

Siddhinath Mahavidyalaya is extremely delighted with the manifesto of the publication of Shodhajyoti, an anthology of research papers from different disciplines of academia. This volume is the very first kind of research venture taken by the institution. The title denoting the meaning 'light of the research' expresses the prime object of publication: Illuminating the light of knowledge/consciousness (jnana) warding off the unconsciousness (ajnana). The invaluable contributions of erudite as well as potential researchers have flourished the saga of Shodhajyoti. Being a multi-disciplinary podium, it has churned variegated elements of research within it. It comprises thirteen research papers from the teachers of this institution. The holistic approach of this publication will decipher the new vistas of research and create an endless quest for Truth, the eternal knowledge.



Debanjan Maity has been teaching Sanskrit in the Department of Sanskrit, Siddhnath Mahavidyalaya, Purba Medinipur as an Assistant Professor since February, 2017. Previously he served Paltagarh Radharani Sikshamandir, Singur as an Assistant Teacher in Sanskrit (H/PG) for six long years. Now-a-days he is also associated with Department of Sanskrit, Jadavpur University as guest faculty for teaching Indian epigraphy.



Shodhajyoti

Dr. Debanjan Maity

Shodhajyoti

**An Anthology of Research Papers
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Mahavidyalaya**

Editor's Note

The Nature, the eternal cause of creation has always been directing her children dwelling in this world. From womb to tomb each activity of the man is cycled abiding by the rule of Nature. She has always been catering endless wealth, unconditional love and nourishment from the dawn of civilization. On the other hand men are reluctant before the wrath of nature. In recent past, the lethal Corona Virus weaponized by its chain of strains namely Corona, Delta, Omicron etc. made a vindictive sacrifice all over the world leaving humanity to existential crisis. There was no country left where Covid-19 did not emboss its deadly claws. The unprecedented lock-down policy has shattered socio-economic fabric of the counties for years to come. Despite absolute uncertainty of life men have combatted the pandemic by introducing life-saving vaccines. Alike previous maladies, this time too, the indomitable men have sung the victory song of life with the innovation in the medical science and technology. So to eliminate any present problem, profound exercise of modern as well as ancient knowledge system has become the part and parcel of modern academia. Besides knowledge makes us feel the change of world and helps excavate the mysteries of past. The ever-changing character of knowledge has made itself immortal as well as joyous. Ancient seers have seen knowledge (jnana) as eternal truth (*satyam jñānam anantam Brahma*)

Today Siddhinath Mahavidyalaya is extremely delighted with the manifesto of the publication of *Shodhajyoti*, an anthology of research papers from different disciplines of academia. This volume is the very first kind of research venture taken by the institution. The title denoting the meaning 'light of the research' expresses the prime object of publication: Illuminating the light of knowledge/consciousness (jñāna) warding off the unconsciousness (ajñāna). The invaluable contributions of erudite as well as potential researchers have flourished the saga of *Shodhajyoti*. Being a multi-disciplinary podium, it has churned variegated elements of research within it. It comprises thirteen research papers from the teachers of this institution. The holistic approach of this publication will decipher the new vistas of research and create an endless quest for Truth, the eternal knowledge.

The publication is a fruit of inspiration provided by Late Nirmal Chandra Maity Sir, founder of the Mahavidyalaya. Sri Maity, the former Headmaster of Shyamsundarpur Patna High School was a national teacher and an acclaimed academician. He nurtured the institution like his own ward from its inception and extended all kinds of co-operation for institutional development. This accomplished

personality set off on his journey towards heavenly abode on September 2020. With a heart laden with sorrow, we mourn for the departed soul of Sri Maity.

We sincerely thank Dr. Uma Ghosh, Principal and Sri Amitava Maity, President, Governing body for their patronage and constant support for this publication. The unsung heroes who directly/indirectly have contributed their whole-hearted efforts to shape this volume deserve kudos too.

We cherish a hope, *Shodhajyoti* will surely encompass the minds of connoisseurs with its all-pervading vivacity.

Debanjan Maity

Shyamsundarpur Patna, Purba Medinipur

22.12.2022

Bio note

Debanjan Maity has been teaching Sanskrit in the Department of Sanskrit, Siddhnath Mahavidyalaya, Purba Medinipur as an Assistant Professor since February, 2017. He is also associated with Department of Sanskrit, Jadavpur University as guest faculty for teaching Indian epigraphy.



He received UG, PG and Ph.D. degrees from Jadavpur University, Kolkata. The title of his Ph.D. dissertation is ‘Concept and Practices of the Disaster Management in Early India: Reflections in the Epics, Purāṇas, Technical Literature and Epigraphy’. Till date, he has published twelve papers in various journals of repute, edited volumes and bulletins. Several articles and one book are in press. He has presented papers in various national and international seminars /conferences like All India Oriental Conference (GU, KKKU) and International Vedanta Congress (JNU), 3rd International Conference on Vedic Science (Deccan College, Pune), the 18th World Sanskrit Conference etc. He was invited as speaker in four higher education institutions like Jadavpur University, Udayanaryanpur Madhabilata Mahavidyalaya, Surendranath College for Women, Nistarini College, Jangipur Collge, Gangadharpur Mahavidyamandir etcetera.

Debanjan’s research interest primarily encompasses the Indian epigraphy and related studies in Ancient Indian history, the environmental and socio-technical issues of early India reflected in early epics, canons, technical texts and archaeological findings. Reappraisal of early texts to enquire the solutions to present-day problems also comes under the arena of his research exercise.

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Evaluation of Seismicity around Barren Island Volcanic Region of Andaman and Nicobar Islands

Uma Ghosh

Abstract:

The spatial variation of *b-value* (of frequency-magnitude relation $\log N = a - bM$) of earthquakes, fractal dimension and energy release is mapped using gridding techniques in the Barren Island volcanic region, Andaman-Nicobar subduction zone. This volcanic Island stands in the midst of a volcanic belt on the edge of the Indian and Burmese tectonic plates and erupted recently on January 23, 2017. The Narcondam Island to the north is a dormant volcano; the Baratang mud volcano within the Andaman Island, on the other hand, got activated in 2003 and 2005.

In this study, some 2454 events $M_b \geq 4$ from the International Seismological Centre (ISC) catalogue, 1964-2014 have been selected. Although the *b-value* for whole region is estimated to be 0.94, The spatial variation of *b-value* as well as fractal dimension in the Barren volcanic area are higher than normal with lower energy release. The *b-value* cross-section map shows higher value beneath the volcanic regions at a depth of 50-60 km and higher fractal values at depth 80-100 km. Radiated energy is, however, much lower below the Barren and Baratang volcanic regions indicating higher stressed zone. Seismicity maps identify variable stressed zones, active faults and the zones of higher and lower energy release. The *b-value* and fractal dimension maps are comparable with these variable stressed zones and the active faults. The energy release map identifies the zones of higher and lower energy release indicating the zones of future probable large earthquake(s).

Keywords: Seismicity, volcano, *b-value*, Fractal dimension, Energy release.

Introduction:

The Andaman and Nicobar Island is one of the seismically most active subduction zone in the world and lie in zone V. The area has witnessed several large earthquakes in the past. These include $M 6.8$ in 1967, $M_w 6.2$ in 1982, $M_w 6.5$ in 2002 (Diglipur), the great Sumatra – Andaman earthquake of $M_w 9.1$ in 2004, $M_w 7.3$ in 2005, $M_w 6.3$ in 2006, two earthquakes of $M_w 6.1$ in 2007 and many aftershocks (<http://asc-india.org>). The Andaman and Nicobar Islands including the only volcanoes in India - Barren Island Volcano which has erupted in recent times and the other Narcondam (which is dormant), are located near the boundary of the Indian plate and the Burmese Microplate. The Andaman Trench marks this boundary and lies in the Bay of Bengal to the west of the archipelago. Another prominent feature is the north-south West Andaman fault which is strike-slip in nature and lies in the Andaman Sea, to the east of this island chain. The Andaman Sea, just like the Atlantic Ocean, is presently being widened by a tectonic process called "Sea Floor spreading". This is taking place along

undersea ridges on the seafloor. The Indian plate is diving beneath the Burmese Microplate along the Andaman Trench in a process known as "Subduction". Shallow and occasional intermediate-depth earthquakes delineate the subducted slab under the Andaman – Nicobar islands joining the seismicity trend of the Indo - Burman ranges (Fig.1). The subduction tectonics of the oceanic Indian lithosphere at the Andaman-Sumatra trench also results in intense seismic activity. The December 26, 2004 Sumatra earthquake (M_w 9.3), one of the largest in the world, occurred at the Sumatra subduction zone. The subduction extends to the north along the Burmese arc. The subduction of the Indian lithosphere along the Burmese arc, beneath the Indo-Burma region, is, however, a typical.

The seismicity in the region has been investigated by many authors (Banghar, 1987 ; Dasgupta and Mukhopadhyay , 1993; Dasgupta et al., 2003 ; Eguchi et al.,1979). Aftershock investigation of the past damaging earthquakes, such as 13 September 2002 Diglipur earthquake (M_w 6.4) (Kayal et al. , 2004) and the 26 December 2004 Sumatra-Andaman earthquake were made to study the seismotectonics of the region .

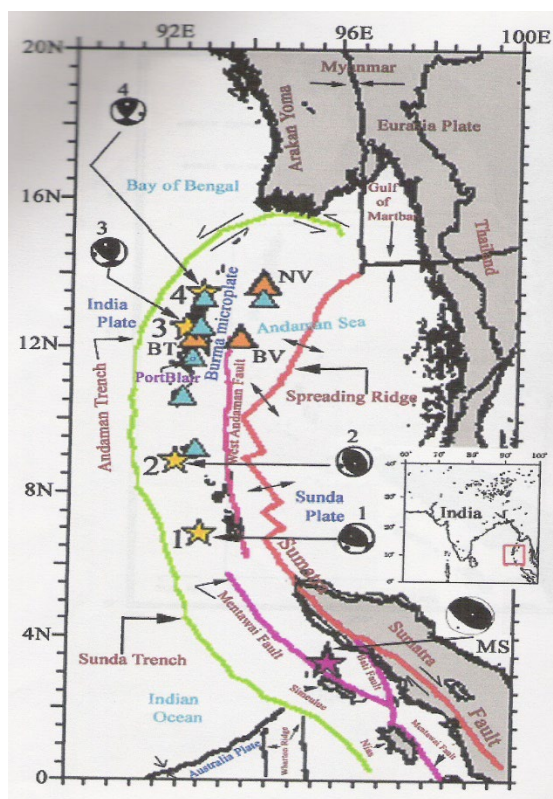


Fig.-1

The Andaman & Nicobar Island regions are highly populated, and seismically highly active. It is, therefore, of great interest to the geoscientists, seismologists and earthquake engineers to understand

the mechanism of the seismic events and their effects for designing earthquake resistant civil structures for planning of hazard free socio-economic projects.

Considering the societal implications of earthquake , it is important to know what kind of studies are being carried out and how to obtain the relevant information . Dissemination of information not only helps the community to face the calamity, but also leads to more efficient hazard management and mitigation.

Objectives:

- (1) Evaluation of seismic parameters like b-value, fractal dimension and energy release, and to map spatial variation of these parameters for comparison study.

ESTIMATION OF b-VALUE:

Maximum Likelihood Method

(Utsu, 1965 ; Aki, 1965)

$$b = \frac{\log_{10} e}{\bar{M} - M_c}$$

where \bar{M} is the average magnitude of events exceeding a threshold magnitude M_c for complete reporting of earthquake magnitudes and $\log_{10} e = 0.4343$. In this study, $M_c \geq 4.0$ is chosen (Fig.2).

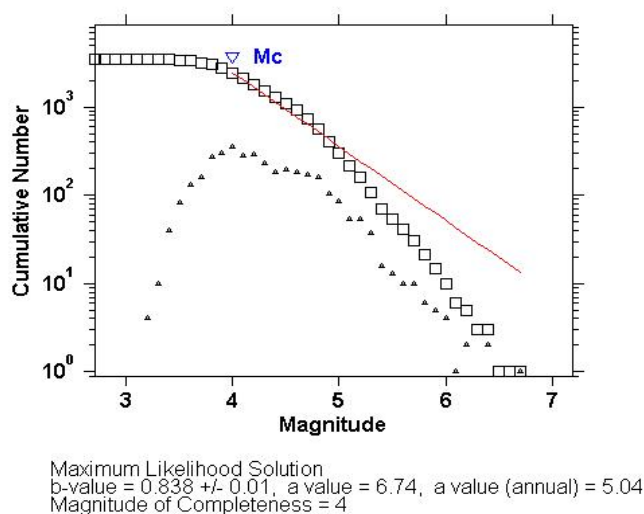


Fig.2 : A plot of cumulative number of earthquakes and magnitude; the threshold magnitude M_c 4.0 is marked.

ESTIMATION OF FRACTAL DIMENSION:

The fractal dimension of the spatial distribution of seismicity is calculated from the correlation integral given by Grassberger and Procaccia (1983):

$$D_{WT} = \lim_{r \rightarrow 0} \log(C_r) / \log r$$

where

$$C(r) = \frac{2}{N(N-1)} N_{(R < r)}$$

is the correlation function and $N_{(R < r)}$ is the number of pairs (X_i, X_j) with a smaller distance than r . If the epicenter distribution has a fractal structure, the following relation is obtained:

$$C(r) \sim r^D$$

where D is a fractal dimension, more strictly, the correlation dimension. Using this relation the fractal dimension of spatial distribution of the earthquakes will be calculated. By plotting $C(r)$ against r on a double logarithmic coordinate, the fractal dimension D can be obtained from the slope of the graph. The distance r between two events, (θ_1, ϕ_1) and (θ_2, ϕ_2) , will be calculated by using a spherical triangle as given by Hirata (1989):

$$r = \cos^{-1} (\cos \theta_1 \cos \theta_2 + \sin \theta_1 \sin \theta_2 \cos (\phi_1 - \phi_2))$$

The slope can be obtained by fitting a least-square line in the scaling region.

Calculation of Radiated Energy:

The energy release of an earthquake is an important quantity that describes the earthquake. Many studies, employing various methods, have attempted to use the observed seismograms for estimation of seismic energy (e.g. Gutenberg & Richter 1942, 1956 a, b; Bath 1966; Thatcher & Hanks 1973; Boatwright & Choy 1986; Singh & Ordaz 1994; Lindenfeld & Berckhemer 1995; Mayeda & Walter 1996). Analysis of cumulative energy release was originally made by Benioff (1951). The relation

between the magnitude m (body magnitude) and the radiated energy E given by Gutenberg and Richter (1956b) can be set up with less theoretical difficulty and a minimum of observational inaccuracy, takes the form : $\text{Log } E = 5.8 + 2.4 m$, where E is in ergs.

The radiated energy E of an earthquake is related logarithmically to the magnitude; it is, however, not clear either from the rate of occurrence or from the b -value what amount of energy is being released. The rate of energy release may be important in indicating changes in the magnitude of the seismogenic forces, changes in seismic efficiency, indicating the deviation of the energy release from a more-or-less constant long-term rate.

Data Treatment, Results and Discussion:

The Barren Island volcanic region stands in the midst of a volcanic belt on the edge of the Indian and Burmese tectonic plates and erupted recently on January 23, 2017. The Narcondam Island to the north is a dormant volcano; the Baratang mud volcano within the Andaman Island, on the other hand, got activated in 2003 and 2005. In this study, 2454 events $M_b \geq 4$ from the International Seismological Centre (ISC) catalogue, 1964-2014 were selected (Fig.3). Magnitude Histogram was shown in Fig.4.

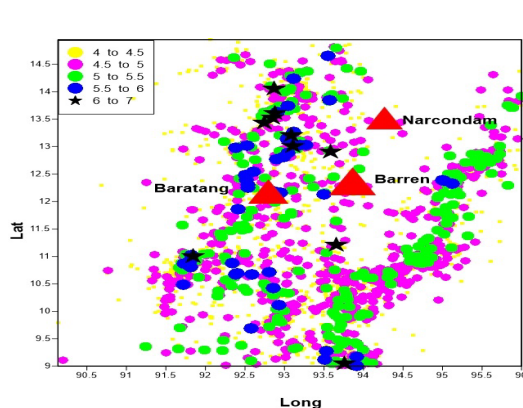


Fig.3 : Epicentre Map of Study Region (From 1964-2014).

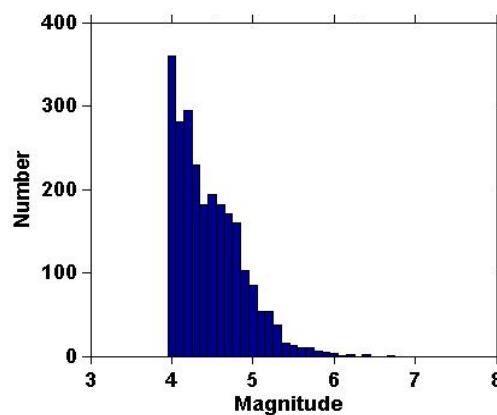


Fig.4: Magnitude Histogram.

In order to spatially map the estimated b -value, fractal dimension and energy release, the entire region was divided into $1^\circ \times 1^\circ$ grids with an overlapping of 0.5° . The b value, fractal dimension and energy release was calculated for each grid separately and taking centre of grid as the plotting point contour maps of b -value (Fig. 5), fractal dimension (Fig. 6) and energy release (Fig. 7) are prepared.

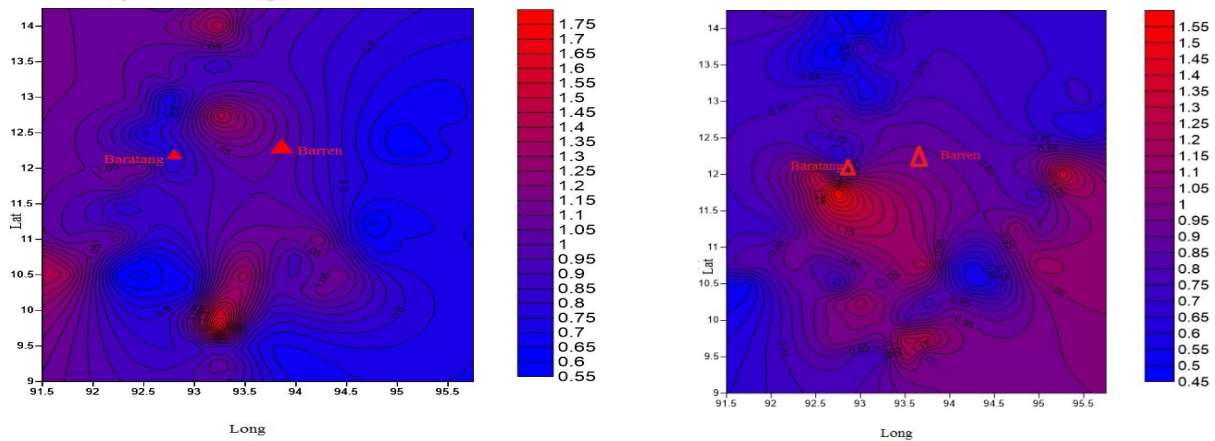


Fig. 5 : Map showing spatial variation of b -value by maximum likelihood method. Fig.6 : Map showing spatial variation of fractal dimension .

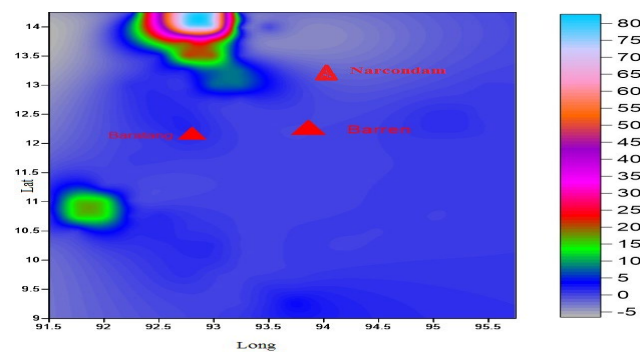


Fig.7 : Map showing spatial variation of Radiated Energy (in ergs).

Although the b -value for whole region is estimated to be 0.94, The spatial variation of b -value as well as fractal dimension in the Barren volcanic area are higher than normal with lower energy release. The b -value cross-section map (Fig. 8) shows higher value beneath the volcanic regions at a depth of 50-60 km and higher fractal values at depth 80-100 km (Fig. 9). Radiated energy is, however, much lower below the Barren and Baratang volcanic regions indicating higher stressed zone (Fig. 7). Seismicity maps identify variable stressed zones, active faults and the zones of higher and lower energy release. The b -value and fractal dimension maps are comparable with these variable stressed zones and the active faults. The energy release map identifies the zones of higher and lower energy release indicating the zones of future probable large earthquake(s).

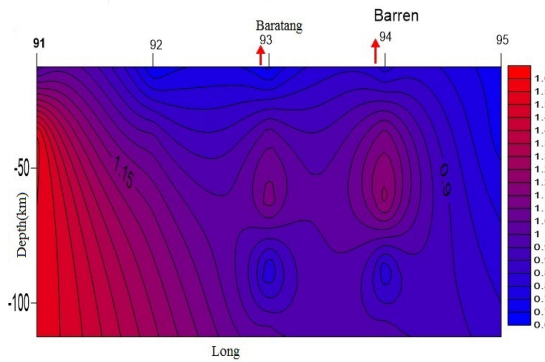


Fig.8 : b-value cross-section map.

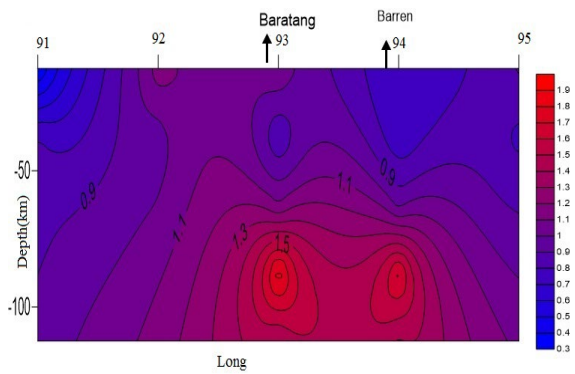


Fig.9 : Fractal Dimension cross-section map.

Conclusions:

- 1) The b -value for whole region is estimated to be 0.94, The spatial variation of b - value as well as fractal dimension in the Barren volcanic area are higher than normal with lower energy release.
- 2) The b -value cross-section map shows higher value beneath the volcanic regions at a depth of 50-60 km.
- 3) The fractal dimension cross-section map shows higher fractal values at depth 80-100 km.
- 4) Radiated energy is, however, much lower below the Barren and Baratang volcanic regions indicating higher stressed zone.
- 5) Seismicity maps identify variable stressed zones, active faults and the zones of higher and lower energy release. The b -value and fractal dimension maps are comparable with these variable stressed zones and the active faults. The energy release map identifies the zones of higher and lower energy release indicating the zones of future probable large earthquake(s).

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Concept of Sustainable Development and Environmental Awareness in Early India:

Reflections in the Select Prakrit and Sanskrit India

Debanjan Maity

Abstract: With the rapid growth of technology and urban culture the earth has been experiencing many natural hazards, wars, conflicts, famines, epidemics etc. For the past few years, the policy-makers are thinking to restore the environment, economy and health system with the policies of sustainable development. The concept of sustainable development and environmental awareness becomes an indispensable part of modern socio-environmental study. The embryo of this modern concept is found hidden in literary tradition of ancient times. Inscriptional literature of early India is such a tool which minutely represents the concept of sustainable development and environmental awareness in early India. This project is an attempt to analyse the concept of sustainable development and its goals like environmental awareness, food-security, poverty, employment, infrastructure development water management in the light of select Prakrit and Sanskrit inscriptions within the time bracket of 3rd century BCE to 6th century CE.

Keywords: Sustainable development, environmental awareness, inscriptions, food security, infrastructure

1.0. From the dawn of civilization, Mother Earth with her children has been experiencing many a natural hazard like flood, excessive rain, drought, volcanic eruption, famine, epidemics and the like. Even the 21st century world, though equipped with advanced technology, is being adversely affected by natural conditions like the climate emergency, deforestation, desertification, greenhouse effect induced by the human activities etcetera and man-made ones like frequent occurrence of war, change of life style and culture etcetera. (Maity, 2020, p. 8). In 2020, the lethal virus Novel Corona Virus has literally tagged a question mark on the existence of human race. The history memorises effect of contagious diseases like Bubonic Plague, Spanish Flu, Cholera, Small Pox etcetera in past or outbreak of H5N1 influenza, SARS- CoV, Avian Influenza, Ebola etc. (“Deadly Diseases: Epidemics throughout History”, 2020). Socio-economic maladies, unplanned and unchecked urbanization, misallocations of resources, problems of land tenure, high birth-rate, cultural variations, weakness in policy mechanism, lack of awareness etc. and lack of economic opportunities are causative factors for degradation of both environmental and social structure (Dasgupta, 2007, p. 7).

1.1. In remote past, consciously or unconsciously man became the friend and protector of nature. The symbiosis of nature and man accelerated the progress of civilization. But with the flow of time, he exploited the environment for achieving more resources as well as power. In recent years, man feels the necessity to protect every element within nature by implementing various laws. It is the call of time to develop the world using the policies of sustainability. So, in modern times, the study of

sustainable development has become an inevitable part of socio- environmental exercise. United Nations defines concept of sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (“Sustainable Development Agenda”, 2020).

1.2. The expression ‘sustainable development’ has its root in the sustainable forest management which was started in Europe during the 17th-18th centuries. The first modern concept can be found in the Brundtland report (1987). Later on, Earth Charter (1992), Agenda 21 were the important minutes taken in that issue. (“Sustainable Development Agenda”, 2020, para 2-4). In July, 2015 United Nations published the 17 ‘Sustainable Development Goals’ (SDGs) as a commitment for global development. The SDGs more rhetorically known as ‘global goals’ target wider area in comparison to Millennium Development Goals (MDGs, 2005-2015). (Duncan French and Louis. J. Kotzé, 2018, p. 1). SDGs address the global challenges like poverty, inequality, climate change, environmental degradation, peace and justice. SDGs are the part of 2030 Agenda for Sustainable Development with work plans for next 15 years.

The 17 goals are: 1. No poverty 2. zero hunger 3. good health and well- being 4. quality education 5. gender equity 6. clean water and sanitation 7. affordable and clean energy 8. decent work and economic growth 9. Industry, innovation and infrastructure 10. reduced inequalities 11. sustainable cities and communities 12. responsible consumption and production 13. climate action 14. life below water 15. life on land 16. Peace, justice and the strong institutions 17. partnership for the goal. (“Sustainable development goals”, 2020). The policy stands on three major pillars viz. environmental, economic and social factors. Although the environment occupies the central positions but other pillars are inter-mingled too. The policies will eliminate the environment threats and bring back a good ecological equilibrium. More we become conscious about the environment possibility of sustainability will increase more.

2.0. Ancient Indian texts like Vedas, Upaniṣads, epics, creative literature and folk tradition record numerous references regarding environmental consciousness. The policies regarding the protection of ecology can be seen as the embryo of sustainable development in Indian Society. Inscriptions of early India present the practical references on the topic. This study is a humble attempt to interpret the Prakrit and Sanskrit inscriptions in the light of sustainable development and environmental awareness.

2.1. The present researcher has taken for study the inscriptions belonging to the time bracket of 3rd century BCE to 6th century CE. The inscriptions fall in the category of early Indian inscriptions belonging to Maurya, Śuṅga, Kuṣāṇa and Gupta ages. Chronology of epigraphs must be ignored at places in this project for the sake of systematic understanding of the topic. Although concept of sustainable development and SDG goals is a profound area of study but the present project spotlight a few important parameters like conservation of flora and fauna, infrastructure/ reconstruction, food

security, employment, water management etc. in the light of early Indian inscriptions. In this paper roman diacritics are used for Sanskrit/ Prakrit words and APA stylesheet is applied for referencing.

2.2. Inscriptions taken for the study are –

Aśokan edicts and other inscriptions related to Aśoka
Junāgaḍh Rock Inscription of Rudradāman I
Junāgaḍh Rock Inscription of Skandagupta
Sohgaurā Bronze Plaque Inscription
Mahāsthān Fragmentary Stone Plaque Inscription

Apart from that a few minor inscriptions within the time frame of 3rd century BCE to 6th century CE are considered.

3.0. Concept of Peace and environmental consciousness reflected in Aśokan edicts

Peace, justice and the strong institutions are the important sustainable development goals. Ferocity of world wars, wars in middle-east has compelled humanity to think for the peace and brotherhood. The SDGs like ‘life on earth’, ‘life under water’ are also another two parameters for well-being of the earth. Aśokan edicts may be taken for study in this purpose. The reign of Aśoka, the Maurya Emperor, spread over four decades (circa 273-232 BCE) may be considered a landmark in Indian history.

Concept of peace

Although there is mention of the Kalinga war in Rock Edict XII (RE hereafter), it is but natural that no detailed description of the war will be available there or any other inscription. Aśoka attacked Kalinga in 261 BCE in his early life eight years after his coronation. However, the four decades long reign witnessed this military campaign for once but the horror of the war indeed aroused a sense of remorse in the man inside him, not the king. As a king he did not see anything exceptional in the deplorable plight of people after the war as he admits that such loss, injury, agony and casualty are but natural when a territory not conquered before is acquired through war RE XII) (Sircar, 1986, p.35). That he did not launch any other war in the rest of his career was simply due to the fact that there was no other country left to be conquered after the annexation of Kalinga. However, as a king he must have felt that a war is never desirable in view of the huge loss of life and property it involves. (Bhandarkar, 1969, p. 291).

Concept of environmental awareness in Aśokan edicts

Aśoka’s measures for the conservation of nature and natural resources can be divided into two categories, viz. protection of plants and conservation of endangered species of animals.

Protection of plants

Medicinal herbs, roots and fruits (i.e. fruit-wielding trees) were among the trees mostly planted by Aśoka. The reference can be drawn from RE II where it is said that Aśoka arranged for medical

treatment of two kinds, medical treatment for both the men and animals. He imported and planted trees and medicinal herbs in the places wherever they did not exist. (*manusa- cikīchā ca pasu-cikīchā ca*) (Sircar, 1986, p. 17). He also caused to plant banyan trees and mango-orchards for the benefit of men and animals in the 17th year of his consecration. i.e. circa 243 BCE. (PE VII) (Sircar, 1986, p. 63). According to his rules, forest should not be set on fire without reason which implies that forests may be burnt for settlement of countries. The PE VII and Queen's Edict refer to *ambāvaḍikā* (mango-orchards). (Bhandarkar, 1969, p. 344). In the *Arthaśāstra*, it is said that a king should set up a separate forest of teak, sal, arjuna, sarjas trees. (AŚ 2.2.2) (Bandyopadhyaya, 2011, p. 177). The list of punishments for cutting down the trees is also prescribed in the third Book of the *Arthaśāstra*. A fine amounting to 5 *paṇas* to 500 *paṇas* should be imposed on a man for cutting down the trees (Bandyopadhyaya, 2011, p. 174).

Measures taken for the protection of animals

The measures adopted by Aśoka for protection of animals are also commendable from the point of ecological sustainability. Aśoka banned the sacrificial slaughter of living beings. In RE I, it was said that in past, thousands of animals were slaughtered for curry every day in the royal kitchen. But when the *dhamma-lipi* was being engraved, only three lives used to be killed for curry, namely two peacocks and one deer; even the deer was occasionally killed. He promised to stop the killing of three living creatures too in future (which, as it seems from his Pillar Edict V (PE hereafter) issued in the 26th year after coronation, he could not fully implement) (RE I) (Sircar, 1986, p. 16).

RE IV and RE VII also convey the message of non-slaughter of animals. In PE II, the king announced that he had shown many favour to bipeds and quadrupeds, birds and aquatic animals including grant of life (Sircar, 1986, p. 16).

PE V issued in the 26th year after his consecration (circa.244 BCE) is the best example of Aśoka's concern for the conservation of fauna. In this edict, 9 birds, 1 insect, 7 aquatic creatures, 3 quadrupeds, 3 other animals had been given total protection from killing and some are provided with temporary exemption from killing and injury under special conditions. (Bhandarkar, 1969, pp. 310-11). The animals which were neither useful nor edible were declared exemption from slaughter. Husks containing living beings or forest should not be set fire without any specific purpose or with an intention to doing injury to lives (PE V) (Sircar, 1986, p. 59). PE V also refers that fishing and selling of fish were strictly prohibited on specified days of the year and on these days injunction over killing of animals was also carried out in elephant forests (*nāgvana*) and in the localities of fishermen (*kevaṭa bhoga*).

Here it is noteworthy that Aśoka could not stop the slaughter of animals completely he tried to restrict their killing. If we judge his restriction from the perspective of ecological consciousness

and consideration for maintaining a balanced economic status of the society, we may be led in the right path of assessing Aśoka as a wise administrator. The economy of a state is dependent on its ecology to a great extent. Forest products are one of the primary sources of king's treasury. Not only products like wood, grass, honey, wax etc. but also the organs of animals were considered as treasure of forest. So, the destruction of forest and its animals might result in the financial degradation of a state. (Guha, 2016, pp. 405-10). Actually, it was a general policy of the Mauryan government to take care of the flora and fauna, of all domestic animals and natural resources all over the country and Aśoka as an ideal ruler improved upon the age- old Mauryan policies and introduced new ones in line with his own ideology of *dhamma*.

3.0. Innovation and Infrastructure in Junāgḍh Inscriptions

Construction of an eco-friendly society is one of the important goals among SDGs. Reconstruction of the damaged physical structures and revitalization of socio-economic life of the society also comes under the same category. The phase restores more or less normal (pre- disaster) life to the disaster-hit people (Dasgupta, 2007, pp. 8-9). The Junāgḍh inscriptions of Rudradāman I (lang: Sanskrit, script: Brahmi, 152-53 CE) and Skandagupta (lang: Sanskrit, script: Gupta Brahmi, 455 CE) document the reconstruction of the dam over the Lake Sudarśana with the initiative of the administration. Both the inscriptions found on the rock at the Girnar Hill, near Junagadh town of Kathiawar District of Gujarat state (Keilhorn, 1981, p. 37). The first inscription records the reconstruction of the dam (*setu*) of the Sudarśana Lake with the help of Suviśākha, an administrator of Ānartta and Saurāṣṭra region without much delay (*anātimahatā kālena*) which was devastated by a destructive non-seasonal storm and rain probably November month of 150 CE. (Sircar, 1986, pp. 176-78). On the other hand, the inscription of Skandagupta mentions that the dam over the Sudarśana Lake had collapsed against the swelling up of the rivers by torrential rain at a night in august month of 136 Gupta era i.e. circa 455 CE. At this time of emergency, Cakrapālita, administrator of the city of Śūrāṣṭra got the dam repaired within two months (Sircar, 1986, pp. 314-15; Sarkar, 2013, pp. 21-22).

3.1. Food Security

The sustainable development goals like 'no poverty', 'no hunger' etc. can be found in the following inscriptions. In the Covid-19 phase, the pictures of unemployment, migrant labours give birth of poverty all over the world. Although Government and NGO have started the system of rationing, community kitchen to feed the distressed still food crisis and poverty

cannot be eradicated properly. Sohgaūrā Bronze Plaque Inscription (language: Prakrit, script: Early Brāhmī, time: 300 CE) and Mahāsthān Fragmentary Stone Plaque Inscription (language: Prakrit, script: Early Brāhmī, 300 BCE) records the famine management system in post-famine situation. The first inscription mentions instruction towards the Mahāmātras (high official of the state in Mauryan era)

from the camp of Manavasiti to disburse grains to four villages namely Mathura, Cañca, Modaama/ Mayudāma and Bhallaka at the time of famine. All the vendors are ordered to carry goods/ grains from the two three-storeyed store houses situated at the localities of Śrīmān and Vaṃśagrāma in abnormal or emergency situation. It was also prescribed not to take grains from the storehouse during normal period. (Fleet (1907), pp. 509- 32; Sircar, 1986, p. 83; Soumya Ghosh, 2016, p.132-33; Ranjusri Ghosh, 2007, p. 110-13). The second one records an order, issued by some ruler to the Mahāmatras stationed at Puḍanagala (now Mahasthangarh in Bangladesh) with a view to help the people of Saḍvargīya sect by distributing sesame (tila), mustards (sarṣapa) and grains (dhānya) at the time of dire need. It was also instructed to mahāmatras to keep the treasury and store house filled with requisite provisions like gaṇḍaka coins and paddy. The favour was done on condition that they repay the things given after they overcome the crisis (ātyayika) caused by fire, flood, pestilence etc. (Sircar, 80; Krishnan, 1989, pp. 104-05)

3.2. Water harvest system reflected in inscriptions

The water harvesting system has a great change since pre independence period to modern times in India. The water-bodies like *vāpī. taḍāga, dīrghikā* (S.K. Maity, pp. 117-18) are referred in the inscriptions like Ārā inscription of Kaniṣka II, The Gundā inscription of the time of Kshatrapa Rudrasimha (yr. 103), Sañchī inscription of Svāmī Jivadāman (Yr. 13), The Gangdhar stone inscription of Viśvavarman, Raypur inscription of Mahāsudevarāja etc. (Banerjee & Sukthankar, 1983, pp. 232 ff)

4.0. After analysing the present concept reflected in the select Prakrit and Sanskrit inscriptions of 900 years now some pertinent questions come to the surface. Can the modern system be compared to early concept and practices of environmental awareness and sustainable development? What will be the evaluation of concept prepared based on inscriptional sources? This study does not claim to contribute any new policy. It tries to reappraise the inscriptions for understanding the early concept of sustainable development and environmental awareness. The basic dissimilarities between ancient and modern concept can be noted here.

- The indigenous thought process regarding the subject does not reflect always modern policies.
- The early system is prescriptive in most of the cases but modern concept of sustainable development has a good success rate with its practical approach.
- If it is thought from scientific ground, there should not be any comparison between the modern and early practices. But from historical viewpoint a conceptual evolution can be identified.

Despite that, inscriptions need sharp scrutiny in this regard.

- There are ample evidences of both environmental consciousness and sustainable development in the inscriptions. Interpretation of epigraphical literature from the parlance of the present topic helps highlight the practical approach of the concept.
- Prescriptive approach in an inscriptional text is not created all on a sudden, rather it is the fruit of experiences of ages. Prescriptions cannot be made without the practical knowledge.
- Ancient men were the true children of nature they can feel the nature more accurately in comparison to the modern technology. Belief in age-old indigenous knowledge gives them the strength to create a more disaster-resilient sustainable society.

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Re-Reading Dr. Sarvapalli Radhakrishnan: The Need of the Hour

Shyamasree Sur

Abstract

“The true teachers help us to think for ourselves in the new situations which arise. We would be unworthy disciples if we do not question and criticize them. Then try to widen our knowledge and help us to see clearly. The true teacher is like Krishna in Bhagavadgita , who advises Arjuna to think for himself and do as he chooses yatha icchasi tatha kuru “-----Dr. S.Radhakrishnan

The life, vision and actions of Dr. Sarvapalli Radhakrishnan clearly proves that he is a ‘Great Teacher : The Teacher of Teachers ‘. Born and brought up in a country with religious atmosphere he made the unseen a visible reality. This great philosopher , thinker and knower of Eastern Philosophy , Religion and Wisdom raised the status of India in the Community of Nations . His Indian thought and wisdom not only imprinted in India but also in Europe , U.S.A.,U.S.S.R.,Germany and even in U.N.O. He is idol of a common man in Indian Society starting from grassroots but reaching to the highest peak in the society . He is the motivating force to every Indian citizen more particularly to the teachers at all levels . In my paper I tried to pay homage to Dr. S. Radhakrishnan by discussing his actions as teacher , as a philosopher , as a Diplomat / Politician and his awards .

Key Words : Philosopher , Life , Vision , Action

Introduction :

“Among the philosophers of our time , no one achieved so much in so many fields as Sarvapalli Radhakrishnan in India....William James was influential in religion , and John Dewey has been a force in politics. One or two American philosophers have been legislators . Jacques Martain has been an ambassador . Radhakrishnan, in a little more than thirty years of work, has done all these things and more.....Never in the history of philosophy has there been quite such a world-figure with his unique appointment at Banaras and Oxford, like a weaver’s shuttle, he has gone to and fro between the East and West, carrying a thread of understanding , weaving it into the fabric of civilization.”

George P. Conger

Sarpapalli Radhakrishnan (5 September,1888-17 April,1975) was an Indian philosopher and statesman who was the first Vice-President of India (1952-1962) and the Second President of India from 1962 to 1967 .

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One of India's most influential scholars of comparative religion and philosophy, Radhakrishnan built a bridge between the East and West by showing how the philosophical systems of each tradition are comprehensible within the terms of the other. He wrote authoritative exegeses of India's religious and philosophical literature for the English-speaking world. His academic appointment included the King George V Chair of Mental and Moral Science at the University of Calcutta (1921-1932) and Spalding Professor of Eastern Religion and Ethics at Oxford University (1936-1952).

Radhakrishnan was awarded the Bharat Ratna , the highest civilian award in India, in 1954. Among the many other honours he received were the British Knight Bachelor in 1931 and the Commonwealth Order of Merit(1963), but ceased to use the title "Sir" after India attained independence. His birthday is celebrated in India as Teachers' Day on 5 September. He was also awarded the Templeton Prize in 1975 in recognition of the fact that "his accessible writings underscored his country's religious heritage and sought to convey a universal reality of God that embraced love and wisdom for all people.

Life of Dr. Sarvapalli Radhakrishnan:

Born at Tirutani, he completed his schooling (1896-1904) at Tirutani ,Tirupati and Vellore. He completed his graduation and post-graduation (1904-1908) from Madras Christian College. At the same time he was married in the year 1906 to Shivakamomma, a wife devoted to her husband. He came in the staff of Department of Philosophy in the Madras Presidency College in 1909 and also completed the Teachers Training Course in 1910 from Teachers Training College, Saidapet, Madras. He studied philosophy at the college level as a matter of chance because he got the textbooks from one of his cousins. But in the later periods of his life he wrote that, if this world is living then nothing in this world is by chance or by accident. This reflects the thought which influenced his life. Later on he wrote a book on , 'The philosophy of Rabindranath Tagore' in 1918. Thereafter he wrote many world renowned books which count to about 150. One of his best creations was , 'Indian Philosophy' written in two volumes. This book gave a new recognition to Indian thought and philosophy in the western world. Dr. Radhakrishnan's journey of life was such that it touched new heights year by year. He served as a Professor of Philosophy at the University of Mysore , occupied the King George V chair of Mental and Moral Science at the Calcutta University, Professor of Eastern Religion and Ethics at Oxford University, Fellow of British Academy, held Sayaji Rao Gaekwad Chair of Indian Culture and Civilization at the Banaras Hindu University (BHU). He was Vice-Chancellor of the Andhra University from 1931-36 and of BHU from 1939-1948. He was also the Chairman of University Education Commission in India. He was Chancellor of Delhi University in 1953. He delivered series of lectures at the Oxford, Harvard, Yale, Los Angeles, Michigan and Cornell Universities. Therefore his life as a Philosopher, Teacher, Thinker, Writer, Orator and Vice-Chancellor was indeed unique.

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He also served as India's Ambassador to the USSR from 1949-1952. He became Vice-President of India in 1952 and continued till 1962. Meanwhile in 1954 he was honoured with Bharat Ratna. He became President of India in 1962 and continued till 1967. But during all these years his love for philosophy was evident in the form of classical writings as essays and books. He never stopped amidst all political assignments. He was a Philosopher Statesman in the true sense. Therefore, during those days Pandit Jawahar Lal Nehru wrote the following about him:

"It was India's peculiar privilege to have a great philosopher, a great educationist and a great humanist as the President. That in itself shows the kind of men we honour and respect."

Dr. Radhakrishnan led a life of retirement at Madras from 1967-1975. The great soul left for heaven on April 17, 1975. His was life of a layman starting from the grassroots. He wrote that, "No particular good fortune has lifted me above the sphere in which our common humanity struggles along..." (Banerjee, p. 11) and touching the highest heights in the fields of Philosophy, Writing, Oratory, Politics and Humanism. Journey of his life was continuous and uniform setting new examples and standards every time. Always dressed in white he looked as a true representative of India before the world community. He is a teacher for us in true sense. His vision and action can be summarised further as follows.

Vision of Dr. Sarvepalli Radhakrishnan:

All individuals are guided by their own thought and vision in all spheres of life. Unlike Animals the Humans have got the unique natural gift to choose for themselves in all spheres of life. Some are more gifted in their choices and related actions. They are known in the society and the world for longer periods of time. Dr. Radhakrishnan is also such a personality who is known for his thought and vision in the world community and will be remembered as a torchbearer in various spheres of life for days to come. His thoughts in some areas of life are given below:

Thought about Life-view and World-view

After chance or accidental choice of Philosophy as a subject at graduation level, and many other incidents in his life his thought about life and the world was reflected in the following words:

"..To all appearance this is a mere accident. But when I look at the series of accidents that have shaped my life, I am persuaded that there is more in this life than meets the eye. Life is not a mere chain of physical causes and effects. Chance seems to form the surface of reality, but deep down other forces are at work. If the universe is a living

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one, if it is spiritually alive, nothing in it is merely accidental. The moving finger writes and having writ moves on."

(Banerjee A.K.1991,BHU,p.12)

The paragraph also reveals that he was a believer in reality of an unseen world. He was a believer in luck, believer in a great pilot. For him success was luck but failure was not by ill luck. He was a positivist/optimist. He believed in goodness of the future. Hence, he wrote, 'Every child is an experiment, an adventure into nobler life and an opportunity to change the old pattern and make it new' (written in the book-The Pursuit of Truth).He believed that true knowledge is to know one's own ignorance. However, the knowledge we are capable of receiving depends on the stage of our development.

Religion

Humanity was Dr. Radhakrishnan's religion. In his own words, he said, "I prefer to be human." As quoted by Banerjee (1991, p.3) he also believed that "Religion consists in doing justice, in loving mercy and in making our fellow creatures happy". He also said that, he suffers when pure personal relationships as a human are spoiled and betrayed. About religious truth he also believed that , all truth about God has its source in God. For him, the end of religion was an essential knowledge of God. However he was also of the opinion that religion must establish itself as a rational way of living. Religion must express itself in reasonable thoughts, fruitful action and right social institution. Secular foundations must be laid deep and preserved worthily if ever the spirit is to be at home. (p. 89- 90, in The Pursuit of Truth by Dr. S. Radhakrishnan).

Science and Philosophy

He was of the opinion that, science helps us to build up our outer life, but another discipline is necessary to strengthen and refine the living spirit. Though we have made enormous progress in knowledge and scientific inventions, we are not above the level of past generations in ethical and spiritual life. (The Pursuit of Truth by Dr. S. Radhakrishnan, p.101).

Society and the World

He believed that economic man is not the whole man. For a complete human being we require cultivation of grace and joy of soul overflowing in love and devotion and free service of a regenerated humanity. The society today has become a prison and the present crisis of civilization is the result of loosening hold of ethical and spiritual ideals. Collective myths have poisoned the soul of men. Collection of dangerous

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weapons is all the ways harmful for the mankind and the world order. The desperate need of today's world is peace. Nothing is inevitable except peace.

Actions of Dr. Sarvapalli Radhakrishnan

Pandit Jawahar Lal Nehru said about him, "Wherever he went, his words brought comfort to the people, and his own wisdom brought people nearer to each other"(Banerjee, 1991,p.5).Some of his actions in different roles have been mentioned below:

Actions as a Teacher

His actions as a Teacher began in 1909 and continued even after completion of Teachers Training in 1910.Once he was asked by his student if he had been abroad for education. He replied, no but I will go there to teach .Such was his determination. He was very friendly with his students.At Mysore while giving tutorials to students at his residence ,he used to receive students himself, offer tea and used to see off them to door.He used to shake hands with each of them. He was given a unique farewell by students when he left for Calcutta university. His carriage during departure was pulled by students and not by horses and the entire platform was full of cries as , 'Radhakrishnan ki jai'.

Even in Calcutta University he took active part in bodies of the university. He was very popular among teachers and students. He was an eloquent speaker. As narrated by a student , once a foreign scholar spoke for fifty minutes on Greek Philosophy in Calcutta but audience could not understand him. Dr. Radhakrishnan spoke the gist within ten minutes and audience was satisfied. As Vice-Chancellor of B.H.U. he solved many problems and even saved the university from atrocities of British forces. He also ensured its educational development. He was not only a teacher for his students but also for his colleagues and diplomats too. According to him a teacher should have openness of mind. He said that, 'the True Teacher helps us to deepen our insight, not alter our view. He gives us a better access to our own scriptures'. Further according to him:

"The true teachers help us to think for ourselves in the new situations which arise. We would be unworthy disciples if we do not question and criticize them. They try to widen our knowledge and help us to see clearly. The true teacher is like Krsna in the Bhagavadgita, who advises Arjuna to think for himself and do as he chooses yatha icchasi tatha kuru."

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(Banerjee 1991,p.15)

He was a great teacher because he reinterpreted the past to weave something new for us in all spheres of life particularly teaching, philosophy, politics and religion. As he himself quoted Confucius saying that, “He who by re-animating the Old can gain knowledge of the New is fit to be a teacher”.

His Actions as a Philosopher

As mentioned above his choice of opting Philosophy was a destined chance. He found that his teachers in the Christian missionary institutions disturbed their faith by criticism of Indian thought. Such teachers were not the seekers of the truth in true terms. By undermining the Indian tradition they restored for him the situation in which all philosophy is born. A critical study of the Hindu religion was thus forced on him. Therefore he worked very hard as a teacher of Philosophy for the period 1909 to 1916. He studied Indian classics of Hinduism, The Upanisads, Bhagavadgita, Commentaries on Brahmsutra by Samkara, Ramanuja, Madhava and others. He also read the classic works of Buddhism and Jainism. At the same time he also read Plato, Kant and many other western philosophers and ideologies. After such a voracious reading, understanding and realization of experiences beyond logical reasoning he excelled as a world renowned writer, orator and critique. He wrote famous books such as- Indian Philosophy, Editions of Upanisads, The Bhagavadgita, The Brahma sutra, The Dhammapad, The idealist view of life, The Philosophy of Tagore, Future of Civilization, Eastern Religion and Western Thought and so many other books. As a speaker he kept his audience spellbound with choice of words, fluency of speech and eloquence skill. He was more spotless in his speech than his spotless white dress. Rather his speeches throughout the world were matchless motivating the audience and attracting them towards rationality of Indian scriptures, ethics, rationality, religion and spirituality. The world community was so impressed by his philosophical wisdom that he was seen as a representative of Indian thought in foreign lands. Therefore his actions as philosopher have benefited the Indian as well as the world community.

Actions as a Diplomat/Politician

Dr. Radhakrishnan served as an ambassador to USSR .During the time he developed special relations with Stalin. Stalin personally welcomed and bid farewell to him. He was so impressed with him that once in the emotional tone he said to Radhakrishnan that, you are the only one who has seen me as a human being. He broke the conventions while dining with Stalin in USSR and also by landing as a privileged guest in White House in USA. As President he made a voluntary cut in his salary from Rs. 10000/ to Rs. 2000/ per

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month. He was deeply involved in UNESCO works also. In UNO he even gave extempore speeches. He was so friendly and easy that while his official visit to U.K., he plainly visited Allen and Unwin (his publishers) to meet as a friend.

Actions and Awards

Dr. Radhakrishnan had significant contributions in many fields. Therefore, he was widely felicitated. He was the first non-Christian to receive Templeton Award for his contribution to the progress of religion. He was also honoured as the Knight of Golden Army of Angels- Vatican's highest honour for Head of a State. During that time Pope himself travelled to India for the first time. He also got several other awards in India and abroad including Bharat Ratna, Peace prize of the German Book Trade etc. He was elected twice as Vice-President and once as President of India. He himself left the office of the President and in his valedictory address said that, "Our slogan should be not power at any price, but service at any cost".

Conclusion:

The above mentioned brief summary of life, vision and actions of Dr. Sarvepalli Radhakrishnan clearly reveals that, he is a 'Great Teacher'. He is a teacher of teachers. He was born and brought up in a religious atmosphere where unseen was an invisible reality. His thought and soul was attacked in several forms in course of his studies which enabled him to bloom as a world renowned philosopher, thinker and a knower of Eastern Philosophy, Religion and Wisdom. This not only raised his personal status but status of India in the community of nations. This was a destined chance. It was for the first time that in the modern era an Indian left his imprints through the Indian thought and wisdom in Europe, U.S.A., U.S.S.R, Germany and even in UNO.

He personifies a common man in Indian society who started his journey from the grassroots and touched the best possible heights in the society. Even today he is a motivating force for each and every Indian citizen in general and Indian teachers at all levels in particular. On the occasion of this Teachers Day I pay my homage to him as a Teacher Educator and as a student of Banaras Hindu University by remembering the following words said by him to the students of B.H.U.:

"Wherever men love reason, shun darkness, turn over towards light, praise virtue; despise meanness, hate vulgarity, kindle sheer beauty, wherever minds are sensitive, hearts generous, spirits free, there is your country. Let us adopt that loyalty to humanity instead of a sectional devotion to one part of the human race."

(S. Radhakrishnan)

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Different Components of Library Catalogue and Retrieving Technique

Sudipta Pradhan

Introduction:

A library catalogue is an essential tool for any library. This tool has been developed to facilitate the use of reading materials in a library. It is useful to both, the readers using the library and the library staff members who help the readers to use the library.

A library catalogue is a list of books and other reading materials available in a particular library. It discloses to the reader the contents of a library collection. Whereas, cataloging is a technique of describing the documents to help the reader to identify the document in which he is interested. Library catalogues originated as manuscript lists, arranged by format (folio, quarto, etc.) or in a rough alphabetical arrangement by author. Printed catalogs, sometimes called dictionary catalogs, enabled scholars outside the library to understand its contents. This would sometimes be interleaved with blank leaves on which additions could be recorded. They can be bound as guidebooks in which slips of paper are bound for new entries. Slips could also be kept loose in cardboard or tin boxes, or stored on shelves. The first card catalog appeared in the nineteenth century, enabling much more flexibility, and towards the end of the twentieth century the OPAC (Online Public Access Catalogue) was developed. With the introduction of modern technologies, users can search for information via OPAC and, more recently, through the Internet.

A library catalogue, thus, lists documents forming the total holdings or a part of the holdings of a library. The use of the resources of a library depends to a large degree on the quality of its catalogue. Therefore, it is essential that the catalogue should be prepared with care and it should be maintained up-to-date. It helps the users to use the library effectively and efficiently. In other words, a library catalogue is a record of the holdings of a library. To meet the requirements of users, it consists of various unit records. These records are called entries. Each entry is designed for satisfying a particular approach of a user.

A modern library provides several facilities to its readers for making use of its collection. One such facility is the catalogue of the library which facilitates the readers to know what documents the library has, where they are located on library shelves, and how to access them.

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Definition:

The word 'catalogue' has been derived from the Greek expression 'kata logos'. It means a list, register, or complete enumeration of something. It now means a list of things, systematically arranged in alphabetical or other order, and often with brief descriptions of items listed.

To 'catalogue' means to compile a list of documents according to a set of rules (i.e., according to a catalogue code) to enable the reader to know what items (documents) are available in the library, and where these documents can be found on the shelves of the library with the help of the class number, call number or other means of identification given in the catalogue entry.

Purposes of a Library Catalogue:

Libraries generally acquire reading and reference materials in various physical forms, which will be utilized by users for study, reference, research, and other purposes. These materials are constantly under consultation or in circulation and therefore, at any given point of time, some of these materials may not be available on the shelves in the library. These reading and reference materials may also be in different physical forms such as printed documents, microfilms, or machine-readable forms. They are located and shelved in different places such as sections, rooms, and floors in the library, depending upon the most appropriate form of storage.

Objectives of a Library Catalogue:

Charles Ami Cutter described the objectives of a library catalogue in 1876 when he published the first edition of his book *Rules for a Dictionary Catalogue*. His views on the subject are often quoted and are relevant even today. According to him, a catalogue should:

- 1) enable a person to find a book of which the author, the title, or the subject is known
- 2) show what the library has by a given author on a given subject in a given kind of literature
- 3) assist in the choice of a book as to its edition (bibliographically) as to its character (literary or topical).

Different components of the library catalogue:

1. Title and statement of responsibility
2. Edition
3. Material-specific area
4. Publication, distribution, etc.
5. Physical description
6. Series
7. Note
8. Standard number

1. Title and statement of responsibility

Title proper: When a multi-part component contains two or more sub-components and bears a collective title as well as titles for the individual sub-components on the primary source, the collective title is chosen as the title proper

General Material Designation: The GMD such as [Cartographic material] [monographs] are normally excluded from the identification of the host item. However, there are two general exceptions. The first is in cases where the general material designation for the host item is different from that for the component part. The second is in cases where the host item bears a title, statement of responsibility, edition statement, and publication details identical to those for a similar publication in a different format.

Parallel titles: are normally excluded from the identification of the host item

Other title information: If the title for a book review, commentary, etc. contains only the title of the work being reviewed, etc., a word or phrase may be added as other title information

Statement of responsibility: The first statement of responsibility is normally included in the identification of the host item.

2. Edition: The edition area is included in the description of the component part only when the edition information applies specifically to the component part. Edition information is about the host item as a whole, or to a complete volume.

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3. Material-specific area: When describing a multi-part component that is issued in successive parts and is intended to be continued indefinitely, the numbering area is included in the description of the component part only when there is numbering information that applies specifically to the multi-part component. Numbering information about the host.

4. Publication, distribution, etc.:

Place of publication, distribution, etc.: The principal place of publication is normally included in the identification of host items of all types, except serials, where it is included only to distinguish between those with identical titles, etc.

Name of publisher, distributor: The principal publisher's name is normally included in the identification of monographic host items (including non-print monographs). For serials, the publisher's name is omitted unless it is required to distinguish the host item from others with the same title, published in the same place.

Date of publication, distribution, etc.: The date of publication may be omitted unless, in the absence of an edition statement, the date is required to distinguish the host item from another edition of the same work.

5. Physical description: Specific material designation and extent of item

If the specific material designation and extent of the component part can be inferred from the identification of the host item and the location of the part within the host, they may be omitted from the description of the component part itself. Otherwise, the extent and specific material designation for the component part should be recorded. Such as [Cartographic material]. – Scale [1:633 600] (W 105°--W 87°/N 54°--N 48°).
– 1 map; 1

6. Series: The series area is included in the description of the component part only when the component being described is a sub-component with a title that can be dissociated from the common title about all the sub-components. In such cases, the common title of the multi-part component is given if appropriate in area 6. If the sub-component carries a numeric and/or alphabetic designation in addition to its title, the numeric and/or alphabetic designation is given as the numbering element in the series area.

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7. Note: The note area in the description of the component part includes only notes that pertain specifically to the component itself. Notes about the host item as a whole, if required, are recorded.

8. Standard number: **Standard numbers** (or alternatives) are included in the description of the component part only when they apply to the component itself. Numbers applying to the host item as a whole are recorded. For Monographs- ISBN and Serial publication – ISSN No. normally included.

Call No.	Author Main Entry	Title
025.00285 HAR	Haravu, L. J.	Library automation: design, principles and practice / L. J. Haravu.
		-- 3rd ed. -- New Delhi : Allied Publishers, 2007.
Acc. No.		xiv, 262p. : ill ; 24cm. + 1 CD-ROM. -- (Library and Information
128158		Science Series: 4)
		Includes Index.
		ISBN: 9788177646450
		Standard Number
		Libraries --Automation
		Subject

Access Point of Library Catalogue

Access Point refers to a name, term, code, heading, word, phrase, etc., a unit of information representing a specific entity that can serve as a search key in information retrieval, under which a library catalog or bibliographic database may be searched and library materials may be identified and retrieved.

Access points are the indexed elements of authority or bibliographic records that help make the record searchable and identifiable. In a catalog, index, or other organized systems some

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examples of access points are, author, title, name (person, family, corporate body, etc.), subjects (topical, geographical, etc.), classification or call number, and codes such as ISBN, etc. which are chosen by the cataloger or indexer, when creating a bibliographic, authority, or metadata record (a surrogate), to enable the retrieval of the record.

Conclusion:

Traditionally, libraries were adorned with cabinets of catalogue cards, each meticulously crafted to represent a singular item within the collection. The tangible nature of these cards, arranged alphabetically by author, title, and subject, provided users with a physical journey through the library's holdings. The act of flipping through cards, while nostalgic, required on-site presence, limiting accessibility and often necessitating assistance from library staff for more intricate searches. Updates were a manual endeavor, and the lack of real-time availability information added an element of unpredictability to the user's quest for specific materials.

The evolution of library systems has witnessed a transformative shift from traditional cataloguing methods to more sophisticated and user-centric approaches. One of the prominent differentiators in this evolution is the distinction between OPAC (Online Public Access Catalogue) and traditional cataloguing systems. The traditional catalogue, characterized by its physical card catalogue and manual indexing, has given way to OPAC. This dynamic online platform enables users to access, search, and retrieve bibliographic information in a digital environment. This transition represents a paradigmatic shift in how libraries organize and provide access to their collections, emphasizing the importance of technology in enhancing user experience and facilitating efficient information retrieval. Understanding the key differences between OPAC and traditional cataloging methods is essential for comprehending the advancements that have shaped the modern landscape of library services and information management.

Integrated library automation packages were introduced in libraries in the 1970s. Minicomputers were used in 1970s in the libraries to computerize operations like circulation, acquisition, cataloging, serials, and Library OPAC. The trend picked up in the early 1980s with the introduction of PCs at a cost affordable to the libraries. The past two decades have witnessed unprecedented developments in computer technology. Resultantly, inexpensive computing resources are now within easy reach of libraries. Computers are being used increasingly to automate various activities in libraries using a suitable off-the-shelf general or specific-purpose software package now available in a wide range for library automation.

This module covers the definition, history, need & purpose of library automation. Planning for library automation, and automation of in-house operations i.e. Cataloguing, OPAC, Circulation, Acquisition, Serial Control, etc. Barcode Technology & RFID is also covered in this module.

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Long to short-term Shoreline Dynamics (1992-2022) of the parts of Andhra Pradesh Coast

Abu Kalam Alberuni

1. Introduction:

Climate change is a global issue in the present scenario that is enormously affecting the whole world, especially in the coastal region (Bera et al., 2022a). The coastal regions faced most of the climatic hazards. The frequency of extreme climatic events in the coastal region is on the rise, like severe cyclonic storms, floods, increasing intensity of storm surges and rising sea levels (Bera et al., 2022, Gargiulo et al., 2020). The result of climate change directly increases the sea level rise, frequency and intensity of cyclones which affected land use land cover, increased coastal erosion and over wash vulnerability (Bera et al., 2022b; C. Donnelly et al., 2006a).

The shoreline changes have been short-term and long-term due to various coastal processes like a wave, currents, tidal action and sea level rise (Mondal et al., 2017). Nowadays coastal erosion major threat to the environment (Hossain et al., 2022) the erosion of the shoreline harms the livelihoods of the coastal population (Mukhopadhyay et al., 2012). In recent times due to technological advancement, the extraction and delineation of shorelines and coastal land forms have been done easily and also reduced uncertainty (Mishra et al., 2019). The study (Gopinath & Seralathan, 2005) was done in the period between 1967-1999 on Part of Andhra Pradesh Coast using toposheet and satellite-based imagery. The study reveals that a total of 29.8 km² eroded between 1967-1999 and the accreted area has been 6.03 km². In the period 1996-1998, the eroded area was 13.64% and the accretion rate was 0.48 km² but the eroded area decreases in the period 1998-1999 that is 3.26 Km² and the erosion rate was 5.47 km²/year during the period 19996-1999. Another study by (Nandi et al., 2016) used DSAS tools and presented long-term and short-term changes in shoreline using EPR and LR in Sagar Island. It was investigated that the erosion rate was -7.91 m/y from 1975 to 2002 and -7.01 m/y during the period 2002-2011. The study found that the southern part of Part of Andhra Pradesh Coast was highly vulnerable due to the high rate of erosion in the shoreline. A similar type of study was found on Part of Andhra Pradesh Coast (Mondal et al., 2020 analysed shoreline shifting from 1975 to 2015, Landsat multispectral image and DSAs tool have been used for the detection of shoreline and shoreline change analysis. EPR and weightage LR method used for short-term and long-term analysis. It was observed that result of the LR method the highest erosion was found at -23.15 m/y in the southwestern part during the period 1975-2015 and the highest erosional rate according to the EPR method was -20.36 m/y.

The shoreline is the dynamic feature in response to natural hazards and it is interference between land and water. Around 40 % of the world's population lives in the coastal area. The coastal region experiences environmental as well as anthropogenic stress (Nassar et al., 2022). The shoreline is highly dynamic, and its changes due to climatic variabilities, sea wave action and human intervention (Hossain et al., 2022). The shoreline changes have been short-term and long-term due to various coastal processes like a wave, currents, tidal action and sea level rise (Mondal et al., 2017). Nowadays coastal erosion major threat to the environment (Hossain et al., 2022). The erosion of the shoreline harms the livelihoods of the coastal population (Mukhopadhyay ²et al., 2012). In recent times due to technological advancement, the extraction and delineation of shorelines and coastal landforms have been done easily and also reduced uncertainty (Mishra et al., 2019). The advantages of new geospatial techniques such as cost-effectiveness, reduction of manual error, maximum group repetitive coverage, inexpensive implementation and also precise distinctiveness between land and water surface (Mishra et al., 2019, Johnson et al., 2015) Presently DSAS (digital shoreline analysis system) has been widely used for delineating shoreline and shoreline-related statics(Nandi et al., 2016). EPR (endpoint rate), WLR (weightage linear regression), NSM (net shoreline movement), and LRR (linear regression techniques) are mostly used for analysing the erosion and accretion activities trend in shoreline on short-term as well as long-term basis (Markose et al., 2016; Mishra et al., 2019) . Presently a wide field of researchers has been motivated in shoreline shifting and related coastal vulnerability (Queiroz et al., 2022). Shoreline change research has been conducted in many places such as Italy, Turkey, Indonesia, and India. However, there is a need for more localized analysis due to differences in geography, geology, and hydrodynamic conditions (Laksono et al., 2022). The coastal region of east in India facing lots of challenges like climatic changes, sea level rise, impact of tropical cyclone, rapid population growth. So, the eastern coast of India has been very much highlight for researcher, numerous works has found in this region (Baral et al., 2018; Basheer Ahammed & Pandey, 2022; Gopikrishna & Deo, 2018, 2019; Hossain et al., 2022; A. Jana et al., 2016; Jangir et al., 2016; Kumar et al., 2020; Maiti & Bhattacharya, 2009; Markose et al., 2016; Mishra, Acharya, et al., 2022a, 2022b; Mukhopadhyay et al., 2012). The shoreline of Sundarban region has very dynamic nature, the erosional activity prominent in this region and rigorously effected by tropical cyclone (Mishra et al., 2021). The shoreline is highly dynamic, and its changes due to climatic variabilities, sea wave action and human intervention (Hossain et al., 2022). The shoreline changes have been short-term and long-term due to various coastal processes like a wave, currents, tidal action and sea level rise (Mondal et al., 2017). Nowadays coastal erosion major threat to the environment(Hossain et al., 2022) The erosion of the shoreline harms the livelihoods of the coastal population (Mukhopadhyay et al., 2012) In recent times due to technological advancement, the extraction and delineation of shorelines and coastal landforms have been done easily and also reduced

uncertainty Mishra et al., 2019). The advantages of new geospatial techniques such as cost-effectiveness, reduction of manual error, maximum group repetitive coverage, inexpensive implementation and also precise distinctiveness between land and water surface (Mishra et al., 2019 ,Johnson et al., 2015) Presently DSAS (digital shoreline analysis system) has been widely used for delineating shoreline and shoreline-related statics(Nandi et al., 2016). EPR (endpoint rate), WLR (weightage linear regression), NSM (net shoreline movement), and LRR (linear regression techniques) are mostly used for analysing the erosion and accretion activities trend in shoreline on short-term as well as long-term basis(Markose et al., 2016; Mishra et al., 2019)

1.1 Objectives:

The study aims -

- To analyse long-term shoreline, change dynamics from 1992-2022.
- To assess short-term shoreline, change dynamics from 1992-2022.

2. Materials and method

2.1 Study area:

The study was done Visakhapatnam coast in Andhra Pradesh, which mainly located at eastern coast of India. This regions have characterised by beaches, cliffs and faced highly wave activities. Where mainly found after cyclonic storm results like erosional and accretional activities. Beaches are Yarada beach, Ramakrishna Beach, Rushikondsa beach, Thotlakonda beach and bheemli beach. The whole study area was subdivided into five zones. Zone I (southern end of yarada beach to Northern end of Yarada Beach), zone II (Northern end of Yarada Beach to Ramakrishna Beach), zone III (Ramakrishna Beach to Rushikonda Beach), zone IV (Rushikonda Beach to Thotlakonda Beach) and zone V (Thotlakonda Beach to Gosthani rivers). The coastal area rough have topography and coarse grain size.

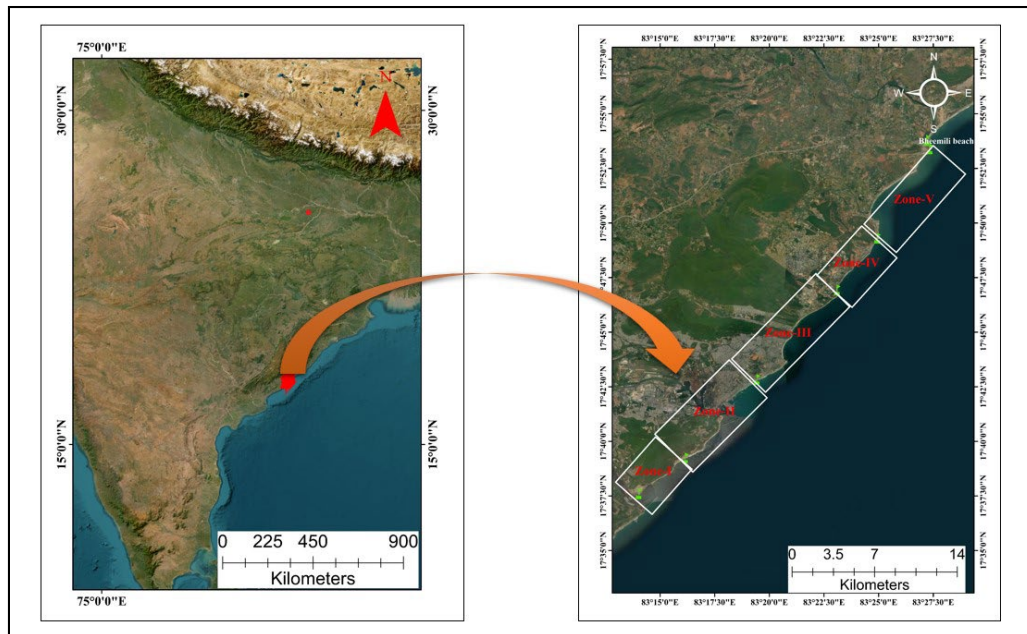


Fig 1 Location map of study area

2.2 Datasets:

In this study, we used multispectral satellite images of Landsat from 1992 to 2022. Multitemporal satellite imagery, that is Landsat 5/TM level 2 tier 1 collected (1992– 2002) and Landsat 8/ OLI level 2 (2012 - 2022) acquired from the USGS site <https://earthexplorer.usgs.gov> were used for shoreline change detection. The whole summary of the satellite image is given in Table nol. The ortho-rectified satellite imageries have been extracted having low cloud cover in the winter period of the year in November and December month. Landsat imageries are medium resolution that is mostly used for shoreline detection (Mishra et al. 2019, 2021). All collected images are in UTM projection 45° N zone and WGS 84 datum. The Landsat 8 OLI image of 2022 has been selected for baseline demarcation for showing the shoreline shifting due to a combination of the new blue band with an improved signal-to-noise ratio (SNR). In this study, we used Arc GIS 10.8 and the DSAS tools for extracting shorelines from satellite images and further statistical calculations that are discussed briefly in the following section. A detailed field survey and household survey was were in the month of December 2022

Tab Details of satellite image

Scene ID	Scene centre time (GMT + 5:30)	Acquire d date	Satellite	Spatial resolution (m)	Cloud cover (%)	Path	Row
LT05_L2SP_141048_19931213_20200913_02_T1	04:10:52	13-12-1992	LANDSAT 5	30	0	141	48
LT05_L2SP_141048_20031209_20200904_02_T1	04:19:22	09-12-2002	LANDSAT 5	30	3	141	48
LC08_L2SP_141048_20131204_20200912_02_T1	04:21:03	04-12-2012	LANDSAT 8	30	0	141	48

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2.3 Shoreline detection:

The shoreline is the transition zone between land and water (Mondal et al. 2020). The researchers considered the high water level HWL to be a widely used indicator for shoreline detection that is extracted from the multi-spectral satellite image. The present study applied a semi-automatic method for shoreline detection. From the Landsat satellite imageries, the green and SWIR band are used for delineating the land-water transition zone. The study checked various indices such as the Normalized Difference Water Index (NDWI), modified the Normalized Difference Water Index (MNDWI), Enhanced Water Index (EWI) and Water Ratio Index (WRI) to determine the differences between land and water zone. Escape the MNDWI index the result are unsatisfactory for other indices, so, we considered the MNDWI index for delineating the differences between land and water in coastal areas in Sagar Island. After extracting the land and water transition zone, a binary image masking is created using the raster-to-vector conversion method and finally, the shoreline was delineated.

2.4 Delineation of zones/ littoral cells and transacts:

The baseline of Andhra Pradesh coast was constructed on the seaward side at a 200 m distance from the shoreline. The baseline is delineated using the DSAS tool in Arc GIS 10.8 to create some fields such as OBJECT ID, SHAPE ID, Group, and SHAPE Length, these fields are required for understanding the information about transect order and relative location of a baseline. After the creation of the baseline, the cast transect was generated at 100 m intervals which are perpendicular to the baseline. The length of the transect is 43.8 km from the baseline and with the help of the transect, the shoreline statics are computed using EPR, and WLR. The entire shoreline of Andhra Pradesh coast was divided into five zones based on physical features such as tidal creek mouth. These zones are started from southern to end point of Yarada Beach to Gosthani River. Zone-I was located in the southern to end point of Yarada Beach section having a length of 5.2 km, the shortest length. Zone II extended from the northern end of the Yarada to the Ramakrishna Beach region. The total distance covered by zone II is 9.9 km. Zone III extended from Ramakrishna Beach to Rushikonda beach. This zone extended 12.1 km. Zone IV covered a distance of 5.5 km that extended from Rushikonda Beach to Thotlakonda Beach. Zone V is Thotlakonda Beach to Gosthani River Mouth. The length of this region is 11.1 km.

2.5 Shoreline Change Rate calculation:

The shoreline change statistics analysis is a more common and widely used method for calculating shoreline change with respect to time. The most common method such as LRR, EPR, NSM, WLR and

SCE is the most popular and widely accepted method by researchers for shoreline change. In this study, these methods are automatically calculated using DSAS 5.1 tool using ArcGIS 10.8 software. The DSAS tool is automatically created a cast transect and automatically calculated the EPR, LRR, and WLR for quantifying the erosion and accretion rate of the shoreline. The present study adopted the WLR method for analysing the long-term (1992-2022) changes in shoreline shifting and the EPR method technique is applied for short-term change analysis of shoreline (1992-2002, 2002-2012, 2012-2022).

2.5.1 End point rate:

EPR statistical method computed for analysis short-term of shoreline change rate. The EPR was calculated by dividing the distance of shoreline movement and the time difference between the youngest and the oldest shoreline.

2.5.2 Linear regression rate (LRR):

The LRR statistical technique was applied to estimate the mean shoreline change. The best-fit regression line is used for calculating the change rate of the shoreline in each transect. In this method, the shoreline change is shown in each transect and determines the relationship between year or time and the rate of change of shoreline in every transect. The value regression coefficient of LRR ranges between 0 to 1 the value '0'-'1' indicates no accuracy level to high-level accuracy.

2.5.3 WLR method:

The WLR method was used for long-term (2000-2020) shoreline change analysis. The shoreline position of the year 2000 is considered the baseline and the shoreline of 2020 is considered a recent shoreline. For long-term analysis shoreline analysis, the WLR method is the more appropriate method. In this method, a best fit least square regression line is conducted based on the shoreline uncertainty of every transect, after that, a weightage value assigns for calculating the uncertainty of every transect.

3. Result

3.1 Shoreline change analysis:

The shoreline change of Part of Andhra Pradesh Coast was analysed for the past 30 years (1992-2022) used multispectral satellite images from Landsat, used the DSAS tool and the statistical method for calculating shoreline change statistics. The EPR and WLR are used for short-term and long-term analysis. The long-term result shows that out of 438 transects, 32.88% of transects experienced an erosional trend and 66.89% of transects had accretion activity. The highest positive change rate was found 0.45 in zone II and the average shoreline change rate was also negative which was -0.46 m/y in

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zone IV. The maximum shoreline change was found at 24.31 in zone-II and the minimum shoreline change rate found in zone-III was -0.74 m/y. The short-term result shows erosional trends found during the period between 2002-2012. Accretion activities found during the period 1992-2002 and 2012-2022.

3.1.1 Long-term change:

The present study has done zone-wise long-term analysis. The result of the WLR method reveals that erosion has occurred in 144 transects and 293 transects had recorded accretion activity. The percentage-wise distribution of long-term shoreline change shows that 32.88% of transects had experienced erosion and 66.89% transects had experienced accretion. The mean shoreline erosion was recorded at -0.36 m/y and is the mean accretion recorded was 0.62 m/y. In this study region the mean shoreline change had approximately recorded at 0.13 m/y. The maximum and minimum shoreline change in the study region was recorded at 24.31 m/y and -3.91 m/y. The accretion work is dominant in the study region, its situated from Gosthani River to southern end of Yarada beach Beach of Andhra Pradesh Coast and interacts with the sea namely the Bay of Bengal.

Zone I has stretches of 5.2 km and a total transect number of transact 52 out of which 23 transects had recorded erosion activity and 31 transects had experienced accretion activity. The percentage-wise distribution shows that 44.23 of transects recorded erosion and the remaining 55.77 of transects recorded accretion activities. The mean shoreline change in this section was approximately 0.08 m/y and the maximum and minimum shoreline change was recorded at 3.53 and -1.18 m/y.

The length of the shoreline in Zone-II had 9.9 km and contained 99 transects, 28.28% of transects were recorded erosion and 71.71% of transects were recorded accretion. Transect 24.31 recorded the highest erosion which is -0.99 m/y and the highest deposition was recorded. Zone III had stretches of 12.1 km and this zone had covered by 121 transects, among them all transects recorded accretion. The mean shoreline change rate in this region had recorded at 0.32 m/y, the maximum shoreline change rate was 5.21 m/y and the minimum shoreline change recorded at -0.74 m/y.

Zone IV covered 55 transects and had a length of 5.5 km, maximum transects faced accretion activity in this region which is 49 and it was recorded erosional transects are only 06. The rate of mean shoreline change 0.2 m/y and the mean erosion rate was recorded as -0.02 m/y. The minimum shoreline change recorded in transect number is -0.85 m/y and maximum recorded is 1.82.

Zone V extended covered the length of 11.1 km and it is contained 111 transects, this zone also face 64.86% erosion accretion face 34.23%. The rate of mean shoreline change was -0.46 m/y and the rate of minimum shoreline change was recorded as -3.91 m/y is the maximum shoreline change is 2.22m/y.

This five zone extended from Gosthani River to southern end of Yarada Beach in Andhra Pradesh coast. Faced higher depositional activity, most of the cyclonic landfall happened in this region and this region also faced the wave and strong sea activity, morphologically this zone was characterised by young coastal plain contained by loose sediment these factors help progress erosional activity in this region.

Table 2: Calculated summary of the shoreline change rates from Zone-I to Zone-V (1992-2022)

Descriptive statistics	Zone-I	Zone-II	Zone-III	Zone-IV	Zone-V	Total
Transect-ID	1-52	52-151	152-272	272-327	327-438	1-438
Total number of transects	52	99	121	55	111	438
Length of shoreline (km)	5.2	9.9	12.1	5.5	11.1	43.8
Total number of transects where erosion was recorded	23	28	15	6	72	144
Total number of transects where accretion recorded	29	71	106	49	38	293
% Total number of transects where erosion was recorded	44.23	28.28	12.4	10.9	64.86	32.88
% Total number of transects where accretion recorded	55.77	71.71	86.78	89.91	34.23	66.89
Mean shoreline change (m/year)	0.08	0.52	0.32	0.2	-0.46	0.13
Maximum shoreline change (m/year)	3.53	24.31	5.21	1.82	2.22	24.31
Minimum Shoreline change (m/year)	-1.18	-0.99	-0.74	-0.85	-3.91	-3.91
Mean erosion rate (m/year)	-0.22	-0.13	-0.02	-0.02	-1.16	-0.36
Standard deviation (m/year)	0.36	0.26	0.09	0.11	1.28	0.82
Mean accretion rate (m/year)	0.39	1.18	0.67	0.44	0.24	0.62
Standard deviation (m/year)	0.62	3.14	0.65	0.38	0.42	1.60

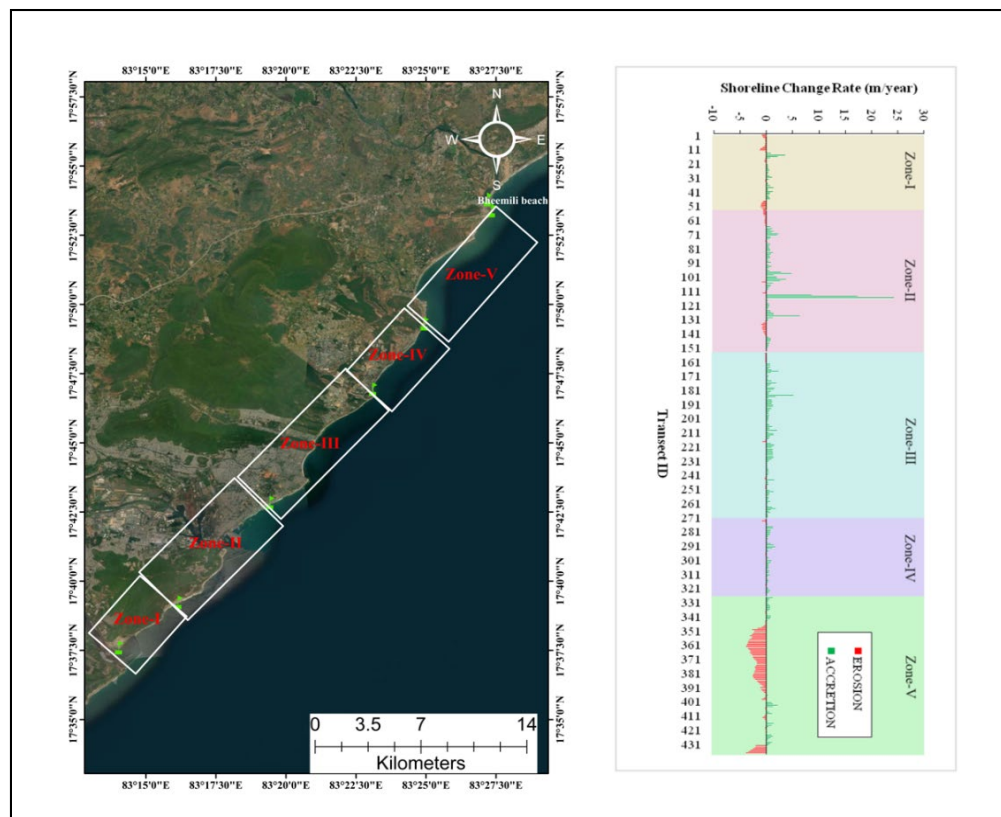


Fig 3 Long-term shoreline changes using WLR method (1992-2022)

3.1.2 Short-term change:

The present study applied EPR and LRR statistical techniques for short-term changes in the shoreline. During the time period between 1992-2022, it was recorded the rate of shoreline changes vary from -1.3 m/y (1992-2002) in zone IV to 1.6 m/y (2012-2022) in zone V. The highest percentage of the erosional transect was recorded in zone IV that is 94.55 (Zone V, 2002-2012) and the highest percentage of accretion transect was recorded in zone VI that is 100% (Zone IV, 2002-2022) was recorded. The changes in mean shoreline ranged from -1.3 m/y to 1.47 m/y. The accretion of shoreline was seen 0.004 m/y to 3.2y/m of the transect. In zone II 3.36% and in zone I 1.16% had found stable transects. 91.00% of transects had faced erosional activities, 3.14% of transects had faced accretion activities and the remaining 2.52% of transects recorded.

Table 3: Short-term shoreline change using EPR method

Time interval	Zone	Total number of transects	Transects of erosion (with %)	Transects of accretion (with %)	Stable transects (with %)	Mean shoreline Change (m/year)	Maximum shoreline change	Minimum shoreline change	Mean erosion rate (m/year)	Standard Deviation erosion (m/year)	Mean accretion rate(m/year)	Standard Deviation accretion (m/year)
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1993– 2003	I	52	7(14.63)	45(86.27)	0	0.48	4.49	-0.9	-0.07	0.22	1.03	0.91
	II	96	26(27.37)	67(69.48)	3(3.16)	0.81	44.63	-14.98	-0.59	1.82	2.21	6.32
	III	121	48(40)	73(60)	0	0.08	3.53	-3.47	-0.38	0.69	0.53	0.66
	IV	56	27(49.09)	29(50.91)	0	-0.02	2.12	-2.05	-0.47	0.63	0.42	0.58
	V	107	77(72.64)	30(27.45)	0	-1.3	2.4	-18.03	-2.82	3.63	0.22	0.5
	Total	432	185(82.82)	244(56.48)	3(0.69)	-0.06	44.63	-18.03	-1	0.81	0.89	3.16
2003– 2013	I	52	45(86.54)	7(13.46)	0	-0.78	4.19	-12.08	-1.77	2.08	0.21	0.73
	II	99	73(73.73)	25(25.25)	1(1.01)	-0.4	5.84	-3.84	-1.16	1.21	0.36	1.05
	III	121	89(73.55)	32(26.45)	0	-0.33	5.97	-3.12	-1	0.89	0.34	0.84
	IV	55	51(92.73)	3(5.46)	1(1.82)	-1.05	0.13	-6.16	-2.1	1.73	0.004	0.02
	V	110	104(94.55)	6(5.46)	0	-0.83	10.95	-4.43	-1.9	1.38	0.23	1.31
	Total	437	362(82.84)	73(16.70)	2(0.46)	-0.62	10.95	-12.08	-1.49	1.45	0.26	0.98
2013– 2023	I	52	9(17.31)	43(82.69)	0	0.8	14.01	-0.89	-0.07	0.2	1.67	2.24
	II	99	2(2.02)	97(97.98)	0	1.17	41.82	-30.71	-0.32	2.67	1.27	4.52
	III	121	1(0.82)	120(99.17)	0	1.47	17.96	-1.28	-0.11	0.11	2.95	2.14
	IV	55	0	55(100)	0	1.6	8.1	0	0	0	3.2	1.45
	V	111	13(11.71)	98(88.28)	0	1.05	12.3	-3.94	-0.12	0.48	2.22	1.82
	Total	438	25(5.71)	413(94.29)	0	1.23	41.82	-30.71	-0.12	1.48	2.58	2.78

The period between 1992-2002 experienced both erosion and accretion activities of the shoreline. During this period erosion and accretion happened from zone I to zone V. The mean shoreline change rate was negative in this period -0.06 m/y. The upper and lower limit of the mean erosion rate extends from 0.81 m/y to -1.3 m/y.

Fig no 4 shows the short-term change of the last phase 2002-2012. In this phase, it shows that the average erosional character of all zone and the rate of mean shoreline change vary from -0.33 m/y to -1.05 m/y. It was also observed that 82.84% of the total transect faced erosion, 16.70% transect face the accretion and 0.46% transect stable.

The migration of the shoreline towards the land also generated vulnerable conditions in the coastal region. The present study area has a prominent erosion area and the shoreline shifted towards land day by day. The effect of regression of the shoreline damaged the private properties, damage the embankment, the intrusion of salt water, loss of agricultural land and dune degradation.

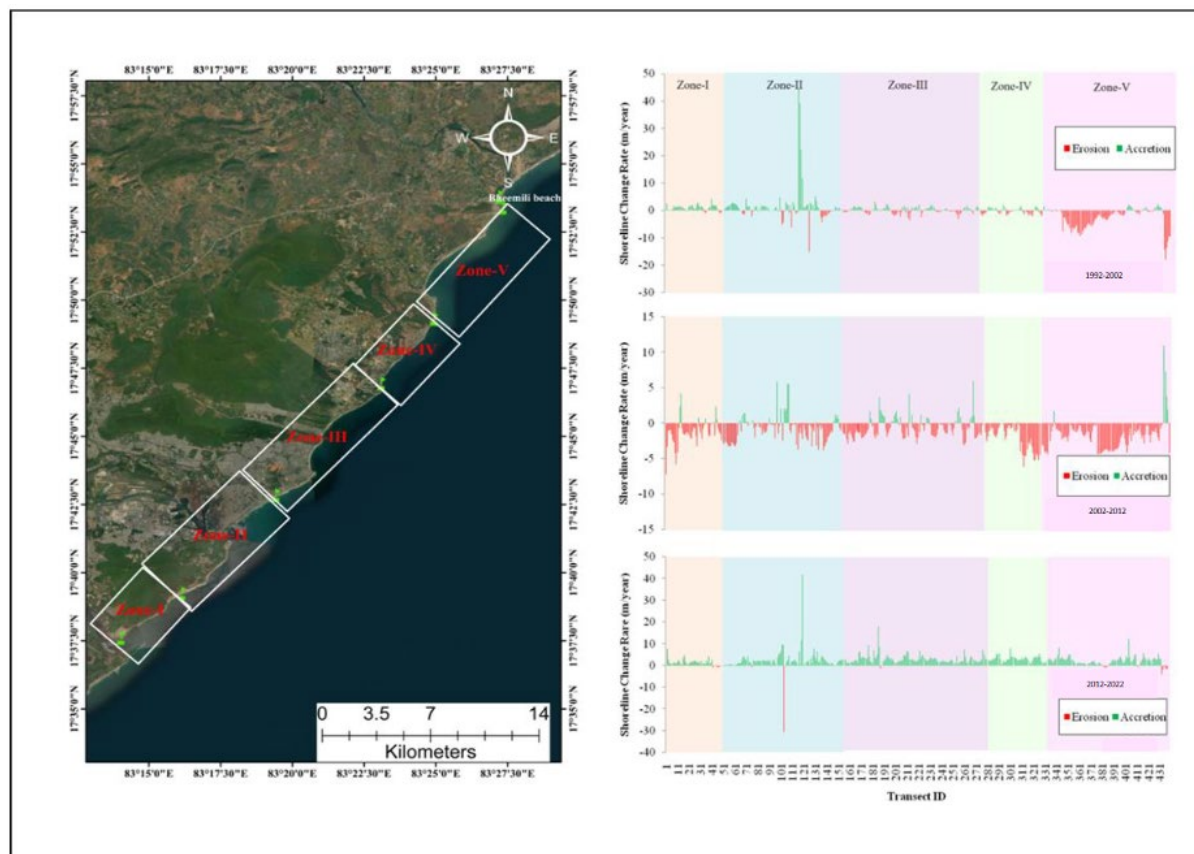


Fig 4 Short term shoreline change using EPR method

Phase 2013-2022 mean shoreline change found in (0.8m/y to 1.6m/y) was. The maximum erosional trend was found in the zone –III. The zone-wise percentage of transect faced accretion activities from 1.27m/y to 3.2 m/y. The accretion trend found in all-zone that is zone-I, Zone II, Zone I, II, Zone-IV and zone V. The erosional trend found in zone I, II, III and V. TD these zone is directly facing several cyclonic activities, wave action and tidal activities.

4. Discussion:

The transects of the study area was accretion prone prone (fig). The various factors like long shore transport, sea level rise, extreme climatic events, storm surge and human land use land cover transformation are responsible for shoreline shifting. According to the result of WLR zone-V, I faced prominent erosion activity. This zone was located in the extreme end of the state facing the wave action of Bay of Bengal. Those cyclones moves towards West Bengal are directly affected in this region increasing shoreline recession. The severe intensity and frequent landfall of tropical cyclones in the monsoon and pre-monsoon periods and the effect of cyclonic activities like storm surges, strong winds, flooding and heavy rainfall drastically change the position of the shoreline in the study area. Several

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cyclones affect to modify the coastal land (Nadi et al. 2016; Mondal et al. 2017). In the study area, a correlation exists between shoreline change and cyclonic events. It is observed that the EPR value during the period 1992-2002 (Table no.) indicates the major part of the shoreline faced erosional work and severe cyclones hit in this region. The anthropogenic activity such as the formation of fisheries, cutting the mangrove vegetation, habitat construction, and agricultural activity are destructed the physical barriers (jana) that plays a significant role for shoreline dynamicity. According to (Nabanita, jana) increasing population in Part of Andhra Pradesh Coast is responsible for the changes in land use pattern which creates vulnerability in this region. The major portion of was submerged under the sea and the people bounded to live to the interior of the was uninhabitable. The southern portion of study area has faced more vulnerable conditions than other parts of the island and erosional activity played the dominant role in this region, most of the shoreline in this region has directly connected with the Bay of Bengal facing lots of cyclonic activity, sea action, storm-surge, sea level rise which are responsible for erosional activity in this region. The major part of this region was characterised by sandy beaches and younger deltaic plains without vegetation, so, the shoreline shifting activity and the inundation of seawater frequently happened in this region these factors are responsible for the regression of seashore in this region.

5. Conclusion:

The comprehensive assessment of shoreline dynamics along the Vishakhapatnam Coast has unveiled a dynamic and evolving coastal landscape. This study conducted a detailed analysis of both short-term and long-term changes, underscoring periods characterized predominantly by erosion and accretion. Notably, it highlighted that Zones v, which include Bheemli beach are experiencing severe erosion. However, recent protective measures have mitigated the intensity of erosion in these areas. In contrast, Zones III and IV, comprising Thotlakonda and Rushikonda continue to face deposition challenges, necessitating sustained intervention.

Spanning from 1992 to 2022, the long-term analysis revealed an average erosion rate of -0.36 meters per year along the Vishakhapatnam Coast, with approximately 32.88% of transects experiencing erosion and 66.895% showing signs of accretion. The study highlighted the varying erosion and accretion trends across different zones. It also shed light on the complex interaction between climatic extremes, such as cyclones, and anthropogenic factors, including land-use changes, construction activities, deforestation, and dune degradation, which contribute to the region's heightened vulnerability.

In response, the study suggests a multifaceted approach to coastal protection, incorporating the use of natural barriers, revised land-use practices, and a combination of hard and soft engineering solutions, improved early warning systems, and infrastructure reinforcement to withstand extreme events. These strategic recommendations are vital for policymakers and planners, providing essential

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guidance for developing effective shoreline management strategies. Such strategies are crucial for preserving the Vishakhapatnam, a region of significant ecological and economic importance.

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কালিদাসের কাব্য মঙ্গলাচরণ

কৃষ্ণপদ পাল

সারসংক্ষেপ:

জনমানসে একটি প্রথা আবহমানকাল ধরে প্রচলিত হয়ে আসছে- শুভকর্মে শুভফলপ্রাপ্তি। অর্থাৎ কোন কার্যারম্ভের পূর্বে শুভমঙ্গলানুষ্ঠান অবশ্যই কর্তব্য। সেটা গৃহনির্মানই হোক বা কোন যাত্রাপথে গমনই হোক। সেই ধারাকে অক্ষুণ্ন রেখে সাহিত্যের নন্দনকাননে মহাকবি কালিদাস তাঁর প্রতিটি কাব্যসৃষ্টির প্রারম্ভে ইষ্টদেবতাকে স্মরণপূর্বক মঙ্গলাচরণ শ্লোক নিবদ্ধ করেছেন। যার উদ্দেশ্য সুস্ঠুভাবে কার্যের পরিসমাপ্তি ঘটানো। এই মঙ্গলাচরণ ভারতীয় সংস্কৃতির ঐতিহ্যমণ্ডিত শিষ্টাচার।

নাট্যশাস্ত্র, অষ্টাধ্যায়ী, মহাভাষ্য, কাব্যপ্রকাশ, ধন্যলোক, রসগঙ্গাধর, তর্কসংগ্রহ, তর্কভাষা, অর্থসংগ্রহ প্রভৃতি আদি অনেক গ্রন্থে এবং আধুনিক কবিদের গ্রন্থেও মঙ্গলাচরণ প্রতিফলিত হয়েছে। মঙ্গলাচরণের এক ঐশ্বরিক শক্তি বোধ হয় কবিদের চিন্তন শক্তিকে এক অন্যমাত্রা প্রদান করে তা বলাবাহুল্য। প্রায় প্রত্যেক কবিই মঙ্গলাচরণের সান্নিধ্যে তাদের কাব্যকে সুস্ঠুভাবে পরিসমাপ্তি করেছেন।

মহাকবি কালিদাসও তাঁর কাব্য-নাটকগুলিতে ইষ্টদেবতাকে স্মরণ করে কাব্য রচনার পরিসমাপ্তি করেছেন। এই শোধপত্রে আমি মহাকবি কালিদাস, তাঁর গ্রন্থে কোন ইষ্টদেবতাকে স্মরণ পূর্বক তাঁর মঙ্গলাচরণ করেছেন এবং সেই মঙ্গলাচরণের মাধ্যমে তিনি কাব্যবিষয়ে কি ইঙ্গিত দিয়েছেন বা তিনি কোন ধরনের মঙ্গলাচরণ বেশি ব্যবহার করেছেন; সেই বিষয়ে সংক্ষেপে আলোচনা করার চেষ্টা করব।

শব্দসংকেত: মঙ্গলাচরণ, ইষ্টদেবতা, অলংকার, বস্তুনির্দেশাত্মক, নৈয়ায়িক, জ্ঞানপিপাসু

ভূমিকা:- সংস্কৃত সাহিত্যের রীতি অনুযায়ী অভিনয়ের পূর্বে মঞ্চ বিঘ্ননাশের জন্য দেবতাদের স্তুতি পাঠের নির্দেশ আছে। এই অংশকে 'পূর্বরঙ্গ' বলা হয়। পূর্বরঙ্গের মধ্যে 'নান্দী' অন্যতম। সাহিত্যদর্পণকার বিশ্বনাথের মতে-

'যন্নাট্যবস্তুনঃ পূর্বং রঙ্গবিঘ্নোপশান্তয়ে।

কুশীলবাঃ প্রকুবন্তি পূর্বরঙ্গ স উচ্যতে।।

প্রত্যাহারাদিকান্যঙ্গান্যস্য ভূয়াংসি যদ্যপি।

তথাপ্যবশ্যং কর্তব্য নান্দী বিঘ্নোপশান্তয়ে।।'^১

আবার বলা হয়েছে আশীর্বাদ দেবদ্বিজাদির স্তুতি, নৃপপ্রশংসা প্রভৃতি থাকায় তাতে সকলের আনন্দ উৎপন্ন হয়। তাই নাম হয়েছে 'নান্দী'।

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‘আশীর্বচনসংযুক্তা স্তুতির্য়স্মাৎ প্রযুজ্যতে।

দেবদ্বিজন্মপাদীনাং তস্মান্নান্দীতি সংজিতা।।’^২

নাট্যপ্রদীপে বলা হয়েছে-

‘নন্দন্তি কাব্যানি কবীন্দ্রবর্গাঃ কুশীলবাঃ পরিষদাশ্চ সন্তঃ।

যস্মাদলং সজ্জনসিদ্ধুহংসী তস্মাদিয়ং সা কথিতেহনান্দী।।’^৩

মহর্ষি পতঞ্জলি বলেছেন-

‘মঙ্গলার্থম্। মঙ্গলিক আচার্যো মহতঃ শাস্ত্রৌঘস্য মঙ্গলার্থং সিদ্ধশব্দমাদিতঃ প্রযুক্ততে।
মঙ্গলাদিনী হি শাস্ত্রাণি প্রথন্তে বীর পুরুষাণি চ ভবন্ত্যযুস্মৎ পুরুষাণি চ, অধ্যোতারশ্চ সিদ্ধার্থা যথা
সুরিতি।’^৪

অধিকাংশ সংস্কৃত নাটকে প্রারম্ভিক মঙ্গলশ্লোক ‘নান্দী’ এই নামে কথিত হয়ে আসছে। সম্ভবতঃ
বিঘ্নের আশংকা না থাকায় পূর্বরঙ্গ অপ্ৰাসঙ্গিক হয়ে পড়লে নাটকের মঙ্গলশ্লোকই ‘নান্দী’ নামে পরিচিত
হয়। এটিকে সাধারণভাবে নাটকের ‘নান্দী’ বলা হয়। এতদসত্ত্বেও নান্দীর সঙ্গে মঙ্গলাচরণের সামান্য
পার্থক্য বিদ্যমান। ‘নান্দী’ পাঠ করবেন নাটকের কুশী-লবেরা আর মঙ্গলাচরণ করেন নাট্যকার বা কবি।
অভিনয়ের নির্বিঘ্ন পরিসমাপ্তির জন্য কুশী-লবেরা ‘নান্দী’ পাঠ করেন এবং কবি পাঠ করেন নাটকটির
লেখা সুষ্ঠু পরিসমাপ্তির জন্য।

উদ্দেশ্যঃ- ভারতীয় পরম্পরানুযায়ী গ্রন্থারম্ভে মঙ্গলাচরণ এক ঐতিহ্য বহন করে চলেছে আসমুদ্র
হিমাচল থেকে সর্বত্র। এ নিয়ে প্রাচীন শাস্ত্রে বিভিন্ন মতামত আলোচিত হয়েছে। ভারতীয় সংস্কৃতিতে
মঙ্গলসূচক কিছু বৈশিষ্ট্য লক্ষ্য করা যায়। বহির্দেশে গমনের পূর্বে গুরুজনদের পাদস্পর্শ করে আশীর্বাদ
গ্রহণ শুভযাত্রার পরিসমাপ্তি ঘটায়। আবার পথিমধ্যে গুরুর সাক্ষাতে চরণ স্পর্শে গুরুর আশীর্বাদ
ভবিষ্যৎ জীবন চরিত্রকে সুগম করে তোলে।

মঙ্গলাচরণের ফলবিষয়ে দুটি মতবাদ পাওয়া যায়-১) প্রাচীন নৈয়ায়িকপন্থী মত ২) নব্য
নৈয়ায়িকপন্থী মত। প্রাচীনপন্থীদের মতে- শুভ মঙ্গলাচরণ করলে নির্বিঘ্নে কাব্য পরিসমাপ্তি হয়। কিন্তু
নব্য নৈয়ায়িকেরা এই যুক্তি খণ্ডন করেছেন। তাঁরা বোঝাতে চেয়েছেন মঙ্গলাচরণ এবং গ্রন্থ-পরিসমাপ্তির
মধ্যে যে কার্য-কারণ সম্বন্ধ আছে তা যুক্তিহীন। মঙ্গলাচরণ ছাড়াই যেমন গ্রন্থের পরিসমাপ্তি হয়েছে
তেমনি মঙ্গলাচরণ করেও গ্রন্থের সমাপ্তি হয়নি। এরকম ঘটনাদ্বয়ের সাক্ষীও আছে সংস্কৃত
সাহিত্যজগতে। যেমন বাণভট্টকৃত কথাকাব্য ‘কাদম্বরী’ তে মঙ্গলাচরণ থাকা সত্ত্বেও সমাপ্তি হয়নি।
অতএব মঙ্গলাচরণের ফলেই শুধুমাত্র গ্রন্থ পরিসমাপ্তি হতে পারেনা। প্রাচীনপন্থীরা অবশ্য বলেছেন
“যেখানে মঙ্গলাচরণ না থাকা সত্ত্বেও গ্রন্থের পরিসমাপ্তি হয়েছে, সেখানে জন্মান্তরীয় মঙ্গলাচরণের
কল্পনা করা হয়েছে। আর যেখানে মঙ্গলাচরণ করেও গ্রন্থ সমাপ্তি হয়নি সেখানে বিঘ্নের আধিক্য সূচিত
হয়েছে, যা মঙ্গলাচরণ দূর করতে অক্ষম।”^৫

সুতরাং বুদ্ধিদীপ্ত, প্রতিভাবান, কবিদের মঙ্গলাচরণ করার উদ্দেশ্যই হল বাধা বিঘ্নকে দূরীভূত
করা। অর্থাৎ কবি তাঁর কাব্য রচনার প্রাক্কালে যদি কোন বাধা-বিপত্তির সম্মুখীন হয়, সেই আশঙ্কায়
মঙ্গলাচরণ করার প্রয়াস ব্যক্ত করেন।

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প্রবন্ধের পদ্ধতি: বর্ণনামূলক পদ্ধতি অবলম্বন করে আমি আমার পাণ্ডুলিপি প্রস্তুত করেছি। এই পদ্ধতি গুণগত মানের উপর জোর দেওয়া হয়।

সাহিত্য পর্যালোচনা:- কবি তাঁর কাব্যের সুষ্ঠু সমাপনের জন্য যে মঙ্গলাচরণ নিবন্ধ করেন। সেই ইঙ্গিত অলংকারশাস্ত্র ‘সাহিত্য দর্পণ’ গ্রন্থে উল্লেখিত আছে। এ-প্রসঙ্গে ‘নাট্যশাস্ত্র’ গ্রন্থেও তদ্রূপ ‘নান্দী’ প্রসঙ্গ উত্থাপিত হয়েছে।

প্রবন্ধের মূল অংশ-

‘কালিদাসগিরাং সারং কালিদাসঃ সরস্বতী।

চতুর্মুখোহথবা ব্রহ্ম্য বিদুর্গান্যে তু মাদৃশাঃ।।’^৬

সাহিত্যের নন্দনকাননে ধ্রুবজ্যোতি কালিদাস কেবল ব্যক্তিমাত্র নন, তিনি একটি সম্পূর্ণ যুগ বললেও বিশ্বায়কর মনে হবেনা সংস্কৃত-জ্ঞানপিপাসুদের কাছে। সেই যুগকে শব্দের সামান্য বেড়াজালে আটকে রাখা যায়না। বিভিন্ন গ্রন্থে কাব্যের ভাষায় কাব্যিকেরা কালিদাসকে কল্পতরু আখ্যায় ভূষিত করেছেন। কাশ্মিরীয় নৈয়ায়িক জয়ন্তভট্ট কালিদাসের সৃক্তিসমূহ অমৃতরসের দ্বারা সিক্ত চন্দনরসের দ্বারা অনুলিপ্ত এবং চন্দ্রকিরণের দ্বারা উদ্ঘুষ্ট বলে বর্ণনা করেছেন-

‘অমৃতনৈব সংসিক্তা চন্দনৈব চর্চিতাঃ।

চন্দ্রাংশুভিরিবোদঘৃষ্টাঃ কালিদাসস্য সূক্তয়ঃ।।’^৭

আলংকারিক, নৈয়ায়িকদের দৃষ্টিপিপাসু ব্যক্তিসম্পন্ন এইরকম একজন মহান ব্যক্তিত্ব নিজের পাণ্ডিত্য প্রকাশের পূর্বে ভারতীয় সংস্কৃতির শিষ্টরীতি অনুসরণ করেছেন; যা জনমানসের হৃদয় স্পর্শ করেছে। তিনি তাঁর প্রতিটি রচণায় ইষ্টদেবতাকে শ্রদ্ধা নিবেদন করে মূল অংশে প্রবেশ করেছেন। ‘কুমারসম্ভবম্’ , ‘রঘুবংশম্’ এবং ‘মেঘদূত’ কাব্যও তাঁর ব্যতিক্রম নয়।

রঘুবংশম্:- ইষ্টদেবদেবীর উদ্দেশ্যে প্রণতি নিবেদন এবং আশীর্বাদের মাধ্যমে মহাকাব্যের সূচনা করতে হবে বলে অলংকার শাস্ত্রে কথিত আছে। এই বিধান অনুসারে কালিদাসও তাঁর পূর্বসূরিদের পথ অনুসরণ করেছেন। ধর্মবিশ্বাসে কালিদাস ছিলেন শান্ত ভক্ত। তাঁর প্রায় প্রতিটি লেখনীতে প্রকাশ পেয়েছে মহেশ্বরকে প্রণতি নিবেদন। ‘রঘুবংশম্’ মহাকাব্যও তাঁর ব্যতিক্রম নয়।

‘শব্দজাতমশেষন্তু ধত্তে শর্বস্যবল্লভা।

অর্থরূপং যদখিলং ধত্তে মুক্ষেন্দুশেখরঃ।।’^৯

শব্দার্থজ্ঞান কাব্য রচনার মূল বৈশিষ্ট্য। পার্বতী-পরমেশ্বর যেমন বিশ্বের ধাত্রী ও ধাতা, শব্দ এবং অর্থও ধাত্রী ও ধাতা রূপ অর্ধনারীশ্বরকে বিশিষ্ট শব্দার্থ জ্ঞানের জন্য প্রণতি নিবেদন করেছেন। আলংকারিক মন্মট তাঁর ‘কাব্যপ্রকাশ’ গ্রন্থে কাব্যরচনার প্রয়োজন সম্পর্কে বলেছেন-

‘কাব্যং যশসেহর্থকৃতে ব্যবহারবিদেঃ শিবেরক্ষতয়ে

সদ্যঃ পরনিবৃত্তয়ে কান্তাসম্মিততয়োপদেশযুজে।।^{১০}

শুধুমাত্র লোকাচার, অর্থের জন্য কাব্যরচনা নয়। অমঙ্গল বিনাশ করে মঙ্গলকামনায় খ্যাতি অর্জন করা কবির ঈঙ্গিত উদ্দেশ্য। ‘রঘুবংশম্’ কাব্যে শ্লোকাদিতে ‘বাগর্থবিব’ পদটি উচ্চারিত হয়েছে। অর্থাৎ প্রারম্ভেই ‘ব’ শব্দের প্রকাশ ঘটেছে। “পণ্ডিতদের মতে-‘ব’ কার ‘ম’ -গণের অন্তর্গত। ‘ম’ ভূ-দেবতাবাচক ও সকলগণের শ্রেষ্ঠ। পাঁচটি অমৃতবীজের অন্যতম (কং, বং, ঝঃ, পঃ, হঃ) হল ‘ব’ কার।”^{১১} আবার ‘বাগর্থো’ -এই পদটিতে তিনটিই গুরুবর্ণ হবে। ছন্দঃশাস্ত্রানুযায়ী এই তিন গুরুবর্ণে একত্রে ‘ম’ গন হয়। এইভাবে ‘ম’ গণের অন্তর্গত ‘ব’ কারের দ্বারা কাব্যরচনা করে কবি কাব্যের শুভফল প্রার্থনা করেছেন। এ-প্রসঙ্গে কামধেনুতন্ত্রে বলা হয়েছে-

‘বকারং চঞ্চলাপাঙ্গি কুণ্ডলীমোক্ষমব্যয়ম্।

পঞ্চপ্রাণময়ং বর্ণং ত্রিশক্তি সহিতংসদা।।

চতুর্বর্গপ্রদং বর্ণং সর্বসিদ্ধি প্রদায়কম্।

ত্রিশক্তি সহিতং দেবি ত্রিবিন্দু সহিতংসদা।।^{১২}

সাংখ্যদর্শনে প্রকৃতি ও পুরুষতত্ত্ব আলোচিত হয়েছে। সাংখ্যমতে প্রকৃতি জগতের কারণ। কেননা, প্রকৃতি থেকেই জগতের অভিব্যক্তি ঘটে। সৃষ্টির পূর্বে জগত প্রকৃতির মধ্যে অব্যক্ত অবস্থায় থাকে। সৃষ্টি প্রক্রিয়ার ফলে সেই অব্যক্ত ব্যক্ত রূপে পরিণত হয় মাত্র। এই পরিণামের জন্য প্রকৃতি ও পুরুষ সংযোগ একান্ত আবশ্যিক। আবার কেবল পুরুষও জগতের অভিব্যক্তির কারন হতে পারেনা। কেননা পুরুষ নিষ্ক্রিয়, নির্বিকার সাক্ষীমাত্র। তাই সাংখ্যদর্শনে বলা হয়েছে- অচেতন কিন্তু সক্রিয় প্রকৃতি এবং নিষ্ক্রিয় চেতন পুরুষের সংযোগবশতঃ জগৎ সৃষ্টি হয়েছে। অনুরূপভাবে আমার মনে হয়েছে জগতের কারণ পার্বতী-পরমেশ্বর যেমন কল্যানের প্রতিমূর্তি তেমনি কাব্য সৃষ্টির উপাদান শব্দ-অর্থও কল্যানকর ফলদায়ক। তাই সাংখ্যদর্শনে প্রকৃতি ও পুরুষতত্ত্ব ও তন্ত্রের শিব-শিবাতত্ত্ব একাকার হয়ে গেছে কালিদাস দর্শনে। তাই মল্লিনাথ বায়ুপুরাণে উদ্ধৃতি দিয়ে বলেছেন-

‘শব্দজাতমশেষন্তু ধত্তে শর্বস্যবল্লভা।

অর্থরূপং যদখিলং ধত্তে মুক্ষেন্দুশেখরঃ।।”^{১৩}

কুমারসম্ভবম্ঃ মহাকাব্যে বস্তুনির্দেশ ও আশীর্বাদের মাধ্যমে মহাকাব্যের সূচনা হবে অলংকার শাস্ত্রানুযায়ী। তাই সাহিত্যদর্পণকার বলেছেন-‘আদৌ নমস্ক্রিয়াশীর্বা বস্তুনির্দেশ এব বা’।^{১৪} ‘কুমারসম্ভবম্’ মহাকাব্যে কবি স্বয়ং জগদম্বা ও জগদীশের লীলাকলা রচনা করেছেন। কবির মনে যে শান্তপ্রেম, তা ব্যক্ত করেছেন এই গ্রন্থে। চতুর্বর্গ ফলপ্রাপ্তির নিমিত্ত মহেশ্বরের কাহিনী গ্রন্থন করেছেন। সেখানে গ্রন্থবিঘ্ন বিনাশের জন্য-‘আশীর্নমস্ক্রিয়া বস্তু নির্দেশো বাহপি তন্মুখম্’ এই নিয়মানুসারে আদিতে বিষয়ের বস্তু নির্দেশ করেছেন।

শ্লোকরম্ভে উল্লিখিত হয়েছে ‘অস্ত্যন্তরস্যাং দিশি’। অস্তি শব্দে প্রথম ‘অ’ দিয়ে শুরু হওয়ায় মাঙ্গলিক বিষয়ের সূচনা হয়েছে। প্রাচীন টীকাকারদের মতে ‘অ’ হল বিষ্ণুর বাচক ‘অকারো বিষ্ণুরাদিষ্টঃ’^{১৫} সেইজন্যই মহাকবি কালিদাস শ্লোকের আদিতে ‘অ’ বর্ণের উল্লেখ করেছেন।

ভারতবর্ষের উত্তরদিকে সর্বদেবতাদের বাসভূমি নগরাজাধিরাজ হিমালয় বিদ্যমান। ‘কুমারসম্ভবম্’ মহাকাব্যের প্রারম্ভিক শ্লোকে ‘উত্তরস্যাং দিশি’ এই পদদ্বয়ের দ্বারা ‘দেবভূমিত্ব’ ও ‘দেবতাত্বা’ শব্দের দ্বারা অচলত্বের অভাব সূচিত হয়েছে। সেই হিমালয় পৃষ্ঠে অবস্থিত যাবতীয় প্রাণী, উদ্ভিদ, জড়বস্তু, জল সবই দেবতারূপে পূজিত হন। পৌরানিক কাহিনী সমৃদ্ধ এই হিমালয় অন্যান্য দেবতাদের থেকেও গুণগ্রাহী। তাঁর পত্নী, পুত্র, কন্যা বিদ্যমান। এই দেবতাত্বা পদের দ্বারা মহাকবি হিমালয়ের উদাত্ত ও লোকোত্তর গুণগুলি প্রতিপাদন করেছেন। এখানে হিমালয় পূর্ব-পশ্চিম সমুদ্রব্যাপিতা প্রসিদ্ধ। তাই ব্রহ্মাণ্ড পুরাণে কথিত আছে-

‘কৈলাসো হিমবাংশৈশ্চ বদক্ষিণে বর্ষপর্বতো।

পূর্বপশ্চিমগাবেতাবর্ণনান্তরূপস্থতো।।’^{১৫}

অভিনবগুপ্ত না থাকলে যেমন ধন্যালোকের মহত্ত্ব প্রতিষ্ঠা হত না, সায়নাচার্য না থাকলে যেমন বেদবাণীর মর্মোদ্ধার অসম্ভব হত, শঙ্করাচার্য না থাকলে যেমন উপনিষদের রহস্য আনুধাবন করা যেতনা, তেমনি মল্লিনাথ ছাড়া কালিদাসের হৃদয়ভূমিতে প্রবেশ এবং তাঁর রচনার রসাস্বাদন দুর্বিসহ হত। তাই আমার মনে হয়েছে যেহেতু কালিদাস ‘কুমারসম্ভবম্’ কাব্যটি শিবপুরান থেকে গ্রহণ করেছেন, সেহেতু তাঁর এই কাব্যের মধ্যে পৌরাণিক ভাবধারা স্থান পেয়েছে। যার ফলে সনাতন ধর্মের অলৌকিক প্রভাব তাঁর কাব্যে মঙ্গলাচরণবৎ প্রতিভাত হয়েছে। যেহেতু দেবতাদের কাহিনী সম্মিলিত কাব্য মহাকবি সুনিপুনভাবে তার লেখনীতে তুলে ধরেছেন, সেহেতু তিনি সর্বদেবতাদের স্থানভূমি হিমালয়কে প্রণতি নিবেদন করেছেন তাঁর কাব্যের মধ্যে। তাই বোধ হয় আলাদা করে মঙ্গলাচরণ করার অবকাশ বোধ করেননি।

মেঘদূতম্- কাব্যজ্ঞদের মতে মঙ্গলাচরণের ত্রিবিধ ভেদ পরিলক্ষিত হয়। ১) নমস্কারাত্মক-যা দেবতাদের প্রণাম জানিয়ে কাব্যের সূচনা হয়। ২) আশীর্বাদাত্মক-যা দেবতাদের সন্নিহিতে আশীর্বাদ প্রার্থনা করে সূচনা হয় কাব্যের ৩) বস্তুনির্দেশাত্মক-যা শ্লোকের প্রারম্ভেই কথাবস্তুর সূচনা হয়।

মহাকবি কালিদাসের অমরসৃষ্টি ‘মেঘদূতম্’ কাব্য প্রথাগত মঙ্গলাচরণকে একটু অন্যভাবে নিয়ে গিয়েছে; যা ভারতীয় শিষ্টাচারসমৃদ্ধ সংস্কৃতিতে ব্যতিক্রমধর্মী নিদর্শন। কাব্যপিপাসু টীকাকারেরা এই ব্যতিক্রমধর্মী মঙ্গলাচরণকে বিভিন্ন ব্যাখ্যায় ভূষিত করেছেন। কালিদাস এই একটিই কাব্যে যে বুদ্ধিমত্তার সঙ্গে মন্দাক্রান্তা ছন্দে আদি-অনন্ত শ্লোকে অত্যন্তসংযোগ দেখিয়েছেন তা বলাবাহুল্য।

মেঘদূতের প্রারম্ভিক শ্লোকে ‘কশ্চিৎ’ এই পদ দিয়ে তিনি কাব্যটি আরম্ভ করেছেন। অর্থাৎ কশ্চিৎ থেকে আমরা পাই ‘কঃ+চিৎ’। এই ‘ক’ অক্ষরটি প্রজাপতি ব্রহ্মার সূচক। “সুতরাং ‘কং ব্রহ্ম খং ব্রহ্ম ইতি বহীন্দ্রোপেন্দ্রমিত্রে কঃ’ ইতি।”^{১৬} আবার এই শ্লোকের প্রথম তিন অক্ষর সম্মিলিত ‘ম’ গণ হওয়ায় দেবতাবাচক শ্রেষ্ঠত্বের আধার সূচিত হয়েছে এবং তা মঙ্গলসূচক। তাই কাব্যাকার বলেছেন- ‘বিশ্বমঙ্গলনিদানমবনিদেবতাকং মগণমাদৌ প্রযুক্তাণঃ’^{১৭}

আমার মনে হয়েছে মহাকবি কালিদাস এই কাব্যের আদি শ্লোকের তৃতীয় চরণে ‘জনকতনয়া’ এবং চতুর্থ চরণে ‘রামগির্যা’ পদটি ব্যবহার করেছেন রাম ও সীতা দেবীকে প্রণতি নিবেদনের জন্য। রামায়ণে বনবাসে থাকাকালীন রাম-সীতা এবং লক্ষ্মণ পর্বতের গুহায় অবস্থান করেছিলেন। তারফলে সেই গিরির নাম ‘রামগিরি’ অভিহিত হয়। সেই স্থান রামের বাসস্থান হওয়ার দরুণ খুবই পবিত্র স্থান বলে গণ্য হয়। এবং সীতাদেবী যে ঘাটে স্নান করতেন সেই ঘাটের জলও খুবই পবিত্র এবং স্নিগ্ধ ছিল। পবিত্র স্থান এবং নামে নিজের মনকে ও শরীরকে পবিত্র করার দরুণ মহাকবি বোধ হয় রাম-সীতার প্রসঙ্গ তুলে

ধরেছেন তার এই 'মেঘদূতম্' কাব্যে। এমনকি কাব্যের নামকরণের মধ্যেও তিনি রামায়ণে বর্ণিত পবনপুত্র হনুমান কর্তৃক গন্ধমাদন পর্বতকে আকাশপথে নিয়ে যাওয়ার যে প্রয়াস তা অনুরূপ ব্যক্ত করেছেন মেঘের দ্বারা। তাই এককথায় রাম, সীতা এবং হনুমানের লীলা কাহিনীকে সম্মান জ্ঞাপন করে তিনি তাঁর কাব্যের প্রারম্ভিক প্রণতি নিবেদন করেছেন।

উপসংহার:- কেবলমাত্র মহাকবি কালিদাস নয়, কালিদাসোত্তর প্রায় সব কবি নাট্যকারও মঙ্গলাচরণ দিয়ে তাদের কাব্য আরম্ভ করেছেন। এমন কি আধুনিক সংস্কৃত সাহিত্যিকরাও 'মহাজনো যেন গতঃ স পন্থাঃ' এই ধারাকে অক্ষুণ্ণ রেখে তাদের কাব্যের সূচনা করেছেন। পৃথিবীর সমস্ত মানবধর্ম তাদের যেকোনো শুভকর্মের পূর্বে হৃদয় থেকে তাঁর ইষ্টদেবতাকে স্মরণ করেন। আমাদের মধ্যে যতই জ্ঞানের ঠুচিয়া থাকুক না কেন আমরা প্রত্যেকেই স্ব-স্ব ইষ্টদেবতাকে স্মরণ করি। তাই মঙ্গলাচরণ প্রাচীন কাব্যের ধারাকে যেমন নদীর মতো বয়ে নিয়ে চলেছে। তেমনি বর্তমান কালের কবিদের মধ্যেও সেই প্রবহমান ধারার ব্যতিক্রম ঘটেনি। হয়তো আধুনিকতার ছোঁয়ায় তাঁর রূপের কিছুটা পরিবর্তন হয়েছে।

আমাদের মনের-গ্লানি, ভয়, সংকোচ একমাত্র দূরীভূত হয় এই ইষ্টদেবতার স্মরণ থেকে। অন্তর থেকে বোধ হয় এক ঐশ্বরিক শক্তি আমাদের হৃদয়াঙ্গনে দোলা দেয়, যার বহিঃপ্রকাশ হয়তো এই কাব্য। কবি হয়তো বা নিজেও কল্পনা করতে পারেননি তাঁর অন্তরস্থিত শক্তিকে। তাই সর্বতোভাবে কবিদের কাব্যের সুষ্ঠু সমাপনে মঙ্গলাচরণ এক ঐতিহ্য বহন করে চলেছে এ বিষয়ে কোনো সন্দেহ নেই। যদিও তথাকথিত মঙ্গলাচরণের শিষ্টতাকে তিনি কাব্যের মধ্যে প্রাধান্য দেননি বলে অনেক কাব্যিকেরা ব্যক্ত করেছেন। এতদসত্ত্বেও আমার চিন্তাধারায় মনে হয়েছে কবি তাঁর বৌদ্ধিক বিকাশের ভাবধারায় কাব্যের মঙ্গলাচরণকে অন্যভাবে ব্যক্ত করতে চেয়েছেন যা আমার মতো অল্পজ্ঞদের বোধগম্যহীন।

পাদটীকা:-

- ১। সাহিত্য দর্পণ (ষষ্ঠ পরিচ্ছেদ)-অধ্যাপক ডঃ উদয় চন্দ্র বন্দ্যোপাধ্যায়। পাতা ০৮-শ্লোক নং-১০।
- ২। সাহিত্য দর্পণ (ষষ্ঠ পরিচ্ছেদ)-অধ্যাপক ডঃ উদয় চন্দ্র বন্দ্যোপাধ্যায়। পাতা ০৯- শ্লোক নং- ১১।
- ৩। অভিজ্ঞান শকুন্তলম্- ডঃ অনিল চন্দ্র বসু। পাতা ০৬- লাইন নং-০৮।
- ৪। মহাভাষ্য (পপ্পশাহিক)-দণ্ডি স্বামী দামোদর আশ্রম। পাতা ১৪৯- মূল অংশে ৩ নং লাইন।
- ৫। কাব্যপ্রকাশ (প্রথম ও দ্বিতীয় উল্লাস)-ডঃ পরমেশ ভট্টাচার্য ও খোকন মাইতি। পাতা ৮৩- লাইন নং-০৯
- ৬। কুমারসম্ভবম্-(প্রথমসর্গ)- রাজীব সিনহা ও শুভময় পাহাড়ী। পাতা ১৮- প্রথমে।
- ৭। অভিজ্ঞান শকুন্তলম্- নির্মাল্য দাস। পাতা ০১- লাইন নং-০৪
- ৮। রঘুবংশম্ (প্রথমসর্গ)- জনেশ রঞ্জন ভট্টাচার্য। পাতা ৩৫- প্রথমে।
- ৯। রঘুবংশম্ (প্রথমসর্গ)- জনেশ রঞ্জন ভট্টাচার্য। পাতা ৩৫- লাইন নং-০৫।
- ১০। কাব্যপ্রকাশ (প্রথমাদি ষষ্ঠোল্লাসান্তঃ)-ডঃ বিপদভঞ্জন পাল। পাতা ০৬- শ্লোক নং-০২।
- ১১। রঘুবংশম্ (প্রথমসর্গ)-অধ্যাপক উদয় চন্দ্র বন্দ্যোপাধ্যায় ও ডঃ অনিতা বন্দ্যোপাধ্যায়। পাতা ০৫-শেষ লাইন

১২। রঘুবংশম (প্রথমসর্গ)-অধ্যাপক উদয় চন্দ্র বন্দ্যোপাধ্যায় ও ডঃ অনিতা বন্দ্যোপাধ্যায়। পাতা ০৬-লাইন নং-০৪১

১৩। রঘুবংশম (প্রথমসর্গ)- জনেশ রঞ্জন ভট্টাচার্য। পাতা ৩৫-লাইন নং-০৫

১৪। রঘুবংশম (প্রথমসর্গ)- জনেশ রঞ্জন ভট্টাচার্য। পাতা ৩৪। পর্যালোচনা অংশে লাইন নং-০৩

১৫। কুমারসম্ভবম-(প্রথমসর্গ)- রাজীব সিন্হা ও শুভময় পাহাড়ী। পাতা ২৬-লাইন নং-০৫

১৬। মেঘদূত ও সৌদামনী- সত্যনারায়ণ চক্রবর্তী। পাতা ৯৩- লাইন নং- ০৫

১৭। মেঘদূত ও সৌদামনী- সত্যনারায়ণ চক্রবর্তী। পাতা ৯৩- লাইন নং- ০৪

গ্রন্থপঞ্জী:-

১) রঘুবংশম (প্রথমসর্গ)- জনেশ রঞ্জন ভট্টাচার্য (সম্পাদক)- বি এন পাবলিকেশন-কোলকাতা- প্রথম সংস্করণ-২০১৭

২) ভারতীয় দর্শন- অধ্যাপক যদুপতি ত্রিপাঠী বি এন পাবলিকেশন-কোলকাতা-অষ্টম মুদ্রণ- ২০১৩

৩) রঘুবংশম (প্রথমসর্গ)-ডঃ দেবকুমার দাস (সম্পাদক)-সদেশ-কোলকাতা-পূর্ণমুদ্রণ-২০১৬

৪) রঘুবংশম (প্রথমসর্গ)-অধ্যাপক উদয় চন্দ্র বন্দ্যোপাধ্যায় ও ডঃ অনিতা বন্দ্যোপাধ্যায়-সংস্কৃত বুক ডিপো-কোলকাতা-পূর্ণমুদ্রণ-২০১৬

৫) কুমারসম্ভবম-(প্রথমসর্গ)- রাজীব সিন্হা ও শুভময় পাহাড়ী (ব্যখ্যাকার)-ডাহ্ পাবলিশিং হাউস-কোলকাতা-প্রথম প্রকাশ-২০১৪

৬) কুমারসম্ভবম- অধ্যাপক শ্রীমদ্ গুরুনাথ বিদ্যানিধি ভট্টাচার্য (সম্পাদক)-সংস্কৃত পুস্তক ভাণ্ডার-কোলকাতা-পরিবর্ধিত সংস্করণ-২০১২

৭) ভারতীয় দর্শন-সমবেদ্র ভট্টাচার্য (সম্পাদক ও লেখক)-বুক সিভিলিটি প্রাইভেট লিমিটেড- কোলকাতা-পূর্ণমুদ্রণ-২০১৪

৮) অভিজ্ঞান শকুন্তলম-ডঃ প্রণব কুমার দত্ত (বিশ্লেষক)-সংস্কৃত বুক ডিপো-কোলকাতা-পূর্ণমুদ্রণ- ২০১৫

৯) অভিজ্ঞান শকুন্তলম- নির্মাল্য দাস- দি ঢাকা স্টুডেন্টস্ লাইব্রেরী-কোলকাতা

১০) কাব্যপ্রকাশ (প্রথম ও দ্বিতীয় উল্লাস)-ডঃ পরমেশ ভট্টাচার্য ও খোকন মাইতি-সংস্কৃত বুক ডিপো-কোলকাতা-২০২১

১১) ভরত নাট্যশাস্ত্র-ডঃ সুরেশ চন্দ্র বন্দ্যোপাধ্যায়- নবপত্রপ্রকাশন- তৃতীয় মুদ্রণ-১৯৯৭

১২) মেঘদূত ও সৌদামনী- সত্যনারায়ণ চক্রবর্তী (সম্পাদক)-সংস্কৃত পুস্তক ভাণ্ডার-কোলকাতা- প্রথম সংস্করণ-২০১২

১৩) সাহিত্য দর্পণ (ষষ্ঠ পরিচ্ছেদ)-অধ্যাপক ডঃ উদয় চন্দ্র বন্দ্যোপাধ্যায়-সংস্কৃত বুক ডিপো-কোলকাতা-২০১৯

১৪) কাব্যপ্রকাশ (প্রথমাদি যষ্ঠোল্লাসান্তঃ)-ডঃ বিপদভঞ্জন পাল-সংস্কৃতপুস্তকভাণ্ডার-কোলকাতা-১৪২৪ বঙ্গাব্দ।

১৫) অভিজ্ঞান শকুন্তলম্- ডঃ অনিল চন্দ্র বসু- সংস্কৃত বুক ডিপো- কোলকাতা- ২০০৬

১৬) মহাভাষ্য (পপশাহিক)-দণ্ডিস্বামী দামোদর আশ্রম (সম্পাদক ও অনুবাদক)-দক্ষিণেশ্বর রামকৃষ্ণ আদ্যাপীঠ-কোলকাতা-১৯২৫ শকাব্দ

১৭) দরিদ্রদুর্দৈবম্- ডঃ পরমেশ ভট্টাচার্য ও খোকন মাইতি-সংস্কৃত বুক ডিপো-কোলকাতা-২০২২

Santal Marriage System in India: A Sociological Analysis

Debabrata Kabi

One of the most significant social institutions is marriage. It is a way of creating a family through which society can continue to exist. Trust, affection, flexibility, and sharing of tasks equally at every stage of life are prerequisites for a happy marriage. Marriage is one of the most important life-cycle ceremonies in India and is expected of Hindus by their families and society. Rituals and symbols are used to express the social process. Every community uses specific types of symbolic behaviours and physical cues to convey the ideals, standards, and ethos around matrimony and family life. As an illustration, the Santal, one of the Indian tribes that are the most colourful and brilliant, have a distinctive culture all their own. A significant component of India's cultural diversity is the Santal culture. Their lifestyle is distinctive, as seen by their traditions, rituals, language, eating and dressing preferences. This study was motivated by the unavailability of studies on Santal marriage systems. The Santal marriage system, including the bride price, laws, and limits, is the main subject of this essay. The finding shows that the majority are now following the traditional tribal marriage systems.

Keywords: Marriage, Society, rituals, Scheduled Tribe.

Introduction:

An agreement that allows people to live together and work together in an organised social life and institutionalised connection is marriage as a social institution. Essentially, the social structure has been changed. It is a stage in a continuous social process that is governed by tradition, which is an institutionalised method of handling such an occurrence. If the husband moves in with his in-laws in a matrilineal society, the modification or partial breakup of the bride's relationships with her immediate family is least noticeable or felt. But it is most marked if the bride leaves her family and goes to live with her husband and his family in a patrilineal society. Her absence makes her own family suffer a loss. But it would be wrong to interpret the same as economic loss. It is the loss of a person in the family, and it is a breach of family solidarity.

Prof. Radcliff Brown (1960) says, "Customs of this kind are the ritual or symbolic expression of the recognition that marriage entails the breaking of the solidarity that unites a woman to the family in which she has been born and grown up". In reality, these traditions might be seen as signs of acknowledgement of the structural transformation that marriage has brought about. In some tribes, the issue of bride price prevalence is crucial to the marriage process. When the boy's party pays the bride price, it may be interpreted as indemnification or compensation for the bride's kin's daughter.

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The husband and his kin may also consider that such payment grants them certain rights over their wife and any children she bears.

Age at marriage: The girls are normally not married before 18 years of age. The boys are married at the age of 20 to 25 years. Pre-puberty marriages are not arranged. Marriages are held when the boys and girls attain physical maturity. The older boys and girls are married first. But, in love cases, the exceptions are found in the Santa community.

Types of marriages: 'Bapla' is the term generally used for marriage by the Santal. It means strengthening of mutual relations between two families. In every type of marriage, the consent of the boy and the girls' are essential. The forms of bapla are as follows –

I. Kirin Bahu Bapla or Biha Bapla:

It is the most common and respected form of marriage. It can be done only in the case of young men and women who have not been previously married. It is the arranged form of marriage which is organized by the parents of the bride and the bridegroom with the help of a reaboric (Ghatak) or match-makers. There is no professional class of match-makers, but friends and relatives usually act in this capacity. The parents of the bridegroom have to pay gonong-pon (bride – price) to the parents of the bride. It is from this that it derives the name 'kirin bahu' which means 'bought bride'. Kirin bahu bapla is also called biha bapla. As the Santali word 'bapla' also means marriage, 'BihaBapla' may be translated as 'marriage par excellence.'

II. Ghar - di - jamai bapla or Gharjawai:

In this form, after marriage, the bridegroom lives in his wife's house and helps them in all kinds of domestic, socio-economic and religious performances. No gonong-pon (bride- price) is necessary and all expenses are borne by the parents of the bride. A person who has no son arranges this type of marriage. Gharjawai is generally brought for the eldest daughter.

III. Chhadibi bapla or Sanga bapla:

It is the second marriage between a widower or a divorced man and a widower or a divorced woman. The bride - price for a widow or a divorced woman is half what is given for an unmarried girl. The reduction in the bride – price in such a case is due to the belief that a widow or a divorced woman will rejoin her first husband after death and that the second husband has the right to enjoy her in his remaining life. But, now in many cases, a full bride - price is given for a widow or a divorced woman, which is equal to an unmarried girl.

IV. Angeer bapla:

It is a marriage by elopement. It generally results in love between a girl and a boy. As per the belief of the Santal people, this type of marriage happens only when a girl elopes with a boy after intake of some herbal medicines. The boy, who affects the girl's mind, gives it and she starts loving the boy forgetting everything in life. Bride – price is not necessary in these cases. But it is sometimes given when the parents arrange regular marriage after elopement.

V. Bride – price:

The bridegroom's family gives Rs.12/- (Baroh taka pon in the local language) and two gunny bags of paddy (about 120 kgs.) to the bride's parents as bride price. If one gunny bag of paddy (about 60 kgs.) is returned to the first child, he gives a calf which is known as ardi goru in the local language to the bride's parents. In case of the death of the bride's father, the bride price is kept by the person who bears the expenses of marriage (such as brother, mother, uncle, etc). Generally, the bride - price is not returned in any case, but if the bride asks for a divorce and there is no fault of the bridegroom, the bride- price is returned to the bridegroom. In the case of Ghar - di- Jamai, the bride -price is not given by the bridegroom's party to the bride's parents. The bride - price for a widow or a divorced woman is half that which is paid for any unmarried girl.

Residence after marriage:

Rules of residence after marriage are patrilocal. The bride joins her husband's family and takes the surname of her husband. She becomes part and parcel of her husband's family after marriage. In the case of gharjawai, the husband lives in her wife's house as a member of the family, but in this case, also the wife changes her surname and accepts the clan name of her husband.

Nowadays, a slight variation from this societal profile is found to be occurring in a good number of cases. In these cases, the couple generally settle down near the wife's kinsmen after marriage. This is generally happening due to economic reasons (i.e., more earnings).

Rules and restrictions in marriage:

a. Tribe – endogamy:

No Santal can marry a non-Santal. Marrying outside the Santal tribe is regarded as taboo. The person who violates this customary law is excommunicated.

b. Clan – exogamy:

Marriage within the clan is prohibited among the Santal. This clan is locally known as 'Jat' and members of a clan are regarded as brothers and sisters. Clan exogamy is observed in the tribe. The persons who violate the norms are excommunicated from the village and community.

Even the marriages within the clan have been sanctioned by arranging a drink (30- 50 glasses of rice - beer) as a fine for the community members and tender in apology in this context. But, this type of case is very rare and generally not in common practice.

c. Incest rule:

Marriage between blood relatives is not permitted and if so happens, then they are excommunicated from the community.

Nowadays, marriages between incest kin are being sanctioned in case of adultery after making a due apology. Marriages between incest kin are never recommended by the community members and are highly abused.

d. Polygyny:

It is normally not found among the Santal. They are generally monogamous, but polygyny is culturally favoured and practised to a very limited extent in case of the barrenness of the first wife. The husband is allowed to bring another wife and both the wives can live together, if they like. This may also happen in case of love and adultery with the permission of the first wife if she does not take divorce.

e. Junior levirate:

This is not very prevalent, but can be allowed if they like. In this case, after the death of her husband, a woman marries her husband's younger brother. This is done when there is an agreement between them and they like to live together as husband and wife.

f. Junior sororate:

After the death of his wife, the husband can marry his wife's younger sister. This is allowed in the community, but it is not essential as a rule. This is not much preferred by the parents of the girl because they do not like to give another daughter in the same family where the elder daughter has died.

g. Prescriptive and preferential marriage:

The Santal are divided into twelve patrilineal exogamous clans namely (in descending order), Kisku, Husda, Murmu, Hamrom, Mardi, Soran, Tudu, Baske, Pauria (Sonaparia), Besra, Chorda and Bedea. Of these, the first eleven clans exist today. Bedea is supposed to have disappeared long ago. There was some sort of ordering in the clan system, somewhat in the above-given form. But now this stratification has been abolished. So, there is no clan hierarchy and all clans enjoy the same status except Besra and Chorda which are somehow regarded as inferior to others due to their quarrel nature and more number of cases of assault in them. Moreover, they also used to consume beef. This relative inferiority is reflected in marriages in which the other clan members do not prefer to have marital relations with these two clans as much as it is possible. There is no occupational specialisation within the clans. It is generally not found that all the clans (sibs) are living together in the same village. Clan membership is patrilineal, so that, a child belongs to the sib of the father. A woman, however, adopts the sib of her husband after marriage. It is the norm that marriage is prohibited within the same clan and a person can marry in another clan only. Sexual relations within the own sib (clan) are regarded as incestuous. It is totally prohibited. It is hoped and presumed that a person will never think of marrying within the same clan and it comes under incest taboo. This thinking and feeling are also reflected in the Santali language – ‘Me jat Kanabon’ which means “we all are from the clan” and the clan members are regarded as brothers and sisters. Every sib (clan) is further divided into a number of subsibs locally known as khut (lineage). The sense of khut kinship and prevailing solidarity prevents a person from marrying in the mother’s khut, though he can marry in any other khut belonging to mother’s clan (Majumder, 1956). The ties with mother’s khut are held to be too close. They mostly prefer to marry outside the clan. Mother’s clan here means the mother’s father’s clan. This cannot be equated with the double descent system of the Dimasas. Among the Dimasas both the patrilineal and matrilineal systems of descent are in vogue and they have both male clans and female clans (Danda, 1978; Bordoloi, 1984). Marriage outside the Santal community is not allowed and the person doing so is excommunicated from the community. But, now, after paying the fine and after tendering an apology, they are readmitted into the community. The Santals who embraced Christianity were excommunicated from the tribe and no marital relation or marriage alliance is preferred with them. But they are not exiled from the village or pada. They invite each other into their marriages and functions but do not participate in each other’s rituals. Only they take part in community feasts. The Christian Santals do not directly come under Santal customary laws, but when they get entangled in a dispute with a Santal they are summoned to the panchayat meetings of the pada and they are forced to obey the decision of the pada panchayat.

h. Living together before marriage:

Generally, it is not possible for a boy and a girl to live together before marriage. It is only possible for a short period in the case of marriage by elopement where the girl runs away from the house and begins to live separately. But, after some time they have to marry due to public pressure and after being approved by the community, they can participate in social functions and other activities. No one is allowed to keep a concubine in the Santal tribe. It is disapproved by the Santal community.

VI. Remarriage (Chhadivi Bapla or Sanga Bapla):

A widow/widower or a divorcee can remarry by his/her own wish. If a widow remarries, then her children stay back with her in-laws or parents and if there is a grown-up young son, then little children (siblings) can stay with him. In cases of divorce, children mostly stay with their father. If the child is too young, then she/he stays with her/his mother. When a child grows up a little, he/she is taken back by his/her father. In this way, in the case of remarriage of a divorced woman, she does not worry for her children because, in case of divorce, the children generally remain the father.

The children born before remarriage and after remarriage enjoy equal rights and equal social status. If the parents do not take care of the children born before remarriage, it is rebuked and condemned in the community.

VII. Divorce (Chhada - Chhedhi or Bapak):

Divorce is allowed in the Santal community. Divorce is locally known as chhada- chhedior bapak in the Santali language. Divorce is not regarded as good in the Santal community and the couple become the laughing stock before others. The children are also not respected, although they have full rights. They face some problems in the community and the children also face some problems in getting proper spouses.

All divorce cases are settled before the village (pada) panchayat or council, which constitutes a kind of court to investigate all aspects of the situation. When guilt is established it is the duty of the panchayat to see that the customary payments are made. The declaration of divorce is done by Manjhihadam at Manjhithan (meeting place). Both parties arrange for a drink of rice beer, which is locally known as handi, for the people present over there as a mark of punishment for taking divorce. The quantity of handi remains to be 5 to 6 glasses of rice beer. If the wife asks for a divorce and the husband does not want to get a divorce, then he demands for the return of bride - price which is accepted by the

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Manjihadam and the panchayat. In this situation, if he demands any expenditure to remarry, it is also approved by the Manjihadam and then a fixed amount is given by the wife's party to the husband for taking divorce from him. It is to be noted here that the wife does not go to the place of Manjihthan as the women are not allowed to go there and she is represented thereby her father or brother or anyone else who is her patron.

Conclusion:

Despite living in the 21st century, most individuals still have a limited perspective. They are a million years old. Some people are conservatives on the surface, while others are hidden conservatives, meaning that while they appear liberal on the outside, they are actually extreme conservatives. It is regrettable that our society still lacks modern thinking after all these years. However, having a progressive community is a blessing, so definitely! I'm referring to the tribals, which is the same group that is labelled as being primitive, backward, untouchable, and other things. From the beginning, they were progressive. Tribal marriage is a complicated kind of matrimony because it can be arranged by negotiation, trial, bride price, an development in some cases. There is a claim that tribal traditions and customs are difficult to alter. But it is false. Tribal practices and traditional saree evolving quickly.

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A Study on Attitude of Higher Secondary School Students towards the Use of ICT in Rural and Urban areas of Purba Medinipur District (WB)

Debasis Sasmal

Abstract:

Information and communication technologies (ICT) is defined as a diverse set of technological tools and resources used to transmit, store, create, share or exchange information. These technological tools and resources include computers, the Internet (websites, blogs and emails), live broadcasting technologies (radio, television and webcasting), recorded broadcasting technologies (podcasting, audio and video players, and storage devices) and telephony (fixed or mobile, satellite, visio/video-conferencing, etc.). Information and communication technology (ICT) in the form of Digital Education can improve rural and urban areas school students' interest. The present study deals with the use of ICT in rural and urban schools. The study was conducted with higher secondary schools with ICT facilities in Medinipur Town and Rural areas adjacent to Medinipur city of Purba Medinipur District. The study found many opportunities for ICT access with existing resources if it is properly used and utilized.

Keyword: Attitude, ICT, Higher Secondary, Computer, Internet

Introduction:

Today's age is technology dependent, whether we like it or not technology is so much involved in our lifestyle. Today we cannot move without technology. Technology has radically changed the quality of our daily lives. Education, health, transport, trade, industry, film etc. have all become dependent on technology. As technology is a blessing to us today, one of the most important aspects of technology is information and communication technology (ICT). With the use of information and communication technology today, education has become more interesting and enjoyable.

Attitude is a psychological construct that is a mental and emotional entity that inheres or characterizes a person, their attitude to approach to something, or their personal view on it. Attitude involves their mindset, outlook and feelings. Attitudes are complex and are an acquired state through life experience. Attitude has been defined in a variety of ways by various thinkers. According to Allport (1935), "Attitude is a mental and neural state of readiness, organized through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations with which it is related". Fishbein and Ajzen (1980) described attitude as a, "predisposition to act towards objects in a consistently

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favorable or unfavorable way”. According to AlGahtani & King, (1999) “ICT has a great impact on how they behave, that is, attitude towards ICT is an antecedent to and a predictor of ICT usage”.

ICT is the technology needed for information processing, in particular, the use of electronic computers, communications devices and software applications to convert, store, protect, process, transmit, and retrieve information from anywhere, anytime. There are large economic incentives to merge the computer network system with the telephone networks using a single unified system of signal distribution, cabling, and management. ICT is an umbrella term that contains any communication device, encompassing radio, television, cell phones, computer and satellite systems, network hardware and so on, as well as the various services and appliances with them such as distance learning and video conferencing.

Literature Review:

Baskey, K. S. (2017). Work on *Use of Ict and Development of Teaching-Learning Activities: A Micro-Study In The District Of Purba Burdwan, West Bengal*. ‘The present paper attempts to analyze the impact of ICT on development of teaching-learning activities among the students and teachers of the surveyed schools in Purba Burdwan district of West Bengal. The study comprises of 120 students and 80 teachers of few selected schools. A nonparametric chi-square test has been used to examine the relationship between use of ICT in school and development of teaching-learning activities among the teachers of the surveyed areas. Also, students’ ‘t’- test has been applied to know whether any significant differences in awareness among the teachers regarding the application of ICT in school and development of teaching-learning activities with respect to gender (Male Female teacher), residing place (Urban Rural) and status of appointment (PGT&TGT)”.

Barodiya, P. et al. (2015). Studied on *Use of ICT in Teacher Education*. “Professional development to incorporate ICTs into teaching and learning is an ongoing process. Teacher education curriculum needs to update this knowledge and skills as the school curriculum change. The teachers need to learn to teach with digital technologies, even though many of them havenot been taught to do so. The aim of teacher training in this regard can be either teacher education in ICTs or teacher education through ICTs. A teacher’s professional development is central to the overall change process in education. In planning the integration of technology in Teacher education it is important for teacher education, Institution to understand the knowledge and skills necessary for teachers to effectively use ICT in their instructions. Teachers need technical assistance to use and maintain technology. In this paper discusses to study of Teacher education, to know the Significance of ICT in teacher education and to provide some Suggestions of teacher education”.

Gope et al. (2022) revealed that, despite the fact that online learning has been available for a while, moving the entire educational system online could cause concerns for all parties involved, particularly the pupils. Pupils in the Purulia district of West Bengal are keen to find out more about the opinions of their peers on online learning. The study's conclusions showed that postgraduate students' perceptions of online learning during the COVID-19 epidemic were moderate and that neither residency nor gender significantly affected these perceptions. According to student opinions, online learning can help with distance learning (29.20%), minimize book reading habits (75.20%), and improve instructional material (68.30%) during the COVID-19 epidemic.

Devi, S. et al. (2012). Observed that *ICT for Quality of Education in India*. 'Information and Communication Technology (ICT) can be utilized for the education sector. Education includes online, distance and part time education. There are unlimited applications of ICT in the real world. In his paper emphasis is on the education field. Traditional non-formal education system process includes activities like admission, Personal Contact Programmers, Exam for any course in a university or Institution. In this process ICT can play a great role in all the activities by providing a lot of benefits to students, teachers, parents and Universities itself. ICT can be used for providing education to the people who are not able to come to school due to various constraints. ICT can play great role in formal and non-formal forms of education. The paper examines certain important issues related with the effective implementation of ICTs in all levels of education and provides suggestions to address certain challenges that would help in the implementation of ICTs in education and simultaneously increasing Quality of education'.

Castro, Sanchez, J. J. and Alemán, E. C. (2011) Work on "ICT is used as a tool for students to discover learning topics, solve problems, and provide solutions to the problems in the learning process. ICT makes knowledge acquisition more accessible, and concepts in learning areas are understood while engaging students in the application of ICT. Support student-centered and self-directed learning Students are now more frequently engaged in the meaningful use of computers".

Chai, Koh and Tsai (2010) study on "the build new knowledge through accessing, selecting, organizing, and interpreting information and data. Based on learning through ICT, students are more capable of using information and data from various sources, and critically assessing the quality of the learning materials. Produce a creative learning environment ICT develops students' new understanding in their areas of learning".

Objectives of the Study:

a) To study the difference in the attitude of higher secondary school students towards the use of

ICT on gender basis (male and female).

b) To study the difference in the attitude of higher secondary school students towards the use of

ICT with respect to interest (rural and urban areas).

c) To study difference of ICT system of higher secondary school on bases of urban and rural area.

Hypothesis of the study:

In this study, objective wise hypotheses are-

Ho1: There is no significant difference in the attitude of higher secondary school students towards the use of Information and Communication Technology (ICT) on gender basis (male and female).

Ho2: There is no significant difference in the attitude of higher secondary school students towards the use of Information and Communication Technology (ICT) with respect to habitat (rural and urban areas)

Ho3: There is no significant difference between rural and urban ICT systems of higher secondary school.

Significance of the study:

- This study will be helpful to the secondary educational institutions and teachers and non-teaching staffs in developing positive attitudes of secondary school students taught by ICT.
- The result of this study will also be useful as because consideration of gender-wise (male and female) and habitat-wise (rural and urban areas) difference was thoroughly analyzed.
- The study will be helpful to student personalized learning and Interactive learning.
- This study will be help to Students can benefit from a broader range of materials that cater to various learning styles.

Operational Definition:

Attitude:

In psychology, an attitude refers to a set of emotions, beliefs, and behaviors toward a particular object, person, thing, or event. Attitude can also be described as the way we evaluate something or someone. For example, we tend to respond positively or negatively about certain subjects.

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We can summarize the main components of attitude which are a collection of our thoughts, feelings, and actions in a given scenario. They are formed as a result of our life experiences, upbringing, education, and social influences.

ICT:

ICT stands for information and communications technology. ICT is the infrastructure and components that help to enable modern computing systems. ICT consists of both the internet as well as the mobile connected which are connected by wireless networks. It also includes all the antiquated technologies such as landline telephones, television and radio. These technologies are widely used all over the world. Apart from that cutting edge technologies such as artificial intelligence (AI) and robotics are the advancement in ICT.

ICT also includes the merger of telephonic communication, audio and visual networks with computer system networks by the use of a single cable or any link system.

Components of ICT:

The major components of the ICT system are as follows: Software, Hardware, Cloud Computing, Transaction, Data, Internet, Communication Technologies

Higher secondary:

Higher secondary education typically refers to the level of education that follows completion of secondary schooling, generally around ages 16 to 18, and prepares students for entry into university or other higher education institutions. In many educational systems, it is considered the final stage of compulsory education and serves as a bridge between secondary education and tertiary education (such as college or university).

Computer:

The term "computer" generally refers to an electronic device that can store, retrieve, and process data. It is capable of executing sequences of instructions (programs) to perform a wide range of tasks, from basic calculations to complex operations. A computer is an electronic device wherein we need to input raw data to be processed with a set of programs to produce a desirable output. Computers have the ability to store, process, and manipulate data. The term "computer" is derived from the Latin word "computare," which means "to calculate." A computer is made to run programs and apps by using both hardware and software.

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It also has a memory to store data, programs, and what they produce.... Read more at:
<https://www.careerpower.in/school/computer/what-is-a-computer>

Internet:

The internet is a global network of interconnected computers, servers, phones, and smart appliances that communicate with each other using the transmission control protocol (TCP) standard to enable a fast exchange of information and files, along with other types of services.

Research Methodology of the Study

Research Design:

Descriptive survey research design has been implemented in the research work.

Variables

Independent Variable

- A) Gender (Males and Females)
- B) Habitat (Rural and Urban areas)

Dependent Variable

- A) Attitude of ICT

Sample Size:

- A. 200 higher Secondary school students of both sexes of rural and urban areas have been selected in the
- B. research work of the researcher as sample. All samples have been selected from Purba Medinipur
- C. district as rural area and Kolkata as urban area of west Bengal. The constitutions of the sample are as

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Rural		Urban		Total
Male	Female	Male	Female	200
50	50	50	50	

Sampling Techniques

For the Secondary school student's selection, stratified random sampling technique has been implemented in the research work.

Research Tools:

A Standardized Computer Attitude Scale (CAS) (Khatoon and Sharma, 2011) has been used to collect the required information from six secondary educational Institutions. Five-point Likert scale, consisting of 'strongly agree', 'agree', 'undecided', 'disagree', and 'strongly disagree' has been used. Purba Medinipur district as rural area and Kolkata as urban area of west Bengal have been used for the purpose of the study.

Procedure:

The procedure of the study which has been followed by the researcher is as follows:

Step 1. At first the preparation of a questionnaire in respect of ICT in education.

Step 2. Selection of secondary educational institutions as well as selection of gender basis (male and female students) and respect to habitat (rural and urban areas) from different secondary educational institutions.

Step 3. Selection and local adaptation of tools for the study.

Step 4. a) Primary data collected from the selected sample groups by the questionnaire.

b) Tabulation of test data to meet the requirement of hypothesis testing.

Population:

Students' selection from four higher secondary educational institutions under the West Bengal Counsel of Higher Secondary Education of both sexes of rural area from Rural areas adjacent to Medinipur city

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and urban area from Medinipur town of the Purba Medinipur District have been implemented in the research work of the researcher.

Collection of Data:

Data have been collected through data collection questionnaire from rural and urban areas in Purba Medinipur District. From Rural areas adjacent to Medinipur city as rural area and Medinipur Town as urban area have been taken into consideration.

Method of Analysis of Data

The data have been collected to suitable statistical analysis. Descriptive statistics like mean, standard deviation and inferential statistics like 't' test have been implemented in the research work of the researcher.

Results

Results based on the objectives, the results of the data are demonstrated in different tables and its

Interpretation is given below: -

Objective 1

To study the difference in the attitude of higher secondary school students towards the use of Information and Communication Technology (ICT) on gender basis (male and female).

Table 1: Attitude of secondary school students towards the use of Information and Communication Technology (ICT) on gender basis (male and female).

variable	Male (N=100)	Female(N=100)	't'- value	Sig/not sig.
Attitude of ICT	Mean=39.36 S.D.=6.25	Mean=44.11 S.D.=7.12	1.88	Not significant at 0.05 level

Table 1: illustrates that the mean, S.D. and 't' scores of the secondary school students of both males (N= 100) and females (N= 100). Though the mean score of females indicates high score (M= 44.11)
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than the males ($M= 39.36$), the 't' score ($t= 1.88$) with degrees of freedom is 297 clearly indicate that there is no significant difference (table value of 't' at 0.05 level is 1.96) between females and males in secondary educational institutions. So the null hypothesis is H_0 is accepted. Thus, there is no significant difference in the secondary educational institutions on gender basis. Therefore, male and females school students are equal in terms of attitude of ICT of higher secondary educational institutions.

Objective 2

To study the difference in the attitude of secondary school students towards the use of Information and Communication Technology (ICT) with respect to habitat (rural and urban areas).

Table 2: Attitude of secondary school students towards the use of Information and Communication Technology (ICT) with respect to habitat (rural and urban areas).

variable	Rural (N=100)	Urban(N=100)	't'- value	Sig/not sig.
Attitude of ICT	Mean=40.25 S.D.=5.55	Mean=43.55 S.D.=6.45	1.98	Significant at 0.05 level

Table 2: illustrates that the habitat wise (rural and urban areas) differences in mean, S.D. and t-value of higher secondary school students of educational institutions. Though the mean score is high of urban areas than rural areas but the t-value ($t=1.98$) with degrees of freedom is 296 showed significant difference in higher secondary educational institutions the two groups (rural and urban areas). So the null hypothesis H_0 is rejected. Thus, there is significant difference in the secondary school students of educational institutions in respect to habitat. Therefore, rural and urban higher secondary school students are not equal in terms of attitude of ICT higher secondary educational institutions. Urban students are more competent in terms of positive attitude while taught through the ICT method.

Limitation of the study

The present study has been delimited to the following: -

- ❖ The study has been delimited to two independent variables - Gender (Males and Females), Habitat (Rural and Urban areas) and one dependent variable - Attitude of ICT.

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- ❖ The study has been delimited to the higher secondary school students of different educational institutions of Purba Medinipur district as rural areas adjacent to Medinipur city and Medinipur town as urban area only.
- ❖ Sample has been also delimited to a fixed sample size of 200 (three hundred) only.

Recommendation of the study:

Many positive outcomes of ICT in secondary school education and it will be compulsory in near future. Irrespective of several lacunas, there are many advantages of ICT use in secondary school education which depicts the success stories of ICT in education. Based on the findings of the study following recommendations can be suggested to improve ICT based digital learning in higher secondary school education-

- 1. Providing proper training to the teachers:** Subject expert teachers are getting only few days training to handle ICT in higher secondary schools, which is very much insufficient as reported by the teachers. Training should be provided with longer term basis with proper hands on practice.
- 2. Proper use of Internet:** ‘Internet in most of the higher secondary schools is used only for administrative purposes and not for students. Basically students who are fully dependent on schools for computer basic learning are unable to use it for their study purposes, which pushed off them behind other students who are internet savvy. Therefore, use of internet is very much necessary for the students to improve their educational as well as ICT skills’
- 3. Increase the number of computers, with proper software and replace damage / outdated models:** “Number of computers along with appropriate software in schools should be increased keeping in mind the students’ strength. Also, quick repair of damaged equipments and replacement of outdated models are extremely necessary” (Dutta & Hazra, 2019)”.

Conclusion of the study:

ICT integration in higher secondary education brings a change in student and teacher learning behavior and progress higher setup skills such as association beyond time and place and clarifies complicate genuine world problems. The introduction of internet and the World Wide Web has pressured new productivity as well as expectations on such endeavors. For the quality and quantity development of the higher higher secondary education instructors should revise their lesson plans or prepare technology suitable lesson plans and try to integrate technology into curriculum. To increase the student populations in the secondary education, role of ICT is very much important. After the analysis of the study it has found that the needs of the secondary students belonging to no different streams are not heterogeneous and their conveniences requires no change to be made in secondary

education. Communication through e-mail, messaging, text, blogs, podcasts, discussion groups and the like can lead to wider dialogues.

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Enhancing Transportation Systems with Fuzzy Logic: A Comprehensive Analysis

Jahedul Mollick

Abstract:

Fuzzy logic has emerged as a promising tool for addressing the complexities and uncertainties inherent in transportation systems. This comprehensive analysis explores the application of fuzzy logic in enhancing various aspects of transportation, including route optimization, traffic management, vehicle control systems, and decision-making processes. By incorporating fuzzy logic techniques, transportation systems can adaptively respond to dynamic and uncertain conditions, leading to improved efficiency, safety, and sustainability. This paper reviews the theoretical foundations of fuzzy logic and examines its practical implementations in transportation, highlighting case studies and real-world applications. Furthermore, it discusses the challenges and opportunities associated with the integration of fuzzy logic into transportation systems and identifies areas for future research and development. Overall, this analysis provides valuable insights into the potential of fuzzy logic to revolutionize the way transportation systems are designed, operated, and managed in the modern era.

Keyword: Fuzzy logic, Transportation systems, Optimization, Traffic management, Decision-making, Uncertainty, Adaptability, Efficiency, Sustainability

1.Introduction:

Transportation systems play a pivotal role in modern society, facilitating the movement of people and goods and supporting economic activities. However, managing and optimizing these systems pose significant challenges due to their inherent complexities and uncertainties. Traditional approaches to transportation planning and operation often struggle to cope with dynamic conditions, leading to inefficiencies, congestion, and safety concerns. In recent years, fuzzy logic has emerged as a powerful tool for addressing these challenges by providing a flexible framework for dealing with imprecise and uncertain information.

Fuzzy logic, a branch of artificial intelligence inspired by human reasoning processes, offers a way to model and reason with vague or ambiguous data. Unlike classical logic, which operates in binary terms of true or false, fuzzy logic allows for degrees of truth, enabling more nuanced decision-making in uncertain environments. This characteristic makes fuzzy logic particularly well-suited for applications in transportation, where variables such as traffic flow, road conditions, and driver behaviour are often inherently fuzzy.

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This comprehensive analysis aims to explore the application of fuzzy logic in enhancing various aspects of transportation systems. We will examine how fuzzy logic techniques can be used to optimize routes, manage traffic flow, control vehicles, and support decision-making processes in transportation operations. By incorporating fuzzy logic into transportation systems, we can adaptively respond to changing conditions, improve efficiency, enhance safety, and promote sustainability.

Through a review of theoretical foundations, practical implementations, case studies, and real-world applications, this analysis will demonstrate the potential of fuzzy logic to revolutionize transportation systems. Furthermore, we will discuss the challenges and opportunities associated with integrating fuzzy logic into transportation planning and operation and identify areas for future research and development. Overall, this study aims to provide valuable insights into how fuzzy logic can contribute to the design, operation, and management of transportation systems in the modern era.

2.Fuzzy Logic: Fuzzy logic provides a flexible framework for dealing with imprecise and uncertain information in transportation systems. By allowing for degrees of truth rather than strict binary values, fuzzy logic enables a more nuanced understanding of complex variables such as traffic flow, road conditions, and driver behaviour.

Here's a simplified mathematical model of a transportation problem using fuzzy logic:

(a) Variables:

- x_{ij} : Amount of goods shipped from source i to destination j
- d_{ij} : Demand at destination j
- s_{ij} : Supply at source i
- c_{ij} : Transportation cost per unit from source i to destination j

(b) Fuzzy Sets: Let's consider the following fuzzy sets for the variables:

- x_{ij} has a membership function $\mu_{x_{ij}}$
- d_{ij} has a membership function $\mu_{d_{ij}}$
- s_{ij} has a membership function $\mu_{s_{ij}}$
- c_{ij} has a membership function $\mu_{c_{ij}}$

(c) Fuzzy Objective Function: Minimize the total transportation cost considering the fuzzy transportation costs:

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$$Z = \sum_i \sum_j (\mu x_{ij} \times \mu c_{ij})$$

(d) Fuzzy Constraints:

- Supply constraint:

$$\sum_j x_{ij} \leq \mu s_{ij}, \text{ for each source } i$$

- Demand constraint:

$$\sum_i x_{ij} \geq \mu d_{ij}, \text{ for each destination } j$$

- Non-negativity constraint:

$$x_{ij} \geq 0, \text{ for all } i \text{ and } j$$

(e) Fuzzy Logic Operations:

- Fuzzy Addition: $\mu x_{ij} = \mu s_{ij} + \mu d_{ij}$
- Fuzzy Multiplication: $\mu x_{ij} = \mu s_{ij} \times \mu d_{ij}$

Advantages of Using Fuzzy Logic

- Flexibility: Fuzzy logic allows for the modelling of uncertainties and vagueness, making it suitable for real-world transport scenarios.
- Robustness: Fuzzy logic-based solutions are often more robust to changes in input parameters compared to traditional methods.
- Intuitive Interpretation: Fuzzy logic provides intuitive and easy-to-understand solutions, making it accessible to non-experts in optimization and logistics.

3.Transportation Systems:

Fuzzy logic is applied in various aspects of transportation systems, including route optimization, traffic management, vehicle control systems, and decision-making processes. It helps in improving the overall efficiency, safety, and sustainability of transportation networks.

4.Optimization:

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Fuzzy logic is utilized for optimizing transportation operations, such as route planning and scheduling, to minimize travel time, reduce fuel consumption, and enhance resource utilization. It considers multiple factors simultaneously and adapts to changing conditions to achieve optimal solutions.

5. Traffic Management:

Fuzzy logic plays a crucial role in traffic management systems by dynamically adjusting traffic signals, lane controls, and speed limits based on real-time traffic conditions. It helps in reducing congestion, improving traffic flow, and enhancing overall system performance.

6. Decision-making:

Fuzzy logic aids in decision-making processes related to transportation, such as route selection, mode choice, and resource allocation. It incorporates uncertain and subjective factors into decision models, allowing for more informed and adaptive decision-making in dynamic environments.

7. Uncertainty:

Transportation systems are inherently uncertain due to factors such as fluctuating traffic volumes, weather conditions, and unforeseen events. Fuzzy logic provides a means to model and reason with this uncertainty, enabling robust and flexible solutions that can adapt to changing circumstances.

8. Adaptability:

Fuzzy logic enables transportation systems to adapt and respond to changing conditions in real-time. By continuously monitoring inputs and adjusting parameters based on fuzzy rules, transportation systems can dynamically optimize their operations to achieve desired objectives.

9. Efficiency:

Fuzzy logic contributes to improving the efficiency of transportation systems by optimizing resource allocation, reducing delays, and minimizing energy consumption. It helps in streamlining processes and improving overall system performance while considering conflicting objectives and constraints.

10. Sustainability:

Fuzzy logic supports sustainability goals in transportation systems by promoting more efficient use of resources, reducing emissions, and mitigating environmental impacts. It enables the development of

intelligent transportation solutions that balance economic, social, and environmental considerations for long-term sustainability.

In summary, fuzzy logic offers a versatile and powerful approach to addressing the complexities and uncertainties inherent in transportation systems, ultimately leading to more efficient, adaptive, and sustainable transportation networks.

Conclusion:

The application of fuzzy logic in transportation systems offers significant benefits in addressing the inherent complexities and uncertainties of modern transportation networks. Through its flexible framework for handling imprecise and uncertain information, fuzzy logic enables more adaptive, efficient, and sustainable transportation solutions.

Fuzzy logic plays a critical role in various aspects of transportation, including route optimization, traffic management, vehicle control systems, and decision-making processes. By incorporating fuzzy logic techniques, transportation systems can dynamically adjust to changing conditions, optimize resource allocation, and improve overall system performance.

Moreover, fuzzy logic facilitates more nuanced decision-making by considering multiple factors simultaneously and accommodating subjective or uncertain inputs. This leads to better-informed decisions that balance conflicting objectives and constraints, ultimately enhancing the effectiveness and reliability of transportation operations.

Furthermore, fuzzy logic supports sustainability goals by promoting more efficient use of resources, reducing emissions, and mitigating environmental impacts. By optimizing transportation systems with fuzzy logic, we can create smarter, greener, and more resilient transportation networks that meet the needs of society while minimizing negative environmental consequences.

In the future, continued research and development in fuzzy logic and its applications in transportation will further advance our understanding and capabilities in optimizing transportation systems. By harnessing the power of fuzzy logic, we can continue to drive innovation and improvement in transportation, ultimately contributing to a safer, more efficient, and sustainable future for all

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জড়বাদী নৈতিকতার একটি দার্শনিক মূল্যায়ন

পলাশ ভূঞা

বীজ শব্দ : কর্মনীতি, নৈতিক, ঋত, কর্মবাদ, কর্মযোগ, পুরুষার্থ, জড়বাদ, সুখবাদ, অসংযত সুখবাদ, সংযত সুখবাদ

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সমাজবদ্ধ জীব হিসাবে মানুষ তার সমগ্র জীবদ্দশাতে কর্মনীতির(Law of Karma) দ্বারা নিয়ন্ত্রিত। 'কর্মনীতি' বলতে সাধারণভাবে বোঝায় কর্মপন্থা, কর্মপদ্ধতি বা কর্মকৌশল। মানুষ সামাজিক জীব হওয়ার সঙ্গে বুদ্ধিবৃত্তি সম্পন্ন হওয়ায় 'কর্মনীতি' একটি অত্যন্ত গুরুত্বপূর্ণ বিষয়। কারন – "বুদ্ধিবৃত্তি সম্পন্ন মানুষের কাছে জীবন শুধু ধারণ করার জন্য নয়, জীবনকে গঠন করতে হয়। জীবনকে গঠন করার জন্য একটি আদর্শের প্রয়োজন হয় যা নৈতিক"।^১ 'নৈতিক'(Moral) শব্দটি একপ্রকার মূল্যবোধক শব্দ, যা আমাদের সমস্তপ্রকার কর্মের মূল্য নির্ধারণ করে। অর্থাৎ 'নৈতিক' (Moral) হল –মানুষের ন্যায়-অন্যায়, ঠিক-ভুল, উচিত-অনুচিত বিষয়ক আলোচনা। বিশ্ব-ব্রহ্মাণ্ডের একটি ক্ষুদ্রতম অংশ হিসাবে এই নিয়মপালন করতে হবে। কারন এই সৌরজগৎ ও তারও বাইরে বিস্তৃত যে মহাবিশ্ব রয়েছে তা একটি সার্বজনীন নৈতিক নিয়মের দ্বারা পরিচালিত, তার নাম হল 'ঋত'(the cosmic and moral order of universe)। প্রসঙ্গত উল্লেখ্য যে, "বৈদিক সাহিত্যে যে নীতির দ্বারা সমগ্র বিশ্বজগৎ পরিচালিত বলে কল্পনা করা হয়েছে সেই নীতি বা নিয়মকে ঋত বলা হয়। সমগ্র বিশ্ব, তার সৌরমন্ডল, দিবা-রাত্রির পরিক্রমা, ঋতু পরিবর্তন- এই সমস্তই ঋতের দ্বারা শৃঙ্খলাবদ্ধ"।^২ ঋকবেদে বলা হয়েছে- "ঋতেন বিশ্বম্ ভুবনম্ বিরাজতঃ"।^৩ Clasical Indian Ethical Thought গ্রন্থে এর সমর্থনে বলা হয়েছে যে, "The law and order in every sphere is a manifestation of this Rta . Along with satya and tapas, it is regarded as one of the primal constituents of the Universe."(R.V,X,190.1)।^৪ ঋত বিশ্বের শৃঙ্খলা যেমন নিয়ন্ত্রণ করে তেমনি সামাজিক জীব হিসাবে মানুষের আচরনকেও নিয়ন্ত্রণ করে। প্রমান স্বরূপ বলা যায় যে, " Rta sets an ideal here with reference to which the distinction between 'is' and 'ought' or 'right' and 'wrong' assumes some meaning..... It is said that Rta is merely a principle of moral order which simply implies that there is no caprice or disorder in the realm of morality ; good acts yield good results and bad acts the bad ones."।^৫

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বিশ্বপ্রকৃতি যেমন ঋত- র নিয়মের দ্বারা শৃঙ্খলাবদ্ধ হয়ে ক্রমশ বিকাশ লাভ করেছে, তেমনি মানুষ বিশ্ব-জগতের অংশ হিসাবে এই নিয়মের অধীন। একইভাবে মানুষের কর্মজীবনের শৃঙ্খলাও নৈতিক নিয়মের দ্বারা পরিচালিত হচ্ছে। এই নৈতিক নিয়মকে 'কর্মবাদ'(Theory of Karma) নামে অভিহিত করা যায়, যা ঋত-র ধারণা থেকে অনিবার্যভাবে নিঃসৃত হয়েছে। কর্মবাদ থেকে দুটি গুরুত্বপূর্ণ ধারণা আমরা লাভ করতে পারি –

১) প্রত্যেক ব্যক্তিকে তার কর্মফল অবশ্যই ভোগ করতে হবে।

২) ভালো কর্ম ভালো ফল দান করবে, মন্দ কর্ম মন্দ ফল দান করবে।

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উপরোক্ত দুটি ধারণা থেকে একপ্রকার সার্বিক কার্য – কারন সম্বন্ধের জ্ঞান পাওয়া যায় , যা ‘নৈতিক কার্য-কারনবাদ’ নামে অধিক পরিচিত । বিষয়টি সহজভাবে ব্যাখ্যা করে বলা যায় যে, জাগতিক বিভিন্ন ঘটনার পেছনে একটি কারন থাকে তেমনই সামাজিক জীব হিসাবে মানুষের কর্মও ইচ্ছারূপ কারন থেকে উৎপন্ন হয় । এই প্রকার ইচ্ছার সঙ্গে সম্পৃক্ত থাকে কামনা , লক্ষ্য বা উদ্দেশ্যের ধারণা । কিন্তু আমাদেরকে একটি বিষয়ে সতর্ক থাকতে হবে যে, “কর্ম মানুষের ইচ্ছাপ্রসূত হলেও কর্মের ফল তার ইচ্ছার উপর নির্ভর করেনা । কর্মের ফল কর্তার ইচ্ছানিরপেক্ষভাবে উৎপন্ন হয় ”।^৬ অর্থাৎ কর্মের ফলে আমাদের কোন নিয়ন্ত্রন নেই কারন তা কার্য-কারন সম্বন্ধে অনিবার্যভাবে নিঃসৃত হয় । কিন্তু যে বিষয়টি আমাদের নিয়ন্ত্রনে রয়েছে সেটি হল- কর্মের কামনা বা উদ্দেশ্য । আমাদের কর্ম প্রবৃত্তির কারনকে আমরা যদি নিয়ন্ত্রন করতে পারি তাহলে তা অধিক ভালো কর্মফল প্রদান করবে । এর প্রমাণ আমরা ভগবদগীতায় উল্লিখিত কর্মযোগের ধারণা থেকে পাই । তাই মানুষের কর্মের কামনা বা উদ্দেশ্যকে সঠিক পথে চালিত করার জন্য ‘শ্রীমদ্ভগবদগীতা’-তে ভগবান শ্রীকৃষ্ণ বলেছেন যে –

“কর্মণ্যোবাধিকারস্তে মা ফলেষু কদাচন ।

মা কর্মফলহেতুঃ ভূঃ মা তে সঙ্গঃ অন্ত অকর্মনি ॥” (শ্রীমদ্ভগবদগীতা ২/৪৭)

অর্থাৎ “কর্মই তোমার অধিকার, ফলে নহে । অতএব কর্ম কর । কিন্তু ফলের আকাঙ্ক্ষাই যেন তোমার কর্মের হেতু না হয় । আবার কর্মত্যাগেও যেন তোমার প্রবৃত্তি না হয়”।^৭ এখানে আমরা অত্যন্ত গুরুত্বপূর্ণ দুটি মার্গের কথা জানতে পারি- ১) প্রবৃত্তি মার্গ ২) নিবৃত্তি মার্গ । দুই প্রকার মার্গের সার কথাটি হল – মানুষ তার কর্মের সমস্ত কামনা বা উদ্দেশ্য ঈশ্বরে সমর্পন করে কর্মে প্রবৃত্ত হবে এবং কর্মফলের আশায় কর্ম সম্পাদন করা থেকে নিবৃত্ত হবে । এক্ষেত্রে উক্তিটি বিশেষ প্রণিধানযোগ্য যেখানে বলা হয়েছে- “ ভগবদগীতা কর্ম পরিত্যাগ বা কর্ম সন্ন্যাসের কথা বলেনা , কিন্তু অনাসক্তভাবে কর্ম করতে বলে । তাই ভগবদগীতার অষ্টম অধ্যায়ে(৮/৭) শ্রীকৃষ্ণ অর্জুনকে বলেছেন- অতএব সর্বদা আমাকে স্মরণ কর এবং স্থায় ক্ষাত্র ধর্মপালন হেতু যুদ্ধ কর”।^৮ এইপ্রকার কর্মযোগের ভাবনার দ্বারা কর্মসাধন করলে কর্মবাদ সুপ্রতিষ্ঠিত হবে এবং তা জগতের কল্যান সাধন করবে ।

৩

ভারতীয় নীতিবিদ্যায় কর্মবাদ(Theory of Karma) খুব গুরুত্বপূর্ণ । কারন কর্মবাদ তত্ত্বটির উপর নির্ভর করে অপরাপর ধারণাগুলি যেমন জন্মান্তরবাদ , কর্তব্যবোধ , পুরুষার্থ প্রভৃতি বিকশিত ও প্রকাশিত হয়েছে । আমরা জানি যে , সমগ্র ভারতীয় দর্শন সম্প্রদায় বেদের প্রামাণ্য স্বীকার করা বা স্বীকার না করা কে কেন্দ্র করে প্রধানত দুটি শিবিরে বিভক্ত- ১) আস্তিক(বেদের প্রামাণ্য স্বীকার করে – ন্যায়, বৈশেষিক, সাংখ্য, যোগ, মীমাংসা, বেদান্ত) ২) নাস্তিক (বেদের প্রামাণ্য স্বীকার করে না – চার্বাক, বৌদ্ধ, জৈন)। তাই স্বাভাবিক কারনেই ভারতীয় দর্শনের বিভিন্ন সম্প্রদায়ের মধ্যে নৈতিক বিষয় সম্বন্ধে মতপার্থক্য লক্ষ্য করা যায় । বিভিন্ন মতপার্থক্যের মধ্যে একটি বিষয়ে আমরা সাদৃশ্য দেখতে পাই, তাহল- বিভিন্ন সম্প্রদায়ের নৈতিক মতবাদ গড়ে তোলার ভিত্তি হল পুরুষার্থের ধারণা । অর্থাৎ যে সম্প্রদায় যেভাবে এবং যে অর্থে পুরুষার্থকে গ্রহন করেছে , সেই অনুযায়ী তাদের নৈতিক মতবাদ গড়ে উঠেছে । তাই পুরুষার্থ বলতে কি বোঝায়? – জানা দরকার । বুৎপত্তিগতভাবে বলা যায় যে , মানুষ যা প্রার্থনা

করে, যে আদর্শকে তার কাম্য বা অভিষ্ট বলে মনে করে তাই পুরুষার্থ। এই প্রসঙ্গে মীমাংসাসূত্র গ্রন্থে মহর্ষি জৈমিনি বলেছেন – “যস্মিন প্রীতিঃ পুরুষস্য তস্য লিপ্সার্থলক্ষণং অবিভক্তত্বাৎ (মীমাংসাসূত্র ৪/১/২)”।^৯ শ্লোকটির অর্থ হল যে, ‘যে বিষয়ে মানুষের প্রীতি হয় তাহাই পুরুষার্থ। তাহার যে লিপ্সা বা অনুষ্ঠান তাহা অর্থত অর্থাৎ স্বাভাবিক অনুরাগবশত প্রাপ্ত’।^{১০} একটি বিষয় খুব স্পষ্ট যে, মানুষের সুখ ও দুঃখাভাবের সঙ্গে পুরুষার্থ ঘনিষ্ঠ সম্বন্ধে আবদ্ধ। তাই পুরুষার্থ মানুষের কর্মপ্রবৃত্তির কারন হয়ে নৈতিকতার নিয়ামক হয়। বিষয়টিকে ‘Classical Indian Ethical Thought’- গ্রন্থে ব্যাখ্যা করে বলা হয়েছে যে, “‘Purusartha’ literally means the end or goal to be aimed at by people. It may also be taken to mean the end or goal that is actually aimed at or desired by men”.^{১১} পুরুষার্থ নামক অধিবিদ্যক তত্ত্বটি হল ভারতীয় নৈতিকতার ভিত্তি। ভারতীয় দর্শনে মোট চার প্রকার পুরুষার্থ স্বীকার করা হয়েছে। যথা – ১) ধর্ম ২) অর্থ ৩) কাম ৪) মোক্ষ। একত্রে এই চারটিকে চতুর্বর্গ বলা হয়। মানুষের দুঃখ নিবৃত্তি ও সুখ প্রাপ্তির উপায় হিসাবে চতুর্বর্গ পুরুষার্থ আমাদের প্রার্থিত বিষয়। কিন্তু সমস্যাটি হল যে, নৈতিকতার ভিত্তিস্বরূপ পুরুষার্থের মধ্যে কোনটি পরমপুরুষার্থ সেই সম্পর্কে বিভিন্ন দার্শনিক সম্প্রদায়ের একমত নয়। চার্বাক ছাড়া সমস্ত দার্শনিক সম্প্রদায় মোক্ষ –কে পরমপুরুষার্থ স্বীকার করে সেই অনুসারে তাদের নীতিতত্ত্ব গড়ে তুলেছেন। চার্বাক দার্শনিকরা কামকে পরমপুরুষার্থ রূপে স্বীকার করে সেই অনুসারে তাদের সুখবাদী(Hedonistic) নীতিতত্ত্ব গড়ে তুলেছেন।

8

সামাজিক জীবন হিসাবে মানুষের আচরনের ন্যায্য-অন্যায্য, উচিত-অনুচিত, ভালো-মন্দ বিষয়ে আলোচনা করা হয়। চার্বাক নীতিবদ্যায় যে দৃষ্টিভঙ্গি থেকে নৈতিকতার আলোচনা করা হয়েছে সেটি হল – যে কর্ম অধিক সুখ উৎপন্ন করতে পারে তা ভালো, আর যে কর্ম অধিক দুঃখ উৎপন্ন করে তা মন্দ। এখন প্রশ্ন হল – চার্বাকদের এই প্রকার দৃষ্টিভঙ্গির মূল কারন কী? এই প্রশ্নের উত্তর বিশ্লেষণ করলে আমরা দেখতে পাব যে, চার্বাকদের সুখবাদী নৈতিকতার মূল হল তাদের অধিবিদ্যা(স্বভাববাদ, যদৃচ্ছাবাদ), যা তাদের জ্ঞানতাত্ত্বিক মতবাদের যৌক্তিক পরিনতি। চার্বাক জ্ঞানতত্ত্বের মূল বক্তব্য হল – ‘প্রত্যক্ষই একমাত্র প্রমাণ’। আত্মা, ঈশ্বর, পরলোক প্রভৃতি প্রত্যক্ষযোগ্য নয় বলে এগুলির অস্তিত্ব চার্বাকরা স্বীকার করেননা। ফলস্বরূপ তাঁরা দেহাতিরিক্ত আত্মা ও কার্য – কারন সম্বন্ধ স্বীকার করেননা। এইজন্যই চার্বাকরা জন্মান্তরবাদ ও কর্মবাদে বিশ্বাসী নয়। এইক্ষেত্রে চার্বাকরা জড়বাদ (materialism) স্বীকার করেছেন, যা তাদের জ্ঞানতত্ত্বের যৌক্তিক পরিনতি। চার্বাক জড়বাদ অনুসারে, জড়বস্তু (ক্ষিতি, অপ, তেজ, মরুৎ- চার মহাভূতের সমন্বয়ে গঠিত) হল একমাত্র সত্তা। তাই চার্বাকরা বলেন যে, মন, প্রান, চৈতন্য, দেহ, এমনকি সমস্ত জাগতিক বস্তু জড়ের স্বভাববশত জড় থেকে উৎপন্ন হয়েছে। প্রসঙ্গত ভারতীয় জড়বাদের প্রবক্তা বৃহস্পতি লৌক্য – র মতটি উল্লেখ করে বলা যায় যে, “প্রারম্ভে অসৎ বা অচেতন থেকেই সৎ বা চেতনের উদ্ভব হয়েছিল(‘অসতঃ সৎ জায়তে’ –ঋগ্বেদ ১০/৭২/২)”।^{১২} অসৎ থেকে সতের উৎপত্তি ব্যাখ্যা করার জন্য চার্বাকেরা বলেন যে, পান, চুন, খয়ের, সুপারি – এগুলির কোনটির মধ্যেও লাল রং না থাকলেও এদের সংমিশ্রনে যেমন লাল রঙের সৃষ্টি হয় তেমনই জড় মহাভূতগুলির সংমিশ্রনে চেতনার সৃষ্টি হয়।

চার্বাক জড়বাদের যৌক্তিক পরিনতি হল তাদের নৈতিক মতবাদ সুখবাদ (hedonism)। চার্বাক সুখবাদের মূল বক্তব্য হল – সুখ হল মানুষের জীবনের চরমলক্ষ্য (summum bonum) বা নৈতিক আদর্শ (moral ideal)। তাই

সুখবাদী চার্বাক নৈতিকতায় 'কাম' – কে পরমপুরুষার্থ রূপে স্বীকার করা হয় ও অর্থ – কে সহায়ক গৌণ পুরুষার্থ বলা হয়। চার্বাকদের এইপ্রকার সুখবাদী নৈতিকতা স্বীকার করার কারন বিশ্লেষণে বলা যেতে পারে –

প্রথমত : চার্বাক অধিবিব্য অনুসারে, ক্ষিতি, অপ, তেজ, মরুৎ- চার মহাভূত স্বভাববশতঃ যদৃচ্ছাভাবে মিলনের ফলে এই দেহ উৎপন্ন হয়েছে। তারপর দেহের ধর্ম হিসাবে চৈতন্য উৎপত্তি হয়। তাঁরা মনে করেন দেহ ও আত্মা অভিন্ন। এই মতটি ভারতীয় দর্শনে দেহাত্মবাদ নামে পরিচিত। দেহাত্মবাদী চার্বাকরা দেহ অতিরিক্ত আত্মা, ঈশ্বর, পরলোক প্রভৃতি স্বীকার করেন না। তাঁরা মনে করেন মৃত্যুতেই জীবনের পরিসমাপ্তি। তাই চার্বাক নীতিতত্ত্বের সারকথা হল – “যতদিন বাঁচবে সুখেই বাঁচার চেষ্টা করবো। কারন মৃত্যুকে কেউ অতিক্রম করতে পারে না (‘যাবৎ জীবৎ সুখং জীবৎ নাস্তি মৃত্যোঃ অগোচরঃ’)”।¹³ তাই চার্বাক নীতিতত্ত্বের সিদ্ধান্ত হল – মৃত্যুভয়ে ভীত না হয়ে সম্পূর্ণভাবে জীবনে সুখ উপভোগ করাই হল মানুষের কর্তব্য।

দ্বিতীয়ত : চার্বাকরা ধর্ম ও মোক্ষকে পুরুষার্থ বলে স্বীকার করেন না। ধর্মকে পুরুষার্থ বলে স্বীকার না করার কারন উল্লেখ করে বলা যায় যে, প্রায় সমস্ত আন্তিক দর্শন সম্প্রদায় মনে করেন যে বেদ হল ধর্মের উৎস। কারন তা অপৌরুষেয়। কিন্তু চার্বাকরা এই মত স্বীকার করেন না। তাদের মতে বেদের প্রামাণ্য স্বীকার করা যায় না। বেদসহ বিভিন্ন ধর্মীয় শাস্ত্রের রচয়িতা হল ঘন্ড, ধৃত ও নিশাচর, যারা নিজেদের জীবন- যাত্রা নির্বাহের জন্য এইসমস্ত শাস্ত্রীয় নিয়মগুলি সৃষ্টি করেছে। তাই বেদ ও অন্যান্য ধর্মীয় শাস্ত্রে যে পাপ-পুণ্যের ধারণা দেওয়া হয়েছে তা গ্রহন যোগ্য হতে পারে না। অপরপক্ষে চার্বাকরা মোক্ষকে পরমপুরুষার্থ স্বীকার না করার কারন উল্লেখ করে বলেছেন যে, মোক্ষ বা মুক্তি বলতে যদি আত্যন্তিক দুঃখ নিবৃত্তি কে বোঝায়, তবে তা সম্ভব নয়। কারন জাগতিক সব বিষয়ের মধ্যে সুখ – দুঃখ সর্বদা মিশ্রিত থাকে। তাই সুখ ক্ষণিক হলেও তা ত্যাগ করা উচিত নয়। চার্বাক মতে, সুখভোগের জন্য যদিও দুঃখভোগ অপরিহার্য তবুও তাকে যথাসম্ভব পরিহার করে সুখভোগ করাই বুদ্ধমান ব্যক্তির কর্তব্য। এই বিষয়ে চার্বাক মতটি উল্লেখ করা যায় – “যথেষ্ট ভোগের দ্বারা বর্তমানকে সার্থক কর- ‘পিব খাদ চ’। এইরূপ যতদিন বাঁচিয়া থাকিবে ভোগসুখেই বাঁচিয়া থাক, খণ করিয়াও ঘৃত পান কর। কারন কাম্যবস্তুর উপভোগই মানুষের চরমলক্ষ্য বা পুরুষার্থ (যাবৎ জীবৎ সুখং জীবৎ ঋণং কৃত্বা ঘৃতং পিবেৎ। ভস্মীভূতস্য দেহস্য পুনরাগমনং কুতঃ)।”¹⁴

উপরোক্ত আলোচনার পরিপ্রেক্ষিতে আমরা দেখতে পাই যে, দৈহিক সুখ এবং ঐহিক সুখই জীবনের একমাত্র কাম্য বা লক্ষ্য। এই মতটি ধৃত চার্বাক সম্প্রদায়ের, যা স্থূল বা অসংযত আত্মসুখবাদ (Gross Egoistic Hedonism) নামে পরিচিত। A Manual Of Ethics গ্রন্থে বলা হয়েছে – “According to this doctrine all pleasure are alike in kind they differ only in intensity or degree ; there is no qualitative difference among them. The pleasures of the body are preferable to those of the soul, because the former are more intense than the latter.....”।¹⁵ প্রাচীন গ্রীক দার্শনিক Aristippus (500BC) হলেন এই Gross Egoistic Hedonism – এর প্রবর্তক। তাঁর মতে, “...the desire for pleasure as the soul motive of our action”।¹⁶ অর্থাৎ আমাদের সমস্ত কর্মের মূল উদ্দেশ্য হল সুখ অন্বেষণ করা। তবে চার্বাকদের অপর এক সম্প্রদায়, সুশিক্ষিত চার্বাকরা স্থূল বা অসংযত আত্মসুখবাদ পরিত্যাগ করেছেন। তাদের মতে, অনিয়ন্ত্রিত দৈহিক সুখ মানুষের কাম্য হতে পারে না। মানুষের উচিত উচ্চতর সুখ অন্বেষণ করা। তাই সুশিক্ষিত চার্বাকরা একপ্রকার সূক্ষ্ম বা সংযত আত্মসুখবাদ (Refined Egoistic Hedonism) প্রচার করেন। মতটি প্রাচীন গ্রীক দার্শনিক Epicurus (341-270 BC)- এর মতের সদৃশ। “....reason has an

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important place in our moral life . It is the proper guide for the attainment of true happiness. Momentary bodily pleasure are not the highest good. But a happy life as a whole is the greatest good .”¹⁷ অর্থাৎ শুধুমাত্র মনুষ্যের প্রাণীর মত সুখ ভোগেই জীবনের সার্থকতা নেই।

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উপরোক্ত আলোচনার পরিপ্রেক্ষিতে বলা যায় যে, চার্বাক নৈতিকতা সুখবাদী দৃষ্টিভঙ্গীর উপর প্রতিষ্ঠিত হওয়ার ফলে সুখ বা কাম হল তাদের মতে সমস্ত কর্মের প্রবৃত্তির কারণ। চার্বাকরা মনে করেন বর্তমান জীবন একমাত্র অস্তিত্বশীল, নিঃশেষে এই জীবনকে ভোগ করা উচিত। এই মতটি অতীতকালে খুবই জনপ্রিয় হওয়ায় চার্বাকরা লোকাযত নামে পরিচিত ছিল। বর্তমান সামাজিক অবস্থার দিকে দৃষ্টিপাত করলে আমরা জড়বাদী নৈতিক সুখবাদের জনপ্রিয়তা আজও লক্ষ্য করতে পারি। চার্বাকদের আত্মসুখবাদী নৈতিকতা গ্রহণ করার ফলে সমাজে আজ মূল্যবোধের অবক্ষয় প্রকট হয়ে উঠেছে। মানুষ নিজের স্বার্থে আত্মসুখের জন্য যেকোন প্রকার অনৈতিক কাজ করেছে। তাই জড়বাদী নৈতিকতাকে নির্বিচারে গ্রহণ করা উচিত নয়। আমাদের সমাজ ও পরিবেশের সার্বিক উন্নতির জন্য চতুর্বিধ পুরুষার্থের অনুশীলন করে সার্বিক উপযোগিতার জন্য কর্মে প্রবৃত্ত হতে হবে।

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Amitav Ghosh's *The Calcutta Chromosome*: A Historical Novel

Chiradip Bera

Abstract

The Calcutta Chromosome: A Novel of Fevers, Delirium, and Discovery (1995) represents Ghosh's first science fiction; this densely layered novel offers an alternate history of the discovery of the parasite that causes malaria. His subsequent novels include *The Glass Palace* (2000), a familial history centred on Burma (Myanmar) between its occupation by the British in 1885 through its independence after World war II and into the late 20th century, and *The Hungry Tide* (2004), set in Bengal and featuring American and Indian characters. Invasion, defined as a forcible entry into a person's domain, provides opportunities for history to be made. It occurs on a massive scale occasionally and has the potential to drastically alter the ecosystem of the nation affected. History, as a record of previous human action, serves as a road map, source of information, and source of criticism. It is unavoidable for any author to describe or depict a nation that is crucial to his or her work. It emphasizes empathy, honesty, understanding, and social conscience through a series of lessons that provide important moral instruction. Literature and history are inextricably linked. Events in history are disordered chronologies of unknown data, necessitating the creation of a paradigm and making sense of them by a historian. In this way, how Amitav Ghosh's novel *The Calcutta Chromosome* explores the history of malaria hypotheses is the main discussion of this paper.

Key words: History, reinvent, disease, discovery

Ghosh is a writer who recreates the history, proposes a framework, and interprets it. It has had a significant influence on his work that ultimately has a sequential circulation since the history gives information for his artistic appreciation and creative impulse. In his writings, he discusses the histories of several nations as well as the individuals who live as witnesses to their lives and experiences. His extensive study experiences, as well as his travels to multicultural countries, have provided him with sufficient opportunity to reflect on cultural and historical disparities.

Ghosh's writings show how history impacts people's lives, personalities, and fates. He wants to recreate India's history by connecting the past events. All of his works are based on his own historical study, both social and scientific. The prominent figures depicted in Ghosh's novels are authentic representatives of the nation's socio-cultural and political structure. His works are all based on historical, sociological, and political sources. In all his fiction and non-fictional works, Ghosh's writings depict historical significance. To justify this context, Latha Chathurvedi states as: Almost all Amitav Ghosh's books... invariably focus on history and its ramification across geography, a theme that has seldom

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been explored before and which he does well with his creative imagination equipped with his own anthropological training.

In his works, historical events are closely entwined with the writer's personal thoughts, emotions, assessments, and life philosophy. The occurrences are detailed chronologically and geographically.

His famous "postcolonial" piece of science fiction, *The Calcutta Chromosome*, is wellknown. This work explores the concept of "alternative" history, which focuses on "subaltern" people, as well as the life of Ronald Ross, the famous scientist who won the Nobel Prize for his discoveries concerning malaria transmission. The work is also primarily about the "subaltern," their silence, and their past.

Pradip Trikha in his article "The Calcutta Chromosome: A Literary Touchstone" comments as, "Ghosh is a novelist who conformingly writes about a vanished era. In his novel, *The Calcutta Chromosome*, he traces the past like social historian and chronicler" (258). The approaches he employs, particularly in dealing with sensitive issues and the style of narration, are the more important features of the work. From the beginning until the end of his storey, he alternates between the past and the present. Further, P.S.Ravi in his article "History Politics and the Individual", considers this technique as a "radically different perception of history are artistically synthesized that the events of the past come alive, making it a living experience" .

The Calcutta Chromosome is a dystopian and magical tale based on the life and study of British scientist Ronald Ross. Literature, physics, philosophy, history, psychology, and sociology are all incorporated into it. It combines horror, health history, and magical realism. It's a search and exploration storey that ties together the past, present, and future in a complex web. There are two parts to it: *The Day After August 20th* . It's about Dr. Ronald Ross, a British medical scientist working in colonial India when he discovered the malaria parasite. The fictitious Ross is untrained in his field, but is guided in the correct route by a small religious community. With its subtle and funny blending of science and folklore, it is a fascinating read.

The novel *The Calcutta Chromosome* chronicles historical study from the eighteenth century through the twenty-first century's lateral revelation of the mysteries involved. It's a rewrite of medical history in the Western world. Ghosh develops a chronological conceptual structure for this storey by fusing reality with fiction, a technique called as *faction*. Ronald Ross's past is a tangle of contradictions. Murugan is fascinated by the early days of malaria research, and he delves into the intriguing life of Ronald Ross. To build a historical backdrop for a spectacular fiction, he largely relies on Ross's *Memoirs*. More than two decades after the discovery, Ross' *Memoirs* were published in 1923.

The narrator realizes a long-forgotten memorial in Calcutta dedicated to Ronald Ross, the Nobel Prize recipient for discovering the malaria parasite. Murugan feels that there is still a hidden history which has been deleted from colonial current societal scribbling records and medical historiography, and he wants to find the missing ties. Ghosh has gathered enough evidence to develop a ground-breaking theory that turns science and religion on their heads. The hypothesis of displacement is supported by his

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footsteps. Murugan believes that there is a "Other Mind" (TCC 35), a group of people who steered Ross to his findings and kept him away from other paths of thought. Ross has never been intellectually interested or research oriented, according to Murugan's account. Only after Dr. Patrick Manson has persuaded him to verify his [Manson's] theories on how the country's oldest and most widely distributed illness is transferred does he begin his search for the malaria vector. Ross was the first one to identify that the malaria transmission parasite is transferred orally, via water supply, from mosquito to man. Ross' path shifted in an instant, and on August 20, 1897, he discovered the link between plasmodium zygotes and *Anopheles stephensi*. This prompted Murugan to uncover a power other than Ross who assisted Ross in his findings.

Ross's findings have always been made by chance, thanks to a bizarre happenstance Lutchman, a friendly dhooly bearer, has. There is very little information in the biography regarding Lutchman, the subject of Ross's first malaria studies. In the youthful Lutchman, he notices an uncommon quality. Throughout his malaria inquiry, he maintains him in his service. Lutchman, who initially came as a patient, later becomes a Ross employee. Ross carries out his experiment on the colonised country's destitute illiterate locals. Ross' discoveries are solely due to Mangala, a lab cleaner. She heals it by telling a storey about soul displacement. Resurrection was once practised by renowned sages. Ross uses the Indians as examples in his studies to establish this act scientifically. Westerners see Mangala's research as counter-science. Science is concealment to Indians, but transparency to westerners.

Science is viewed by Indians as a mythical and superstitious concept. They are unable to or are not permitted to flourish in the alien world, whereas Indian soil has no differences in terms of enabling people to be successful. The intruders obtain names by utilising various Indigenous knowledge. Many more Indians than Ross would care to admit have aided him in his malaria research lab. Westerners have no qualms about deceiving those who have assisted them with their study.

Ghosh concludes the tale with the deep transformation to suggest a future for the impoverished in which they appear to wield authority. As a result, Ghosh's work is concerned with the past, voice, and future of the underclass.

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Yoga for Mental and Physical Health

Dipanwita Ghana

Abstract

Yoga in Daily Life is a system of practice consisting of eight levels of development in the areas of physical, mental, social and spiritual health. When the body is physically healthy, the mind is clear, focused and stress is under control. Yoga, an ancient practice originating from India, has gained widespread popularity across the globe due to its numerous physical, mental, and spiritual benefits. Integrating yoga into daily life can lead to profound improvements in overall well-being and quality of life. This abstract outlines the key benefits and importance of practicing yoga regularly.

The goals of “Yoga” are physical Health, mental Health, social Health, spiritual Health, self-Realization, or realization of the Divine within us. These goals are attained by love and help for all living beings, Respect for life, protection of nature and the environment, A peaceful state of mind, Full vegetarian diet, Pure thoughts and positive lifestyle, Physical, mental and spiritual practices, Tolerance for all nations, cultures and religions. Yogic techniques are known to improve one’s overall performance. Pranayama is an important, yet little known part of Yoga. Until recently, this art and science of yogic breathing was almost completely unknown to the common man like many other ancient Indian arts. Pranayama techniques act to purify the nadis including these three main energy channels.

Keywords: Yoga, Pranayama, Mental Health, Physical Fitness

1. Introduction:

Yoga originated in India several thousand years ago as a system of physical and spiritual practices. It was formalized in the second century BC in the form of the Yoga Sutras, attributed to the scholar Patanjali. The word 'yoga' means 'union' or 'yoke' or 'joining'. Originally, yoga was a method for joining a regular imperfect human being with the divine principle, or God. It is aimed to unite the mind, the body and the spirit. Through the practice of yoga, the mind can be trained to relax through deep breathing and become focused while holding the breath. This practice will lead to control of the mind. Doing yoga, not just the physical portion, but also immersing oneself on to the mental aspect of it, can help improve mental health. Yogis (those who do yoga) believe that yoga can reduce, and eventually prevent, the build-up of repressed emotions in the mind. The process is gradual but the effects, if yoga continues to be practiced, are lasting. "Yoga is a very effective stress reduction and relaxation tool. Performance of various postures requires the tensing and stretching and then relaxing of muscle groups and joints, which effectively produces relaxation in much the same way that a massage does. Yoga

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practice also draws attention towards breathing, which produces a meditative and soothing state of mind", says Mark Dombeck, Ph.D

2. Operation Definition:

2.1 Yoga:

Yoga is a physical, mental and spiritual practice that originated in ancient India. First codified by the sage Patanjali in his Yoga Sutras around 400 C.E, the practice was in fact handed down from teacher to student long before this text arose. Traditionally, this was a one-to-one transmission, but since yoga became popular in the West in the 20th century, group classes have become the norm.

The word yoga is derived from the Sanskrit root *yuj*, meaning "to yoke," or "to unite". The practice aims to create union between body, mind and spirit, as well as between the individual self and universal consciousness. Such a union tends to neutralize ego-driven thoughts and behaviours, creating a sense of spiritual awakening.

2.2 Pranayama:

Pranayama is a Sanskrit term composed of two words: "prana," meaning life force or vital energy, and "ayama," meaning extension or control. Thus, pranayama refers to the practice of controlling and extending the breath to regulate the flow of prana within the body. It is a fundamental aspect of yoga, focusing on breath regulation to enhance physical, mental, and spiritual well-being. Here is a detailed look at pranayama:

Pranayama is the practice of breath control in yoga, involving various techniques to regulate the inhalation, exhalation, and retention of breath. It aims to harness and direct the vital energy (prana) to improve physical health, calm the mind, and facilitate spiritual growth.

2.3 Mental Health:

Mental health refers to a person's emotional, psychological, and social well-being. It influences how individuals think, feel, and act, and it plays a crucial role in determining how they handle stress, relate to others, and make decisions. Mental health is essential at every stage of life, from childhood and adolescence through adulthood.

2.4 Physical Fitness:

Physical fitness refers to the ability of an individual to carry out daily tasks with optimal performance, endurance, and strength while managing fatigue and reducing the risk of injury and disease. It

encompasses various attributes such as cardiovascular endurance, muscular strength, flexibility, and body composition.

2. Yoga and Mental Health:

3.1 Stress Reduction:

Yoga promotes the relaxation response, counteracting the body's stress response. Practices such as deep breathing, meditation, and progressive relaxation can reduce cortisol levels, a primary stress hormone. Yoga encourages mindfulness, helping practitioners stay present and focused, which can reduce stress and anxiety.

3.2 Anxiety Management

Pranayama, or yogic breathing exercises, can calm the nervous system and reduce anxiety. Yoga enhances body awareness, which can help individuals recognize and manage physical symptoms of anxiety.

3.3 Improved Sleep

Yoga practices, especially those that involve relaxation and meditation, can improve sleep quality by promoting relaxation and reducing insomnia. Yoga can help regulate the sleep-wake cycle, improving overall sleep patterns.

3.4 Emotional Regulation Mindfulness practices in yoga can enhance emotional regulation, helping individuals manage their emotions more effectively. Yoga can build resilience against stress, helping individuals recover more quickly from emotional setbacks.

3.5 Social Connection

Practicing yoga in a group setting can foster a sense of community and belonging, which is important for mental health. Yoga classes often create support networks, providing social support that can alleviate feelings of loneliness and isolation.

3.6 Self-Compassion and Acceptance

Yoga teaches non-judgmental awareness of oneself and others, fostering self-compassion and acceptance. The practice encourages a deep connection with oneself, promoting inner peace and contentment.

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3.7 Boosts your immune system functionality:

Asana and pranayama probably improve immune function, but, so far, meditation has the strongest scientific support in this area. It appears to have a beneficial effect on the functioning of the immune system, boosting it when needed (for example, raising antibody levels in response to a vaccine) and lowering it when needed (for instance, mitigating an inappropriately aggressive immune function in an autoimmune disease like psoriasis).

3.8 Maintains our nervous system:

Some advanced yogis can control their bodies in extraordinary ways, many of which are mediated by the nervous system. Scientists have monitored yogis who could induce unusual heart rhythms, generate specific brain-wave patterns, and, using a meditation technique, raise the temperature of their hands by 15 degrees Fahrenheit. If they can use yoga to do that, perhaps you could learn to improve blood flow to your pelvis if you're trying to get pregnant or induce relaxation when you're having trouble falling asleep.

4. Yoga and Physical Fitness

4.1 Improves our flexibility:

Improved flexibility is one of the first and most obvious benefits of yoga. During our first class, we probably won't be able to touch our toes, never mind do a backbend. But if you stick with it, we will notice a gradual loosening, and eventually, seemingly impossible poses will become possible. We will also probably notice that aches and pains start to disappear. That's no coincidence. Tight hips can strain the knee joint due to improper alignment of the thigh and shinbones. Tight hamstrings can lead to a flattening of the lumbar spine, which can cause back pain. And inflexibility in muscles and connective tissue, such as fascia and ligaments, can cause poor posture.

4.2 Ups our heart rate:

When we regularly get our heart rate into the aerobic range, we lower our risk of heart attack and can relieve depression. While not all yoga is aerobic, if we do it vigorously or take flow or Ashtanga classes, it can boost our heart rate into the aerobic range. But even yoga exercises that don't get your heart rate up that high can improve cardiovascular conditioning. Studies have found that yoga practice lowers the resting heart rate, increases endurance, and can improve our maximum uptake of oxygen during exercise—all reflections of improved aerobic conditioning. One study found that subjects who were taught only pranayama could do more exercise with less oxygen.

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4.3 Drops our blood pressure

If we have got high blood pressure, we might benefit from yoga. Two studies of people with hypertension, published in the British medical journal *The Lancet*, compared the effects of Savasana (Corpse Pose) with simply lying on a couch. After three months, Savasana was associated with a 26-point drop in systolic blood pressure (the top number) and a 15-point drop in diastolic blood pressure (the bottom number—and the higher the initial blood pressure, the bigger the drop).

5. Conclusions:

Yoga affects every cell of the body. It brings about better neuron-effectors communication, improves strength of the body, increases the optimum functioning of all organ-systems, increases resistance against stress and diseases and brings tranquility, balanced, positive attitude and equanimity in the practitioner which makes him lead a purposeful and healthier life.

6. Discussion:

Yoga is an ancient discipline of body, mind, and spirit that has been Westernized and practiced for its health benefits, similar to alternative medicinal (herbal) treatments, as a complement to more conventional medical therapy. Hatha Yoga, through holding static physical postures (asanas), uses stretching and improves muscular strength and flexibility so that it would likely be beneficial for some musculoskeletal problems (Luskin et al., 2000) [12]. In fact, two limited studies of yoga in osteoarthritis of the hand and carpal tunnel syndrome show greater improvement in pain than in control groups. In combination with breath control, which adds additional neuromuscular effects, Hatha Yoga has provided some limited benefit in other musculoskeletal-related pain management, especially back pain and in the management of multiple sclerosis. These recent findings should not be surprising because yoga postures have been utilized in most athletic programs throughout Western societies for many years to both prevent and treat musculoskeletal injuries. Interestingly, anecdotal reports from non-Western societies where yoga posturing has been used instinctively by native populations for sitting and sleeping, find relatively few musculoskeletal problems (e.g., lower back pain and joint stiffness). Through body- and breath-control, including relaxation techniques, Hatha Yoga clearly has additional benefits for cardiopulmonary endurance in healthy people Kona et al., 2000 [8 Tella et al., 2000 [12]; Yadav and Das, (e.g., increased CO₂) that is produced by a change in the chemo reflex threshold. Yoga breathing while performing postures, especially relaxation postures (e.g., Savasana), also has been shown to significantly reverse the physiologic effects of stress (i.e., increased HR, fib, and BP). Some of these physiological benefits are possibly self-controlled (i.e., psychologic); however, there are data in healthy subjects Selvamurthy et al., 1998) [17] showing that yoga breathing techniques have effects on the autonomic nervous system as well (Rub et al., in preparation). It is likely that the yoga practices

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of controlling body, mind, and spirit combine to provide useful Psychophysiological effects for healthy people and for people compromised by musculoskeletal and cardiopulmonary disease. No effects of yoga practices, on the other hand, have been shown convincingly for diseases such as chronic tinnitus (Kroner-Hedwig et al., 1995) [9] or epilepsy that do not have neuromuscular or neurovascular involvement. Further studies, therefore are needed to confirm the cellular and psychophysiological effects of Hatha Yoga.

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