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A 10/74E, Prahlad Ghat
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Content

EDITORIAL

The editorial team feels happy to bring out Volume XII No. 1 & 2 (February & August, 2025) issue of Emerging Trends in Education which is an interdisciplinary peer reviewed journal of Association of Innovative Education. This joint issue consists of 10 articles and one Book review from various disciplines. The first article on Population in the Eyes of Media discusses and analyses the role of different types of media in covering the various factors responsible for Population growth in the world. The paper also talks in length about the role of digital platforms in disseminating information in the present scenario. The second article on Architectural Wonders of India: Understanding Ancient Indian Knowledge of Science and Technology in absence of Formal Education system examines the development and knowledge of ancient India about Science and technology of architecture and appeals to the present day men to reflect on the practices to make this planet a place for happy living by contemplating on the ways to adapt safe and healthy future for our coming generations. The article on Design and Fabrication of Piezoelectric Materials for different Biomedical applications focuses on the recent developments in design, fabrication and applications of piezoelectric materials in the biomedical fields. The author has attempt to present types of Piezoelectric materials and the fabrication techniques and stated their uses in treating the various fatal diseases. The paper also highlights the challenges and future prospects of piezoelectric material in biomedicine. The next article Economic Conflicts: A Hawk-Dove Explanation deals with the Hawk-Dove techniquein dealing with the Economic crisis. The paper further explains that in economics, "hawks" are policymakers who prioritize controlling inflation, favoring tighter monetary policy like higher interest rates, while "doves" prioritize economic growth and employment, preferring looser policies like lower interest rates to stimulate the economy and how this technique be applied to stabilize the economic crisis. The next article on Role of parents, community, ECEC and stakeholders in early intervention as per RPD-2016 and NEP 2020 discusses the role of parents, community, Early childhood education and care and various stakeholders in ensuring overall development and their integration in society of the visually impaired children. The article on Study of the quality of life of private sector employees after covid-19 deals with the struggles and challenges faced by the private sector employees during and after COVID-19 and suggests some practical measures for organizations to foster a healthier work environment to enhance employees work productivity after COVID-19. The article on social work strategies for Reducing School Dropout Rates in marginalized communities delves into the approaches like community driven approach, Mentorship program, Trauma-Informed Approaches and Teacher support systems to reduce school dropouts in marginalized communities and suggests ways to institutions through policy and practice to ensure that every child has the opportunity to complete their education. In the next article on water conservation in the pre-medieval north India, the author discusses the various techniques used in the pre-medieval period by the North Indians to conserve water. The papers discusses in the length the benefits of these methods used for water conservation in the past and suggests that it should be used in present also to making the living possible on this planet. The next article in this issue talks about the holistic philosophical framework emphasizing the dignity of every human being with respect to the views of Pandit Deendayla Upadhayaya. The paper describes the key tenets of Integral Humanism and professional social work as incorporated by Pandit Deendayal Upadhayay as a political program. The tenth article of this issue talks about Information Society and Manuel Castells. In this article the author discusses about the best known work trilogy of Castells and explores how technology, economics and culture are converging to create a new type of society which he calls the network society. The eleventh article is a Book Review of Prof. K.S. Misra on Critical Thinking among teachers and Students which is published by National Psychological corporation. The entire collection of articles are presented through this joint issue covers diverse areas. The effort is being made to incorporate areas pertaining to social issues, technological concerns and underlying value basis of the challenges which human mankind is facing. Our concern through these articles is that our readers get benefitted and understand the nuances of the various processes.

Prof. Kalplata Pandey

Emerging Trends in Education [Vol. XII - No. 1 & 2. February & August 2025. pp 1-18]

Population in the Eyes of the Media

Amrita Paul*

Prithvish Nag**

Abstract

The emerging patterns of population, particularly in the latter half of the last century, and their complex, multifaceted consequences have raised significant concerns among planners and academicians. This is evident from the substantial volume of recent literature addressing this issue. Population growth-related topics have gained paramount importance within the broader development framework, especially in light of deteriorating resource situations, environmental degradation, and the accompanying decline in quality of life, all attributed to population growth. Current trends indicate a declining growth rate, an ageing population, late marriages, a higher dependency ratio, an increase in "ghost houses," and reduced demand for housing and schools, all of which suggest shifts in population dynamics shortly. While several countries have experienced a decrease in their population, others with medium-sized populations and higher growth rates are poised to play a more significant role in the global economy. Furthermore, population parameters are changing rapidly, making it challenging to capture these shifts through decadal censuses and occasional surveys. In this context, the media have become increasingly sensitive to population issues, highlighting the necessity of integrating conventional data sources with electronic data for comprehensive analysis. The media's approach to these topics often reflects diverse considerations that may not align with traditional analyses and research methods used in the past. As a result, the media can no longer be overlooked as a valuable source of information in the realm of population analysis.

Introduction

Media serves as a significant conduit in our daily lives, influencing every aspect of our existence—from the policies that shape our socio-economic and politico-cultural perspectives to the practices of various organisations and institutions within society. It has become a key instructor and influencer, particularly with the rise of digital media. Digital platforms play a vital role in the dissemination of

* Assistant Professor & Head of Geography Department, Belda College, Vidyasagar University, West Bengal.

** Former Vice Chancellor, Mahatma Gandhi Kashi Vidyapit, Varanasi.

information through visual data, the coordination of medical resources via mobile health applications, and the promotion of public health campaigns on social media. Additionally, digital tools are essential for effective population management and disease tracking (Bao, Cao, Xiong, and Tang, 2020). With continuous updates and alerts, online news keeps us informed at the global, national, and local levels, providing not just information but also entertainment. Consequently, media capture more of consumers' time and attention than ever before. Industry estimates indicate that adults spend an average of 11 hours each day engaging with mass media, amounting to more than half of their working hours.

Objective

The objective of this research paper is to investigate the potential of integrating media-based sources with traditional data sources for population analysis. Traditional sources, such as censuses and surveys, provide information at infrequent intervals, typically every five to ten years. However, population dynamics are continuously evolving and cannot be fully understood through such limited timeframes. Therefore, incorporating both media and traditional sources has become essential. This paper aims to highlight the role of media in bringing attention to critical population issues that are poised to shape the world in the coming years.

Research Methodology

To achieve these objectives, a comprehensive global survey of electronic media was conducted. The findings indicate that the media have recently begun to prioritsze population issues significantly. However, there are considerable variations in the spatial coverage, frequency of reporting, depth of analysis, and methods of information collection. Despite these inconsistencies, the widespread presence of media engages with nearly every aspect of life, making it a considerable player in public discourse and a substantial revenue generator.

The mass media industry comprises eight primary sectors that generate income while fulfilling the public's demand for entertainment and information. These sectors include books, newspapers, magazines, recordings, radio, movies, television, and the Internet. Historically, print media (comprising books, newspapers, and magazines) accounted for more than half of the total revenue generated by the industry before 1987. However, the advent of the internet has transformed the media landscape, emerging as a dominant force that has significantly replaced print media revenue streams. In fact, as of now, print media

contributes only 31 per cent of the total income generated by the overall media industry.

This research underscores the necessity of integrating various sources of information to provide a more comprehensive understanding of population dynamics and to emphasize the media's critical role in addressing and informing the public about demographic issues.

> *"Consumers need to have an internal compass where they're able to balance the capabilities that technology offers them for work, for search with the qualities of the lives they live offline".*
>
> **Richard Hernandez, Google**

Analyzing Population Issues Through the Lens of Digital Media

While digital media is often criticized for challenges such as misinformation, lack of guidance, and information leakage, this paper seeks to analyze the increasing use of digital media in connection with real-world scenarios involving social chaos, social solidarity, demographic and economic crises, and population policy. In this context, the paper aims to explore population issues as portrayed by the media.

Why Population Issues Matter?

As of November 2022, the world population surpassed the 8 billion mark, with the 2020 World Population Data Sheet projecting an increase from 7.8 billion in 2020 to 9.9 billion by 2050—a growth of over 25 per cent. However, this growth is not uniform across the globe. A review of global population dynamics since the first decade of the 21st century and projections for 2050 reveal significant deviations from traditional notions of population growth.

In many regions, while populations have increased, growth rates have declined. Total fertility rates have fallen below the replacement level of 2.1 children per woman, which signifies that substantial countries like China, India, and the United States may begin to experience population declines. Factors such as reduced fertility rates, an ageing population, increased life expectancy, lower immigration rates, changing marriage patterns, and improved status for women are set to alter the mindset and quality of life for future generations by 2050. Signs of depopulation have already emerged.

Demographic Shifts and Economic Implications

The ageing population has led to a decrease in the percentage of children, while

the dependency ratio continues to rise, negatively impacting the economy. Childcare centres are increasingly being repurposed as old-age homes, and demand for housing is either stagnating or declining. In response, governments are amending population policies to encourage higher birth rates, often through incentives. Although women are enjoying greater privileges and independence, they frequently face the dilemma of choosing between career advancement and motherhood. As a result, by 2050, women may bear greater responsibility for sustaining the global economy.

Moreover, depopulation has prompted significant redistribution. A minimum population level is necessary to maintain, sustain, and grow institutions, infrastructure, and services. In developed countries, while infrastructure exists, diminishing populations hinder their sustainability. Consequently, immigration policies have been relaxed, and incentives are offered to attract qualified and skilled individuals from developing nations. However, similar challenges are afflicting developing countries as well, where regional disparities in total fertility rates and women-child ratios are increasingly apparent, leading to further redistribution within these nations.

Complexity of Population Predictions

According to John I. Clarke, predicting population changes is inherently complex, as human systems do not adhere to predictable laws and transform rapidly. While it is essential for countries to engage in futurology to strategise for planned growth, one must approach such predictions with caution, acknowledging the uncertainty of the future. Nations must devise strategies to address the alarming issues stemming from declining populations. This is the first instance where the world must contemplate survival amid depopulation, which will necessitate redistribution and may trigger significant international and domestic migrations. Now is indeed the time to assess and respond to this unprecedented situation.

Role of Media

The media have been particularly sensitive to developments in countries like China and Canada, and to some extent, India. It has introduced new terms and acronyms in response to these demographic shifts. Media priorities may fluctuate based on the significance of issues, time, and context. For example, the focus on China stems from its recent population policies and their implications, which are

redefining the nation's economic future amid ageing and slow growth. The media questions whether China's younger generation can reverse the trend of population decline, highlighting the need for bold actions.

In summary, as the world grapples with demographic changes, a nuanced understanding augmented by media analysis will be crucial for navigating the complexities of population issues and their societal impacts.

Population Trends According to the Media

> *It is the dawn of 2023. Ahead of us are several national problems that continue to be overlooked. The solutions are obvious, but the intent to act is missing. Critical areas face stagnation, with population and education on top of the list. Both sectors are interrelated but their current state is at the heart of everything that plagues Pakistan's progress. The last 10 years show little change in our educational trends. Universal primary enrolment, especially for girls, is lagging. And fertility rates have not changed for a decade."*
>
> **Zeba Sathar,2023**

The above-mentioned comment was published in DAWN on 16th Jan, 2023. It is a Pakistani English-language newspaper that was launched in British India in 1941, became a daily newspaper in October. In this newspaper, Zeba Sathar further added that "Population control is a term full of fallacies; it is decidedly not the way the state should tackle demographic challenges". Related to this, Mahmood Mamdani, in his book on The Myth of Population Control, mentioned how population used to control state politics-policy-society, that too before 50 years from today. The book was on the impact of an emergency on a village in Punjab.

It was 24th November 2021 when India's government declared that the country's fertility rate had dropped below the replacement rate (2 children per woman), which indicates an insufficiency of new births to cope with a steady population structure for the future, like many of the richer nations (Brazil, Russia, China) are going to face. It is no surprise that demographers are now explaining this falling fertility scenario as a 'demographic contagion'. According to the Managing Editor of the Times of India, more babies were born in India in 2003 than in any year before and after:

> *"All these indicators point in the same direction – Indian family size is shrinking faster than most people think. It took only 14 years for the*

fertility rate to fall by 50% (from 3 to 2) in India, whereas in Bangladesh – globally acclaimed for birth control – a similar fall took 17 years."

The Times of India, or TOI, is theoldest and 4th largest (by circulation) English-language daily newspaper owned by The Times Group. TOI issued its first edition on 3rd November 1838 as The Bombay Times and Journal of Commerce. In the era of today's communication networks, like the broadcast industry (one-way communication by antenna, satellite, two-way communication by underground cable), we cannot ignore the role of the newspaper, which acts moresmartly. Unfortunately, these newspapers are struggling to make a profit. Advertising revenues in the last five years have plummeted, partly because of difficult economic conditions in the United States, but also because newspaper readers have migrated to other sources for their requirements. Adults within the age-group of 18 to 35 are less likely to read a daily newspaper-even online, than mature adults in the age-group of 45 and above (Fig.1).The media highlighted that the world's population reached 8 billion on November 15, 2022. Their focus was primarily on economic implications, the evolving developmental landscape, emerging opportunities, and potential investments. This coverage was notably contemporary, as the media did not rely exclusively on decadal censuses or occasional surveys. Instead, it emphasised trends such as the slowing population growth rate, which could lead to depopulation, as well as the redistribution of populations. This redistribution included both skilled and unskilled migration across borders and continents. The media also sought to identify potential beneficiaries of these demographic changes. Various forms of electronic media, including YouTube, newspapers, and websites, addressed these issues, although the scale of their reporting varied widely, ranging from local community perspectives to continental analyses (Fig 1).The media has taken up issues that are more pressing and have an immediate impact on society and the economy. However, the spatial extent varies. It has been more concerned with population increase in some places and decline all over, fertility rate, birth rate, over-population, projections for the year 2050 and 2100, impact on house owners, property tax, movement of skilled persons, immigration, ease of getting visas, spouses work permit, economic chaos, overpopulation and over consumption, climate change, shrinking small towns, ageing societies, myth of population control, policies, closure of childcare centres and the most frequently discussed about the issues related to the China's population.

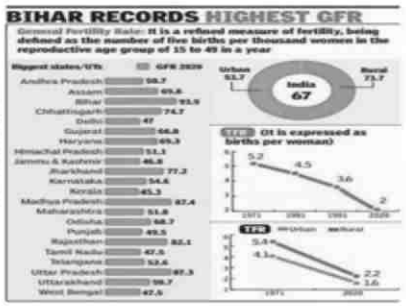
Singapore's population increases 3.4% after two years of decline

The number of citizen marriages rose 20.6 per cent, while the resident fertility rate recovered slightly from a historic low.

SINGAPORE: Singapore's total population grew by 3.4 per cent to 5.64 million as of June this year, after two straight years of decline, according to an annual report by the National Population and Talent Division on Tuesday (Sep 27).

People in the central business district of Singapore on Mar 25, 2022. (Photo: CNA/Gaya Chandramohan)

Fertility rate declined by 20% in India in 10 years: SRS data



The global population at 8 billion people

In 1974, the world had 4 billion people. The United Nations estimates the global population has doubled since then, passing 8 billion on Nov. 15, 2022, a period of just 48 years.

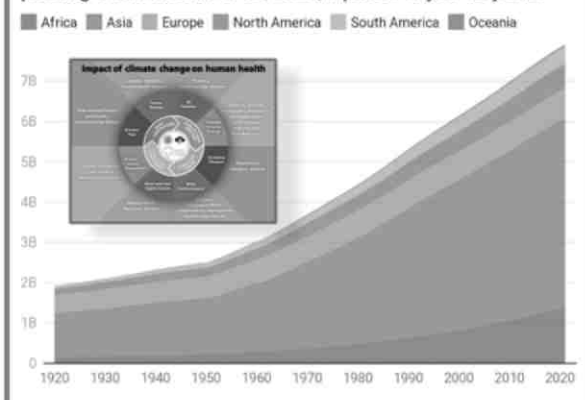


Chart: The Conversation/CC-BY-ND • Source: OWID/UN • Get the data • Download image • Created with Datawrapper

China's population has increased by 53.38 mln in past decade: NBS

EUROPE • RUSSIA

Russia's population is in a historic decline as emigration, war and a plunging birth rate form a 'perfect storm'

Should military operations continue in the coming months, as expected, Russia may see less than 1.2 million births next year, the lowest in modern history.

BY **BLOOMBERG**
October 18, 2022 5:50 AM EDT

THE BUSINESS TIMES

INDIA

India to become most populous country by 2023, experts call it an opportunity for nation

THE LEVEL GROUND

An ageing population is not a problem for the private homes market

SCIENTIFIC AMERICAN.

CLIMATE CHANGE | OPINION

Population Decline Will Change the World for the Better

A future with fewer people offers increased opportunity and a healthier environment

By Stephanie Feldstein on May 4, 2023

8 billion people: why trying to control the population is often futile – and harmful

Elon Musk has said that "population collapse due to low fertility rates is a much bigger risk to civilization than global warming".

Business Standard is another English-language daily newspaper that offers opinions and insights on a range of subjects, including the Indian economy, infrastructure, international business, trade, stock and currency markets, corporate governance, and policy-oriented demographic issues. As mentioned above, *Business Standard,* with its own views, has identified one of the root causes of declining fertility and the resulting ageing of a country.

Similarly, as in China, India has been an example of population control policies. There are plenty of cases, like Iran, that have made contraceptives available to their public health services to reduce their population growth rate successfully. Bangladesh has been investing in community outreach services and the empowerment of women. Saudi Arabia permitted women to access contraception in the private sector without foisting any state policy. Families across the globe enable themselves to pursue their wishes and fundamental rights. The country director of the Indian Population Council has rightly mentioned that the recent *new population narrative asks that the state should not be the controller but the enabler* (https://www.dawn.com).Although it has been a hotly debated issue, it is also a media version that in today's world, from the context of society-ecology-health, one of the most effective ways that we can help our planet is by choosing to have a smaller family.

"Having one child means that there is time for us as a couple as well as our children. We are able to give our child more in terms of time than we would be able to if we had more children and the bond between the three of us often draws comment. We are able to afford to buy more sustainable foods and fuels."

Population Matters. 2024

Fertility Trends

Based on 2019 data from the *World Data Sheet, 2020* of the Population Reference Bureau, the total fertility rate varied from 0.92 in South Korea to 6.86 in Niger. However, as per the fertility rate by the World Bank in 2020, it varies from 1.22 in Taiwan in Asia to 7.15 in Niger in Africa. Regarding China, its population continued to grow till 2022 before approaching zero growth and eventually entering a stage of normalised decline. *South China Morning Post*, a Hong Kong-based English-language newspaper, mentioned that "in the next 10 to 20 years, China's natural population growth will not continue falling, it will fluctuate around zero and could see small drops, but there will not be rapid decreases"(Sun, 2022). Chen Weifurther observes that the natural population increase was 2.04 million people in 2020 and 0.48 million in 2021. Moreover, apart from China, the attention of the media is equally on India:

Since 1950 India and China have provided 35% of the world's population growth.

But China's strict family-planning rules—the so-called one-child policy introduced in 1980—drastically reduced its birth rate. Now its population is about to decline. Although the Communist Party allows women to have three children, they average only 1.2. By 2050 China's population will be 8% smaller than it is now. India's population, meanwhile, will continue growing. It is expected to peak at 1.7bn in 2064, when it will be nearly 50% larger than that of China (see chart). India is expected to provide more than a sixth of the increase of the world's working-age population (15-64-year-olds) between now and 2050.

The Economist, 2023

The Economist, a British weekly newspaper, has been insightful regarding current affairs, international business, politics, technology, and culture. According to this newspaper, demographers have also supported the nation's three-child policy that was rolled out in 2021 due toits likely impact on population growth. Besides, there are warnings that China's ageing population crisis will continue to deepen, as the number of people aged 60 and older accounted for 18.9 per cent of the population in 2021, up from 18.7 in 2020. The number of people aged 65 and older accounted for 14.2 per centof the population, up 13.5 per centlast year and the first time it has ever topped 14 per cent, which some experts view as a key threshold in defining the level of population ageing.

In Europe, *Hungary Today*, a major daily newspaper, highlightsthat in the year 2021, about 93 thousand children were born and 153 thousand have died in this country. The former is a relatively good one, but the latter is a bad one. The balance of the two statistics is a shortage of around 60 thousand, which will be offset by an immigration surplus. During peacetime, since the introduction of official statistics, this country has never had a natural population balance as bad as that of 2021 (Hungary Today, 2022). However, the country is very hopeful for 2022 onwards to show a more positive picture in this context.

Am Expat, a news site in Germany, published that the proportion of young people is sinking to a historic low as a result of the rapidly ageing population in Germany. Although the country has long been coping with ageing,recently the statistics from the Federal Statistics Office (Destatis) exposed the fact of an all-time low proportion of young people (since 1950). The youth population in Germany had reached a peak back in the 1980s when they made up 16.7per centof the population. Of the 83.2 million people living in Germany at the end of 2020, nearly 8.4 million were aged between 15 and 24 years (in 1983, the figure was 13.1 million). This means that the so-called *Generation Z* makes up 10.1 per cent of the total population. Except for the year 2015, the number and proportion of 15- to 24-year-olds in the German population have been falling steadily since 2005 (Carter, 2021).

If the prediction based on the projections from NRS is realised, Scotland's

population will fall by 1.5 per centover the next 25 years, while the UK population will grow by 5.8 per cent.The Scottish workforce is already over 50, and this figure would grow. In this context, urgent action was needed to make this country fit for the future. Its chief executive stated:

> "Even before the pandemic, our health and social care services faced immense pressure and now they're being stretched to breaking point. If we are to deliver on the healthcare needs of older people both now and in the future, more investment and resources will be needed to ensure older people can access what they need, when they need it." (Age Scotland, 2022)

Croatiais an area that has experienced 10 per cent fewer people living within its territory than a decade ago, according to preliminary results of a census released on 14th January 2022. According to the national statistics offices, this European Union country had 3.8 million in 2021, compared with 4.2 million in 2011. It was also mentioned that, in the last ten years, the number decreased by 396 thousand people. For this country, this shortage of population amounts to *depopulation* – a matter of concern to almost all the countries of Europe, with some exceptions. However, elsewhere in the Balkan region, there has been a combination of low birth rates and emigration toward more prosperous countries in the European Union. The Croatian government has singled out the problem as a major challenge for the authorities and even the country's future.

TheKorea Times, the oldest of three English-language newspapers published daily in South Korea, is also very much sensitive about demographic situations amid the country's chronically low birth rate, rapid ageing and a decline in incoming foreigners during the pandemic. Currently, South Korean women are estimated to have an average of less than 0.80 children throughout their entire reproductive period, down from 0.84 just a year earlier.

The number of newborns declined to 260 thousand in 2021, which is equal to as low as 0.5 per cent of the total population. The country's total population was estimated to have peaked at 51.84 million in 2020 before falling to an estimated 51.75 million (2021) and a projected 37.7 million in 2070, according to the latest medium variant projection by Statistics Korea (2018). This will put the country in a major drop in the working-age population, a phenomenon known as a *demographic cliff.* Further, if this trend continues, the working-age population will reach 17.37 million in 2070, making up 46.1 per centof the total population. Policymakers warned the country may face an *"age quake" starting in 2030-40*, an earthquake-like demographic shock from a fall in population and rapid ageing, if it does not promptly tackle the issue. By 2100, its population is projected to be 24 million (a fall of 53%) from the year 2019.

> "Many young people are delaying or giving up on getting married or having babies due to economic difficulties and changes in social norms. The number of those getting married sharply fell due to the COVID-19 pandemic."
>
> *The Korea Times, 2021*

TheGuardian.com is aBritish news and media website owned by the Guardian Media Group. As of November 2014, it was the second most popular online newspaper in the UK, with over 17 million readers per month; with over 21 million monthly readers, covering subjects including sport, business, environment, technology, arts and media, and lifestyle. On 19th November 2022, a published article about 'I'm afraid to have children: fear of an older future in Japan and South Korea' depicts the real demographic crisis in Japan. In 2014, Japan's population was estimated at 127 million which is expected to shrink to 107 million, with a wholesome of 16 per cent of the population by 2040. Furthermore, the population will be squeezed by 24 per centby 2050 (97 million). If the demographic trend continues, this island country is going to face a total population decline of 50% or more by the year 2100. Further, on 4th January 2023, the *Times of India* posted another issue like "Japan offering money to make families exit Tokyo." On 29th January 2023, the article "Japan PM: Now or never to fix birth rate" was published by *The Telegraph,* rightly revealing the fear of the country's administration about the future crisis..

BBC recently highlighted attempts to slow Bulgaria's population decline - the fastest in the world - by improving educational and economic opportunities in the country, making it more attractive for younger workers to stay rather than emigrate elsewhere in the European Union or to other countries. The United Nations regularly publishes demographic projections estimating how the world's population could change over the next several decades, and it is found that 20 countries are projected to have the largest percentage decline in population between 2020 and 2050. Further, following the U.S. Census Bureau's *Population Projections 2017*, the decade 2030s will be marked as a '*Transformative Decade*' and is going to emerge as a decade of important demographic momentum. By 2030, the population will be older and fall into the 60+ age group, which in turn will expand the volume of the aged population so that 1 in every 5 Americans will be in the retirement age. It indicates 20 per cent of the total population exceeds the defined margin of 7 per cent marked by the United Nations. Strikingly, by 2035, there will be 76.7 million under-18 people with 78 million above-65 population. Though overseas territories of other countries, the French territory of Wallis and Futuna, is projected by the UN to have an 18.7 per cent population loss over the next three decades.

World population to decrease from 2064- a report was published by *Deutsche Welle* on 3rd February 2022 in *Frontline*. There was an argument that we need a plan B if the Earth finds itself irreversibly damaged through climate change, overpopulation, a third world war or an eventual mass extinction. According to a 2020 report published in *The Lancet* by researchers from the Institute for Health Metrics and Evaluation (IHME), the global population could decrease after the second half of the century. Elon Musk tweeted a new concept of "*population collapse*". That means there might not be enough population for *Musk's Mars colonization plan.* They argued, "If there are not enough people for Earth, then there definitely won't be enough for Mars". Predictions by the IHME suggest that by 2064, the global population will reach its peak at 9.73 billion, followed by a decrease of almost a billion by the end of the century. These findings show a very different perspective from previous projections by the United Nations, which estimate a steady increase to around 11 billion by 2100 (Welle,2022).

According to IHME researchers, the declining population will not necessarily be a bad concept for the future. It may offer relief to the environment because fewer people use fewer resources and generate fewer carbon emissions. But it cannot be a remedy against climate change. Some countries like Japan, Spain and Ukraine could face a halving or more of their population by 2100. China is predicted to fall from its current 1.4 billion people to roughly 700 million, despite the 2015 end of the one-child policy. But the situation is not the same for all countries. Sub-Saharan Africa, North Africa and the Middle East are the only regions expected to have a higher population in 2100 than in 2017. On average, higher-income Western European countries would reach a population peak before 2040, much earlier than the predicted 2064 global peak. In the case of Germany, the population would peak at 85 million by 2035, but decrease less severely to about 60 million by 2100 (Welle, 2022).

Emerging Population Issues

Yahoo News is very much aware of the historical drop in the number of newborn babies relative to the population of women between 15 to 44. The long decline of the US birthrate is well documented and published in an article, "America is looking down to barrel of population collapse" on 29th November 2021. A recent Pew poll found the fraction of non-parents between 18 and 49 saying they were "very likely" to have kids fell from 32 per cent in 2018 to 26 per centthis year, while the fraction saying they were "not too likely" or "not at all likely" increased from 37 to 44 per cent. The US has been experiencing a weirdly high rate of birth, compared to other nations, significantly because of teen pregnancy and more immigration. But these major sources of birth mentioned above have been steadily declining for decades.

Roughly, there has been a marked association between continued enforcement of rigid gender norms and lower fertility. Several countries like South Korea and Japan have very severe social sanctions against single mothers and some of the lowest birthrates in the world, at an estimated 1.4 and 0.9 children per woman, respectively. Germany used to have a very patriarchal welfare state and paid for it in the form of a low birthrate, too, though it seems to have made some progress in this area recently. By contrast, Sweden and France have kept their fertility rate comparatively high (1.7 & 1.8) by embracing gender equality and, especially for single parents, as it is harder to raise a child solely (Cooper, 2021).

The immediate task for the world is to save more and more children at birth and ensure that they grow into healthy and educated adults. Considering India aims to become a $5 trillion economy by 2025, even if this happens, the estimated per-capita GDP rank would still be around 135 out of 190 economies. The harsh reality is that, among the Asian economies, India's per-capita GDP is lower than some of the neighbouring countries. It has to get transformed from an *emerging* to a *developed* economy, or it may find itself in a *middle-income* trap. Therefore, a nation first needs to raise incomes, which requires job creation. Especially for the countries, where on the one hand, “growth is jobless”, and on the other hand, there is a lack of structural change, with the share of the workforce in agriculture increasing. This does not bode well for the country's demographic dividend. With the sympathetically unbalanced wealth distribution, the top 1 per cent of people in India hold 33 per cent of the wealth, and the top 10 per cent hold 64.6 per cent of the country's wealth as per the *World Inequality Report*, 2022. Income needs to be inclusive, or else India will grow rich without Indians getting rich. Furthermore, with a median age of 28.3 (considering 15-29 years as youth), potential decline of the working-age population, the median age may rise to 30.2 by 2026 and 34.5 by 2036. Such a trend will affect the economy and society.

Another major issue is depopulation in one form or another. It appears that fertility, mortality, out-migration, selective migration, ageing and their combinations have been contributing to this process, which has become almost endemic. Localities, villages, cities, regions and nations are suffering due to depopulation. Ninety small cities and counties that are on the verge of extinction due to remarkable population decline have been designated as "*depopulation areas*". Governments are planning to provide intensive administrative and financial support to help the concerned areas escape from their crisis of extinction. Regarding South Korea, It is interesting to note that the designation of depopulation areas came after the *Special Act on Balanced National Development* was revised late last year and its enforcement decree

was amended in June (Korea Times, 2021). The designation of depopulation areas is a new starting point for the government's efforts to solve the problem of population decline. With this process becoming rampant, governments and planning authorities will be forced to take similar measures. Nonetheless, how will the *depopulated areas* be defined by different governments? Will the reduction of population be the only criterion? In any case, a depopulated nucleus, over time, may take the shape of a *depopulated region,* derailing the concerned social and economic setup.

Population Turmoil – Economy and Future World

As mentioned earlier, China is facing the most hazardous decline in population in decades, setting the stage for potential demographic, economic and even political crises shortly. Moreover, the labour force has been declining since 2012 and is now 40 million fewer than a decade ago, which will be going to affect the economic growth in a stormy manner or more strongly. The World's centre of economic gravity is being shifted eastward due to comparatively rapid population growth. India, with a growing middle-class population and its expanding discretionary spending, will become 3rdthird-largest (5.9%) importer by 2050, right behind China and the US. In 2014, the third-biggest economy in PPP terms (India) was around 50 per cent larger than the fourth-biggest economy (Japan). Presently, it ranks 8th amongst the large importing nations and will take over the 4th position by 2030. The share of the European Union and the US is expected to decline in all the import sectors. At the same time, the increasing purchasing power of the middle-class consumers of Asia will account for a larger share of import demand globally.

Experts have estimated that demographic shift or decline data collected amid the COVID-19 pandemic, revealed by the 2020 census, indicate transformations likely to come in U.S. politics. Besides the emergence of COVID-19, it is also part of longer-term declining trends in fertility that show no signs of alteration. These trends have already caused major economic dislocations for the U.S. as well as for the rest of the world. It does not matter how anyone looks at this situation, but population decline is not always good news for the days to come. Perhaps this is the reason for the gradual shift of the world market eastward, and considering the global market U.S. will come down to the 2nd position, leaving the first position for China just within 2030 as projected.

> "Though only the population decline or enlargement were not the things affecting the economy over the time. All the facts like, the emergence of the internet, the growth of the Chinese economy and a regime shift in monetary policy played their role. But it's hard to

> overlook the impact of population size, which had been a steady tailwind of the US economy after World War II, then became a steady headwind in the late 1980s and will remain so ever since."
>
> *(https://www.heraldnet.com/opinion/comment-shrinking-population-can-only-hurt-u-s-its-economy/)*

Indonesia has a higher young population base in comparison to Western nations, which indicates a potentially large-active-skilled workforce. However, the recent situation has slowed down the country's birth rate and increased life expectancy at birth. As per the United Nations' projections, almost two-thirds of Indonesia's population (67%) is going to accept an urban lifestyle by the year 2050, though now it is 58 per cent(2020). It is reason to be optimistic for Indonesia's future as well. According to *PricewaterhouseCooper* (2017), Indonesia will be the world's fourth most powerful economy by 2050. In this report entitled "*The Long View – How will the Global Economic Order Change by 2050,*" PwC elaborated on the way the economy of this country will grow based ona rigorous modelling approach. The report says Indonesia's projected rise from the current position as the eighth to the fourth largest world economy behind China, India and the USA, indicates that it is going to dominate the 21st century, though the gap between the third and fourth largest economies may be significant.

The new phase that **I**ndia's1.417 billion people may have surpassed China's population puts a spotlight on India in the global market. It is an opportunity for India to reimagine strategies and build on its successes to provide a healthy and happy life for its people, as mentioned by the executive director of the Population Foundation of India. Some experts estimate that India will not hit its population peak until 2065, which means that even if the younger demographic produces only one or two children per couple, the population size will continue to increase over time before it stabilises, driving what PFI calls the "population momentum" (Rajvanshi, 2023). Further…

> "India can learn from China's shrinking population by achieving low fertility rates without imposing further population control methods. "India must put an end to the noise around the possible introduction of a two-child norm," said Muttreja, the executive director of the Population Foundation of India (PFI), adding that a few Southern Indian states like Kerala, Tamil Nadu, and Andhra Pradesh have already achieved this by providing better access to education and development opportunities."
>
> *(https://time.com/6248790/india-population-data-china/)*

India's 63 biggest cities with a population of more than one million in 2021

are now home to more than a quarter of its middle class. They also regenerate 29 per cent of the country's disposable income, 27 per cent of total spending and 36 per cent of the total savings that drive demand for goods and services, fuelling an economic boom (Gupta and Sidhartha. 2022). Rapid urbanisation is triggering significant changes across cities, which are emerging as growth centres and swelling the ranks of their middle class. The textile city of Surat in Gujarat has shown the sharpest growth in the number of super-rich households between 2015-16 and 2020-21. A pan-India survey by a think tank, *People Research on India's Consumer Economy* (PRICE), has shown noticeable results and provides an insight into the income demographics and changes taking place in the cities, which are seen as the engines of growth for Asia's third-largest economy. With 2.76 million households, Delhi has the largest middleclass, followed by Mumbai at 2.44 million and Kolkata and Chennai at about 1.60 million each.The Indian prime minister can claim that the nation, which may have just passed China as the world's most populous, is finally meeting its economic potential (Schultz and Beniwal. 2023). According to Nandan Nilekani, the founder of Infosys Ltd, India is on the cusp of huge change. The US-China rivalry is providing a tailwind. India and Vietnam will be big beneficiaries as companies move toward a '*China-plus-one'* strategy, supply-chain analysts claim. Apple Inc.'s three key Taiwanese suppliers have won incentives from the Indian government to boost smartphone production and exports. Morgan Stanley predicts that India will drive a fifth of world expansion this decade, positioning the nation as one of only three that can generate more than US$400 billion annual output growth. Noteworthy is that the Indian government's manufacturing aspiration is not new. Its '*Make in India'* campaign kicked off in 2014, seeking to emulate China and the tigers of East Asia. Quraishi observed that, besides, a decreasing skilled population across Europe and America has resulted in a shortage of manpower, making India's population an asset that's "politically important and indispensable." Further, he expressed. "Other countries may hate India, but they love our market" (Rajvanshi, 2023).

Becoming the world's most populous country can signal a "paradigm shift" for India's development, Muttreja remarked that is because the country's younger population also comes with a huge potential to boost the economy, what economists usually call the *demographic dividend*. In 2021, the working-age population of India stood at a whopping 900 million, according to OECD data. The Centre for Economics and Business Research predicts India to become a $10 trillion economy by 2035 (Rajvanshi, 2023).

Despite the advantage of having the maximum young population, the Indian government has not been that successful in prioritising the upskilling of its young people, given that India's labour force participation rate, which accounts for how much of the country's working-age population works or wants to work, is a mere 40

per cent. However, the government has taken certain steps for skill improvement, and for this purpose, a separate ministry has been formed. To absorb the young working population, this country will need to create at least 90 million new non-farming jobs by 2030 (Sankhe, *et al*., 2020). It has generally been agreed that India can do better by investing in women's equity for economic development.

Conclusion

It appears that the media have become more vibrant in comparison to the traditional sources of information and analysis. Perhaps the decadal censuses are not at par with the frequent developments taking place regarding population worldwide. The interim population surveys or data collection can only meet the requirements partly. The media, armed with access to citizen cards, UDAI in India, sensors, digital traces, websites, mobile phones, bank accounts and recording of other electronic imprints have made an impact in population studies as well. Further, the electronic data is programmable and very soon we should be able to get the macro population trends live. In smaller countries, the whole population's data is online. Hence, dependency on regular censuses and surveys is becoming less relevant. A stage may come when undertaking censuses may not be required at all. Should we, the population scientists, ignore the media as an additional source of information? The experiences of various countries would be varied, as policies framed by the national governments have overall control over the population. The issues related to depopulation, redistribution, ageing, reduction of growth rate, late marriage and the like have been highlighted more by the media. They have a wider outreach and hence can make a bigger impact in society.

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Architectural Wonders of India: Understanding Ancient Indian Knowledge of Science and Technology in Absence of Formal Education System

*Arati Upadhyay**

*Dr.Yogendra Pandey***

Abstract

The big challenges for the young architects in the developing country like India are to express a cultural identity of their local qualities in their cities. Globalization increases the limit of cultural borders, customs and earthly differences. Although, the current curriculum is in much more scanned format yet does not promise a positive response for the conflict. Although we have well educated civil engineers and trained architects today, yet we witness hazards due to collapsing of buildings, bridges, flyovers and shocking piercing of roads.

Since as an Indian we have Rich Knowledge of Mathematics, Science and technology from ancient era and the proof is our splendid and marvelous heritage in the form of sculptures, structures and architectural benchmarks. This architectural knowledge would help a lot to young architects to universalize the architectural repertoire valid for all without much regard to any identical hurdles.

This paper draw and examines the development and knowledge of ancient India about science and technology of architecture and its influences also sketch the relevance to draw attention of modern man to the need for look back to learn how can we live and make harmony with nature. This would lead us to live a sustainable, bright, happy, healthy and safe future to our forthcoming generations.

1. INTRODUCTION

We are living in twenty first century where everything is possible. We have all the modern scientific theories, knowledge, and technologies. There is never being a strange if we will be successful to find out the God Particle in upcoming years. Still, when we walkout on the roads, used to face unavoidable traffic jam, despite of having all the modern machinery and techniques people die due to collapsing

* Assistant Professor, Deptt. of Education, L.K.C. Government P.G. College, Gangoh, Saharanpur, U.P.

** Associate Professor, Faculty of Education, Banaras Hindu University, U.P.

of under construction as well as constructed over bridges and buildings. Streets are full of overflowing savage waters. Although we have well educated civil engineers as well government authority yet there is no town planning. In fact, we are living in a very haphazard way.

According to an old saying food, clothes, and shelter are the most prominent basic need of mankind and shelter is one of them most basic physiological need. The journey of men go from the dwelling in the caves to carving out temples in mountains, they have modified shelter with every passing era. Indian architecture is really a fascinating fusion of both art and science. It has crossed the limits of engineering and design from strategically placed astronomy towers to impressive and awe inspiring tombs. And the most important thing is that all these happened without the aid of modern machinery and machines.

So, take a break and stop, just move U-turn towards the past and know its ability to do what we cannot even do with modern tools and technologies. Just have a look on few architectural wonders of ancient India : Breihadeswara temple of Tamilnadu, Khazuraho group of monuments, Ruins of Hampi, Veerupaksha and Lepakshi temples in Karnataka, Konark's Sun temple , Odisa Stupas (specially Sanchi), Mahabodhi Temple, Monolithic wonder statue of Gomateshwar, Iron pillar of Delhi, Champaner-Pavagarh archaeological Parks, Bhimbetaka, Kailashnath Temple, Kanheri, Ajanta, Ellora and Elephanta caves, Mahabalipuram, Rani KaVav and of course the first of firstest Harappa And MoahanjodaroTown planning and drainage system.

2. Research Method

It is a qualitative research. The study has the chief characteristics of document based analytical research. Researcher collected the information through comprehensive literature review and content analysis of the published works about ancient Indian knowledge: Mathematics, science and technology.

3. Brief Discussion about Science and Architecture of few Structures

So, let's analyze the splendid and incredible town planning and drainage system of the Harappa civilization. Today we are 'So Called' most civilized generation on the earth, most technosevy and innovative mind holder species. Intellectual Property Rights and Patent culture are the focus of current era yet we are suffering with invalid, unreliable and non-sustainable infrastructures. Just think how the benchmark town planning and infrastructure possible even before five thousand years ago approximately. Is it not fascinating that the cities of Harappa and Mohenjo-Daro were distinguished by the orientation of streets and buildings

according to the cordial direction at that time: east-west and north-south and fortification all around? There were large gateways at various entry points of the cities; the most outstanding feature of the civilization is well laid out streets and side lanes.

Source of Picture: Google Images

At present time it is too common to see people campaigning to make others understand assimilate civic sense but civic sense of Harappan people were really adorable, no encroachment on the street was to be seen even the width of these street were in a set ratio.

The second ancient wonder is Vijaystambh and Brihadeswara temple. It is the place where walls sing and sculptures dance. These were not built by the stone merely but the pride of the people. Vijaystambha is 112 feet high and could be collapse by self load. But it is still stand just because it was designed as central chamber and outer gallery and joint through sty case. Who thought that science could be took such an inspiring and beautiful shape!

The thousands years old temple of lord Shiva that is Brihadeswara located in Thanzavur, Tamilnadu. It is fine example of the Dravadian architecture built by Raja RajaChola I. It is Two hundred and sixteen feet high and more than one hundred and thirty thousand tones of granite is said to have been used to build it. The surprising thing is that there is neither a mountain nor a rocky hill for approximately 60 kilometer around Thanzavur. The architecture of this place is

based on interlocking technique also known as puzzle technique. It means placing one stone with the one just to lock it without using cement stucco plaster and any adhesive. There is nothing between two stones.

Source of Picture: Google Images

It has been seen that many monuments like London's Bigben, Italy's Leaning Tower are tilting with time but even after thousands of years this temple is absolutely straight. This is because it's Puzzle or interlocking technique. The other reason is that the base of the temple is so wide that has kept it straight. The other specialty of the temple is that it was built without digging the earth means on a plain land. It is such a superb architecture.

The stone placed at the top of the temple also known as Kumbham weigh around 81 tones which are carved out of a single rock. Its wonder! how they would have placed this single stone at the top. Those days when they had no cranes to lift their stone, they made a ramp of around 6 km long. Elephants, horses, buffaloes and laborer together carried the stone to the top of the temple.

The next wonder is Kailashnath temple. It is the high point of the Hindutemples undoubtedly. There are columned galleries, three storey high large sculpted panels and alcoves containing enormous sculptures. In attempting to recreate this version of paradise the ancient craftsman and artist of Ellora came up with something of an architectural marvel. It is the largest monolithic structure in the world carved at a single rock. Wherever normal temples built from base to upward The Kailash temple was Top to downward.

Source of Picture: Google Images

Further Ajanta Caves are of course the splendid paragon of ancient Buddhist civilization, Filled with paramount tranquility. These exemplify the unsurpassed imaginative power and engineering excellence of the bygone era. The architects of these projects were so proficient that someone of the caves they excavated reaches almost hundred feet into the rock. The Khazuraho groups of monuments are a vast complex of Jain and Hindu temple. It is a UNESCO world heritage site and blending of art and science can see here.

The pride of Odisa Konark Sun Temple is also a wonder where even stones speak up in prayers. You cannot yourself from the fascinating architecture and erotic sculpture of the Konark Sun temple. Elaborately carve wheels, walls and pillars of the sun Chariot styled temple is main attraction.

Source of Picture: Google Images

There are 24 carved wheels each of them three meters in diameter pulled by seven horses. And the wonder of the temple is none other than the Sun dials. A beautiful blending of science, architecture and devotion can calculate time to exact minute even today. Is it not amazing! The wonder architects and engineers continue to baffle by its architecture and engineering.

Now come to the ruins of Hampi, the lasting testament to the grandeur of the Vijaynagar Empire. It is also UNESCO world heritage site. It has mainly speculating temple like Vithala, Veerupakshi, Lepakshi temples, Grand Lotus mahal and Ganesha temple. One of the gems of Hampi is the Veerupakshi temple.

Source of Picture: Google Images

The attraction of it is nine tiered eastern gateway, which is at 50 meters, well-proportioned and incorporates some earlier structures. Gateway has a brick superstructures and a stone base. Veerupaksha temple looks like geometric expression. Fractals are the foundation of this expression (repetition across different scales called fractals). Is not that beautiful!

A timeless story carves in rock of the Elephanta caves. These stunning archaeological remains of the elephant caves echo the story of rich dynasties that ruled that place at that time. This is beautiful blending of sculpture, art and aesthetic beauty. Sprawling from the entrance to the back colossal cave one measure to an elegant height of thirty nine meter and it is enough to drench one in the splendid and vast world of rocks and architecture. The ancient Indian has the great sense of water harvesting. Rani kiVav, Pandav and Kanheri caves are few examples of the rich knowledge of those people.

Source of Picture: Google Images

A temple turned upside down to worship water in Rani kiVav. To worship hallowed water of Saraswati River, this was built by Rani Udaymati in Eleventh century AD. It is 64 m long, 20 m wide and 27 m deep and runs downwards up to a length of seven stories and also a beautiful example of subterranean architecture. With the central theme the ten incarnation of lord Vishnu, this entire story is came up with 800 structures. All of which represent human, nymphs, god and the kings in varying form of skill. It is astonishing fact that in those times it acted as natural coolant. Just think about the level of scientific and architectural prowess it would have taken to conjure up a monument an inverted temple of the impeccable style.

Source of Picture: Google Images

3. Result and Discussion

It is very common feeling of happiness on seeing the beauty of buildings but very few person think about the ancient science and technology used. Sculptures and

architecture of past time, huge water harvesting system or skyscrapers buildings and unique rock-cut structures had been made without any modern technology or machinery. Such architecture has their own interesting stories. Just imagine how scientific and brilliant those minds who thought all these at that time were! So, the question is, the shadow of science of that era is more impressive than the picture of today!

High-tech equipment's and tools are the necessity of current era in building construction. This is why we see the modern marvel like Burj Khalifa of Dubai and Tokyo's Skytree. But when the advance equipment like cranes and transportation technology were not present there, even then shocking architectural structures were constructed in India. We have discussed few of them earlier. Here at this stage let's discuss the implications of this study.

The relationship between the architecture and mathematics is so deep, so that could not recognized as two different subjects for many decades. The knowledge of Mathematics and Architecture in India was so progressive and hence we can see there were different principles and mathematics behind each different architecture. There is enormous and marvel architecture of ancient time give us message of civic sense and secondly the human values like cooperation, coordination, foresightedness, energy, courage and of course sustainable living with nature. We used to travel these places just for fun and refreshing ourselves during holidays and do not listen their silent voice generally.

We are organizing conferences on Climate change and Global Warming like COP, Earth Summit and many more. Used to take oath to control the increasing level of temperature, level of GHGs into environment etc, but not ready to compromise with unscientific and unsustainable use of technology for development.

- If those people were aware about water harvesting and natural cooling system before four to five thousands year ago, why cannot we?
- If they could carve the rock without using dynamite, why cannot we?
- If they could construct marvel of town planning without a bit of encroachment, why cannot we?

These were few gems from the architectural mine of ancient India. It is a long list of such examples from ancient to modern India till eighteenth century. We need to learn from them to attain the **SDG 2030**. There is no other way to live sustainably without leaving our monotonous attitude about development like : Apna to kaamchalrhahaina!

4. Conclusion

The paper concluded that we cannot escape the pride that we feel whenever

someone mention the India, wherever we go , whoever we are and whatever we are doing. And yes, we would be the richest country if the culture, heritage, mathematics, science and technology were a currency.

We have faced countless invasions and wars, conquest and peace keeping eras. These metamorphosed our society, polity and as well geography. But through all of these the one and only things that has still remained constant is the architectural and artistic prowess of the masters. Their sheer genius and beauty of architecture and science has not dimmed hitherto.

Among the many wonder of the world it is the phenomenon of cutting to sheer, solid natural rock preparing remarkable architect structure and sculpture. Though this is found in the many part of the world but nowhere else to be found abundance and variety of rock cut structure that been found in India. From the beginning of recorded history, it is fascinating to see how closely man has worked with nature. He looked for solace and support and found spiritual contentment in the sun and the sky, in fire and water. Man replicated the beauty of nature on materials we found in nature, coloring it with his own emotion and feeling and thus was born art. The art became sustainable through the use of brain.

The need of present time is to learn from our past and apply their knowledge in present for giving our forthcoming generations a bright, happy, healthy, safe and sustainable future. It is time to understand how the ancient sustainable architectures can give base to the new urbanism, new classical architecture and eco cities. Such knowledge will contribute, much to the education of new and young aspiring minds in globalization.

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Design and Fabrication of Piezoelectric Materials for Different Biomedical Applications

Dr. Gopal Krishna Gupta*

Abstract

Piezoelectric materials possess the unique ability to convert mechanical energy into electrical signals, making them highly suitable for biomedical applications such as tissue engineering, wound healing, biosensing, and self-powered implants. This review summarizes recent developments in the design, fabrication, and application of piezoelectric materials in the biomedical field. Various material systems including ceramics, polymers, and biopolymers are discussed with a focus on their performance, biocompatibility, and fabrication challenges. Additionally, the review outlines advanced fabrication techniques such as electrospinning and 3D printing and addresses the limitations and future directions of this emerging field.

1. Introduction

Piezoelectric materials, which generate electrical signals in response to mechanical deformation, have emerged as powerful candidates for biomedical applications due to their ability to interface with biological systems without the need for external power sources. This electromechanical coupling can be exploited to stimulate tissue growth, monitor physiological signals, and even harvest energy from body movements (Dagdeviren et al., 2014; Zhou et al., 2022). The natural mechanical dynamics of the human body—such as heartbeat, respiration, and muscle movement—create an ideal environment for these materials to operate.

The origin of piezoelectricity in biomedical applications can be traced back to the exploration of materials like lead zirconate titanate (PZT), a ceramic with a high piezoelectric coefficient. However, due to toxicity concerns stemming from lead content, the focus has shifted toward lead-free ceramics such as barium titanate ($BaTiO_3$) and potassium sodium niobate (KNN) (Yin et al., 2021). These materials are being developed into biodegradable and bioresorbable formats to reduce the need for surgical removal after therapeutic use (Chen et al., 2022).

Polymeric piezoelectric materials, particularly poly(vinylidene fluoride) (PVDF) and its copolymers (e.g., PVDF-TrFE), offer advantages such as flexibility, ease of processing, and mechanical compatibility with soft tissues (Persano et al.,

* Department of Physics, Jananayak Chandrashekhar University, Ballia

2018). These polymers have been widely adopted in the development of wearable biosensors, implantable devices, and smart wound dressings. Through electrospinning and 3D printing, researchers have been able to fabricate fibrous and porous scaffolds that support cell adhesion and tissue regeneration while delivering electrical stimulation (Ghosh et al., 2019; Pan et al., 2023).

Natural piezoelectric materials such as collagen, chitosan, and cellulose have also gained attention due to their inherent biocompatibility and biodegradability. These biomaterials provide promising platforms for in vivo applications without eliciting adverse immune responses (Kumar et al., 2023). Although their piezoelectric response is typically lower compared to synthetic materials, their performance can be enhanced through chemical modification or blending with nanoparticles (Sun et al., 2020).

The integration of piezoelectric materials into biomedical systems opens up novel pathways for developing self-powered sensors, actuators, and scaffolds. However, challenges remain in optimizing their mechanical robustness, biodegradability, and electromechanical efficiency. Continued research at the interface of materials science, tissue engineering, and bioelectronics is essential to fully realize the potential of these materials in clinical settings.

2. Types of Piezoelectric Materials

Piezoelectric materials are categorized based on their origin and composition, primarily into **ceramics**, **polymers**, and **natural biopolymers**. Each class exhibits unique characteristics in terms of piezoelectric response, mechanical properties, biocompatibility, and biodegradability, influencing their suitability for specific biomedical applications.

2.1 Ceramic-Based Piezoelectric Materials

Ceramic piezoelectric materials, particularly **lead zirconate titanate (PZT)**, are among the most studied due to their high piezoelectric coefficients and excellent electromechanical coupling (Yin et al., 2021). PZT has been widely used in ultrasound transducers, actuators, and energy harvesters. However, the presence of lead raises toxicity concerns, especially for in vivo biomedical uses.

To address this, **lead-free ceramics** such as **barium titanate ($BaTiO_3$)** and **potassium sodium niobate (KNN)** are being explored. $BaTiO_3$ is biocompatible and has demonstrated promise in bone regeneration scaffolds and biosensors (Chen et al., 2022). KNN offers good piezoelectricity and stability while avoiding lead-based toxicity, making it an attractive candidate for implantable devices (Yin et al., 2021).

Recent studies have also introduced **biodegradable ceramic piezoelectrics**, which gradually dissolve in the body after use, eliminating the need for surgical removal and reducing risks of chronic inflammation (Chen et al., 2022).

2.2 Polymeric Piezoelectric Materials

Polymeric materials such as **poly(vinylidene fluoride) (PVDF)** and its copolymer **PVDF-TrFE** are flexible, lightweight, and mechanically compatible with soft biological tissues. Their piezoelectricity arises from the alignment of molecular dipoles in the β-phase crystalline structure, which can be enhanced through stretching, poling, or incorporation of nanoparticles like ZnO or $BaTiO_3$ (Persano et al., 2018).

PVDF-based materials are extensively used in **wearable biosensors**, **flexible implants**, and **self-powered medical devices** due to their high dielectric strength and ease of fabrication (Ghosh et al., 2019). Additionally, their electroactive behavior supports cell growth and proliferation when integrated into scaffolds, making them ideal for tissue engineering applications.

2.3 Natural Biopolymer-Based Piezoelectrics

Natural biopolymers, including **chitosan**, **collagen**, and **cellulose**, exhibit inherent piezoelectric properties due to their non-centrosymmetric molecular structures. These materials are highly **biocompatible** and **biodegradable**, which is advantageous for temporary implants and wound healing applications (Kumar et al., 2023).

Chitosan, derived from crustacean shells, can be engineered into nanocomposites to improve its piezoelectric and mechanical properties. These materials have demonstrated potential in developing **probiotic implants**, **neural tissue scaffolds**, and **energy-harvesting patches** (Kumar et al., 2023). Although their piezoelectric response is generally lower than synthetic alternatives, they can be functionalized with nanoparticles or blended with synthetic polymers to enhance performance.

2.4 Composite Piezoelectric Materials

To combine the advantages of ceramics and polymers, **composite materials** have been developed. These materials typically embed ceramic particles (e.g., $BaTiO_3$, PZT) into a polymer matrix (e.g., PVDF) to yield improved **flexibility**, **processability**, and **piezoelectric response** (Sun et al., 2020). Composites enable custom design of materials with tunable mechanical and electrical properties for a broad range of biomedical applications.

innovation in healthcare technology.

4.1 Tissue Engineering

Piezoelectric scaffolds can mimic the natural electromechanical environment of tissues such as bone, cartilage, and nerve. When mechanical forces—such as body motion or physiological loading—are applied, these scaffolds generate localized electrical signals that promote **cell proliferation, alignment, and differentiation** (Li et al., 2021).

In **bone tissue engineering**, scaffolds made of $BaTiO_3$ and PVDF have shown to enhance osteogenic differentiation by activating voltage-sensitive calcium channels, leading to improved bone formation (Han et al., 2020). Likewise, in **neural regeneration**, piezoelectric conduits guide axonal regrowth while also stimulating neurons with endogenous electrical signals (Chen et al., 2022).

Electrospun PVDF-TrFE nanofibers have been particularly successful due to their flexibility, large surface area, and ability to maintain a stable β-phase, offering promising outcomes for **cardiac and musculoskeletal tissue** engineering (Ghosh et al., 2019).

4.2 Wound Healing

Piezoelectric wound dressings can accelerate wound closure by enhancing **fibroblast migration**, **collagen deposition**, and **angiogenesis** under mechanical deformation. These dressings exploit mechanical movements from respiration or body motion to generate endogenous electric fields that simulate the **natural bioelectric signals** found in wound sites (Han et al., 2020).

Hydrogels embedded with PVDF or ZnO nanoparticles have been used to fabricate **self-powered wound dressings**, which not only provide a moist healing environment but also offer real-time mechanical stimulation to boost tissue regeneration.

4.3 Biosensing and Diagnostics

Piezoelectric sensors can detect micro-deformations and vibrations with high sensitivity, making them ideal for **real-time, non-invasive monitoring** of physiological signals such as heartbeat, respiration, joint movement, and gait. These sensors are often integrated into **wearable or skin-mounted devices** for continuous health monitoring (Lee et al., 2017).

Implantable biosensors using PVDF or KNN ceramics have also been explored to monitor **tumor growth**, **pressure in internal organs**, and **neural activity**. Their high signal-to-noise ratio and ability to function without external power improve

Summary Table of Material Characteristics

Material Type	Piezoelectric Coefficient	Flexibility	Bio-compatibility	Bio-degradability
PZT (Ceramic)	Very High	Low	Low (Lead)	No
BaTiO?, KNN (Ceramic)	Moderate-High	Low	Moderate	Limited
PVDF (Polymer)	Moderate	High	High	No
Chitosan, Cellulose	Low-Moderate	High	Very High	Yes
Composites	Tunable	Medium-High	Medium-High	Material-Dependent

3. Fabrication Techniques

3.1 Electrospinning

Electrospinning produces nanofibrous scaffolds with high surface area and porosity, ideal for tissue engineering. PVDF electrospun fibers are often used to develop nerve and bone regeneration scaffolds due to their electromechanical coupling and resemblance to native extracellular matrix (Ghosh et al., 2019).

3.2 3D Printing

Additive manufacturing or 3D printing allows for the fabrication of custom-designed piezoelectric devices with complex geometries. This technique is particularly beneficial in designing patient-specific implants. Recent developments include 3D printed piezoelectric hydrogels and flexible pressure sensors for wound healing applications (Pan et al., 2023).

3.3 Thin Film Deposition and Surface Engineering

Techniques like spin-coating, sputtering, and chemical vapor deposition are used for thin film fabrication. Surface treatments such as corona poling and plasma activation can enhance alignment of dipoles in polymeric materials, improving their piezoelectric properties (Sun et al., 2020).

4. Biomedical Applications

Piezoelectric materials have found broad utility in the biomedical field due to their ability to generate electrical signals from mechanical stimuli—a property that enables autonomous sensing, active tissue stimulation, and energy harvesting in vivo. Their integration into devices and systems for **tissue engineering**, **wound healing**, **biosensing**, and **implantable energy harvesters** represents a major

patient comfort and reduce maintenance (Persano et al., 2018).

4.4 Energy Harvesting for Biomedical Devices

Piezoelectric materials can serve as **biomechanical energy harvesters**, converting kinetic energy from bodily motions—such as walking, breathing, or heartbeat—into electrical energy. This energy can be used to **power low-energy medical implants**, including pacemakers, drug delivery pumps, and biosensors (Zhou et al., 2022).

For example, conformal PVDF-based films have been integrated onto lungs and diaphragms to harvest energy during respiration, successfully powering small diagnostic devices (Dagdeviren et al., 2014). This represents a step forward toward **self-sustaining implantable systems**, reducing or eliminating the need for batteries or surgical replacements.

4.5 Smart Drug Delivery

Emerging research explores piezoelectric materials in **smart drug delivery systems** that release therapeutics in response to biomechanical stimuli. These systems use mechanical stress to trigger piezoelectric stimulation, which can drive the controlled release of drugs from reservoirs or hydrogels (Pan et al., 2023). This technique is being explored for **cancer therapy**, **diabetes management**, and **wound treatment**.

5. Challenges and Future Perspectives

While the potential of piezoelectric materials in biomedicine is immense, challenges such as long-term stability, immune response, and precise control of piezoelectric output remain. Future work should focus on:

- Developing biodegradable, lead-free materials,
- Enhancing the mechanical compatibility with soft tissues,
- Integrating machine learning for smart biosensing systems.

Multifunctional piezoelectric materials that combine sensing, energy harvesting, and therapeutic effects will likely define the next generation of medical devices.

6. Conclusion

Piezoelectric materials offer exciting opportunities in the biomedical field through their ability to translate mechanical stimuli into electrical signals. With advancements in material science and fabrication methods, their application range has expanded from sensors to regenerative medicine and beyond. Further interdisciplinary research will be key to overcoming current limitations and

realizing the full potential of piezoelectric-based biomedical devices.

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Economic Conflicts: A Hawk-Dove Explanation

Dr. Gunjan Kumar*

Abstract

Being an evolutionary process, there may be many immediate as well as long term causes of violence or conflicts.Conflicts need resources like arms, people, food, capital, time and many such resources which are spent by the groups in order to obtain economic control and political influences. This non-productive spending of inputs and resources can be considered as a social cost with a negative growth effect on the economy.The persistence of conflict is mainly due to relative deprivation of one or more sections against another.The capability of weaker sections (Doves) should be raised by increasing their social, economic and political possession up to such a level that they become able to fight against exploitation by Hawks independently.Present conflicts observed in various regions are different from traditional Hawk-Hawk conflict, that is, conflict for higher power and control. The conflicts are mainly between mobilised Doves and the elites who are in power and authorities.

1. Introduction

Human society which settles and structures itself in the form of groups, experiences conflicts over resources among these various groups. Being a group of rational beings, these social groups also develop a cooperative and acceptance approach. Whether the conflicts or cooperation will dominate is determined by the 'Institutions' or 'Rules of the Game' present in the society as they guide the behaviour of the people.

Being an evolutionary process, there may be many immediate as well as long term causes of violence or conflicts. For example, horizontal inequality has been identified as one prime cause of conflicts in social science literature (Henrich,J and Boyd, 2008, Freeman, D; Langer, A. 2004). A comparative unequal society with horizontal inequalities and relative deprivation experiences frequent and persistent conflicts. Hence the notion that ethnicity or identity necessitates conflict may not be true as they also evolve over time.

Although the literature of conflicts is vast in political science and other social sciences, economists have also paid attention to this. In fact, it is rarely possible to disentangle political, cultural and economic elements as each is embedded in another. Conflicts need resources like arms, people, food, capital, time and many such resources which are spent by the groups in order to obtain economic control and political influences. This non-productive spending of inputs and resources

* Department of Economics, JNCU, Ballia.

can be considered as a social cost with a negative growth effect on the economy. The time, labour, capital and many such resources get wasted which could be used otherwise. Moreover, conflicts cause instability and uncertainty which reduce investment and therefore development.

Several approaches have been used in social sciences to understand and explain the societal conflicts. The paper uses the theoretical literature background and takes the help of Hawk-Dove model to develop an explanatory insight into the social and economic disagreements and strife. Though the use of the Hawk-Dove game in social conflict is not new, this paper attempts to provide some extensions incorporating "Non-Hawks and Non-Doves" in the model. The aim is to reflect the situation that competition of power, control over resources and relative deprivation of some communities over others are more dominant causes of persistent conflicts rather than identity or ethnic issues. The paper argues that the changing economic positions of the different social groups change their strategies and it is the strategy and position which matters. Further, the paper aims to provide insight into the situation of persistence of conflicts rather than to specify any model. It also does not attempt to explain any equilibrium, but the process of continuation of conflicts.

2. Hawk-Dove Explanation

John Maynard Smith and George Price have given the model of the Hawk-Dove game in the context of animal conflict. This model also has positive relevance in case of social and economic conflict that human society experiences across the time (Mc Adams R. & Nadler, J. 2003). In this model, there are two players and two strategies Hawk and Dove. Hawk always fights and plays the "attacking" game, while Dove always plays "defensive" game and runs away if attacked. When two hawks meet, a fight ensues and generates a cost. On the other hand, when a Hawk meets a Dove, the Hawk gets the resource and Dove gets nothing. But when a Dove meets another Dove, they share the resources. The payoff matrix of the traditional Hawk Dove game is:

	Hawk	**Dove**
Hawk	(v-c)/2, (v-c)/2	v, 0
Dove	0, v	v/2, v/2

Where,

v=value of the resource

c=cost of the fight

V (H/H) = (v-c)/2, V (H/D) = v, V (D/H) = 0 and V (D/D) = v/2 are the payoffs of

individual strategies i.e. Hawk against Hawk, Hawk against Dove, Dove against Hawk and Dove against Dove respectively.

But in economics and social sciences, conflicts often occur between more than two players and are different from the animal conflicts. Most of the economic and social conflicts often occur between groups rather than between individuals. In any economy, Hawks refer to the group of individuals who are possessor of the economic, social and political power (w_H) at period 't' and will possess it with greater likelihood than any other player in the period 't+1'. The reason behind this is that the control over the gains of economic exploitation of available resources as well as over the state apparatus itself tends to reinforce continuity in the power for these elite groups (Alesina etal, 2003; Ashraf Q & Galor, o, 2011; caselli, F & Colemar, W.J, 2013). On the other side, Doves are non-possessors or have little possession (w_D) and always have a threat to their possession. Hawks have a high endowment 'w_H' either as a group or individual, while Doves have comparatively very low access to resources and political participation 'w_D'. Therefore, unlike traditional Hawk-Dove game we have a situation where $w_H \neq w_D$. There is one more type of players we do experience in real life who are neither pure Hawks nor pure Doves, as they play Dove strategy with strong elites and Hawk strategy with the marginalised Doves (Kamphorst, J.J. A. & Vander Laan, G., 2006). Their endowment can be expressed as: $w_H > w_N > w_D$ and their role is important. The 'Non-Hawk Non-Dove' players wait for the resources given up by the Hawks and are unable to fight with the Hawks. They may even abandon their resources if attacked by strong elites (Hawks). But these players are capable enough to exploit the poor Doves and are full of ambitions. They always try to improve their endowment.

Unlike Doves, Hawks (elites) do not struggle for survival and fight for small resources rather they struggle for state controlled vast and valuable resources. Extending the Hawk- Dove model from two players to more than two players ($n>2$) one may consider several elite players (Hawks) competing for the same resource i.e. control of the state or other such controls. In $n>2$ players game let 'p' be the number of Hawks and 'v' be the value of these resources they (elites) are competing for. Therefore, the payoff for each Hawk is 'v' with probability 1/p otherwise it costs '-c' where 'c' is the cost of the fight. Hawks may fight individually or in the form of various elite groups, but whenever they fight by forming elite sub-groups, they may be considered as single player with one objective as we observe cartels in oligopoly.

There are possibilities of conflicts between Hawks in a conventional way, that is, between individuals, but Doves and 'Non-Hawks Non-Doves' often attempt to

fight in the form of groups for their improvement in case they involve in conflicts with other groups or individuals. The endowment 'w_H', 'w_N' and 'w_D' determines the strategy followed by different players. Hawks having high social, political and economic possession 'w_H' fight for higher control and luxuries while Doves having little resources 'w_D' in hand struggle for existence and betterment with their limited resource access. Non-Hawks Non-Doves players try to imitate Hawks and therefore attempt to gain more in case whenever they meet Doves. On the basis of these specifications the persistence and evolution of conflicts can be explained through various postulated stages:

2.1 Stage of few Hawks

Initially, one may start with the assumption of a society with a small number of powerful possessors (Hawks) with a very high endowment 'w_H' and a large population of Doves with a comparatively low endowment 'w_D'. The endowment of Doves may be equal to or slightly higher than the subsistence level depending upon the social and political institutions of the time. There may be one strongest Hawk at the top, but for a generalisation small number of Hawks is used. These assumptions don't seem unreasonable as most of the societies have experienced some or other types of monarchy in the past. Since the number of Hawks is small, the cost of identification of other Hawks is very low which provides the opportunity to avoid the cost of the fight. But the possibilities of the fight always remain there in the expectation of higher control and possession. The expected payoff of Hawk in this stage is:

$$W(H) = w_H + (1/p)\,v - \{1-1/p\}c \quad \ldots\ldots (1)$$

The smaller 'p' increases the expected value of resources and lowers the cost of the fight for the Hawks. In the case of co-ordination or agreement of not fighting, the payoff becomes:

$$W(\breve{H}) = w_H + v/p \quad \ldots\ldots (2)$$

Since $W(\breve{H}) > W(H)$ because of $c>0$, it induces the Hawks to co-operate. Hawks may agree not to fight and enjoy the possession they have at optimum because of their small numbers. But any such coordination will be a temporary equilibrium rather than evolutionary stable strategies, though it may last longer. The distribution of resource 'v' among the Hawks may be vertical or horizontal depending on the institutional context. On the other side, due to the large number of Doves ($k= n-p$) the payoff of Dove is very small:

$$W(D) = w_D + v/k \quad \ldots\ldots (3)$$

v = value of the resources left by Hawks

k = number of Doves

Now let's consider some players who have higher endowment 'wN>wD'. These players may be explained as the group of individuals who enjoy some favour and extra resources from Hawks in comparison to poor Doves. They may be referred as the Non-Hawks Non-Doves. The strategy of Non-Hawks Non-doves is different from Hawks. The aim of such players is to increase their endowment rather than the strategy of sharing like Doves. They don't have the resources (wN<wH) to engage in a fight with the Hawks, but, are in a position to exploit Doves. Therefore, such players play 'Hawk' strategy with the players other than the Hawks. If 'q' is the population of these Non-Hawks Non-Doves out of k = n-p, where 'n' is the total population and 'p' is the number of Hawks, the expected payoff for them become:

$$W(N) = wN + q/k\ \{(v - c)/2\} + \{(k-q)/k\}v \quad \ldots\ldots (4)$$

q/k = probability of meeting another similar player (Non-Hawks Non-Doves)

{(k-q)/k} = probability of meeting Doves

With the introduction of these new Non-Hawks Non-Doves players in the extended model the payoff of Dove becomes:

$$W(D) = wD + \{v/(k-q)\} \quad \ldots\ldots (5)$$

q = number of Non-Hawks Non-Doves

k-q = population of Doves

2.2 Stage of Hawk-Hawk fight

A large endowment 'w_H' and higher expected payoff 'W (H)' attract some new players to adopt Hawk strategy, i.e. to enter into the arena of political and economic control. In economics, evolutionary game theoretic literature adopts the replicator dynamics. It assumes that the share of the population using each strategy grows at a rate proportional to how well the agents using the strategy are doing relative to the whole population. Therefore, in this stage there is a rise in the population of the Hawks. But the question is who would be these players.

Due to repetition of the game, there is a learning rule. Learning takes the form of actions. Although learning takes place by all the agents, only some become able to bring it in action. Mostly the players who had $w_N > w_D$ and $w_N > c$ can play the action that was chosen by the player with the highest payoff (Hawks). Here 'w_N' refers to the endowment of Non-Hawks Non-Doves which has improved over

time. Such players turn themselves from 'Non-Hawks Non-Doves' and adopt 'Imitate the Best Behaviour (IBA)' strategy and are referred as IBA players. The rise in the population of Hawks 'p' reduces the expected value of resources and increases the expected cost for the Hawks[2]. Additionally, it also increases the transaction cost of identification of Hawks and bargaining with large numbers of such Hawks. Due to decrease in the expected value of resources or increase in the cost of fighting as well as becoming identification of Hawks and agreement difficult, it may lead to coordination failure among the Hawks (possessors). This renders paradoxical strategies where possession reduces the chances of future ownership and the temporary equilibrium may get disturbed. Impatience and the risk to future possession may lead to Hawk-Hawk fight. The intensity of fight increases with the number of Hawks 'p' and the cost of Hawk strategy. This stage reflects violent conflict among the Hawks. Any institutional change in favour of new Hawks may make the previous possessors either to surrender or get vanished. The possession 'w_H' of previous Hawks may decline sharply while new Hawks may gain the possession because of favourable environment. But unfortunately, they also do not care for the masses.

2.3 Mobilisation

In the battle of Hawks, the weaker sections of Doves get deprived of due access to land, employment and state benefits over time. People or social groups feel deprived of something they had but subsequently lost or when others have gained relative to them. This deprivation is not a natural phenomenon, but is created and used by political and economic elites in order to maintain their power to control and administrate economic resources. Deprivation may sow the seeds of conflict, but due to low endowment '($w_D < c$)' individuals do not independently drive to violent means. They may lose whatever small possession they do have in case of a fight. Instead, the continuous pattern of relative deprivation creates an environment primed for conflict and Doves start mobilising themselves for a common political and economic objective. Ethnicity often becomes such an instrument of mobilisation because ethnic groups are often easier to organise and consolidate than interest groups. If the size of ethnic class is small, a broader framework like language, region or religion prevails for mobilisation. Mobilisation on any line whether ethnicity, caste, region or religion also depends on the Hawks against whom the group has to fight. It is worth mentioning here that deprivation rather than ethnicity or poverty is the source of mobilisation and conflict. In this stage Doves organise themselves into a group and become ready to 'fight back'. They start preparation of changing their strategy from Dove to Hawk and willing to have their share in political and economic control. They

desire to have participation and share in state-controlled benefits and resources 'v'. The group formation leads to accumulation of resources to fight against Hawks which was not possible individually because of low 'w_D'. Now the expected payoff of the mobilised group is:

$$\sum_{i=1}^{1} wg \ (1/p)\, v - \{1\text{-}1/p\}c$$

m = Number of members in the group
wg = contribution to the group by individual members
v = value of the resources under the control of Hawks
c = cost of the fight
p = number of Hawks (including the new group)

Doves become able to bear the cost of fight as a group. Individually, they have to lose less 'wg' ($wg<w_D$) on one hand and on the other hand have larger pooled resources ($\sum_{i=1}^{1} wg$). This is a stage of transformation of potential strife into actual strife. Perceived benefits of fight outweigh the cost which leads to violence. The success of the group depends on the size and pooled resources of the group. The privileged Hawks fear loss of position as well as possession and therefore have a powerful motive of suppressing such uprisings or opposition and to maintain the power. Those who have the power, have access to organised force (police or army) and to state finances use it for suppression. However, if the group of mobilised Doves is strong and large enough, it becomes difficult for the Hawks to handle the situation. Perceiving the threat to their possession ($w_H>w_D$), Hawks may display the consent to compromise. In the expectation of higher cost of violence and fight in comparison to loss by sharing of the resources 'v', they may become ready to share the political control and the state controlled resources with this organised group. Now, this gives rise to a situation of bargaining between two Hawks: one the previous possessors and second the mobilised and organised Doves. The payoff for each of them will be:

$$W(H) = w_0 + (v\text{-}c)/2$$

'w_0' refers to the endowment of each group w_H for the Hawks or Σ wg for the group of Doves. (c>0) induces the adoption of better strategies for the Hawks to share and compromise rather than fight.

$$\{W(H) = w_H + v/2\} \quad > \quad \{W(H) = w_H + (v\text{-}c)/2\}$$

W (H) represents a situation of Hawk adopting the Dove strategy. Generally, the elites or possessors may also offer “bribes' to the leaders of mobilised group to stop fighting in the form of power participation, new territorial formation or its

control, wealth and to some extent jobs to the followers as an immediate solution. This leads to negotiation and any agreement leads to a redistribution of resources and their control. But the story does not end here.

There exists a great deal of literature concerning both pros and cons of vertical decentralisation. Local leaders and communities have more information, but there is a greater likelihood that local elites will dominate and a new class of Hawks will rise over time with a new game but smaller territory. It may enhance the possibilities for corruption at the local level often dominated by local elites. There is a high possibility of a new conflict game over time unless there is a change in the "rules of the game". A mere change of the players at the position of Hawks brings temporary peace and new conflict will arise sooner or later depending upon the recognition of deprivation and time for mobilisation of the exploited groups. Relative deprivation may still persist among the masses and new leaders and followers will rise and conflicts will persist.

2.5 How to Avoid Conflict

There can be many ways to avoid the violent conflict in the game over resources. One way of avoiding disputes in the conflict game is "penalty attachment". Any play of the Hawk strategy by any player should be penalised. This penalty will generate extra cost to the Hawk other than the cost of fighting and will reduce his possession. But the formulation of this type of strategy requires third party enforcement. A central and independent authority can be formed as a third party (Laporta, R. etal, 1999). But the unbiasedness of this authority is doubtful as rule makers, enforcers and possessors all belong to the same group of Hawks. It is also difficult to identify each Hawk strategy in case of a large number of players. The second strategy can be a "reward attachment". Subjects can be promised certain show up reward and informed at the outset that they had the opportunity to earn or lose money, depending on their decisions of cooperation and conflict. All such information should be ex-ante not ex-post. The 'reward' for cooperation may create an incentive to cooperate only if ex-post sharing of money will be just. Both of these strategies have their own problem of identification and enforcement.

There is a third strategy which is termed as "Retaliation". In a social context Retaliation refers to "Tit for Tat" strategy. In this strategy a threshold level of endowment 'w_R' is made available to all the players more specifically to Doves so that they can retaliate in case of any exploitation. The capability of weaker sections (Doves) should be raised by increasing their social, economic and political possession up to such a level that they become able to fight against exploitation by Hawks independently. This can only be done by changing the "rules of game". The payoff matrix in the new context will be:

	Hawk Hawk	**Dove** Retaliator
Hawk	(v-c)/2, (v-c)/2	(v-c)/2, (v-c)/2
Retaliator	(v-c)/2, (v-c)/2	v/2, v/2

$V(R/R) > V(H/R)$
$v/2 > (v-c)/2$

As c>0, there will be only one evolutionary stable strategy 'to cooperate' and share the resources. The payoff in the case of 'n' players will be v/n for each player. In such situation, Retaliators may have some higher possession, but not enough to exploit the others and capture most of the resources like Hawks. A slightly higher amount of inequality is acceptable in the society and has never been a source of conflict. But chances of turning of Retaliators into Hawks cannot be denied. Unlike the population consisting doves, a population of Retaliators can never be invaded by Hawks. Therefore, the best strategy is to have the population of retaliators and no doves (Wood, D. H., 2012). This equilibrium can be achieved both ways, either by curtailment of w_H (possession of Hawks) or by raising the possession of Doves $w_D$up to w_R.

3. Conclusion

In any society, history and institutions determine the resource distribution and control amongst its members. An unequal access to political and economic power leads to unequal benefits from state resources, which results the establishment and continuation of extractive institutions. In any case of conflict, we can observe lack of political and economic inclusivity. In countries or regions with significant horizontal inequalities, conflicts will persist in various forms unless there is a change in the “rules of the game”. Change of the players at the relative position of Hawks and Doves may bring peace for some time, but the conflicts will remerge over the course of time. Concentration of power and wealth can never ensure the security and stability of even those who possess it. The rich want to isolate themselves from poor to escape from redistributive policies and poor wants to be close to the rich. This results a hefty competition over the resources and conflict among the social groups. Resources spent by the groups in order to obtain economic and political influence can be used to empower the population or groups at the margin, which will lead to the evolution of institutions for development in general. Development can help to mitigate the benefits of using violence, by increasing the costs of such action.Societies which are badly affected by strife and violence should empower the marginalised groups and should avoid the formation of fault lines among the various social groups. A threshold level of

possession of resources (economic, social and political) should be made available to all to avoid the conflict. A sustained and broadly shared growth with proportional representation can resist violent uprisings, while spatial segregation and economic deprivation only lead to instability and conflict. From the policy perspective the challenge is to design and implement strategies to avoid the conflict through empowerment of deprived sections with greater economic opportunities and resource control. The role of policy is also to break (or avoid the formation) of ethnic diversity fault lines with segregation and deprivation. Any institutional arrangement which establishes some individuals or social groups at the position of "Hawks" and others at the level of deprivation makes the society and economy less stable. Present conflicts observed in various regions are different from traditional Hawk-Hawk conflict, that is, conflict for higher power and control. The conflicts are mainly between mobilised Doves and the elites who are in power and authorities. The persistence of conflict is mainly due to relative deprivation of one or more sections against another.

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Emerging Trends in Education [Vol. XII - No. 1 & 2. February & August 2025. pp 45-53]

Role of Parents, Community, ECEC and Stakeholders in Early Intervention as per RPD-2016 and NEP 2020

Dr. Dilip Kumar Singh*

Abstract

The intervention at an early age has major significance in the development of visually impaired children as maintained by RPD-2016, that is, the Rights of Persons with Disabilities Act, 2016, and NEP 2020 definition or the National Education Policy 2020. Both the documents emphasize the need for Early Childhood Education and Care (ECEC) to lay down a solid base for children with disabilities. It goes in tune with early identification of disabilities and inclusive education as a critical factor that would ensure children with visual impairments receive proper support as early as possible-the same reflected under NEP 2020. This stressed the need for an inclusive and equitable education system to include early intervention measures under the broader frame of ECEC.

In the various stakeholders, such as the community, parents' involvement with educators and health professionals, have made great strides in the process of supporting early intervention. Community programs would offer localized resources to enable a more supportive and inclusive environment where different needs of far-visually impaired children are catered to.

RPD-2016 and NEP 2020 showcase the importance of ECEC, the community, and stakeholders in early intervention concerning visually impaired children. Their collaboration becomes imperative in ensuring that the child has access to a range of services and support to optimize their early development and integration into society.

Visual impairment is a condition to experiences a significant reduction in their ability to see everything.

The use of braille, abacus for visually impaired students refers to a tactile mathematical tool designed to teach. Such as substraction, addition, multiplication, divison. It incorporates raised beads and rods that can be manipulated by touch,making it accessible for students with visual impairment.

Visual impaired students benefits:

Independence: learning braille gives independence to the blind child as he can read and write on his own without the help of any assistive devices.

* Assistant Professor, VCW, Department of Education, Rajghat Varanasi

Empowerment: Visually impaired children can empowered by the ability to read and write braille. They can achieve personal growth and academic success through education and information.

Enhanced sensory development: Reading Braille enhances tactile sensitivity and is a unique sensory experience for a blind child.

INTRODUCTION

Early childhood education definitely plays a leading role in shaping the lives of children with visual maladies by imperative means within the initial years of life. ECEC programs offer structured environments where cognitive, emotional, and social development are imbued within activities and learning opportunities customized and modified for the different needs presented by the visually impaired child. Government intervention and policy support, as contained in the RPD-2016 and NEP 2020, are paramount in this respect. The policies are aligned on early identification and intervention for children with visual impairments, thus ensuring that from onset visually impaired children get equitable access to quality education. Inclusionary systems embed these children within mainstream settings, allowing learning opportunities with their peers.

To attain this end, adaptation of the curriculum is essential, which involves modifying instructional strategies, learning resources, and assessment methods to meet the diverse needs of the visually impaired children. Such curricula foster a more accessible and engaging learning context as well as meaningful experiences to enable participation and avoid situations of marginalization. However, to date, implementation of ECEC for visually impaired children faces a multitude of challenges and barriers. Lack of teachers trained on inclusive teaching practices, those who could utilize technologies to aid teaching-learning processes, limited opportunities to attend a school, inadequate infrastructure, and deep-rooted societal stigma complexes have further complicated matters by alienating children.

The making of a world more inclusive requires a multiplatform strategy. Here, continuous professional development for in-service teachers and support for human and it resource and infrastructure in collaboration with the community are implemented to establish an enabling environment to assist with inclusion. In brief, NGOs and organizations can start campaigns to build up societal acceptance and support for children with visual impairments.

Role of ECEC

Early Childhood Education and Care (ECEC) constitutes a vital segment of the

entire process of development and education of children with visual impairment, laying the groundwork for their lifelong learning and integration into broader society. For young children with visual impairment, acquiring cognitive, motor, and social skills in early years may be a perplexing problem due to them being denied access to visual stimuli. The ECEC programs have planned an environment that enables rich sensory, structured learning of these young children, focusing particularly on the preservation of advanced function and sensory skills. In the absence of having access to visual stimuli, these programs try to build touch, hearing, and smell perception to help children experience and identify their surroundings and thus acquire fundamental life skills. Interventions at this level will not only target reducing delays in their development, but will also promote confidence and independence in the visually impaired child by encouraging them to interact with peers and the larger community.

In conjunction with that, ECEC plays a very important role in terms of early identification and assessment of visual impairments enabling an early input of support systems and interventions. Teachers who work in ECEC are trained to assess the unique needs of children with visual impairments and formulate individualized education plans (IEPs) in close collaboration with specialists and therapists. With assistive technologies and adaptive teaching strategies, inclusive learning experiences were devised for accessibility and enjoyment of all children. ECEC programs also tend to put great emphasis on family involvement, offering parents and families guidance and resources to further their child's development, whether in the home or within the larger community.

Through ECEC, visually impaired children will have access to a caring and nurturing environment that encourages holistic development. ECEC introduces children to inclusive education, thus abridging the transition to formal schooling. Early Childhood Education and Care is a starting point in preventing the different types of disadvantage that children with visual impairment will have individually in the future, these include in their school-age academic, social, and emotional development. ECEC provided that avenue into a more inclusive and equitable education system that allows visually impaired children to develop their potential and lead fulfilling lives

Government and policy support

Government and policy support are paramount in ensuring equal access to quality education and early intervention services for children with visual impairments. Policies and legislations such as the Rights of Persons with Disabilities Act of 2016 (RPD-2016) and National Education Policy of 2020 (NEP 2020) in India demonstrate the commitment to promoting inclusive education that caters to the

unique needs of children with disabilities, including visual impairment. They require that early detection and diagnosis of disabilities be made and that special educational facilities be extended to these children, making sure they are not sidelined in their development and education. It embodies the right to inclusive education, stemming from a commitment to ensure that schools take seriously the fact that children with disabilities need to be provided with inclusive education and that therefore relevant steps should be undertaken towards its realization, such as providing accessible infrastructure, special teaching, and assistive technologies.

NEP 2020 reinforces the outlook that an inclusive system should be attuned to meet the needs of all learners, with an emphasis on building an equitable and supportive education system. It ought to see the merging of children with visual impairment into mainstream education with a sense of belonging and equality. The policy has required that teacher training programs equip teachers with skills needed to meet diverse needs of the children with visual impairments and create flexible and adaptable inclusive curricula. The use of technology is further encouraged by NEP 2020 as a good means of improving the learning outcomes and supporting assistive devices and digital learning resources aimed towards the visually impaired.

Government measures such as scholarship, financial aid programs, and special education grants are also important resources in support of the education of visually impaired children.The programs effectively reduce economic pressure for families and give their children the resources to empower them with success. Also, collaboration with NGOs and the private sector is encouraged with the aim of designing strong policies on inclusive education and enhancing access to support services.

There are still challenges to be addressed for successful implementation of inclusive education policies, policies, and programs despite these robust policy frameworks. What is needed is continual, effective monitoring and evaluation to ensure that sound policies become actions on the ground. Providing thorough training for teachers, as well as infrastructure and resource support, is critical to establishing an inclusive education system that supports a great percentage of the visually-impaired children. Despite this challenge, the way forward involves a collective effort on the part of government agencies, teachers, community members, and other stakeholders in overcoming these barriers to build an inclusive society in which visually-impaired children can flourish and accomplish their full potential.

InclusiveCurriculum

An inclusive curriculum for learners with visual impairments, elaborated in the Rights of Persons with Disabilities Act, 2016 (RPD-2016) and the National Education Policy 2020 (NEP 2020), creates an inclusive education platform in which diversity is valued. Inclusive education, as necessitated within RPD-2016, raises the global curriculum's attention to various learning styles of the visually impaired students: thus, teaching materials, assessment alternatives, and classroom practices must be subjected to this law to allow the visually impaired to have full participation in education. In addition, the RPD-2016 underlines the provision of assistive devices and technology that will permit effective access by learners with visual impairments to the curricular content and thus reduce learning barriers.

NEP 2020 builds upon the principles of inclusivity and equity by espousing a curriculum that is flexible and responds to the needs of all learners. It insists on the necessity for a universal design for learning (UDL) framework that can provide access to curricular content for students of various abilities. For blind learners, this means adapting braille, large print, and audio resources while also incorporating tactile learning mechanisms and modern technologies contributing to multisensory learning. NEP 2020 also insists on tailored learning pathways that allow visually impaired learners to progress at their own pace in accordance with their needs and strengths.

An inclusive curriculum for learners who are blind, within the specified and stipulated provisions of RPD-2016 and NEP 2020, ought to place emphasis on fostering critical thinking, creativity, and problem-solving skills rather than endorsing rote learning. This demands creating an active, participatory environment within classroom contexts enabling blind learners to be active in discussions and collaborative activities.

Challenges and barriers

Early childhood education and care (ECEC) are critical for children's lifelong learning and well-being. They provide the necessary groundwork for children in the early years. Although it can be considered as one of the key pillars of social and economic development in the knowledge-based economies, the provision and access to ECEC services is limited and faces challenges and barriers worldwide. Affordability is a key barrier to quality care. Most families do not have easy access to ECEC, and the poorest families are distinctly incapable of paying for better ECEC. This cost-hermetic access leaves the children with spread parental income at a developmental deficit, as economically disadvantaged children cannot afford well-resourced programs. Moreover, not enough or clear funding

mechanisms exist for Early Childhood Care and Education (ECEC), resulting in unequal quality services. In many regions, government funding falls short of covering the costs of providing high-quality care, forcing providers to cut costs or pass along expenses to families. Cultural and linguistic diversity in ECEC presents challenges as well. Early childhood education and care (ECEC) services in increasingly heterogeneous societies must address children with diverse cultural and linguistic backgrounds. So much of the program doesn't have staff or the training to really support bilingual or multicultural education." As a result, the learning situation may not fit all kids perfectly, limiting their cognitive and social development. The ECEC landscape is further challenged by policy and regulatory barriers. In most countries, there is no coherent policy framework governing the sector, leading to fragmented and often inconsistent service delivery. Rugged regulations on child-to-staff ratios, facility standards, and curriculum requirements also differ across regions, producing ambiguity and variability in the quality of care that is given. Finally, the COVID-19 pandemic has exposed and exacerbated many pre-existing challenges of the ECEC sector. The pandemic caused widespread closures of childcare centres, interrupted learning and heightened financial strain on both families and providers. This transition to remote or hybrid learning models was especially difficult for younger children, who thrive from in-person, tactile learning experiences. Restoration of ECEC in the wake of the pandemic and its effects will need to be guided by policies and investments specifically aimed at refortifying the system and are essential if we are to rebuilding the sector and to make the sector more resilient for both crises, such as the COVID-19 pandemic, and systemic shocks such as climate change. Tackling these challenges and barriers in ECEC asks for a multifaceted approach combining increased investment, reform of policies, professional development and societal engagement. Addressing these challenges could contribute to moving towards a more equitable, high-quality ECEC system that meets the developmental needs of all children, irrespective of circumstances. The curriculum should also include life skills education and vocational training to assist visually impaired students in achieving independence and gaining meaningful employment.

Teacher training is a crucial element in the successful implementation of an inclusive curriculum. Both RPD-2016 and NEP 2020 give importance to ongoing professional development programs that equip teachers in effectively supporting visually impaired students. This training course should not only cover the use of assistive technologies but also include the teacher's awareness and identification of the special learning needs of visually impaired students and the adoption of inclusive teaching methods. Besides, the creation of a school environment which can provide the support and inclusiveness to visually impaired students is of

major importance, teachers, students, and staff should respect and accept the needs of visually impaired students and join to make it a reality.

Although RPD-2016 and NEP 2020 put forward progressive frameworks, the execution of inclusive curriculum for visually impaired students is still confronted with some challenges. Inadequate resources, lack of skills in teachers and limitations in infrastructures can be the major hindrances for the effective implementation of inclusive educational policies. Addressing the problems needs a joint and concerted effort between the government, educational institutions, and non-governmental organizations to bring the inclusive curriculum vision to life.

The future curriculum should create a path to use technological advances that will result in improving the quality of education for visually impaired students. By implementing digital learning platforms, accessible e-books and interactive learning applications, educational institutions will be present in a wide number of available resources that will enable visually impaired students to get the maximum benefit. Also, by developing partnerships among schools, NGOs, and private sector, resources would be more available and supportive educational environment would be promoted for the visually impaired.

Future direction

The teacher training programs that will endow the teachers with specific skills should be the focus of future efforts. The fact that the use of modern technologies such as screen readers, Braille displays, and digital learning platforms in the regular education would not only give the handicapped students equal opportunities but also it should be done well. The collaboration between government agencies, non-governmental organizations, and private entities will be the driving force in solving the problems related to the development of infrastructure, the allocation of resources, and public attitudes. These efforts will in the end result in a successful way of solving the visually impaired persons' issues on their way to get independence and social inclusion. As per the Rights of Persons with Disabilities Act, 2016 (RPD-2016) and the National Education Policy 2020 (NEP 2020), the inclusion and integration of visually impaired individuals is the future direction of the education system which is inclusive, accessible, and equitable for all. RPD-2016 gives emphasis to new techniques such as early intervention, accessible infrastructure, and the use of loom assistive technologies to ensure that the visually impaired individuals fully participate in education and society. NEP 2020 wants to reach this by implementing new curriculums that are inclusive and flexible, promoting teacher training as well as leveraging technology to enhance the learning experiences for the visually impaired students.

The aims for the treatment of visual impairment under the Act on the Rights of Persons with Disabilities, 2016 (RPD-2016) and the National Education Policy 2020 (NEP 2020) are created to ensure equal, inclusive, and empowering experiences for the visually impaired individuals in education and society. RPD-2016 which is the Act on the Rights of Persons with Disabilities (RPD) 2016, is an act which provides for the creation and development of barrier-free environments for disabled persons in the sectors of health, education, employment, rights and protection. It seeks to provide equal rights and opportunities for visually impaired individuals by identifying them early and administering the needed treatments to be sure they get the right educational and personal development support. It forms the basis of teach them services and provides services like assistive technologies, such as Braille, screen readers, and audio resources, and requires that educational institutions and public facilities include the appropriate disability-friendly infrastructure which is of course necessary to bring disabled students to the same level at par with their peers. Apart from this, the law works towards absolute eradication of discrimination and at the same time offering legal cover for the blind people hence leading to the realization that they can be part of all life sites. On the other hand, NEP 2020 prioritizes an educational setting that is inclusive by ensuring that there are flexible curriculums catering to diverse needs of the blind students that the integration of assistive-teaching devices and the application of the more person-specific learning approach inflexibly allow. It also stresses the fact that the staff for such special programs should be especially trained to be able to handle the specially challenged students thereby helping the students to cope with the condition amicably. NEP 2020 also underscores the involvement of the parents and the other community people in the visually challenged student's learning process, thereby, creating a cohesiveness that not only will help this child but will also boosts the overall power of the education facility. These plans/combinations together are designed to help the visually impaired by providing them with a much more equal, more accessible, and more supportive system where they can succeed both academically and socially.

CONCLUSION

In conclusion, the involvement of parents, the community, Early Childhood Education and Care (ECEC), and various stakeholders is vital for the early intervention of visually impaired children, ensuring their overall development and integration into society. According to the Rights of Persons with Disabilities Act, 2016 (RPD-2016) and the National Education Policy 2020 (NEP 2020), identifying and addressing the unique needs of visually impaired children early on is crucial. Parents serve as the primary advocates for their child's needs, fostering a nurturing home environment. The community plays a significant role

by promoting awareness and inclusive practices, which help dismantle societal barriers and create a more accepting atmosphere. ECEC programs offer essential opportunities for children with visual impairments to engage in tailored educational experiences that emphasize sensory development and early learning. Various stakeholders, including educators, healthcare professionals, government agencies, and NGOs, collaborate to ensure access to resources, assistive technologies, and specialized services that support inclusion. The combined efforts of these groups, guided by the principles outlined in RPD-2016 and NEP 2020, are crucial for establishing an inclusive, equitable, and supportive environment for visually impaired children, enabling them to reach their full potential. Together, they ensure that these children are not only educated but also empowered to lead independent and fulfilling lives in an inclusive society.

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Study of the quality of life of private sector employees after COVID-19

Dr. Rubee*

Abstract

The COVID-19 pandemic has had a profound impact on the quality of life of private sector employees, affecting their mental, physical, and emotional well-being. This research paper explores various dimensions of employees' lives post-pandemic, such as life enjoyment, sense of meaning, energy levels, availability of leisure time, and job satisfaction. The study was conducted on 125 employees from two private sector companies using structured questionnaires and supplemented with secondary sources. The findings reveal that a significant number of employees face issues like low energy, reduced life satisfaction, mental stress, and a lack of work-life balance. Although more than half reported satisfaction with job performance, a considerable proportion expressed dissatisfaction due to post-pandemic changes. The paper concludes with practical suggestions for organizations to foster a healthier work environment, including flexible policies, mental health resources, better workload management, and open communication. These steps can significantly enhance employee well-being and productivity in the post-COVID era.

Introduction

The COVID-19 pandemic has impacted the lives and quality of life of people globally in various ways. Private sector employees have also not been untouched by this pandemic. Lockdowns, changes in working hours, fear of job loss, and health concerns have had a profound impact on their quality of life. In this research paper, the researcher will study how the quality of life of private sector employees has changed after the COVID-19 pandemic (D'Mello etal). The COVID-19 pandemic has brought unprecedented changes to the lives of people across the world, and private sector employees have not been untouched by it. The pandemic has not only changed their workplace but has also had a profound impact on their personal lives, mental health, and overall well-being. Lockdowns, social distancing rules, and new ways of working have impacted the quality of life of private sector employees in many ways.

During the pandemic, many companies had to allow their employees to work from home, making it difficult to maintain a work-life balance. The line between

* Assistant Professor, Department of Social Work, Janayak Chandrashekhar University, Ballia.

home and office became blurred, and employees had to work longer hours. As a result, many employees felt stressed, anxious, and lonely (Jayaro & K et al-2022). Additionally, the fear of losing their jobs due to the pandemic also prevailed among employees, putting further pressure on their mental health. This study aims to assess the quality of life of private sector employees after the COVID-19 pandemic. The provided data examines how much employees enjoy life, offering insight into their well-being and overall satisfaction levels (Rai & Verma, 2023).

Objectives of the Study

The objectives of this study are as follows:

- To assess various aspects of the quality of life of private sector employees after the COVID-19 pandemic.
- To identify both the positive and negative impacts of the pandemic on their quality of life.
- To provide recommendations for improving the quality of life post-pandemic.

Data Collection

- Primary Data: The study is conducted on a total of 125 employees of two large private sector companies by asking them questions related to various aspects of their quality of life such as physical health, mental health, social relations and economic status through a structured questionnaire using Google Form.
- Secondary Data: The data will be collected from government reports, research papers and other relevant documents.

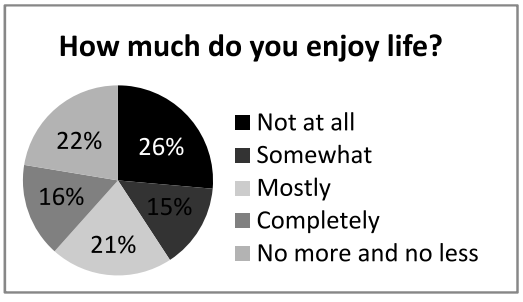
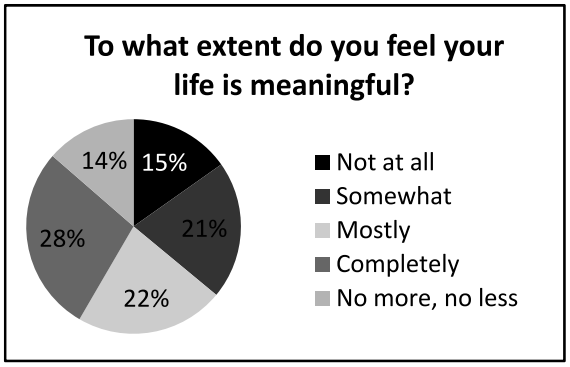


Figure 1: Responses from private sector employees on how much they enjoy life:According to the data, 41% of employees experience low enjoyment in life, with 26% choosing "not at all" and 15% choosing "somewhat". This significant percentage points to concerns related to mental health, workplace stress or work-life balance challenges that have increased due to the pandemic. Meanwhile, 37% of employees report moderate to high life enjoyment, with 21% choosing "mostly" and 16% choosing "completely", indicating a relatively

positive outlook. Additionally, 22% of employees selected "neither more nor less", indicating a balanced but notable level of satisfaction.

Based on the above analysis, it can be concluded that the long-lasting psychological and economic impacts of COVID-19, including job insecurity and financial instability, have negatively impacted the mood of employees. As we all know that workplace conditions, such as increased workload, remote work challenges and changing job roles also play a significant role in overall happiness levels. Additionally, due to lack of work-life balance, employees are both able to enjoy their personal life nor spend time with family, friends and relatives, which is a major reason for deprivation of joy in their life and this situation is affecting their physical and mental health drastically.

Figure 2: Summary of the responses of private sector employees regarding the extent to which they feel their lives are meaningful:



Finding revealed a diversity of experiences among respondents. 35% of respondents expressed a weak sense of meaning in life, with 14% selecting "not at all" and 21% selecting "somewhat" - answers provided by respondents reflecting personal struggles in their lives, workplace dissatisfaction or lack of purpose. In contrast, 50% of employees express a strong sense of meaning in life, with 22% selecting "mostly" and 28% selecting "completely". This indicates a positive outlook, possibly influenced by fulfilling careers, supportive relationships or personal growth. Additionally, 14% remain neutral, selecting "no more, no less", indicating a balanced but indifferent outlook on the meaning of life.

The above data shows that a person's employment plays an important role in the meaning of life, as monotony or stressful situations in the job have a negative impact on their emotions. Thus, a person's work-life balance is an important factor. At the practical level, it was observed that due to the prolonged COVID-19, financial instability and excessive work pressure among employees had an adverse effect on their mental health, which caused a state of boredom, inferiority and depression in most employees. When such feelings arise in employees, they start considering their lives meaningless.

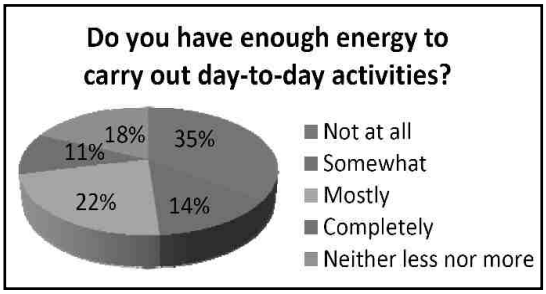


Figure 3: Information about the energy levels of private sector employees while performing daily activities post-COVID-19.

The results show that the majority of employees (35%) reported that they do not have enough energy at all to carry out their day-to-day tasks, which could be indicative of factors such as work-related stress, burnout, or the health effects of COVID-19. Additionally, 14% of respondents feel only somewhat energetic, while 18% feel neither more nor less energetic, which suggests a neutral attitude. On the other hand, 22% of employees feel mostly energetic, and only 11% feel completely energetic, indicating that less than one-third of employees have optimal energy levels to carry out daily tasks. This data shows that post-pandemic workplace conditions, including workload, remote work challenges, and mental health struggles, are posing varying levels of physical, mental, and social challenges to employees.

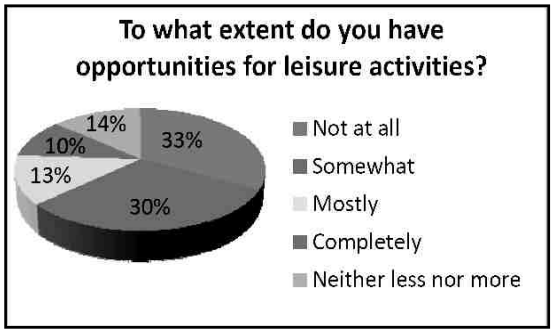


Figure 4: The availability of leisure opportunities for private sector employees post-COVID-19.

The findings show that 33 percent of employees feel they have no opportunity for leisure activities, while another 30 percent report having only limited time. This suggests that work pressure, companies requiring employees to work even on holidays (meetings, PPT presentation & data collection) and the inability to find time for personal tasks during the workday lead to dissatisfaction among employees.

On the other hand, only 10 percent of employees feel they have full access to leisure opportunities, while 13 percent feel they mostly have access. The relatively low percentage of employees with adequate leisure time suggests that post-pandemic workplace demands continue to impact employees' ability to engage in activities that promote relaxation and well-being. Additionally, 14 percent of employees feel neutral about their leisure opportunities, reflecting a mixed perception within the workforce.

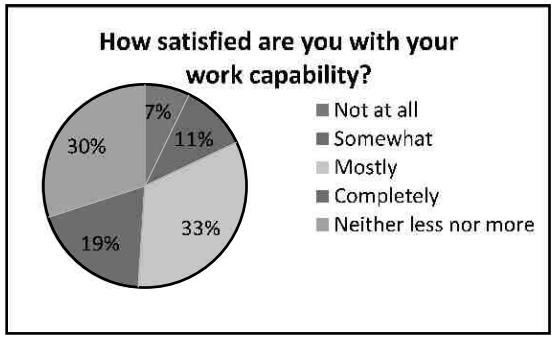


Figure 5: Job satisfaction among private sector employees post-COVID-19.

The findings show that 33% of employees feel mostly satisfied with their job performance, while 19% feel completely satisfied. This suggests that more than half of employees have a positive perception of their ability to perform their jobs effectively, which can be attributed to experience, skill development or a supportive work environment.

However, 11% of employees feel only somewhat satisfied, while 7% are not at all satisfied with their job performance. This indicates that a portion of the workforce is struggling with post-pandemic challenges such as skill gaps, burnout or difficulty adapting to changes in work processes. Additionally, 30% of employees feel neutral about their job performance, indicating uncertainty or fluctuation in confidence levels.

Suggestions

- The company should eliminate the culture of working on holidays in its policies so that the employee can spend quality time with his family, friends and relatives, which is very important for his mental health.
- From time to time, the team leader should also be evaluated on the parameters related to human relations along with work and targets. Confidential feedback also needs to be taken from the employees working under the manager so that the company can get information about the real condition of the person leading the team.
- Employers should implement policies that promote better work-life balance, such as flexible work schedules, remote work options and clear boundaries between work and personal life.
- Organizations should provide mental health resources such as counseling services, stress management workshops and employee assistance programs. So that the state of mental stress of the employee can also be monitored and work can be done at various levels to improve his mental health.
- Workload distribution should be reviewed to ensure that the employees are not overburdened.
- Introducing wellness programs, meditation breaks or stress-relieving activities at the workplace can improve employee energy levels.

- Employers should create a positive and gratifying work environment by providing opportunities for career growth, skill development and meaningful tasks.
- Organizations should promote initiatives such as company-sponsored team outings, social events and wellness programs to improve relaxation and well-being.
- Encouraging employees to take time off and ensuring they have weekends free from work can help enhance their quality of life.
- Creating a culture of open communication where employees can express concerns about job satisfaction can lead to better improvements in the workplace.

Concussion

The study comprehensively analyses the quality of life among private sector employees post-COVID-19, highlighting significant concerns about life enjoyment, meaning, energy levels, leisure opportunities and job satisfaction. A large proportion of employees report low enjoyment in life, attributed to factors such as stress at work, financial instability and lack of work-life balance. Similarly, employees feel a low sense of meaning in life, which is often associated with job dissatisfaction and mental health struggles. These findings indicate that many employees are struggling to find fulfillment in both personal and professional aspects of life.

Energy levels also remain a concern among employees, reporting a lack of energy to perform daily tasks, possibly due to work-related burnout, remote working challenges and overall stress. Furthermore, leisure opportunities are limited for a significant portion of employees, stating that they have little or no time to relax. This imbalance between work and personal life further contributes to dissatisfaction and mental fatigue. However, job satisfaction presents a slightly more optimistic outlook, with employees expressing confidence in their work performance. This suggests that despite workplace challenges, many employees still find motivation and support in their professional roles. However, a notable percentage (18%) remains dissatisfied, struggling with skills gaps and adapting to the post-pandemic work environment. Overall, the study underlines the need for organizations to address workplace stress, promote work-life balance and provide mental health support. Implementing flexible work arrangements, reducing excessive workloads and promoting a supportive environment can improve employees' overall well-being, energy levels and job satisfaction, leading to a healthier and more productive workforce

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Social Work Strategies for Reducing School Dropout Rates in Marginalized Communities

Dr. Pushpa Mishra*

Abstract

School dropout remains a critical issue in marginalized communities worldwide, perpetuating cycles of poverty and social inequity. This review examines social work interventions aimed at reducing school dropout rates, focusing on community-based strategies, mentorship programs, trauma-informed approaches, and teacher support systems. Drawing from global and Indian contexts, the review highlights effective models and their implications for practice and policy.

Introduction

School dropout is a persistent and complex issue that affects educational systems worldwide, particularly within marginalized communities. It is influenced by a confluence of factors including poverty, systemic discrimination, lack of access to quality education, familial responsibilities, and psychosocial issues such as trauma and mental health disorders (McElvain, 2015; Robertson, Nguyen, & Salehi, 2022). For students in marginalized communities—such as racial minorities, low-income families, immigrant groups, and lower caste populations in countries like India—these barriers are often amplified by long-standing social and institutional inequalities (Chakrabarti, Nair, & Donta, 2017).

The consequences of early school dropout are far-reaching, often resulting in unemployment, intergenerational poverty, increased risk of involvement with the criminal justice system, and reduced health outcomes (Wilson & Tanner-Smith, 2013). Dropping out of school not only limits individual potential but also undermines social cohesion and economic development, particularly in regions where educational access is already fragile.

Social workers, with their training in community engagement, psychosocial support, and policy advocacy, are uniquely equipped to intervene in these contexts. Their work often involves addressing both individual-level and systemic challenges—bridging gaps between schools, families, and social services (Tolan et al., 2013). Social work interventions range from mentorship programs and trauma-informed school practices to community-based initiatives that address food insecurity, mental health, and family instability.

* Associate Professor, Department of Social Work, Jananayak Chandrashekhar University, Ballia.

This review aims to examine the range of social work strategies that have been implemented to address school dropout rates, with a focus on marginalized communities. It evaluates evidence-based interventions, highlights best practices, and identifies policy implications that could support scale-up and sustainability in both developed and developing country contexts.

Community-Based Interventions

Community-based interventions are a cornerstone of dropout prevention strategies in marginalized populations. These interventions are grounded in the social work principle of "person-in-environment," recognizing that a student's academic outcomes are deeply influenced by familial, cultural, and socio-economic contexts (McElvain, 2015). By addressing the broader community factors that contribute to educational disengagement—such as poverty, instability, lack of access to healthcare, and family trauma—social workers play a crucial role in creating conditions conducive to school retention.

One of the most prominent examples of effective community-based intervention is **Communities In Schools (CIS)** in the United States. CIS places social workers directly in schools to deliver integrated student support services that include basic needs assistance, academic tutoring, behavioral health referrals, and family engagement (ICF International, 2005). A multi-year evaluation by ICF International (2005) found that schools implementing the CIS model with fidelity experienced significantly higher graduation rates and reduced dropout rates compared to schools without such interventions. This model demonstrates the value of consistent adult support within the school building—often a key factor in the educational success of students from high-risk environments.

In the Indian context, community-based interventions have also shown potential, particularly in rural and tribal areas where caste discrimination, child labor, and early marriage intersect with school dropout. Programs led by NGOs often include parental engagement, income support, and village-level educational advocacy. Social workers operating in these spaces play multiple roles—mobilizers, mediators, and case managers—ensuring that the barriers to education are holistically addressed (Chakrabarti, Nair, & Donta, 2017).

These examples affirm that when interventions are community-centered, culturally responsive, and multi-sectoral, they are more likely to succeed. Social workers are particularly adept at navigating such integrated systems, making them indispensable to efforts aimed at reducing dropout rates in marginalized settings.

Mentorship Programs

Mentorship has emerged as a key social work strategy to prevent school dropout, particularly among students from marginalized communities. Effective mentorship programs provide emotional support, academic guidance, and a consistent relational anchor that helps students navigate the challenges of their environment. These programs are especially vital in settings where students face limited adult supervision, unstable home lives, or systemic barriers such as discrimination and poverty (Tolan et al., 2013).

Research consistently shows that structured mentoring interventions can significantly reduce dropout rates and improve academic performance. A meta-analytic review by Wilson and Tanner-Smith (2013) found that mentoring programs positively impact school attendance, grades, and retention, with the strongest effects observed in youth at the highest risk of dropout. Furthermore, Wilson, Lipsey, and Soydan (2011) emphasized that mentoring relationships that are long-term, structured, and professionally supported are more likely to yield positive educational outcomes.

One successful example is the **Truancy Intervention Project (TIP)** in Atlanta, Georgia, which targets chronically absent students and provides them with trained volunteer advocates. These mentors work closely with students and families to address legal, psychological, and academic barriers to regular attendance. According to program reports, students who complete TIP interventions demonstrate higher school re-engagement and reduced disciplinary referrals (TIP, 2023). The involvement of social workers in these programs is central, as they offer case management, crisis intervention, and connection to broader community services.

Mentorship is also a culturally adaptable strategy. In marginalized settings across India, informal mentoring—often facilitated by community health workers, NGO staff, or school counselors—has been effective in engaging adolescent girls at risk of early school exit due to gender norms or child marriage (Chakrabarti, Nair, & Donta, 2017). Social workers in these contexts often serve as role models and confidants, helping to shift perceptions about education and gender roles.

What distinguishes effective mentorship in social work practice is its holistic and strength-based approach. Mentors not only address academic issues but also provide psychosocial support and affirm the identity and potential of students who may otherwise feel invisible or undervalued in their school environments.

Trauma-Informed Approaches

Trauma-informed approaches in education recognize that adverse childhood experiences (ACEs)—such as abuse, neglect, domestic violence, and community trauma—can significantly impair a student's capacity to learn, regulate emotions, and remain engaged in school (Robertson, Nguyen, & Salehi, 2022). These effects are often magnified in marginalized communities, where systemic poverty, racial discrimination, caste-based oppression, and gender-based violence are more prevalent and less often addressed by institutional support systems (Chakrabarti, Nair, & Donta, 2017).

Social workers are central to trauma-informed educational environments because they are trained to identify and respond to signs of trauma while advocating for systemic changes in school policy and culture. Trauma-informed strategies typically involve creating psychologically safe environments, training educators to recognize trauma symptoms, integrating restorative justice practices, and emphasizing social-emotional learning (Wilson et al., 2011). These efforts help reduce punitive disciplinary practices that disproportionately affect marginalized students and contribute to school disengagement.

One of the foundational principles of trauma-informed education is the shift from asking, "What's wrong with the student?" to "What happened to the student?" This perspective allows for a more empathetic and holistic approach to discipline and academic intervention. In U.S. schools, programs like those developed under the **Substance Abuse and Mental Health Services Administration (SAMHSA)** trauma-informed care model have shown success in improving attendance and reducing behavioral incidents among students with high ACE scores (SAMHSA, 2014).

In the Indian context, social workers implementing trauma-informed practices have focused on building safe spaces for vulnerable children—particularly those affected by conflict, displacement, and gender-based violence. Programs often include peer support groups, school-based counseling, and community sensitization efforts. For instance, among adolescent girls in rural Karnataka, trauma resulting from gender-based violence and stigma around menstruation contributes to chronic absenteeism and school dropout. Trauma-informed programming, including menstrual health education and emotional support, has shown positive impacts on retention and well-being (Chakrabarti et al., 2017).

Importantly, trauma-informed care must be culturally responsive. In diverse educational settings, trauma manifests differently based on socio-cultural context, and so interventions must be locally relevant and inclusive. Social

workers' community ties and cultural competence allow them to effectively design and deliver trauma-informed strategies that are both respectful and impactful (Robertson et al., 2022).

Teacher Support Systems

Teachers in under-resourced schools often lack access to professional support, which can contribute to burnout and high turnover—both of which negatively impact students. The **Saharaline** project in India addresses this gap by providing WhatsApp-based support for teachers in low-income schools (Varanasi, Vashistha, & Dell, 2024). Teachers receive real-time help with academic, behavioral, and emotional challenges.

This model has demonstrated promise in improving teacher confidence and student engagement, particularly among girls in rural and caste-marginalized communities. Social workers, acting as facilitators in such networks, can help build a sustainable support system for educators (Varanasi et al., 2024).

Case Study: Marginalized Adolescent Girls in India

In Karnataka, India, research with adolescent girls from Scheduled Castes and Scheduled Tribes revealed that early marriage, gender discrimination, and poor school conditions were key drivers of absenteeism and dropout (Chakrabarti et al., 2017). Social work interventions in these communities have included life-skills training, community sensitization, and advocacy against child marriage.

By working with families and leveraging peer networks, social workers have helped shift community attitudes toward girls' education. Multi-stakeholder programs also provide menstrual hygiene support, career counseling, and safe spaces for discussion, addressing structural and cultural barriers simultaneously (Chakrabarti et al., 2017).

Discussion

The reviewed strategies demonstrate that school dropout prevention in marginalized communities requires a multifaceted and holistic approach. Social workers are integral to these efforts, acting as connectors across individual, familial, institutional, and policy levels. Programs that are embedded in schools and culturally adapted are more likely to be effective.

Collaborative models—where social workers partner with educators, health professionals, and community leaders—yield the best outcomes. Moreover, ensuring that these models are scalable and sustained through policy support is vital for long-term impact.

Conclusion

Reducing dropout rates in marginalized communities is not just an educational goal; it is a social justice imperative. Social work strategies—especially when community-based, trauma-informed, and mentor-driven—can make a measurable difference in school retention. As more evidence becomes available, these approaches must be institutionalized through policy and practice to ensure every child has the opportunity to complete their education.

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पूर्व मध्यकालीन उत्तर भारत में जल संरक्षण की तकनीक : एक ऐतिहासिक विश्लेषण

सर्वजीत कुमार पाल*

सार संक्षेप

हमारे देश में जल संसाधनों के प्रबन्धन का इतिहास बहुत पुराना है। प्राचीन काल से ही भारतीयों ने सभ्यता और संस्कृति के विकास के साथ–साथ भारत की जलवायु, मिट्टी की प्रकृति और अन्य विविधताओं को ध्यान में रखकर बरसाती पानी, नदी–नालों, झरनों और जमीन के नीचे मिलने वाले, भूजल संसाधनों के विकास और प्रबन्धन के क्षेत्र में उल्लेखनीय प्रगति की थी। इन उपलब्धियों के प्रमाण देश के कोने–कोने में उपलब्ध हैं। वस्तुतः ये प्रमाण यहाँ के लोगों के उन्नत ज्ञान, दूरदृष्टि और परिस्थितियों की बेहतरीन जानकारी को दर्शाते हैं तथा वर्तमान परिप्रेक्ष्य में भी प्रासंगिक हैं। जल प्रबन्धन का पहला प्रमाण सिंधु घाटी में खुदाई के दौरान मिला। धौरावीरा में अनेक जलाशयों के प्रमाण इस बात को दर्शाते हैं कि इस समय भी जल संरक्षण को लेकर लोग सोचते थे। प्राचीन भारत में जल संरक्षण के लिए मौर्य काल एक नवीनतम तकनीकी वाला काल रहा, जहाँ लोग तालाब, बाँध इत्यादि से न केवल परिचित थे अपितु वर्षा के लक्षण, मिट्टी के प्रकार और जल प्रबन्धन के तरीकों को भी अच्छी तरह से जानते थे। पूर्व मध्यकाल में भी ये परंपरागत रूप से चली आ रही जल संरक्षण की विधियाँ समाज में जारी रहीं। इस काल में उत्तर भारत में राजपूत शासकों का वर्चस्व रहा जो विभिन्न क्षेत्रों में सिंचाई के लिए अथवा विनोद के भाव से तथा अपनी शक्ति प्रदर्शित करने के उद्देश्य से विशाल जलाशयों के निर्माण कराते रहे। विभिन्न क्षेत्रों के पुरातात्विक साक्ष्यों से नालियों कुओं, तालाबों एवं बांधों की उपस्थिति की पुष्टि भी होती है। इस शोध पत्र में पूर्व मध्य काल में जल संरक्षण के लिए किये गए उपायों की समीक्षा की जाएगी तथा पूर्व मध्यकाल के दौरान परम्परागत रूप से जल स्त्रोतों के निर्माण कार्यों को देखा जायेगा।

पृष्ठभूमि–

प्राचीन काल से ही भारत देश अपनी सांस्कृतिक परम्पराओं के सन्दर्भ में अपनी विशेष पहचान रखता है। यहाँ की परम्पराओं का समाज और संस्कृति में विशेष महत्त्व है। सतत विकास के जल मूलाधार तत्व है और सामाजिक आर्थिक विकास उर्जा और खाद्य उत्पादन, स्वस्थ्य पारिस्थिकी तंत्र और स्वयं सम्पूर्ण मानव जाति के अस्तित्व के लिए बेहद आवश्यक है। जलापूर्ति का महत्वपूर्ण साधन वर्षा है। समय पर बारिश से पानी की प्राकृतिक आपूर्ति सुनिश्चित नहीं थी अतः सिचाईं के लिए कुओं और नहरों की आवश्यकता होती थी। प्राचीन काल से ही वर्षा की कमी को किसी न किसी प्रकार की सिचाईं नदियों, नहरों, झीलों, टैंकों, कृतिम जलाशयों पोखरों

* शोध छात्र, इतिहास विभाग, काशी हिन्दू विश्वविद्यालय , वाराणसी।

आदि के माध्यम से दूर किया जाता रहा है। (Date, R. 2008) जल संचयन तथा जल प्रबंधन का मुख्य आधार इसकी धार्मिक एवं आर्थिक आवश्यकता है। ऋग्वेद में आवट (Macdonell A.A. & Keith AB, 1912) शब्द का उल्लेख प्राप्त होता है। इसका अर्थ कृत्रिम रूप से बनाया गया कुआं होता है। ये कुआं हमेशा पानी से भरा रहता था तथा निर्माताओं द्वारा इसे ढक दिया जाता था। पानी को पत्थर के एक पहिये द्वारा रस्सी की सहायता से बाल्टी द्वारा निकाल लिया जाता था। उसके बाद पानी लकड़ियों की एक बाल्टी (जिसे अहावा कहा जाता था) में डाल दिया जाता था। इन कुओं का उपयोग व्यापक स्तर पर सिचाईं के लिए किया जाता था। एक अन्य शब्द किपा का उल्लेख ऋग्वेद में ही दिखाई देता है। इसका अर्थ कृत्रिम गड्ढा होता था जो एक कुँए को ही दर्शाता है। ऋग्वेद में उल्लेख मिलता है कि

या आपो दिव्या उत वा स्त्रवान्ति खनित्रिमा उत वाप या स्वयेय्जा।
समुन्द्रार्था याः शुचयः पावकास्ता आपो देवीरिह माम्वान्तु।।(Sharma G.S.,2016)

ऋ.7.49.2

खनित्रिमा शब्द का उल्लेख ऋग्वेद में खुदाई द्वारा निर्मित कुएं के सन्दर्भ में मिलता है। यह कृत्रिम रूप से जल संचयन के लिए बनाये गये जलाशय को उद्धत करता है। इस कुएँ से जल का उपयोग सिंचाईं करने के लिए किया जाता है। (Macdonell A.A. & Keith AB 1912) कीथ के अनुसार ऋग्वेद में ही हमें सिंचाई के लिए नहरें निकाले जाने के उल्लेख प्राप्त होने शुरू हो जाते हैं। (झा एवं श्रीमाली 1981)। ऋग्वेद में ही वर्णन मिलता है कि जो जल अंतरिक्ष से उत्पन्न होते हैं, नदी के रूप में बहते हैं, जो खोद कर निकाले जाते हैं, अथवा जो अपने आप उत्पन्न होकर सागर की ओर गति करते हैं, जो दिप्तियुक्त एवं पवित्र करने वाले हैं, वे देवी रूपी जल यहाँ हमारी रक्षा करें। (Sharma,4.5.2016) प्राचीन काल में कुछ अपराधों के शुद्धिकरण के लिए जल का प्रयोग किया जाता था। (Sharma R, 2017)। अग्निपुराण में लिखा है कि कृषि की वृद्धि के लिए सिचाईं के साधनों को जुटाना राज्य के आठ कर्तव्यों में एक प्रमुख कर्तव्य है। इसी प्रकार संस्कृत साहित्यों में भी अरघट्ट और अरघट्ट खीचने वाले लोगों अरघत्तियनर का उल्लेख मिलता है (Habib Irfon 2018)।

अर्थशास्त्र में सम्पूर्ण जल को राज्य की संपत्ति बताया गया है। अर्थशास्त्र के अनुसार सिंचाई के विकास के लिए राज्य को सिंचाई प्रणालियों को विकसित करना चाहिए (Sharma, R, 2017)। इसके बदले राज्य सिंचाई कर लगाता था। जो लोग स्वयं अपने प्रयास से सिंचाई के निमित्त जलाशय या जल स्रोत बनवाते थे, राज्य उनके करों के भुगतान में छूट प्रदान कर सकता था। अर्थशास्त्र में प्राकृतिक जलाशयों से पानी निकालकर सिंचाई करने पर राज्य कुल उपज की एक चौथाई दर से सिंचाई कर लगाता था (Rangrajan,1992)। पद्मपुराण में कहा गया है कि जल एक सद्वस्तु है। उसमें स्नान करने अथवा उसके दर्शन करने मात्र से बाहर तथा अंतर्मन के पाप धुल जाने के कारण मुनि लोग सिद्धि प्राप्त करते हैं। प्राणिमात्र जल पीते रहने से दीर्घायु होते हैं (Yadav, 2009)। बृहत्संहिता के अनुसार जहाँ जल हो, चाहे वो किसी के द्वारा बनाये गये जल

स्त्रोत में उपलब्ध हो अथवा प्रकृति से ही बने जलाशयों में संरक्षित हो, और उत्तम वायु हो, ऐसे स्थानों पर देवता निवास करते हैं (Dabral, 2015)। महाभारत में वर्णित है कि पृथ्वी पर कुछ भाग विशेष महत्वपूर्ण स्थान रखते हैं। इन महत्वपूर्ण भाग में जलाशय सबसे विशेष हैं (Yadav, 2009)। शुक्रनीति में वर्णन मिलता है कि राजा के महल में पीने और नहाने के लिए अपने स्वयं के कुंड और पानी की व्यवस्था होनी चाहिए। इस ग्रंथ में जलयंत्र का भी उल्लेख मिलता है। जलयंत्र के माध्यम से कुएं से जल निकालकर महल के विभिन्न हिस्सों में पानी पहुंचाने की व्यवस्था थी। पद्म पुराण में भी जलयंत्रगृह का उल्लेख मिलता है। जलयंत्रगृह का अर्थ कुएं से मशीनों द्वारा पानी खींचने के लिए घर था। उर्ध्वार्धर दिशा में पानी खींचने के लिए यह विधि सुविधाजनक थी। अतः कुएं, टैंक से अच्छे तरीके से पानी निकाला जा सकता था। 11वीं सदी की पुस्तक कृषिपरासर में वर्षा के पूर्वानुमान की जानकारी मिलती है। दिनों से मौसम का अनुमान लगाकर वर्षा की भविष्यवाणी की जाती थी। इस प्रकार के भविष्य के वर्षा के आधार पर जलाशयों में जल संरक्षित कर लिया जाता था तथा अपने दैनिक जीवन व कृषि संबंधी आवश्यकता को पूरा किया जाता था। खुयां नामक इंजीनियर ने अपने परिश्रम एवं कौशल से बांध निर्माण की अद्यतन तकनीकी विकसित की थी। उसने झेलम नदी के पानी, जो अत्यधिक बहाव क्षेत्र में फैल जाता था, को बड़े बोल्डरों के माध्यम से बांध बनाकर रोक दिया। फिर उसने इस क्षेत्र को साफ करवाया तथा पत्थरों से तटबंधों का निर्माण कराकर बांध का पानी खोल दिया (Date, 2008। इसी प्रकार जहाँ उसने कहीं भी झेलम नदी में बाढ़ से विनाश की स्थिति देखी वहां उसने बांध का एक चैनल बना दिया। इन बांधों से प्रत्येक गांव में सिंचाई के लिए जल आपूर्ति की सुविधा प्रदान की जाती थी। नहरों के माध्यम से प्रत्येक गांव में उसके द्वारा पानी पहुंचाया जाता था।

पूर्व मध्यकालीन काल ईसा की छठवीं शताब्दी से बारहवीं शताब्दी तक माना जाता है। इस दौरान उत्तर भारत में विभिन्न शासकों ने राज्य किया, जिनमें हर्षवर्धन का शासन, और राजपूत राज्यों का उदय एवं विकास शामिल है। जल स्रोतों का निर्माण इस काल में एक महत्वपूर्ण पहलू था क्योंकि यह न केवल खेती के लिए, बल्कि दैनिक जीवन, धार्मिक अनुष्ठानों, और सैन्य आवश्यकताओं के लिए भी आवश्यक था। उत्तर भारत में जल संरक्षण की समझ विभिन्न समाजों और संस्कृतियों में गहराई से निहित थी। इस समयावधि में, जल संसाधनों के प्रबंधन और संरक्षण के लिए विभिन्न तकनीकों और पद्धतियों का विकास और कार्यान्वयन किया गया था। जल स्रोतों को बचाने और उनका समुचित उपयोग सुनिश्चित करने के लिए समुदायों ने कई अनोखी और अभिनव व्यवस्थाएँ अपनाईं। उदाहरण के लिए, बावड़ी या बावली (सीढ़ीदार कुआं), जल संचयन की एक प्राचीन पद्धति थी, जिसका उपयोग न केवल जल संरक्षण के लिए, बल्कि सामाजिक और धार्मिक कार्यक्रमों के लिए भी किया जाता था। चालुक्य शासकों के समय ग्यारहवीं सदी में बनायीं गई रानी की वाव जल संरक्षण की इसी प्रकार की एक संरचना है। इसी तरह, तालाब, झीलें और कूप जैसी जल संचयन संरचनाओं का निर्माण और रखरखाव समुदाय द्वारा किया जाता था। इसके अलावा, नहरी सिंचाई की प्रणाली को भी महत्वपूर्ण माना जाता

था। इसमें नदियों और जल स्रोतों से पानी को खेतों तक पहुँचाने के लिए नहरों का निर्माण शामिल था, जिससे कृषि के लिए जल उपलब्धता सुनिश्चित होती थी।

इस दौरान उत्तर भारत में जल संरक्षण एक महत्वपूर्ण सामाजिक, आर्थिक, और पर्यावरणीय पहल थी। जल संरक्षण का प्रमुख उद्देश्य जल संचयन, समुद्री संसाधनों का प्रबंधन, और जल संचयन के साधनों का प्रयोग करना था। इसका मूल उद्देश्य बाढ़, सूखा, और अन्य प्राकृतिक आपदाओं का सामना करना था। इस काल में, जल संरक्षण का संकल्प समुद्री, नदी जल, और अन्य प्राकृतिक संसाधनों का सदुपयोग करने पर आधारित था। पूर्व मध्यकाल में, प्रतिहार, परमार और चाहमान तथा चंदेल इत्यादि शासकों ने नदी जल का संचयन किया, तालाब, कुएं, और बांध निर्मित किए, जो किसानों को जल संचयन के लिए उत्साहित करने में मदद करते थे। उदहारण के लिए चौहान शासक अर्णोराज ने अनाजी सागर तथा बीसल देव ने बीसलसर का निर्माण कराकर किसानों को जल संकट से राहत दिलाई (Gupta, 2012)। गुप्तकाल के उत्तराधिकारी राजवंशों के समय में, जल संरक्षण के लिए नहरों और बांधों का निर्माण किया गया, जिनसे खेती में पानी की आपूर्ति सुनिश्चित होती थी। इस समय में, जल संचयन को बढ़ावा दिया गया, जिससे भूमि का उपयोग करने की अधिक संभावना थी। राजपूत शासकों के शासनकाल में, जल संरक्षण की नई पहल की गई। इस समय में, बड़े बांधों का निर्माण किया गया, जिससे नदियों का प्रबंधन किया जा सकता था। इसके अलावा, तालाबों का निर्माण भी बढ़ाया गया, जो जल संचयन के लिए महत्वपूर्ण थे।

पूर्व मध्ययुगीन जल प्रबंधन तकनीकों का ऐतिहासिक अध्ययन –

पूर्व मध्ययुगीन भारत के दौरान, जल प्रबंधन तकनीकों ने कृषि प्रधान समाजों को बनाए रखने और शहरी विकास को सुविधाजनक बनाने में महत्वपूर्ण भूमिका निभाई। इस अवधिके दौरान जल प्रबंधन तकनीकों का एक अवलोकन इस प्रकार है–

टैंक सिंचाई प्रणाली – कृत्रिम जलाशयों या टैंकों से युक्त टैंक सिंचाई प्रणालियाँ प्रारंभिक मध्ययुगीन भारत में प्रचलित थीं। इन टैंकों का निर्माण आमतौर पर जमीन में गड्ढे खोदकर और उन्हें वर्षा जल और सतही अपवाह को संग्रहित करने के लिए मिट्टी के तटबंधों से बांधकर किया जाता था। वे सिंचाई के लिए महत्वपूर्ण जल स्रोतों के रूप में कार्य करते थे, विशेषकर शुष्क मौसम के दौरान। वर्तमान हरियाणा में स्थित सूरज कुण्ड, जिसका निर्माण महाराजा सूरजपाल तोमर ने आठवीं शताब्दी में करवाया था, इस प्रकार की सिचाईं प्रणाली का स्त्रोत था। इस कुण्ड को अनंग बांध से जोड़कर सिचाईं के लिए प्रयोग में लाया जाता था।

नहर– पूर्व मध्ययुगीन भारत में नदियों और जलाशयों से कृषि क्षेत्रों तक पानी वितरित करने के लिए नहरों और सिंचाई नेटवर्क का निर्माण देखा गया। अक्सर शाही संरक्षण में बनाई गई इन नहरों से खेती के विस्तार और कृषि उत्पादकता में वृद्धि में मदद मिली। प्रायद्वीपीय भारत में राष्ट्रकूटों और चालुक्यों द्वारा नहरों के निर्माण से शुष्क क्षेत्रों को उपजाऊ कृषि भूमि में बदलने में मदद मिली। भारतीय प्रदेशों में नहरों का उल्लेख ऋग्वेद से ही मिलना प्रारंभ हो जाता है।

कश्मीर में लिखा गया ग्रन्थ राजतरंगिणी में भी नहरें बनाने के उल्लेख मिलते हैं। खुयाँ नाम के एक अभियांत्रिक ने झेलम नदी से नहरों का एक जाल बना कर अपने राज्य में सिचाईं के लिए जल की उपलब्धता को सुनिश्चित किया।

जल उठाने वाले उपकरण – सिंचाई प्रयोजनों के लिए भूजल निकालने के लिए विभिन्न जल उठाने वाले उपकरणों का उपयोग किया गया था। इनमें फारसी पहिया (रहट) या चरखी प्रणाली शामिल थी, जो मानवीय शक्ति या पशु शक्ति द्वारा संचालित की जाती थी। इन उपकरणों ने किसानों को कुओं से भूजल तक पहुंचने और सिंचाई चैनलों के माध्यम से खेतों में वितरित करने में सक्षम बनाया। पूर्व मध्यकाल तक इस प्रणाली का प्रचलन व्यापक स्तर तक हो चुका था।

जल संरक्षण तकनीकें – पूर्व मध्ययुगीन भारतीय समाजों ने मिट्टी के कटाव को रोकने, वर्षा जल के संरक्षण और भूजल के पुनः भंडारण के लिए एक सामान ऊचाई पर बांध, सीढ़ीदार और चेक बांध जैसी जल संरक्षण तकनीकों को भी विकसित किया। सीमित जल संसाधनों का कुशलतापूर्वक दोहन करने के लिए ये तकनीकें पहाड़ी और अर्ध–शुष्क क्षेत्रों में विशेष रूप से महत्वपूर्ण थीं।

बाँध – बांध, जिन्हें चेक डैम के रूप में भी जाना जाता है, जल प्रवाह को नियंत्रित करने और मिट्टी के कटाव को रोकने के लिए नदियों और नालों पर बनाए गए थे। ये कम ऊंचाई वाले बांध स्थानीय रूप से उपलब्ध सामग्री जैसे पत्थर, मिट्टी और लकड़ी के लट्ठों का उपयोग करके बनाए गए थे। बंधों ने वर्षा जल को बनाए रखने, भूजल को फिर से भरने और सिंचाई उद्देश्यों के लिए जलाशय बनाने में मदद की। वे सूखे और पानी की कमी वाले क्षेत्रों में पानी के संरक्षण के लिए आवश्यक थे। वर्षा जल संचयन विशेष रूप से शुष्क और अर्ध–शुष्क क्षेत्रों में प्रचलित था जहाँ जल संसाधन सीमित थे। एकत्रित वर्षा जल का उपयोग घरेलू कामों, पशुधन और सिंचाई के लिए किया जाता था।

कुआं – घरेलू और कृषि प्रयोजनों के लिए भूजल तक पहुंच के लिए कुएं खोदे गए। बावड़ियों के समान लेकिन कम गहराई वाली बावलियों का निर्माण भी समुदायों को पानी उपलब्ध कराने के लिए किया गया था। ये पारंपरिक जल स्रोत ग्रामीण बस्तियों के लिए आवश्यक थे और प्रारंभिक मध्ययुगीन उत्तर भारत में जल संसाधनों के स्थायी प्रबंधन में योगदान करते थे।

झालरा– झालरा किसी नदी या तालाब के पास आयताकार टैंक होता था जो धार्मिक कार्यों को संपन्न करने के लिए बनाया जाता था। इसके अलावा भी ये झालरा कई प्रकार के कार्यों के लिए प्रयोग में लाये जाते थे। कुछ ऐसे जल स्त्रोत होते हैं जिनमे संचित जल का उपयोग व्यक्ति पेयजल के रूप में नहीं कर सकता है। झालरा जल संचयन का ऐसा ही एक जलस्त्रोत था। इन झालरों में तर्पण कार्य, मृत्युपरांत स्नान आदि का कार्य किया जाता था। वर्तमान राजस्थान में जोधपुर शहर के आस– पास आज भी लगभग आठ झालरे बेहद आकर्षित करते हैं (व्यास, 2021)।

कुण्ड – देश के विभिन्न हिस्सों में कुंड देखे जा सकते हैं। कुडं निजी भी होते हैं और सार्वजनिक भी। निजी कुंड पानी के ज्यादा संग्रहण के लिए घर में आवश्यकतानुसार गड्ढा खोदकर उसे चूने इत्यादि से पक्का कर ऊपर गुम्बद या ढक्कन बनाकर ढँक दिया जाता था। पानी को साफ स्वच्छ और उपयोग लायक बनाये रखने के लिए तल में राख और चूना भी लगाया जाता था, ताकि पानी में कीटाणु आदि न जन्में। कुण्ड घर के वाटर टैंक की तरह होता था। सार्वजनिक कुण्ड ढकें हुए भी होते थे और खुले हए भी। कुण्डों का इस्तेमाल पानी पीने, नहाने आदि में किया जाता था। कुण्डों की गहराई आवश्यकतानुसार बनवाई जाती थी। इनकी गहराई इतनी सी भी हो सकती थी कि झुककर किसी भी पात्र से इनमें से जल निकाला जा सके।

जल संसाधन प्रबंधन में सम्राटों की भूमिका –

पूर्व मध्ययुगीन भारत के दौरान, राजाओं ने जल संसाधन प्रबंधन में महत्वपूर्ण भूमिका निभाई, क्योंकि उनके पास जल बुनियादी ढांचे के निर्माण, रखरखाव और विनियमन की देखरेख के लिए काफी अधिकार और संसाधन थे। जल प्रबंधन में उनकी भागीदारी कृषि प्रधान समाजों को बनाए रखने, आर्थिक समृद्धि को बढ़ावा देने और सामाजिक व्यवस्था बनाए रखने के लिए आवश्यक थी। इस अवधि के दौरान राजाओं ने जल संसाधन प्रबंधन में कई तरीकों से योगदान दिया।

बुनियादी ढांचे का विकास – बड़े पैमाने पर जल बुनियादी ढांचा परियोजनाओं, जैसे जलाशयों, टैंकों, नहरों और सिंचाई नेटवर्क के निर्माण को शुरू करने में राजाओं की महत्वपूर्ण भूमिका थी। उन्होंने इन परियोजनाओं के लिए वित्तीय और भौतिक सहायता प्रदान की, अक्सर शाही फरमानों या संरक्षण के माध्यम से श्रम और संसाधन जुटाए। इन पहलों का उद्देश्य कृषि उत्पादकता को बढ़ाना, शहरी विकास को समर्थन देना और कमी के दौरान पानी की उपलब्धता सुनिश्चित करना था। राजाओं ने नियामक उपायों और प्रशासनिक संस्थानों के माध्यम से जल संसाधनों पर अधिकार का प्रयोग किया। उन्होंने पानी के उपयोग, वितरण और स्वामित्व को नियंत्रित करने वाले कानून और नीतियां बनाईं, जिससे जल संसाधनों तक समान पहुंच सुनिश्चित हुई और समुदायों के बीच विवादों का समाधान हुआ। चंदेल शासकों ने सम्पूर्ण बुंदेलखंड को मंदिरों और पक्की झीलों से सजा दिया (त्रिपाठी 1971)। सम्राटों ने जल–संबंधी गतिविधियों की निगरानी करने और जल प्रणालियों के कुशल कामकाज को सुनिश्चित करने के लिए, नियमों को लागू करने के लिए जल प्रबंधकों और नहर पर्यवेक्षकों जैसे अधिकारियों को नियुक्त किया।

सार्वजनिक कार्य व धार्मिक–सांस्कृतिक महत्त्व – राजाओं ने अपनी परोपकारिता प्रदर्शित करने और सार्वजनिक कल्याण को बढ़ावा देने के साधन के रूप में जल प्रबंधन से संबंधित सार्वजनिक परियोजनाओं को बढ़ावा दिया। उन्होंने बावड़ियों, टैंकों और अन्य जल संरचनाओं का निर्माण करवाया अक्सर इन स्मारकों पर शाही संरक्षण के प्रतीक के रूप में उनके नाम या

उपाधियाँ अंकित की गईं। राजाओं ने व्यापार मार्गों और तीर्थ स्थलों पर धर्मशालाओं (विश्राम गृह) और भंडारों (सार्वजनिक जल औषधालय) की स्थापना का भी समर्थन किया, जिससे यात्रियों और तीर्थयात्रियों को आवश्यक सेवाएं प्रदान की गईं। राजाओं द्वारा की गई जल प्रबंधन पहलों का अक्सर धार्मिक और सांस्कृतिक महत्व होता था, जो भारतीय समाज में पानी और आध्यात्मिक विश्वासों के बीच अंतर्संबंध को दर्शाता है। गोंड राजाओं के समय जो भी व्यक्ति तालाब का निर्माण कराता था उसे लगान से मुक्त कर दिया जाता था (मिश्र, 2009)। राजाओं ने पानी को पवित्र और शुद्ध करने वाला मानते हुए मंदिरों व अन्य धार्मिक स्थलों के पास जल संरचनाओं के निर्माण को प्रायोजित किया। इन परियोजनाओं ने धर्मपरायणता और भक्ति के रूप में कार्य किया, जिससे जनता की आध्यात्मिक भलाई में योगदान हुआ।

रक्षा और सुरक्षा के दृष्टिकोण से जल संरक्षण कार्य – शासकों ने रक्षा और सुरक्षा उद्देश्यों के लिए जल संसाधनों के रणनीतिक महत्व को पहचाना। उन्होंने टैंकों और जलाशयों जैसे जल निकायों को तोड़फोड़ या दुश्मन की घुसपैठ से बचाने के लिए उन्हें मजबूत किया। राजाओं ने नदी तटों और नहरों के किनारे किलेबंदी में भी निवेश किया, जिससे महत्वपूर्ण जल बुनियादी ढांचे की सुरक्षा और बाहरी खतरों से सुरक्षा सुनिश्चित की गई। उन्होंने भावी पीढ़ियों के लिए प्राकृतिक संसाधनों को संरक्षित करने के लिए पर्यावरण संरक्षण और टिकाऊ जल प्रबंधन प्रथाओं की वकालत की। उन्होंने पारिस्थितिक स्वास्थ्य और मानव कल्याण के बीच परस्पर निर्भरता को पहचानते हुए वनों की कटाई, मिट्टी के कटाव और जल प्रदूषण को रोकने के उपाय लागू किए। जल संसाधनों पर पर्यावरणीय गिरावट के प्रभाव को कम करने के लिए उन्होंने सूखा प्रतिरोधी फसलों की खेती, वनीकरण प्रयासों और मिट्टी संरक्षण तकनीकों को बढ़ावा दिया।

जल संरक्षण पर धर्म और संस्कृति का प्रभाव –

प्रारंभिक मध्ययुगीन भारत में जल संरक्षण प्रथाओं पर धर्म और संस्कृति का गहरा प्रभाव था। जल न केवल जीविका के लिए आवश्यक था, बल्कि आध्यात्मिक महत्व भी रखता था, धार्मिक मान्यताएँ और सांस्कृतिक परंपराएँ जल प्रबंधन के प्रति दृष्टिकोण को आकार देती थीं। यहां ऐसे कई तरीके हैं जिनसे धर्म और संस्कृति ने इस अवधि के दौरान जल संरक्षण को प्रभावित किया।

पवित्र नदियाँ और जल निकाय – गंगा, यमुना, सरस्वती और गोदावरी जैसी नदियाँ हिंदू धर्म में पवित्र मानी जाती थीं, और माना जाता था कि उनके जल में शुद्ध करने वाले गुण होते हैं। इन नदियों और उनसे जुड़े जल निकायों की सुरक्षा और संरक्षण के लिए एक मजबूत सांस्कृतिक अनिवार्यता थी। इन नदियों के किनारे रहने वाले समुदायों ने जल संसाधनों के प्रति श्रद्धा और समर्पण की भावना को बढ़ावा देते हुए, उन्हें सम्मान देने और पूजा करने के लिए अनुष्ठान और समारोह विकसित किए।

धार्मिक त्यौहार और अनुष्ठान – धार्मिक त्यौहारों और अनुष्ठानों में अक्सर पानी से संबंधित गतिविधियाँ शामिल होती हैं, जैसे अनुष्ठान स्नान, मूर्तियों का औपचारिक विसर्जन (विसर्जन),

और नदियों और तालाबों में प्रार्थना करना। इन प्रथाओं ने पानी के सांस्कृतिक महत्व को सुदृढ़ किया और इसकी शुद्धता और प्रचुरता को बनाए रखने के महत्व को रेखांकित किया। धार्मिक अनुष्ठानों को सुविधाजनक बनाने और जल संरक्षण प्रयासों में सामुदायिक भागीदारी को बढ़ावा देने के लिए राजाओं और धार्मिक संस्थानों ने घाटों (नदी के किनारे के कदम) और मंदिर के टैंक (कुंड) के निर्माण और नवीनीकरण को प्रायोजित किया।

जल संरक्षण संरचनाएँ – कई जल संरक्षण संरचनाएँ, जैसे बावड़ियाँ टैंक और जलाशय मंदिरों, मस्जिदों और अन्य धार्मिक स्थलों के पास बनाए गए थे। ये संरचनाएँ व्यावहारिक और प्रतीकात्मक दोनों उद्देश्यों को पूरा करती थीं, अनुष्ठानिक स्नान और पीने के लिए पानी उपलब्ध कराती थीं और साथ ही शासकों और धार्मिक संरक्षकों की उदारता का प्रतीक भी थीं। इन संरचनाओं की स्थापत्य सुंदरता और आध्यात्मिक महत्व ने समुदायों को इन्हें पवित्र विरासत स्थलों के रूप में संरक्षित और बनाए रखने के लिए प्रेरित किया।

सामुदायिक भागीदारी और सहयोग – धार्मिक और सांस्कृतिक संस्थानों ने जल संरक्षण पहल के लिए सामुदायिक समर्थन जुटाने में महत्वपूर्ण भूमिका निभाई। मंदिर, मठ और धार्मिक बंदोबस्त अक्सर जल संसाधनों का प्रबंधन करते थे और जल बुनियादी ढांचे के रखरखाव के लिए धन आवंटित करते थे। सामुदायिक नेतृत्व वाली पहल, जैसे सामुदायिक कुओं का निर्माण और जल–बंटवारे की व्यवस्था (पत्तल) का आयोजन, ने आम भलाई के लिए जल संसाधनों के प्रबंधन में सामूहिक कार्रवाई और सहयोग को बढ़ावा दिया।

प्रतीकवाद और पौराणिक कथाएँ – जल संरक्षण प्रथाओं को अक्सर प्रतीकवाद और पौराणिक कथाओं से जोड़ा जाता था, जो पानी के आसपास की सांस्कृतिक मान्यताओं और आख्यानों को दर्शाते थे। उदाहरण के लिए, हिंदू पौराणिक कथाओं में समुद्र मंथन की कहानी अमरता के अमृत के लिए देवताओं और राक्षसों के बीच लौकिक संघर्ष का प्रतीक है, जो जीवन और कायाकल्प के स्रोत के रूप में पानी के पवित्र महत्व को उजागर करती है।

वर्तमान परिदृश्य में पूर्व मध्यकालीन जलस्त्रोत निर्माण एवं जल संरक्षण का प्रभाव– आधुनिक भारत पर पूर्व मध्ययुगीन जल संरक्षण प्रथाओं का प्रभाव महत्वपूर्ण और बहुआयामी है। वर्तमान समय में सदियों पहले की प्रथाओं और समसामयिक मुद्दों के बीच संबंध स्थापित करने की कोशिश की गई है। जल संरक्षण के सिद्धांतों की प्रासंगिकता कालातीत है।

पारंपरिक जल संचयन प्रणालियाँ– भारत में कई प्रारंभिक मध्ययुगीन सभ्यताएँ, जैसे कि सिंधु घाटी सभ्यता, जल संचयन और प्रबंधन की परिष्कृत प्रणालियों को नियोजित करती थीं। बावड़ियाँ, तालाब और जलाशय बनाने जैसी तकनीकें आम थीं। इन प्रथाओं ने भारत में आधुनिक जल संरक्षण रणनीतियों की नींव रखी, वर्षा जल संचयन और चेक बांधों के निर्माण जैसी प्रेरक पहल की।

समुदाय–आधारित प्रबंधन– प्रारंभिक मध्ययुगीन जल संरक्षण प्रयासों में अक्सर जल संसाधनों के प्रबंधन के लिए पूरे समुदाय को एक साथ काम करना शामिल होता था। जल प्रबंधन के लिए यह समुदाय–केंद्रित दृष्टिकोण आधुनिक भारत में समुदाय–आधारित वाटरशेड

प्रबंधन कार्यक्रमों जैसी पहलों के माध्यम से प्रतिध्वनित होता है। जल के संरक्षण और प्रबंधन में स्थानीय समुदायों को शामिल करके, ये पहल स्थिरता को बढ़ावा देती हैं और सुनिश्चित करती हैं कि जल संसाधनों का प्रभावी ढंग से उपयोग किया जाए।

जलवायु परिवर्तनशीलता के प्रति अनुकलून– भारत हमेशा से जलवायु परिवर्तनशीलता से ग्रस्त रहा है, जिसमें सूखा और अनियमित वर्षा शामिल है। प्रारंभिक मध्ययुगीन सभ्यताओं ने इन चुनौतियों से निपटने के लिए जल संरक्षण तकनीकों का विकास किया, जैसे कि सूखे के दौरान उपयोग के लिए प्रचुर मात्रा में पानी को संग्रहीत करने के लिए भूमिगत भंडारण टैंक का निर्माण करना। इसी प्रकार, आधुनिक भारत को जलवायु परिवर्तन के कारण समान चुनौतियों का सामना करना पड़ता है, और प्रारंभिक सभ्यताओं से सीखे गए अनुकूली जल प्रबंधन के सिद्धांत आज भी प्रासंगिक बने हुए हैं।

सांस्कृतिक और आध्यात्मिक महत्व– भारत में पानी का गहरा सांस्कृतिक और आध्यात्मिक महत्व है, जैसा कि गंगा जैसी नदियों को दी गई श्रद्धा से पता चलता है। प्रारंभिक मध्ययुगीन समाजों ने न केवल व्यावहारिक कारणों से बल्कि उनके आध्यात्मिक महत्व के लिए भी जल स्रोतों के संरक्षण के महत्व को पहचाना। पवित्र नदियों और जल निकायों की सुरक्षा और संरक्षण के प्रयासों के साथ, जल संरक्षण के प्रति यह सांस्कृतिक रवैया आधुनिक भारत को प्रभावित करना जारी रखता है।

शहरी नियोजन और बुनियादी ढाँचा– भारत में प्रारंभिक मध्ययुगीन शहरों की योजना अक्सर जल निकायों के आसपास बनाई गई थी और उनमें जल आपूर्ति और स्वच्छता के लिए जटिल प्रणालियाँ थीं। इन ऐतिहासिक शहरी नियोजन प्रथाओं ने भारत में आधुनिक शहरी विकास रणनीतियों को प्रभावित किया है, जिसमें तेजी से बढ़ते शहरों में स्थायी जल प्रबंधन पर नए सिरे से ध्यान केंद्रित किया गया है।

निष्कर्ष– पूर्व मध्ययुगीन उत्तर भारत में जल संरक्षण एक बहुआयामी प्रयास था जिसमें तकनीकी नवाचार, सामुदायिक भागीदारी और सांस्कृतिक प्रथाओं का एकीकरण शामिल था। परिवर्तनशील जलवायु परिस्थितियों के बीच क्षेत्र में कृषि समाज के अस्तित्व के लिए ये प्रयास आवश्यक थे। मध्ययुगीन उत्तर भारत में ये पारंपरिक जल संरक्षण विधियाँ पानी की कमी की चुनौतियों को स्थायी तरीके से अपनाने और कम करने में प्राचीन समाज की सरलता और संसाधनशीलता का प्रमाण थीं। मध्ययुगीन उत्तर भारत में राजाओं ने जल संसाधन प्रबंधन में बहुआयामी भूमिका निभाई, अपने क्षेत्र के कल्याण के लिए जल संसाधनों के उपयोग और संरक्षण को नियंत्रित करने के लिए राजनीतिक, आर्थिक और सांस्कृतिक प्रभाव डाला। स्वदेशी ज्ञान, तकनीकी नवाचार और सामुदायिक भागीदारी में निहित ये समाधान, पर्यावरणीय चुनौतियों का समाधान करने और मध्ययुगीन उत्तर भारत में पानी की कमी को कम करने में सहायक थे। वे समकालीन जल प्रबंधन प्रथाओं और सतत विकास प्रयासों के लिए मूल्यवान सबक प्रदान करते हैं। पूर्व मध्यकालीन जल स्त्रोत निर्माण की तकनीकों को अपनाकर हम समकालीन जल चुनौतियों का समाधान करने, सतत विकास को बढ़ावा देने और भविष्य की पीढ़ियों के लिए जल

संसाधनों की सुरक्षा के लिए ऐतिहासिक जल संरक्षण प्रथाओं में निहित ज्ञान के धन को संरक्षित करके और लाभ उठा सकते हैं। आधुनिक भारत पर पूर्व मध्ययुगीन जल संरक्षण प्रथाओं का प्रभाव गहरा है। ये प्राचीन तकनीकें और सिद्धांत समकालीन जल प्रबंधन रणनीतियों को आकार देना जारी रखते हैं, जो देश की जल चुनौतियों से निपटने के लिए टिकाऊ और लचीले दृष्टिकोण में मूल्यवान अंतर्दृष्टि प्रदान करते हैं।

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एकात्म मानववाद और व्यावसायिक समाजकार्य

डॉ संजीव कुमार*

सारांशः

दीनदयाल उपाध्याय भारतीय स्वतंत्रता संग्राम के महान नेता और विचारक थे। उन्होंने भारतीय समाज और राष्ट्र के लिए एक सशक्त, स्वावलंबी और समृद्ध आर्थिक मॉडल की आवश्यकता पर बल दिया। उनकी दृष्टि में भारत में समाजवाद और पूंजीवाद दोनों से अलग, व्यक्ति–केंद्रित एवं समृद्धि–मुक्ति केंद्रित आर्थिक मॉडल का विकास करना था। यह समय से आगे की सोच थी।

उन्होंने विकास के स्वदेशी आर्थिक मॉडल की वकालत की। उनके इन विचारों ने भारतीय समाज को स्वावलंबी बनाने में महत्वपूर्ण योगदान दिया। उनकी सोच का महत्वपूर्ण पहलू यह था कि ''हम भारतीयों को अपनी धार्मिक और सांस्कृतिक विरासत को महत्त्व देना चाहिए, जो पश्चिमी विचारधारा से अलग हैं। उनके विचार हमें बताते हैं कि "समाज और अर्थव्यवस्था में एकता और समृद्धि की दिशा में सोचना चाहिए।" उन्होंने संपूर्णता, एकता, और समरसता के महत्व को रेखांकित किया और इसका समर्थन दिया।

पंडित दीनदयाल उपाध्याय के विचार हमें समाज, व्यक्ति और प्रकृति के बीच एक संतुलित संबंध की बात और इसे बढ़ावा देने पर बल देते हैं। उन्होंने हमें सिखाया कि हमें अपनी परंपराओं और संस्कृति को महत्व देना चाहिए और उसे आगे बढ़ाना चाहिए। उनकी विचारधारा में हमें एकात्मकता और समरसता की महत्ता का अनुभव होता है। उनके द्वारा उठाए गए सवालों के माध्यम से हमें यह पता चला कि "पश्चिमी विचारधाराओं की जगह हमें अपनी धार्मिक और सांस्कृतिक विरासत को अपनाना चाहिए।"

पंडित दीनदयाल उपाध्याय के विचारों को ध्यान में रखते हुए, हमें चाहिए कि हम अपने समाज और राष्ट्र को एकता, समृद्धि और सामाजिक समरसता की दिशा में ले जाएं। उनके विचारों को अपनाकर हम एक बेहतर और समृद्ध भविष्य की दिशा में कदम बढ़ा सकते हैं। दीनदयाल उपाध्याय जी के विचारों ने हमें एक समृद्ध और संरचित समाज की दिशा में सोचने के लिए प्रेरित किया है। उनका संदेश है कि हमें अपनी धार्मिक, सांस्कृतिक और आर्थिक विरासत को महत्व देना चाहिए और एक सामूहिक संवाद के माध्यम से समाज के विकास में सहयोग करना चाहिए। उनके विचार और दृष्टिकोण से हमें एक समृद्ध, सामर्थ्यवर्धक और संरचित समाज की दिशा में कदम बढ़ाने की दिशा दी है।

प्रस्तावना

पंडित दीनदयाल उपाध्याय (25 सितम्बर 1916–11 फरवरी 1968) भारतीय समाज और राजनीति के राष्ट्रवादी विचारक थे। पंडित दीनदयाल उपाध्याय का जन्म मथुरा जिले के फराह

* सहायक आचार्य, समाज कार्य विभाग़, जननायक चन्द्रशेखर विश्वविद्यालय, बलिया।

शहर के पास नगला चंद्रबन गांव में हुआ। इस गांव को अब दीनदयाल धाम कहा जाता है। आपके पिता, भगवती प्रसाद उपाध्याय, एक ज्योतिषी थे और मां, रामप्यारी उपाध्याय, एक गृहिणी और धर्मपरायण हिंदू थीं।

आठ वर्ष की आयु में, आपके माता–पिता की मृत्यु हो गई, और आपको अपने मामा और मौसी के पास जाकर रहना पड़ा। आपकी शिक्षा सीकर के हाई स्कूल में पूरी हुई जहां से सीकर के महाराजा ने आपको एक स्वर्ण पदक, किताबें खरीदने के लिए 250 रुपये, और 10 रुपये की मासिक छात्रवृत्ति प्रदान की। आपने अपनी इंटरमीडिएट की पढ़ाई पिलानी, राजस्थान से की। आपने सनातन धर्म कॉलेज, कानपुर से बीए की डिग्री हासिल की। सन 1939 में, आप आगरा गए और अंग्रेजी साहित्य में स्नातकोत्तर की डिग्री हासिल करने के लिए सेंट जॉन्स कॉलेज, आगरा में दाखिला लिया, लेकिन अपनी पढ़ाई को जारी नहीं रख पाए । कुछ परिवारिक और वित्तीय समस्याओं के कारण आप एम .ए. की परीक्षा नहीं दे सके। आपने परंपरागत भारतीय पोशाक धोती–कुर्ता और टोपी पहनकर सिविल सेवा परीक्षा में भाग लिया इस कारण आपको पंडितजी के नाम से पहचान मिली।

आपके द्वारा 1940 के दशक में राष्ट्र पुनरुत्थान के आदर्शों को फैलाने के लिए लखनऊ से मासिक 'राष्ट्र धर्म' शुरू किया गया। जिसका उद्देश्य ''राष्ट्रीय आस्था'' को बढ़ावा देना था। आपने लखनऊ से पांचजन्य (साप्ताहिक) और स्वदेश (दैनिक) का संपादन किया। हिंदी में आपने चंद्रगुप्त मौर्य पर एक नाटक लिखा और बाद में शंकराचार्य की जीवनी लिखी। आपने हेडगेवार की मराठी जीवनी का अनुवाद किया।

आप एक महान विचारक और संगठनकर्ता थे। आपने देश को 'एकात्म मानववाद' नामक विचारधारा से परिचित कराया, जो कि भारतीय सनातन सोच को समकालीन बनाने का प्रयास करती थी। आपने एक समृद्ध और मजबूत भारत की दिशा में एकता की मान्यता की। राजनीति के अलावा, आपकी साहित्यिक रूचि भी गहरी थी। आपने हिंदी और अंग्रेजी भाषाओं में कई लेख लिखे थे, जो विभिन्न पत्रिकाओं में प्रकाशित हुए थे। आपने 'एकात्म मानववाद' की मान्यता का प्रचार किया जिसके द्वारा एक समृद्ध और सशक्त भारत की दिशा में राष्ट्रीय एकता को महत्व दिया गया था। आपके द्वारा बताये गए विचार और सिद्धांतों से हमें हमें काफी कुछ सीखने की आवश्यकता है।

एकात्म मानववाद

एकात्म मानववाद मानव जीवन व सम्पूर्ण सृष्टि के सम्बन्ध का दर्शन है। पंडित दीनदयाल उपाध्याय ने अपने सुदीर्घ चिन्तन, अध्ययन एवं मनन के बाद सन् 1964–65 में एक विचारधारा के नाते इसका प्रणयन किया। इसका पूर्ण वैज्ञानिक विवेचन पंडित दीनदयाल उपाध्याय ने किया था। यह राष्ट्रीय विकास का 'मार्गदर्शक–दर्शन' है। इस दर्शन को पंडित दीनदयाल उपाध्याय द्वारा 22 से 25 अप्रैल, 1965 को मुम्बई में दिये गये चार व्याख्यानों के रूप में प्रस्तुत

किया गया था।

प्राचीन एवं सनातन वैचारिकी मानती है कि पश्चिम की राष्ट्र–राज्य परिकल्पना से पुरानी कल्पना भारत के 'सांस्कृतिक राष्ट्रवाद' की है। भारतीय संस्कृति की एक गौरवसम्पन्न ज्ञान–परम्परा है, हमें इसी ज्ञान–परम्परा में भारत का भविष्य खोजना चाहिए। पाश्चात्य राजनैतिक चिन्तन ने मानव को 'सेक्यूलरवाद, व्यक्तिवाद (पूंजीवाद), समाजवाद एवं साम्यवाद की विचार धाराएं दी थी। स्वतंत्र भारत का नेतृत्व भी इन्हीं वादों में भारत का भविष्य खोज रहा था। दीनदयाल जी ने इस खोज में हस्तक्षेप करते हुए यह सवाल खड़ा किया कि जब हमने पाश्चात्य साम्राज्यवाद को नकार दिया, तब अब हमारी क्या मजबूरी है कि हम 'पाश्चात्य– वादों' का अनुगमन करें।

सामान्यतः भारत के राजनैतिक विचारक सोचते थे कि हमें कुछ संशोधनों के साथ इन पाश्चात्य वादों को ही स्वीकारना पड़ेगा क्योंकि हमारे पास कोई अन्य चिंतन नहीं है। हम तो राष्ट्र थे ही नहीं। पाश्चात्यों ने ही आकर हमको राष्ट्र बनने के लिए तैयार किया है। उनका विचार है हम राष्ट्र बनने जा रहे हैं या हम नवोदित राष्ट्र हैं, आदि, आदि।

मानव की तरफ देखने की पाश्चात्य दृष्टि खण्डित हैं। उनका व्यक्तिवाद, समाजवाद का दुश्मन है तथा समाजवाद, व्यक्तिवाद का शत्रु है। वे प्रकृति पर मानव की विजय चाहते हैं, इस प्रकार यहां भी प्रकृति बनाम मानव उनका समीकरण है। सेक्यूलरवाद को अपना कर उन्होंने अपने सार्वजनिक जीवन को अध्यात्म से काट लिया, अतः भौतिकवाद बनाम अध्यात्म, स्टेट बनाम चर्च तथा रिलिजन बनाम सांइस के द्वंद्वमूलक समीकरण वहां उत्पन्न हुये। दीनदयाल जी मानते थे कि पश्चिम की यह बहस भी एक मानवीय बहस है, इसे हमें जानना चाहिए तथा इससे कुछ सीखना भी चाहिये, लेकिन हमें इन द्वंद्वमूलक निष्कर्षों का अनुयायी नहीं बनना चाहिये।

एकात्म मानववाद, व्यक्ति बनाम समाज नहीं वरन व्यक्ति और समाज की एकात्मता का विचार है। यह मानव बनाम प्रकृति नहीं वरन मानव के साथ प्रकृति की एकात्मता का विचार है। भौतिक बनाम अध्यात्मिक नहीं वरन इनकी एकात्मता का विचार है। भारत में इसे धर्म कहा गया है 'यतो अभ्युदय निःश्रेयस संसिद्धि स धर्म।' अर्थात् यह व्यष्टि, समिष्ट, सृष्टि व परमेष्ठी की एकात्मता का विचार है। यह विचार दृश्यमान पृथकताओं में एकात्मता के सूत्र खोजता है। संसार में पृथकता नहीं विविधता हैं, जो 'पिंड' में है वही 'ब्रह्माण्ड' में है। आज मानव अपने को व्यक्ति मान कर अपनी सामाजिक संस्थाओं से युद्ध कर रहा है, परिवार, जाति, वंश , पंचायत सब को अपना दुश्मन मान रहा है। समाजवाद के नाम पर तानाशाहियों का सृजन कर रहा है, विकास के नाम पर प्रकृति से युद्ध कर रहा है, पर्यावरण का विनाश कर भयानक विभीषिकाओं को आमंत्रित कर रहा है। अध्यात्म का निषेध कर भोगेन्द्रियों का गुलाम बन रहा है। सुख की खोज में दुःख कमा रहा है तथा आनंद की अवधारणा से अपरिचित रह रहा है।

भारतीय परम्परा इन पृथकताओं का निषेध करती है। वह जड़–चेतन सभी से अपने रिश्ते

स्थापित करती है। धरती 'माता' है चन्द्रमा 'मामा' है पर्वत 'देवता' है, नदियां 'माता' हैं। समाज का हर व्यक्ति परस्पर जुड़ा हुआ है, यह संसार परायेपन की जगह नहीं, यह 'वसुधा तो एक कुटुम्ब' है आदि विचार मानव को असम्बद्धता, पृथकता तथा द्वन्द्वशीलता के सम्बंधों से निजात दिलाते हैं।

एकात्मता, समग्रता में निहित रहती है। समग्रता के अभाव में खण्ड दृष्टि से मानव आक्रांत होता है। जैसे ब्रह्माण्ड की समग्रता है, वैसे ही व्यक्ति की भी समग्रता है। व्यक्ति अर्थात केवल शरीर नहीं, उसके पास मन है, बुद्धि है और आत्मा भी है । यदि इन चारों में से एक की भी उपेक्षा हो जाये तो व्यक्ति का सुख विकलांग हो जायेगा। इन चारों के पृथक पृथक सुख से व्यक्ति सुखी नहीं होता, उसे तो एकात्म एवं घनीभूत सुख चाहिये। जिसे आनंद कहते है। वैसे ही समाज केवल सरकार नहीं है, उसकी अपनी संस्कृति है, जन एवं देश है। इन चारों के सम्यक संचालन के बिना समष्टि के सुख का संधान नहीं होता। इस प्रकार सृष्टि के पंच–महाभूत (पृथ्वी, जल, आकाश, प्रकाश व वायु) हैं, जिनके साथ न्याय–संगत व्यवहार होना चाहिये तथा अदृश्य किन्तु अनुभूति में आने वाले आध्यात्मिक तत्वों से भी योग्य साक्षात्कार होना चाहिये, तभी मानव सुखी होगा।

व्यष्टि, समष्टि, सृष्टि तथा परमेष्ठी से एकात्म हुआ मानव ही विराट पुरुष है। इसके पुरुषार्थ चतुर्यामी है 'धर्म, अर्थ काम और मोक्ष' ये पुरुषार्थ मानव की परिस्थति निरपेक्ष आवश्यकतायें हैं, इनकी सम्पूर्ति करना समाज व्यवस्था का काम है। धर्म–अर्थात शिक्षा–संस्कार एवं विधि व्यवस्था। अर्थ–साधन पुरुषार्थ है। धर्मानुसार अर्थव्यवस्था, रोजगार, उत्पादन, वितरण एवं उपयोग आदि। काम–'धर्माविरुद्धो कामोऽहम्' (जो धर्म के अविरूद्ध हैं, मैं वह काम हूँ–गीता) समस्त एषणायें इसके अन्तर्गत आती हैं, उनको सांस्कृतिक उपागम प्रदान करना संगीत एवं विविध कलाओं के माध्यम से एषणाओं को सकारात्मक बनाना। धर्म विरुद्ध काम पुरुषार्थ नहीं, वरन विकार है। मोक्ष–परम पुरुषार्थ है, जब व्यक्ति अभाव व प्रभाव की कुण्ठाओं से मुक्त हो जाता है। अब इसे कुछ नहीं चाहिये 'विगतस्य कुण्ठः इति वैकुण्ठ।'

यह समस्त भारतीय विचार प्रवचनों का नहीं वरन राष्ट्रनीति एवं राजनीति का विषय होना चाहिये। इसके आधार पर देश की नीतियां बननी चाहिये।

एकात्म मानववादएवं व्यावसायिक समाज कार्य

समाज कार्य, सहायतामूलक–प्रक्रियात्मक कार्य है जोकि सामाजिक संकटों और व्यक्तिगत समस्याओं का समाधान के लिए आपसी संवाद, सहयोग, भाईचारे की कामना करता है। यह सामाजिक सहयोग के माध्यम से लोगों के जीवनस्तर में सुधार लाने के लिए कार्य करता है। समाज कार्य, समस्याग्रस्त व्यक्तियों के समायोजन, उनके समाजिक और मानसिक स्वास्थ्य में सुधार और उन्हें जीवन के सभी क्षेत्रों में सक्षम बनाने का प्रयास करता है।

समाज कार्य के क्षेत्र निम्न हैं, जैसे कि शिक्षा, स्वास्थ्य, आर्थिक विकास, सामाजिक समृद्धि,

पर्यावरण संरक्षण, और समाज के विभिन्न वर्गों की सहायता। समाज कार्य 'सामाजिक संगठन' या 'संस्था' द्वारा किया जाता है, जोकि लोगों की मदद के लिए विभिन्न कार्यों और योजनाओं को संचालित करती है। सामाजिक–संगठन समुदाय के विकास और सुधार के लिए काम करता है। समाज कार्य में सहयोग, समर्थन और समाजिक न्याय की भावना शामिल होती है। यह लोगों के बीच समरसता और एकता को बढ़ावा देता है ताकि समाज में समृद्धि हो सके। समाज कार्य महत्त्वपूर्ण है क्योंकि यह समाज को समृद्धि, सुधार और समानता की दिशा में आगे बढ़ने में मदद करता है। इसके माध्यम से समाज में सकारात्मक बदलाव लाया जा सकता है और लोगों के जीवनस्तर में सुधार किया जा सकता है। समाज कार्य समाज की समृद्धि और समानता की दिशा में एक महत्त्वपूर्ण कदम है। इसके माध्यम से समाज में सहानुभूति, समरसता, और सामाजिक समृद्धि को प्रोत्साहित किया जा सकता है। समाज कार्य समाज में सकारात्मक बदलाव लाने का माध्यम है और इसे बढ़ावा देना और समर्थन करना हमारा कर्तव्य है। यह समाज सुधार में महत्त्वपूर्ण भूमिका निभाता है और एक बेहतर और संतुलित समाज की दिशा में एक कदम होता है। इस तरह, समाज कार्य समाज के सुधार और विकास के लिए आवश्यक है और इसे समर्थन और प्रोत्साहन देना हमारा धर्म है।

इस प्रकार सामुदायिक विकास एवं सामुदायिक संगठन व्यावसायिक समाज कार्य का विषय क्षेत्र है। सामजिक कार्यकर्ताओं ने सामाजिक संगठन को समाज कार्य की प्राथमिक पद्धति के रूप में मान्यता दी है। भारत जैसे देशों में इसकी अति आवश्यकता है। समाज कार्य के नजर में समुदायिक विकास वह संकल्पना है जो समुदाय के सदस्यों के स्वयं के संसाधनों, संस्कृति, और सामाजिक संगठन को सशक्त बनाने पर आधारित है। सामुदायिक विकास सामाजिक, आर्थिक, शैक्षिक और सांस्कृतिक स्तर पर होता है। ग्राम आधारित विकास, समुदाय के सदस्यों के लिए अवसरों का सृजन करता है और उन्हें सामाजिक रूप से सुदृढ़ बनाता है। इसमें स्वास्थ्य सेवाएं, शिक्षा, रोजगार, और संसाधनों का प्रबंधन भी शामिल है। समाज कार्य का लक्ष्य समाज में गुणात्मक सुधार लाना और समुदाय के सर्वागीण विकास को बढ़ावा देना है। समाज कार्य, समाज के विभिन्न पहलुओं को समझता है और समस्याओं का समाधान ढूंढता है। समाज कार्यकर्ता समुदायों में जागरूकता फैलाते हैं, सामाजिक समस्याओं पर काम करते हैं, और समुदाय के विकास के लिए कार्य करते हैं। इस प्रकार, समुदायिक विकास और समाज कार्य सामाजिक सुधार और परिवर्तन की दिशा में महत्वपूर्ण हैं और समाज के सुधार और समृद्धि में महत्वपूर्ण भूमिका निभाते हैं ।

निष्कर्ष

परिणामतः हम यह समझ पाए हैं कि एकात्म मानववाद एक दार्शनिक सिद्धांत है जो मानवीय समाज में एकता, समरसता और सहयोग को प्रोत्साहित करता है। यह जहाँ मानवता के मूल्यों और मानवीय समृद्धि के लिए सामाजिक एवं आध्यात्मिक विकास को प्रोत्साहित करता है। वहीं समाजकार्य भी इसी दिशा में कार्य करता है और समाज में सुधार लाने के लिए विभिन्न क्षेत्रों में

योजनाएं और कार्यक्रम संचालित करता है। संक्षेप में कहें तो एकात्म मानववाद और समाजकार्य दोनों ही मानवीय समृद्धि और सामाजिक समृद्धि के लिए प्रयास करते हैं। एकात्म मानववाद में मानवता के सभी अंशों का सम्मान किया जाता है, समानता की भावना होती है, और समृद्धि के लिए सभी को साथ लेकर चलने की बात की जाती है, वहीं समाजकार्य मानवता की मदद करने और समाज में सुधार लाने के लिए विभिन्न क्षेत्रों में काम करता है।

एकात्म मानववाद की दृष्टि से, समाज कार्य मानवीय समस्याओं का समाधान करता है और समृद्धि के लिए उपाय ढूंढता है। यह समाज में समानता, न्याय, और समरसता को बढ़ावा देता है। समाज कार्य विभिन्न क्षेत्रों जैसे शिक्षा, स्वास्थ्य, गरीबी निवारण, महिला सशक्तिकरण, जलवायु परिवर्तन, बालकल्याण आदि में कार्य करके समाज को सुधारने का प्रयास करता है।

एकात्म मानववाद और समाजकार्य के बीच संबंध गहरा है। जब समाज कार्य एकात्म मानववाद के सिद्धांतों पर आधारित होता है, तो वह समाज में एकता, सामञजस्य और समृद्धि को प्रोत्साहित करता है। समाज कार्य मानवीय समृद्धि के लिए समाज में सुधार लाने का काम करता है, जो एकात्म मानववाद की मूलभूत धारणाओं को भी प्रोत्साहित करता है।

इस प्रकार, एकात्म मानववाद और समाजकार्य एक–दूसरे को पूरक हैं। दोनों मिलकर समाज में एकता, समसयता और समृद्धि की दिशा में काम करते हैं और मानवीय समृद्धि के लिए संघर्ष करते हैं।

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सूचना समाज एवं मैनुअल कास्टेल्स

डॉ0 विवेक कुमार यादव*

सार संक्षेप

प्रस्तुत लेख मैनुअल कास्टेल्स द्वारा निर्मित 'सूचना समाज' से सम्बन्धित प्रमुख सिद्धान्तों में से एक पर आधारित है। कास्टेल्स वर्तमान सामाजिक परिदृश्य को सूचना युग' के रूप में परिभाषित करते हैं, जिसमें मानव समाज एक नये तकनीकी प्रतिमान में अपनी गतिविधियों का प्रदर्शन करता है। कास्टेल्स कहते हैं कि यह वर्तमान परिदृश्य 20वीं शताब्दी के उत्तरार्ध में सूचना एवं संचार प्रौद्योगिकी की क्रांति द्वारा अस्तित्व में आया। मेरा मानना है कि सर्वप्रथम कास्टेल्स ने इस नई सूचना एवं संचार प्रौद्योगिकी को परिभाषित किया एवं इसकी तीन प्रमुख विशेषताओं नेटवर्क तर्क, कालातीत समय एवं प्रवाह का स्थान की व्याख्या की, जो केवल मीडिया और समाज के मध्य हो रही अन्तर्क्रिया में परिलक्षित होता है। इसलिए कास्टेल्स ने अपने सूचना समाज के सिद्धान्त को एक पद्धतिशास्त्र के रूप में प्रयोग किया है।

प्रस्तावना

मैनुअल कास्टेल्स एक स्पेनिश समाजशास्त्री हैं, जो प्रमुखतः सूचना समाज, संचार और वैश्वीकरण से सम्बद्ध विषयों पर शोध से जुड़े हैं। इनका जन्म स्पेन के कैटलन शहर में 9 फरवरी 1942 को हुआ था। जनवरी 2020 में, कास्टेल्स को स्पेन के सैंचेज के सरकार में विश्वविद्यालयों के मंत्री के रूप में नियुक्ति प्राप्त हुई। वह बार्सिलोना में यूनिवर्सिटेंट ओबेरट्टा ओ कैटाल्या (UOC) के समाजशास्त्र के पूर्व प्रोफेसर हैं। वर्तमान में विश्वविद्यालय के प्रोफेसर और वालिस एनेनबर्ग चेयर प्रोफेसर ऑफ कम्युनिकेशन टेक्नोलॉजी एवं सोसाइटी ऑफ एनबर्ग स्कूल ऑफ कम्युनिकेशन, यूनिवर्सिटी ऑफ सैदर्न कैलिफोर्निया, लॉस एंजिल्स में हैं। वह समाजशास्त्र के प्रोफेसर एमेरिटस एवं कैलिफोर्निया विश्वविद्यालय, बर्कले में शहरी एवं क्षेत्रीय योजना के प्रोफेसर एमेरिटस हैं, जहां उन्होंने 24 साल तक अध्यापन कार्य किया। कास्टेल्स सेंट जॉन्स कॉलेज, कैम्ब्रिज विश्वविद्यालय के एक अध्येता भी रहे हैं। साथ ही कास्टेल्स ने नेटवर्क सोसाइटी, कॉलेज ऑफ मोडियल स्टडीज, पेरिस की अध्यक्षता भी की।

सामाजिक विज्ञान उद्धरण सूचकांक के 2000 से 2014 के अनुसंधान सर्वेक्षण ने कास्टेल्स को दुनिया के सर्वश्रेष्ठ पांचवे पायदान के सामाजिक विज्ञान के विद्वान और अग्रेतर संचार विद्वान के रूप में नामित किया है। कास्टेल्स को 'नेटवर्क समाज' में शहरी और वैश्विक अर्थव्यवस्थाओं की राजनीतिक गतिशीलता की अवधारणा को आकार देने के लिये 2012 के होलबर्ग पुरस्कार से सम्मानित किया गया था। सन् 2013 में उन्हें समाजशास्त्र के लिये बलजान पुरस्कार से

* सहायक आचार्य, समाजशास्त्र विभाग, जननायक चन्द्रशेखर विश्वविद्यालय, बलिया।

सम्मानित किया गया था।'

मैनुअल कास्टेल्स का जीवन परिचयः–

मैनुअल कास्टेल्स ने अपना प्रारम्भिक अध्ययन–अध्यापन एवं जीविकोपार्जन का कार्य 'ला मंच' से प्रारम्भ किया, लेकिन बाद में वह बार्सिलोना चले गए, जहां उन्होंने कानून और अर्थशास्त्र का अध्ययन किया।

एक रूढ़िवादी परिवार में जन्म लेने के कारण वे रूढ़िवादिता से अत्यन्त चिन्तित थे। कास्टेल्स कहते हैं कि ''मेरे माता–पिता बहुत अच्छे माता–पिता थे। मेरा परिवार एक दृढ़ रूढ़िवादी परिवार था लेकिन मैं कहूंगा कि मेरे माता–पिता के अलावा मेरे चरित्र को आकार देने वाली मुख्य बात यह थी कि मैं फासिस्ट स्पेन में पला–बढ़ा हूँ। युवा पीढ़ी के लोगों के लिये यह समझना मुश्किल है कि स्पेनिश युवा पीढ़ी इस स्थिति को किस आशय से देखती और समझती है। वास्तव में आपके पास अपने स्वयं के एवं अपने सम्पूर्ण वातावरण के विरोध करने के अतिरिक्त और कुछ भी नहीं था, विशेषकर उस स्थिति में जब आप खुद पंद्रह या सोलह वर्ष के हो और आपको स्वयं का राजनीतिकरण करना पड़े।''

कास्टेल्स फ्रांस में चल रहे छात्र विरोधी 'फ्रेंको आन्दोलन' में राजनीतिक रूप से सक्रिय थे, परन्तु एक किशोर की राजनीतिक सक्रियता फ्रांस के सरकार को रास नहीं आई। वे कास्टेल्स को देशद्रोही के रूप में देखने लगे और उनके साथ देशद्रोहियों की तरह व्यवहार करना शुरू कर दिए। परिणामस्वरूप कास्टेल्स फ्रांस से स्पेन भागने को मजबूर हो गए। कास्टेल्स ने 20 वर्ष की आयु में अपनी स्नातक की पढ़ाई पेरिस में ही रहकर पूरी की। आगे की पढ़ाई के लिये उन्होंने पेरिस विश्वविद्यालय में प्रवेश लिया जहाँ उन्होंने समाजशास्त्र विषय में डॉक्टर की उपाधि प्राप्त की। कास्टेल्स ने सन् 1964 में सोरबोन से स्नातक की उपाधि और 1967 में पेरिस विश्वविद्यालय से पी–एच०डी० की उपाधि प्राप्त की। 24 वर्ष की आयु में कास्टेल्स लगभग 1967 से 1979 तक के बीच कई बार पेरिस विश्वविद्यालय में प्रशिक्षक बने। ये पहली बार पेरिस एक्स यूनिवर्सिटी नानट्रे (जहां कास्टेल्स ने डैनियल कोहन–बेंदित को पढ़ाया) में जब उन्हें प्रशिक्षक के रूप में नियुक्ति प्राप्त हुई तब उन्हें छात्र–विरोध का सामना करना पड़ा और अन्ततः उन्हें 1968 में निकाल दिया गया। इसके पश्चात् वे 1970 से 1979 तक "School of Higher Studies in Social Sciences" में प्रशिक्षक के रूप में पुनः नियुक्त हुए। 1979 में कैलिफोर्निया विश्वविद्यालय, बर्कले ने कास्टेल्स को समाजशास्त्र के प्रोफेसर एवं नगरीय एवं क्षेत्रीय नियोजन के प्रोफेसर के रूप में नियुक्त किया।

2003 में कास्टेल्स दक्षिण कैलिफोर्निया विश्वविद्यालय के एनबर्ग सम्प्रदाय के संचार विज्ञान के प्रोफेसर के रूप में जुड़े तथा संचार एवं प्रौद्योगिकी विभाग के प्रथम विभागाध्यक्ष बने। कास्टेल्स दक्षिण कैलिफोर्निया विश्वविद्यालय के 'पब्लिक डेप्लोमेसी' संस्था के संस्थापक सदस्य हैं, कूटनीति केन्द्र के संकाय सलाहकार परिषद के एक वरिष्ठ सदस्य हैं और एनबर्ग अनुसंधान नेटवर्क के अन्तरराष्ट्रीय संचार संस्थान के सदस्य भी हैं। कास्टेल्स का सम्पूर्ण जीवन स्पेन और

यूनाइटेड स्टेट में व्यतीत हुआ। 2008 से अब तक वह European Institute of Innovation and Technology के सलाहकार बोर्ड के सदस्य हैं। कास्टेल्स जनवरी 2020 से स्पेन में विश्वविद्यालयों के मंत्री के रूप में कार्य कर रहे हैं।

मैनुअल कास्टेल्स का अध्ययन क्षेत्रः–

मैनुअल कास्टेल्स के समाजशास्त्रीय अध्ययन का केन्द्र बिन्दु नगरीय समाजशास्त्र संगठन अध्ययन, इंटरनेट अध्ययन, सामाजिक आन्दोलन, संस्कृति का समाजशास्त्र और राजनीतिक अर्थव्यवस्था के संयोजन के साथ अनुभवजन्य अनुसंधान साहित्य को संश्लेषित करता है।

नेटवर्क समाज की उत्पत्ति के बारे में उनका मानना है कि उद्यम का नेटवर्क के रूप में परिवर्तन होने से इलेक्ट्रानिक इंटरनेट तकनीकों का जुड़ाव नेटवर्क संगठन के स्वरूपों से जुड़ा एक पूर्वानुमान होता है। इसके अतिरिक्त कास्टेल्स ने चतुर्थ विश्व (Fourth World) शब्द को गढ़ा जिसमें उप–जनसंख्या को सामाजिक रूप से वैश्विक दुनिया से पृथक रखा गया हैं। सामान्यतः इस विश्व का वर्णन समकालीन औद्योगिक समाज द्वारा निर्मित आदर्श से परे जीवन जीने के खानाबदोश, देहाती और शिकारी तरीके को दर्शाने के लिए किया गया है।

बीसवीं सदी के कई महा– आख्यानों में से एक है **'सूचना युग'**। मैनुअल कास्टेल्स ने अपनी तीन खण्डों में फैली हुई विस्तृत रचना The Rise of Network Society- The Power of Identity, End of Millennium में यही आख्यान पेश किया है। उनके विमर्श में सूचना युग एक ऐसे विचार की तरह उभरता है जो बीसवीं सदी और उसकी अतीत हो चुकी उपलब्धियों के बाद भी बचा रह गया है।

कास्टेल्स का कहना है कि सूचना युग ''मन की शक्ति को उजागर करता है, जो नाटकीय रूप से व्यक्तियों की उत्पादकता को बढ़ाएगा और अधिकाधिक अवकाश की ओर ले जाएगा, जिससे लोग **'वृहद अध्यात्मिक और तीव्र पर्यावरणीय चेतना'** प्राप्त कर सकेंगे।'' इस तरह का बदलाव सकारात्मक होगा। कास्टेल्स का तर्क है कि इससे संसाधन की खपत कम होगी। सूचना युग, उपभोग की बढ़ती प्रवृत्ति और नेटवर्क समाज यह तीनों वर्तमान जीवन में आधुनिक समाज का वर्णन करने और आधुनिक समाज के भविष्य को चित्रित करने का प्रयास कर रहे हैं। जैसा कि कास्टेल्स का सुझाव है, समकालीन समाज को 'मशीन के पुरातन रूप को नेटवर्क के साथ प्रतिस्थापित करने' के रूप में वर्णित किया जा सकता है।

1970 के दशक में, एलेन तोरेन (कास्टेल्स के बौद्धिक जनक) के बौद्धिक पथ का अनुसरण करते हुए कास्टेल्स ने मार्क्सवादी दृष्टिकोण से नगरीय समाजशास्त्र की विविधता का अध्ययन किया, जो नगर के संघर्षपूर्ण परिवर्तन में सामाजिक आंदोलनों की भूमिका पर केन्द्रित है। इसी संदर्भ में कास्टेल्स ने **'सामूहिक उपभोग'** (सार्वजनिक परिवहन, सार्वजनिक आवास इत्यादि) की अवधारणा को प्रस्तुत किया, जिसमें राज्य के हस्तक्षेप के माध्यम से आर्थिक एवं राजनीतिक स्तर के संघर्षों तक विस्थापित होने वाले सामाजिक संघर्षों की एक विस्तृत श्रृंखला थी। 1980 के

दशक के प्रारम्भ में मार्क्सवादी संरचनाओं को पार करते हुए उन्होंने अर्थव्यवस्था के पुनर्गठन में नई तकनीकों की भूमिका पर अपना ध्यान केन्द्रित किया। 1989 में कास्टेल्स ने अर्थव्यवस्था के संदर्भ में समय और दूरी के समन्वय के लिये उपयोग की जाने वाली वैश्विक सूचना नेटवर्क के अभौतिक तत्वों एवं उपकरणों के लिये **'प्रवाह के स्थान'** (Space of Flows) की अवधारणा को प्रस्तुत किया। 1990 के दशक में कास्टेल्स ने The Information age : Economy Society and Culture' में जटिल शोध को एक त्रयी के रूप में प्रस्तुत किया, जिसमें "The Rise of the Network Society" (1996). "The Power of Identity" (1997) "End of Millennium" (1998) सम्मिलित है। दो वर्ष बाद, दुनिया भर के विश्वविद्यालयों की संगोष्ठियों में इस त्रयी को अत्यधिक लोकप्रियता एवं स्वीकृति प्राप्त हुई, जिससे प्रेरित होकर इसके दूसरे संस्करण (2002) को कास्टेल्स ने प्रकाशित किया जो पहले संस्करण (1996) से 40 प्रतिशत भिन्न है।

The Information Age Economy, Society and Culture तीन समाजशास्त्रीय आयामों का निर्माण करती है– उत्पादन, शक्ति और अनुभव। इस संदर्भ में यह तथ्य महत्वपूर्ण है कि अर्थव्यवस्था का संगठन, राज्य और उससे सम्बन्धित संस्थाओं एवं जिस तरह से दैनिक जीवन को अर्थ प्रदान करता है वे सामाजिक गतिशीलता के अप्रासंगिक स्रोत हैं। इसे असत्त और अन्तर्सम्बन्धित संस्थाओं के रूप में समझा जाना चाहिए। इसके अतिरिक्त, कास्टेल्स राज्य की भूमिकाओं पर बल देते हुए इंटरनेट के विकास के विश्लेषण के साथ एक स्थापित साइबरनेटिक संस्कृति के सिद्धान्तकार बने, जिसमें राज्य सामाजिक आंदोलनों और व्यापार की भूमिकाओं को उनके हितों के अनुसार आर्थिक बुनियादी ढांचे को आकार देने पर जोर दिया गया है। उनका कहना है कि हमारा **'समाज सामाजिक सम्बन्धों के जाल'** (Net) एवं **'स्व'** (Self) के द्विध्रुवी विरोध के समक्ष तेजी से संरचित है। जहाँ **'नेट'** सामाजिक संगठनों के प्रमुख रूप में क्षैतिज एकीकृत पदानुक्रमों के स्थान पर नेटवर्क संगठनों को दर्शाता है, वहीं 'स्व' एक सामाजिक स्वरूप के परिवर्तित सांस्कृतिक परिदृश्य में सामाजिक पहचान और अर्थ का उपयोग करने वाले प्रथाओं का निरूपण करता है।

कास्टेल्स वर्तमान सामाजिक परिदृश्य को सूचना युग के रूप में परिभाषित करते हैं, जिसमें मानव समाज एक नए तकनीकी प्रतिमान में अपनी गतिविधियों का प्रदर्शन करता है। कास्टेल्स तर्क देते हैं कि इस परिदृश्य को सूचना एवं संचार प्रौद्योगिकी की क्रांति के द्वारा 20वीं शताब्दी के उत्तरार्ध में लाया गया था। कास्टेल्स एक ऐसे महत्वपूर्ण सिद्धान्तकार हैं, जिन्होंने नयी सूचना एवं संचार प्रौद्योगिकी को विश्लेषित किया और इसके तीन मुख्य विशेषताओं–**नेटवर्क तर्क, कालातीत काल** एवं **प्रवाह के स्थान** को प्रस्तुत किया है, जो केवल मीडिया और समाज की अन्तःक्रिया में दिखलाई देता है। इसलिए कास्टेल्स सूचना एवं संचार प्रौद्योगिकी को अपने सूचना समाज के सिद्धान्त के अन्तर्गत एक पद्धति के रूप में प्रयोग करते हैं।

कास्टेल्स के अनुसार– सूचना समाज में बाजार वास्तविक समय के आधार पर संचालित होता है। पूँजी विभिन्न अर्थतंत्रों के बीच घंटो, मिनटों और सेकेंडों में तेजी से आती–जाती है। बड़े

पैमाने पर होने वाले उत्पादन का समय क्रम और जीवन चक्र, उसकी जैविक और सामाजिक लय महत्वहीन हो जाती है। वृद्धावस्था और मृत्यु भी अपनी अनुष्ठानिकता खो देती है। वृद्ध लोगों की गिनती का तरीका बदल जाता है। उन्हें जल्दी रिटायर हो जाने वालों, वक्त पर रिटायर होने वालों, अवकाश ग्रहण के बाद भी काम कर सकने वाले बुजुर्गों में बाँट कर देखा जाने लगता है। अधिक आयु वाली इन श्रेणियों का जोड़–तोड़ करके तरह–तरह के समुच्चय बनाये जाते हैं। मीडिया को आकर्षित करने वाली घटनाएँ भी अपनी आंतरिक क्रमबद्धता खो कर एक जैसी सांसारिकता के दायरे में देखी जाने लगती है। कास्टेल्स निष्कर्ष निकालते हैं कि क्रम या सिलसिले के खत्म होते ही ऐसे समय की रचना होती है जो समरूप होता है, यानि जिसमें अलग–अलग परतें नहीं होती, यानि जो शाश्वत होता है।

मार्शल मैक्लुहान ने कास्टेल्स के सूचना समाज की अवधारणा पर टिप्पणी करते हुए कहा है कि कास्टेल्स का सूचना समाज पश्चिमी विज्ञान तंत्र के सबसे पुराने मिथकों में से एक है एवं कभी न रुकने वाली मशीन का शिकार नजर आता है। आधुनिक विज्ञान के आधार में न जाने कब से एक ऐसी मशीन की खोज निहित है, जिसमें कोई घर्षण नहीं होगा और जो किसी भी तरह के पैमाने के मातहत नहीं होगी। वस्तुतः आधुनिक विज्ञान दो तरह के रूप को अपनाता है : **ऊर्जा आधारित** और **सूचना आधारित**। कास्टेल्स ऊर्जा–विज्ञान की उपेक्षा करते हैं और इसी कारण उनका सूचना समाज साहित्यालोचक **फ्रेंक कारमोड** के शब्दों में **'समाप्ति के बोध'** से कतराता हुआ अपने युगांत की समझ से वंचित हो जाता है।

काल– चिंतन की दृष्टि से औद्योगिक समाज और सूचना समाज का फर्क समझ लेना भी जरूरी हैं। औद्योगिक समाज **टेलर** द्वारा प्रवर्तित काल की यांत्रिक धारणा और **रोथलिस बर्गर** द्वारा प्रवर्तित काल की मानवीय सम्बन्धों पर आधारित धारणा (समुदायों, अनौपचारिकता, रोजमर्रा के प्रतिरोध का काल) के बीच सक्रिय रहा है। इसके विपरीत कास्टेल्स पारिस्थितिकीय समय (सुदीर्घ और विकासमान) के बीच कार्यरत हैं। कास्टेल्स परिस्थितिकीय समय की धारणा समाजशास्त्री लैश और उरो से उधार लेते हैं। कास्टेल्स को लगता है कि आज का समय पारिस्थितिकीय आंदोलनों का है। उनके अनुसार पारिस्थितिकीय चिंतन का तात्पर्य है मनुष्य और प्रकृति के बीच सम्बन्धों को दीर्घकालीन नजरिये से देखना। यह दृष्टि एक नयी जैविक अस्मिता गढ़ने में मदद कर सकती है, जिसके तहत कोई प्रजाति अपनी अस्मिता और एकता में मिलकर ही समग्र बन सकती है। साथ ही कास्टेल्स की दृष्टि में यह भी साफ हैं कि पारिस्थितिकीय समय कोई रहस्यमय अथवा प्रौद्योगिकी विरोधी अवधारणा नहीं है। वे इस समय को **'विज्ञान आधारित आन्दोलन'** के माध्यम से पारिस्थितिकीय संतुलन की खोज के रूप में देखते हैं। उनका कहना है कि पर्यावरण आंदोलन की कामयाबी इस बात पर काफी कुछ निर्भर है कि वह संचार की नयी प्रविधियों पर कितनी कुशलता से महारत हासिल करता है। कास्टेल्स की यह थीसिस उस समय काफी मजबूत लगने लगती है, जब **ग्रीनपीस फूड फर्स्ट फ्रेंड्स ऑव अर्थ, द रेन फॉरेस्ट एक्शन नेटवर्क** जैसे पर्यावरण के लिये संघर्षरत संगठनों के इलेक्ट्रानिक संचार कौशल का पहलू सामने आता है। मुश्किल यह है कि कास्टेल्स की यह

समझ बेहतरीन होने के बाद भी अंततः पश्चिम केन्द्रीय ही साबित होती हैं। वे उस दुनिया की बातें करते हैं, जिसमें सबके पास टीवी है। वे पर्यावरण आंदोलन को विज्ञान सम्मत मानते हैं। उनके ख्याल से यह आंदोलन प्रकृति को मानव जीवन के लिये उपयोगी मशीन के रूप में फिर से स्थापित करने की कोशिश है, पर वे यह भूल जाते हैं कि पर्यावरण आंदोलन का असली मुद्दा प्रकृति के साथ तारतम्यता न होकर अपना वजूद बनाए रखने के लिये संघर्ष का है।

कास्टेल्स की सैद्धान्तिक परिकल्पना–

कास्टेल्स ने अपनी सैद्धान्तिक परिकल्पना **'नेट'** और **'सेल्फ'** (स्व) के मध्य हो रहे द्वन्द्वात्मक विरोध के रूप में प्रस्तुत की है, जो दो सैद्धान्तिक मान्यताओं के वास्तविक और शक्तिशाली संयोजन पर आधारित है। वास्तव में कास्टेल्स का मुख्य तर्क यह है कि इस सदी के अंत में पूँजीवाद का एक नया रूप उभरा है, जो अपने चरित्र में वैश्विक, अपने लक्ष्यों में कठोर एवं अपने पूर्ववर्तियों की तुलना में बहुत अधिक लचीला हैं। इस पूँजीवादी व्यवस्था को सांस्कृतिक विशिष्ठता, दैनिक जीवन और पर्यावरण पर नियंत्रण के लिये सामाजिक आंदोलनों के माध्यम से सम्पूर्ण विश्व जगत में चुनौती दी जा रही है। यह तनाव सूचना युग को केन्द्रीय गति प्रदान करता है, क्योंकि हमारा समाज नेट और स्व के द्विध्रुवी विरोध के समक्ष तेजी से संरचित हो रहा है, यहाँ नेट का तात्पर्य नेटवर्क संचार मीडिया के व्यापक उपयोग के आधार पर निर्मित नए संगठनात्मक संरचनाओं से है। नेटवर्क पैटर्न उच्च आधुनिकी आर्थिक क्षेत्रों, उच्च प्रतिर्स्पधी निगमों के साथ–साथ सामुदायिक और सामाजिक आंदोलनों की प्रमुख विशेषता है। वहीं स्व उन गतिविधियों का प्रतीक है जिनके माध्यम से समाज के सदस्य संरचनात्मक परिवर्तन और अस्थिरता की स्थितियों के तहत अपनी पहचान को पुनः पुष्टि करने का प्रयास करते हैं, जो सामाजिक और आर्थिक गतिविधियों के संगठन के साथ गतिशील नेटवर्क में चलायमान है।

नेट और स्व की प्रस्थापना की विवेचना के पश्चात् कास्टेल्स ने फ्रांसीसी समाजशास्त्री **ऐलन तुरैन** जो कि सामाजिक आंदोलनों के अध्ययन से निकटता से जुड़े थे, से प्रभावित होकर तीन प्रकार के पहचानों (Identification) की व्याख्या प्रस्तुत की है, जो विभिन्न सामाजिक संगठनों से सम्बन्धित है–

1– वैधानिक पहचान (Legitimizing Identity)

इस प्रकार के पहचान की प्रमुख विशेषता सामाजिक कर्ताओं पर समाज के प्रमुख संगठनों द्वारा अपने वर्चस्व तथा तर्कसंगतता को स्थापित करना है। वस्तुतः वैधानिक पहचान से सभ्य समाज और उनसे सम्बन्धित संस्थाएं निर्मित होती है जिसे मैक्स वेबर ने कहा है।

2– प्रतिरोध पहचान (Resistance Identity)

यह पहचान उन कर्ताओं द्वारा निर्मित है जो समाज द्वारा निर्मित वर्चस्व के तर्क द्वारा बाहर किए जाने की स्थिति में है। प्रतिरोध पहचान उत्पीड़न अथवा असहनीय स्थितियों का सामना करने के तरीके के रूप में समाज अथवा समुदाय के गठन की ओर ले जाती है।

3– परियोजना पहचान (Project Identity)

सक्रिय आंदोलन, जिसका उद्देश्य विद्यमान सामाजिक व्यवस्था को परिवर्तित करना है। मात्र अभिजात वर्ग के विरोध में अपने को पहचान देने के लिये अस्तित्ववान है। नारीवाद और पर्यावरणवाद इसी श्रेणी के पहचान के अन्तर्गत सम्मिलित हैं ।

उपर्युक्त बिन्दु यह बतलाते हैं कि कास्टेल्स की विशेष उपलब्धि दो सैद्धान्तिक दृष्टिकोणों (नेट व स्व) को मिश्रित करना है, जो परस्पर आश्रित और वास्तविक है। वास्तव में कास्टेल्स का सिद्धान्त अन्य पूर्ववर्ती सिद्धान्तों से पृथक एवं मौलिक है। सूचना युग किसी सिद्धान्त का वर्णन नहीं करता अपितु यह अभ्यास का विश्लेषण करके संचार सिद्धान्त की व्याख्या करता है। अध्ययन की यह पद्धति कास्टेल्स को सुसंगत रूप से एक प्रभावशाली अध्ययन क्षेत्र को समाहित करने में सक्षम बनाती है। उदाहरणस्वरूप – सिलिकॉन वैली की उच्च तकनीक प्रयोगशालाओं से कोलम्बियाई जंगल की निम्न तकनीक प्रयोगशालाओं तक, वैश्विक पूँजीवादी बाजारों से टोक्यो मैट्रो प्रणाली पर हुए आतंकवादी हमले तक एवं उससे भी आगे तक। कास्टेल्स का यह द्वय दृष्टिकोण उसके विश्लेषण को अत्यधिक मजबूती प्रदान करता है। वहीं पहचान की व्याख्या के अन्तर्गत कास्टेल्स ने सामाजिक कर्ताओं पर समाज के वर्चस्व एवं तर्क संगतता, समाज द्वारा निर्मित वर्चस्व का तर्क द्वारा प्रतिरोध एवं सक्रिय आंदोलन के माध्यम से व्यवस्था को परिवर्तित करने पर बल दिया है।

कास्टेल्स ने **'सूचना युग'** (The Information age) में सामाजिक विकास के नए चरण के आने की घोषणा की है। वह इसे सूचना युग या सूचनावाद कहता है और यह मानता है कि इस युग का पदार्पण पिछले दो चरणों के बाद आता है। वह दो चरण है–**पूर्व उद्योगवाद** और **उद्योगवाद।** सूचनात्मकता अनिवार्य रूप से पिछले औद्योगिक चरण से भिन्न है। विकास के प्रत्येक प्रणाली (Mode) में एक संरचनात्मक रूप से निर्धारित प्रदर्शन सिद्धान्त होता है जिसके चारों ओर तकनीकी प्रक्रियाओं का आयोजन होता है। उद्योगवाद आर्थिक विकास की ओर उन्मुख होता है, जो अधिकतम उत्पादन की नींव पर खड़ा है। सूचनावाद तकनीकों विकास की ओर उन्मुख है, वही तार्किक विकास ज्ञान के संचय एवं सूचना प्रसंस्करण में जटिलता के उच्च स्तर की ओर बढ़ रहा है।

हालांकि कास्टेल्स का मानना है कि सूचना प्रसंस्करण और उसके उत्पादन दोनों पर ध्यान केन्द्रित न करके उत्पादन पर ध्यान केन्द्रित करने से उत्पादन और भी अधिक बढ़ जाता है। जबकि ज्ञान का उच्च स्तर सामान्य रूप से इनपुट के प्रति इकाई के उत्पादन स्तर से अधिक हो सकता है, जो कि सूचनावाद के अन्तर्गत तकनीकी उत्पादन कार्य की विशेषता को दर्शाता है। इसलिए कास्टेल्स के अनुसार, मानव अथवा सामाजिक विकास एक दिशा में गतिमान होता है और यह दिशा प्रभावशीलता की ओर अग्रसर है। प्रत्येक अग्रमुखी चरण प्रदर्शन की प्रभावशीलता में अपने पूर्ववर्ती चरण को अपने में समाहित कर लेता है। प्रभावशीलता के इस उदय को कैसे प्राप्त किया जाता है? कास्टेल्स का तर्क है कि सूचना युग एक ऐतिहासिक काल है, जिसमें

मानव समाज अपने चारों ओर गठित माइक्रो इलेक्ट्रानिक आधारित सूचना/संचार प्रौद्योगिकी एवं आनुवंशिक अभियांत्रिकी तकनीकी प्रतिमान में अपनी सामाजिक क्रियाओं का निर्वहन करते हैं। इसका तात्पर्य यह है कि सूचना प्रौद्योगिकी से आनुवांशिक अभियांत्रिकी प्रौद्योगिकी तक की सभी वर्तमान प्रौद्योगिकियां अपने मूल में सूचना की प्रक्रिया है। यह बिन्दु कास्टेल्स को इस निष्कर्ष पर ले जाता है कि, सूचना के संदर्भ में समकालीन समाज और उसके पूर्ववर्ती समाजों के बीच अंतर केवल मात्रात्मक नहीं अपितु गुणात्मक है। इस स्थिति की व्याख्या करने के लिये कास्टेल्स ने सूचना समाज एवं सूचनात्मक समाज के मध्य अंतर को निम्नवत् प्रस्तुत किया है–

'सूचना समाज' समाज में सूचना की भूमिका पर जोर देता है, परन्तु मेरा तर्क यह है कि सूचना अपने व्यापक अर्थ में, ज्ञान के संचार के रूप में सभी समाजों में महत्वपूर्ण रही है। उदाहरणार्थ, मध्यकालीन यूरोप, जो सांस्कृतिक रूप से संरचित एवं कुछ हद तक एकीकृत व साथ ही एक बौद्धिक ढांचे के रूप में विद्यमान था।

इसके विपरीत **'सूचनात्मक समाज'** सामाजिक संगठन के एक विशिष्ठ स्वरूप की विशेषता को इंगित करता है, जिसमें सूचना उत्पादन, प्रसंस्करण, एवं प्रसारण इस ऐतिहासिक अवधि में उभरती हुई नई तकनीकी स्थितियों के कारण उत्पादकता और शक्ति के मूलभूत स्रोत बन जाते हैं।

इस प्रकार, समकालीन समाज को यथोचित सूचनात्मकता कहा जा सकता है, क्योंकि सूचना उत्पादकता का मुख्य स्रोत उत्पादन एवं उत्पादन के मुख्य साधन हैं। हालांकि, अपनी सभी महत्वपूर्ण कृतियों में कास्टेल्स ने **'सूचनात्मक'** शब्द का प्रयोग **'सामाजिक विश्व'** के कुछ स्थानों के लिये किया है, जबकि सम्पूर्ण समाज के लिये वह अधिकतर 'नेटवर्क समाज' शब्द का उपयोग करते हैं। कास्टेल्स कहते हैं कि नेटवर्क तर्क (Network Logic) समाज के नए स्वरूप की एक अन्य महत्वपूर्ण विशेषता है, परन्तु यह तर्क कहाँ से आता है? इस प्रश्न का उत्तर 'प्रौद्योगिकी' में निहित है, क्योंकि यह पूरी तरह से सूचना प्रसंस्करण प्रौद्योगिकियां हैं जो इलेक्ट्रानिक आधारित सूचना नेटवर्कों के सामाजिक संगठन और सामाजिक अन्तर्क्रिया के नये स्वरूपों के गठन की अनुमति देती हैं। इस प्रकार समाज की पूरी संरचना, कास्टेल्स के अनुसार, प्रौद्योगिकियों पर केन्द्रित है, या यहां तक कि प्रौद्योगिकी ही समाज हैं और प्रौद्योगिकी को समझे बिना समाज को नहीं समझा जा सकता है। परन्तु प्रौद्योगिकी हमें समाज को समझने में कैसे मदद करती है? इस प्रश्न का उत्तर पहले ही दिया जा चुका है कि समकालीन समाज सामाजिक विकास की प्रक्रिया का एक उत्पाद है। यह प्रदर्शन की प्रभावशीलता में अपने पूर्ववर्ती चरणों से भिन्न है। यह प्रभावशीलता प्रमुख तकनीकी प्रतिमान **'पदार्थ प्रसंस्करण से सूचना प्रसंस्करण'** में परिवर्तन के कारण प्राप्त होती है। इसके अलावा, नई प्रौद्योगिकियाँ न केवल समाज की क्षमता को बढ़ाती हैं बल्कि अपने स्वयं के प्रदर्शन के सिद्धान्त के अनुसार इसकी संरचना को आकार भी प्रदान करती हैं। इसका तात्पर्य यह है कि क्या कास्टेल्स प्रौद्योगिकी को सामाजिक विकास की प्रेरक शक्ति मानते हैं? इससे कास्टेल्स पर तकनीकी नियतिवादी होने का

आरोप लगाया जाता है, परन्तु कास्टेल्स अपने ऊपर तकनीकी नियतिवादी होने के आरोप को सिरे से खारिज करते हैं। फिर भी उनके सिद्धान्त में प्रौद्योगिकी और समाज का विलय कुछ महत्वपूर्ण सवाल उजागर करता है।

निष्कर्ष

उपर्युक्त तथ्यगत विश्लेषण से स्पष्ट है कि कास्टेल्स के सूचना युग का सिद्धान्त समकालीन समाज पर सूचना संचार तकनीक के प्रभाव से निर्मित आज का प्रभावपरक सिद्धान्त है। कास्टेल्स इस बात पर जोर देते हैं कि उनका यह सिद्धान्त वास्तव में समकालीन मीडिया के सिद्धान्त क्षेत्र को एक सामाजिक दायरे में लाने का अथक प्रयास है। कास्टेल्स के मन मस्तिष्क में **'सामाजिक विश्व'** का यह चित्र प्रौद्योगिकी द्वारा उत्पन्न समस्याओं पर कुछ नवीन दृष्टि निर्मित करता है। कास्टेल्स इस बिन्दु पर लगातार जोर देते हैं कि नई तकनीकी प्रतिमान सामाजिक परिवर्तन के प्राथमिक आयाम हैं। कुछ आलोचक कास्टेल्स पर तकनीकी नियतिवादी होने का आरोप भी लगाते हैं। स्वयं कास्टेल्स ने इन आरोपों को नकारा और यह घोषणा की कि तकनीकी ही समाज है और तकनीकी उपकरणों को समझे बिना समाज को नहीं समझा जा सकता है। तकनीकी समाज का निर्धारण नहीं करती, बल्कि समाज पर इसे लागू करती है। हालांकि कास्टेल्स की सूचना समाज की प्रमुख विशेषताओं के विश्लेषण से यह पता चलता है कि यह विरोधात्मक या विरोधाभास है। अर्थात् कास्टेल्स प्रौद्योगिकी को समाज का प्रतीक मानते हैं और समाज प्रौद्योगिकी आधारित उनके मीडिया सिद्धान्त का प्रतीक है।

कास्टेल्स ने सभी प्रकार के सामाजिक और सांस्कृतिक परिवर्तन के महत्व पर अधिक जोर नहीं दिया है, क्योंकि इन परिवर्तनों ने समकालीन वैश्विक पूंजीवादी, सामाजिक–आर्थिक स्थिति को विकसित होने में बाधा पहुंचाई हैं। कास्टेल्स के लिये 'स्थान और समय' महत्वपूर्ण है, हालांकि लचीली सूचनात्मक नेटवर्क व्यवस्था में ठोस पदानुक्रमित औद्योगिक सामाजिक संरचना के परिवर्तन को स्पष्ट करने के लिये मात्र अनुपात–लौकिक रूपांतरण पर्याप्त नहीं लगते हैं।

इस प्रकार कास्टेल्स ने अपने सिद्धान्त में समय और स्थान के साथ तीसरे आवश्यक तत्व के रूप में नेटवर्क तर्क को महत्त्वपूर्ण स्थान दिया है। इसे सबसे महत्वपूर्ण तत्व भी माना जा सकता है, क्योंकि कास्टेल्स का कहना है कि यह एक पूर्ववर्ती तत्व है, एक नई सामाजिक संरचना का उद्‌भव हमारे जीवन की भौतिक नींव, समय और स्थान के पुनर्परिवर्तन से जुड़ा हुआ है। अब प्रश्न यह उठता है कि क्या कास्टेल्स सामाजिक जगत में इन तीन तत्वों की खोज करते हैं? क्या कास्टेल्स अपने वादे के मुताबिक नेटवर्क समाज का सिद्धान्त प्रस्तुत कर पाए हैं? इस प्रश्न का जबाव आलोचकों ने निश्चित रूप से नहीं के रूप में दिया है। कास्टेल्स अपने सिद्धान्त में पूरे समाज को इंटरनेट की छवि और समानता के रूप में देखते है। उनका कहना है कि **''सभी प्रक्रियाएँ संगठनात्मक रूप से नेटवर्कों द्वारा निर्मित होती हैं।''** अन्य शब्दों में, सभी समकालीन प्रवाह आर्थिक, वित्तीय, वैयक्तिक आदि की पहचान एवं निर्माण सूचना के प्रवाह के प्रतिमानों द्वारा की जाती है और यदि सूचना का प्रसारण अधिकतर नए सूचना एवं संचार

तकनीकी के चैनलों में प्रसारित होता है, तो प्रसारित होने वाले संदेश मीडिया के स्वरूप और विशेषताओं को प्राप्त हैं, वे हैं– नेटवर्क तर्क, समयहीन समय और प्रवाह का स्थान। मूल में इसलिये कास्टेल्स के सूचना समाज के सिद्धान्त में मीडिया सिद्धान्त अन्तर्निहित है, जो तीन बिन्दुओं के आधार पर स्पष्ट होता है–

1– यह मीडिया सिद्धान्त मार्शल मैक्लुहान के सैद्धान्तिकरण का अनुसरण करता है, जहाँ मीडिया को संचार के उपकरण के रूप में न मानकर ऐसी तकनीक के रूप में जाना जाता है, जो मानव सम्बन्धों के प्रतिमान को परिवर्तित करते हैं।

2– नेटवर्क तर्क की अवधारणा पश्चिमी सभ्यता के विकेन्द्रीकरण की चुनौती के मैकलुहानियन विचार पर आधारित है। मैक्लुहान के अनुसार उनकी चुनौती का उचित उत्तर सामाजिक विश्व की केन्द्र परिधि की संरचना का विकेन्द्रीकरण है और कास्टेल्स यह सुझाव भी देते हैं कि समकालीन नेटवर्क आईसीटी समाज की नेटवर्किंग की मांग करता है।

3– नेटवर्क तर्क के अतिरिक्त नए मीडिया की दो अन्य महत्वपूर्ण विशेषताएं **'कालातीत समय'** और **'प्रवाह का स्थान'** है जो मैकलुहान के **'अनुगमन के सिद्धान्त'** का अनुसरण करता है। साथ ही समय और स्थान के परिवर्तन के कारण इलेक्ट्रानिक माध्यम द्वारा लेखन को एक प्रमुख माध्यम के रूप में प्रतिस्थापित करता है। निश्चित रूप से कास्टेल्स ने आने वाली नयी सूचना की पहचान करने के लिये तकनीकी क्रांति की अवधारणा को प्रस्तुत किया है, जो न केवल सामाजिक परिवर्तन का कारण बनी वरन् उसने यह बताया कि सामाजिक परिवर्तन के माध्यम से क्या हो सकता है एवं क्या होगा।

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BOOK REVIEW

Misra, K. S. (2024). *Critical thinking among teachers and students*. Agra: National Psychological corporation.

ISBN81-973165-4-8, pp. i -vii, 180.

There are fifteen empirical, 16 research papers and seven theoretical research articles are in this book.

Rihunlang Rymbai explained in detail the concept of critical thinking and its importance. Gagandeep Kaur and Manpreet Kour provided a framework on the concept of thinking critically while teaching or learning. They explained critical thinking skills in education processes and their importance. They opined that future teachers themselves must become critical thinkers first. They advocated employing specific strategies like- in-class discussions, problem-based learning, collaborative learning, discussion methods, questioning approaches, and evidence-based projects for developing critical thinking abilities among students.

In her chapter on 'Cognizing scientific inquiry through the lens of critical thinking – A confluence of ideas and intellect' Rakhi Sawlani discussed the concepts of critical thinking and various forms of scientific inquiry.

Monika Verma and Vijay Jaiswal discussed critical thinking in mathematics learning. Besides explaining the concept of critical thinking and importance in mathematics learning, they suggested some ways and approaches to improve critical thinking.

Ram Mehar discussed critical thinking in teacher education. *His focus was on theory and practice with emphasis on critical pedagogy through which learner could develop critical thinking with their peer group.*

S. P. Pandey discussed critical thinking for teaching ancient Indian history. He traced the historical roots of critical thinking from Ancient Greece, emphasizing its formalization in the 19th and 20th centuries. He elaborated the importance of history education in developing critical thinking skills, going beyond memorization to foster analytical thinking, evaluative reasoning, and empathetic understanding.

Arpita Kumar discussed critical thinking in Indian educational system and traced its evolution through the ages and its present status.

Abha Singh and Sohan Singh investigated the relationship between scientific creativity and critical thinking among senior secondary students. They found a positive relationship between fluency and critical thinking among boys but for girls no relationship was observed.

Suhrid Sinha, Ajay Kumar Singh, Mistu Bhattacharjee, Juli Sinha, and Saurav Sinha reported a comparative study of critical thinking among the graduates and postgraduates of Barak valley. Results indicate no significant differences in critical thinking abilities between graduate and postgraduate groups or among different genders.

Akanksha Singh and Anjali Dwivedi studied relationship between critical thinking and research aptitude among doctoral students of education. They found a positive correlation between research aptitude and four dimensions of critical thinking-objectivity, problem-solving, stance exploration, and information appraisal.

Amit Khanna studied critical thinking among teachers selected as principals of Govt. Inter Colleges of Uttar Pradesh.

Aruna Mathur concluded that post-graduate prospective teachers are superior to graduate prospective teachers on composite critical thinking as well as process and product dimensions of it.

K. S, Misra described the process of construction of Critical Thinking Inventory. It measures six dimensions of critical thinking namely- problem solving, stance exploration, search for evidence, objectivity, rationality, and information appraisal, its item analysis and standardization. Alpha reliability was .821 and split-half reliability was .754.

Priyanka Singh studied gender differences in critical thinking among B.Ed. students. Both male and female B.Ed. students were equal on critical thinking abilities.

Jyoti Gupta investigated the relationship between critical thinking and science achievement among 9th grade students. She found that students with high critical thinking excel those with moderate and low critical thinking on achievement in science, and critical thinking as well as all dimensions of it are positively related to achievement in science.

Madhuri Rathour investigated the relationship between critical thinking and personality traits among undergraduate students.

Sajad Ahmad Malik and S.A. Shaffi conducted a study on critical thinking among undergraduate students of different faculties. No differences were found between male and female students.

Nishta Rana conducted a study on critical thinking abilities among college students in relation to their residential backgrounds, type of institution and academic achievement. Her findings revealed that students from urban residential backgrounds exhibit stronger critical thinking abilities than their rural counterparts.

Prateek Upadhyay and Swangi compared critical thinking among secondary level teachers. They found that secondary level teachers of science stream have higher critical thinking ability than their Arts stream counterparts. However, no gender difference existed in critical thinking ability of teachers.

Ruchi Dubey and Shiv Singh conducted a study on critical thinking in relation to social intelligence among undergraduate students in reference to gender and stream. The study indicated existence of positive relationship between social intelligence and critical thinking among male, female, Arts stream, Science stream and Commerce stream undergraduate students.

Santosh Pal and K. S. Misra investigated the relationship between critical thinking skills and conflict management styles among adolescents, with a focus on gender and geographic location differences. Results revealed that most conflict management styles showed no significant correlation with critical thinking, but a negative relationship was found between the Obliging Style and critical thinking among adolescents with males showing stronger relationship between conflict management styles and critical thinking as compared to females.

Stuti Srivastava studied the relationship between critical thinking and scientific temper. She found a positive relationship between scientific temper and overall critical thinking as well as four dimensions of it namely-problem solving, stance exploration, search for evidence and objectivity.

Sujata Saha and Asha Pandey reported the results of an experimental study conducted to find out the impact of collaborative learning on critical thinking. Collaborative learning was found effective for developing problem solving among M.Ed. students.

On the whole, all the 23 chapters are worth reading. They can make one understand the concept of critical thinking. Perusal of empirical papers will empower the readers to formulate new problems for conducting research on correlates of critical thinking.

Prof Kalplata Pandey

Former Vice Chancellor

JNCU, Ballia

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