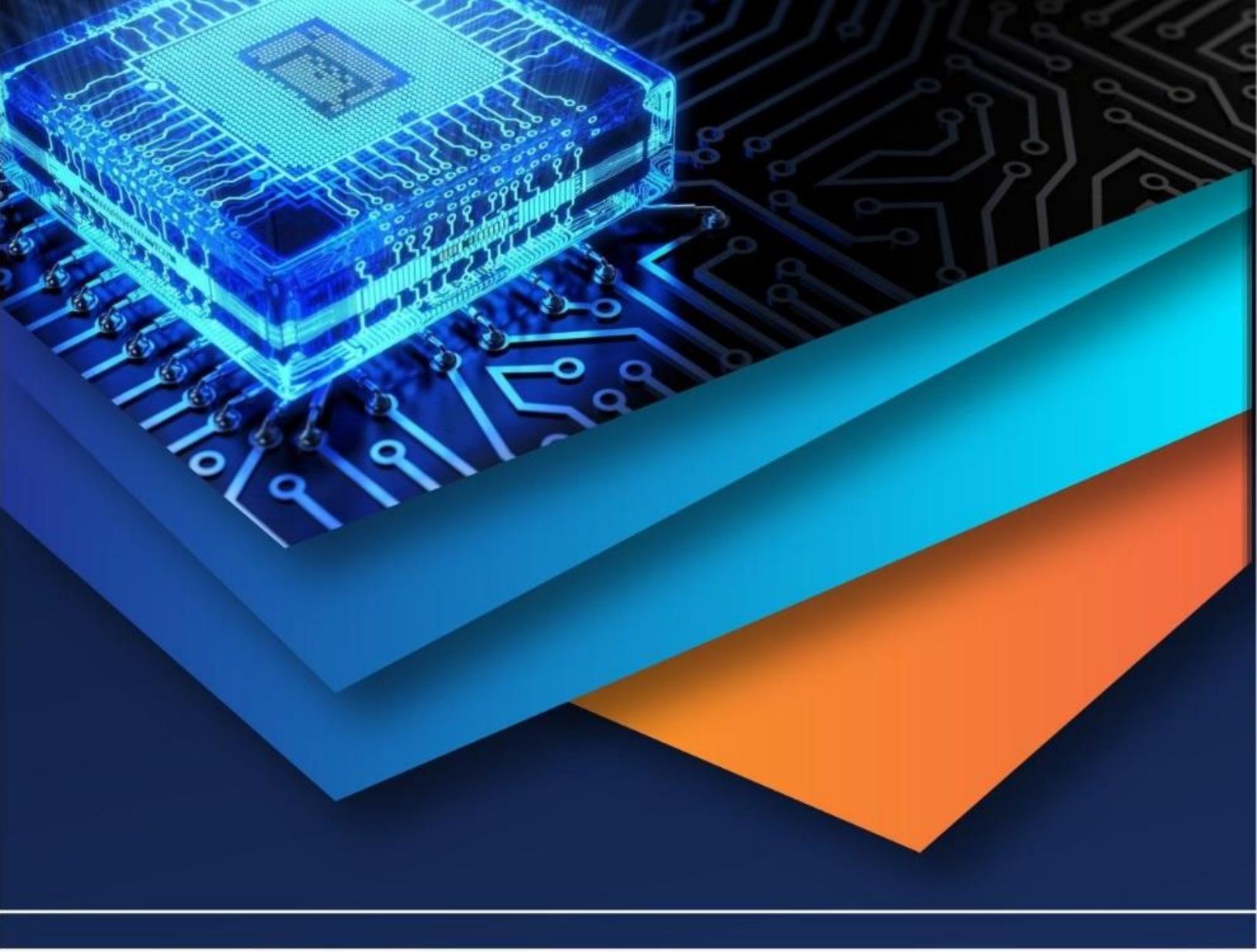

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