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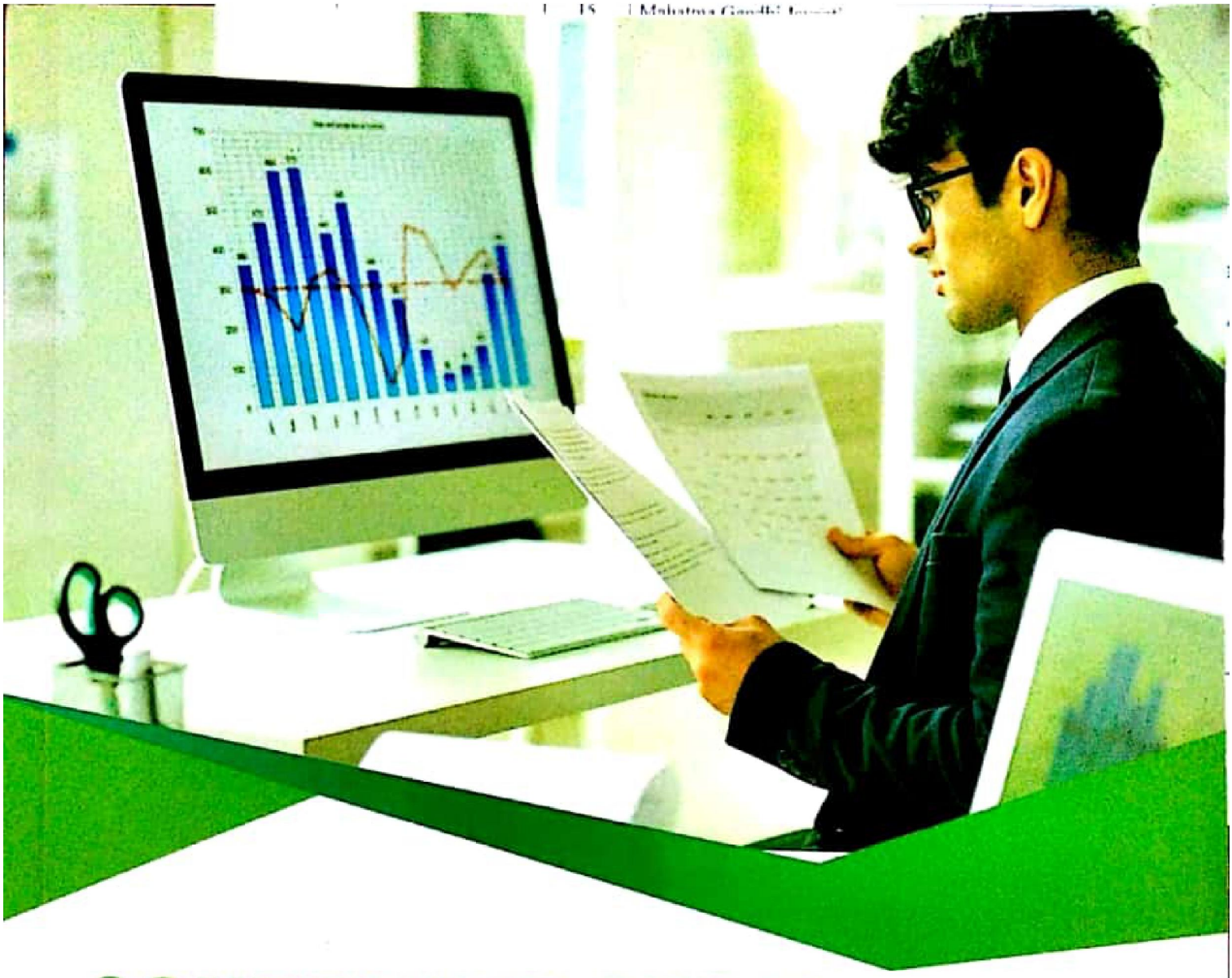

CONTEMPORARY ISSUES
IN MULTIDISCIPLINARY SUBJECTS

VOLUME 2

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ROLE OF LANGUAGE IN BUILDING OF SOCIAL APPROACH

Dr. Shailendra K. Bansode [50]

Abstract:

The Indian Languages and Writing in both its substance and mode incorporates permanence with change, an unquestioned assurance to several fundamental code of belief of the conventional blended with a reaching out to explore the new, a shifting of the focus to the individual and the personal but without serving of links with the familial and the societal. The poets, short story writers and novelists reflect the Indian reality imaginatively, imbuing it with bold technical innovations-all of which deserve detailed analysis, definition, classification and evaluation. The term Indo-Anglian is used to denote original literary creation in the English by Indians. Today there are a large number of educated Indians who use English language as a medium of creative exploration and expression of their experience of life. Their writing has now developed into a substantial body of literature in its own right. But today this literature is referred to as Indian English Literature and at present it is Indian Writing in English with which we are studying social development with Indian sensibility.

Keywords: *Language, Writings, Literature, Novel, Poets, social approaches.*

Introduction:

The Britisher's have been ruling the country for several decades and Macaulay's education policy has determined English Teaching in India as the important English policy. Emergence of Indian writing has become a vital part of English literature today. Its basic reasons are so many; chief among them is the past of Indian political term. On account of wiser India's recommendation this has been possible, it is suspected by some Indians, but surely for administrative reason it was politically decided that the Masses be taught English and it was a hectic demand on the side of the Indians to prefer instructions in English. As a result of this, Macaulay's recommendations were fully accepted by the government, and it is somewhere in 1835 this education began operating with a view to promoting western science and literature among the natives.

The result of this the learners were exposed to the new discipline and to widen their attitude and the scientific, rational approach in life. It helped to liberate Indians from the creative, narrow outlook. It is related to the social cultural practices prevented in those days, under which comes caste ridden society which is the major setback to the Indians. This new method of instructing English helped the regional languages to develop slight higher level in the matter of creativity. Among greater men of letters, great social reformist and revolutionist like Raja Ram Mohan Roy come forward and their

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emerged Indian Renaissance of the 19th century for all Indian writers to write for Indian-ness. Apart from this, many Indian people engaged them in writing in English for the social causes but their purpose was not for English creation.

Objectives:

1) To search the Role of English Literature in Social progress.
2) To search and study different aspects of in English literature for Social maturity.
3) To evaluate thematic concern, narrative technique and comparative perspective of social approaches

Content:

The other social, cultural problems of native Indians inspired to the great Indian writers for lot of translations of works. For example the great work of Shakespeare helped in early period as a model to the Indian dramatist and for their work in translation so output of it with direct result is our Indian Drama in English study. The best example of it is in 1832 entitled The Persecuted was the solid contribution in Indian drama. In the earlier period persons like Rabindranath Tagore, Keshubhai Sen and Shri Aurobindo, M.K.Gandhi, Dr. Radhakrishanan and writing of Jawaharlal Nehru were on one side and Dr. Babasaheb Ambedkar were on other side to flourish English Language. The output of this is nothing but the Indians began to use English language for creative Expression. The best example of it with simple imitation is Henry Derizeo's volume of poems published in 1823 and other work in 1983 entitled with, the Shair and Other Poems. This has left chances of writing in English on the deep rooted English race.

If you look at the English poetry of Madhusudan Dutt, a Bengali poet of his talent, whose only aim in life was to win recognition as a writer of English verse. Similar to this the unforgettable names in the period of initial stage were Rabindranath Tagore and Sarojini Naidu they wrote not only prose work but also expanded good work in poetry. Added to this a major milestone work in the 20th century was contributed by the great Indo- Anglican poet and prophet whose name is Aurobindo.

He has contributed exhaustive treasure of his working to the new generations as a unique-one in that century. In this manner Indians proved as the beneficiates by this particular benefit. If you look at the Indian Sensibility after getting Independence and the present period of it and all together challenges from all side only possible to remove if they drive Britishers from India. The spectacle presented challenges, dynamic problem of the partition of the country, the whole country bathed in blood so people worried in a mood to repent.

The first problem of disunity and disintegration between Hindus and Muslims posed a great threat for the survival of the country due to this political division. Problems of cast and un-touch ability were no less grave. The speech of J. Nehru and his writings presents us the horror of the days. A Host of writers came forward recalled in their sentiments of pity, loss, and awakening of the masses and presenting the problems of division.

Our country was facing total disaster, poverty growing population, extreme unemployment and horrible conditions of Indians victimized by this. But the brief story enough to reflect conditions of communal riots and violence, murder and killing hatred and suspension is given by R.K.Narayan in his book, Another Community. At the same time the born of Mulkraj Anand as a creative man of social

sense and deep concerns helped M.K.Gandhi to become giant personality. His contribution in novel writing helped Gandhi to mobilize public opinion with sermons. So today's work of Gandhi shows us the importance and greatness of Mulkraj Anands literary contribution in the life of Gandhi. The best example of Mulkaraj Anand is given in his novel Coolie. In this way, one side of the Indian socio-cultural reality at the same time another significant problem of the inner world of an individual has been given authentic touches by the writers.

An active citizen who has been exposed to the multidimensional undercurrents of socio-cultural, economic, and humanistic and the tender problems of the hearts are faithfully bended in the poetry of modern Indian poets. The problems of dignity of Indian and human mind to create new situation helps Indian sensitive citizen in their life. The factors like Science, Technology, economy, medicine, political awareness and above all a rational scientific temper of time spirit alter the vary life style of modern man and all these factors find voice in our Indian Writing in English as our Indian responsiveness.

The glorious part of our Indian literature is Indian Poetry. As we know literature has incorporated with universal values as far as the English Literature in India is concerned. It has its own sociological and racial interest means the literature is both universal and also Indian. Beauty and tragedy with fatality crisscrossed in the life of Indian poetry. It is both subject matter and style. It also includes customs, beliefs, situations, places and superstitions. The first phase of poetry by Aurobindo Ghosh, Sarojini Naidu and Swami Vivekananda has the grace of divine love which they had defined in the words like the God, god's gift and grace. It is the god-bhkta relationship like lord Krishna and Meerabai. All they had mythological references with them to create a poetic act.

The development within a poem is a sign of maturity in the poet. Hence, in our Indian Writing in English the most well-known name in Indian writing poetry contribution is Nissim Ezekiel. Towards end, in the study of our Indian sensibility in Indian Writing in English Novel writing assumes significant dimensions and the writers involved themselves in the process of investigating social, social-political and socio-cultural aspects of Indian situations in which the sense of native problem are found projected. Their identity of Indian sensitivity and the greatness of Indian writing lie in their full time orientation. The best example of it is Raja Rao's Indian novel, The Serpent and the Rope. But it doesn't mean that this writing is only particular about only Indian mind. In many of the books there is universal touch relating to man and woman of the world. Writers in general chose to tackle problems of poverty, unemployment, caste-ridden society and the problems of education, superstition, freedom of women etc. But the writers like Raja Rao had devoted themselves to the specific area of typical behavior. Raja Rao's Kanthapura is a literary document to present Indian situation, authentically making Kanthapura as a model village. All problems being faced by Indians are tackled in the book and it becomes microcosm of Indian with the role, Gandhi's personality plays.

The group of women writers accepted the challenges to reveal most innate problems with their own kind. Out of these groups of the novelist Kamala Markanday, Ruth Jhabwala and Anita Desai showed remarkable awareness of the challenges of present day reality, feminism, free sex, Isolation, alienation and identity crisis etc., are some of the major thematic concern of the women novelists of today. Before conclusion a lot can be said very positively about women writers in fiction. It is the surprising improvement that was began to participate in this challenging activity in Indian side. Hence, it has sensibility to conclude, the ability to write about social development with Indian Sensibility in

Indian Writing in English which has opened the new vistas for young Indian writers (women/men) as a new trend of writing in our English Literature in postmodern period.

Conclusion:

In the part of conclusion, we may say that emergence of Indian language in English of Indian writing in English is a vital part of English and the past of Indian political term is the chief among them. It helped to liberate Indians from the creative, narrow outlook. To write about Indian-ness greater men of letters, great social reformist and revolutionist like Raja Ram mohanroy comé forward in 19th century. Similar to this Dr. M.K. Gandhi, R. Tagore, Dr. Radhakrishanan and J. Nehru use one side and on other side Dr. B.R. Ambedkar began to use English language for creative expression. But in the contribution of English Poetry Dr. Madhusudan Dutt's work as a writer of English verse and in the work of good Prose of Poetry R. Tagore and S. Naidu's work played most important role in our literature.

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IMPACT OF GLOBALIZATION ON LANGUAGE AND LITERATURE

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Cultural Displacement of the New Woman as an Impact of Globalisation: a Transnational Feminist Study of select Women Writers

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Abstract:

Globalization is a crucial characteristic of present-day post-modern societies which impact upon culture, literature, language communication and the policy of language learning. The impact of Globalisation is conspicuous in recent South Asian literature which witnessed the proliferation of substantial Immigrant narratives by women writers. While negotiating with the identity and shifting territories across the globe the women writers come across the issues of dislocation. This is an attempt to study transnational feminism as a medium of narrating the multicultural aspects of postcolonialism, mass migration and the contemporary identities of women narratives. The select writings are Brick Lane by Monica Ali, Salam Paris by Kavita Daswani, Queen of Dreams by Chitra Bannerjee Divakaruni, Jasmine by Bharati Mukherjee, An American Brat by Bapsi Sidhwa focus on the transnational identities of the new women, their resistance against the exploitation. The select writings by explore and establish the issues of identity, cultural assimilations, family relationships, and transnational space/place of nation-states.

Key Words: Globalization, Immigrant Narratives, Transnational Identities, Mass Migration

The Paper:

"We need to articulate the relationship of gender to scattered hegemonies such as global economic structures, patriarchal nationalisms, 'authentic' forms of tradition, local structures of domination, and legal-juridical oppression on multiple levels … transnational feminist practices require this kind of comparative work rather than the relativistic linking of 'differences' undertaken by proponents of 'global feminism'; that is, to compare multiple, overlapping, and discrete oppressions rather than to construct a theory of hegemonic oppression

under a unified theory of gender."

-Indrepal Grewal and Caren Kaplan

Transnational Feminism, Global Feminism and Third World Feminism:

Third world, transnational, and global feminisms focus on the situation of racial-ethnic women originating from the third world. Most second wave white feminisms in the West—liberal, radical, psychoanalytic have assumed that women everywhere face similar oppression merely by virtue of their gender. Global feminism as it first emerged in the 1980s was largely a global application of this white feminist outlook.

The term transnational is an umbrella concept that emerged as to name the increasing flows of people, things, images, and ideas across the borders of nation-states in an era of globalization. Transnational feminist perspectives focus on the diverse experiences of women who live within, between, and at the margins or boundaries of nation-states around the globe; they transcend nation-state boundaries and speak to a wide range of interacting forces that have an impact on gendered relationships and experiences in a geopolitical context. The focus on the transnational in feminist research aims to de-centre Western epistemologies, shaking the foundation of the sometimes taken-for-granted framework of Western or European focused feminist research in the English literature.

Third world and transnational feminisms emerged in the 1980s and early 1990s to challenge this white feminist assumption. These feminisms are predicated on the premise that women's oppression diverges globally due to not only gender, but also race, class, ethnicity, religion, and nation. Therefore, third world women suffer from multiple forms of oppression qualitatively different from the gender oppression experienced by middle-class white women in the West. Third world and transnational feminisms are distinct, however, not only in their origins and outlooks, but also in their goals and priorities.

Third World Feminism aims at generating descriptively reliable feminist analyses by Third World women themselves. Consequently, its focus has been on Third World women's activisms in their particular local/national contexts. Transnational feminism, on the other hand, is primarily interested in feminist organizations, networks, and

movements occurring outside and beyond individual nation-states at the transnational level

Transnational feminist research, therefore, is a radical framework to confront histories and contemporary practices of imperialism, colonialism and nationalism and their effects on women, gender and sexuality issues; and to displace Eurocentric and liberal feminist theories and ideologies.

The novel Brick Lane by Monika Ali centers around the life of Nazneen, a Bangladeshi immigrant who marries an older man named Chanu Ahmed in an arranged marriage. She relocates to London to start her new married life with her husband. In London, Nazneen is exposed to a new culture, and struggles to find balance between new possibilities and old traditions. Nazneen also maintains contact with her outcast sister, Hasina, who ran away with a man in a love marriage. In her letters, Hasina describes her difficult life working in a factory, and then later as a prostitute.

In the months after Chanu's departure, Nazneen finds a newfound sense of independence and freedom as she works to provide for herself and her children. Meanwhile, Hasina finds a fresh start and the possibility of love with another man in Bangladesh. The novel ends with Nazneen going ice skating for the first time, symbolizing her dream of finally leading an independent life.

Kavita Daswani is one of the contemporary Diaspora writers who proliferates the struggle of younger generation—the teenage Indian females or newlywed girls who struggle in the international space to create their comfort zone and identity. In her novel Salam Paris, Anaya Shah, a young, beautiful Muslim girl, a resident of Mahim from one of the suburbs of Mumbai, develops a fetish for fashions and modeling which she gradually obtains through her beauty, risk, flight and plight. As a model she explores variant national and international locations and also her 'self'. Being born in an orthodox Muslim family, she faces an array of restrictions, accusations and labels as she enters the world of fashions and glamour. Daswani epitomizes the psychological trauma that Tanaya experiences due to the shift in geographical locations which provide her fame and identity but at the same time her ethnicity and religion pinch her.

In **The Vine of Desire, Divakaruni** portrays the Indian women, caught in multicultural challenges in an alien culture, which represents

transformation in motion, from traditional wives to modem women to survive on their own to sustain their identity. Sudha saves her daughter by breaking all the traditional cultural patterns bound with Indian marriage institution. With all these burdens, she visits America to give emotional support to her sister and a new direction to her life, even though she is well aware of the fact that her sister's husband Sunil has a secret passion for her. Meanwhile, she becomes the cause of the breakup of her sister's home. She encounters all these challenges, variable cultural differences in America and takes up a job there as a home nurse to an old man, who suffers from extreme depression for his homeland, India.

Bharati Mukherjee's Jasmine (1989) portrays Jasmine who is highly resourceful, strong and has the ability to perfect her social and personal reality. She is the widowed young Indian girl, comes to America but raped by cheat. She burns her memory and moves ahead. She assumes various names and positions. The novel set in the 1980s about a young Indian woman in the United States who, trying to adapt to the American way of life in order to be able to survive, changes identities several times. Mukherjee's own experiences of dislocation and displacement in her life helps her in recording the immigrant experience of the protagonist in this novel.

An American Brat by Bapsi Sidhwa contrasts the status of women in the Third World and First World countries through a female character Feroza who migrates from Pakistan to America where she finds herself tempted for an inter-community marriage. An assortment of elements such as diaspora, self assertion, female characterization, migration experience and inter cultural marriage are touched upon. How an individual from the Third world suffers, adjusts and lives in the First World is brought to limelight. It is the story of a girl who changes herself from a dependent and shy girl to an independent, self-determining and self confident woman.

Conclusion:

Globalization has given new pastures to the border crossing activities and the emergence of migrated communities on a large scale; the alien experiences and emotional distress are part of this global phenomenon. The study of contemporary South Asian women's fiction promises a new shift both in women's literature and lives. The writers succeed in portraying the conflict between the cultural ties of their

adopted homeland and the native homeland that they are uncertain of returning to. They promote a transnational culture, recognize the ability to move beyond cultures and moreover learn to afford a life without depending on others. The paper examined the female subjectivity and their changing identity in South Asian women writings through the representation of multiple identities and experiences of diasporic women characters.

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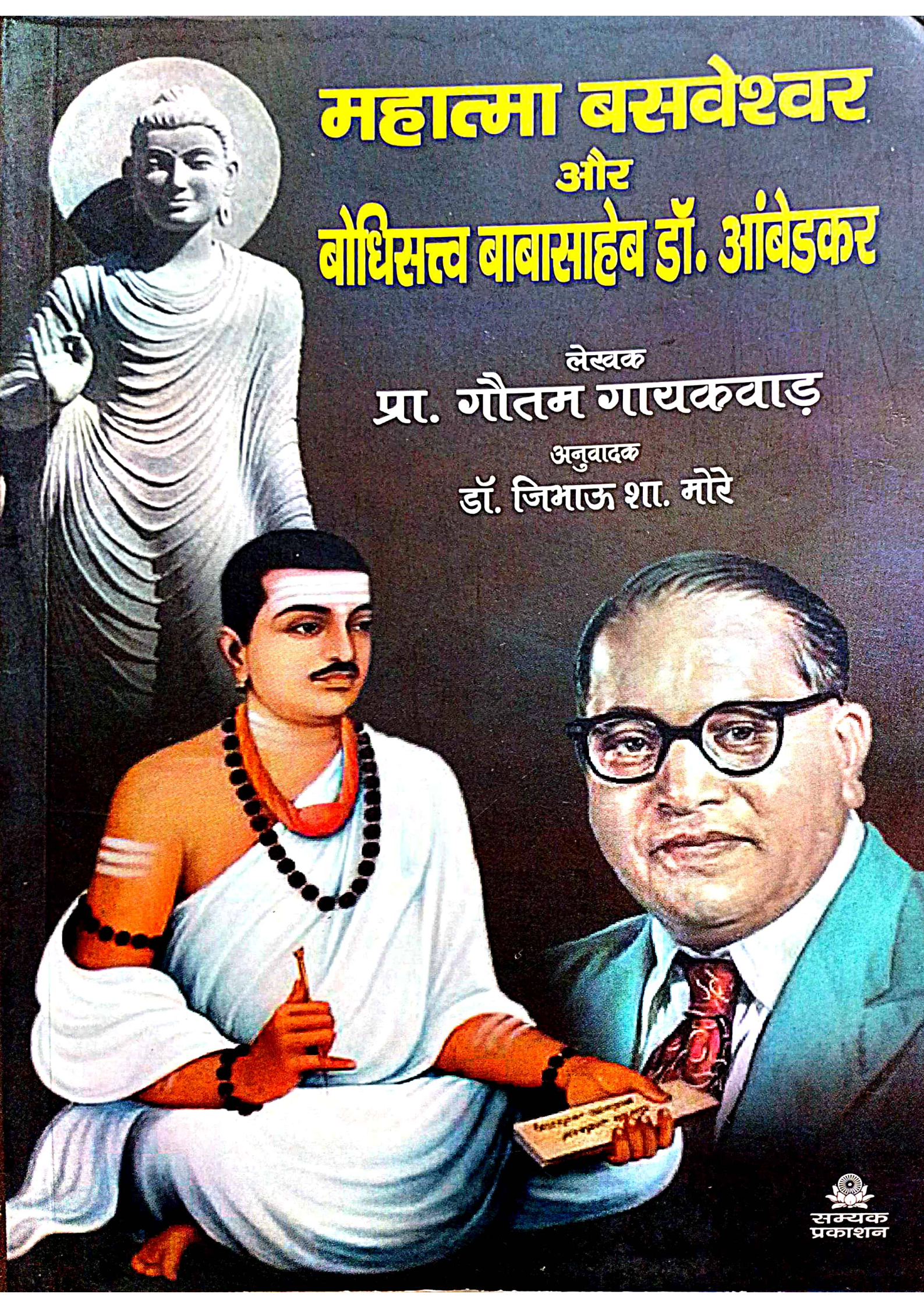

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प्रा. डॉ. सुरेश देवरे*

प्रस्तावना :–

1980 ची सातवी लोकसभा निवडणूक महाराष्ट्रातच नव्हे तर देशभर एक आश्चर्याची गोष्ट बनली होती. 1977 मध्ये इंदिरा गांधी सरकार पायउतार झाल्यावर स्वातंर्त्या नंतर कॉग्रेस पक्षाची मक्तेदारी मोडून निघाली, अशी परिस्थिती निर्माण झाली होती. मात्र हि परिस्थिती फार काळ टिकली नाही.. जनता पक्षात सहभागी झालेल्या विविध राजकीय पक्षांच्यां नेत्यां मधील मतभेद विकोपाला गेले आणि त्यांनी इंदिरा गांधी यांना सत्तेत येण्याचा मार्ग मोकळा करून दिला. दरम्यानच्या काळात महाराष्ट्राच्या राजकारणातही अशीच वेळ येऊन राजकीय समीकरणे झपाट्याने बदलली. इंदिरा गांधीना झालेल्या विरोधाचा परिणाम हा महाराष्ट्राच्या 'पुलोद' सरकारवरही झाला. राज्याची सूत्रे बदलली जाऊन 1980 च्या लोकसभा निवडणुक लढविली गेली. या निवडणुकीचा आढावा या प्रकरणातून घेतला गेला आहे.

1977 मधील जनता लाट :–

आणीबाणीमुळे इंदिरा गांधी आणि कॉंग्रेस पक्षाच्या विरोधात जबरदस्त वातावरण तयार झाले होते. त्याचा प्रत्यय 1977 च्या लोकसभा निवडणुकीत आला. केवळ जनता पक्षाच्या नावावर अनेक उमेदवार निवडून आले. त्यावेळच्या जनसंघाचे रामभाऊ म्हाळगी यांना 1977 मध्ये ठाणे मतदारसंघातून उमेदवारी दिली गेली. पुण्यातून समाजवादी पक्षाचे मोहन धारिया यांना जनता पक्षाची उमेदवारी मिळाली. रामभाऊ म्हाळगी हे पुण्याचे. 1971 मध्ये त्यांनी पुण्यातूनच लोकसभेची निवडणूक लढवली होती. म्हाळगी यांना उमेदवारी मिळालीच पाहिजे, असा आग्रह त्यावेळच्या जनसंघाच्या नेत्यांनी जनता पक्षाच्या नेतृत्त्वाकडे धरला. त्यामुळे म्हाळगी यांना ठाण्यातून उमेदवारी दिली गेली.

* राज्यशास्त्र विभाग, के. जे. सोमैया महाविद्यालय, कोपरगाव

त्या निवडणुकीत इंदिरा गांधी यांच्या विरोधात एवढी प्रखर लाट होती की स्थानिक आणि उपरा उमेदवार अशी तुलना करण्याचेही मतदारांच्या मनात आले नव्हते. रामभाऊ म्हाळगी हे ठाणेकरांना अपरिचित होतेय तरीही त्या निवडणुकीत ते प्रचंड मतांनी लोकसभेवर निवडून गेले. याच निवडणुकीत जॉर्ज फर्नांडिस हे बिहारमधील समस्तीपूर मतदारसंघातून निवडून आले. विशेष म्हणजे जॉर्ज फर्नांडिस हे निवडणुकीवेळी तुरुंगात होते. त्याआधीच्या 67 आणि 71 अशा दोन लोकसभा निवडणुका जॉर्ज फर्नांडिस यांनी मुंबईतून लढविल्या होत्या. बिहारशी तसा फर्नांडिसांचा काहीच संबंध नव्हता. मात्र आणीबाणीविरोधी लाटेत फर्नांडिस हे संपूर्ण देशातून विक्रमी मतांनी लोकसभेवर निवडून आले.

1977 ते 1980 बिगर कॉंग्रेस सरकारची वाताहत :–

इंदिरा गांधी यांनी देशात आणीबाणी लागू केल्यानंतर प्रथमच केंद्रात स्थापन झालेले बिगर काँग्रेस सरकार अल्पजीवी ठरले. जनता पक्षात सहभागी झालेल्या विविध राजकीय पक्षांच्यां नेत्यांमधील मतभेद विकोपाला गेले आणि त्यांनी इंदिरा गांधी यांना सत्तेत येण्याचा मार्ग मोकळा करून दिला. 1977 ते 1980 या कालावधीत जनता पक्षाचे सरकार होते. जयप्रकाश नारायण त्याचे प्रणेता होते. परंतु पद घेण्यास त्यांनी नकार दिला होता. मोरारजी देसाई, मधु लिमये, राजनारायण, जॉर्ज फर्नांडिस, मधू दंडवते यांसारखे समाजवादी नेते मंत्रिमंडळात होते. संघ परिवारातील अटलबिहारी वाजपेयी, लालकृष्ण अडवाणी, नानाजी देशमुख यांच्यासह काँग्रेसमध्ये बंडखोरी करून बाहेर पडलेले चौधरी चरणसिंग, चंद्रशेखर, मोहन धारिया, रामधन, कृष्णकांत यांचाही समावेश होता. जगजीवनराम आणि हेमवतीनंदन बहुगुणा यासारख्या काँग्रेसजनांनीही त्यांना 'हात' दिला होता. जनता पक्षाचे सरकार आल्यानंतर मोरारजी देसाई, चौधरी चरणसिंग आणि जगजीवनराम यांनी पंतप्रधान पदासाठी दावा केला होता. नेता निवडीचा अधिकार जयप्रकाश नारायण आणि जे. बी. कृपलानी यांना देण्यात आला होता. त्यांनी मोरारजी देसाई यांच्या नावाला पसंती दिली. चरणसिंग गृहमंत्री, तर जगजीवनराम संरक्षणमंत्री बनले. 24 मार्च 1977 रोजी मोरारजी मंत्रिमंडळाने शपथ घेतली. दोन महिन्यातच बिहारमध्ये झालेल्या दलित हत्याकांडाच्या विषयावरून सरकारमध्ये मतभेद सुरू झाले. पाठोपाठ आणीबाणी लागू केल्याच्या मुद्दयावरून इंदिरा गांधी यांना अटक झाली. याविरुध्द संजय गांधी यांनी रान पेटवले. हजारो काँग्रेस कार्यकत्यांनी स्वतः अटक करवून घेतली. या विषयावरदेखील मंत्रिमंडळात वेगवेगळे सूर उमटले. मतभेद वाढल्यानंतर गृहमंत्री चरणसिंग यांना राजीनामा देणे भाग पडले. कारण इंदिरा गांधी यांना अटक करण्याचे आदेश त्यांनीच दिले होते. पंतप्रधान मोरारजी देसाई याबाबतीत असहमत होते.

काही दिवसानंतर चरणसिंग यांनी दिल्लीत मोठे शक्तिप्रदर्शन केले. त्यांची सभा खूप मोठी होती. त्यांनतर चरणसिंग यांचे मनपरिवर्तन घडवून पुन्हा मंत्रिमंडळात घेण्यात आले. यावेळी त्यांना उपपंतप्रधान करण्यात आले. तसेच अर्थमंत्रालयदेखील दिले गेले. मंत्रिमंडळातील संतुलन राखण्यासाठी जगजीवनराम यांनाही उपपंतप्रधान बनवणत आले. एकाचेवेळी दोन उपपंतप्रधान होणे ही पहिलीच वेळ होती.

1978 च्या कालखंडात हे घडत असताना काँग्रेसमध्ये पुन्हा विभाजन झाले. एका गटाचे नेतृत्व इंदिरा गांधींकडे तर दुसऱ्या गटाचे नेते यशवंतराव चव्हाण, ब्रह्मनंद रेड्डी, देवराज अर्स होते, नोव्हेंबर 1978 मध्ये इंदिरा गांधी कर्नाटकातील चिकमंगळूर मतदारसंघातून निवडून लोकसभेवर पोहोचल्या होत्या. याच दरम्यान जनता पक्षात द्विसदस्त्वाचा मुद्दा समोर आला. जनसंघातील लोक एकाच वेळी आरएसएस आणि जनता पक्षाचे सदस्य राहू शकत नाहीत, असा मुद्दा मधू लिमये यांनी मांडला. त्यामुळे आरोग्य मंत्रालय सांभाळणारे राजनारायण यांनी राजीनामा दिला. उत्तर प्रदेशात रामनरेश यादव, बिहारमध्ये कर्पुरी ठाकूर, हरियाणात चौधरी देवीलाल यांनाही मुख्यमंत्रिपदाची खुर्ची सोडावी लागली. हे तिघेही समाजवादी व लोकदलाचे सदस्य होते. चरणसिंग यांना धडा शिकवण्यासाठी मोरारजी देसाई यांनी हा डाव खेळला होता.

1979 मध्ये अखेर चरणसिंग यांनी बंडाचे निशाण फडकावले. त्यांच्या गटातील 90 खासदारांनी मोरारजी देसाई यांचा पाठिंबा काढून घेत त्यांच्या विरूद्ध अविश्वास प्रस्ताव दाखल केला. मधू लिमये, राजनारायण, जॉर्ज फर्नांडिस यांसारखे जुने समाजवादी चरणसिंग यांच्या सोबत गेले. चरणसिंग यांच्या नेतृत्वाखाली जनता पक्ष (धर्मनिरपेक्ष) हा नवा पक्ष स्थापन झाला. पुढे या पक्षाचे नामांतर होऊन लोकदल हे नवे नाव देण्यात आले.

अविश्वास ठराव मंजूर झाल्यनाने मोरारजी देसाई यांचे सरकार कोसळले. 15 जुलै 1979 रोजी देसाई यांनी आपला राजीनामा राष्ट्रपती नीलम संजीव रेड्डी यच्याकडे सुपूर्द केला. काँग्रेस पक्षाच्या पाठिंब्याने चरणसिंग पंतप्रधान बनले. या नव्या सरकारमध्ये यशवंतराव चव्हाण उपपंतप्रधान बनले. दुर्दैवाने हे सरकार देखील औट घटकेचे ठरले. शपथ घेतल्यानंतर केवळ तीनच आठवडयात पंतप्रधान चरणसिंग यांनी राजीनामा दिला. संजय गांधी यांच्यावरील खटले मागे घेण्याच्या अटीवर इंदिरा गांधींनी पाठिंबा देण्याचा निर्णय घेतला, तो चरणसिंग यांनी अमान्य केला. 20 ऑगस्ट 1979 रोजी लोकसभेत विश्वासदर्शक ठराव मांडला जाणार होता. चरणसिंग लोकसभेत न जाता थेट राष्ट्रपतींकडे गेले आणि राजीनामा सुपूर्द केला. 22 ऑगस्ट 1979 रोजी राष्ट्रपतींनी लोकसभा बरखास्त केली. चौधरी चरणसिंग असे पंतप्रधान होऊन गेले ज्यांनी लोकसभेचे

तोंडदेखील पाहिले नाही. पुढे 1980 च्या जानेवारीत देशाला मध्यवधी निवडणुकीला सामोरे जावे लागले. काँग्रेसला बहुमत मिळाले आणि इंदिरा गांधी पुन्हा पंतप्रधान बनल्या.

महाराष्ट्र लोकसभा 1980 एक दृष्टीक्षेप :–

मतदारसंघ रचना

सर्वसाधारण	अ . जाती	अ. जमाती	एकूण
४११	०३	०४	४८

(स्त्रोतः निवडणूक आयोग भारत सरकार)

मतदार

मतदार	महिला	पुरुष	एकूण
	१६३३०५७६	१७१५४४८८	३३४८५०६४

(स्त्रोतः निवडणूक आयोग भारत सरकार)

मतदान स्थिती

एकूण मतदान	प्रत्यक्ष मतदान	टक्केवारी	बाद मते	मतदान कक्ष
३३४८५०६४	१९०१८८००	५६. ८० %	२. ७८ %	३९३५१

(स्त्रोतः निवडणूक आयोग भारत सरकार)

एकूण उमेदवार 417

सर्वसाधारण		अ . जाती		अ. जमाती		एकूण	
पुरुष	महिला	पुरुष	महिला	पुरुष	महिला	पुरुष	महिला
३५५	१६	२५	--	१८	१	३९८	१७

(स्त्रोतः निवडणूक आयोग भारत सरकार)

पक्षनिहाय विजयी उमेदवार :–

अ. क्र	मतदारसंघ	विजयी उमेदवार	राजकीय पक्ष
१	राजापूर	मधु दंडवते	जे.एन.पी.
२	रत्नागिरी	बापूसाहेब परुळेकर	जे.एन.पी.
३	कुलाबा	ए. टी. पाटिल	कांग्रेस(आय)
४	मुंबई द	राजदा र. गोकुळदास	जे.एन.पी.
५	मुंबईउत्तर	भोले आर आर	कांग्रेस(आय)
६	मुंबई द	प्रमिला माधू दंडवते	जे.एन.पी.
७	मुंबई उ पु.	सुब्रमनियन स्वामी	जे.एन.पी.
८	मुंबई उत्तर पश्चिम	राम जेथमलानी	जे.एन.पी.
९	बॉम्बे उत्तर	रवींद्र वर्मा	जे.एन.पी.
१०	ठाणे	म्हाळगी रामचंद्र काशिनाथ	जे.एन.पी.
११	डहाणू (एसटी)	सिंहगड दामू बारकू	कांग्रेस(आय)
१२	नाशिक	वाघ प्रताप देवरम	कांग्रेस(आय)
१३	मालेगाव (एसटी)	खांडोले जमारू मंगळु	कांग्रेस(आय)
१४	धुळे (एसटी)	भोई रेश्मा मोतीराम आयएनसी	कांग्रेस(आय)
१५	नंदुरबार(एसटी)	सिरूपिंग हिरया नाईक पोलिस	कांग्रेस(आय)
१६	एरंडोल	विजयकुमार नौदल पाटिल	कांग्रेस(आय)
१७	जळगाव	यादव शिवराम महाजन	कांग्रेस(आय)
१८	बुलढाणा (एससी)	वासनिक बालकृष्ण रामचंद्र	कांग्रेस(आय)
१९	अकोला	वैरले मधुसूदन एटाराम	कांग्रेस(आय)
२०	वाशिम	गुलाम नाबी आजद	कांग्रेस(आय)
२१	अमरावती	उषा प्रकाश चौधरी	कांग्रेस(आय)
२२	रामटेक	बर्वे जतीराम चैत्रम	कांग्रेस(आय)
२३	नागपूर	धोटे जंबुवंत बापुराव	कांग्रेस(आय)
२४	भांडारा	पारधीर केशौरओ एततरमजी	कांग्रेस(आय)
२५	चिमूर	मुत्तेमवार व्हिलास बाबूरा	कांग्रेस(आय)
२६	चंद्रपूर	शांताराम पोटदु खे	कांग्रेस(आय)
२७	वर्धा	वसंतराव साठे	कांग्रेस(आय)
२८	यवतमाळ	पाटील उत्तमराव देवराव	कांग्रेस(आय)

२९	हिंगोली	उत्तमराव बळीरामजी राठोड	कांग्रेस(आय)
३०	नांदेड	चव्हाण शंकरराव भैरव	कांग्रेस(आय)
३१	परभणी	यादव रामाराव नारायणराव	कांग्रेस(आय)
३२	जालना	बाळासाहेब पवार	कांग्रेस(आय)
३३	औरंगाबाद	काझी सेल	कांग्रेस(आय)
३४	बीड	क्षीरसागर केसरबाई सोनाजीराव	कांग्रेस(आय)
३५	लातूर	शिवराज विश्वनाथ पाटिल	कांग्रेस(आय)
३६	उसमानाबाद (एससी)	सॅमंत त्र्यंबक मारोत्राव	कांग्रेस(आय)
३७	सोलापूर	कुचण गंगाधर श्रीरामप्पा	कांग्रेस(आय)
३८	पंढरपूर(एससी)	थोरात संगीता बागवान	कांग्रेस(आय)
३९	अहमदनगर	आठरे चंद्रभान बालाजी	कांग्रेस(आय)
४०	कोपरगाव	विखे एकनाथराव विठ्ठलराव	कांग्रेस(आय)
४१	खेड	मोरे रामकृष्ण स.	कांग्रेस(आय)
४२	पुणे	गाडगीळ विठ्ठल नरहर	कांग्रेस(आय)
४३	बरामाती	पाटिल शंकरराव बाजीराव	कांग्रेस(आय)
४४	सातारा	चव्हाण यशवंतराव बालवंतराव	कांग्रेस(यु)
४५	कराड	मोहिते यशवंतराव जिजावा	कांग्रेस(आय)
४६	सांगली	पाटिल वसंतराव	कांग्रेस(आय)
४७	इचलकरंजी	माने राजाराम शंकरराव	कांग्रेस(आय)
४८	कोल्हापूर	गायकवाड उदयसिंगराव नानासाहेब	कांग्रेस(आय)

(स्रोतः निवडणूक आयोग भारत सरकार)

मतदान टक्केवारी व विजयी उमेदवार :–

पक्ष	लढविलेल्या जागा	विजय	पराभव	टक्केवारी
कॉंग्रेस(आय)	४८	३९	०९	५३.३
जे.एन.पी.	३१	०८	२३	२०.४२
कांग्रेस(यु)	२४	०१	२३	११.८१

(स्रोतः निवडणूक आयोग भारत सरकार)

निवडणुकीची वैशिष्टे :–

- कॉंग्रेस (आय) चे निर्विवाद वर्चस्व राहिले.
- जनता पक्षाची ताकद महाराष्ट्राबरोबरच देशातही कमी झाली.

- या निवडणुकीत महाराष्ट्रातून 17 पैकी 3 महिला निवडून आल्या.
- कांग्रेस मधून बाहेर पडलेल्या गटांना मोठा फटका बसला.
- शिवसेनेने दोन जागावरुन निवडणूक लढविली होती. त्या दोन्ही जागेवर पराभव झाला व एका जागेवर तर अनामत रक्कमही जप्त झाली.

महाराष्ट्राच्या बाबत तर या निवडणुकीत मोठी निराशा झाली. काँग्रेस मधून बाहेर पलेल्या महाराष्ट्रातील नेत्यांची मोठीच राजकीय नाचक्की झाली. त्याच महाराष्ट्रात झालेला 'पुलोद' सारखा प्रयोग पुरता फसला. काहींना तर राजकरणातून बाहेर पडावे लागले. राष्ट्रीय पातळीवरही आघाडीचे प्रयोग फसले आणि त्याचा फटका महाराष्ट्राच्या राजकारणाला तेवढाच झाला हे खरे. ही निवडणूक महाराष्ट्राच्या बाबतीत तर कॉंग्रेस धार्जीनी ठरली व त्याचा फायदा कोणतेही कष्ट न घेता कोंग्रेसच्या आश्रयाला राहिलेल्या नेत्यांनाच झाला. दरम्यानच्या काळातील आणीबाणीने कॉंग्रेस विरोधकांचा आधीच उत्साह मावळलेला होता त्यातच इंदिरा गांधीच्या झंजावातापुढे विरोधकांची मोठी वाताहत झाली. त्यामुळे देशभराबरोबरच महाराष्ट्रातही लोकसभेत कॉंग्रेसचीच सरसी झाली.

पुन्हा एकदा इंदिरा गांधी :–

सातव्या लोकसभा निवडणुकीत काँग्रेसने 492 उमेदवार उभे केले. त्यापैकी 353 जिंकले. जनता पक्षाला केवळ 31 जागा मिळाल्या. चरणसिंग यांच्या लोकदलाला 42 जागांवर विजय मिळाला. काँग्रेसनंतर हा दोन नंबरचा पक्ष बनला. माकपचे 37 तर भाजपचे 10 उमेदवार लोसभेवर निवडून गेले. बंडखोरी केलेल्या काँग्रेसने 13 जागा पटकावल्या. 28 महिलांनी लोकसभेत प्रवेश केला. द्रमुक (17), अपक्ष (9) यांनीही चांगले यश प्राप्त केले. इंदिरा गांधी मेडक (आंध्र प्रदेश), रायबरेली (उत्तर प्रदेश), या दोन्ही ठिकाणाहून निवडून आल्या. संजय गांधी अमेठीतून विजयी झाले. नारायण दत्त तिवारी (नैनीताल), राजेंद्रकुमार बाजपेयी (सीतापूर), शीला कौल (लखनौ), व्ही. पी. सिंग (अलाहाबाद), कमलापती त्रिपाठी (वाराणसी), आरीफ मोहम्मद खान (कानपूर), मोहसिना किडवाई (मेरठ), हेमवतीनंदन बहुगुणा (गढवाल), पी. व्ही. नरसिंहराव, विजय भास्कर रेड्डी, पी. शिवशंकर (आंध्र प्रदेश), आर. वेंकटरमण (मद्रास दक्षिण), जाफर शरीफ, एस. एम. कृष्णा, ऑस्कर फर्नांडिस (कर्नाल) हे देखील निवडून आले. जनता पक्षातर्फे मधू दंडवते, प्रमिला दंडवते महाराष्ट्रातून विजयी झाले. यशवंतराव चव्हाण, सुब्रम्हण्यम स्वामी, राम जेठमलानी, अटल बिहारी वाजपेयी, देवीलाल, बन्सीलाल हे देखील निवडून आले. मधू लिमये, शरद यादव, मुरलीमनोहर जोशी, सुषमा स्वराज, सिकंदर बख्त, विजयाराजे सिंधीया, कुशाभाऊ ठाकरे, बापू काळदाते, लालूप्रसाद यादव, मुरली देवरा यांना मात्र पराभव पत्करावा लागला होता.

प्रो. डॉ. सुनील जयसिंग कवडे गौरव ग्रंथ

महाराष्ट्राच्या राजकीय प्रक्रियेची वाटचाल

१९५२-२०१९

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डॉ. विलास आवारी
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डॉ. संजय काळे
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प्रा. जाधव परिक्षित शत्रुघ्न*

प्रस्तावना

लोकशाही व्यवस्थेत निवडणुकांना अत्यंत महत्त्वाचे स्थान असते. निवडणुकीच्या माध्यमातून लोकांना आपले मत व्यक्त करण्याची संधी प्राप्त होते. लोकशाही शासन पध्दती यशस्वी करण्यासाठी निवडणुका मुक्त आणि निःपक्षपातीपणे होणे आवश्यक असते. भारताने बहुपक्ष पध्दतीचा स्वीकार केला आहे. त्यामुळे जनतेसमोर अनेक पर्याय खुले होतात व योग्य प्रतिनिधी निवडला जातो. निवडणुकीच्या माध्यमातून जनतेला आपल्या राजकीय जागरुकतेचा परिचय करुन देता येतो. अनेक राजकीय पक्ष सत्तेच्या स्पर्धेत असतात आणि सर्वांचा कमी–अधिक प्रमाणात राजकीय प्रभाव असतो. अशी पध्दती 'बहुपक्षी पध्दती' म्हणून ओळखली जाते. भारतातील पक्षपध्दतीचे बदलते स्वरुप स्वातंत्र्योत्तर काळात बरीच वर्ष केंद्रात व राज्यांत कॉग्रेस हा एकच पक्ष प्रबळ होता. म्हणजे तेव्हा एक प्रबळ पक्ष पध्दती होती. 1977 मध्ये अनेक पक्ष एकत्र येऊन एक प्रबळ पक्ष पध्दतीला आव्हान देऊन त्याचा प्रभाव संपवला. 1989 नंतर लोकसभेत एका पक्षाला बहुमत न मिळाल्याने आघाडी सरकारे स्थापन झाली. 1998 मध्ये भाजपाला आघाडी सरकार स्थापन करता आले, पण ते एकच वर्ष टिकू शकले. पुन्हा ऑक्टोबर 1999 मध्ये भाजपने 'राष्ट्रीय लोकशाही आघाडी' (NDA) या नावाने सरकार स्थापन केले एप्रिल 2004 मध्ये कॉग्रेसच्या नेतृत्त्वाखाली 'संयुक्त पुरोगामी आघाडी' (UPA) चे सरकार सत्तेवर आले. राष्ट्रीय लोकशाही आघाडी (NDA) ने देशातील चांगली स्थिती लक्षात घेत (भाजपने) 2004 मध्ये सहा महिने अगोदर निवडणुका घेण्याचे ठरविले. अटल बिहारी वाजपेयी यांच्या नेतृत्त्वाखाली एनडीए पुन्हा सत्तेवर येणार, असा अंदाज सर्वत्र वर्तविला जात होता. भारतीय अर्थव्यवस्था 2004 मध्ये चांगल्या स्थितीत होती. इंडिया शायनिंग ही घोषणा करीत भाजप निवडणुकीच्या मैदानात उतरली होती. सोनिया गांधी परदेशी आहेत हा मुद्दाही त्यावेळी प्रचारात होता. भाजपचा प्रचार हायटेक

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होता, तर त्या तुलनेत कॉंग्रेसचा प्रचार धर्मनिरपेक्षता, सर्वांगीण विकास, दुर्बल घटक व अल्पसंख्यांक वर्गासाठी सर्वसमावेशक धोरण असा होता. सल्लागारांची मते डावलून गांधींनी द्रमुक व राजद यांच्याशी आघाडी केली. कॉंग्रेस विजयी होऊ शकेल अशा राज्यांतच गांधी यांनी प्रचार केला. नागरिकांशी विशेषतः महिलांशी संवाद साधण्यावर त्यांनी भर दिला. 'कॉंग्रेस का हाथ, आम आदमी के साथ' ही त्याची घोषणा होती. तरीदेखील निवडणुकीचा निकाल सर्वांना आश्चर्याचा धक्का देणारा ठरला होता. निकाल लागला तो एनडीएच्या विरोधात. 1999 च्या तुलनेत कॉंग्रेसच्या 21 जागा वाढत 145 झाल्या. मात्र मित्रपक्षांमुळे युपीएला 218 जागा मिळाल्या, भाजपच्या जागा 44 ने कमी होत 138 वर पोहोचल्या. तर एनडीए 270 वरुन 181 पर्यंत जागामध्ये घट झाली. (युपीए) संयुक्त पुरोगामी आघाडी 145 जागावरुन 218 जागावर पोहोचली. मार्क्सवादी कम्युनिस्ट पार्टी (सीपीएम) च्या नेतृत्त्वाखाली डावी आघाडी 59 जागा मिळवत तिस–या स्थानावर होती. डाव्या पक्षांच्या पाठिंब्याने युपीए चे सरकार स्थापन झाले. कॉंग्रेस अध्यक्षा सोनिया गांधी यांनी स्वतः पंतप्रधान होण्यास नकार देत निरीक्षकांना चकित केले. त्याऐवजी माजी अर्थमंत्री मनमोहन सिंग यांनी नवीन सरकारचे नेतृत्व करण्यास सांगितले. मनमोहन सिंग यांनी यापूर्वी 1990 च्या उत्तरार्धात पंतप्रधान नरसिंह राव यांच्या कॉंग्रेस सरकारमध्ये अर्थमंत्री होते. मनमोहन सिंग कधीही लोकसभेची जागा जिंकली नव्हती. तरीही त्यांची चांगली प्रतिमा आणि सोनिया गांधी यांच्या सहमतीमुळे त्यांना युपीए मित्रपक्ष आणि डाव्या आघाडीला पाठिंबा मिळाला.लोकशाहीत निवडणुकांच्या माध्यमातुन शांततामय व सनदशीर पध्दतीने सत्तांतर घडून आणले जाते. त्यासाठी या व्यवस्थेत निवडणुका अत्यावश्यक ठरतात. लोकसंख्या, विस्तारित प्रदेश, प्रदेशातील विविधता इ. घटक लक्षात घेऊन एक व्यक्ती किंवा एक संस्था स्वबळावर निवडणुका लढवू शकत नाही. म्हणून राजकीय पक्ष आवश्यक असतात.भारतातील विविधता, विविध प्रदेश भाषा, जात, धर्म इत्यादीमध्ये विविध हितसंबंध विकत होतात. त्यातून राष्ट्रीय व प्रादेशिक पातळीवर सत्ता प्राप्तीसाठी राजकीय पक्ष जन्माला येतात.2004 लोकसभा निवडणुकीत भाजपची इंडिया शायनिंगची घोषणा, भाजप 2004 च्या लोकसभा निवडणुकीपूर्वी 1999 मध्ये सत्तेत आलेल्या आपल्या तीन महत्त्वाच्या मित्रपक्षांशी संबंध तोडले होते. भाजपने प्रादेशिक पक्षाच्या मतदाराकडे दुर्लक्ष करण्याची चूक केली. याचा परिणाम असा झाला की 2004 मध्ये 14 व्या लोकसभेत अटल बिहारी वाजपेयी यांचे सरकार सत्तेतून बाहेर पडले. भाजपला आपल्या विजयाची इतकी खात्री होती की वेळेपूर्वीच निवडणुका घेण्यात आल्या. भाजपच्या उदासीनतेमुळे द्रमुक, इंडियन नॅशनल लोकदल आणि एलजेपी सारख्या राजकीय पक्षांनी 2004 च्या सार्वत्रिक निवडणुकांपूर्वी राष्ट्रीय लोकशाही आघाडी (NDA) तून बाहेर पडले. या तीन पक्षांच्या विभक्तेमुळे (NDA) राष्ट्रीय लोकशाही आघाडीने लोकसभेच्या 55 जागा गमावल्या. त्यामुळे NDA सत्तेतून

बाहेर पडले. भाजपला 1999 मध्ये 182 जागा लोकसभेत होत्या. 2004 मध्ये मात्र 138 जागावर समाधान मानावे लागले.

2004 लोकसभा निवडणूक एकुण मतदार

निवडणुकीचे वर्ष	एकुण मतदार	मतदान करणा-यांची संख्या	टक्केवारी
1999	619536847	371669104	59.99 %
2004	671487930	389948330	58.07 %
2009	716985101	417357674	58.21 %
2014	834082814	554171819	66.44 %
2019	910512091	613656298	67.40 %

झालेले मतदान

2004 ची लोकसभा निवडणुक चार टप्प्यांत घेण्यात आली. त्यामध्ये एकुण मतदारांची संख्या 67 कोटी 41 लाख 87 हजार 930 इतकी होती. मात्र प्रत्यक्ष मतदानात सहभागी मतदाराची संख्या 38 कोटी 99 लाख 48 हजार 330 इतकी होती. एकुण मतदानाची टक्केवारी 58.07% इतके होते.

निवडणुकीचे टप्पे

1) पहिला टप्पा	20 एप्रिल 2004	141 मतदार संघ
2) दुसरा टप्पा	26 एप्रिल 2004	137 मतदार संघ
3) तिसरा टप्पा	5 मे 2004	83 मतदार संघ
4) चौथा टप्पा	10 मे 2004	182 मतदार संघ

लोकसंख्येचे प्रमाण

भारत हा जगातील सर्वात मोठी लोकशाही असलेला देश आहे. 14 व्या लोकसभा निवडणुकीत 543 सदस्य असलेल्या मतदार प्रत्येक मतदार संघात लोकसंख्याचे प्रमाण (सरासरी) 12 लाख होते.

2004 च्या लोकसभा निवडणुकतील राष्ट्रीय पक्ष

अ.नं.	राष्ट्रीय पक्ष	लोकसभेतील जागा	मतदानाची टक्केवारी
1.	इंडियन नॅशनल कॉ ग्रेस	145	26.53
2.	भारतीय जनता पार्टी	138	22.16
3.	कम्युनिष्ट पार्टी ऑफ इंडिया मार्क्सवादी	43	5.33
4.	बहुजन समाज पार्टी	19	5.66
5.	कम्युनिष्ट पार्टी ऑफ इंडिया	10	1.41
6.	राष्ट्रवादी कॉ ग्रेस पक्ष	09	1.80

2004 च्या लोकसभा निवडणूकतील प्रादेशिक पक्ष

अ.नं.	प्रादेशिक पक्ष	लोकसभेतील जागा	राज्य
1.	समाजवादी पक्ष	36	उत्तर प्रदेश
2.	राष्ट्रीय जनता दल	24	बिहार
3.	द्रवीड मुन्नेत्र कळघम	16	तामिळनाडू
4.	शिवसेना	12	महाराष्ट्र
5.	बिजू जनता दल	11	ओडिशा
6.	जनता दल (युनायटेड)	08	बिहार
7.	शिरोमणी अकाली दल	08	पंजाब
8.	तेलुगू देसम	05	आंध्र प्रदेश
9.	झारखंड मुक्ती मोर्चा	05	झारखंड
10.	जनता दल सेक्युलर	03	कर्नाटक
11.	राष्ट्रीय लोक दल	03	बिहार

विभागानूसार जागा (प्रादेशिक)

प्रादेशिक विभाग	एकुण जागा	भारतीय राष्ट्रीय कॉ ग्रेस		भाजप		इतर	
दक्षिण भारत	131	48	14	18	1	65	13
पश्चिम भारत	78	27	10	28	7	23	3
उत्तर भारत	225	46	12	78	34	101	22
उत्तर-पूर्व भारत	25	11	3	4	2	13	4
पूर्व भारत	63	8	3	7	4	48	1
केंद्रशासित प्रदेश	13	5	5	3	-	-	5
एकुण	543	145	+ 31	138	-44	264	+17

Times of india

दक्षिण भारतात भाजपच्या वर्चस्वाला मर्यादा

दक्षिण भारतात लोकसभेच्या 131 जागा आहेत. त्यापैकी 18 जागा भाजपला मिळाल्या आहेत. कॉग्रेसला 248 जागा मिळाल्या आहेत. त्यामध्ये 14 जागांची वाढ झाली आहे. इतर पक्षांना 65 जागा मिळाल्या आहेत. द्रवीड मुन्नत्रे कळघम (DMK) ने 16 जागावर विजय मिळविला. तेलुगू देसम ला 5 जागा. दक्षिण भारतामध्ये केरळ, तामिळनाडू, कर्नाटक, आंध्रप्रदेश, या राज्यात प्रादेशिक पक्ष भाषिकतेच्या आधारावर निवडणुकीत विजय मिळवितात.

पश्चिम भारत

पश्चिम भारतामध्ये महाराष्ट्र, गोवा, गुजरात ही राज्य येतात. पश्चिम भारतामध्ये लोकसभेच्या 78 जागा असून त्यापैकी भारतीय राष्ट्रीय कॉग्रेस ला 27 जागा मिळाल्या आहेत, तर भाजपला 28 जागा मिळाल्या आहेत. इतर सहकारी पक्ष यांना शिवसेना

12 जागा मिळाल्या आहेत. राष्ट्रवादी कॉंग्रेस पक्षाला 9 जागा मिळाल्या आहेत. महाराष्ट्रात कॉंग्रेस, राष्ट्रवादी, भाजप, शिवसेना या पक्षाचा प्रभाव दिसून येतो. गुजरातमध्ये भाजपला जास्त जागा मिळाल्या आहेत.

उत्तर भारत

उत्तर भारतामध्ये उत्तर प्रदेश, राजस्थान, मध्यप्रदेश, छत्तीसगढ, उत्तराखंड, हरियाना, पंजाब, जम्मू–कश्मीर या राज्याचा समावेश होतो.उत्तर भारतामध्ये 225 लोकसभा जागा आहेत. त्यापैकी 78 जागा भाजपला मिळाल्या आहेत. भाजपच्या सहकारी पक्ष असणाऱ्या शिरोमणी अकाली दलाला (पंजाब) 8 जागा मिळाल्या आहेत. भारतीय राष्ट्रीय कॉंग्रेस ला 46 जागा मिळाल्या आहेत. त्याचबरोबर समाजवादी पार्टी ला 36, राष्ट्रीय जनता दल (बिहार) 24, बहुजन समाज पार्टी (उत्तर प्रदेश) 19 जागा मिळाल्या आहेत.

उत्तर–पूर्व भारत

उत्तर–पूर्व भारतामध्ये आसाम, मणिपूर, मेघालय, त्रिपूरा, अरुणाचल प्रदेश, सिक्कीम, मिझोराम, नागालँड ही राज्य आहेत.उत्तर–पूर्व राज्यामध्ये लोकसभेच्या 25 जागा आहेत. त्यापैकी 11 जागा कॉंग्रेसला मिळाल्या आहेत. भाजपला 4 जागा मिळाल्या आहेत. प्रादेशिक व इतर पक्षांना 13 जागा मिळाल्या आहेत. पूर्वेत्तर राज्यामध्ये भाजपला जनाधार मिळविता आला नाही. त्यामुळे त्यांच्या जागा निवडून येवू शकल्या नाहीत.

पूर्व भारत

पूर्व भारतामध्ये ओडिशा, झारखंड, प.बंगाल ही राज्य येतात.63 जागांपैकी भाजपला 7, कॉंग्रेसला 8, तर इतर पक्षांना 48 जागा मिळाल्या आहेत.

केंद्रशासित प्रदेशामध्ये

या मध्ये दादर हवेली, अंदमान, लक्षद्विप, चंदिगड, दमन–दिव, दिल्ली या केंद्रशासित प्रदेशांचा समावेश होतो.या सर्व केंद्रशासित प्रदेशामध्ये लोकसभेच्या 13 जागा आहेत. त्यापैकी कॉंग्रेसने 5, भाजपने 3, इतर 5 जागांवर विजय मिळवला आहे. विभागानुसार भाजप व राष्ट्रीय कॉंग्रेस यामध्ये कॉंग्रसने इतर पक्षाबरोबर आघाडी स्थापन करुन 2004 च्या लोकसभेत सरकार स्थापन केले. भाजप ला सरकार स्थापन करण्यात अपयश आले.

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भारताने लोकशाही शासन पध्दतीचा स्वीकार केला आहे. भारतीय संविधानाने

निवडणुक प्रक्रियेत पुरुषांप्रमाणेच स्त्रीयांना देखील समान अधिकार दिलेले आहेत. मतदारामध्ये त्यांचे प्रमाणही जवळपास समसमान दिसून येते. महिलांच्या राजकीय समावेशामुळे राजकारणातील प्राधान्यक्रम बदलले. स्थानिक पातळीवर महिलांच्या राजकीय सबलीकरणासाठी प्रक्रिया घडत आहे. स्वतःच्या जीवनामध्ये सकारात्मक बदल घडवून आणण्याचे माध्यम किंवा साधन म्हणून राजकारणाकडे पाहण्याची दृष्टी महिलांमध्ये विकत होत आहे.राजकीय प्रक्रियेमध्ये सहभागी होवून महिला स्वतःची ओळख निर्माण करीत आहेत. महिला मतदार वर्गात कोणताही दबाव किंवा दपडण नसेल तरच त्या निर्भयपणे या प्रक्रियेत सहभागी होवू शकतात.भारतामध्ये लोकशाहीच्या माध्यमातून महिलांना समाज व्यवस्थेमध्ये सामाजिक, आर्थिक आणि राजकीय व्यवस्थेमध्ये सहभागी होण्याची संधी मिळते. स्थानिक पातळीवर हा सकारात्मक बदल घडून आलेला आहे. 2004 च्या लोकसभा निवडणुकीत स्त्रियांचे प्रतिनिधीत्वही त्यांच्या लोकसंख्येच्या तुलनेत अत्यल्प आहे. लोकसभा निवडणुकीत महिलांनी मोठ्या प्रमाणात सहभागी होऊनही महिला विजयी होण्याचे प्रमाण कमी दिसून येते, कारण महिला प्रतिनिधी ही एक राजकीय वारसा असणाऱ्या कुटूंबातील असेल तरच राजकारणात सक्रीय सहभाग दिसून येते सामान्य महिलांचा राजकारणात सहभाग खूप कमी आहे. तो स्थानिक राजकारणात दिसून येते. महाराष्ट्रातून लोकसभेत प्रतिनिधी महिलांची संख्या 6 इतकी होती. (त्यामध्ये शिवसेना प्रतिनिधी भावना गवळी (वाशिम मतदार संघ), कल्पना रमेश नरहिरे (उस्मानाबाद मतदार संघ), राष्ट्रवादी कॉग्रेस पक्षाच्या सूर्यकांता पाटील (हिंगोली मतदार संघ), माने निवेदिता (इचलकरंजी मतदार संघ), भाजपच्या प्रतिनिधी रुपालीताई दिलीपराव निलंगेकर (लातूर मतदार संघ), कॉग्रेसच्या प्रतिनिधी प्रिया सुनिल दत्त (उत्तर–पश्चिम मुंबई मतदार संघ).14 व्या लोकसभा निवडणुकीत महिला प्रतिनिधीची संख्या पुरुषवर्गापेक्षा कमी आहे. लोकसभेतील 543 जागापैकी महिला प्रतिनिधी 52 जागावर विजय मिळविला, ही संख्या आत्तापर्यंतच्या सर्व लोकसभापैकी जास्त होती. लोकसभेतील महिला प्रतिनिधीचे प्रमाण 11% इतके होते. भारतीय राजकारणात महिलांचा सहभाग वाढताना दिसून येतो.

14 वी लोकसभा निवडणूकीत महिला सहभाग

अ क्र.	महिला सदस्य	पक्ष	मतदार संघ
1	श्रीम.ममता बॅनर्जी	ए.आय.टी.सी.	कलकता साऊथ (वेस्ट बंगाल)
2	श्रीम.सुशिला बंगारु लक्ष्मण	बी.जे.पी.	जलोर – एस.सी.(राजस्थान)
3	श्रीम. सुस्मिता बाऊरी	सी.पी.आय.(एम)	विष्णूपूर – एस.सी. (वेस्ट बंगाल)
4	सौ.भावना गवळी (पाटील)	एस.एस.	वाशिम (महाराष्ट्र)
5	श्रीम.भवानी राजेंथीरन एम.एस.के.	डी.एम.के.	रामनाथपूरम (तामीळनाडू)
6	श्रीम. झाशी लक्ष्मी	आय.एन.सी.	बोबीली (आंध्र प्रदेश)
7	श्रीम.अनुराधा चौधरी	आर.एल.डी.	कैराना (उत्तर प्रदेश)
8	श्रीम.रेणुका चौधरी	आय.एन.सी.	खाम्मम (आंध्र प्रदेश)
9	श्रीम.प्रिया सुनिल दत्त	आय.एन.सी.	मुंबई बोरीवली वेस्ट (महाराष्ट्र)
10	श्रीम.मेनका संजय गांधी	बी.जे.पी.	पीलीभीट (उत्तर प्रदेश)
11	श्रीम.सोनिया गांधी	आय.एन.सी.	राय बरेली (उत्तर प्रदेश)
12	श्रीम.तेजस्वीनी गौडा	आय.एन.सी.	कानकापूरा (कर्नाटक)
13	श्रीम.परमीतजी कौर गुलशन	एस.ए.डी.	भटींडा-एस.सी. (पंजाब)
14	श्रीम.सुब्बुलक्ष्मी जगादेसन	डी.एम.के.	तिरुचेनगोडे (तामीळनाडू)
15	श्रीम. परिनीत कौर	आय.एन.सी.	पटियाला (पंजाब)
16	श्रीम. सुशिला केरकेट्टा	आय.एन.सी.	खुंती- एस.टी. (झारखंड)
17	श्रीम.मेरीया कुमार	आय.एन.सी.	ससाराम – एस.सी.(बिहार)
18	श्रीम.मनोरमा मध्वाराज	बी.जे.पी.	उडपी (कर्नाटका)
19	श्रीम.सुमन माहातो	जे.एम.एम.	जमशेदपूर (झारखंड)
20	श्रीम.किरण माहेश्वरी	बी.जे.पी.	उदयपूर (राजस्थान)
21	श्रीम.निवेदिता माने	एन.सी.पी.	इचलकरंजी (महाराष्ट्र)
22	कु.मायावती	बी.एस.पी.	अकबरपूर (एस.सी.) आंध्रप्रदेश
23	श्रीम. इंग्रीड मेकलेओड	आय.एन.सी.	नॉमिनेटेड अँगलो इंडियन (छत्तीसगढ)
24	श्रीम.मेहबुबा मुफ्ती	जे.अँड के.पी.डी.पी.	अनंतनाग (जम्मू अँड कश्मीर)
25	श्रीम.जया प्रदा नहाटा	एस.पी.	रामपूर (उत्तर प्रदेश)
26	श्रीम.कल्पना रमेश नरहिरे	एस.एस.	उस्मानाबाद (महाराष्ट्र)
27	श्रीम.अर्चना नायक	बी.जे.डी.	केंद्रपूरा (ओडीसा)
28	श्रीम.लक्ष्मी पनाबाका	आय.एन.सी.	नेल्लोर – एस.सी. (आंध्र प्रदेश)
29	श्रीम.नीता पेटेरिया	बी.जे.पी.	सिओनी (मध्य प्रदेश)
30	श्रीम.रुपालीताई दिलीपराव निलंगेकर	बी.जे.पी.	लातूर (महाराष्ट्र)
31	श्रीम.सुर्यकांता पाटील	एन.सी.पी.	हिंगोली (महाराष्ट्र)
32	श्रीम.दग्गुबटी पुरनदेसवरी	आय.एन.सी.	बापटला (आंध्र प्रदेश)
33	श्रीम. के. राणी	आय.एन.सी.	रसीमपूरा – एस.सी. (तामीळनाडू)
34	श्रीम. राजनीत रंजन	एल.जे.एस.पी.	सहासरा (बिहार)

35	श्रीम.अगथा के. संगमा	एन.सी.पी.	तूरा (मेघालय)
36	श्रीम. पी. साथेदेवी	सी.पी.आय (एम)	बडागरा (केरला)
37	श्रीम. रुबाब सयदा	एस.पी.	बहिराचू (उत्तर प्रदेश)
38	श्रीम.यशोधारा राजे सिंधीया	बी.जे.पी.	ग्वालीयर (मध्य प्रदेश)
39	श्रीम.सेलीजा	आय.एन.सी.	अंबाला – एस.सी. (हरीयाणा)
40	श्रीम.व्ही.राधीका सेलवी	डी.एम.के.	तीरुचेंदूर (तामीळनाडू)
41	श्रीम.मिनाती सेन	सी.पी.आय (एम)	जलपैगुरी (वेस्ट बंगाल)
42	श्रीम.करुणा शुक्ला	बी.जे.पी.	जंजगिर (छत्तीसगढ)
43	श्रीम.ज्योतीरमोये सिकदार	सी.पी.आय (एम)	क्रिष्णानगर (वेस्ट बंगाल)
44	श्रीम. कांन्ती सिंग	आर.जे.डी.	आराह (बिहार)
45	श्रीम. मीना सिंग	जे.डी. (यु)	बिक्रमगंज (बिहार)
46	श्रीम.प्रतिभा सिंग	आय.एन.सी.	मंडी (हिमाचल प्रदेश)
47	श्रीम.संगिता सिंग देव	बी.जे.पी.	बोलनगीर (ओडीसा)
48	श्रीम.सी.एस. सुजाथा	सी.पी.आय (एम)	मावेल्लीकारा (केरला)
49	श्रीम. सुमित्रा महाजन (ताई)	बी.जे.पी.	इंदोर (मध्य प्रदेश)
50	श्रीम. जयाबेन बी. ठक्कर	बी.जे.पी.	बरोडा (गुजराथ)
51	श्रीम.क्रिष्णा तिराथ	आय.एन.सी.	करोलबाग– एस.सी.(एन.सी.टी ऑफ दिल्ली)
52	श्रीम.उषा वर्मा	एस.पी.	हरोडी –एस.सी. (उत्तर प्रदेश)

महाराष्ट्र लोकसभा निवडणूक 2004

प्रातिनिधिक लोकशाहीत निवडणुकाच्या माध्यमातून शांततामय व सनदशीर पद्धतीने सत्तांतर घडून आणले जाते.त्यासाठी या व्यवस्थेत निवडणुका अत्यावश्यक ठरतात. धार्मिक,भाषिक, जातीय, प्रादेशिक या आधारावर महाराष्ट्रातील राजकारण आधारलेले आहे.महाराष्ट्रातील राजकीय इतिहासात कॉग्रेस पक्षाला स्वातंत्र्या पासून मतदारांचा मोठा पाठिबा मिळालेला दिसून येतो. भारतीय राज्य घटनेनुसार महाराष्ट्राला लोकसभेतील 48 जागा आहेत.महाराष्ट्र 48 लोकसभा मतदार संघामध्ये विभागला असून प्रत्येक मतदारसंघावर वेगळा असा राजकीय प्रभाव आहे. महाराष्ट्राला मोठी राजकीय परंपरा लाभली आहे. 2004 च्या लोकसभा निवडणुकीमध्ये पश्चिम महाराष्ट्र आणि इतर काही जिल्ह्यां मध्ये मराठा समाज संघटीतपणे राष्ट्रवादी आणि कॉग्रेस मागे उभा राहिलेला दिसतो. या निवडणुकीत भाजपनेष्षायनिंग इंडिया व फील गुड या मोहिमेची सुरुवात केली, भाजपचा महाराष्ट्रातील सहकारी पक्ष शिवसेना यांनी मराठी भाषिक हिंदुत्व या आधारावर निवडणूक लढविली. या निवडणुकीत दोन्ही पक्षांना महाराष्ट्रात काही प्रमाणात यश मिळाले. भाजपने विशेषतः विदर्भ, मराठवाडा या भागात मोठा मतदार वर्ग निर्माण केला तर शिवसेना मुंबई, सिंधुदुर्ग, रायगड, ठाणे, औरंगाबाद या ठिकाणी शिवसेनेने एक हाती सत्ता स्थापन केली. शहरी भागात भाजपला मोठ्या प्रमाणात मतदान मिळाले परंतु ग्रामीण महाराष्ट्रात कॉग्रेस व राष्ट्रवादी कॉग्रेस यांना जनतेने

पाठींबा दिलेला दिसून येतो. सहकार क्षेत्र हे या दोन्ही कॉंग्रेसच्या राजकारणा मागील आर्थिक आधारस्त्रोत आहेत. याची जाणीव असल्याने भाजपने सहकार क्षेत्रावर नियंत्रण आणण्याचा प्रयत्न केला. पश्चिम महाराष्ट्रत कॉंग्रेस व राष्ट्रवादी कॉंग्रेस यांना मतदार वर्गाचा पाठिबा मिळाला. महाराष्ट्रात मराठा समाजाची लोकसंख्या जास्त असल्याने राजकारणात मराठा समाजाचे वर्चस्व दिसून येते.मराठा समाजातील लोक मोठ्या प्रमाणात शेती क्षेत्रात गुंतले असून या लोकसमुहाचा सहकार क्षेत्राशी संम्बंध आहे.

14 व्या लोकसभेच्या (2004) निवडणुकीत महाराष्ट्रातील 48 जागापैकी 25 जागा भाजप व शिवसेना युतीला मिळाल्या.त्यात भाजपला 13 व शिवसेनेला 12 जागा मिळाल्या आहेत.विदर्भ व मराठवाडा या विभागातील मतदारांनी युतीला भरभरून पाठिबा दिला. या विभागातील एकूण 19 जागापैकी 16 जागा युतीला मिळाल्या. त्या बरोबर भारतीय राष्ट्रीय कॉंग्रेस व राष्ट्रवादी कॉंग्रेस यांना महाराष्ट्रातील लोकसभा निवडणुकीत अनुक्रमे 13 व 9 जागा मिळाल्या आहेत.

महाराष्ट्र संदर्भात लोकसभेतील जागा

अ.नं.	राष्ट्रीय ध्रादेशिक पक्ष	लोकसभेतील जागा	मतदानाची टक्केवारी
1	भारतीय राष्ट्रीय कॉंग्रेस	13	23.77
2	भारतीय जनता पार्टी	13	22.61
3	राष्ट्रवादी कॉंग्रेस पक्ष	09	15.20
4	शिवसेना	12	20.11
5	रिपब्लिकपार्टी ऑफ इंडिया	1	0.1
——	ऐकून	48	———

2004 ची लोकसभा निवडणुक महाराष्ट्रातील प्रतिनिधी

अ क्र	मतदार संघ	संवर्ग	प्रतिनिधीचे नाव	पक्ष	मिळालेली मते
1	राजापूर	GEN	सुरेश प्रभाकर प्रभू	शिवसेना	264001
2	रत्नागिरी	GEN	अनंत गीते	शिवसेना	334690
3	कोलाबा	GEN	ए .आर .अंतुले	कॉंग्रेस	312225
4	मुंबई–दक्षिण	GEN	मिलिंद मुरली देओरा	कॉंग्रेस	137956
5	मुंबई–दक्षिण मध्य	GEN	मोहन रावले	शिवसेना	128536
6	मुंबई–उत्तर मध्य	GEN	एकनाथ एम .गायकवाड	कॉंग्रेस	256882
7	मुंबई–उत्तर –पूर्व	GEN	कामात गुरुदास	कॉंग्रेस	493420
8	मुंबई–उत्तर–पश्चिम	GEN	सुनील दत्त	कॉंग्रेस	385755
9	मुंबई–उत्तर	GEN	गोविंदा	कॉंग्रेस	559763

अ क्र	मतदार संघ	संवर्ग	प्रतिनिधीचे नाव	पक्ष	मिळालेली मते
10	ठाणे	GEN	परांजपे प्रकाश विश्वनाथ	शिवसेना	631414
11	डहाणू	ST	शिंगाडा दामोदर बारकू	कॉंग्रेस	256004
12	नाशिक	GEN	पिंगळे देविदास आनंदराव	राष्ट्रवादी कॉंग्रेस	307613
13	मालेगाव	ST	हरिचंद्र देवराम चव्हाण	भाजप	218259
14	धुळे	ST	चाहुरे बापू हरी	कॉंग्रेस	210714
15	नंदुरबार	ST	गावित माणिकराव	कॉंग्रेस	351911
16	एरंडोल	GEN	अण्णासाहेब एम .के .पाटील	भाजप	289559
17	जळगाव	GEN	वाय.जी.महाजन	भाजप	298865
18	बुलढाणा	SC	अडसूळ आनंदराव विठोबा	शिवसेना	369975
19	अकोला	GEN	धोत्रे संजय शामराव	भाजप	313323
20	वाशीम	GEN	गवळी भावना पुंडलिकराव	शिवसेना	358682
21	अमरावती	GEN	अनंत गुढे	शिवसेना	203216
22	रामटेक	GEN	मोहिते सुबोध बाबुराव	शिवसेना	276720
23	नागपूर	GEN	विलास मुत्तेमवार	कॉंग्रेस	373769
24	भंडारा	GEN	पटेल शिसुपाल नत्थू	भाजप	277388
25	चिमूर	GEN	शिवणकर महादेओराव सुकाजी	भाजप	336711
26	चंद्रपूर	GEN	अहिर हंसराज गंगाराम	भाजप	366014
27	वर्धा	GEN	वाघमारे सुरेश गणपत	भाजप	269045
28	यवतमाळ	GEN	राठोड हरिसिंग नसरू	भाजप	298513
29	हिंगोली	GEN	सुर्यकांत पाटील	राष्ट्रवादी कॉंग्रेस	327944
30	नांदेड	GEN	डी.बी.पाटील	भाजप	361282
31	परभणी	GEN	तुकाराम गणपतराव रेंगे पाटील	शिवसेना	339318
32	जालना	GEN	दानवे रावसाहेब दादाराव पाटील	भाजप	369630
33	औरंगाबाद	GEN	चंद्रकांत खैरे	शिवसेना	477900
34	बीड	GEN	जयसिंगराव गायकवाड पाटील	राष्ट्रवादी कॉंग्रेस	425051
35	लातूर	GEN	रुपालीताई दिलीपराव निलंगेकर	भाजप	404500
36	उस्मानाबाद	SC	नरहिरे कल्पना रमेश	शिवसेना	294436
37	सोलापूर	GEN	देशमुख सुभाष सुरेशचंद्र	भाजप	316188
38	पंढरपूर	SC	आठवले रामदास बंडू	आर. पी. आय	347215

39	अहमदनगर	GEN	गडाख तुकाराम गंगाधर	राष्ट्रवादी कॉंग्रेस	362938
40	कोपरगाव	GEN	बाळासाहेब विखे पाटील	कॉंग्रेस	358866
41	खेड	GEN	आढळराव पाटील शिवाजीराव	शिवसेना	360501
42	पुणे	GEN	कलमाडी सुरेश	कॉंग्रेस	373774
43	बारामती	GEN	पवार शरदचंद्र गोविदराव	राष्ट्रवादी कॉंग्रेस	634355
44	सातारा	GEN	पांडुरंग जाधव	राष्ट्रवादी कॉंग्रेस	281577
45	कराड	GEN	पाटील श्रीनिवास दादासाहेब	राष्ट्रवादी कॉंग्रेस	436732
46	सांगली	GEN	पाटील प्रकाशभाऊ वसंतदादा	कॉंग्रेस	305048
47	इचलकरंजी	GEN	माने निवेदिता संभाजीराव	राष्ट्रवादी कॉंग्रेस	422272
48	कोल्हापूर	GEN	मांडलिक सदाशिवराव दादोबा	राष्ट्रवादी कॉंग्रेस	401922

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1) लोकसत्ता,
2) डॉ. य. दि. फडके : 'लोकसभा निवडणुका'
3) 'विचार मंथन' अथर्व पब्लिकेशन्सः डॉ. विलास आवारी, डॉ. बाळ कांबळे
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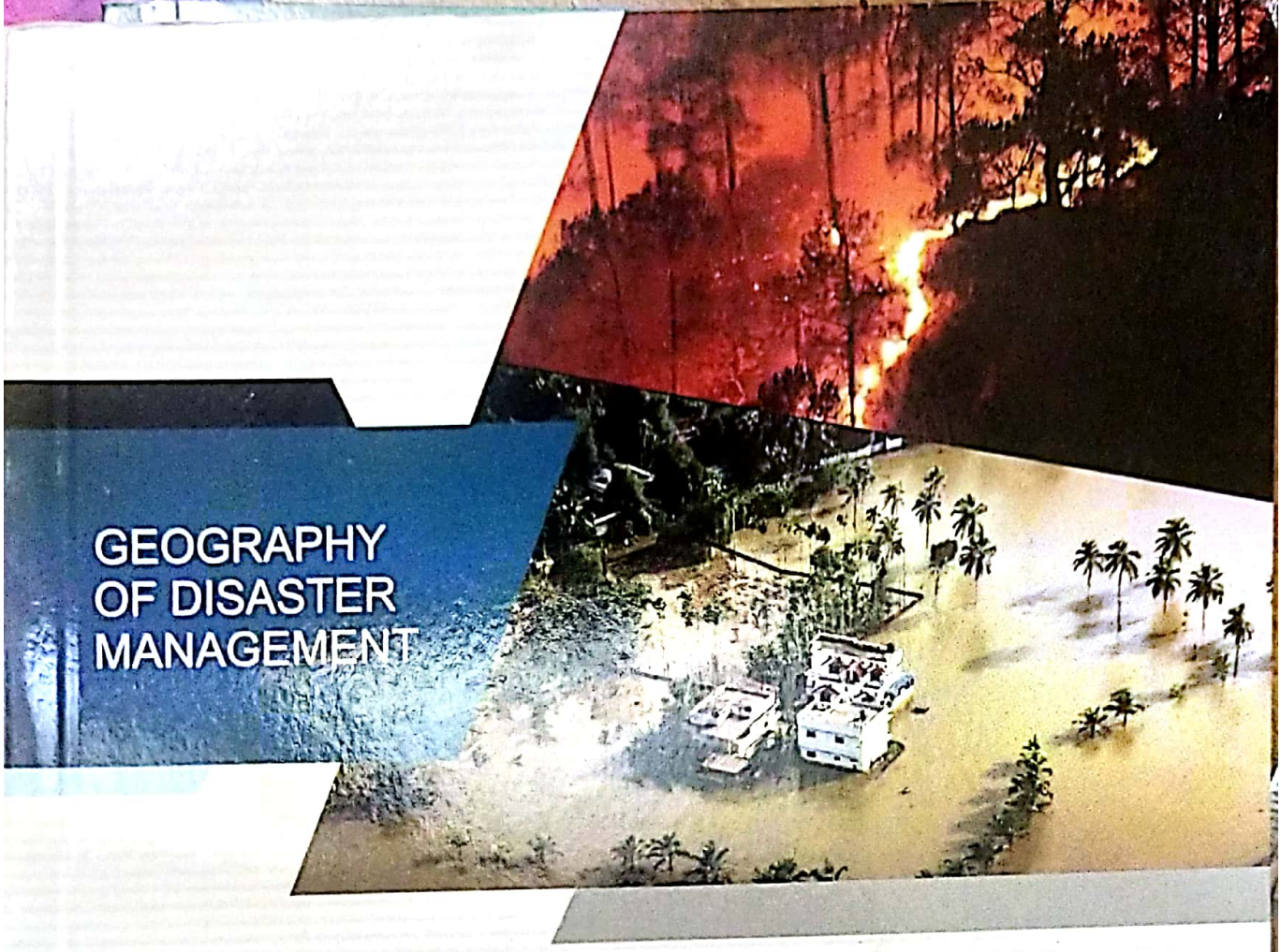
5) Times of India
6) Election Commission of India, https://eci.gov.in



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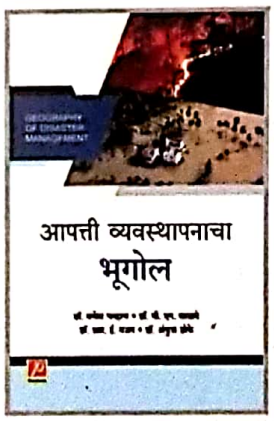
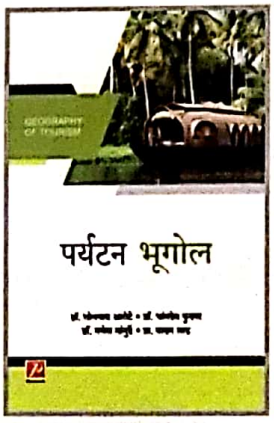
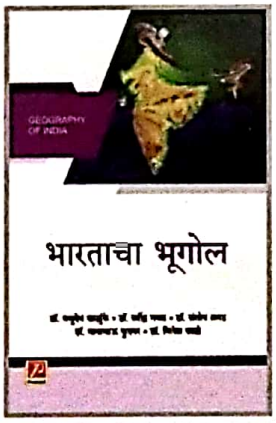
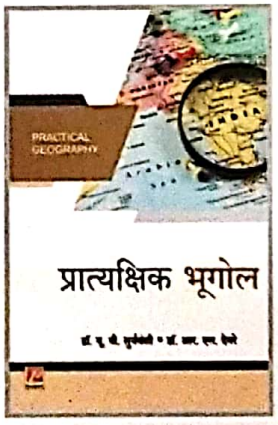
'आपत्ती व्यवस्थापनाचा भूगोल' या ग्रंथात आपत्ती व्यवस्थापनातील संकल्पना, आपत्ती आणि संकट : ओळख, आपत्ती व्यवस्थापन आणि उपाययोजना, हवामानविषयक आपत्ती आणि व्यवस्थापन, भूगर्भीय व भूरूपशास्त्रीय आपत्ती आणि व्यवस्थापन, मानवनिर्मित आपत्ती आणि व्यवस्थापन, जागतिक समस्यांचा अभ्यास, आपत्ती घटनांचा अभ्यास या विविध घटकांची विस्तृत माहिती दिली आहे. पर्यावरणीय संकल्पनाचे आकलन सुलभ व्हावे म्हणून विविध आकृत्या, नवीन संकल्पना, तक्ते, नवीन संज्ञा सदर पुस्तकात अत्यंत सोप्या व सुलभ भाषेत मांडण्याचा प्रामाणिक प्रयत्न केला आहे. त्यासाठी वेगवेगळी संदर्भ ग्रंथ, नियतकालिके, इंटरनेटवरील माहिती, वृत्तपत्रीय कात्रणे इत्यादींचा वापर केला आहे. सदरचे पुस्तक सद्यकालीन पर्यावरणीय घटकांवर आधारित असल्याने विविध स्पर्धात्मक परीक्षांना तसेच नेट/सेट परीक्षांनाही उपयोगी ठरेल असा प्रयत्न आहे.









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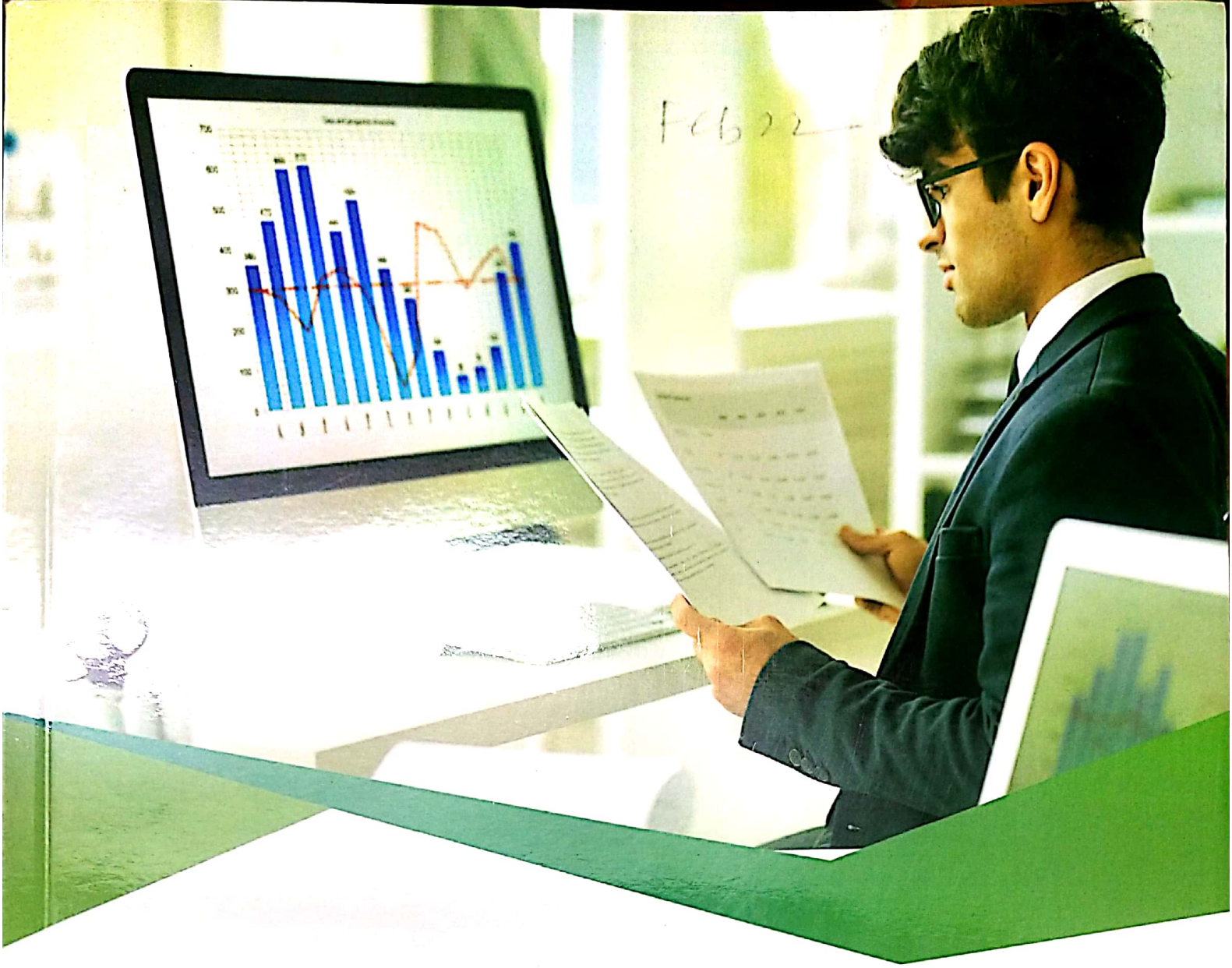

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IMPACT ANALYSIS OF TOURISM ON ENVIRONMENTAL COMMUNITY

Dr. Ganesh K. Chavhan [49]

Abstract:

Tourism is an important sector to any country for the development of the economy. But tourism industry is directly related to the environment. The quality of the environment, both natural and man-made, is essential to tourism. However, the relationship of tourism with the environment is complex. It involves many activities that can have adverse environmental effects. Many of these impacts are linked with the construction of general infrastructure such as roads and airports, and of tourism facilities, including resorts, hotels, restaurants, shops, golf courses and marinas. The negative impacts of tourism development can gradually destroy environmental resources on which it depends. On the other hand, tourism has the potential to create beneficial effects on the environment by contributing to environmental protection and conservation. It is a way to raise awareness of environmental values and it can serve as a tool to finance protection of natural areas and increase their economic importance. In this paper, we describe that the effects of tourism on natural resources, environmental pollution, physical environment and tourist activities in the national park. In addition, we explain environmental impacts of tourism on global scale, positive impacts of tourism and, finally, how tourism can contribute to environmental conservation.

Keywords: *Tourism, Environment, Direct Impact, positive impact, negative impact*

Introduction:

Tourism is one of the biggest and fastest growing sectors in the global economy and has significant environmental, cultural, social and economic effects, both positive and negative. Tourism can be a major tool for economic development but, if not properly planned it can have destructive effects on biodiversity and pristine environments, and can result in the misuse of natural resources such as freshwater, forests and marine life. At a number of sites tourism development has resulted in serious water shortage affecting both local communities and industry, forests have been depleted and coral reefs have been damaged. The adverse impact that tourism can have on the environment both undermines the basic resource for tourism in coastal areas and heavily affects other non-tourist economic activities.

Negative impacts from tourism occur when the level of visitor use is greater than the environment's ability to cope with this use within acceptable limits of change. Uncontrolled conventional tourism poses potential threats to many natural areas around the world. It can put

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enormous pressure on an area and lead to impacts such as soil erosion, increased pollution, discharges into the sea, natural habitat loss, increased pressure on endangered species and heightened vulnerability to forest fires. It often puts a strain on water resources, and it can force local populations to compete for the use of critical resources. Sustainable tourism development always needs to respect the environment and refer to accepted principles of sustainability. It must be planned to make balanced use of the resources of any site, thus avoiding negative effects, reducing visitor satisfaction, or adversely impacting the local society, economy and culture. Sometimes it may be difficult to quantify limits, but they are essential for sustainable tourism .Thus, if it is to maintain the main elements on which it is based, the tourism sector needs to invest in the maintenance of the natural environment. If properly planned, tourism can become a positive force for conservation and environmental protection, and economic development.

Objectives:

The specific objectives were the followings

a. To understand the positive and negative impact of tourism on environment
b. To develop a model to minimize the negative impact of tourism on environment.
c. To determine the direct impact of tourist activities in the respective tourism areas.

Research methodology:

The study has been conducted mainly on the basis of literature survey and secondary information. Various seminar papers and summary of discussion in those seminars, taskforce reports of research organization, journals and some periodicals on environmental impacts of tourism have been surveyed for the purpose of the study. Some environmental analyst and expertise person has also been interviewed for the purpose of accumulating facts and information.

Direct Environmental Impacts:

Quality of Water: The tourism industry impacts water quality through construction and maintenance of tourist infrastructure, recreational boating, and certain activities of the cruise industry. Tourist infrastructure increases the pressure on existing sewage treatment plants and can lead to overflows during peak tourist times. The most significant problem from the standpoint of human health associated with recreational boating and water quality is the discharge of sewage into water bodies with limited flushing, where the discharge occurs near the location of shellfish beds. Diseases that can be potentially transmitted through human contact with fecal discharge and/or ingestion of contaminated shellfish include typhoid fever, dysentery, infectious hepatitis, and non specific gastroenteritis.

Air Quality: Most tourism-related air pollution comes from automobiles. Automobiles emit by far the most carbon monoxide of all transportation modes. In 1997, they emitted 26 million short tons of carbon monoxide, compared with 1.7 million short tons from recreational marine vehicles, and 1 million from aircraft. Specific information on tour bus emissions was not available, but all heavy-duty diesel vehicles emitted 1.4million short tons in 1997. Transport by air, road, and rail is continuously increasing in response to the rising number of tourists and their greater mobility. The International Civil Aviation Organization reported that the number of international air passengers worldwide rose from 88 million in 1972 to 344 million in 1994. One consequence of this increase in

air transport is that tourism now accounts for more than 60% of air travel and is therefore responsible for an important share of air emissions. One study estimated that a single transatlantic return flight emits almost half the CO emissions produced by all other sources) consumed by an average person per year

Noise pollution: Noise pollution from airplanes, cars, and buses, as well as recreational vehicles such as snowmobiles and jet skis, is a problem of modern life. In addition to causing annoyance, stress, and even hearing loss for humans, it causes distress to wildlife, especially in sensitive areas (www.unepie.org/tourism).

Solid Waste and Littering: In areas with high concentrations of tourist activities and appealing natural attractions, waste disposals a serious problem and improper disposal can be a major despoiler of the natural environment, rivers, scenic areas, and roadsides. For example, cruise ships in the Caribbean are estimated to produce more than 70,000 tons of waste each year. Solid waste and littering can degrade the physical appearance of the water and shoreline and cause the death of marine animals

Habitat/Ecosystem: Alteration and Fragmentation Ecosystems and natural habitat can be damaged by tourist infrastructure, tourist activities, recreational boating, and the cruise industry. Recreational boats and cruise vessels can damage aquatic vegetation by cutting it with their propellers or otherwise damaging it when running aground. Wetlands have been destroyed in order to build tourist related infrastructure, such as airports, roads, and marinas

Impacts on Wildlife: Impacts from tourist infrastructure can be direct, such as when development in lower elevations of mountain resorts restricts the migratory range of certain wildlife, or indirect, such as when marine turtles are disoriented by automobile headlights and resort illumination. The two primary ways in which tourist activities disturb wildlife are by altering their eating habits and feeding patterns, and by altering their habitat. Feeding patterns are altered directly by tourists feeding animals, and indirectly by littering, which encourages wildlife to scrounge for food. Wildlife habitat is altered by tourists‟ trampling and by the use of off-road vehicles

Cultural Impacts: Tourism can diminish the aesthetic appeal of a destination through the construction of buildings that clash with the surrounding environment, creating "architectural" or "visual" pollution.

Impact on Gateway Communities Outside National Parks and Other Host Communities: Tourism affects the natural landscape and character of "gateway communities," which are adjacent to national parks, and other significant tourist destinations. Development related to tourist activity can be detrimental to cultural and aesthetic aspects of these communities if undertaken in an indiscriminate and/or scattered manner.

Loss of biological diversity: The effects on loss of biodiversity: a) It threatens our food supplies, opportunities for recreation and tourism, and sources of wood, medicines and energy. b) It interferes with essential ecological functions such as species balance, soil formation, and greenhouse gas absorption. c) It reduces productivity of ecosystems. d) It destabilizes ecosystems and weakens their ability to deal with natural disasters such as floods, droughts, and hurricanes, and with human-caused stresses, such as pollution and climate change.

Tourism, especially nature tourism, is closely linked to biodiversity and the attractions created by a rich and varied environment. It can also cause loss of biodiversity when land and resources are

strained by excessive use, and when impacts on vegetation, wildlife, mountain, marine and coastal environments and water resources exceed their carrying capacity. This loss of biodiversity in fact means loss of tourism potential. Introduction of exotic species which tourists and suppliers can bring in species (insects, wild and cultivated plants and diseases) that are not native to the local environment can cause enormous disruption and even destruction of ecosystems.

Depletion of the ozone layer: The ozone layer, which is situated in the upper atmosphere (or stratosphere) at an altitude of 12-50 kilometers, protects life on earth by absorbing the harmful wavelengths of the sun's ultraviolet (UV) radiation, which in high doses is dangerous to humans and animals. The tourism industry may be part of the problem; direct impacts start with the construction of new developments and continue during daily management and operations. Refrigerators, air conditioners and propellants in aerosol spray cans, amongst others, contain ODSs and are widely used in the hotel and tourism industry. Emissions from jet aircraft are also a significant source of ODSs. Scientists predict that by 2015 half of the annual destruction of the ozone layer will be caused by air travel.

Climate change: Climate scientists now generally agree that the Earth's surface temperatures have risen steadily in recent years because of an increase in the so-called greenhouse gases in the atmosphere, which trap heat from the sun. One of the most significant of these gases is carbon dioxide (CO), which is generated when fossil fuels, such as coal, oil and natural gas are burned and when there are changes in land use, such as deforestation. In the long run, accumulation of CO and other greenhouse gases in the atmosphere can cause global climate change a process that may already be occurring. Air travel itself is a major contributor to the greenhouse effect. Passenger jets are the fastest growing source of greenhouse gas emissions. The number of international travelers is expected to increase from594 million in 1996 to 1.6 billion by 2020, adding greatly to the problem unless steps are taken to reduce emissions (WWF, 1992).

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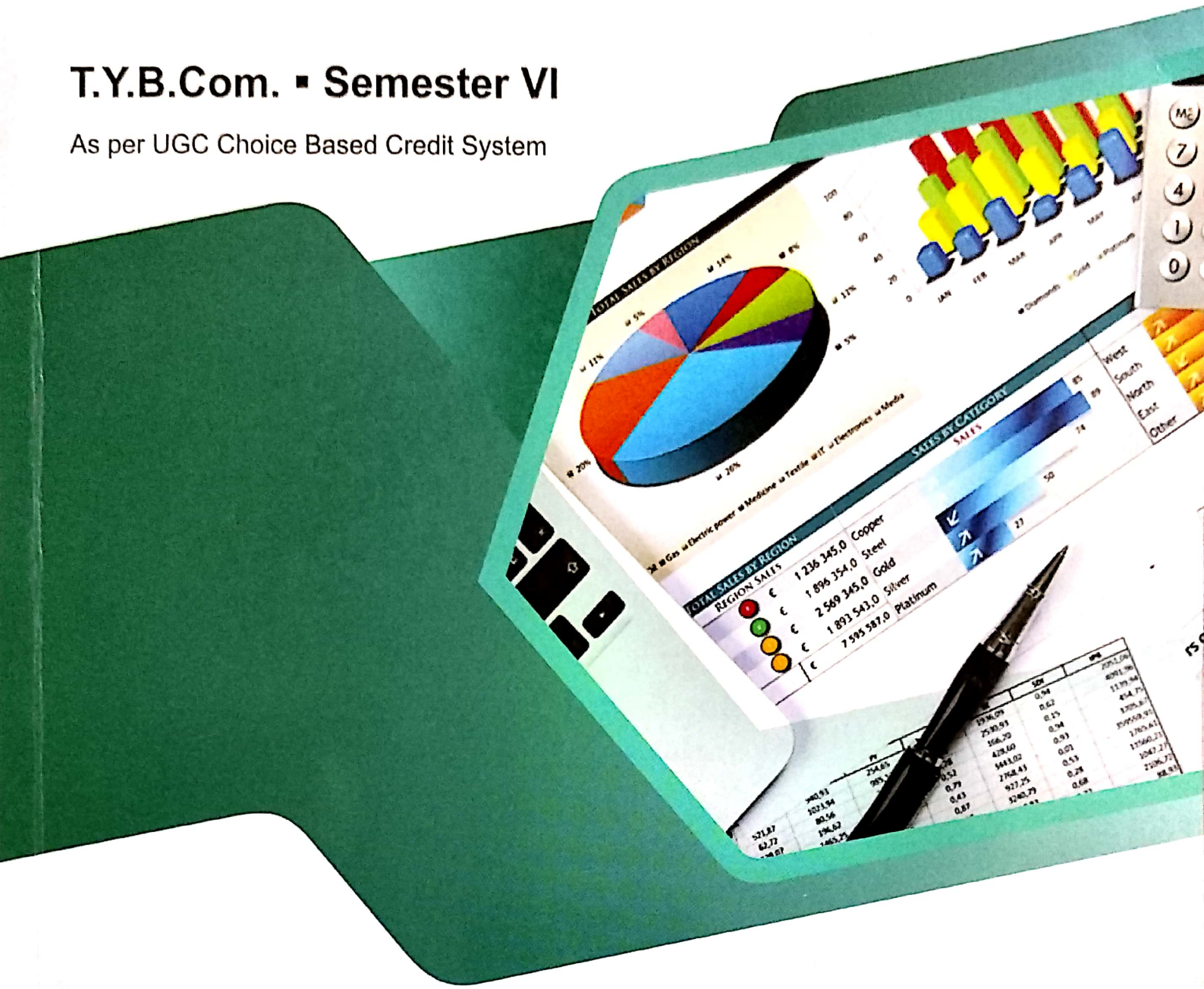

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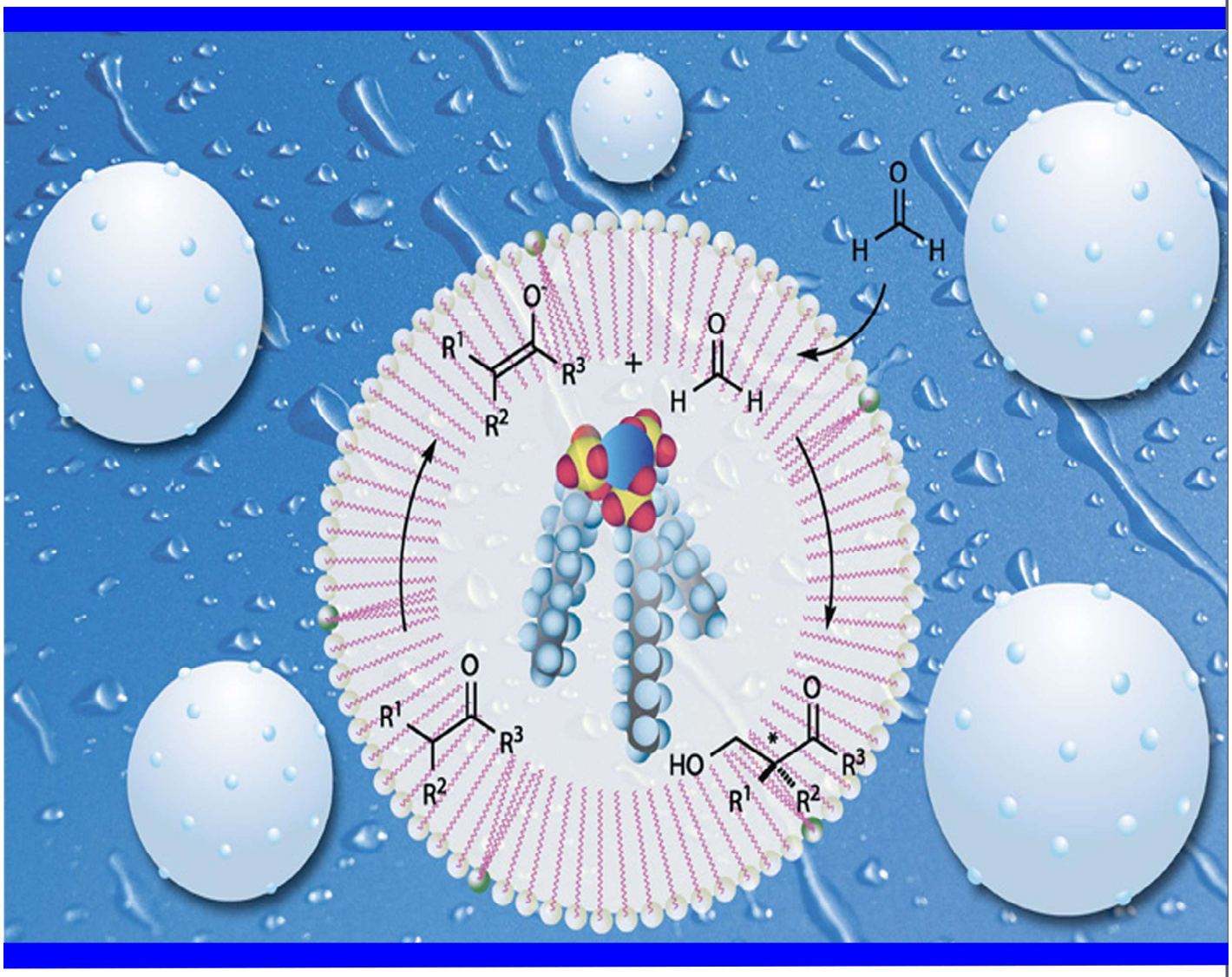

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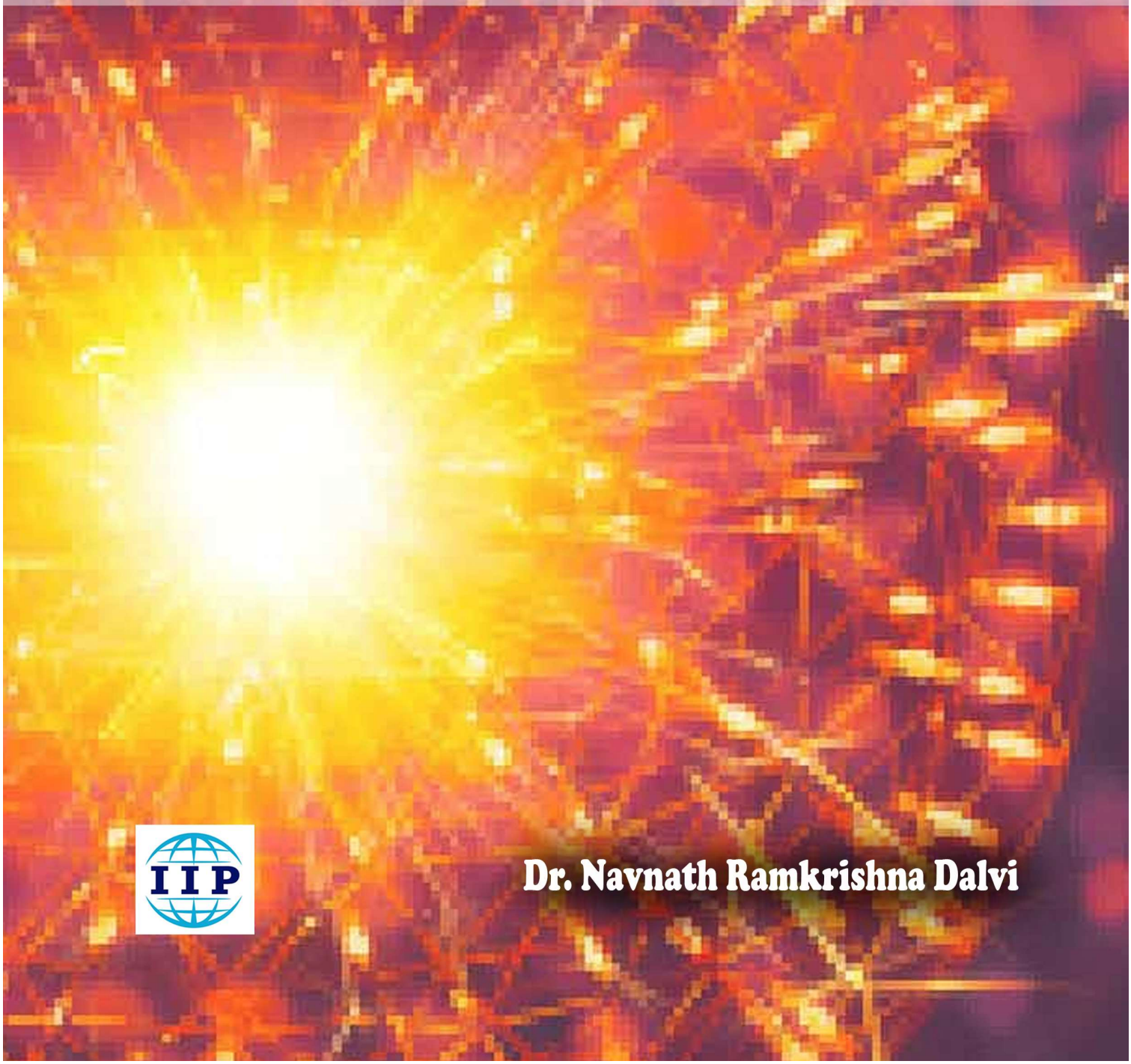

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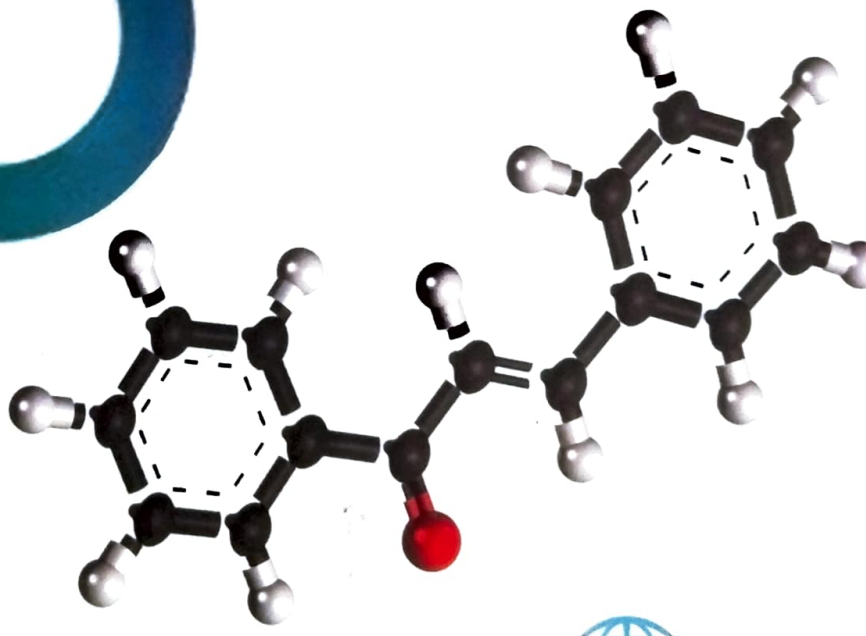

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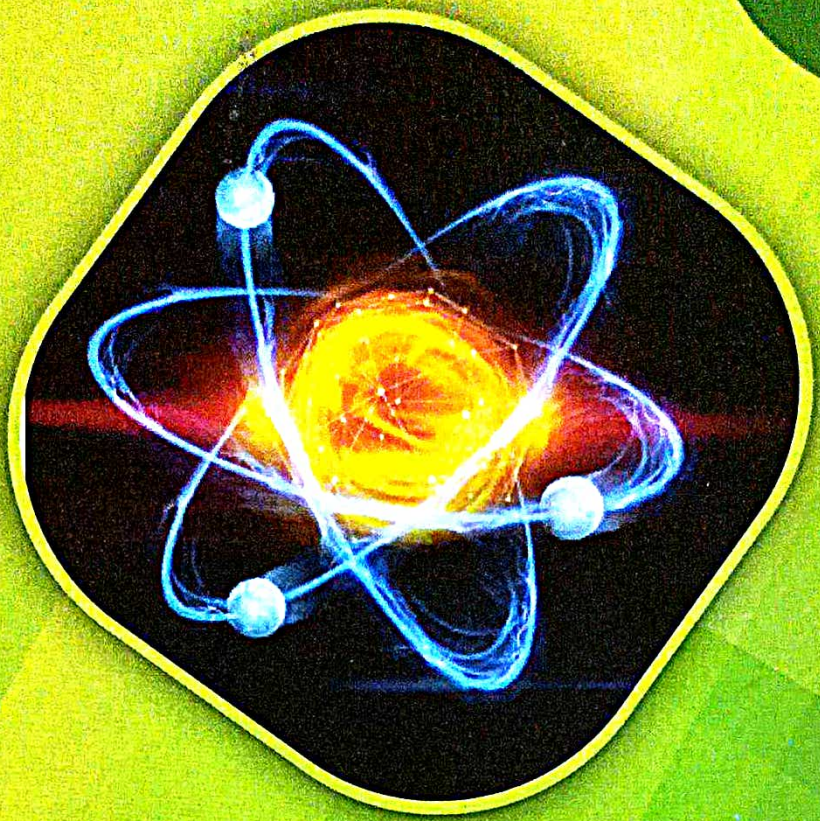

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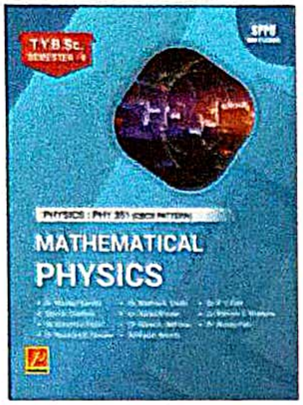

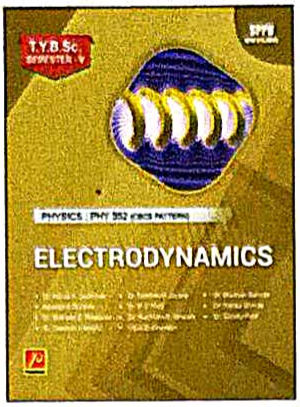

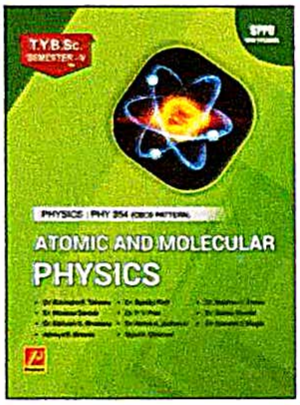

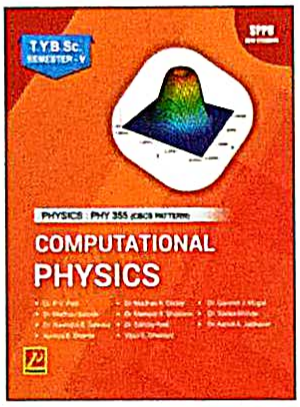

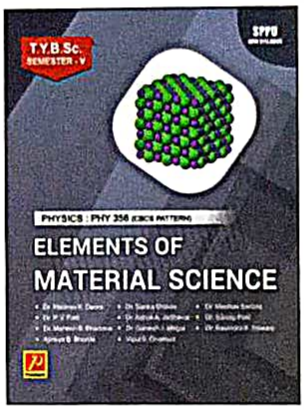

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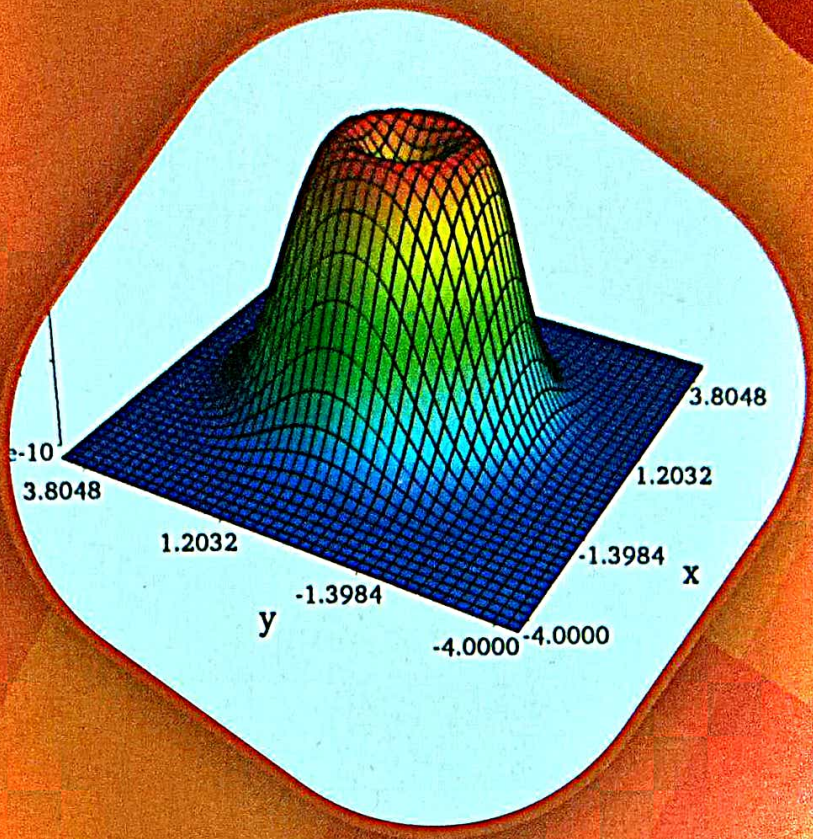

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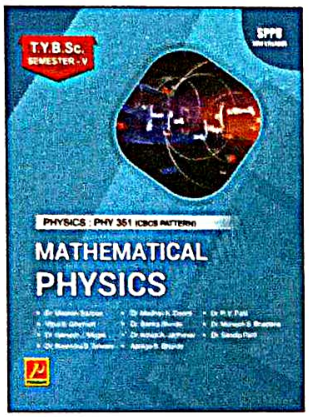

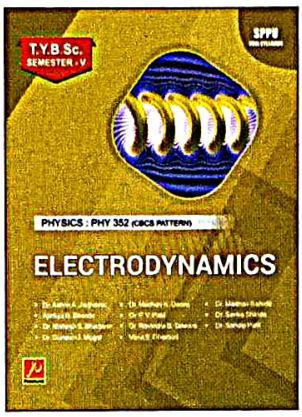

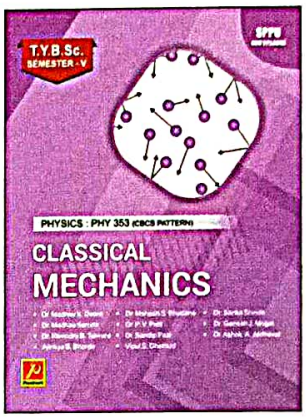

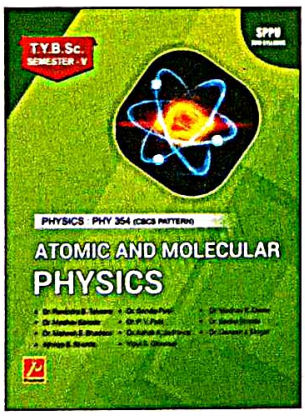

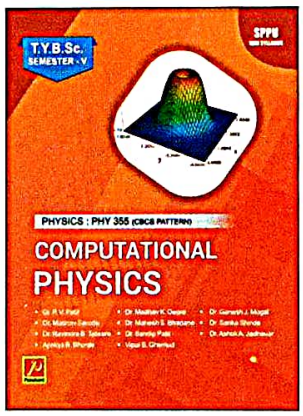

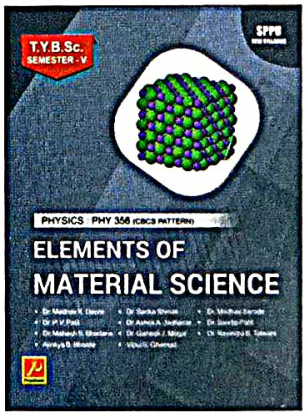

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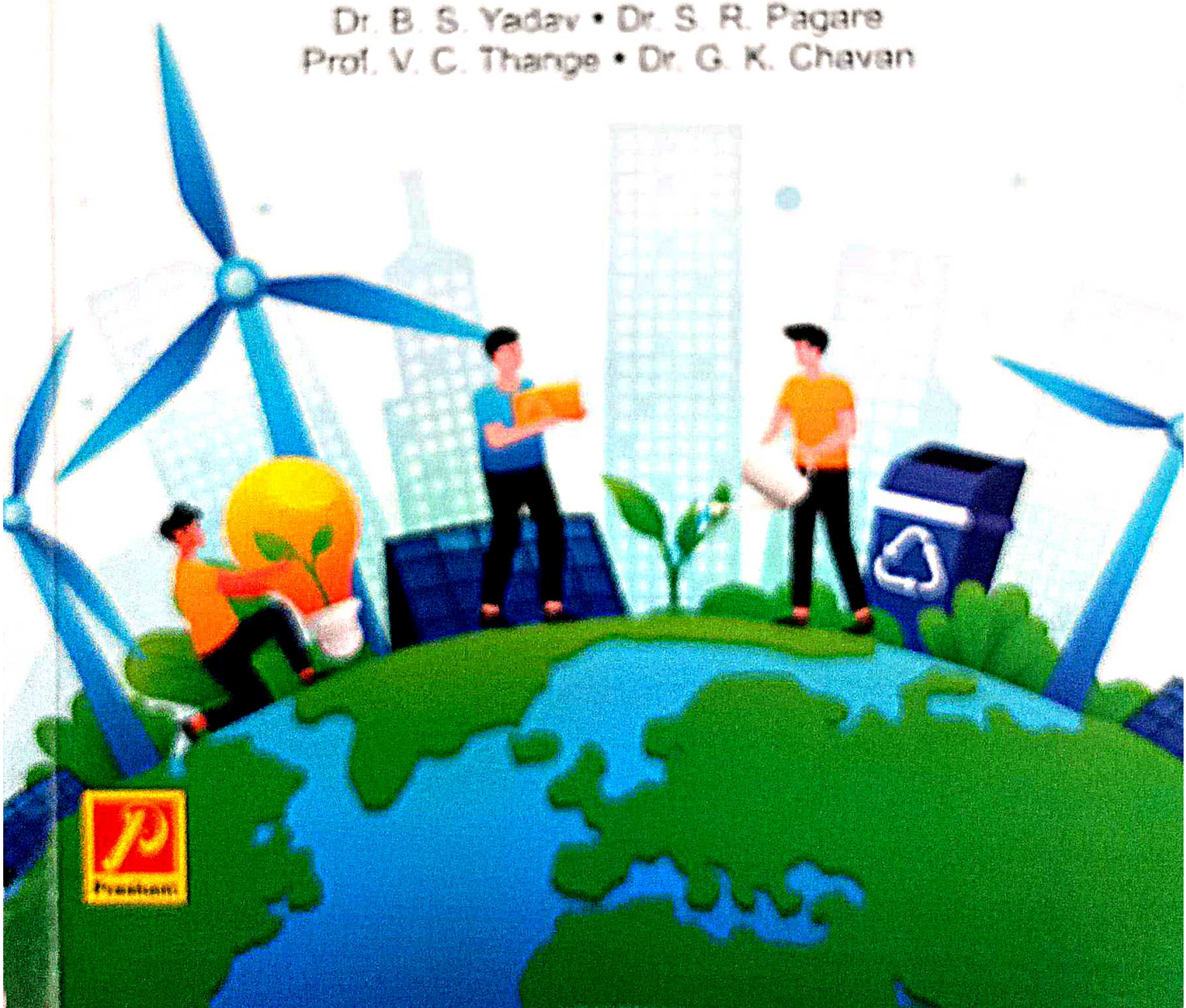

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Improvement of Eco-Friendly Capability of Future Educators

- Dr. Ravindra Talware
Department of Physics
K. J. Somaiya College, Kopargaon, Dist: Ahmednagar

Abstract:

The construction of the procedure of formation and development of environmental capability of future teachers will be considered. As a result of the research, the following main directions of the formation and development of environmental capability have been identified: reorientation and expert growth, organizational and evidence support of a digital-development environment. The principles and organizational and educational circumstances of the formation of environmental capability have been determined.

Keywords: Principles of the formation of environmental capability, Structural components of innovative capability.

Introduction:

It is essential that a person has comprehensive information not only in dissimilar areas of the environment, but also has the aptitude to act in a particular environmental condition. Presence of environment responsive is to act capably in a specific environmental condition based on the knowledge and experience gained previously. Environmental advantage is a set of environmental protection of consistent personal qualities (awareness, abilities, education, and systems of activity) essential for future teachers. Environmental advantage is the capability, willingness and knowledge of a person to preserve the environment, resolve environmental problems. Environmental advantage is the ability to use hypothetical understanding, applied abilities and skills acquired in the field of Environmental Science in exercise. Environmental capability is the Latin word capability means worthy. Capability in addition to pure specialized information, abilities and educations, it also comprises the appearances of creativity, teamwork, aptitude to work in a cluster, expansive ability, actual estimation, consistent intellectual, categorization and admittance to evidence. Education meant the development of ecological advantage is an education [1].

The word environmental education which became the basis for influential education in order to solve environmental difficulties related with the study of Natural Sciences, Environmental Science. Environmental advantage is the application of information about the environment and human activities, environmental hazards to health and the capability to act environmentally appropriately in certain alive circumstances. Nowadays, the most auspicious approach on socio-economic development, including the symposium on Sustainable Development adopted by Indian governments, highlights the necessity to modification human's awareness and routine in the direction of determining requirements within the structure of the prospects of natural ecosystems[2]. Environmental compression is the capability, enthusiasm and knowledge of individual person to preserve alive atmosphere to solve the environmental difficulties. The capability to solve ecological difficulties, the knowledge of contributing in applied work on the protection and enhancement of the environment, ecologically important individual potentials means exchangeable, accountability for the consequences of environmentally oriented activities. Like biological, visionary, communal, traditional, skilled.

The primary stage of the development of the individual's environmental capability is environmental knowledge, which is considered by four component: 1) understanding of nature as the place of the residence, its "home 2) knowledge of Natural Science about the collaboration of environment and humanity 3) structural and other capabilities of environmental happenings 4) capability and skills to achieve devices that regulate the state of the natural environment. In agreement with the summary of educational organizations that carry out specialized preparation, reeducation and specialized growth of authorities, training of educational disciplines on Environmental Safety, Environmental Safety and sensible use of nature should be confirmed. At the level of higher education institutions, this mission can be explained through a wide range of educational resources, due to the absence of a systematic feature (ecology of model programs, extracurricular activities, extracurricular activities), as well as educational activities of academies, libraries, especially protected natural areas, zoological gardens, botanical gardens, etc.[3]. The level of air quality are indicated in table 1.

Air Superiority Index levels of health	Numerical Standards	Significance
Good	0 to 50	Air quality is considered satisfactory and air pollution poses little or no risk.
Moderate	51 to 100	Air quality is adequate, however for some contaminants there may be a reasonable health concern for a very small number of people who are usually sensitive to air pollution.
Unhealthy for sensitive group	101 to 150	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
Unhealthy	151 to 200	Everyone may begin to experience health effects, members of sensitive groups may experience more serious health effects.
Very Unhealthy	201 to 300	Health warnings of emergency conditions. The entire population is more likely to be affected.
Hazardous	301 to 500	Health alert: everyone may experience more serious health effects.

The following organizations are used in the improvement of developing scholars Environmental camps: Single (information, discussions etc.), Cluster (presentations, practical, tournaments etc.), Community (seminars, visualizations etc.).

The expansion of ecological sections of students is supported in some points:

1. **Study to know:** This stage of the development of environmental awareness and abilities. It approved by learning biology, ecology, geography, chemistry etc. courses in a higher educational institution. The development of environmental advantage is approved through several categories of activities of students.
2. **Wisdom to acquire:** This stage of making their own inventive goods, the application of ecological developments. This is prepared through specific work with students. For example, sewage treatment model and soil as a place of

residence were effected etc.

3. **Education to living:** It is significant to actively contribute in ecological elevations. For example, green hand, story, paper etc. It teaches societies who are not uncaring to the life difficulties of their area, creating lively life situation.
4. **Study to stay:** This stage, the development of ecological advantage is accomplished, the scholar selects the technique of life. In the process of ecological movement is accepted on his individual.

The HEIs there will be a meeting called "contemporary approaches of evaluating the excellence of the environment". During the Meeting, contributors will conduct small research assignment and make typical explanations to ecological difficulties. Scholars are requested to transmit schemes on ecology. For example, resolve of air contamination in the areas of structure of CO to cut of trees". In the process of obtaining ecological compensation, environmental thinking in students is progressively formed as the basis of ecological culture and ecological development, which in turn is an important element of the development of a spiritual and moral personality[4].

We highlight the following important zones of the ecological movement in the field of general education: ecology of educational activity,ecologyofcommunication,environmental-orientededucational-social practice and the ecological aspect of professional orientation. At different stages of education, these meaningful lines are made in different proportions depending on the student's leading activities. Ecology of educational activity, it studies the association between the educational movement of a person, the surrounding educational and social environment. Content of this field awareness: To evaluate the impact of environmental circumstances on understanding realization, Proposal and establish an environment to recover investigation consequences, Health and safety, Ensure environmental safety when employed with evidence streams, Use of universal instructive expertise to distribute thoughts, Institute of communal enterprise in resolving native ecological difficulties, monetary feeding and healthy lifestyle.

Thus, ecological capability is confirmed by the application of interconnected, universal social purposes of education, education, growth and comprises the development: knowledge of the natural-

scientific and socio-cultural life of human activity in the atmosphere, actions associated to ecological exposures for the atmosphere, human health, life safety, ecological harmless lifecycle, aptitude to enterprise their events in relationships of ecological protection, responsible attitude to the consequences of his activities for environmental safety, human health and safety of the environment.

The main ideas essential for the development of environmental advantages are: Designs, development, administration, indicators, properties, assurance, environmental hazard, environmental destruction, environmental nursing, carefulness, stoppage of destruction to the environment. Conservational sections include all the basic sections designed in over-all education, ecological intellectual style and performance in socially challenging ecological circumstances that arise in dissimilar procedures and informations of human activity [5].

The stability content of the subject "environmentalism and maintainable growth of the continuous environment of the gaining of ecological information by students in the informative procedure. The content of ecological education is replicated in its following features:

1. Expansion of systematic and instructive associations to the social environment.
2. Significance (to regulate the cost in environment in humanity and human life).
3. Movement (information, applied and innovative abilities).

Movement - to identify and find solutions to environmental problems, environmental research, creation and implementation of environmental projects (development of a plan, creation of a project, model, forecast, application of ICT) [6].

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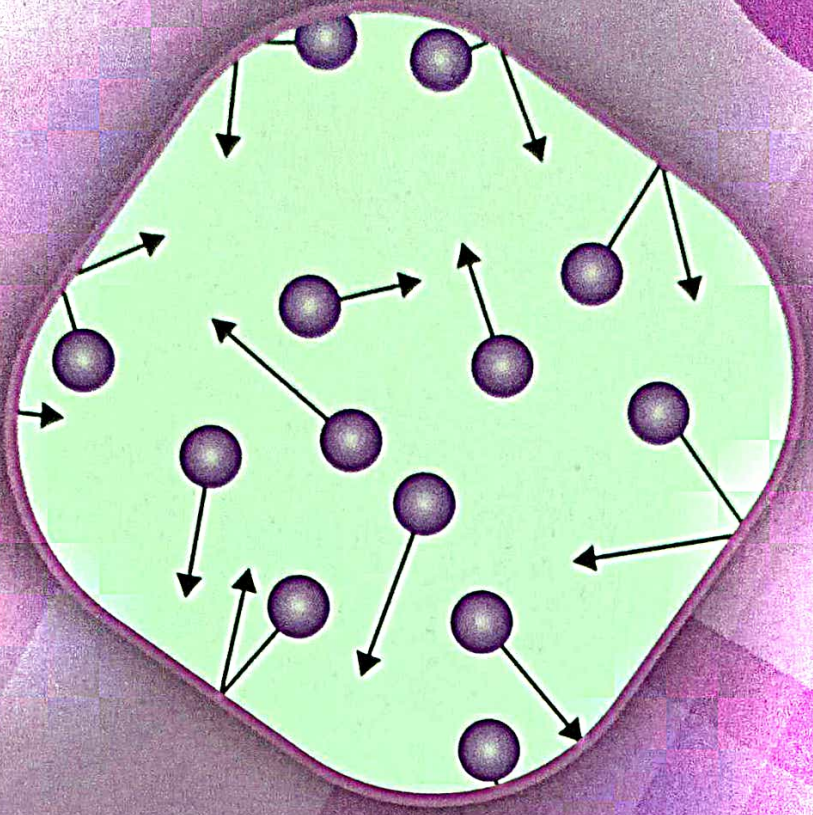

PHYSICS : PHY 353 (CBCS PATTERN)

CLASSICAL MECHANICS

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- Dr. Madhav Sarode
- Dr. Ravindra B. Talware
- Ajinkya B. Bhorde
- Dr. Mahesh S. Bhadane
- Dr. P. V. Patil
- Dr. Sandip Patil
- Vipul S. Ghemud
- Dr. Sarika Shinde
- Dr. Ganesh J. Mogal
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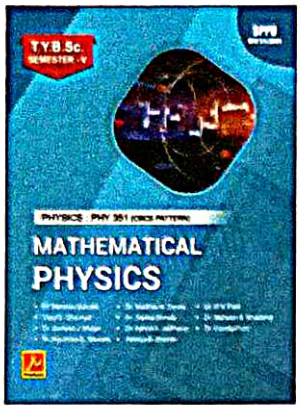

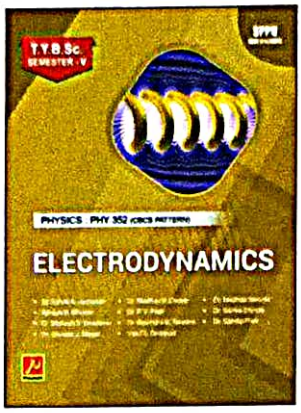

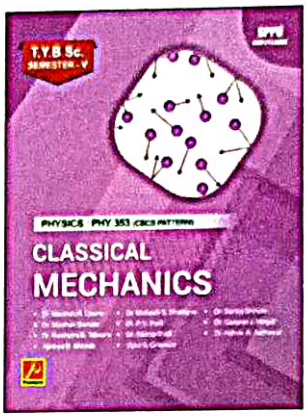

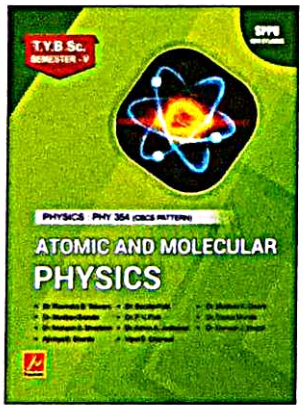

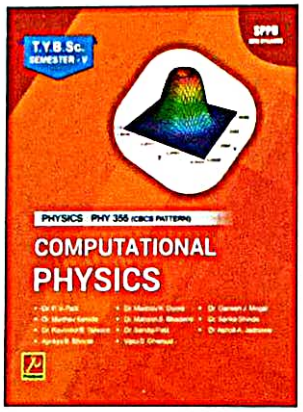

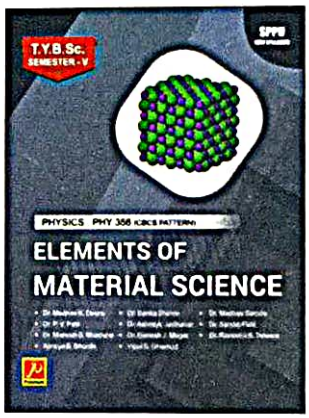

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PHYSICS : PHY 352 (CBCS PATTERN)

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- Dr. Mahesh S. Bhadane
- Dr. Ganesh J. Mogal
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- Dr. P. V. Patil
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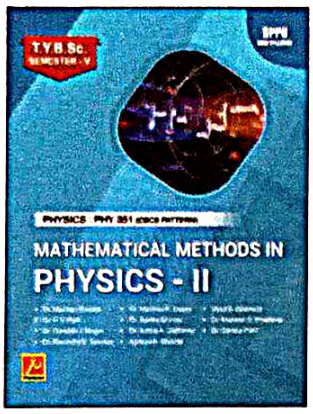

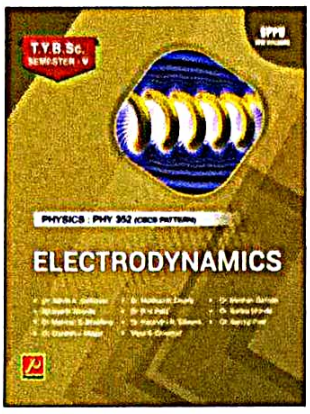

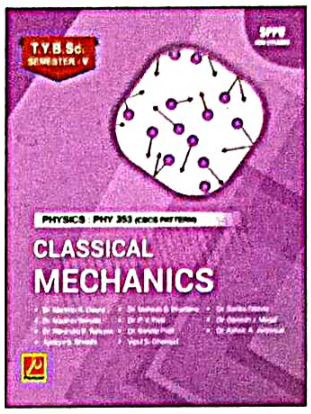

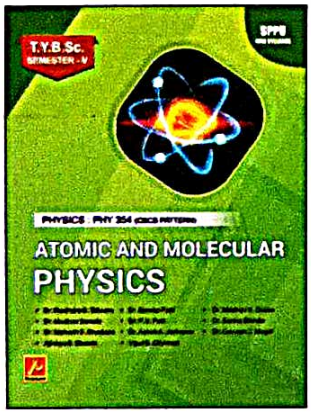

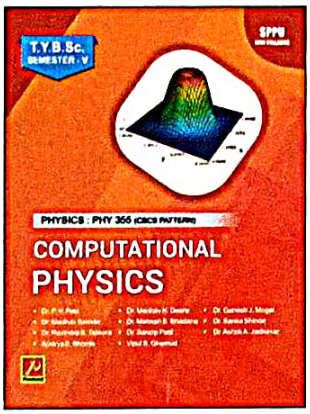

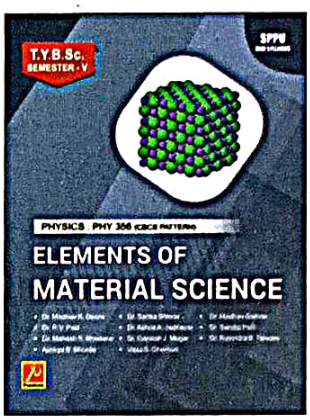

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PHYSICS : PHY 351 (CBCS PATTERN)

MATHEMATICAL METHODS IN PHYSICS - II

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- Dr. P. V. Patil
- Dr. Ganesh J. Mogal
- Dr. Ravindra B. Talware
- Dr. Madhav K. Deore
- Dr. Sarika Shinde
- Dr. Ashok A. Jadhavar
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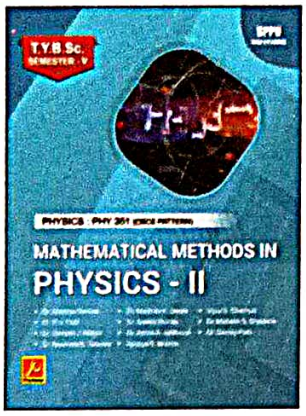

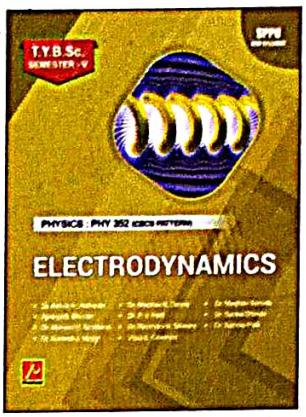

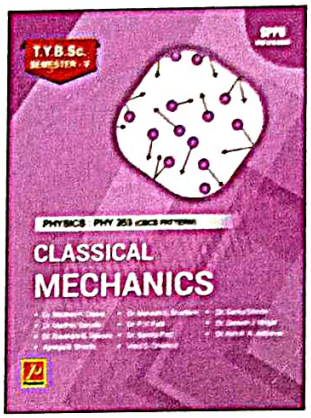

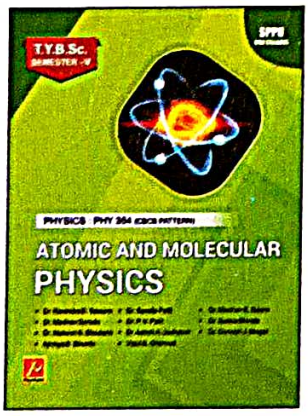

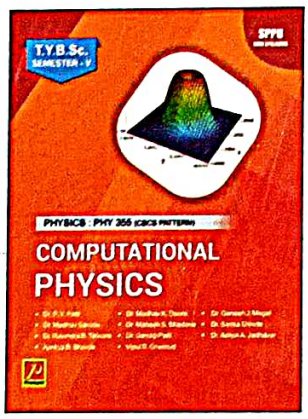

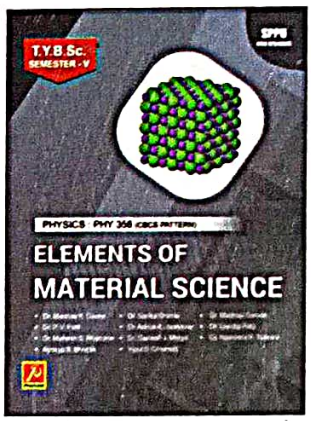

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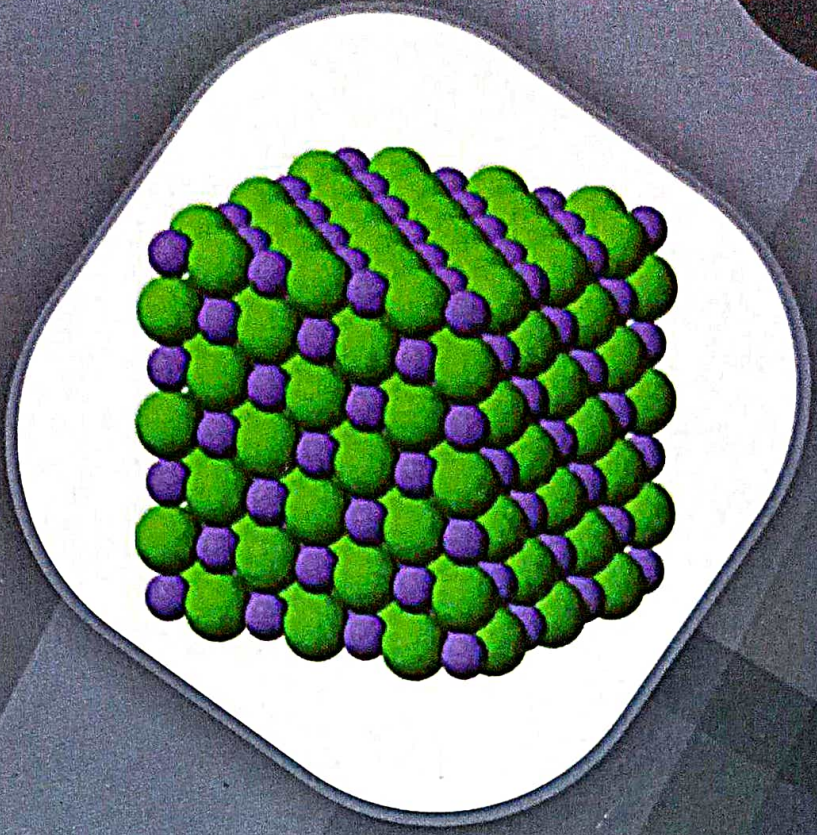

PHYSICS : PHY 356 (CBCS PATTERN)

ELEMENTS OF MATERIAL SCIENCE

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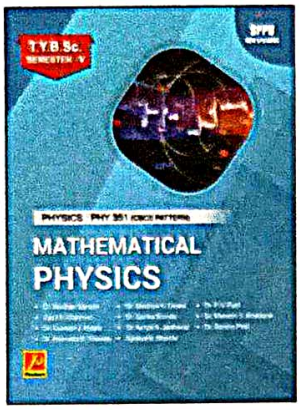

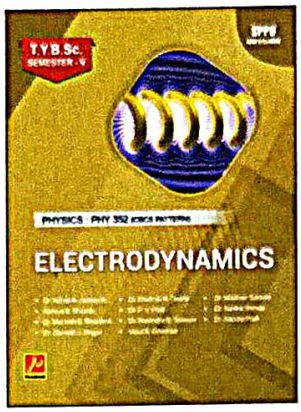

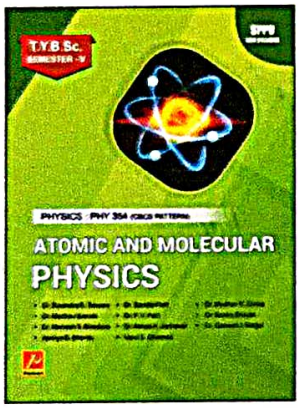

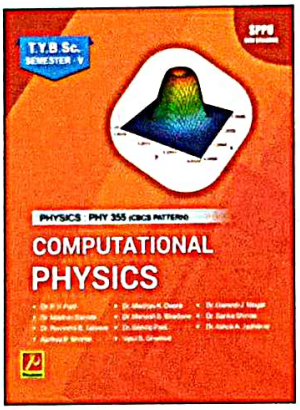

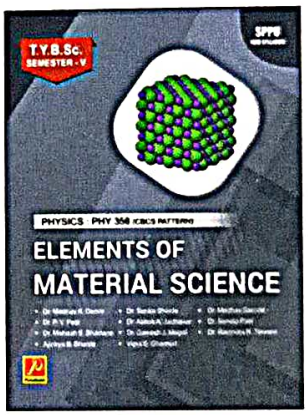

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BOTANY

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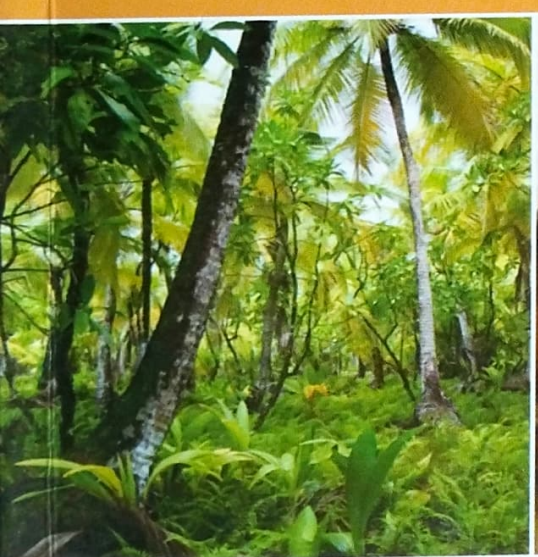
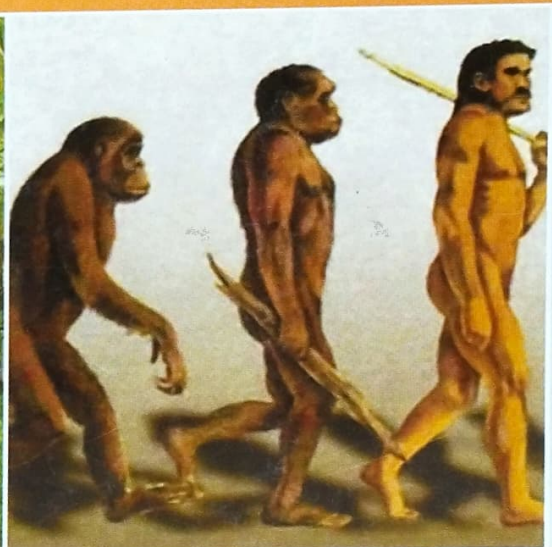
BO 354 ▪ Plant Ecology
BO 364 ▪ Evolution and Population Genetics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- Dr. G. S. Shinde
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T.Y.B.Sc. | Sem. V-VI | PAPER - IV

BOTANY

(CBCS PATTERN)

BO 354 ▪ PLANT ECOLOGY

BO 364 ▪ EVOLUTION AND POPULATION GENETICS

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BO 354 : PLANT ECOLOGY
2 Credits (30 Lectures)

CREDIT - I **(15 Lectures)**

1. **Introduction :** 03
Introduction, interrelationship between the living world and the environment, levels of organization, components and dynamism of ecosystem, homeostasis, niche concept, concept of limiting factors.

2. **Biogeography :** 03
Floristic realms, speciation and its types, biogeographic regions of India, Plant indicators

3. **Population ecology :** 03
Definition, characteristics, population growth form, r and k selection.

4. **Community ecology :** 04
Introduction and Definition, community structure, physiognomy, Raunkiaer's life form classification, keystone species, edge and ecotone.

5. **Biogeochemical cycles :** 02
The carbon cycle, Nitrogen cycle, Phosphorus cycle, and Hydrologic cycle.

CREDIT - II **(15 Lectures)**

6. **Ecological Impact Assessment (EIA) :** 05
Introduction, Historical Review of EIA, Objectives of EIA, Stages of EIA process: Screening; Scoping ; Baseline study; Impact prediction and assessment; Mitigation; Producing Environmental Impact Statement (EIS); EIS review; Decision making; Monitoring, Compliance and Enforcement; Benefits of EIA.

7. **Environmental Audit :** 04
Meaning and concept, need, objectives, benefits, types, audit protocol, process, certification, personnel environmental audit.

8. **Remote Sensing :** 04
Definition, basic principles, process of ecological data acquisition and interpretation, global positioning system, application of remote sensing in ecology.

9. **Ecological management :** 02
Concepts, sustainable development, sustainability indicators.

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- Mr. S. S. Mokal
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Preface

It's a great pleasure for us to present this book Environmental Impact Assessment, Skill Enhancement Courses [SEC] (Zo-3610, Semester VI) for T. Y. B. Sc. Zoology and other Students those prefer this course as optional course. It is written as per the revised syllabus of S.P.P.U., Pune that will be effective from the academic year 2021- 2022. The Environmental Impact Assessment has been primed keeping in view the distinctive requirements of B. Sc. Zoology students. The contents of the book have been drawn-up to accommodate the widening prospects of the discipline of Life Sciences and other faculty students.

The main aim in writing this book is to provide basic, applied, advanced information of the subject to cater the needs of the students. The figures, photographs, questions, definitions and references included in each chapter will help the reader to grasp the subject matter.

We feel it's not a new creations but presentation in simple form and lucid language for the better understanding of students.

We express our sincere thanks to the authors of source, reference material that has been referred here directly or indirectly and mentioned at the end of each chapter.

The authors are extremely thankful to Mr. Pradeep Patil, Mr. Rangrao Patil and the staff of Prashant Publication, Jalgaon for taking keen interest in publishing this book in an attractive form.

Valuable and constructive suggestions from the readers, teachers and the students are solicited for the improvement of this book.

- Authors

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE

Syllabus for T.Y.B.Sc. Zoology w.e.f. June 2021

ZO-3610, Semester - VI, Environmental Impact Assessment

Skill Enhancement Course [SEC]

(2 Credits - 30 Hours)

1. Environment : **(2 L)**

1.1 Definition.
1.2 Divisions.
1.3 Importance.

2. Pollution : **(3 L)**

2.1 Definition and types.
2.2 Impact on wildlife, natural resources, development.

3. Sustainable development : **(2 L)**

3.1 Definition and need.
3.2 Exploitation of natural resources.
3.3 Concept of carrying capacity.
3.4 Three pillars of Sustainability.
3.5 UN 17 Sustainable Development Goals (SDGs).

4. Overview of Environmental Protection acts : **(5 L)**

4.1 The Air (Prevention and Control of Pollution) Act 1981.
4.2 The Water (Prevention and Control of Pollution) Act 1974.
4.3 The Environment Protection Act 1986.
4.4 The National Green Tribunal Act 2010.
4.5 Biological Diversity Act 2002.

5. Environmental Impact Assessment (EIA) : **(5 L)**

5.1 Definition, need and importance of EIA.
5.2 EIA notification 2006 - key elements, History and Evolution of EIA.
5.3 Categories of Industries / establishments requiring EIA, Types of EIA - strategic EIA, regional EIA, sectoral EIA, project level EIA and life cycle assessment.
5.4 Rapid and comprehensive EIA.

6. EIA Process : **(5 L)**

6.1 Screening, Scoping and consideration of alternatives.
6.2 Baseline data collection, Impact analysis, Mitigation, Reporting, Public hearing.
6.3 Review of EIA.
6.4 Decision-making, monitoring clearance conditions.

7. Stake holders in EIA process : **(3 L)**

7.1 Project proponent, Environmental consultant.
7.2 CPCB / MPCB.
7.3 Public, EIA agency (IAA).

8. Overview of Scheme for Accreditation of EIA Consultant Organizations (NABET / QCI) : **(5 L)**

8.1 Eligibility and benefits.
8.2 EIA coordinator (EC), Functional area experts (FAEs).
8.3 Functional area associate (FAA) and team members: Role, educational qualification, experience and functions.

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Editors :

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Chapter 30

GLOBAL AND NATIONAL LEVEL STATUS OF BIODIVERSITY

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Abstract:

Biodiversity plays a fundamental role as ecosystem services in the maintenance of natural ecological processes. The economic or utilitarian values of biodiversity rely upon the dependence of man on biodiversity; products that nature can provide: wood, food, fibers to make paper, resins, chemical organic products, genes as well as knowledge for biotechnology, including medicine and cosmetic sub-products. It simply means the existence of a wide variety of plant and animal species in their natural environments or the diversity of plant and animal life in a particular habitat. The best way to conserve biodiversity is to save habitats and ecosystems rather than trying to save a single species. The conservation of biological diversity has now become a global concern. There are basically two main approaches of biodiversity conservation namely, in-situ conservation (within habitat) and ex-situ conservation (outside habitat). The biodiversity is usually described at three levels and it has a large number of values. In present discussion, author is trying to discuss different levels and values of biodiversity in modern context.

Introduction:

Global Concept

Biodiversity is the measure of the variety of earth's animal, plant and microbial species; of genetic differences within species; and of the ecosystems that support the species. Out of an estimated

30 million species on earth, only one-sixth has been identified and authenticated in the past 200 years. An estimated biodiversity covers 400,000 higher plants. Between seven and nine million square kilometres of tropical rain forests, covering large tracts of Central America, the Amazon basin and the Guianas, West Africa and Zaire, South East Asia, New Guinea and the islands of Melanesia are estimated to be there on the face of the earth.

In Central America, two-thirds of the forests have already disappeared. In Columbia, it has been cleared at the rate of a million hectares a year. The tragic story of the rain forests in Brazil is no different. Tropical rain forests are the greatest, most enduring celebrations of life ever to have evolved on this planet. No other environment has so many species of plant and animal life. Biologically, tropical rain forests are the centres of the world; much of the earth's contemporary flora and fauna originated in the humid tropics. For millions of years, tropical rain forests have been factories of evolutionary diversity from which plants and animals, capable of adapting to more difficult environments, have gone forth to populate the subtropical and temperate regions. It is essential to maintain areas of tropical rain forest large enough for this evolution to continue. (Source: Botanical Survey of India, Kolkata)

The tropical forests are regarded as the richest in biodiversity. Species diversity in tropics is high. The reasons are as follows:

1. Warm temperate and high humidity provide favourable conditions for many species.
2. Tropical communities are more productive because these areas receive more solar energy.
3. Over geographical times the tropics have had a more stable climate. In tropics, therefore, local species continued to live there itself.
4. Among plant rates of out crossing appear to be higher in tropics.

Biodiversity exists on earth in eight broad realms with 193 biogeographical provinces. Each biogeographical province is

composed of ecosystems, which are constituted by communities of living species existing in an ecological region. The developing countries, located in subtropical/ tropical belt are far richer in biodiversity than the industrial countries in the temperate region. The Vavilovian Centres of diversity of crops and domesticated animals are also located in the developing countries.

National Concept

Patterns in Biodiversity

Species are not uniformly distributed over the Earth; diversity varies greatly from place to place. In terms of the number of basic kinds of organism and number of species of each kind, biodiversity has varied markedly through geological time; and, in terms of present day species richness, biodiversity varies greatly between one part of the earth and another. The present global patterns in biodiversity indicate that the species richness tends to vary geographically according to a series of fairly well-defined rules. For example, in case of terrestrial environments:

- Warmer areas hold more species than the colder areas;
- Wetter areas hold more species than the drier ones;
- Larger areas hold more species than the smaller areas;
- Areas of varied climate and topography hold more species than the areas of uniform climate and topography;
- Areas at lower altitude (elevation) hold more species than the high altitude areas; and
- Less seasonal areas hold more species than the highly seasonal areas.

Similarly, in case of pelagic marine species, there tends to be more species in warmer and less seasonal waters, i.e. at lower latitudes. In a much more simplified way, it can be said that there are much more species, both per unit area and overall, in the tropics than in temperate regions and for more in the latter (temperate regions) than in Polar Regions. The moist tropical forests, in general, are the most species rich areas or environments on earth. Though they cover just about 7% of the world's surface; but it is estimated that they may hold more than 90% of the world's species, if the yet unknown tropical forest micro fauna (mainly insects) is

accepted. If small tropical forest insects are discounted, then the areas that may be similarly rich in species are:

Coral reefs; and Areas of Mediterranean climate in South Africa and Western Australia. These areas are rich in species, especially for flowering plants (angiosperms).

The centres of greatest biodiversity tend to be in the tropics. The reasons for greater biodiversity in the tropics are as under: Tropical areas receive more solar energy over the year. Therefore, tropical communities are more productive resulting in a greater resource base that can support a wider range of species. Warm temperatures and high humidity of tropical areas provide favourable environmental conditions for many species that are unable to survive in the temperate areas. Over geological times, the tropics have had a more stable climate than the temperate areas. In tropics, therefore, local species continued to thrive and live there itself; whereas, in temperate zones, they tend to disperse to other areas. There has been more time for tropical communities to evolve as they are older than temperate ones. This could have allowed tropical communities greater degree of specialization and local adaptation to occur. In tropics, the greater pressure from pests, parasites and diseases does not allow any single species to dominate. Thus, there is opportunity for many species to coexist. In temperate areas, on the other hand, there is reduced pressure from pests, parasites and diseases due to cold, and there is one or a few dominating species that exclude many other species. In tropics, higher rates of out crossing among plants may lead to higher levels of genetic variability.

India as Mega-Diverse Biodiversity

Biodiversity has three aspects, viz. genetics, species and ecosystem. India is recognized to be uniquely rich in all these three aspects. The country has a rich heritage of biodiversity, encompassing a wide spectrum of habitats from tropical rainforests to alpine vegetation, and from temperate forests to coastal wetlands. Almost all the biogeographical regions of the world are represented here in India. With a mere 2.4% of the total land area of the world,

the known biodiversity of India contributes 8.22% of the known global biodiversity. India is one of the twelve mega-diversity nations of the world accounting for 7.31% of the global faunal and 10.88% of the global floral total species. Currently available data place India in the tenth position in the world and fourth in the Asia in plant diversity. In terms of number of mammalian species, the country ranks tenth in the world; and in terms of endemic species of higher vertebrates, it ranks eleventh. In terms of number of species contributed to agriculture and animal husbandry, it ranks seventh in the world.

Some of the salient features of India's biodiversity are as under:

1. India has two major realms called the Palaearctic and the Indo Malayan; and three biomes, namely the tropical humid forests, the tropical dry deciduous forests and the warm desert/ semi-deserts.
2. India has ten biogeographic regions, namely the Trans-Himalayan, the Himalayan, the Indian desert, the semi-arid zone, the Western Ghats, the Deccan Peninsula, the Genetic plain, North-East India, the Islands, and the coasts.
3. India is one of the 12 mega-diversity nations of the world.
4. India is one of the 12 centres of origin of cultivated plants.
5. There are two hotspots that extend into India. There are the Western Ghats/ Sri Lanka and the Indo-Burma region (covering the Eastern Himalayas). Further these hotspots are included amongst the top eight most important or hottest hotspots.
6. India has 26 recognised endemic centres that are home to nearly a third of all the flowering plants (angiosperms) identified and described to date.
7. India has six Ramsar Wetlands. They are –
8. Chilika Lake, Harike Lake, Loktak Lake, Keoladeo National Park, Wular Lake and Sambhar Lake.
9. India has 5 world heritage sites namely, Kaziranga National Park, Keolades Ghana National Park, Manas Wildlife Sanctuary, Nanda Devi National Park and Sundarban National Park.

10. India has twelve biosphere reserves, namely Nilgiri, Nanda Devi, Nokrerk, Manas, Sunderbans, Gulf or Mannar, Great Nicobar, Similpal, Dibru-Saikhowa, Dehang Debang, Pachmarchi and Kanchanjanga.
11. Further, amongst the protected areas, there are 88 national parks and 490 sanctuaries in India covering an area of 1.53 lakh sq.km.
12. Based on a survey of about two-third of the geographical area of the country, the Ministry of Forests and Environment (MOEF) reports that India has at present 89,317 species of fauna and 45,364 species of flora representing about 7.31% of the world fauna and 10.88% the world flora described so far.
13. In plants, the species richness is high in angiosperms, bryophyta and petridophyta, and in the family orchidaceae. In animals, arthropoda (insects) are predominant.
14. India is also rich in agro-biodiversity. There are 167 crop species and wild relatives. Further, India is considered to be the centre of origin of 30,000 to 50,000 varieties of rice, pigeon-pea, mango, turmeric, ginger, sugarcane, gooseberries, etc. and ranks seventh in terms of contribution to world agriculture.
15. India also boasts of rich marine biodiversity, along the coastline of 7516.5 km with exclusive economic zone of 202 million sq.km, supporting the most productive ecosystems such as mangrooves, estuaries, lagoons and coral reefs. The number of zooplankton recorded is about 16,000 species. The benthic fauna largely consists of polychaeta (62%), crustacean (20%) and molluscs (18%) with the biomass of about 12 gm per sq.metre. Over 30 species of marine algae and 14 species of seagrass have been reported. There are over 45 species of mangrove plants. Over 342 species of corals belonging to 76 genera have been reported and about 50% of the world's reef building corals are found in India.

Conclusion

Biodiversity loss is important in its own right because biodiversity has cultural values, because many people ascribe intrinsic value to biodiversity, and because it represents unexplored options for the

future (option values). People from all walks of life value biodiversity for spiritual, aesthetic, recreational, and other cultural reasons. Species extinction at the global level is also of particular significance, since such permanent, irreversible losses of species are a loss in the constitutive elements of well-being. Population extirpation and loss of habitat are particularly important at national and local levels, because most ecosystem services are delivered at the local and regional level and strongly depend on the type and relative abundance of species.

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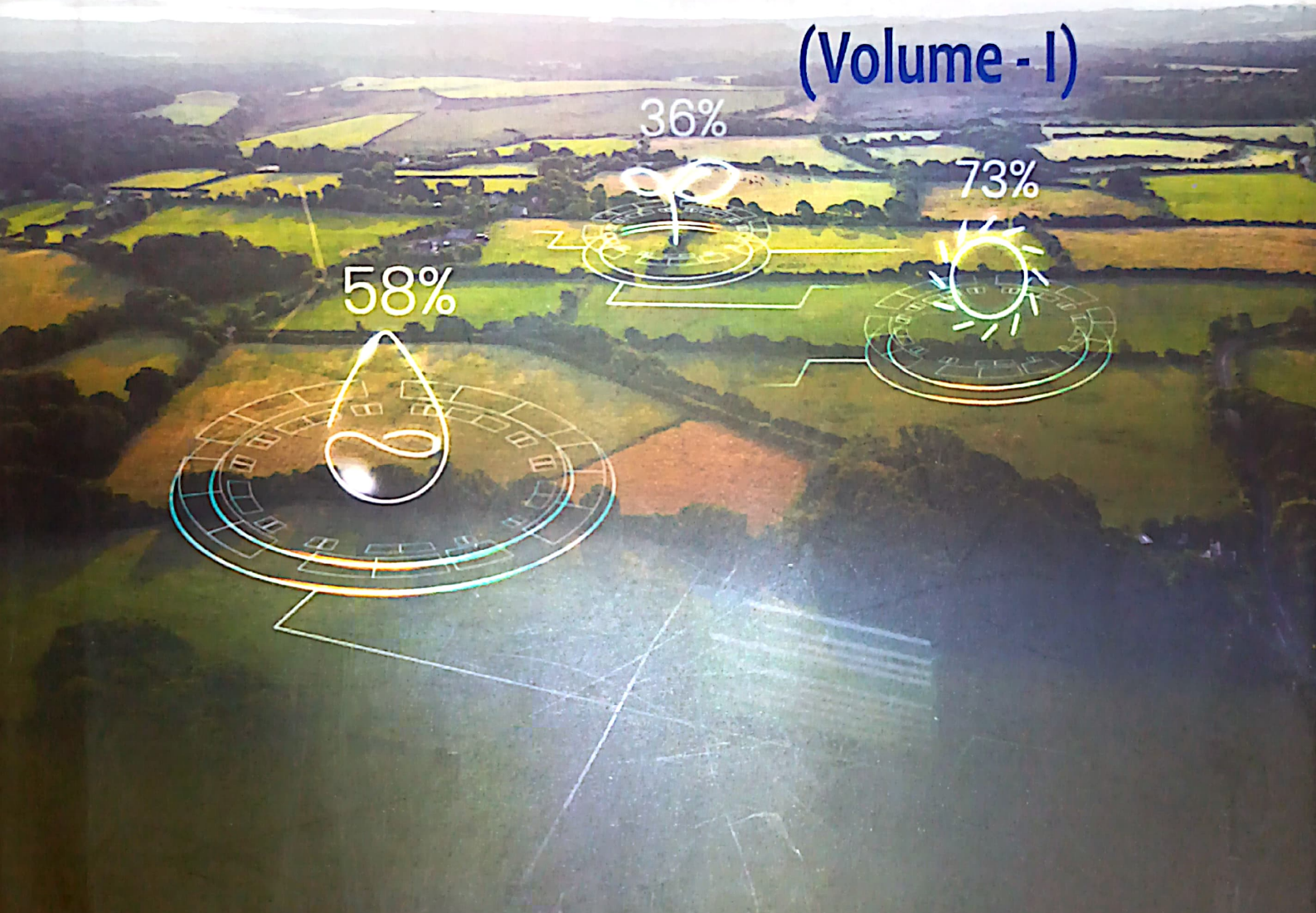
EMERGING TRENDS IN ENVIRONMENTAL SUSTAINABILITY

(Volume - I)



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SCIENG PUBLICATIONS

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ROLE OF MICROBES IN ENVIRONMENTAL SUSTAINABILITY

PATIL JAGRUTI [1]

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ABSTRACT

The microbial world represents the environmental treasure, which play important role in the sustainable development of the ecosystem. Environmental protection is one of the most important prerequisites for humankind. The microbial community in the ecosystem can maintain the environment clean and it controls the overload of contaminants. Biodegradation is a useful as well as interesting technique for remediating, controlling, including cleaning methods contaminated environments with the help of microbes. Microorganisms play an essential role in environmental sustainability they use agriculture as bio-fertilizers including bio-pesticides. Currently, the great research topic reason of microbes is environmentally friendly with good useful genetic content to solve environmental problems. Microbial involvement may be useful to clean the contaminated area from accelerated heavy metals, and pesticides, including several industrial wastes. The useful and important activities performed by microbes for a sustainable environment.

KEYWORDS: Microbes, Sustainable environment, Bioremediation.

INTRODUCTION

Currently, the world is experiencing major environmental issues. Microbes are important and good substitutes to control the challenges. Microbes exist in all areas of the ecosystem due to their metabolic actions is incredible, and begin to survive in all range of environmental situations (Gupta et al., 2017). Environmental microbes, like bacteria, fungi, archaea, etc., are essential components of the environment that play an essential function in eco-friendly energy. Environmental microbiology is mainly targeted at microbial populations of species constitution, ecological dispersion, diversity form, and community genetic features including interaction with surroundings (Li et al., 2019).

Microbes described a greater portion of the global biological diversity along with play a crucial function in ecosystem action, giving roles to sustaining life on earth. They are a main

source of the plant as well as animal biological diversity and they play an essential function in biogeochemical cycling (Pajares et al., 2016). Eco-friendly technique to eliminate chemical pollutants from the environment with the help of microorganisms. It is the indicator that is revealed in a study of the microbial world along with the diversity that is useful for humans as well as the ecosystem also it acts as a life-promoting component (Sangwan and Dukare, 2018). Beneficial microbes perform an important role in natural as well as human-made aquatic ecosystems. They play an important role to regulate the algal community in this way to prevent undesired algal blooms (Zhou et al., 2009).The microorganisms may degrade the complex contaminants into a simple form by metabolic actions (Salama et al., 2022).

Bioremediations process which eliminates the contaminants from surroundings and this is environmentally friendly with main efficacious technique. The contaminants may eliminate from the soil as well as water with the help of microbes, called bioremediation (Coelho et al., 2015). Bioremediation techniques in which uses microorganisms to remediate a polluted environment and lead to a return to its original condition (Iranzo et al., 2001). Bioremediation method is taken place with the use of various microbes in different conditions it consists of *Flavobacterium, Achromobacter, Xanthobacter, Arthrobacter, Nitrosomonas, Bacillus, Mycobacterium, Alcaligenes, Corynebacterium* ,etc (Sharma, et al., 2019). The metals are removed with the help of several microbes such as bacteria, fungi, algae in addition to yeast, etc (Zhango et al., 2020). The microbial perspectives may be efficiently useful for sustainable agriculture (Ahmad et al., 2018). The biodegradation process in which several microbes are capable to degrade naturally as well as synthetic polymers (Devi et al., 2015).

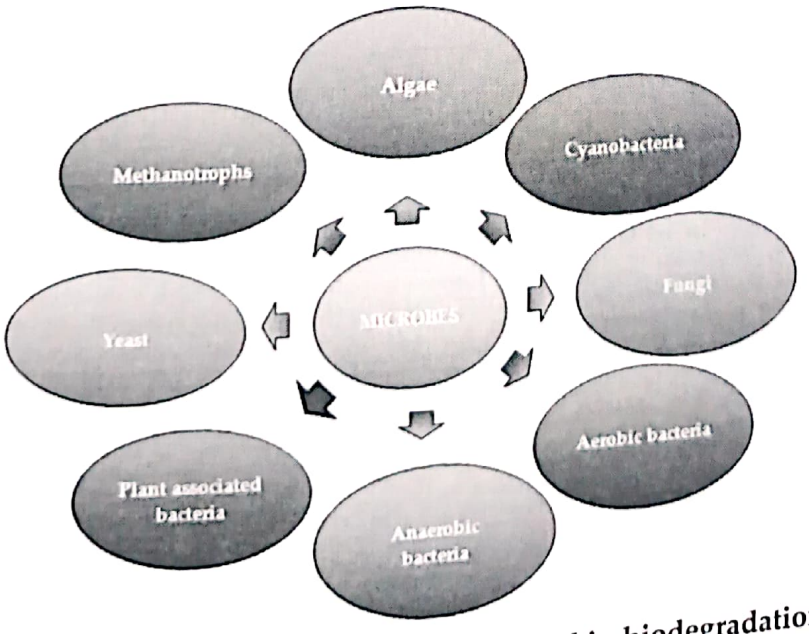

Fig. 1: Different types of microbes involved in biodegradation.

MICROBIAL BIOREMEDIATION

Bioremediation is a promising technology for several growing problems. Bioremediation gives the changes of degrading, eliminating, changing, immobilizing, as well as detoxifying several chemicals from the environment with the help of bacteria, and fungi including plants (Uqab et al., 2016).

PRINCIPLES OF BIOREMEDIATION

The bioremediation technique is mainly dependent on biodegradation. It is described as the total elimination of organic harmful contaminants into non-toxic composites that are safe for human beings, plants as well as the aquatic community (Harekrishna and Kumar, 2012). A goal of bioremediation is the promising them to function by providing an optimum amount of the nutrients as well as chemicals that are crucial for the metabolism to break down or detoxify material that is harmful to the environment as well as living things. The metabolic reactions are carried out through enzymes. The bioremediation can be effectual, microbes that enzymatically assault the contaminants then change into nontoxic compounds. Bioremediation is effectual only when the environmental state allows microbial growth as well as action, that role includes the modification of environmental factors to permit microbial growth including degradation that is carried out rapidly.

FACTORS AFFECTING MICROBIAL BIOREMEDIATION

BIOLOGICAL FACTORS

The biotic components are influenced by the degradation of the organic material by competition in microbes for controlled carbon sources, the antagonistic interactions in microbes, and predation of the microbes through protozoa as well as bacteriophages. The speed of pollutant degradation is mainly based on the amount of the pollutants along with the quantity of the "catalyst" that exists. An aspect of the particular enzymes through cells may rise or reduce the speed of pollutant degradation. The main biological factors consist of mutation, enzyme actions, and the size of the population.

ENVIRONMENTAL FACTORS

Metabolic attributes of microbes with physicochemical features of targeted pollutants detect desirable interaction in the activity. The microbe's growth, as well as actions, are influenced by pH, nutrients, soil texture, temperature, site features, moisture, redox potential including the content of oxygen, a deficit of the human needs in that area as well as Physical and chemical bioavailability of the contaminants (pollutant concentration, solubility, chemical nature, chemical including toxicity).

AVAILABILITY OF NUTRIENTS

An inclusion of nutrients manages the crucial nutrient stability for microbes' growth including reproduction as well as possessing an effect on biodegradation speed in addition to efficacy. To exist and with proceed their microbial actions microbes required various nutrients like carbon, phosphorous in addition to nitrogen. The inclusion of a suitable amount of nutrients is a promising action for rising the metabolic action of microbes.

TEMPERATURE

The physical factors in which temperature is one of the major essential factors that regulate the existence of microbes including constituents of hydrocarbons. The biological enzymes are mainly involved in the degradation process that possesses optimum temperature with that not possess similar metabolic turnover of each temperature. Furthermore, a degradation activity for a particular compound required a particular temperature. Temperature is increased or decreased the bioremediation action reason of that greatly affects the microbial physiological characteristics.

CONCENTRATION OF OXYGEN

Certain organisms need oxygen and other organisms do not need oxygen depending on their demand to promote biodegradation speed in a good manner. The biological breakdown occurred in aerobic as well as anaerobic states, reason for oxygen is the gaseous need for various living things. The occurrence of oxygen in various states may increase the metabolism of hydrocarbon.

pH

pH is an indication of the acidity, basicity as well as alkalinity of the substance, which are mainly affected by the microbial metabolic actions with rising including reducing the elimination activity. Soil pH is a characteristic that shows the capability of microbial growth. The greater or smaller pH values indicate inferior consequences; metabolic activity is greatly affected by even small differences in the pH (Abatenh et al., 2017).

TYPES OF BIOREMEDIATIONS

BIOSTIMULATION

The biostimulation technique which introduced particular nutrients in an area like soil and groundwater enhances the actions of microbes. That mainly enhances the bacterial as well as fungal population. Initially, providing fertilizers, trace elements as well as growth additives. Then, supplying other environmental need such as temperature, pH including oxygen increases the metabolism. Nutrients are the essential requirements of life that use by

microorganisms for their basic needs like energy as well as enzymes to break down contaminants.

BIOATTENUATION

Bioattenuation is also known as natural attenuation which removal of pollutants from the environment. 1) The microorganisms that exist in soil, as well as groundwater, utilized certain chemicals like food. While it totally breakdown the chemicals, that may convert the water into non-toxic gases. 2) The chemicals may adhere to the soil, which keeps them in the region. 3) The pollution proceeds from the soil as well as groundwater, which may combine into pure water. That decreases or dilutes pollution. 4) Certain chemicals, such as oil as well as solvents, may evaporate, which intends it convert liquids into gases in the soil. Whether gases liberate in the air of the ground surface, the sunlight can destruct it.

BIOAUGMENTATION

The bioaugmentation process in which introduced the contaminants degrade microbes increases the biodegradative ability of the microbial community on a polluted site. To rising a natural microbe's community growth as well as increases degradation it particularly feeds on pollutants area. Furthermore, genetically manipulated microbes that may signify the rise of the degradative capability of the various kinds of environmental contaminants. The reason of the possesses varied metabolic forms to convert into a low complex including nontoxic final products (Meena et al., 2021).

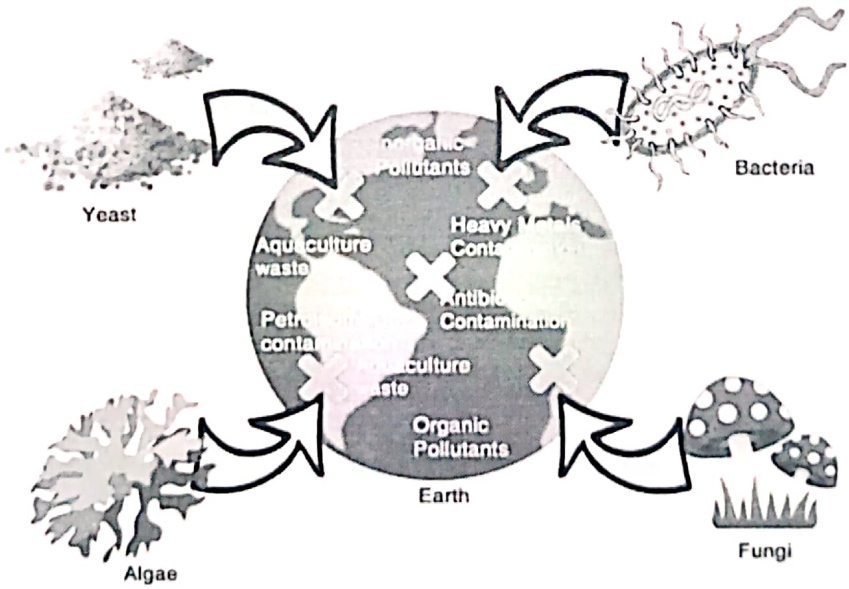

Fig. 2: Bioremediation using microorganisms (Pal et al., 2020).

APPLICATIONS OF MICROBES IN ENVIRONMENTAL SUSTAINABILITY

ROLE OF MICROORGANISMS IN THE DEGRADATION OF ORGANIC POLLUTANTS

The environmental issue due to organic waste mainly pesticides, hydrocarbons, herbicides as well as several hazardous wastes is a major global issue. The essential topic to determine the function of microbes in organic waste biodegradation this is a good substitute to the physicochemical method. Organic contaminant degradation through microbes is carried out in aerobic as well as the anaerobic situation. The pesticide used in the agricultural field is today a usual method. But certain pesticides remain in the soil to make contaminants that sometimes because both surfaces as well as groundwater pollution. A fungus-like *Trichoderma Miridae* is involved in endosulfan as well as methyl parathion pesticides breakdown (Tiedje et al., 2022).

ROLE OF MICROORGANISMS IN SUSTAINABLE AGRICULTURE

Microbial biofertilizers, as well as biopesticides, has a potent tool for sustainable agriculture. The various bacterial species such as *Bacillus, Azotobacter, Mesorhizobium, Rhizobium, Acetobacter, Azorhizobium, Aspergillus, Allorhizobium, Mesorhizobium, Pseudomonas, Aspergillus,* etc., they are capable to promote plant growth. The other microorganisms like *Aspergillus niger, Bacillus subtilis, Pseudomonas corrugata, Streptomyces nojiriensis, Rhizobium sp.,* in addition to Bacillus subtilis, increased growth as well as the development of the plant. The various phosphate-solubilizing microorganisms like *Bacillus sircalmous, Bacillus megaterium,* and *Bacillus circulans* including *Bacillus subtilis* (Dastagir, et al., 2019).

ROLE OF MICROBES IN DEGRADATION OF PLASTICS

The biodegradation process in which several microbes are capable to degrade natural as well as synthetic polymers. Microbes like bacteria including fungi are mainly included in plastics degradation (Riaz et al., 2019). Microbes are capable to join the polymer's surface; A organism is attached to the surface, that can grow used of polymer like the carbon supply. The initial degradation step in which extracellular enzymes are secreted through microorganism bring about the primary chain break, resulting of developing the small molecular weight particles, such as monomers, and dimers including oligomers. That small molecular weight composite is again utilized through microorganisms like carbon as well as electricity virtue (Fesseha et al., 2019).

Table 1: Plastic degrading microorganisms

Microorganisms	Enzyme produced	Polymer degraded	Reference
Aspergillus flavus	Glycosidase	Polycaprolactone	Fesseha et al., 2019
Amycolatopsis species	Manganese peroxidase	Polylactic Acid	Fesseha et al., 2019
Aureobasidium pullulans	Extracellular esterase	Dioctyl adipate (DOA)	Trivedi et., 2016
Pestalotiopsis microspora	Serine	Polyurethane	Trivedi et., 2016
Alcaligenes faecalis	Polycaprolactone depolymerase	Polycaprolactone (PCL)	Trivedi et., 2016
Comomonasaci divorans	Estrase	Polydiethylene adipate	Trivedi et., 2016
Rhizopus delemar	Lipase	Polylactic acid	Trivedi et., 2016

BIODEGRADATION OF XENOBIOTIC COMPOUNDS (XC)

The Xenobiotic compounds (XC) are mainly man-made chemical composites it is extrinsic for the environment. To degrade those compounds, various microbes along with their enzymes perform an essential role. Bacterial species like *Pseudomonas sp.* as well as *Bacillus sp.*, are capable of in the breakdown of the xenobiotic compounds. The fungi consist of *Aspergillus niger*, and *Penicillium italicum*, in addition to *Gliocladium deliquescens* are capable of breakdown several XC. Naphthalene, toluene, phenol, benzene, etc. are certain XC fast breakdown through aerobic action while chlorinated dioxins including certain pesticides such as DDT are degraded through anaerobic action (Mondal and Palit, 2019).

Table 2: List of Xenobiotics compounds and degrading microbes

Xenobiotic Compound	Microbes	Reference
Endosulfan compounds	*Mycobacterium sp.*	Mondal and Palit, 2019
Benzene	*Bacillus sp.*	Mondal and Palit, 2019
Endosulphate compounds	*Arthrobacter sp.*	Mondal and Palit, 2019
Vinyl chloride	*Dehalococcoides sp.*	Singh and Garima, 2015
Benzene	*Dechloromonas sp.*	Singh and Garima, 2015
Naphthalene	*Pseudomonas putida*	Singh and Garima, 2015

CONCLUSION

Presently, incineration, recycling as well as land filling is mainly used to decrease the number of harmful contaminants from polluted areas, but they hurt the environment. So, Microbes play an important role in the environment and are a good substitute to control environmental problems. Microbial inoculation in that manner either changes or decreases

the use of agrochemicals to clean environments greatly influenced by pollution. Microbes control the biogeochemical cycle globally. Microbial involvement may be useful to clean polluted areas from accelerated heavy metals, and pesticides, including several industrial wastes.

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About the Editor

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EMERGING TRENDS IN ENVIRONMENTAL SUSTAINABILITY

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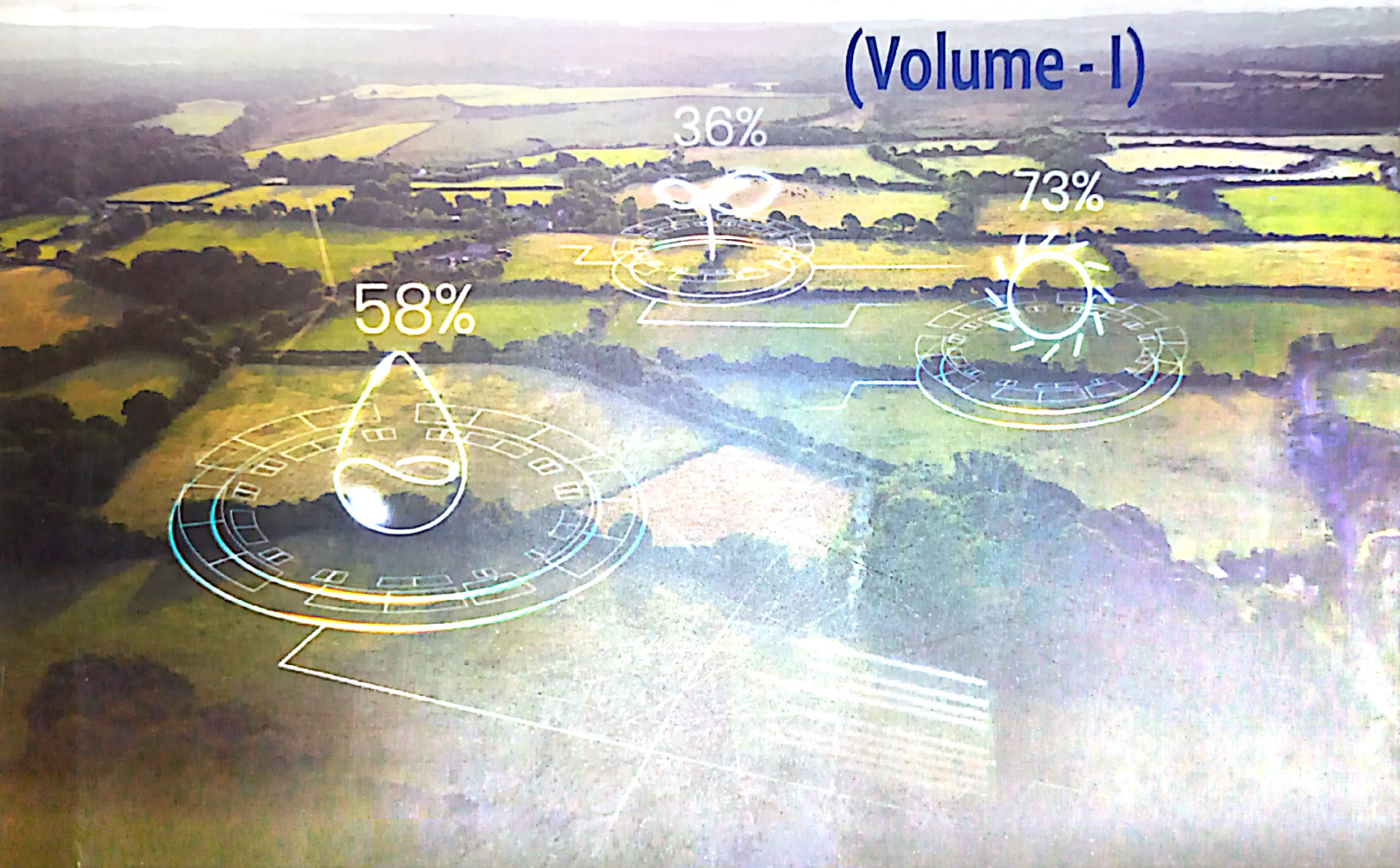

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Chapter 1

ENVIRONMENTAL AWARENESS: NEED OF THE HOUR

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ABSTRACT

Environmental issues such as global warming, carcinogens, pollution, etc. catch our attention as these directly affect our lives. Greenhouse effect, global warming, climate change, acid rain, e-waste, etc. are critical environmental issues currently faced by all. Humans cause a significantly large degradation of the environment amongst all creatures. Environmental awareness is nothing but understanding the environment, changes in the same, causes of the changes, solutions to the environmental problems, and most importantly the importance to protect the environment. Sustainability essentially means preserving the earth's environment and conserving its resources for coming generations. Sustainable development essentially consists of key elements such as sustainable material, sustainable energy, sustainable manufacturing, sustainable water, sustainable transportation, and sustainable farming.

KEYWORDS: Environmental degradation, Sustainability, Ecosystem, Biodiversity, Resources, Conservation.

INTRODUCTION

'Environ' means 'to surround' or 'to enclose'. Thus, the environment is nothing but surroundings. The environment can be as small as micro-scale or as big as the universe. Surrounding is nothing but everything around us. Now, when have you noticed the surrounding last time? It gets noticed only when the degradation is visible or sensed. Environmental issues such as global warming, carcinogens, pollution, etc. catch our attention as these directly affect our lives (Lovelock et al., 2016). Has described precisely and more importantly in lucid language the approach to witnessing life on Earth. Humans used to heavily depend upon wood as a fuel one or two centuries before and still there were no environmental issues such as an increase in carbon dioxide due to deforestation and burning of wood. Now, what has been changed to worry about the same? The answer is the

scale! Population explosion and exploitation of trees have increased multiple times compared to the plantation of new trees. This example is interesting as trees absorb carbon dioxide and after burning the same mass of wood equivalent amount of carbon dioxide will be released. The fundamentals of air pollution are discussed in depth by (Boubel et al., 2013) describing its history, causes, scale, short-term and long-term effects, emission standards, etc. If any activities cause considerable changes to the surroundings/environment progressively, they may cause permanent (i.e., irreversible) damage. It is said that a picture is equivalent to thousands of words! Smog blanketed New York City in 1966 (so long back!) as shown in Fig. 1 is nothing less than a scary photo. How long such a situation can be ignored? Environmental awareness is nothing but understanding the environment, changes in the same, causes of the changes, solutions to the environmental problems, and most importantly the importance to protect the environment. Environmental awareness is the need of the hour. This chapter which is of significant importance is designed and written to be comprehensive and solution-oriented rather than just an informative one.

Fig. 1: Smog blanketed New York City
(https://www.businessinsider.com/manhattan-smog-photos-1966-2013-1)

This chapter addresses environmental issues: causes and solutions, and strategies for securing the environment detailing the importance of environmental awareness.

ENVIRONMENTAL ISSUES

There are numerous environmental issues. Enlisting and addressing most of them are not the objectives of this chapter. However, addressing awareness of key environmental issues is preferred. Greenhouse effect, global warming, climate change, acid rain, e-waste, etc. are critical environmental issues currently faced by all. (Houghton et al., 2004). has discussed these issues in detail and also proposed a strategy to mitigate the intensity of problems. Witnessing the irresponsible behavior of individuals and countries, the foremost thing to

address the environmental issues is to admit that the environment is degrading and events such as global warming, climate change, etc. are real and inevitable.

CAUSES

Degradation in the quality of the environment may occur due to various causes. These primary causes (forces) can be broadly classified into natural forces, human activity, a combination of natural and human activity, and social forces (Nwachukwu et al., 2014). Natural forces such as earthquakes, hurricanes, volcanoes, etc. are the events that human beings cannot have control over or cannot avoid as of now. These are the forces on a large scale and can cause considerable irreversible changes to the environment even if the events might be local. Humans cause a significantly large degradation of the environment amongst all creatures. Well-known human activities such as all types of pollution (water, air, sound, soil, etc.), all types of waste (solid, liquid, industrial hazardous waste, etc.), over-exploitation of natural resources such as groundwater, crude oil, etc., expansionistic activities such as deforestation, demolition of hills, mining, etc., disastrous biological viruses, nuclear mishaps, etc. are critical to the environment. A few causes can be termed as a combination of human and natural activity such as global warming, drought, and desertification where cause and effect are evident. Other social forces associated with humans are poverty, illiteracy, war, terrorism, hunger, population, etc. Let us discuss human forces in slightly more detail. How many of us know running refrigerator and air conditioning unwarrantedly costs the environment directly or indirectly? Do we know which human activities are leading to greenhouse gas emissions (GHG)? What do we understand by synthetic fluids with larger ozone depletion potential (ODP)? And so on! Let us take an example of a single individual and how much the contribution to the degradation of the environment is. Energy usage is the main contributor which affects the environment directly. Does that mean we should give up using energy? The answer is NO! Let us first evaluate how much a single person roughly consumes energy. Suppose a person 'A' consumes electricity of 100 units (kWh), travels around 20 km every day for his office work by own vehicle and thus consumes around 15 L of petrol, and utilizes 5 kg of liquefied petroleum (LPG) gas in a month. A's carbon footprint can be evaluated since 1 unit of electricity is 1 kg CO_2 equivalent, 1 L of petrol is 3 kg CO_2 equivalent, and 1 kg of LPG is 3 kg CO_2 equivalent. Thus, A emits 160 kg CO_2 equivalent in the environment. Carbon dioxide is a greenhouse gas; thus, one can evaluate own contribution to global warming. Please mind the fact that this is a direct contribution. There is indirect contribution also as one consumes goods that are transported from one place to another, one city to another, one state to another, and also one country to another.

SOLUTION

Now the causes of environmental issues are known. The next logical step should be how to avoid or minimize the activities or events that cause these issues. Human activities that cause environmental degradation can be minimized. Environmentally friendly things are popularly termed 'eco-friendly'. The word 'eco' is often used as a synonym or acronym for environmental conscious or ecological things. Although consumerism may be termed a root cause of environmental issues, the solution lies in terms of sustainable living and development. The terms 'sustainability' has emerged in the literature on environmental problems since the 1980s out of global awareness of overpopulation and this word is going to be the buzzword or watchword globally in the coming decades.

Sustainability is one of the significant tools for environmental management. Sustainability essentially means preserving the earth's environment and conserving its resources for coming generations. Sustainable development essentially consists of key elements such as sustainable material, sustainable energy, sustainable manufacturing, sustainable water, sustainable transportation, sustainable farming, sustainable buildings, sustainable urban density, infrastructure, etc. Have you ever got upset with large landfills full of plastic waste?

Sustainable material necessarily means a bio-degradable material that is eco-friendly over in-disposable one causing environmental issues. (Peters et al., 2012) has presented innovative sustainable materials and various designs. Production of a specific material or an end product and also its use comes under sustainable material (Singh et al., 2016). have provided sustainable manufacturing methods for advanced materials. As discussed in the previous section energy consumption is the key contributor to environmental issues. Now, the question is how to minimize energy consumption because it cannot be made to zero. This requires efforts from individuals and also government bodies who are policymakers.

Sustainable energy is not new to readers and bio-fuels, various green or renewable energies such as solar, wind, etc. have still significant scope to fulfill the ever-increasing energy demand replacing conventional thermal power plants. Coal which is used as a primary fuel in thermal power plants has a significant effect on the environment as discussed by (Greb et al., 2006). Clean energy, green energy, renewable energy, and sustainable energy are often used as synonyms. Green energy is considered to be generated from natural resources and to cause no harm to the environment. Clean energy consists of zero-carbon energy sources and no or a negligible amount of pollution results. The energy source in the case of renewable energy naturally replenishes itself.

Sustainable energy necessarily means that the source can be maintained for the indefinite future without compromising or threatening future generations. Renewable and

sustainable energy are often used interchangeably. Thus, there is a thin line between various classifications of energy. With a recent water crisis in the city of Cape Town (Bischoff et al., 2020). It is evident that water scarcity is a potential threat to socio-economic development and livelihood in several countries if not attended to and solved in time (Liu et al., 2017) have provided a detailed review on water scarcity assessment till now and also for the future. Rainwater harvesting over-processed supply water can be considered sustainable water in both rural and urban areas. Low-flow taps to save water and using grey water to flush the toilets for efficient usage of water can opt for sustainable water in the individual capacity.

According to the environmental protection agency (EPA), in the United States, transportation is the biggest contributing economic sector to greenhouse gas emissions (Hull et al., 2008) discussed problems in the integration of policy and the implementation mechanisms faced in establishing a sustainable transport system (Jacyna et al., 2014) discussed the proposed simulation model to establish a sustainable transport system in Poland. Cycles, public transport, vehicles with green fuels, etc. can opt for sustainable transportation. Eco-system management of composite feedbacks between key elements of the environment such as water, plants, soil, climate, animals, and people can be effectively handled by sustainable agriculture. (Sullivan et al., 2003) has provided the fundamentals of sustainable agriculture. Organic over inorganic farming is one example of sustainable agriculture. Sustainable food has become a necessity as the world has come closer and the global food system contributes to various environmental issues at different stages right after the production till it reaches the end user such as processing, transportation, storage, waste, etc. (Garnett et al., 2013) has presented the problems and solutions concerned with sustainable food (Loynachan et al., 1999). Emphasized the importance of sustainable soil regarding sustainable food or agriculture for a sustainable society. How many of us have thought of the future of soil before? Energy efficient building which doesn't need the usage of air-conditioners and over-usage of lights is a good example of a sustainable building. Waste and water management such as treated wastewater for sanitation can successfully contribute to a sustainable urban density and infrastructure.

Small, however, impactful solutions are proposed like green energy such as solar energy should be promoted. Renewable energy should gradually replace thermal power plants. Individuals should be cautious about energy consumption just as the expenditure of money. Public transport should be preferred and promoted. Usage of cycles should be opted and promoted. Unnecessary consumption of electricity should be avoided. Natural ventilation at houses can be an alternative to the usage of air conditioners. Electric (run on solar chargers) and hydrogen-powered vehicles should be preferred over polluting vehicles run on internal combustion engines which consume petrol or diesel. Avoidable usage of

lifts and elevators is possible. Usage of electricity for heating water should be avoided as electricity is mostly produced in thermal power plants with efficiency as low as 30 %. Solar water heaters and solar cookers are the best alternatives with zero running costs and no harm to the environment. Have you noticed the emission of CO_2 equivalent while booking a flight? The enormous amount of emitted CO_2 makes air travel most harmful to the environment. Of course, one should not stop flying, however, if it is avoidable, other modes of travel should opt. Equipment with larger efficiency or coefficient of performance should be opted although at the higher initial cost due to lower consumption of energy and hence possible smaller damage to the environment. Carbon capture and storage (CCS) technology is going to be the future technology and there is going to be a huge demand for CCS technology in the coming years.

STRATEGY

Lack of environmental education in schools is a root cause of insignificant knowledge of both local and global environmental problems in several countries. Thus, one critical aspect or mandatory condition for a successful environmental awareness or management effort is the provision of effective environmental education in schools and awareness training initiatives in various institutes and organizations (Perron et al., 2006) have provided measures to improve the training conducted in organizations for environmental awareness. (Phyper and MacLean, 2009) have provided comprehensive guidelines to adopt green strategies in business. Applied Environmental Science and Engineering for a Sustainable Future (AESE) series of books focuses on several environmental issues and their solutions through innovations in science and technology. Novel steps proposed in the present chapter that should be initiated for effective environmental awareness are launching government-backed interactive mobile apps on environmental awareness.

Implementing courses with certifications in environmental awareness at prime institutes and digital platforms (m-learning or e-learning).

- Increasing environmental awareness through advertisements on television, YouTube, over-the-top (OTT) media service platforms, and print media.
- Making scientific journals on environmental awareness publish state-of-the-art research free to the public.
- Promoting research to solve a variety of environmental issues through innovations in science and engineering by granting funds.
- Publishing animated documentaries through schools.
- Promoting and obliging sustainable manufacturing and rewarding successful practitioners periodically.

- Promoting and incubating start-ups aimed at providing solutions to environmental issues. Conducting a bi-annual audit to ensure that environmentally responsible decisions are practiced in the institutes/organizations.
- Protecting the ecosystem and bio-diversity as every other element of the environment plays its role to maintain the equilibrium.

CONCLUSION

The present chapter essentially focuses on the immediate need to address the environmental issues, discusses its causes and solutions, and provides the strategy to overcome these problems in a long run for a sustainable future. The main objective of the chapter is to detail to the readers the importance of awareness for securing the environment.

NOMENCLATURE

ACRONYMS

CCS Carbon capture and storage

EPA Environmental protection agency

GHG Greenhouse gas emissions

LPG Liquefied petroleum gas

ODP Ozone depletion potential

OTT Over-the-top

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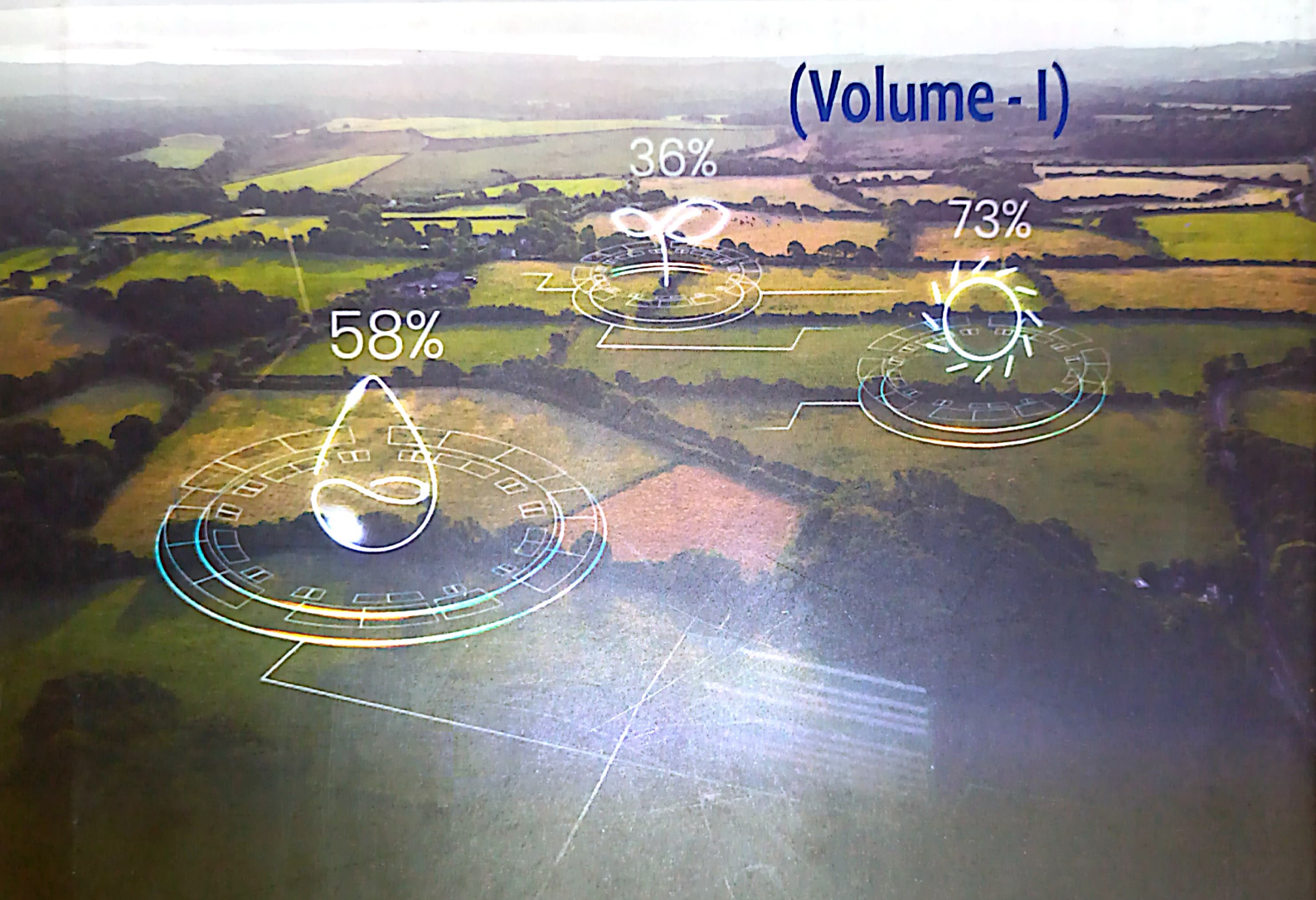

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Chapter
10

BIOMEDICAL WASTE MANAGEMENT FOR SUSTAINABLE DEVELOPMENT

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ABSTRACT

Biomedical waste generated from hospitals, research institutes, healthcare centers, and nursing homes contains hazardous and infectious materials. It is very crucial to know for the employees about the hazards of biomedical waste in the working environment. The disposition of biomedical waste is done scientifically and effectively to avoid the risk for patients, communities, healthcare workers, and their surrounding environment. Biomedical waste collection, segregation, transportation, treatment, and disposal are the steps included in the procedure for biomedical waste management. Incineration, autoclaving, microwaving, chemical disinfecting, and land filling are the methods for the disposal of biomedical waste. The proper management of biomedical waste is receiving attention for sustainable development.

KEYWORDS: Biomedical Waste, Biomedical Waste Management, Sustainable Development, Healthcare workers.

INTRODUCTION

Human activities resulted in a generation of waste. Waste is a substance that is not suited for its intended or expected use. Such waste might be harmful to human beings therefore the proper management of waste is needed. Human activities are responsible for the generation of both solid and liquid waste. Solid waste is further classified into three types a) Household waste b) Industrial waste c) Hospital waste or biomedical waste. Due to the presence of some toxic substances, biomedical waste is considered hazardous waste. Liquid waste is also divided into two types a) Liquid reagents and b) Washing or cleaning water piped in the drain (Sahil S. et. al., 2022). Biomedical waste management has a major issue of concern for nursing homes and healthcare establishments, individuals, governments, and the environment. As per the Biomedical waste Rule (Management and Handling), 1998, in

India, biomedical waste is defined as "any waste that generate in the process of diagnosis, treatment or immunization of humans and animals and research activities pertaining thereto in the production or testing of biologicals". The main factor responsible for differentiating biomedical waste into different categories is the risk which is involved in handling and treatment of biomedical waste. If such waste is unmanaged has a high tendency to show a harmful effect an on-individual's health, especially for healthcare workers and sanitation workers. Healthcare and sanitation workers constantly come in contact with biomedical waste as an occupational hazard. The mismanagement of biomedical waste affects operators, generators, and common people as well (Divya R. et. al., 2018). In the year 2009, 240 people suffered from Hepatitis B virus infection due to the reuse of syringes (Priya D. et. al., 2009). The repercussions of mismanagement of biomedical waste are hazardous such as-

a) Release of emissions during biomedical waste burning
b) Exposure of the public to infectious microbes
c) Transfer of hepatitis B and C or HIV or some blood-related diseases
d) Environmental disruptions and adverse effects on ecological balance.

SOURCES OF BIOMEDICAL WASTE

The sources of biomedical waste can be classified into two types i.e. primary sources and secondary sources. Hospitals, laboratories, nursing homes, clinics, offices of physician dentists, dispensaries, and veterinarians are primary sources of biomedical waste whereas, research institutes, and education institutes are secondary sources of biomedical waste. Health center includes infected swabs, sharp like syringes and needles, organ, tissue, blood products, and waste of animals from veterinary hospitals. 85% of hospital waste is non-hazardous, 10% is infectious and 5% is non-infectious (K. Radha et. al., 2009).

TYPES OF BIOMEDICAL WASTE

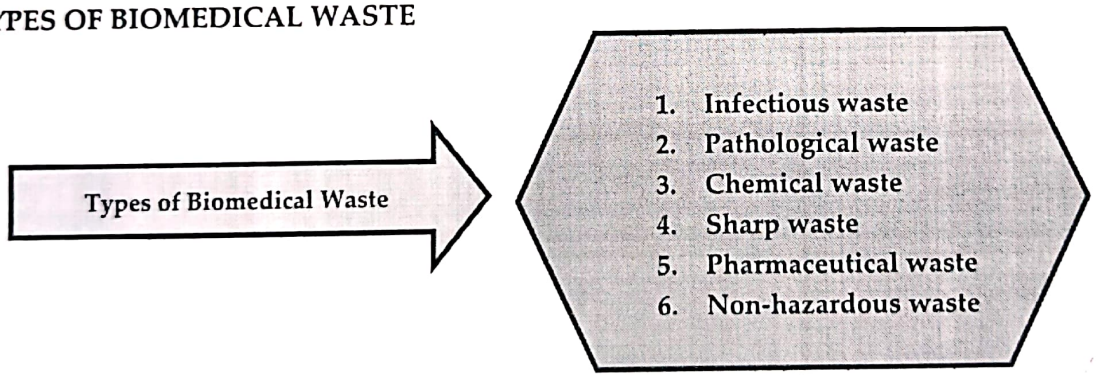

Fig. 1: Types of Biomedical Waste

1. INFECTIOUS WASTE: Infectious waste is waste that contains infectious pathogens, resulting in disease progression. The infectious waste includes laboratory cultures, microbiological products, contaminated blood material, human excreta, masks, gloves, goggles, and long-sleeved gowns. This waste can spread infection in healthcare workers or sanitation workers, and proper handling of waste is not done.

2. PATHOLOGICAL WASTE: Pathological waste includes a smaller slice of part of any organ, body part, and tissue of the human body or animal. It originates from the organ or tissue samples that are examined for diagnosis of a diseased abnormality. This waste can similarly spread a disease infection to infectious waste due to the presence of infectious viral particles in organ tissue.

3. CHEMICAL WASTE: Chemical waste accounts for nearly 3% of waste that originated from health care centers or nursing homes. The chemical waste contains a substance such as expired disinfectants, laboratory reagents, solvents, and waste that contains heavy metal (broken thermometers, Batteries).

4. SHARPWASTE: The sharp Sharpen of the important types of biomedical waste. It is composed of scalpels, infusions set, intravenous or hypodermic needles, blades, syringes, and broken glasses. Healthcare workers are infected by sharp waste very easily if it is contaminated with a virus. Therefore, proper disposal of sharp waste is necessary to prevent infections (Saikiran C. et. al., 2021).

5. PHARMACEUTICAL WASTE: pharmaceutical waste includes expired pharmaceutical products, contaminated pharmaceutical products such as vaccines, transdermal patches, etc.

6. NON-HAZARDOUS WASTE: It includes office paper, water bottles, food waste, and newspapers.

7. OTHER WASTE: The waste generates during various diagnostic methods and test kits are another type of biomedical waste produced in substantial amount in healthcare center and nursing homes.

MANAGEMENT OF BIOMEDICAL WASTE:

The wastes like tissues, organs, bandages, needles, blood products, and body parts discharged from healthcare centers are segregated, collected, stored, transported, treated, and disposed of in properly.

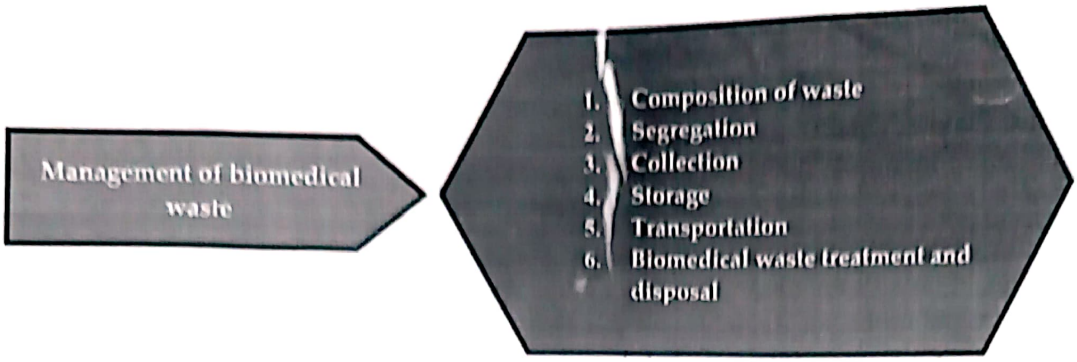

Fig. 2: Steps for Management of Biomedical Waste

1. COMPOSITION OF WASTE: It is necessary to identify the type of biomedical waste and the amount of biomedical waste for the successful management of biomedical waste.

2. SEGRATION: segregation is defined as the basic division of biomedical waste into various categories thereby lowering the cost of disposal of waste. This process can differentiate biomedical waste into different categories and place each one of the categories of waste in separate coded bags or containers of a point where waste is generated.

COLOUR CODING SYSTEM FOR WASTE SEGREGATION

Yellow, Red, Blue, and White bins color coding system is used for biomedical waste segregation. A different kind of waste is collected in various color-coded bags.

Table 1: Plastic bag color coding for biomedical waste segregation

Yellow Bags	Red Bags	Bluebags	White Bags
Human organs, tissues, body parts, discarded capsules and tablets, culture plates, laboratory reagents, blankets, matrices, bed sheets contaminated with blood, etc.	Plastic tubings, catheters, gloves, urine bags, etc.	Glass bottles, plates, body implants, screws, etc.	Scalpels, blades, hypodermic needles, fixed needle syringes, etc.

3. COLLECTION: The biomedical waste generated from the hospital ward, laboratory, and operation theatre is collected into different containers.

4. STORAGE: There is a certain limitation clause for biomedical waste. Biomedical waste generated in multi-specialty hospitals should be stored for 8-10 hrs. Only and not more than 24 hrs in nursing homes.

5. TRANSPORTATION: Transportation of biomedical waste has to be done by using containers and carts. Vans and trolleys used to transport biomedical waste should be cleaned regularly. During transportation, we should take a precaution so that there is no spillage of biomedical waste from vans and containers (Mohammed S. et. al., 2019).

6. BIOMEDICAL WASTE TREATMENT AND DISPOSAL

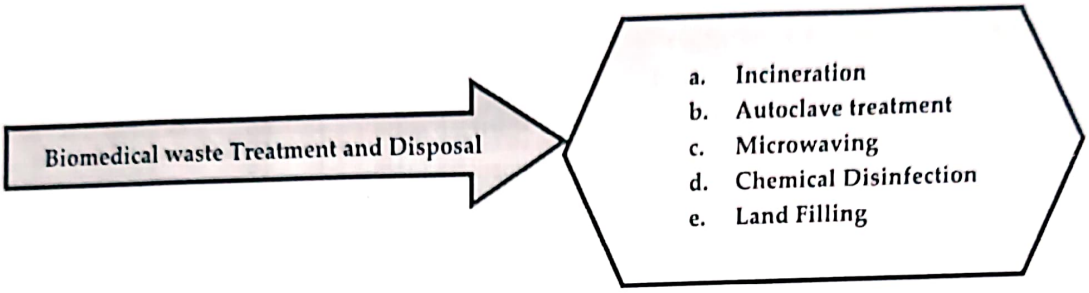

Fig. 3: Techniques for Biomedical Waste Treatment and Disposal

a. INCINERATION: The rise in temperature results in dry oxidations. The incineration method is used to reduce organic waste into inorganic waste and combustible waste into incombustible waste to decrease the weight and volume of biomedical waste which cannot be reused or disposed of in the open field. The incineration method is suitable for sharp and pathological waste (Farook S. et. al., 2012).

b. AUTOCLAVE TREATMENT: Autoclave is an instrument that is used to sterilize medical types of equipment. Autoclave work on concept steam under pressure. Autoclaving helps inactivation of the microorganisms that present in medical waste before of its disposal. It can operate at 121°C for 60 minutes. Autoclaves are used to manage up to 90% of biomedical waste (Kirti M. et. al., 2016).

c. MICROWAVING: In microwaving, the process of disinfection of biomedical waste is carried out by steam and moist heat which is generated due to microwave energy. The particles in biomedical waste vibrate due to high microwave frequency (300- 300000 MHz). These vibrations generate that and disinfect the waste (Kirti M. et. al., 2016).

d. CHEMICAL DISINFECTION: Chemical Disinfection is generally preferred for the treatment of infectious liquid waste. Dissolved chlorine, sodium hypochlorite, peracetic acid, chlorine dioxide, and hydrogen peroxide are some examples of chemicals used for the treatment of biomedical waste (Vinodini R. et. al., 2021).

e. LAND FILLING: Land filling is specially designed for the disposal of waste in the ground. Effectively treated biomedical waste is no longer hazardous and it is mixed along with the typical solid waste for disposal.

CONCLUSION

Every healthcare center and nursing home which generate biomedical waste must set up required treatment facilities to make sure proper treatment and disposal of biomedical waste to decrease the risk of contact or exposure to patients, doctors, community, and staff from hazardous biomedical waste. Safe management and disposal of biomedical waste is our legal necessity and social responsibility.

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An edited, book emphasized environmental welfare by representing the emerging trends and sustainability of the environment. Environmental sustainability has become the most emerging terminology concerning environmental hazards and climate change. For handling the climatic crisis, there is a need for environmental sustainability, and studying the emerging trends in this area has become an indispensable part. The book contains integrated information on climate change causes, sources, prevention, and solution to reduce the consequences. It includes environmental awareness, climate change, environmental legislations, conservation of biodiversity, green economy and technologies associated with eco-friendly development, the impact of the environment on human health, assessment of environmental impact, global environmental sustainability, remote sensing, and geographical information systems, emission of greenhouse gasses and carbon footprints, bio-economy, recycling and management of waste, sustainability of the ecosystem, depletion of the ozone layer, pollution, hazards to an ecosystem, etc. the integrated knowledge and detailed studies are depicted in this book. The present book studied the emerging trends associated with environmental sustainability. The workers belonging to environmental sciences, life sciences, geographical studies, ecosystem studies, etc., can be benefited from this book.

About the Editor

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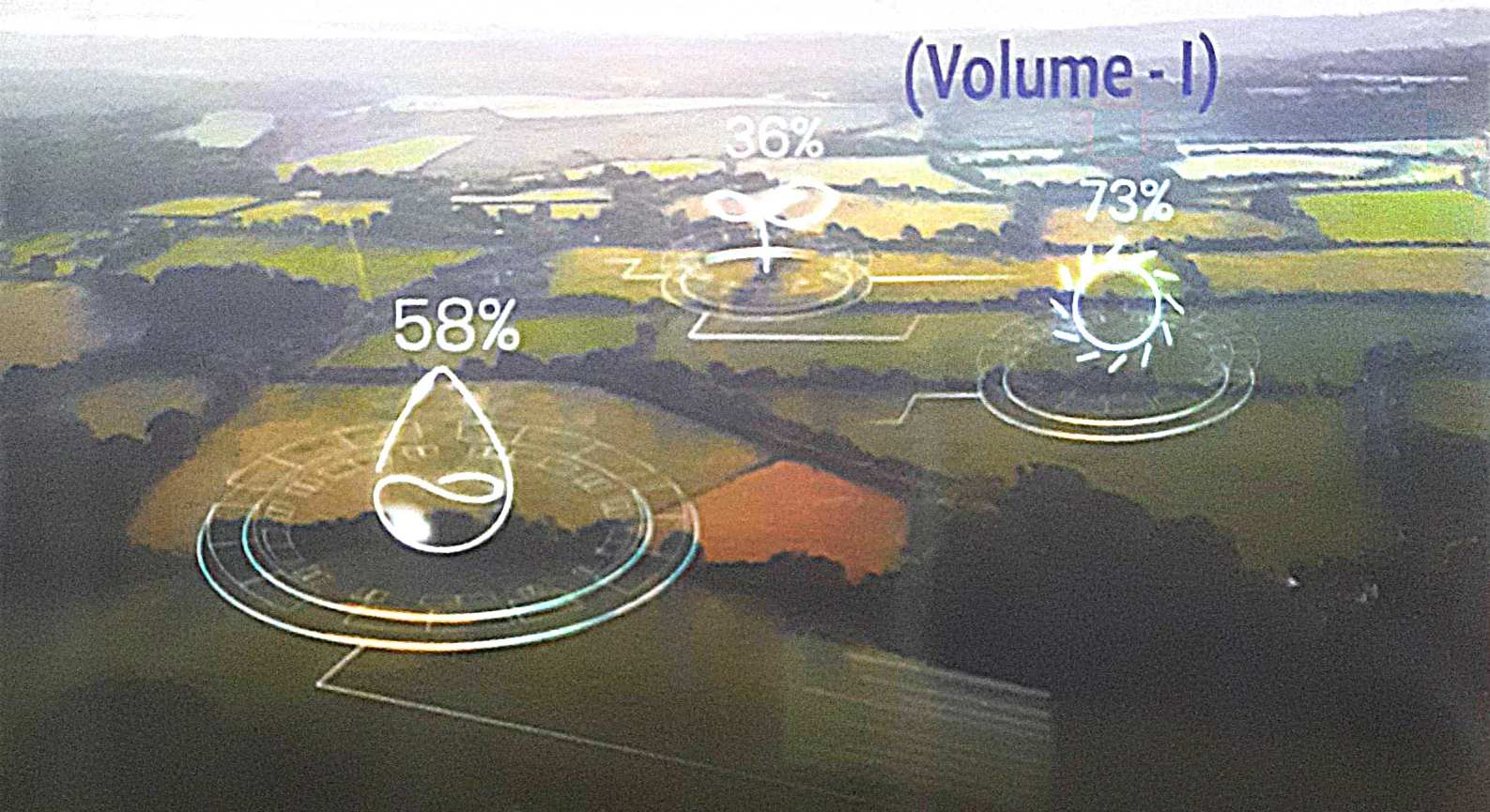
EMERGING TRENDS IN ENVIRONMENTAL SUSTAINABILITY

(Volume - I)



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SCIENG PUBLICATIONS

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Chapter 16

RECENT TRENDS IN ENVIRONMENTAL ENGINEERING

CHAUDHARI YOGESH[1]

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ABSTRACT

Nowadays, Environmental engineering is a rapidly rising new interdisciplinary area in the engineering field. The environment is playing a very essential role in the survival of living things. Environmental conservation is the world's requirement. For the preservation of the environment, theoretical understanding is not enough although it also required technological things. The developed community in which enormous importance on environmental engineering to accomplish innovative modification in areas of social, agriculture, economical, scientific, industrial as well as cultural fields. Environmental engineering is described as the regulation in an area of technical science in which engineering techniques are greatly used. It is mainly useful in environmental protection. Environmental engineering is widely applied in the field of the control of waste, soil destruction, water resources, and industrial activities including new things of green chemistry.

KEYWORDS: Environmental engineering, Sustainable Development, GIS.

INTRODUCTION

The environment is described as the total of living as well as non-living elements in nature that mainly affect human life. The environment is the conditions surrounding or areas where all things live (Gana and Peter, 2015). The Environment consists of abiotic elements like climate, land, and atmosphere including water; biotic elements include animals, bacteria, viruses as well as plants (Adewuyi et al., 2018). Environmental issues are rising presently because humans' lifestyles are changed due to that biodiversity reduction, excessive utilization, as well as unbalanced inconsequent application of valuable resources occurred. A present environmental catastrophe mainly occurred due to anthropogenic activities that build to prepare our perception of science including technology it may be a proper reply to the decline of valuable resources as well as environmental contaminations (Castellanos et al., 2021).

Environmental engineering is a rapidly rising new interdisciplinary area in the engineering field. Environmental engineering includes an application of applied science along with technology to enhance living standards. That consist of biology, chemistry, mathematics, physics, planning, as well as economics. The main aim of this field is human health safety, environmental standards preservation, regulation of aesthetics addition to biodiversity sustainability along with standards of living. The field of inclusion consists of management of water, regulation of solid substances, control of liquid waste as well as gaseous substances regulation, in municipal along with industrial regions. One of those areas, work is included in the pattern, studies, construction, arrangement, operation as well as preservation. Consequently, environmental engineer duties included communication with persons; an external environment; acts, standards, rules including suggestions; projects endowment; energy including system aiding industries. Human health engineering in historical background, an environmental engineering area is increased with development in widest engineering regulation it is presently perceived, inclusive of various kind of disciplines as well as sub-disciplines (Smith et al., 2002).

Geographic Information System term was coined by Roger Tomlinson in the 1960s (Gajos and Sierka, 2012). GIS is playing an important role in the agriculture area. The rising role the agriculture management worldwide through supporting farmers enhances crop productivity, lower expenditure as well as maintains land well effectively (Chandrakar et al., 2016). The use of GIS technology understands the properties of the environment, to preserve the environment. it is an important technology for regional as well as rural arrangements (Liu and Cheng, 2020).

ENVIRONMENTAL ENGINEERING

The environmental industry is rapidly rising industries currently, urban development, growth of population, economic as well as industrial development, with rising resource utilization in current decades due to that causes various environmental issues worldwide. Decreasing biodiversity, greenhouse gases released, deforestation including vegetation elimination, water, soil as well as air pollution, along with climate change are the main environmental problems in developing countries. So, the action of environmental conservation with sustainable development is the basic aim to enhance community life. Use of several sciences along with technologies in the area of sustainable assessment. Environmental engineering is an interdisciplinary area it needs the composites of physicochemical including biological basis and engineering study to save as well as improve the environment. An area of the environmental engineering associated plan from several branches to make a program it possesses powerful establishment in science as well as engineering. Environmental engineering is described as a category of the environment it

uses scientific as well as engineering basis to save the environment as opposed to harmful consequences of the natural components with probably adverse events of natural as well as human activities with to enhance the environmental status.

Environmental engineering is main according to the basis on engineering, biology, and soil science including chemistry to clarify environmental issues (water, soil, in addition to air) these are analyzed in environmental engineering. Environmental science is mainly a union of physicochemical, biological, geological, and social in addition to cultural sciences it is connected to the life of the person or community. Environmental issues may be associated with several components like population expansion, climate change, in addition to habitat destruction. Several issues are occurred due to human activities; with these issues are a danger to human health. These major environmental issues face currently that does not clarify exclusively with science including knowledge, although the uniform analysis with knowledge of economics, culture, ethics, sociology, economics as well as politics may clarify it in that manner environmental engineering is greatly useful (Saremi et al., 2020).

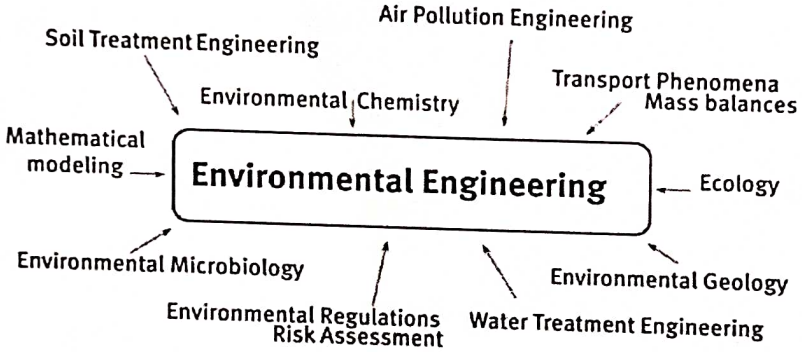

Fig. 1: Role of Environmental Engineering for Sustainable Development (Salic and Zelic, 2018).

IMPORTANCE OF ENVIRONMENTAL ENGINEER

Nowadays, the extinction of species including rainforest reduction as well as a negative impact on the environment including climate, due to that wildlife destruction occurred. For that reason, the way of living is denoting rising problems it placed on the resources as well as an environmental process like water, air including land, unable to carry on continuously. In these aspects environmental impacts on the community and the importance of the engineer in protecting, and saving along with decreasing the environmental issues that mainly impact sustainable development is extremely crucial considering the negative effect, that issues may be managed through the environmental engineer. Environmental engineering gives prominence to environmental engineering that is related to the role of

science as well as engineering basis for saving the population pressure from, a consequence of the negative environmental components, protect to environments from the probably harmful impacts of the natural as well as human actions, with enhancement the quality of the environment.

The environmental engineer implements science with technology it approaches the problems of energy conservation and formation with the regulation of the waste from human as well as animal activities. Moreover, it is involved in determining probable answers in areas of community health, like water-borne infections, enactment of rules that assist appropriate cleanliness in the urban, rural in addition to common regions. An environmental engineer is mainly incorporated in animal agriculture, garbage disposer, air pollution regulation, management of wastewater, recycling, community health as well as environmental engineering rules.

The environmental engineer analyzes a consequence of the technological development in the environment, through performing studies on the management of harmful waste to assess the importance of those dangers, and guidance on the treatment with constraints including an advance directive to restrict problems. The frequent regional, as well as global environmental problems like the consequence of acid rain, water pollution, global warming, ozone reduction in addition to air pollution, take place due to automobile expend as well as industrial activities. It is involved with the economy including environmental sustainability. So, that is the responsibility of the environmental engineer it motivates as well as recommended stakeholders intricated, by restricting along with decreasing the issues associated with environmental effects on public health. An ecosystem is constantly contingent on environmental concerns on the regular way like global warming, water as well as air pollution including habitat reduction from the economic growth. In an ecosystem, human beings are devoted to similar inconveniences and notable health effects, that the environmental engineer required proficiency to restrict with decrease the consequences on the environment (Otti et al., 2018).

ROLE OF ENVIRONMENTAL ENGINEERING FOR SUSTAINABLE DEVELOPMENT

Environment preservation is the world's fact. For the preservation of the environment theoretical understanding is not enough although that also required technological things. Environmental engineering is a field of technical understanding that is mainly associated with environmental issues including clarification from it. Environmental engineering mainly focuses on enhancing as well as regulating nature's ecosystem. The main goal of sustainable development is to enhance the situation of the current state does not adjust to the demand of generations to come. Environmental engineering can be used for sustainable development. The civilized community is which enormous extent of environmental

engineering to lead to growing alternation in the area of industrial, agriculture, social, scientific, economic as well as cultural fields.

Environmental engineering is described as a direction in an area of technical science in which an engineering approach with techniques is used. That may be proficiently used in environmental conservation. Environmental engineering is majorly used the in fields of water resources, soil erosion, waste control, industrial activities, and air protection in addition to a new approach to green chemistry. To the extent that the addition of environmental engineering as preservation of the environment involved may be stated the importance of environmental engineering is excellent. The various kinds of importance the environmental engineering like reducing soil erosion to protect the forest, air pollution reduces as far greatest degree with the help of environmental engineering, and the breakdown of the biosocial complex is resisted with the use of environmental engineering techniques, That also involved in the sustainable development of a nation, agriculture advances is required with necessities may be achieved with the help of environmental engineering, world worldwide catastrophe on the environment that may be reduced through the use of environmental engineering techniques, a worldwide catastrophe on the environment that may be reduced through the use of environmental engineering techniques, Environmental engineering is applicable for conservation of the social energy, That is very useful for the social as well as economical growth (Mishra and Dhal, 2017).

APPLICATION OF GIS IN ENVIRONMENTAL ENGINEERING

Environmental engineering is an interdisciplinary area it greatly used for the study of geographical information (Zuki et al., 2022). Human developmental activities are challenged in recent times to protect the environment with preserving a well standard of life. Although begins the advancing actions, an assimilative ability of environmental factors like water, air as well as a land of several pollutions is infrequently analyzed.

GIS is important for study including developing a fast reduction strategy for hazardous environments. GIS is mainly used in environmental facts structure for details confirmation, data restoration/distribution including examination. GIS is an essential technology it may be useful to restrict harm to essential resources including habitats of the woodlands as well as wetlands. GIS is a very crucial technique it is used by environmentalists to achieve, examine, and maintain as well thematic oceanic information by map formation. Prosperous perception including the reply of the infectious disease explosion is mainly based on the capability to regard a neighboring condition. The various kinds of water/wastewater use the GIS techniques to incorporate various kinds of details including the importance of the geographic constituent in the single controllable system.

USE OF GIS IN AGRICULTURE

GIS is playing a very essential role in an agricultural field regulating crop productivity, observing crop rotation methods, as well as extruding soil reduction in agricultural fields. Stabilizing inputs along with outputs in the field is the elemental advantage. GIS possesses the ability to assess including conceiving agricultural environments with functionality confirmed to be greatly useful included in the agricultural sector.

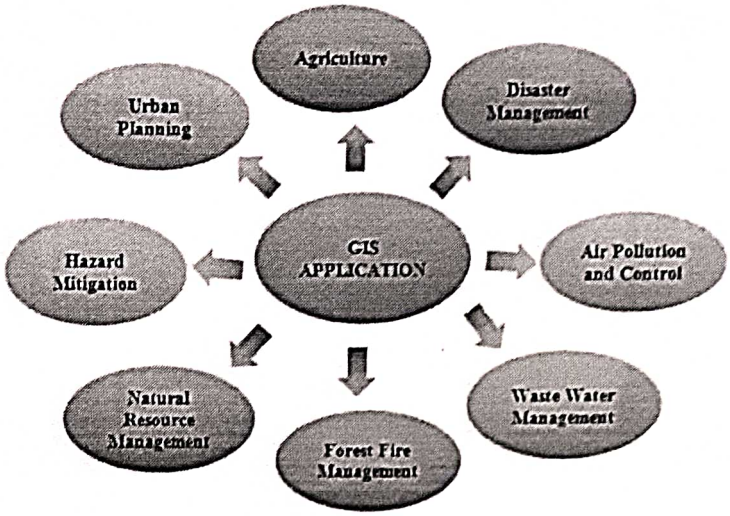

Fig. 2: Environmental Applications of GIS.

ROLE OF GIS IN CLIMATE CHANGE

The GIS is an advanced technique majorly used the scientists, planners as well as engineers to show including study all kinds of region-assigned data consisting of meteorological details. To examine a probable interaction within several components, going us near to the correct perception of how the climate changes in the next decade along with centuries.

ROLE OF GIS IN FOREST MONITORING

Effectual forest administrators detect changeable circumstances that take inventive findings for sustainable protection. GIS is useful for evaluating situations by historical evaluation, kinds of soil, changing climate design as well as land usage. Geographical data give forest administrators guidelines for assessing the design.

GIS FOR AIR QUALITY

The air standards are essential for health including the surrounding, although the root of pollution is complicated to observe. GIS systems maintain statistical as well as geographic information to give a system it depicts a link in low air standards including the events of

lacking humans including ecosystem health. Hence, the GIS help in managing contaminants released. GIS system enables finding where contaminants are derived from along with managing these regions and preserving air standards.

GIS TO ASSIST IN THE EARLY DETECTION OF INFECTIOUS DISEASES

The disease spreads in a geographic region, with intrusion taking place as regards human, climatic in addition to various types of landscapes. GIS technique described various types of information to geographic region, that excels in pursuing disease spread as well as medical provisions, availability of testing facilities, health care personnel allocation in addition to the availability of hospital bed. The outbreak, GIS gives tools it fasts the accumulates of precise area information. GIS evaluation like detecting an implicit disease hot spot including determining a close-by hospital's capability to manage the predicted rise in the service necessary whether the outbreak becomes takes place (Khandve and Mokadam., 2011).

Table 1: Application of GIS.

Field	GIS Application	References
Agriculture	Soil analysis, crop yield evaluation	Ghosh and Kumpatla, 2022
Forestry	Management of resources	Sonti et al., 2015
Health	Health and Human Services	Singh et al., 2005
Urban utilities	Urban planning and development	Singh et al., 2005
Disaster management	Mapping hazard-prone regions, Emergency management	Singh et al., 2005
Environment	Environmental impact analysis	Singh et al., 2005

CONCLUSION

Environmental engineering is a rapidly rising new interdisciplinary area in the engineering field. Environment plays a major role in the economic growth of a nation. Intensive Growth in the economy is a specific issue that is largely or mostly based on science, culture, language as well as society as a whole. Environmental engineering is a major innovation in the field of science and technology. Environmental engineering is efficiently utilized for the preservation of the environment. The developed community in which enormous importance on environmental engineering to accomplish innovative modification in areas of social, agriculture, economical, scientific, industrial as well as cultural fields.

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About the Editor

Asst. Prof. Aakash Dilip Pawar, M.Sc., B.Ed., NET, SET, D.M.L.T, D.S.M, Asst. Prof. Aakash Dilip Pawar currently working as Head of the Department of Microbiology and Assistant Professor at K.J. Somaiya College of Art, Commerce, and Science, Kopargaon (Maharashtra). He has completed his Post Graduation in Microbiology from K.T.H.M College, Nashik. He has more than Four years of teaching experience in various disciplines of undergraduate and postgraduate courses in Life Sciences viz.., Genetics, Molecular Biology, Virology, Immunology, Medical Microbiology, and Biochemistry. He has guided more than 40 students in their M.Sc. dissertation work. He has published many Research papers/articles in an international peer-reviewed journal and received an **"International Best Researcher Award 2022"**. He has been appointed as **"Editor" (Editorial Board Member) and Reviewer for Multiple International Journals.** He has been awarded the **"National Best Teacher"** by SRA, Bangalore National Award 2022. He has been awarded **"Best Head of the Department (H.O.D) 2022"** by "Research Education Solutions" in Association with "The International School of Technology and Sciences AP". He has also been awarded the **"National Eminence Award"** by Global Worthy Wellness Foundation.

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EMERGING TRENDS IN ENVIRONMENTAL SUSTAINABILITY

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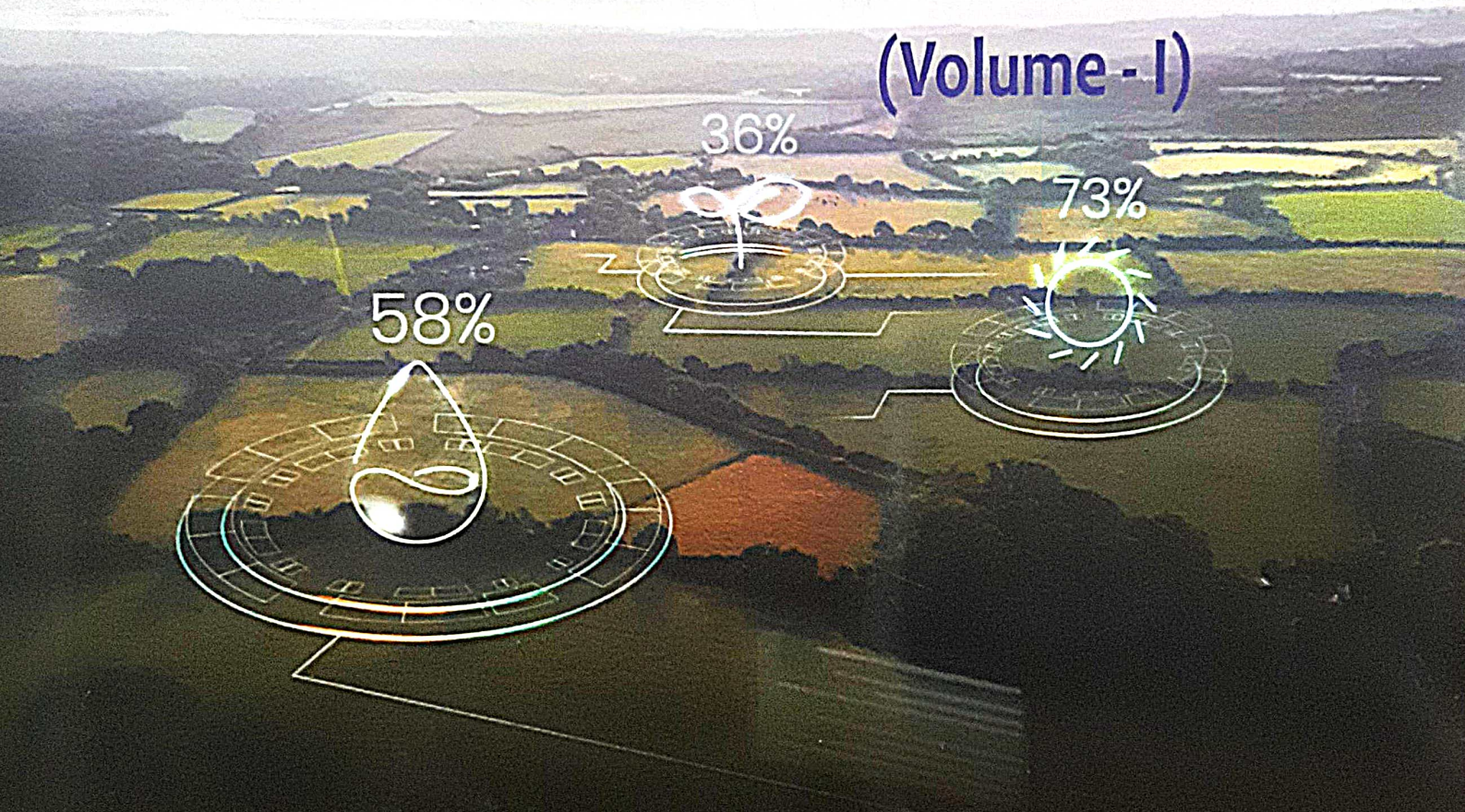

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SCIENG PUBLICATIONS

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Chapter 20

RECENT TRENDS IN GREEN TECHNOLOGY FOR A SUSTAINABLE FUTURE

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ABSTRACT

The present study focuses on the crucial and economic sustainability of green technology. Some natural resources are unable to be renewable to overcome this problem green technology found solutions including various types of alternative resources for a sustainable future. By using available natural sources like sun, water, wood, and air electricity can be generated as well as biofuel can produce from sugarcane, maize, etc. Electronic vehicles are the best example of the development of green technology. Also, other examples of green technology are solar power and wind power. Green chemistry is a newly established method that helps to reduce harmful chemicals that are toxic and convert them into eco-friendly ones. Green information technology synthesizes environment-friendly disposable material which required less energy. Green energy is the best way for the production of renewable energy by using natural sources. To reduce dependency on natural resources. Green building is an innovative way for a sustainable environment and helps to improve human health. Nanoparticles can be useful for the purification of water and the method will be cost-effective. The main aim of green technology is to help to control changes that occur in climate in today's situations. With the help of green technology, it is possible to reduce the negative impact of humans on the environment and waste management can be simplified.

KEYWORDS: Green technology, Renewable sources, Green Chemistry, Green building, and Sustainability.

INTRODUCTION

Green technology is an innovative environmentally friendly method for a sustainable future. In this approach, various types of technology and scientific terms are involved to diminish human influence on nature (Wang et al., 2021). Clean technology is another word for green technology which helps to conserve the environment (Hall et al., 2010). In our living world, there are a very limited amount of natural resources available which are unable to be renewable (Shafiei et al., 2017). Some natural resources have been already

depleted over time. With the help of green technology, it is possible to the production of alternative sources such as clean energy, alternative fuels, and other technologies which are not harmful to the environment. According to the year, 2018 Global footprint research study showing humans are using these natural properties 1.7% more rapidly than the earth can able to restore. Therefore it is today's need to create interest in green technology which prevents the environment by controlling climate change. Through this technology, it is possible to find out new progressive and advanced technics which are helpful to reduce our dependency on natural non-renewable sources including fuel and fossils (Mueller et al., 2017). Wind and solar discovery is the best part of green technology. It cannot produce harmful waste and products which won't harm the planet.

AMBITIONS OF GREEN TECHNOLOGY

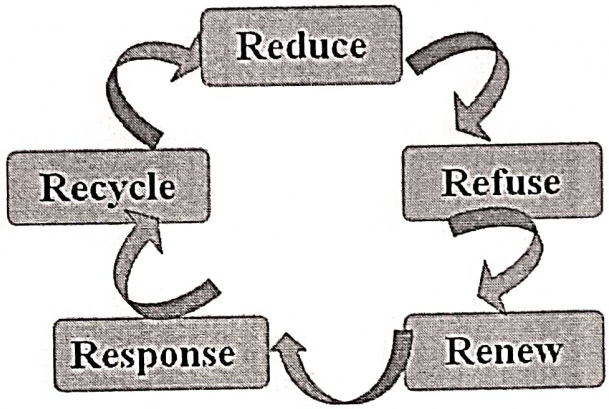

Fig. 1: Goals for the sustainable green technology

REDUCE

The main objective of green/clean technology is to reduce the harmful emanation of Carbon dioxide and apart greenhouse gases that harm the environment. By this mechanism avoiding climate change is possible. By controlling waste, Energy consumption, wastage of clean water and meaningless use of fuels sustainable future is possible.

REFUSE: Refuse the usage of all the materials which are not friendly to the environment and not easily decomposed. Refuse the utilization of plastics. Non -eco-friendly substances cause a huge loss of nature.

RENEW: To prevent the environment from danger some products can able to renewable. Organic waste is not harmful to the environment so we can reuse it for some purpose. Using natural resources including water, sun, and wood from that energy is produced. This energy is called renewable energy. Power from Wind, water, solar, wastewater, and biofuel-producing energy is renewable (McDonough et al., 2003).

RESPONSIBILITY: It is everyone's responsibility not to et al., 2003). Waste electricity by switching off electrical things after use. Also, not to waste water, do not waste fuel unnecessarily, and more importantly, do not waste food and cook food as much as required.

RECYCLE: Recycling is the best option for avoiding pollution as well as saving time and money. Paper, batteries, cans, clothes, and plastics all these things can recycle (Qamar et al., 2021).

BRANCHES OF GREEN TECHNOLOGY

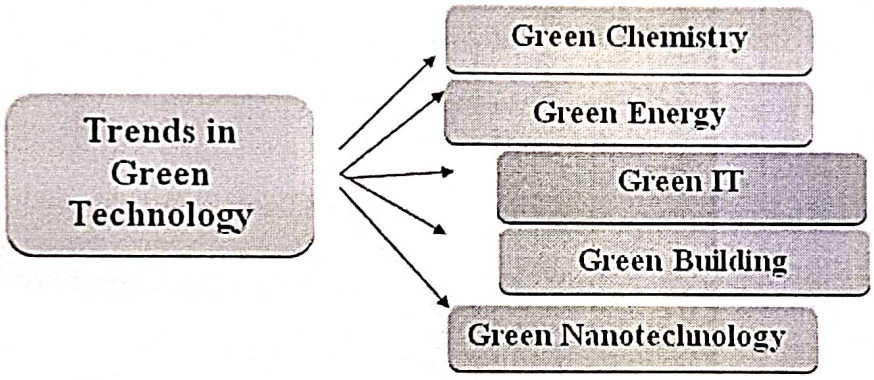

Fig. 2: Present trends in Green Technology

GREEN CHEMISTRY

In 1991, Paul Anastas was the first person who found the term green chemistry and exhibits it in a program organized by the US environmental protection agency (EPA) for the implementation of the development of sustainable chemistry. It is also known as sustainable chemistry. The aim of green chemistry is the prevention of pollution. The meaning of green chemistry is the proper designing and manufacturing of chemical products and processes that reduce or eliminate the use of hazardous chemical substances. By this method, chemically harmful substances are reduced and waste remains environmentally friendly (Sharma et al., 2019).

Following are the principles of green chemistry developed by Paul Anastas:

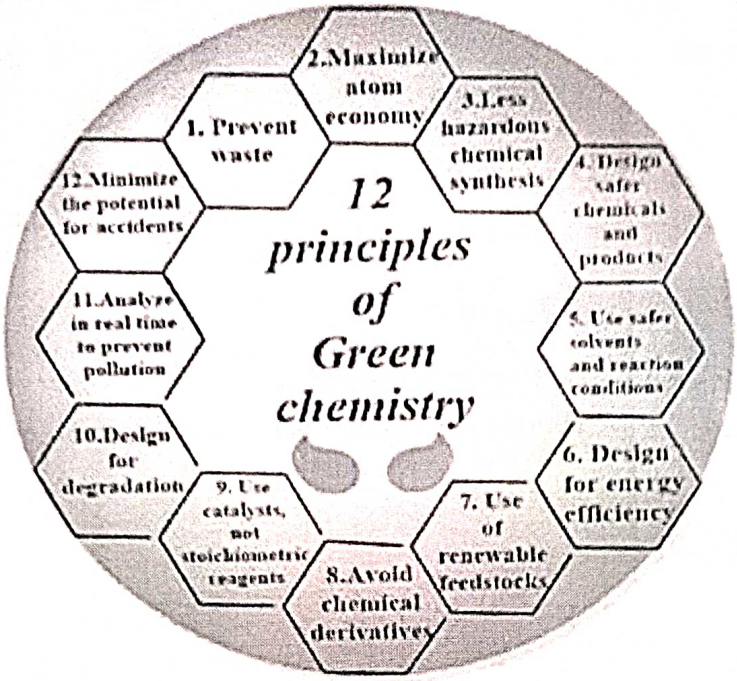

Fig. 3: Green chemistry principles

1. **PROHIBITION OF WASTE:**
   Hundreds of tons of waste are emitted into the air, water, and land by various types of industries every single day. Prevention of waste is a better choice than cleaning up and treating the waste after created. Using a chemical process in such a way that there is no formation of byproduct (Krass et al., 2013).

2. **SAFE CHEMICAL AND PRODUCT:**
   The chemical products should be designed in a way that has high efficacy and less toxicity.

3. **SECURE SOLVENTS AND AUXILIARIES:**
   Sometimes solvents are inflammable and carcinogenic which are hazardous to human health. Avoid the use of auxiliaries' substances including solvents, which are separate agents if possible.
   EXAMPLE: In recent years dry cleaning fabric, toxic solvent perchloroethylene was used which one replaced by liquid CO_2.

4. **THE EFFICIENCY OF ENERGY:**
   The energy required for the process should be carried at a low degree of temperature and pressure.
5. **DON'T USE CHEMICAL DERIVATIVES:**
   At the time of derivatization avoid the protecting group, and blocking group if possible. Because they highly increase waste products during the process.

6. **CATALYST:**
   Catalysts help increase the rate of reaction and minimize waste. Selective catalysts are preferred as a stoichiometric reagent.

7. **FORMATION OF CHEMICALS AND PRODUCTS TO DEGRADE:**
   Products should be manufactured in a way that in the end, they should be breakdown into harmless degradation and not harm the environment.

8. **REAL-TIME EXAMINATION FOR POLLUTION:**
   Advanced methods are needed to check real-time, monitor, and control the process before the production of hazardous substances.

9. **SAFEGUARD CHEMISTRY FOR ACCIDENTAL PREVENTION:**
   Chemical materials should be avoided during the process which creates chemical accidents, fire, and blasts. This concept motivates chemistry at the social and educational levels.

10. **UTILIZATION OF RENEWABLE FEEDSTOCK:**
    Raw materials used in feedstock should be able to renew.

11. **ATOM ECONOMY:**
    Atom economy uses to measure the total productive atom utilize from starting to the end of the chemical process. It is a better way to calculate the efficiency of the reaction than the reaction yield.

12. **HARMLESS CHEMICAL SYNTHESIS:**
    Operate synthetic methods for the production of nonhazardous substances for human health and also nature.

GREEN ENERGY

The energy created by using natural sources such as water, and wood, and with the help of the sun is called green energy. It is unable to cause environmental pollution and does not harm nature and animals. It can be useful for cooling water, heating water, generating electricity, and for transport electricity (Midilli et al., 2006). This type of energy is eco-friendly.

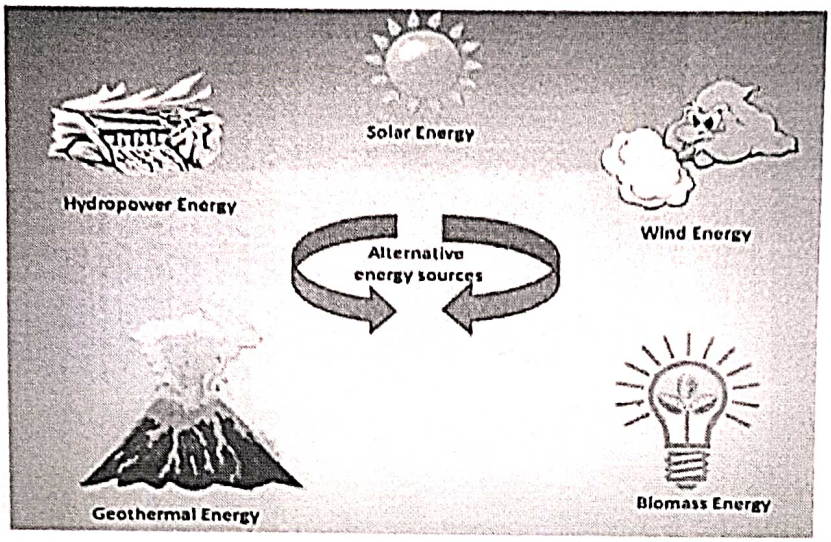

Fig. 4: Types of Green Energy

SOLAR POWER: Solar power known as energy is converted from sunlight to electricity. The year of 1955, the first solar car was created by William G. Cobb. It was a 15-inch tiny vehicle. It was known as the sun-mobile. Samsung Company of India launched solar dependent phone, Known as the Solar Guru in 1107. That phone was able to charge anywhere in the presence of sunlight. One hour of doing solar charging was an able call for 5-10 minutes.

WIND POWER: Wind turbines are helpful for the conversion of kinetic energy into mechanical energy which uses for the production of clean electricity. In the year 1920 Betz prove that wind machines can be creating captured 59.3% of the power. If a 2-megawatt turbine is put appropriate manner it can provide sufficient emissions of electricity power to 500 houses for one year (Islam et al., 2013).

WATER POWER: To make electrical energy hypo electricity utilizes the energy through running water. Hypo electric point is high on the place where stored the running water. High-flow water produced better electricity. Sometimes waves form in the water of the sea producing eco-friendly electricity (Elghali et al., 2007).

GEOTHERMAL ENERGY: Geo–Earth; Therm-Heat of earth. Geothermal energy is synthesized from the heat created by the earth.

BIOFUEL: Biofuel creates from biological sources such as sugarcane or wood waste. These are alternative sources of natural fuels.

BIOGAS: Biogas is produced from the breaking down of organic material. It is a renewable source. It is also used in kitchens in some villages. In some places, street lights are also utilizing this gas.

GREEN INFORMATION TECHNOLOGY:

The goal of green IT is to reduce the negative impact of materials used in computer operations. Finding a way to manufacture its environmentally friendly product which can be easily decomposed. Therefore, less energy is required for the disposal of the material synthesized by using green technology. It is possible by this concept to reduce of consumption of energy and Cost-effective techniques. Also, find a way to renewable sources (Murugesan et al., 2008).

GREEN BUILDING:

Green buildings are designed for enhancing the efficacy of building and utilize energy. It is built to decrease the harmful impact on human health and creates a positive impact on nature is the goal of this concept. Ecofriendly painting, bamboo, and woven wool are now used for carpeting. Using ecological concrete and enhancing the quality of human life. Example: Aluminum, green roof (Zuo et al., 2014).

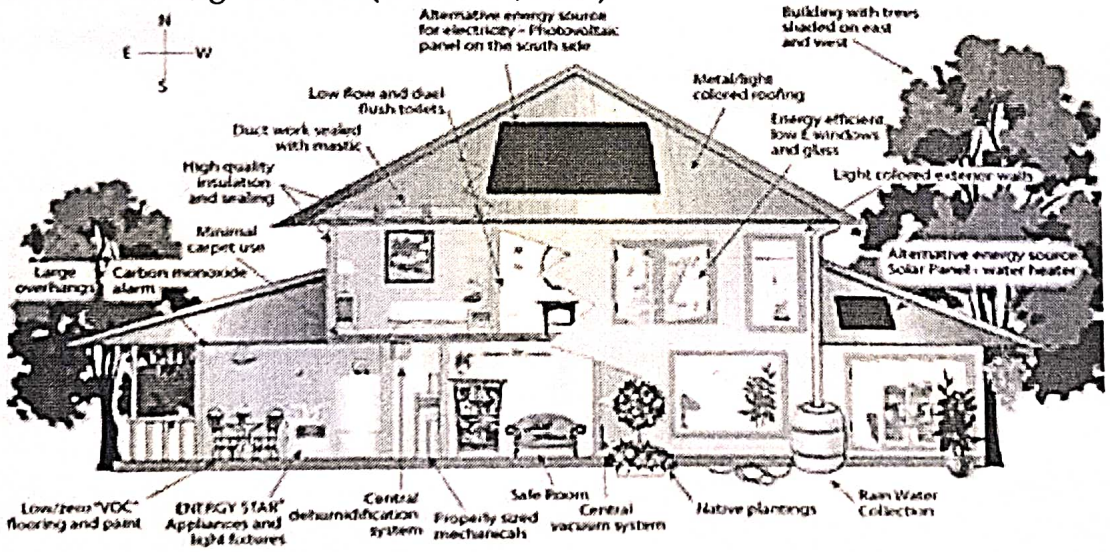

Fig. 5: Layout for the Green Building

GREEN NANOTECHNOLOGY

Nanotechnology is now used to the improve sustainability of our environment. Nanomaterials are not dangerous to the health of the environment. With the help of this concept risk to human health can be reduced (Nasrollahzadeh et al., 2019). Due to the human influence and increasing, population clean water treatment is essential. By using this nanoparticle alternate solution can be provided to clean germs from the water bodies. Nano filters are helpful for the purification of water and are also cost-effective. By using nanoparticles, it is possible to removing of industrial pollutants from contaminated soil, air, and water present underground (Guo et al., 2012).

CONCLUSION:

The present study concludes that it is necessary to protect our surrounding environment, conservation of natural resources, and development of other economical features for a sustainable future. A healthy environment requires awareness of sustainable development. This awareness will help to enhance the development of green technology. There is a need of obtaining changes in productivity and consumption motif of resources. By using natural sources alternative resources are forming that are not harmful to the environment, and renewable energy production is possible due to this term. Due to the green chemistry, environmentally friendly waste can be generated and the production of toxic waste reduces. A living cost-effective and healthy life is possible because of the development of green buildings. Branches of green technology are providing a precious impact on human as well as environmental health.

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About the Book

An edited, book emphasized environmental welfare by representing the emerging trends and sustainability of the environment. Environmental sustainability has become the most emerging terminology concerning environmental hazards and climate change. For handling the climatic crisis, there is a need for environmental sustainability, and studying the emerging trends in this area has become an indispensable part. The book contains integrated information on climate change causes, sources, prevention, and solution to reduce the consequences. It includes environmental awareness, climate change, environmental legislations, conservation of biodiversity, green economy and technologies associated with eco-friendly development, the impact of the environment on human health, assessment of environmental impact, global environmental sustainability, remote sensing, and geographical information systems, emission of greenhouse gasses and carbon footprints, bio-economy, recycling and management of waste, sustainability of the ecosystem, depletion of the ozone layer, pollution, hazards to an ecosystem, etc. the integrated knowledge and detailed studies are depicted in this book. The present book studied the emerging trends associated with environmental sustainability. The workers belonging to environmental sciences, life sciences, geographical studies, ecosystem studies, etc., can be benefited from this book.

About the Editor

Asst. Prof. Aakash Dilip Pawar, M.Sc., B.Ed., NET, SET, D.M.L.T, D.S.M, Asst. Prof. Aakash Dilip Pawar currently working as Head of the Department of Microbiology and Assistant Professor at K.J. Somaiya College of Art, Commerce, and Science, Kopargaon (Maharashtra). He has completed his Post Graduation in Microbiology from K.T.H.M College, Nashik. He has more than Four years of teaching experience in various disciplines of undergraduate and postgraduate courses in Life Sciences viz.., Genetics, Molecular Biology, Virology, Immunology, Medical Microbiology, and Biochemistry. He has guided more than 40 students in their M.Sc. dissertation work. He has published many Research papers/articles in an international peer-reviewed journal and received an **"International Best Researcher Award 2022"**. He has been appointed as **"Editor" (Editorial Board Member) and Reviewer for Multiple International Journals.** He has been awarded the **"National Best Teacher"** by SRA, Bangalore National Award 2022. He has been awarded **"Best Head of the Department (H.O.D) 2022"** by "Research Education Solutions" in Association with "The International School of Technology and Sciences AP". He has also been awarded the **"National Eminence Award"** by Global Worthy Wellness Foundation.

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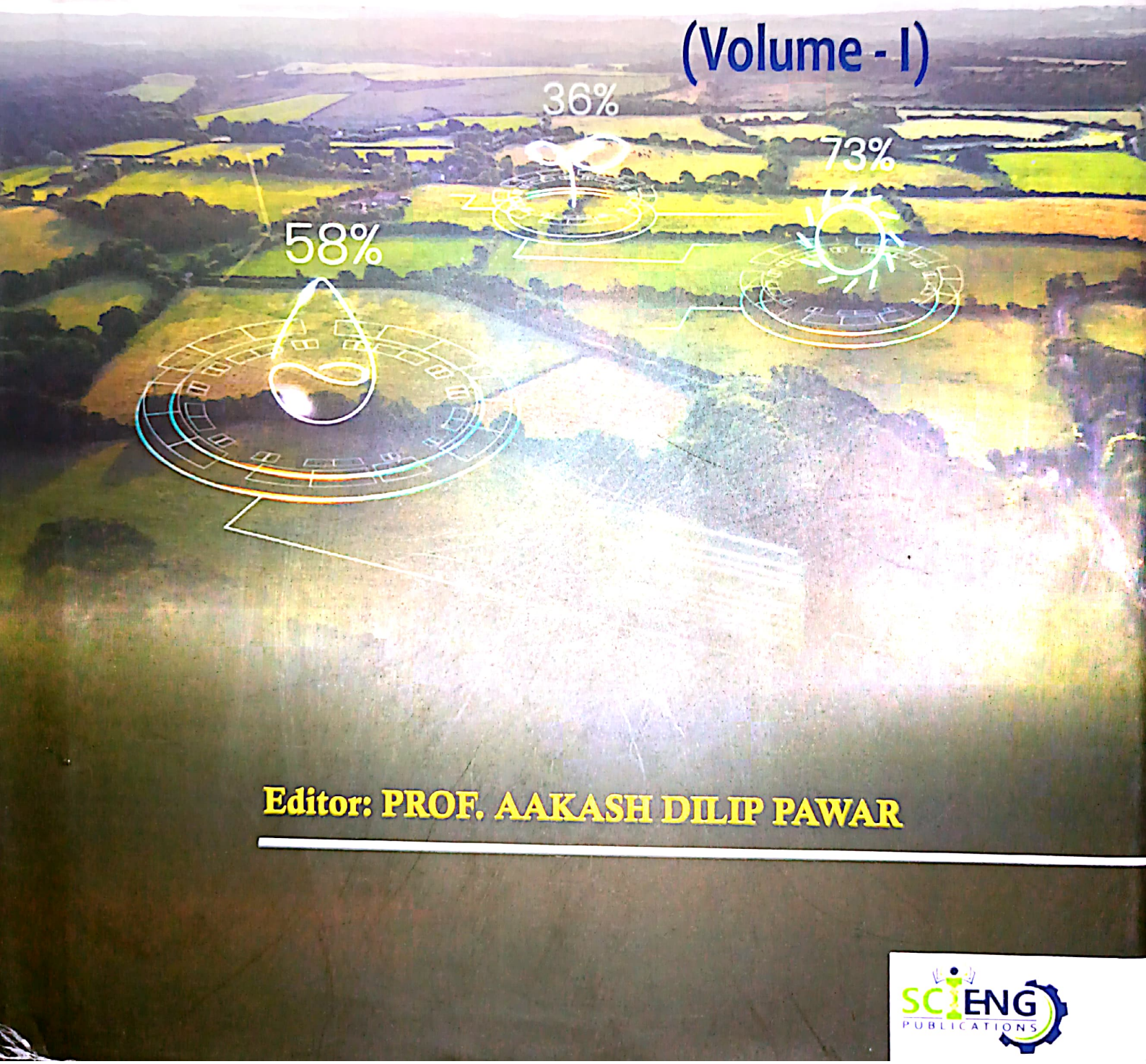

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CONTENTS

Chapter 18

CARBON FOOTPRINT- THREATS AND OPPORTUNITIES

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ABSTRACT

Carbon footprint can be termed as the total Co_2 and other GHGs emitted into the atmosphere due to the life activities of mankind. The carbon footprint is recorded individually for each individual. The emission of greenhouse gases increases the temperature of the earth. Human activities including, household fuel and electricity consumption, fuel consumption and emission of harmful gases in the environment by the use of vehicles, gases and chemical emissions by industries, plastic pollution, etc. are responsible to increase the carbon footprints in the environment. Greenhouse gases generally get trapped in the atmosphere and they contribute to the generation of heat by increasing the temperature of the atmosphere and ultimately contributing to climatic changes. All types of industries, their products, and people have their carbon footprint. Carbon footprint is the prior cause of climate change induced by humans. With the help of carbon footprint study, it has become easy to identify the sources of GHG emissions, quantification of emissions, reduction of emission area, and improve efficiency. In this chapter, we are going to focus on the basic concept of carbon footprint, greenhouse gases and the factor affecting the emission of greenhouse gases, various threats of carbon footprints to the environment, and the importance of studying carbon footprint for the welfare of the environment and maintaining environmental sustainability.

KEYWORDS: Greenhouse gases, carbon emission, carbon monoxide, methane, global warming.

INTRODUCTION

In the present day, there is a need of developing frameworks and waste management Carbon footprint is the generation of the total amount of greenhouse gases by the activity of humans (Larsen *et al.*, 2009). Globally, the per person average carbon footprint is about 4 tons. There is a need of reducing the average carbon footprint by 2 tonnes over the globe. During the chain of production of goods for the consumer, its processing, and retailing, the

emitted greenhouse gases amount is the estimated carbon footprint (Salo *et al.*, 2017). The way to communicate with the consumer about carbon footprint is carbon labeling. At different levels, carbon footprints can be accounted for, for example, services, per person, national, product, etc. For the emission of greenhouse gases, all kinds of human activities are found to be responsible (Zhao *et al.*, 2012). The emission of greenhouse gases increases the temperature of the earth. Human activities including, household fuel and electricity consumption, fuel consumption and emission of harmful gases in the environment by the use of vehicles, gases and chemical emissions by industries, plastic pollution, etc. are responsible to increase the carbon footprints in the environment. Greenhouse gasses include methane (CH_4), carbon dioxide (CO_2), and nitrous oxide (N_2O), along with other gas families including, per fluorocarbons (PFCs) and hydro fluorocarbons (HFCs). Carbon footprint is studied to measure the total emission of greenhouse gases in the environment caused due to direct and indirect lifestyle activities of humans (Hyman *eet al.*, 2003). This includes the activities of governments, individuals, industry sectors, companies, populations, processes, organizations, etc. Different product's greenhouse gases emission includes services and goods of consumers. Reduction of each carbon footprint is a very tedious process and it will not be going to result overnight (Mills *et al.*, 2011). For this, we need to focus on making small changes in our lifestyle and daily habits, which ultimately result in making big difference in carbon footprint reduction. In this chapter, we first study the basic concept of carbon footprint along with the importance of carbon footprint, different greenhouse gases, its emission, and reduction strategies.

GREENHOUSE GASES

The emission of greenhouse gases is the largest threat to carbon footprint worldwide affecting environmental health. The emission of greenhouse gases is arising during each step of life activities and actions of humans. It could be directly by the application of fertilizers, by animals, or by the use of fuel, and indirectly by the generation of electricity, etc. each type of greenhouse gas possesses a different ability to increase the temperature of the atmosphere (Cowie *et al.*, 2012). Greenhouse gases generally get trapped in the atmosphere and they contribute to the generation of heat by increasing the temperature of the atmosphere and ultimately contributing to climatic changes. Different greenhouse gases responsible to increase heat in the atmosphere include fluorinated gases, carbon dioxide, nitrous oxide, methane, etc. enhanced greenhouse emissions are responsible for the rapidly increasing temperature of the atmosphere (Kweku *et al.*, 2018). All greenhouse gases are not completely responsible for increasing the temperature of the atmosphere but their capacity relies on radiative forcing and the time duration of these gases sustaining in the atmosphere. GWP (Global warming potential) is a term that consists of the average warming of the atmosphere due to greenhouse gases. GWP is represented by the relation of

Co_2 and the mathematical calculation of greenhouse gases, hence the carbon dioxide equivalent (Co_2-e) is a unit of global warming (Shang *et al.*, 2011). The increase in the emission of Kyoto gases is the biggest threat to global warming. In addition, with fluorinated gases, carbon dioxide, nitrous oxide, and methane the members of the family chlorofluorocarbons consist a high potential for global warming. Black carbon and Tropospheric ozone are also found to be responsible for warming the troposphere.

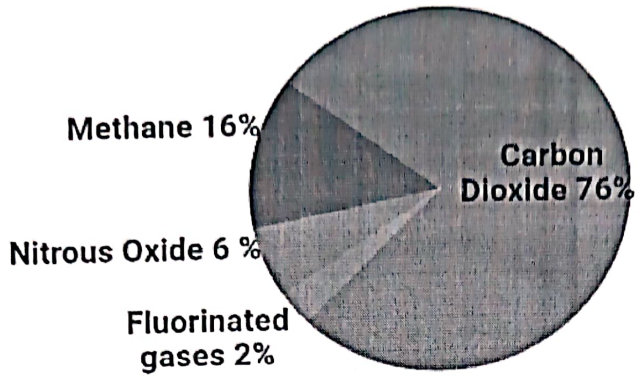

Fig 1: Evaluation of Major Greenhouse gases emitted globally in the atmosphere.

The rate of GHGs concentration increment is extensively higher and far crossing the natural range of atmosphere given by the ice core studies and geological evidence. Combustion of fossil fuel into Co_2 holds the biggest contribution to GHGs, which is approximately (76 %). Next to that CH_4 contributed 16 % and N_2O contributed 6 %, and other fluorinated gases 2 % to the overall Co_2-e (Keywood *et al.*, 2017). Agricultural systems are the biggest source of emission of these two gases into the atmosphere. The concentration of carbon dioxide and other gases is increased in the atmosphere due to human activities. Comparatively the current atmospheric Co_2 concentration has increased about 50 % from the pre-industrial period. Generation of electricity, its transportation, power stations of coal-fired, deforestation, and agriculture are the largest emitters of carbon dioxide, methane, and other GHGs in the atmosphere (Crutzen *et al.*, 1993).

CARBON FOOTPRINT CONCEPT

The ecological footprint is the set of concepts that would be studied back to understand the concept of carbon footprint. Carbon footprint can be termed as the total Co_2 and other GHGs emitted into the atmosphere due to the life activities of mankind. The carbon footprint is recorded individually for each individual. In the agenda of the world environment, the issue of global warming had taken a prominent part. For several decades the carbon footprint concept has been in use but was known by different terms in different

areas of study. The carbon footprint may be considered as the hybrid form of ecological footprint. The carbon footprint is considered an indication of global warming (Kumar *et al.*, 2014).

All types of industries, their products, and people have their carbon footprint. An individual's footprint includes the emission of gases from various sources, the food they eat, daily activities, clothes they bayed, everything discarded or thrown by the person, and many more. From all those daily life activities we can calculate an individual footprint. The higher the footprint of an individual the greater the strain and adverse effects on the environment. By taking the assessments of greenhouse gas emissions, we can be able to measure the carbon footprint of an organization, nations, industries, and individuals. Carbon accounting is denoted by the assessment of the life cycle and different calculative activities. If the carbon footprint size is known it will be easy to apply the methodologies to reduce those footprints, for example, improvement of energy efficiency, product and process management, technological development, consumption strategies, carbon capture, carbon offsetting, etc.

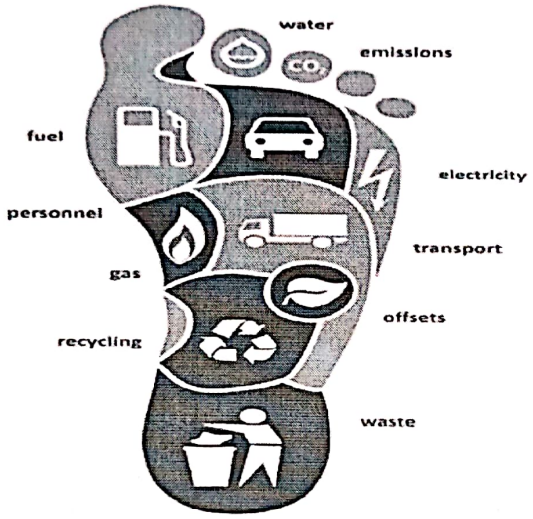

Fig 2: The carbon footprint of an individual and the all activities responsible for GHG emissions carried out by Society.
(Source- https://justenergy.com/blog/how-to-calculate-your-carbon-footprint/)

There are several online calculators are available for calculating a carbon footprint. Those calculator websites are supported by peer-reviewed publicly available data. These websites take your overall information including your home size, transportation medium, diet, recreation and shopping activities, heavy appliances, heating and electricity uses, etc.

Based on the information provided by you, these websites calculate and give your carbon footprint. Carbon footprint calculations of services, products, and industries are a bit tedious task. Life-cycle assessment (LCA) is a tool applied by most industries in which the carbon footprint of the industry is measured along with other factors considered for the assessment of services and products. The International Organization for Standardization (ISO), has a standard- ISO 14040:2006 conduct the study of LCA (Murphy *et al.*, 2009). It provides a tool for monitoring, quantifying, verifying, validating, and reporting the emission of GHGs and their removal. By using the carbon intensity or emission intensity and estimating the annual fuel uses, other inputs, or chemical uses, the carbon footprints can be measured during any prisses is being newly designed.

THREATS OF CARBON FOOTPRINTS

Changes in the climatic conditions are altering the condition of our planet, it is causing events of extreme weather like wildfire, heat waves, tropical storms, negative impact on crop production, plants and animals' natural habitat disruption, and many more bad impacts on the environment. The effects of greenhouse gases including carbon on the environment are necessary to understand for preventing the global warming threats, because, carbon emission is one of the biggest causes of global warming. Ignoring the carbon emission impacts can threaten the planet.

The carbon footprint has a very bad impact on the planet and environmental health and sustainability. Carbon footprint is the prior cause of climate change induced by humans. It involves air pollution of urban regions, it also results in a rain of toxic acid, acidification of oceans and coastal regions, it also has the very worst effect on melting the polar and glacier ice, all these consequences leading to global warming. Fossil fuel burning, transportation, management of commercial and domestic waste, production of electricity, production of food, etc. all these events are responsible to emit greenhouse gas (Rees *et al.*, 2018). These greenhouse gases can create the "Greenhouse effect" and the thermal infrared radiations are emitted by these gases. The thermal infrared radiations trap the heat in the atmosphere, which leads to global warming. Along with the environmental threats, carbon footprint also has health-related threats to mankind. Excess emission of greenhouse gases into the atmosphere leads to respiratory disorders and other health-related problems in humans due to the discharge of harmful gases into the air.

CARBON FOOTPRINT IMPORTANCE

Measurement and controlling of GHGs emissions are made easy by measuring and understanding the carbon footprint. With the help of carbon footprint study, it has become easy to identify the sources of GHG emissions, quantification of emissions, reduction of emission area, and improve efficiency (Montoya *et al.*, 2015).

Fig 3: Strategies to reduce Carbon Footprint

Cost reduction and environmental efficiency can be induced by carbon footprint. Concerning the social responsibility of corporate, carbon treading, legislative requirements, or brand image improvement, carbon footprint reporting is very important. The carbon footprints of an organization or site can be quantified under legislative actions. As a control measure for reducing carbon footprints, almost all organizational and personal carbon footprints should be demonstrated. For competitive advantages, carbon footprint calculation and strategies for reduction of emission of GHGs are begun to be implemented worldwide. People are getting aware of climate change and contributing to the reduction of GHG emissions (Pandey et al., 2018). Reducing the use of vehicles can reduce the emission generated by fossil fuel combustion. Each individual should have their indicators of carbon footprint to reduce GHG emissions and improve the sustainability of the environment.

CONCLUSION

As we discussed, the carbon footprint is evidence of greenhouse gases emission in the environment by various organizations, industries households, and individual activities on mankind. The daily life activity of an individual somehow contributes to the emission of a little amount of GHG. Increased emission of GHG in the environment leads to increasing atmospheric temperature, resulting the global warming threats. To prevent this serious and adverse effect, there is a need to studding and calculate the carbon footprint of every individual's actions. The carbon footprint threatens environmental health and sustainability due to the adverse effect of GHG emissions. Studying carbon footprint can help to reduce the emission of GHG and improve environmental health. Regular calculation of carbon footprint is very important to reduce the problems like global warming. There is a need to focus on the study of the carbon footprint of every individual and event as the reduction is not going to happen overnight.

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An edited, book emphasized environmental welfare by representing the emerging trends and sustainability of the environment. Environmental sustainability has become the most emerging terminology concerning environmental hazards and climate change. For handling the climatic crisis, there is a need for environmental sustainability, and studying the emerging trends in this area has become an indispensable part. The book contains integrated information on climate change causes, sources, prevention, and solution to reduce the consequences. It includes environmental awareness, climate change, environmental legislations, conservation of biodiversity, green economy and technologies associated with eco-friendly development, the impact of the environment on human health, assessment of environmental impact, global environmental sustainability, remote sensing, and geographical information systems, emission of greenhouse gasses and carbon footprints, bio-economy, recycling and management of waste, sustainability of the ecosystem, depletion of the ozone layer, pollution, hazards to an ecosystem, etc. the integrated knowledge and detailed studies are depicted in this book. The present book studied the emerging trends associated with environmental sustainability. The workers belonging to environmental sciences, life sciences, geographical studies, ecosystem studies, etc., can be benefited from this book.

About the Editor

Asst. Prof. Aakash Dilip Pawar, M.Sc., B.Ed., NET, SET, D.M.L.T, D.S.M, Asst. Prof. Aakash Dilip Pawar currently working as Head of the Department of Microbiology and Assistant Professor at K.J. Somaiya College of Art, Commerce, and Science, Kopargaon (Maharashtra). He has completed his Post Graduation in Microbiology from K.T.H.M College, Nashik. He has more than Four years of teaching experience in various disciplines of undergraduate and postgraduate courses in Life Sciences viz., Genetics, Molecular Biology, Virology, Immunology, Medical Microbiology, and Biochemistry. He has guided more than 40 students in their M.Sc. dissertation work. He has published many Research papers/articles in an international peer-reviewed journal and received an **"International Best Researcher Award 2022"**. He has been appointed as **"Editor" (Editorial Board Member) and Reviewer for Multiple International Journals**. He has been awarded the **"National Best Teacher"** by SRA, Bangalore National Award 2022. He has been awarded **"Best Head of the Department (H.O.D) 2022"** by "Research Education Solutions" in Association with "The International School of Technology and Sciences AP". He has also been awarded the **"National Eminence Award"** by Global Worthy Wellness Foundation.

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EMERGING TRENDS IN ENVIRONMENTAL SUSTAINABILITY

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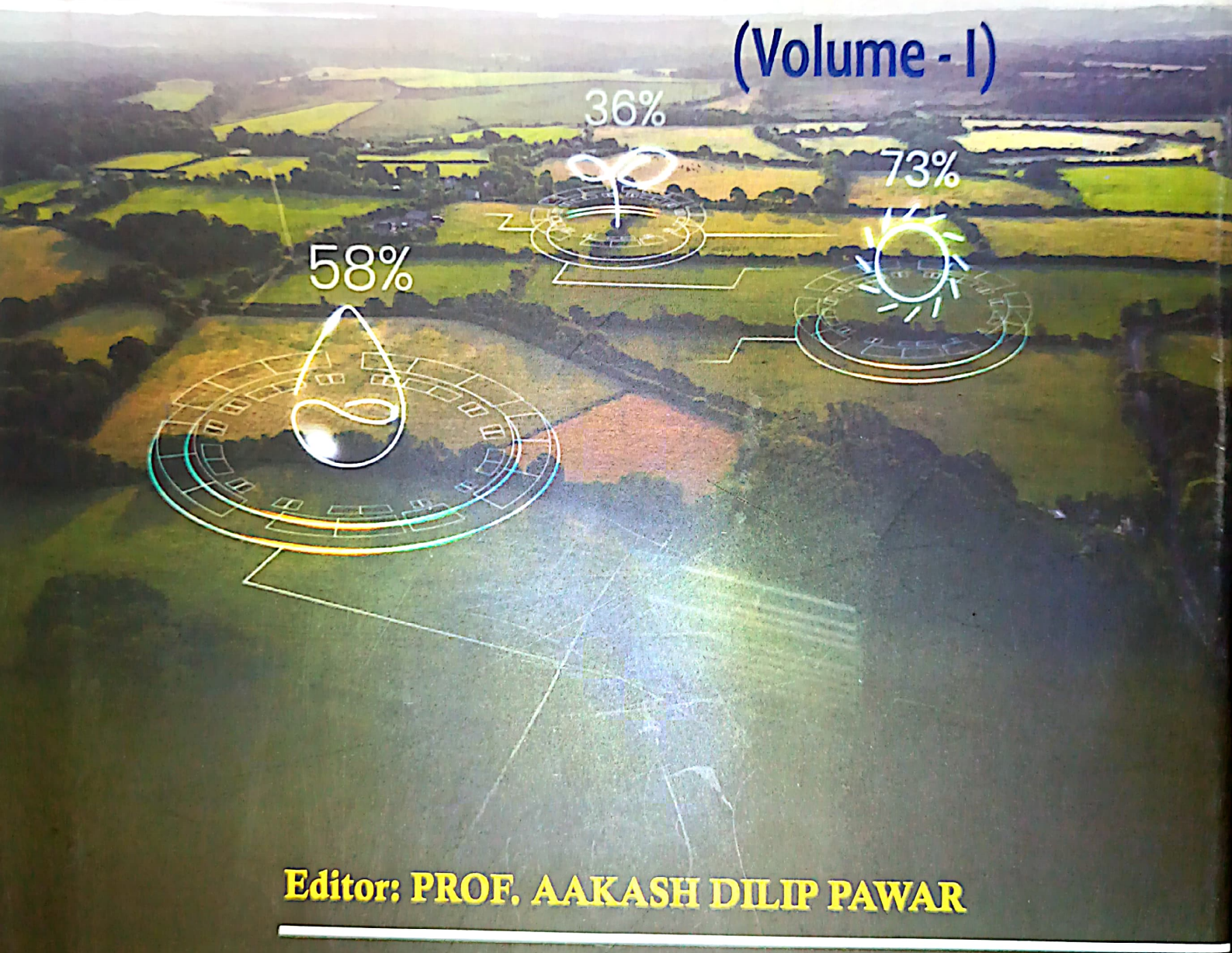

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SCIENG PUBLICATIONS

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Chapter 22

THE ADVERSE EFFECTS OF POLLUTION ON THE ENVIRONMENT

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ABSTRACT

Nowadays, pollution is going to be a crucial problem for the environment. Not only nature is responsible for letting the environment be polluted but human activities are too. There are several contaminants are present in the environment or can be made by humans themselves. Those contaminants are also known as "Pollutants". There are several different types of pollution Natural pollution and Anthropological type of pollution which is also known as manmade pollution. Overall pollution is lead to affect not only the health of humans but it can affect the entire ecosystem surrounding that and ultimately it affects the environment. Strictly following the preventive measures to overcome pollution is today's great need and we all need to follow it for the betterment of the environment.

KEYWORDS: Pollution, Adverse effects, Natural pollution, Anthropological pollution, Classification, Preventive measures.

INTRODUCTION

Nowadays, we all are well known for the phenomenon of "Pollution". All the countries in the world are expanding technologies day by day for the betterment of life. But along with that, cluelessly the pollution is uplifting by it. Let's get a look into the world with lots of pollution and try to overcome this global problem.

Pollution can be defined as the impurities in the nature or environment that cause disadvantageous effects. Pollution can occur in the expression of any substance such as solid, liquid, or gaseous form or it can occur in the form of any energy like light, sound, heat, radioactivity, etc.

The substances that can harm the environment or that can cause pollution are called pollutants. Pollutants can either be natural or created by humans.

Natural or manmade pollutants can harm not only the life of human beings but they show a negative impact on all the living things in the environment.

Behind most of the endemic and pandemic and premature deaths as well, there is pollution which plays a vital role to destroy the life cycle. The recent COVID-19 pandemic is a very relevant example which is a health crisis at the global level. (Douglas et al., 1968)

In many countries including India, excess usage of pesticides and fertilizers with nitrogen base in agriculture, a large number of industrializations, the leftover part of crops, urbanization, fires in forests, dust in deserts, and insufficient management of waste have increased the risk to the health of the environment and give rise to the pollution. Improper disposal of hazardous wastes, e-waste, and domestic wastes can lead to the destruction of the ecosystem (Van et al., 1992).

There is a massive need to control pollution by practicing various preventive measures.

TYPES OF POLLUTION

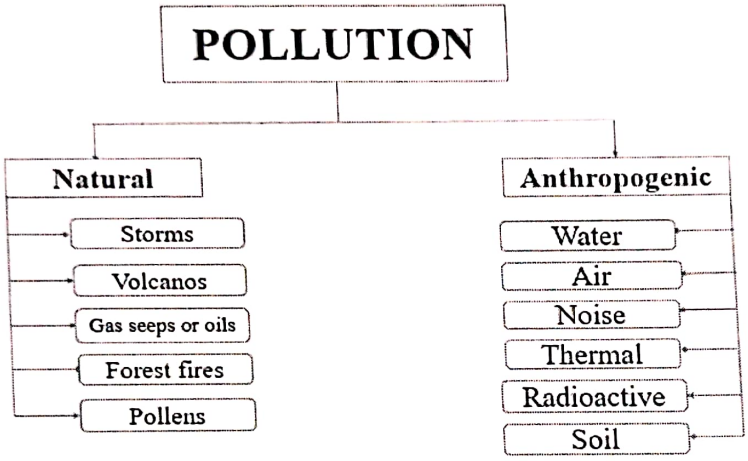

Fig. 1: Types of pollution

Classification of pollution is done according to the environmental conditions such as air, water, and soil or based on the type of those particular pollutants like heat, carbon-di-oxide, mercury, lead, biocide, noise, solid waste, etc.

Pollution is mainly classified as Natural pollution which originated from natural processes and artificial pollution which originated artificially and are also known as human activity (Shortle et al., 2001).

AIR POLLUTION

The free suspension of pollutants into the air causes adverse effects on environmental health and besides that, it is responsible for disturbing the life on earth and also leads to climate change. Air pollutants such as gases (carbon monoxide, nitrous oxide, ammonia, sulfur dioxide, methane, carbon dioxide, chlorofluorocarbon), organic and inorganic particulates, and biological particles. Air pollution leads to cause disease, and hypersensitivity even sometimes causes the death of humans. Other living things such as microorganisms, animals, and crops of food in the environment also get destructed by the contaminated air or we can say polluted air. The natural environment is affected too. Such as habitat degeneration or ozone depletion, and climate change.

One more source of air pollution is Greenhouse gases including CO_2 and methane which are naturally present in the ambiance. These gases are mandatory to our day-to-day life but they use to absorb the sunlight which is reflected from the earth and kept the sunlight absorbed and does not escape into space. Due to this holding of sunlight, the earth's temperature is kept warm by those gases. This rising temperature of the earth due to greenhouse gases is called the greenhouse effect. Human activities such as deforestation and Fossil fuel burning can increase the number of greenhouse gases in the atmosphere. This condition created by a human is called global warming.

Pollution is a remarkably risky aspect for numerous diseases which are related to pollution such as infections of the respiratory system, diseases related to the heart, Chronic Obstructive Pulmonary Diseases (COPD), Lung cancer, stroke, and many more. Evidence suggests that the polluted air is even linked to the mental health of human beings although it gives rise to psychiatric diseases like depression, reduces the IQ of the individual, and has damaging effects on perinatal wellness. The harmful effects of air pollution on a human being or any other living thing is depended upon the exposure of the type of pollutants on the individual, the condition of exposure, and the status of health and genetics of that individual.

A huge number of industrializations, wildfires, abundant use of vehicles, fossil fuels burning, construction, smoking, agricultural activities, mining, volcanos, dust storms, etc. are the causes of air pollution (Brunekreef et al., 2002).

WATER POLLUTION

Polluted water seems dirty, bad in smell, or sometimes wastes or scraps floating on the surface of the water that can easily be identified as polluted water. Meanwhile, in some cases, water seems clean, and does not smell bad but it is loaded with several hazardous chemicals that can't be seen or smelled.

Drinking polluted water can lead to exposure to many acute and chronic diseases in our bodies. As per the estimation of the United Nations, approximately 4000 children died each year due to drinking polluted water. Sometimes people are even completely unknown about that the consumption of fish from contaminated water can also make us sick because they contain many pollutants in their flesh.

Some activities of humans are a major cause of water pollution. Dumping or seeping the oils and chemicals into the waterbodies from the factories is also malpractice done by humans that majorly contributes to water pollution. These seeped chemicals and oils create a toxic and harmful environment for amphibious life.

The major contribution of humans to water pollution. In Indian culture, many sculptures of Lord *Ganesha* and Goddess *Durga Mata* which are made up of non-dissolvable material that is Plaster of Paris were immersed into the various waterbodies every year. Along with the sculptures, a large quantity of degradable and non-degradable waste is also immersed in waterbodies which are also called *Nirmalya* in the local language (Goel et al., 2006).

SOIL POLLUTION

Exposure to harmful and toxic materials or chemicals in the soil is defined as soil pollution. Those contaminants present in soil can be inorganic ions and salts (carbonates, nitrates, phosphates, sulfates, etc), heavy metals which are super toxic to the soil such as arsenic, Chromium, cadmium, zinc, copper, nickel, manganese, lead, etc. and various organic compounds such as Proteins, lipids, fatty acids, nucleic acids, hydrocarbons, alcohol, etc. are formed by the activity of microbes or organism's decomposition such as plants and animals. Moreover, several harmful compounds get introduced into the soil from the atmosphere either by wind activity or rainstorms, or water condensation. Anthropogenically, excess use of pesticides for crops, organic fertilizers, mineral fertilizers, agricultural wastes, wastes from irrigations, during construction, uses of paints with the lead base, destruction of aged buildings can contaminate the nearby soil by asbestos, inappropriate disposal of extremely toxic wastes from the industry and wastes from the rural community are the major causes of soil pollution (Mirsal et al., 2008)

NOISE POLLUTION

Noise pollution is an invisible hazard. Noise pollution can be defined as annoying or disturbing noise that can harm life in the environment. The high degree of sound mixed in the environment leads to various adverse effects on animals, plants, and humans as well. The high sound of machinery at construction places, the sound of traffic, vehicles, horns, sound systems at parties, and functions like DJs, amplifiers, home theatres, etc. are the major sources of noise pollution (Singh et al., 2004).

POLLUTION CAUSING AGENTS

The pollution-causing agents are divided into two types - Natural agents and Man-made agents. Natural agents that cause pollution are released chlorine and sulfur gases from the activity of volcanoes, a large amount of ash and smoke from wildfires, storms of dust, biological decomposition, erosion, etc. one interesting fact about natural pollution is it does not affect the environment as much as the manmade pollution does because of its ability of regeneration. Moreover, manmade sources majorly contribute to causing pollution. Man is the major pollution-causing agent. By developing new technologies as per the necessities of humans, we're going to introduce our environment to more and more severe pollution. These going to affect not only the environment but also human health are costed for it. (Geissen et al., 2015)

Fig. 2: Types of Pollutants

1. Solid waste involves domestic solid waste such as garbage, debris, scraps, ashes, etc. similarly wastes from agriculture, wastes from dead animals, industrial solid wastes, plastics, electronic wastes, etc.

2. Liquid waste involves liquid industrial wastes (it contains alkalis, acids, and many more toxic substances), domestic liquid waste, drainages, sewages, acid rains, etc.

3. Gaseous waste involves immersed gases from industries such as Nitrogen dioxide, Sulphur dioxide, Carbon monoxide, Ozone, Chlorofluorocarbon, smoke from burning of plastics, garbage, etc.

4. Weightless waste involves radioactivity, heat, noise, etc. it is also known as energy waste.

ADVERSE EFFECTS OF POLLUTION

ON HUMAN HEALTH: Different types of pollution make many harmful effects or health issues to human beings. This means human beings can be affected by many acute and chronic diseases after exposure to polluted or contaminated water such as diarrhea, malnutrition, several skin diseases, and many more. Many respiratory diseases can occur

due to exposure to polluted air. Human beings suffered from cardiovascular effects due to exposure to a high degree of sound or sometimes it leads to permeant loss of hearing ability. Skin burns or radiation sickness can cause due to radioactive pollution.

ON PLANTS: Leaf tips or margin burning, stunted growth, mottled foliage, twig dieback, delayed maturity, early leaf drop, and mainly reduced quality and quantity of crop or yield.

ON ECOSYSTEM: Pollution can majorly affect our ecosystem by different means such as over fertilization. Pollution also affects the large number of ecosystems that are sensitive to nitrogen such as wildlife, dry grasslands, etc.

TO THE ATMOSPHERE: Pollution can lead to the increase of greenhouse gases due to which climate changes and global warming can happen.
By studying all these circumstances, we need to overcome this purely dangerous phenomenon of "Pollution" (Simoni et al., 2015).

SOLUTION ON POLLUTION

Eliminating or reducing toxicity and the number of hazardous substances from their sources is more likely the solution to pollution.
There is no exact solution for pollution but we can use most of the preventive measures to overcome this dangerous situation. The natural causes of pollution might not be in our control but we can certainly prevent the types of pollution which are created by humans by following some preventive measures to stop or reduce the pollution such as-

a. Less use of private vehicles. Use mostly public transport.
b. Innovation of more and more electric vehicles so that lesser fuel will be used.
c. Say "No" to the plastic.
d. Mostly use solar energy.
e. Proper disposal of hazardous chemicals and the water with toxic materials immersed in the industries and factories.
f. Avoid smoking.
g. Bioremediation.
h. Proper disposal of medical waste.
i. Use dissolvable material for making sculptures of Lord *Ganesha* and Goddess *Durga Mata* which are used to immerse in waterbodies every year. Make it eco-friendly.
j. Avoid DJs and loud sound systems in functions to reduce the risk of noise pollution.

And many more likewise measures to get prevented pollution. (Shen et al., 1995)

CONCLUSION

We have seen in this chapter how pollution is becoming a huge problem not only at the local but the global level every day and how it is going to take the life of humans and the entire environment in danger. Accordingly, we conclude that the pollution is just rising day by day and if no action would be taken on time, then it will cost not only the health of living organisms but their lives too.

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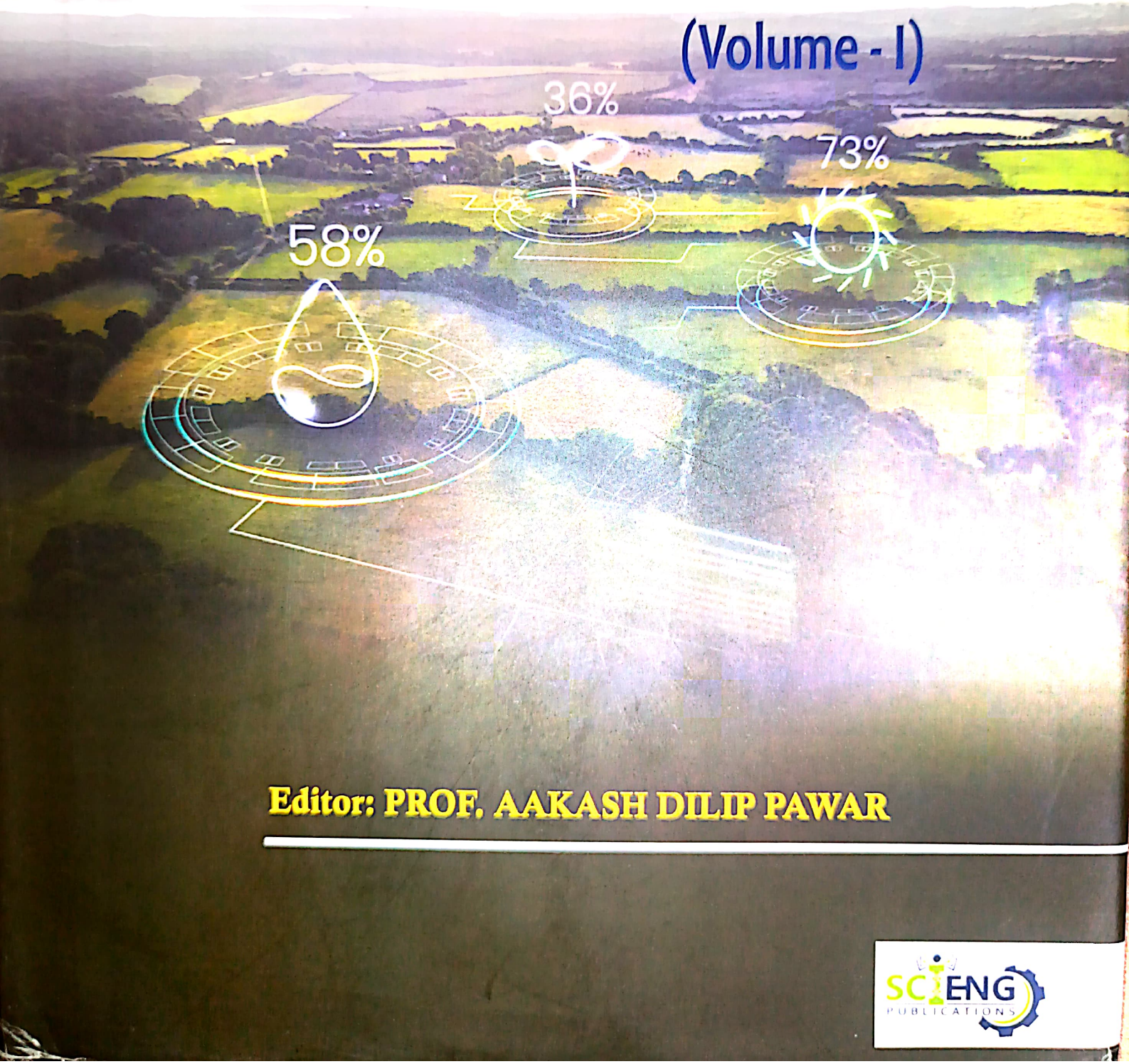

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SCIENG PUBLICATIONS

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Chapter
12

BIOECONOMY: THE NEED OF TOMORROW

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ABSTRACT

The bio-economy is a central platform for economic growth. This economy sustainably boosts the economy with the use of renewable natural resources. Bioeconomy defines the need for biological resources for the well-being of humans, animals, nature, society as well as economy. Bioeconomy is closely associated with the Circular economy and green economy. The circular economy recycles and reuses the product without wasting them. Hence it is considered a closed type economy that aims to achieve sustainable growth. A green economy encompasses with reduction of carbon emissions with maximum and proper use of biological resources. The current information helps to spot the topics of Bio-economics and its need to increase the economy globally.

KEYWORDS: Bioeconomy, Sustainable growth, Circular economy, green economy, renewable natural resources.

INTRODUCTION

The idea of a living prosperity i.e., "Bio-economy" approaches the novel and avid concept for readers (Sijtsema *et al.*, 2019). It focuses on the National-International disputes and the role of natural sciences in solving any complex economic problems. Bio-economy is about using renewable resources like plants, water, Sun, Wind, etc to make biological products (Verga *et al.*, 2020). Nature is the wealth that blooms the economy in a perfect pleasure and prosperous way. Climate change, Global warming, Acid rain, deforestation, technology, and man resources are certain factors that affect the bio-economy and ultimately collapse the economy of the nation (Sillanpaa *et al.*, 2017). The use of renewable resources to manufacture the product is a gift for our economy which corresponds to the richness of the bio-economy and moves the environment towards sustainability. The products once used must be recycled and reused for further processes to create an eco-friendly environment without waste of renewable resources. This is provided by the use of a circular economy

(Shirvanimoghaddam *et al.*, 2020). The circular economy is a closed economy system that helps various stakeholders to achieve their goals in the field of the economy (Geng *et al.*, 2008). Conversely is the concept of the linear economy where the product is manufactured and after its use, it is disposed of without following any recycling process (Andrews *et al.*, 2015). The bio-economy of India in the year 2020 is found to be $70.2 billion while the economy of India in the year 2021 showed a value of $80.12 billion with a growth of 14% in one year. This progress in the bio-economy showed a positive and impulsive change in the Indian economy (Worrall *et al.*, 2017).

APPROACH TO BIOECONOMY

The economy is incomplete without livestock, nature, goods, and exchanges. An economy is defined as a system where people learn to adapt to earn their living to satisfy their needs, through various processes of presentation, production, utilization, expand nature and exchange (Lundvall *et al.*, 2007). Bioeconomy is also referred to as bio-economy or biobased renewable economy. Bioeconomy is the use of renewable natural resources according to knowledge, biological procedures, and laws to produce goods, wares, and services in an eco-friendly way (Birch *et al.*, 2010). The new and advanced model is a bio-economy that provides an efficient network for the global economy. It uses biological, biobased resources to make food, goods, industrial product, and energy. Production of important material by remains of plants and decaying matter and conversion of fissile fuels to make beneficial products involve bio-economy (Naik *et al.*, 2010). Bio-based economy aims to grow sustainability by cracking off the challenges like changing climate, and human activity and to grow the economy broadly. Food and agriculture organization (FAO), an agency of the United Nations, America defines the bio-economy as – The manufacturing, Usage, preservation, and maintenance of natural resources including information, science, innovation, and technology to supply certain needs of procedures products, and services (Nwachukwu *et al.*, 2019). Bio plus economy together contributes to biology and naturally renewable resources.

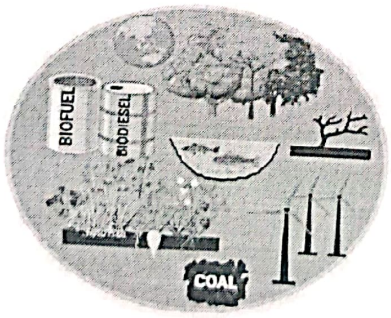

Fig. 1: Renewable Recourses

Different nations define Bioeconomy in different ways:
Canada defines the competitive, information-based, and novel production and exploitation of renewable resources in a sustainable way to supply goods in an environment-friendly way (Ritchie *et al.*, 2003).

An economy that depends on vital biological resources to make energy, goods, food, commodity, and services is the definition of a bio-economy given by Finland (McCormick *et al.*, 2013).

France defines bio-economy as all tasks that include manufacturing, use, and transportation of biobased resources to meet people's needs while supplying ecosystemic facilities (McCormick *et al.*, 2013).

CIRCULAR BIOECONOMY

Circularity and sustainability are the main goals of the Bio-economy. The circular economy relies on principles of restating, mending, reprocessing, and recycle are primary parts of the bio-economy. 'Biodiversity' in the true sense is the engine of Bioeconomy because it determines the need of living systems to survive and adapt to changing habitats, which ensures the reliability and stability of natural resources (Breithoff *et al.*, 2020). A circular bio-economy involves a theoretical framework for use of renewable wealth to manage our production system, food, land, industrial area, and health to accomplish sustainable growth in consistency with Mother Nature. The circular bio-economy follows simple steps:
Collection of raw materials ⟹ Production of materials ⟹ Usage of Product ⟹ Recycle of Product (Matos *et al.*, 1998).

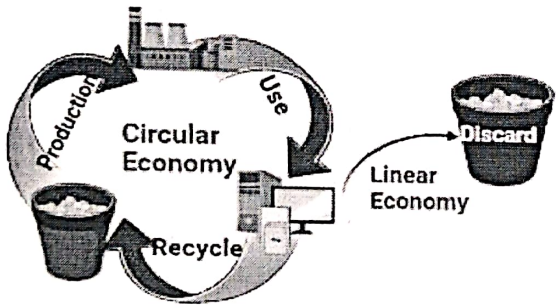

Fig. 2: Layout of Circular and Linear Economy

In this economy, nothing is wasted. In this way, a circular bio-economy follows the maximum utilization of products and services. It benefits the economy, society, and ultimately environment. This economy acts as a catalyst; the best example of it is wood. The

'wood' is a common natural material found in the motherland is transformed into a novel matter referred to as "Nanocellulos" or "Nanofibrillated Cellulose" which is not only fivefold heavier than steel material but also fivefold lighter. Japan introduced a car in the year 2019 which consists of non-cellulose material (Nishino *et al.*, 2014). The mission of the Circular bio-economy is to eliminate waste and promote the secure use of renewable biological sources. Rather biomaterials are also used in a linear way which leads to the production of waste without recycling it harms the environment and ultimately collapses the economy.

EXAMPLES OF BIOECONOMICS

Bioeconomy starts from biobased resources. They act as a substratum to make the biological product. Bioeconomy is an important core and backbone of our lives. Many conventional biobased products including flax, fires, paper, dyes, textiles, adhesions, paints, etc. are derived partially or fully from biological matter (De Smet, *et al.*, 2020). Modern biological materials consist of a wide range of semi-products like polymers; building components are well-used to make final biobased materials like lubricants, bioplastics, cleansers, and many more. Ethylene a factor extracted from cane sugar is used in producing polyethylene polymer. A lengthy chain of repeating units of chemical constituent is called a polymer. Other polymers like polystyrene, PVC (Polyvinyl Chloride), and polyamides are used to make commodity polymers. Biofuel is produced from Saccharum through fermentation indirectly or produced directly from biogas (Fu *et al.*, 2005). However, many advanced varieties of biological products are growing which include biochemical and materials that are biobased with additional and new properties, working, new formulas for pharmaceutical purposes, and collection of healthy ingredients for food. The main niche in the bio-economy is the food system. This system includes agriculture, forestry, food production, and fisheries.

GREENING THE BIOECONOMY

Bioeconomy is associated with Green Economy for development and growth. Green Economy can consider as another sight one that can initiate and develop consistently in humans' life. A green economy boosts social equity and a person's well-being while reducing natural calamities. (Reiter *et al.*, 2001). Green Economy decreases ecological risks and biological insufficiency and achieves sustainable growth by avoiding degradation and decomposition of the environment. The overall green economy focuses on the term 'Green' which soothingly benefits the ecosystem without any negative impact on the economy.

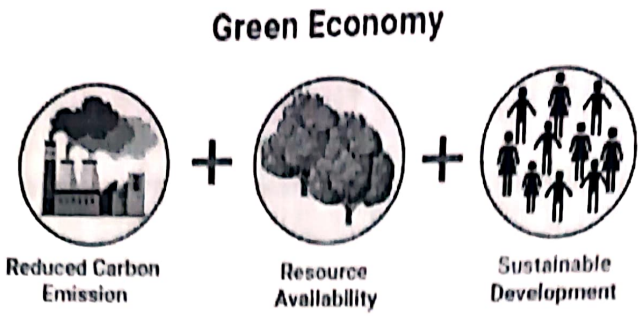

Fig. 3: Greening the Bioeconomy

The Green economy relies on 5 factors waste and water management, renewable resource and energy, green infrastructure, sustainable growth, and transport. This means this economy supports an evergreen and peaceful environment that results in raising the economy in an eco-friendly way (Pan *et al.*, 2018). It destines green speculation.

The belief of a green economy is to reduce carbon discharge, aim for equal sharing of resources, and maintenance of the helpful relationship between nature and society. This can be achieved by increasing communal consumption of different forms of energy viz. Wind, solar, geothermal, and hydroelectric power (Caspary *et al.*, 2009). Setting substantial natural eco-friendly agriculture, organizing home-based farming, use of electrical vehicles, and investing in a green economy are some of the human activities contributing to Greening the world's Bioeconomy (Van *et al.*, 2014).

NEED AND OBJECTIVES OF BIOECONOMICS

According to the EU (European Union) of Bioeconomy different strategies of Bioeconomy have been given below:

Table 1: Objectives and Needs of Bioeconomy (Wolfe *et al.*, 2001)

Objectives of Bioeconomy	Need of Bioeconomy
1) This economy ensures the reliability of food, feed, and nutrition.	1) It gives food safety and governs the scarcity of water.
2) Adapting and alleviating climate breakdown.	2) To reduce ecological footprint by the usage of nature-friendly materials.
3) Making jobs available and creating strong European diligence.	3) Bioeconomy boosts the economy in an environment-friendly manner.
4) Use of fewer nonbiological resources and minimizing the need for unfeasible resources.	4) To preserve the motherland and make use of natural things for the welfare of humans.
5) Governing sustainable use of renewable biological resources.	5) To encourage sustainable resources without depending on a non-renewable fuel source to circumvent overuse.

THE BIO-ECONOMY: FUTURE OF INDIA'S ECONOMY

Over the later 25 years, the Bio-economy has raised India's upcoming economy in a very crucial way. India stands in the first 3 ranks in the sub region of South Asia and for biotechnology, it ranks among the leading Twelve destinations overall in the world. India's mission called 'Make in India' plays a key role in promoting medical supplies where 80 to 90% of demand is fulfilled through import services. As per India's Bioeconomy Report of the year 2022, the net effect of Corona vaccines on the bio-economy was noted as $8.7 billion. India is a leading country in dispenses of vaccines of measles, BCG, Covid, and DPT vaccines. India has helped many other countries in need of vaccines. In the biofuel case, India has shown great growth from 2025-2023 with the objective year of 20% of ethanol mixing. The nation has shown a tremendous increase of $10.48 billion in the year 2021 in the agriculture field of biopesticides, biofertilizers, and bio-stimulants which helps to shine the economy of India (Perišić *et al.*, 2022).

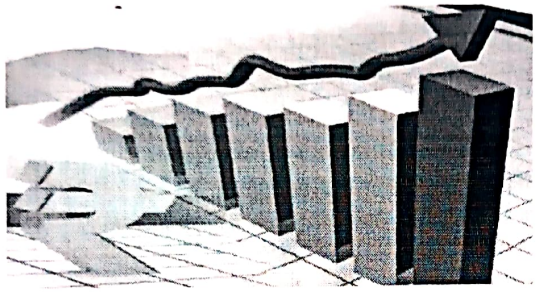

Fig. 4: Bioeconomy

CONCLUSION

Bioeconomy proves one of the valuable economic sectors in the field of bio-economy. It has become the need of not only the economy but also human activities. It focuses on greening, the enlightening eco-friendly economy with imperishable growth. It makes use of renewable resources to cherish the economy by using the circular and green economy healthily. Agriculture, medicine, aquarium, drugs, and vaccines are some of the fields which help us to uplift the Indian economy efficiently.

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About the Book

An edited, book emphasized environmental welfare by representing the emerging trends and sustainability of the environment. Environmental sustainability has become the most emerging terminology concerning environmental hazards and climate change. For handling the climatic crisis, there is a need for environmental sustainability, and studying the emerging trends in this area has become an indispensable part. The book contains integrated information on climate change causes, sources, prevention, and solution to reduce the consequences. It includes environmental awareness, climate change, environmental legislations, conservation of biodiversity, green economy and technologies associated with eco-friendly development, the impact of the environment on human health, assessment of environmental impact, global environmental sustainability, remote sensing, and geographical information systems, emission of greenhouse gasses and carbon footprints, bio-economy, recycling and management of waste, sustainability of the ecosystem, depletion of the ozone layer, pollution, hazards to an ecosystem, etc. the integrated knowledge and detailed studies are depicted in this book. The present book studied the emerging trends associated with environmental sustainability. The workers belonging to environmental sciences, life sciences, geographical studies, ecosystem studies, etc., can be benefited from this book.

About the Editor

Asst. Prof. Aakash Dilip Pawar, M.Sc., B.Ed., NET, SET, D.M.L.T, D.S.M, Asst. Prof. Aakash Dilip Pawar currently working as Head of the Department of Microbiology and Assistant Professor at K.J. Somaiya College of Art, Commerce, and Science, Kopargaon (Maharashtra). He has completed his Post Graduation in Microbiology from K.T.H.M College, Nashik. He has more than Four years of teaching experience in various disciplines of undergraduate and postgraduate courses in Life Sciences viz., Genetics, Molecular Biology, Virology, Immunology, Medical Microbiology, and Biochemistry. He has guided more than 40 students in their M.Sc. dissertation work. He has published many Research papers/articles in an international peer-reviewed journal and received an **"International Best Researcher Award 2022"**. He has been appointed as **"Editor" (Editorial Board Member) and Reviewer for Multiple International Journals.** He has been awarded the **"National Best Teacher"** by SRA, Bangalore National Award 2022. He has been awarded **"Best Head of the Department (H.O.D) 2022"** by "Research Education Solutions" in Association with "The International School of Technology and Sciences AP". He has also been awarded the **"National Eminence Award"** by Global Worthy Wellness Foundation.

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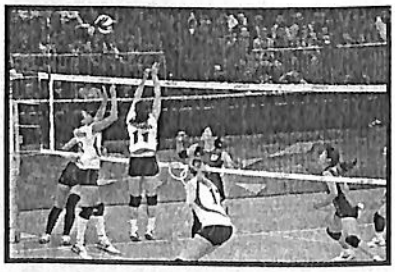

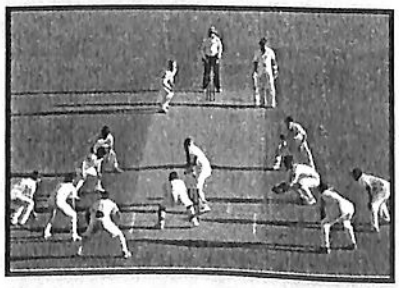

संपादक

डॉ. दीपक माने

डॉ. सुरेखा दप्तरे

डॉ. उमेशराज पनेरू

डॉ. पांडुरंग लोहोटे

अनुक्रम

क्रिकेट

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प्रस्तावना :

क्रिकेट हे नाव 'क्रिक' या शब्दावरून आले असावे. इंग्लंडमध्ये सुरुवातीच्या काळात क्रिकेट हा लहान मुलांचा खेळ मानला जात असे. अठराव्या शतकाच्या मध्यापर्यंत, क्रिकेटची बॅट साधारणतः हॉकी स्टिकसारखी असे. क्रिकेट हा एक बॅट आणि बॉलचा खेळ असून दोन संघात प्रत्येकी ११ खेळाडूमध्ये मैदानावर मध्यभागी आयताकृती २२ यार्ड लांब खेळपट्टीवर खेळला जात असे. हा जगातील दुसऱ्या क्रमांकाचा लोकप्रिय खेळ आहे. आपल्या विरोधी संघापेक्षा जास्त धावा काढणे हा या खेळाचा उद्देश आहे. क्षेत्ररक्षणासाठी सर्व ११ खेळाडू जाऊ शकतात. परंतु एकाच

वेळी फक्त दोन फलंदाजच मैदानात जातात. प्रथम कुणी फलंदाजी करावी हे ठरवण्यासाठी संघाचे कर्णधार नाणेफेक करतात.

सन १९०० च्या पॅरिस क्रीडा स्पर्धेत क्रिकेटला ऑलिम्पिक खेळ म्हणूनही समाविष्ट करण्यात आले होते, जिथे ग्रेट ब्रिटनने फ्रान्सचा पराभव करून सुवर्णपदक जिंकले होते. उन्हाळी ऑलिम्पिकमध्ये क्रिकेटचे हे एकमेव प्रदर्शन होते. पहिला आंतरराष्ट्रीय कसोटी सामना सन १८७७ मध्ये ऑस्ट्रेलिया आणि इंग्लंड यांच्यात खेळला गेला

क्रिकेटचे स्वरूप (Cricket Format) :

क्रिकेटमध्ये तीन प्रकारचे स्वरूप चालू आहे. कसोटी सामना, एकदिवसीय क्रिकेट आणि टी-२०.

अ. **कसोटी सामना क्रिकेट :** कसोटी क्रिकेट हा क्रिकेट खेळातील सर्वात प्रदीर्घ वेळ चालणारा प्रकार आहे आणि क्रिकेटमध्ये सर्वोच्च स्थान मानले जाते. दोन राष्ट्रीय संघात २ डावांचा सामना खेळवला जातो, जो पाच दिवस टिकू शकेल, तसेच क्षमता आणि सहनशक्ती असलेल्या संघांची ही परीक्षा असते.

ब. **एकदिवसीय आंतरराष्ट्रीय किंवा मर्यादित षटक :** आंतरराष्ट्रीय दर्जाच्या दोन संघांदरम्यान हा फॉर्मेट खेळला गेला आहे. दोन्ही संघांमध्ये सामान्यत: ५० ओव्हरचा सामना असतो. 'क्रिकेट वर्ल्ड कप' हा या फॉर्मेटमध्ये खेळला जातो. मर्यादित षटकांच्या स्पर्धेचे स्थान सर्वोच्च मानले जाते.
विसाव्या शतकात आंतरराष्ट्रीय एकदिवसीय खेळाचा विकास झाला. ऑस्ट्रेलिया आणि इंग्लंड यांच्यात मेलबर्न क्रिकेट मैदानावर दि. ०५ जानेवारी १९७१ रोजी ऑस्ट्रेलिया व इंग्लंड यांच्यातील पहिला आंतरराष्ट्रीय एकदिवसीय सामना खेळला गेला. जेव्हा तिसऱ्या कसोटीचे पहिले तीन दिवस संपले तेव्हा अधिकाऱ्यांनी सामना सोडण्याचा निर्णय घेतला आणि त्याऐवजी ४० षटकांचा एकदिवसीय सामना खेळण्यात आला. ऑस्ट्रेलियाने ५ गडी राखून हा सामना जिंकला.

क. **टी-२० क्रिकेट :** टी -२० हा क्रिकेटचा एक छोटासा परंतु अत्यंत लोकप्रिय प्रकार आहे. २००३ मध्ये इंग्लंड आणि वेल्समधील आंतरदेशीय स्पर्धेदरम्यान इंग्लंडमध्ये ओळख झाली होती. या स्वरूपात प्रत्येक संघ कमाल २० षटके खेळतात. प्रत्येक गेममध्ये सुमारे ९० मिनिटांचा खेळ हा गेम तीन तासात पूर्ण

होतो. पूर्वीच्या विद्यमान खेळाचा हा प्रकार खूपच लहान आहे. हे स्वरूप मैदानातील प्रेक्षक आणि दूरदर्शनवरील प्रेक्षकांसाठी खूप लोकप्रिय आहे. २००७ मध्ये दक्षिण आफ्रिकेत खेळलेला पहिला टी -२० विश्वचषक आणि भारताने या प्रकारचा पहिला विश्वचषक जिंकला.

भारतीय क्रिकेटचा संक्षिप्त इतिहास (Indian Cricket History) :

संपूर्ण जगात आणि भारतामध्येही क्रिकेट या खेळाचे स्थान सर्वोच्च मानले जाते. हा भारताचा अतिशय लोकप्रिय खेळ आहे. भारतीय क्रिकेट नियामक मंडळ (बीसीसीआय) हे भारतातील क्रिकेटचे नियामक मंडळ आहे. तामिळनाडू सोसायटी नोंदणी कायद्यांतर्गत नोंदणीकृत एक संस्था म्हणून डिसेंबर १९२८ मध्ये मंडळाची स्थापना केली गेली. बीसीसीआय ही भारताची श्रीमंत क्रीडा संस्था आणि जगातील सर्वात श्रीमंत क्रिकेट बोर्ड आहे. बीसीसीआयने भारतात इंडियन प्रीमियर लीग (आयपीएल) आणला आणि हे स्वरूप आता इतर देशांमध्येही खूप लोकप्रिय झाले आहे.

- भारतामध्ये क्रिकेटची सुरुवात ही अप्रत्यक्षरित्या १८ व्या शतकामध्ये झाली. युरोपियन व्यापारी यांनी या खेळास सुरुवात केली.
- भारतीय क्रिकेट खेळाची सुरुवात सन १९३१ मध्ये झाली.
- पहिला कसोटी सामना हा दि. २५ जून १९३२ मध्ये लॉर्डसच्या मैदानावर इंग्लंड या संघाविरुद्ध खेळण्यात आला.
- कसोटी सामन्यात पहिला विजय हा सन १९५२ मध्ये मिळाला.
- पहिला एकदिवशीय सामना हा दि. १३ जुलै १९७४ मध्ये झाला.
- पुरुषचा टी-२० पहिला सामना दि. १ डिसेंबर २००६ मध्ये झाला. पण भारतीय महिला संघाचा दि. ५ ऑगस्ट २००६ मध्ये पहिला सामना खेळला गेला होता.

भारतरत्न पुरस्कार : भारतरत्न हा पुरस्कार भारतातील सर्वोच्च समजला जाणारा नागरी सन्मान आहे. भारताची कीर्ती जगभरात पसरवणाऱ्या व्यक्तींना हा पुरस्कार दिला जातो. या पदकावर एका सोनेरी पिंपळपानावर एका बाजूला मधोमध सूर्याची प्रतिमा व तिच्या खाली 'भारतरत्न' लिहिलेले असते व पाठीमागे देशाचे राष्ट्रीय चिन्ह (चौमुखी सिहाची प्रतिमा). या पुरस्कारत कुठलीही पदवी किंवा मानधन नसते. पण त्यांना 'Indian order of precedence' मध्ये ७ वे स्थान मिळते.

क्रीडा क्षेत्रात हा पुरस्कार फक्त क्रिकेट लेजंड सचिन तेंडुलकर यांना देण्यात आला.

वर्ल्ड कप स्पर्धांची माहिती (५०-५० ओवर)
(World Cup Information 50-50)

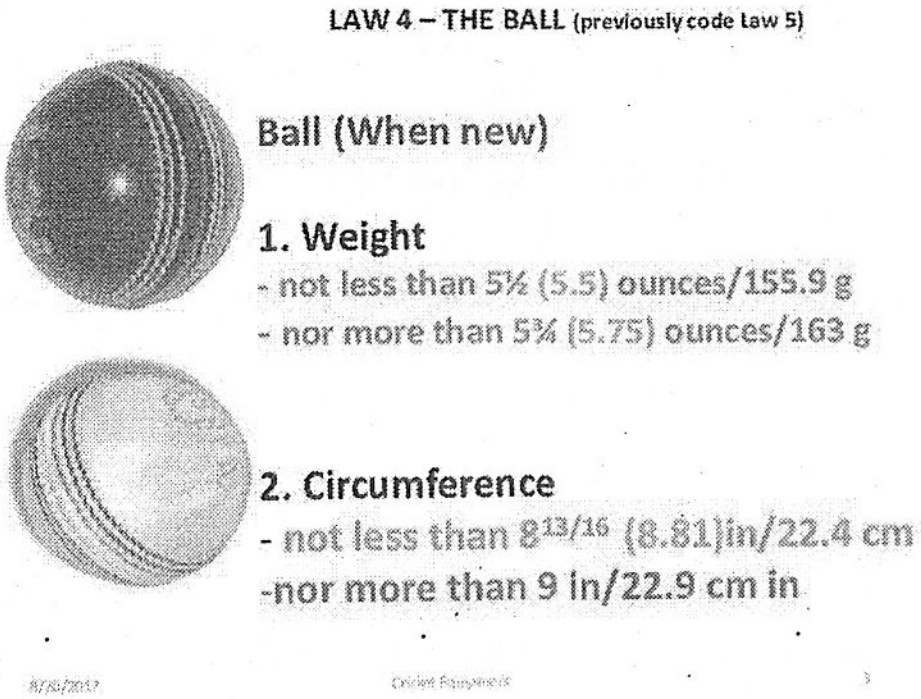
वर्ष	स्पर्धेचे आयोजन करण्यात आलेले ठिकाण	विजयी संघ	उपविजयी संघ
१९७५	इंग्लंड	वेस्ट-इंडीज	ऑस्ट्रेलिया
१९७९	इंग्लंड	वेस्ट-इंडीज	इंग्लंड
१९८३	इंग्लंड	भारत	वेस्ट-इंडीज
१९८७	भारत व पाकिस्तान	ऑस्ट्रेलिया	इंग्लंड
१९९२	ऑस्ट्रेलिया व न्यूझीलंड	पाकिस्तान	इंग्लंड
१९९६	पाकिस्तान, भारत व श्रीलंका	श्रीलंका	ऑस्ट्रेलिया
१९९९	इंग्लंड व वेल्स	ऑस्ट्रेलिया	पाकिस्तान
२००३	साउथ-आफ्रिका	ऑस्ट्रेलिया	भारत
२००७	वेस्ट-इंडीज	ऑस्ट्रेलिया	श्रीलंका
२०११	भारत व श्रीलंका	भारत	श्रीलंका
२०१५	ऑस्ट्रेलिया व न्यूझीलंड	ऑस्ट्रेलिया	न्यूझीलंड
२०१९	इंग्लंड व वेल्स	इंग्लंड	न्यूझीलंड

T-२० वर्ल्ड कप स्पर्धांची माहिती (World Cup Information)

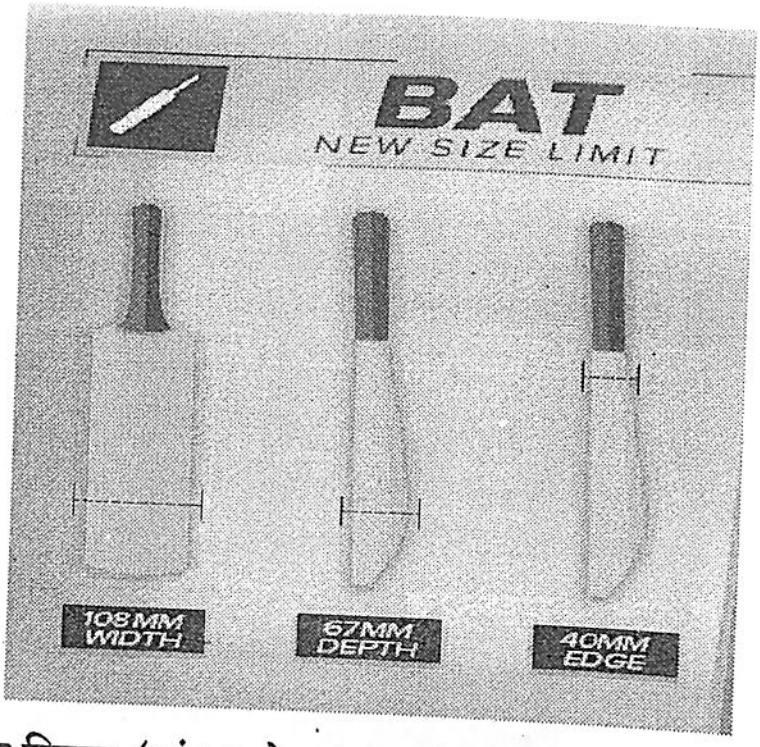
वर्ष	स्पर्धेचे आयोजन करण्यात आलेले ठिकाण	विजयी संघ	उपविजयी संघ
२००७	साउथ-आफ्रिका	भारत	पाकिस्तान
२००९	इंग्लंड	पाकिस्तान	श्रीलंका
२०१०	वेस्ट-इंडीज	इंग्लंड	ऑस्ट्रेलिया
२०१२	श्रीलंका	वेस्ट-इंडीज	श्रीलंका
२०१४	बांगलादेश	श्रीलंका	भारत
२०१६	भारत	वेस्ट-इंडीज	इंग्लंड

साहित्य (Equipment) :

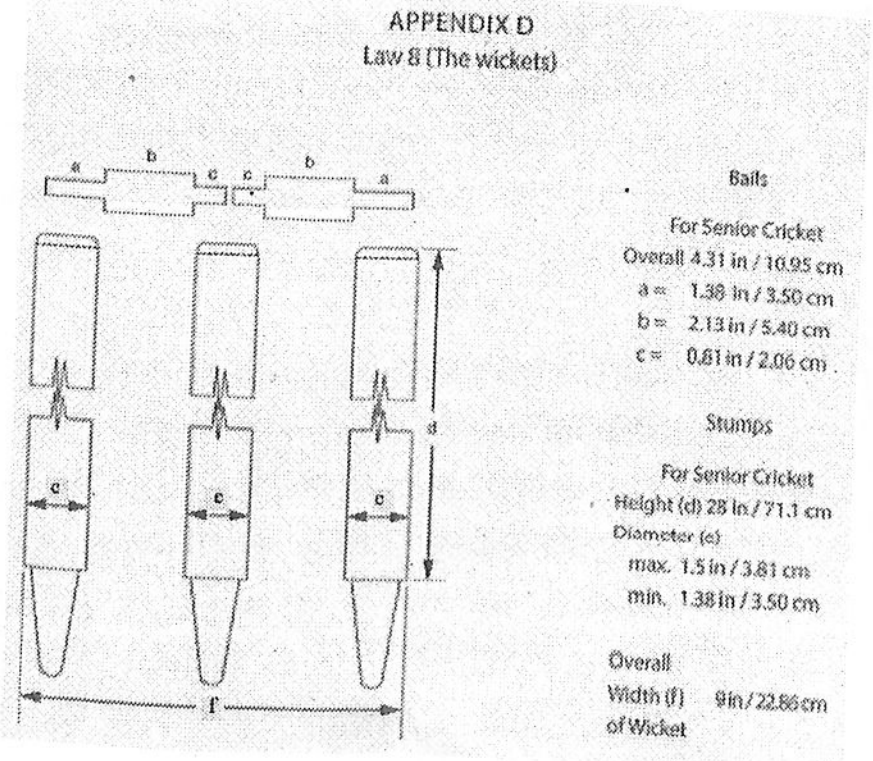
अ. चेंडू (बॉल) – चेंडू हा शिवण असलेला जाड कातड्याचा आणि गोलाकार असतो. पुरुषासाठी नवीन बॉलचे वजन ५.५ औंस / १५५.९ ग्रॅमपेक्षा कमी किंवा ५.७५ औंस / १६३ ग्रॅम, त्यापेक्षा जास्त नसावे आणि परिघात हा ८.८१ in/२२.४ सें.मी. पेक्षा कमी, ९ in/ २२.९ सें.मी. पेक्षा जास्त नसावा. तर महिलासाठी बॉलचे वजन ४.४९ औंस / १४०. ग्रॅमपेक्षा कमी किंवा ५.३१ औन्स / १५१ ग्रॅम, त्यापेक्षा जास्त नसावा आणि परिघात हा ८.२५ in/२१.० सें.मी. पेक्षा कमी, ८.८८ in/ २२.५ सें.मी. पेक्षा जास्त नसावा.



ब. बॅट – क्रिकेट बॅट ही बॉल मारण्यासाठी क्रिकेटच्या खेळात फलंदाजांकडून वापरल्या जाणाऱ्या उपकरणांचा एक विशिष्ट तुकडा असतो, ज्यामध्ये सामान्यत: flat - frozen willow-wood blade जोडलेली stick handle असते. ICCच्या नियमानुसार क्रिकेट बॅटची ब्लेड खालील परिमाणांपेक्षा जास्त नसते. लांबी ३८ इंच (९६५ मि.मी.) पेक्षा जास्त असू शकत नाही, रुंदी : ४.२५in/ १०.८ सें.मी./ १०८ मि.मी., खोली : २.६४ in / ६.७ सें.मी. /६७ मि.मी., कडा : १.५६ in / ४.० सें.मी./ ४० मि.मी.



क. यष्टी व विट्या (स्टंप व बेल्स) – यष्टी आणि विट्या सहसा लाकडापासून बनविल्या जातात आणि खेळपट्टीच्या प्रत्येक टोकाला विकेट बनवतात. प्रत्येक विकेटची एकूण रुंदी ९ इंच (२२.९ सें.मी..) आहे. प्रत्येक यष्टी २८ इंच (७१.१ सेंमी.) उंच आहे आणि १.५ इंच (३.८१ सेंमी.) आणि १. ३८ इंच (३.४९ सेंमी.) लांबीचा किमानतम व्यास आहे.


APPENDIX D
Law 8 (The wickets)

Bails

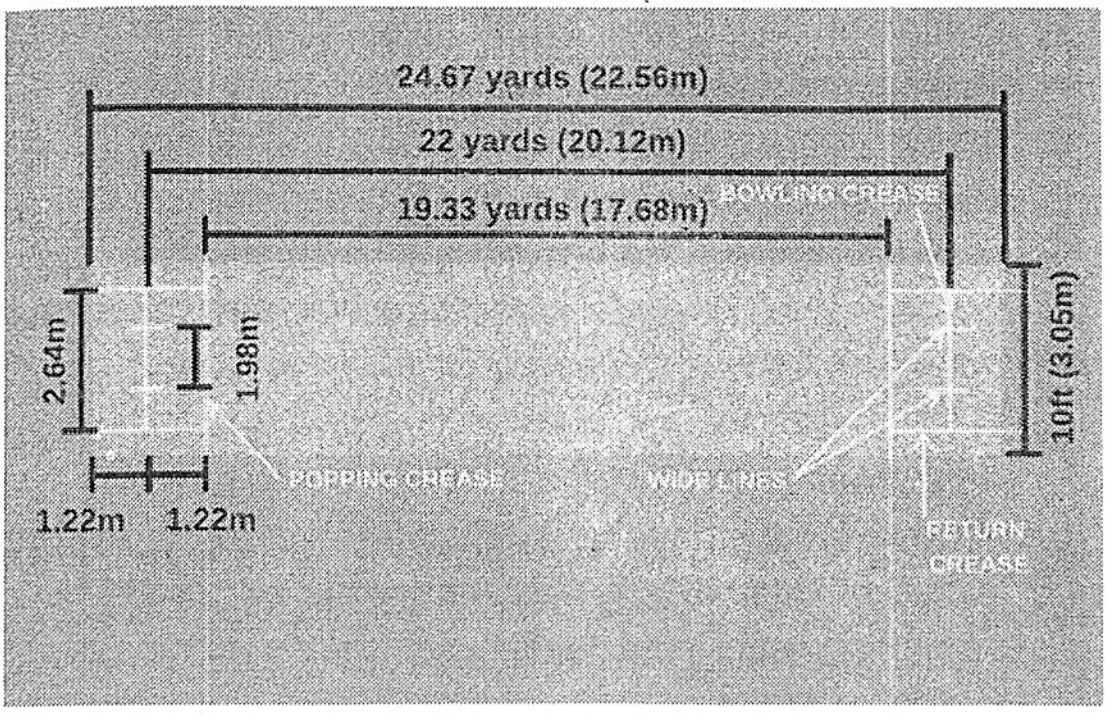
For Senior Cricket
Overall 4.31 in / 10.95 cm
a = 1.38 in / 3.50 cm
b = 2.13 in / 5.40 cm
c = 0.81 in / 2.06 cm

Stumps

For Senior Cricket
Height (d) 28 in / 71.1 cm
Diameter (e)
max. 1.5 in / 3.81 cm
min. 1.38 in / 3.50 cm

Overall Width (f) of Wicket 9in / 22.86 cm

ड. **खेळपट्टी (पीच) :-** खेळपट्टी ही २२ यार्ड (२०.१२ मीटर) लांबी आणि १० फूट (३.०५ मीटर) रुंदीचा आयताकृती क्षेत्र असते. पॉपिंग (फलंदाजी) क्रीज यष्टीच्या समोर दोन्ही बाजूंनी ४ फूट चिन्हांकित केले जाते आणि गोलंदाजीच्या क्रीजसह यष्टी सेट केलेले असतात.



क्रिकेटची नियमावली (Rules) :

बाद होणाच्या पद्धती

फलंदाज बाद होण्याचे एकूण ११ मार्ग आहेत, त्यापैकी पाच प्रकार हे सामान्य आहेत तर सहा अगदी दुर्मीळ. सामान्यतः बाद होण्याचे प्रकार आहेत.

अ. **झेल :** जेव्हा फलंदाजाने मारलेला चेंडू क्षेत्ररक्षक जमिनीला लागण्यांच्या आधी पकडतो तेव्हा त्या बाद होण्याच्या प्रकाराला झेलबाद म्हणतात. झेलबादाचे श्रेय गोलंदाज व क्षेत्ररक्षक दोघांनाही दिले जाते.

ब. **त्रिफळाचीत :** जेव्हा गोलंदाजाने टाकलेला चेंडू फलंदाजी करणाऱ्या फलंदाजाच्या टोकावरील यष्टींना लागतो आणि कमीत कमी एक विट्टी (बेल) जागेवरून खाली पडते, तेव्हा त्याला त्रिफळाचीत म्हणतात. जर चेंडू यष्टींना लागला परंतु विट्या (बेल) पडल्या नाहीत तर फलंदाज नाबाद ठरतो. गोलंदाजाला या बळीचे श्रेय दिले जाते.

क. **पायचीत (LBW) :** जेव्हा गोलंदाजाने टाकलेला चेंडू बॅटला किंवा बॅट धरलेल्या हाताला न लागता फलंदाजाच्या पायावर, पॅड्जवर किंवा शरीरावर

आदळतो तेव्हा खेळाचे पंच, चेंडू यष्टींवर आदळला असता की नाही हें ठरवून फलंदाजाला बाद देऊ शकतात. हा नियम मुख्यतः फलंदाजाला चेंडू बॅटऐवजी पायाने किंवा शरीराने अडवण्यापासून परावृत्त करण्यासाठी आहे. पायचीत होण्यासाठी, चेंडूचा टप्पा लेग स्टंपच्या बाहेर पडणे किंवा फलंदाजाला लेग-स्टंपच्या रेषेबाहेर लागणे अपेक्षित नसते. तो ऑफ-यष्टीच्या बाहेर पडल्यास हरकत नसते.

ड. **धावचीत :** जेव्हा जवळचा फलंदाज त्याच्या क्रिजमध्ये नसेल, तेव्हा क्षेत्ररक्षण करणाऱ्या संघातील खेळाडूने जर चेंडू मारून यष्टी उडवली तर त्याला धावचीत म्हणतात. यासाठी चेंडू अचूकपणे यष्ट्यांवर मारावा लागतो, किंवा फलंदाज धाव घेण्याच्या प्रयत्नात असताना, बहुधा तो यष्टिरक्षक किंवा यष्टीजवळच्या क्षेत्ररक्षकाकडे फेकावा लागतो. फलंदाज धाव घेण्याच्या प्रयत्नात नसतांना देखील 'धावचीत' होवू शकतो. तो फक्त त्याच्या क्रिजबाहेर असणे गरजेचे असते.

ढ. **यष्टीचीत :** चेंडू खेळतांना जेव्हा फलंदाज क्रिजच्या बाहेर जातो. परंतु धाव घेण्याचा प्रयत्न करत नाही आणि चेंडू त्याला चकवून यष्टिरक्षकाच्या हातात जातो तेव्हा यष्टिरक्षक त्याची यष्टी उडवतो. या बाद होण्याच्या प्रकाराला 'यष्टिचीत' म्हणतात. गोलंदाज व यष्टीरक्षकाला या बळीचे श्रेय दिले जाते. नो-बॉल वर फलंदाज धावचीत होवू शकतो, परंतु यष्टिचीत होऊ शकत नाही.

ण. **हिट विकेट :** चेंडू खेळत असताना किंवा नुकत्याच टोलावलेल्या चेंडूवर धाव घेण्याच्या प्रयत्नात असतांना, जर फलंदाजाचा किंवा फलंदाजाने घातलेल्या कपडे, उपकरणे, बॅटने त्रिफळ्यांला धक्का लागून त्यावरील बेल्स खाली पडल्या तर फलंदाज बाद होतो.

त. **चेंडू दोन वेळा टोलावणे :** हा प्रकार खूप दुर्लभ असून, धोकादायक खेळ आणि क्षेत्ररक्षकांचे संरक्षण करण्याच्या हेतूने सुरक्षा उपाय म्हणून अंमलात आणला गेला. कायदेशीररित्या जर चेंडू खेळल्यानंतर, यष्ट्यांवर जात असेल तरच फलंदाज दुसऱ्यांदा चेंडू अडवू शकतो. बाकीवेळा फलंदाजाला बाद ठरवले जाते.

थ. **क्षेत्ररक्षणात अडथळा :** हा सुद्धा एक दुर्लभ प्रकार आहे. जर फलंदाजाने मुद्दामच क्षेत्ररक्षकास अडथळा निर्माण केला (शारीरिकदृष्ट्या) तर फलंदाजाला बाद दिले जाऊ शकते.

द. **चेंडू हाताळणे :** फलंदाज हेतुपुरस्सर विकेट वाचवण्यासाठी चेंडूला हात लावू शकत नाही. येथे एक गोष्ट लक्षात घेणे गरजेचे आहे की जेव्हा फलंदाजाने बॅट पकडलेली असते तेव्हा त्याचे ग्लोव्हज किंवा हात हे बॅटचा भाग असतात, त्यामुळे चेंडू ग्लोव्हजला लागून थेट क्षेत्ररक्षकाच्या हातात गेल्यास फलंदाज झेलबाद होतो.

ध. **टाईम आउट :** एक फलंदाज बाद झाल्यावर दुसऱ्या फलंदाजाला त्याची जागा घेण्यासाठी साधारण तीन मिनिटे दिली जातात. जर तीन मिनिटात पुढच्या फलंदाजाने आपली खेळी सुरू केली नाही केली तर त्याला टाईम्ड आउट बाद घोषित केले जाते व त्याच्या पुढील फलंदाजाला मैदानात उतरण्याची संधी देण्यात येते. या बळीचे श्रेय कोणालाही दिले जात नाही.

न. **रिटायर्ड आउट :** पंचांच्या परवानगीशिवाय एखादा फलंदाज बाद होण्याआधी निवृत्त होऊ शकतो, त्याला रिटायर्ड आउट दिले जाते.

बाद झालेला नसतांनाही फलंदाज मैदान सोडून जाऊ शकतो. जर फलंदाजाला दुखापत झाली किंवा तो आजारी पडला, तर तो तात्पुरता निवृत्त होतो आणि त्याच्याऐवजी दुसरा फलंदाज फलंदाजीला येतो. हे 'रिटायर्ड हर्ट' किंवा 'रिटायर्ड हिल' म्हणून नोंदवले जाते. निवृत्त झालेला फलंदाज नाबाद असतो आणि जर तो बरा झाला तर पुन्हा फलंदाजी करू शकतो. दुखापत झालेली नसतांनाही फलंदाज निवृत्त झाल्यास त्याला रिटायर्ड आउट म्हणून बाद दिले जाते; कोणाही खेळाडूला याचे श्रेय दिले जात नाही. कोणताही फलंदाज नो-बॉलवर त्रिफळाचीत, झेलबाद, पायचीत, यष्टिचीत किंवा हिट विकेट या प्रकारांनी बाद होऊ शकत नाही. तसेच वाईड चेंडूवर तो त्रिफळाचीत, झेलबाद, पायचीत किंवा चेंडू दोन वेळा टोलावणे या प्रकारांनी बाद होऊ शकत नाही. यापैकी कांही प्रकारांमध्ये गोलंदाजानें चेंडू टाकलेला नसतांनाही फलंदाज बाद होऊ शकतो. स्ट्राईकवर नसलेला फलंदाज जर चेंडू टाकण्याआधी क्रिजच्या बाहेर गेला तर, गोलंदाज त्याला धावचीत करू शकतो आणि फलंदाज क्षेत्ररक्षणात अडथळा आणि रिटायर्ड आउट या पद्धतीने केव्हाही बाद होऊ शकतो. टाईम्ड आउट हा प्रकार नैसर्गिकरीत्याच चेंडू न टाकता बाद होण्याचा असतो. बाकी सर्व प्रकारांमध्ये चेंडू टाकला गेल्यानंतरच फलंदाज बाद दिला जातो.

अतिरिक्त धावा किंवा अवांतर धावा

क्षेत्ररक्षण करणाऱ्या संघांनी केलेल्या चुकांमुळे फ्फलंदाजी करणाऱ्या संघाला वाढीव धावा मिळतात, त्यांना 'अवांतर धावा' असे म्हणतात. खालील चार प्रकारे या धावा दिल्या जातात:

अ. **नो बॉल :** नियम मोडण्याच्या दोन प्रसंगांमध्ये गोलंदाजाला एका अवांतर धावेचा दंड केला जातो (१) हातांची चुकीची हालचाल करून चेंडू फेकणे; (२) पॉपिंग क्रिजच्या पुढे जाऊन गोलंदाजी करणे (ओव्हरस्टेपिंग); (३) रिटर्न क्रिजच्या बाहेर पाय राहणे. या दंडात्मक धावेशिवाय, गोलंदाजाला एक अतिरिक्त चेंडू टाकावा लागतो. मर्यादित षटकांच्या सामन्यामध्ये, गोलंदाजी करणाऱ्या संघाने क्षेत्ररक्षणाच्या निर्बधाचे उल्लंघन केल्यास तो चेंडू नो बॉल ठरवला जातो. खेळाच्या लहान प्रकारात (२०-२०, एकदिवसीय) फ्री-हिटचा नियम केला गेला आहे. पुढच्या पायाच्या नो-बॉलनंतरचा चेंडू हा फलंदाजासाठी फ्री-हिट असतो. या चेंडूवर फलंदाजाला धावचीत सोडून इतर कोणत्याही प्रकाराने बाद होण्याची भीती नसते.

ब. **वाईड :** गोलंदाजाने फलंदाजाच्या कक्षेबाहेर चेंडू टाकल्यास एक अतिरिक्त धाव दिली जाते. नो-बॉल प्रमाणेच वाईड बॉल टाकल्यास गोलंदाजाला एक अतिरिक्त चेंडू टाकावा लागतो. वाईड चेंडू जर सीमारेषेपार गेला, तर फलंदाजी करणाऱ्या संघाला पाच धावा दिल्या जातात (वाईडसाठी एक आणि सीमारेषेपार चेंडू गेल्यामुळे चार).

क. **बाय :** फलंदाज चेंडू खेळू शकला नाही आणि चेंडू यष्टिरक्षकाजवळून मागे निघून गेला आणि फलंदाजाला धावा काढण्यासाठी वेळ मिळाला तर अवांतर धाव दिली जाते (बायमुळे मिळणाऱ्या धावांना प्रतिबंध करणे हा चांगल्या यष्टिरक्षकाचा एक गुण असतो).

ड. **लेग बाय :** चेंडू टोलावण्याचा प्रयत्न करताना, फलंदाजाच्या बॅटला न लागता शरीराच्या इतर कोणत्याही भागाला लागून फलंदाजाला धावा काढण्यासाठी वेळ मिळाल्यास अतिरिक्त धावा दिल्या जातात.

गोलंदाजाने नो किंवा वाईड बॉल टाकल्यास, त्याच्या संघाला एक अतिरिक्त चेंडू टाकावा लागतो आणि त्यामुळे फलंदाजी करणाऱ्या संघाला अशा जास्तीच्या चेंडूवर अधिक धावा करण्याची संधी मिळते. बाय आणि लेग बाय या चेंडूंवर धावा करण्यासाठी फलंदाजाला धावावे लागते (जर, चेंडू सीमारेषेपार गेला नाही तर) परंतु, या धावा फलंदाजाच्या वैयक्तिक धावसंख्येमध्ये मोजल्या न जाता, संघाच्या एकूण धावसंख्येमध्ये मोजल्या जातात.

इ. **डकवर्थ/ लुईस नियम :** हा नियम One Day व T-20 या खेळात आणतात. या नियमात प्रत्येक बॉल व विकेट नंतर यात बदल होत असतो. याबद्दलची अधिक माहिती पुढील लिंक वर उपलब्ध होईल. https://www.icc-

cricket.com/about/cricket/rules-and-regulations/duckworth-lewis-stern

ई. **टाय (Tie) :** One Day व T-20 सामन्यात रन्स् दोन्ही संघाचे समान झाल्यानंतर Super Over घेऊन सामन्याचा निकाल लावण्यात येतो. जर Super Over मध्येही रन समान झाल्यानंतर त्याच सामन्यात ज्या संघाने अधिक वेळेस बॉलने सीमारेषा (Boundary) क्रॉस केली असेल, तर त्या संघास विजयी घोषित करण्यात येते. याचे उत्तम उदाहरण म्हणजे सन २०१९ World Cup च्या अंतिम सामन्यात याच निर्णयामुळे इंग्लंड जिंकले. या सामन्यात सामना व सुपर ओवर यात रन्स् समान झाले होते.

कौशल्ये (Skills) :

क्रिकेट या खेळात फलंदाजी, गोलंदाजी, फिल्डिंग व विकेट-कीपिंग ही कौशल्ये आहेत.

फलंदाजीची कौशल्ये

दक्षिण आफ्रिकेच्या क्रिकेट संघाचे माजी मुख्य प्रशिक्षक बॉब वूल्मर यांनी 'दि आर्ट अँड सायन्स ऑफ क्रिकेट'मध्ये लिहिले आहे की फलंदाजीला पाच मूलभूत तत्त्वे आहेत : चेंडू पहा, आपले डोके चेंडू सोडताना स्थिर ठेवा, चेंडूची लांबी अचूकपणे सांगा, आपल्या हातांना आपले शरीर आणि पाय योग्य स्थितीत नेणे आणि योग्य शॉट निवडणे.

अ. **बचावात्मक फटका (डिफेन्स शॉट) :** चेंडू हा स्टॉपवर येण्यापूर्वी तो रोखण्यासाठी फलंदाज बॅटने खेळत असतो तर हा फटका खेळण्यासाठी जास्त ताकद वापरणे आवश्यक नसते. बॅटला यष्टीच्या दिशेने जाताना थांबवण्यासाठी हलक्या हाताने खेळता येते. डिफेन्स फटका प्रामुख्याने दोन प्रकारचा असतो. (१) पुढील पाय पुढे काढून चेंडूला रोखणे (२) मागील पाय मागे घेऊन चेंडूला रोखणे. हा बचाव शॉट आहे, या शॉटमधून धावासुद्धा करता येतात.

ब. **लेग ग्लान्स शॉट :** हा फटका खेळण्यासाठी फलंदाजाचे मनगट मजबूत असणे आवश्यक आहे, कारण शेवटच्या क्षणी फलंदाज लेग साइड खेळतो. हा फटका खेळत असताना आपण सावधगिरी बाळगली पाहिजे, कारण जर आपण तो झटकन चुकवला तर एलबीडब्ल्यू साठी (लेग फोर विकेट) जाण्याची अधिक शक्यता असते.

क. **ड्राइव्ह शॉट :** ड्राईव्ह शॉट सरळ बॅटने खेळला जातो. त्यास चेंडूच्या रेषेत येऊन व चांगली बॅट स्विंग आवश्यक असते. यात कव्हर ड्राईव्ह, ऑन डाईव्ह, ऑफ ड्राईव्ह, स्ट्रेट ड्राइव्ह आणि स्क्वेअर ड्राईव्हसारखे विविध प्रकारचे फटके आहेत. ड्राईव्ह शॉट हा सामान्यत: एक फटका असतो जो आगामी क्रिकेटर्सना प्रथम शिकविला जातो.

ड. **फ्लिक शॉट :** फ्लिक शॉट मनगट शक्तीचा वापर करून लेगच्या साईडला खेळला जाणारा फटका आहे. हा कमी जोखीम असलेला आहे व हा फटका बॅकफूट आणि फ्रंटफूट असे खेळू शकतो. विराट कोहली भारतीय संघाचा कर्णधार फ्लिक शॉट चांगला खेळतो. तो फ्लिक शॉटमध्ये तज्ज्ञ आहे. कारण त्याचे मनगट खूपच मजबूत आणि सामर्थ्यवान असल्यामुळे तो हा शॉट सहज खेळू शकतो.

इ. **स्क्वेअर ड्राइव्ह शॉट :** स्क्वेअर ड्राइव्ह नवशिक्यांसाठी खेळणे खूप अवघड आहे, कारण हा फटका क्रॉस बॅटने खेळावा लागतो. तसेच चेंडूच्या वेगाचे योग्य ज्ञान असणे आवश्यक आहे आणि स्क्वेअर ड्राईव्ह आणि स्क्वेअर कट हे सारखेच दिसतात परंतु प्रत्यक्षात ते कठीण आहेत. स्क्वेअर ड्राईव्ह गुडघे टेकून वाइड बॉलवर फटकावण्यासाठी व स्क्वेअर कट फलंदाजाच्या कमरेपेक्षा वर ऑफ साईडला असल्यास खेळला जातो.

ई. **कट शॉट :** क्रिकेटमध्ये आपण क्रॉस बॅटने धावा काढू शकतो, जर आपल्याला कट शॉट उत्तम प्रकारे खेळायचा असेल तर जेव्हा बॉल आपल्या शरीराच्या जवळ येतो, तेव्हा आपण तो मागील पाय वर टाकून चेंडू मारावा जेणेकरून तो थर्ड मॅनच्या खेळाडूंकडे किंवा त्याच्या बाजूस जाईल.

उ. **स्वीप शॉट :** स्वीप शॉट क्रॉस बॅटने पुढचा पायावरं खेळला जाणारा फटका आहे. हा फटका गुडघा टेकून खेळण्याचा एक अचूक मार्ग आहे. आपले डोके चेंडूच्या रेषेत खाली असले पाहिजे आणि बॅट स्विंग योग्य असणे आवश्यक आहे. जेव्हा बॉल शरीराच्या जवळ येतो, तेव्हा क्रॉस बॅटने स्विंग करा.

ऊ. **पुल आणि हुक शॉट :** हुक शॉट हा बाउन्सर चेंडूला फलंदाजाच्या छातीच्या वर असलेल्या चेंडूवर खेळला जातो. हुक शॉट स्क्वेअर लेगच्या दिशेने खेळला जाईल, आपण तो हवेत किंवा जमिनीवर खेळू शकता. फलंदाज क्रॉस बॅटने स्क्वेअर लेगच्या दिशेने खेचतो.

पुल आणि हुक शॉट पुढच्या पायावर किंवा मागील पायावर खेळला जाऊ

शकतो, परंतु मागील पायावर खेळल्यास अधिक फायदे आहेत. परिपूर्ण शॉटसाठी मागील पायांवर खेळायला हवे. भारतीय क्रिकेट संघात रोहित शर्मा पुल शॉट उत्तम प्रकारे खेळतो, तो पुल शॉटचा मास्टर आहे.

ए. **रिव्हर्स स्वीप शॉट :** रिव्हर्स स्वीप हाही एक स्टँडर्ड स्वीप असतो. हा उलट दिशेने खेळलेला क्रॉस बॅट फटका आहे. लेग साईडवर स्वीप शॉट खेळला जातो, पण रिव्हर्स स्वीप शॉट हा विरुद्ध बाजूस थर्ड मॅन किंवा बॅकवर्ड पॉईंटकडे खेळला जातो. येथे LBW होण्याचा धोकादेखील जास्त आहे. तसेच फील्डरकडे झेल जाण्याची शक्यता असते.

रिव्हर्स शॉटचे दोन मास्टर आहेत एबी. डी. व्हिलियर्स आणि मॅक्सवेल. ते षटकार मारण्यासाठी रिव्हर्स स्वीप खेळतात.

ऐ. **अप्परकट शॉट :** जेव्हा चेंडूला अतिरिक्त बाऊन्स मिळतो तेव्हा अप्परकट खेळत असतात. हा शॉट थर्ड मॅनच्या बाजूस खेळला जातो. हा शॉट आधुनिक क्रिकेटमध्ये अधिक आहे. अप्परकट शॉट वेगवान बाउन्सी ट्रॅकवर T-20 सारख्या शॉर्ट ओव्हरमध्ये अधिक पाहण्यास मिळतो. मास्टर ब्लास्टर सचिन तेंडुलकरचा हा सिग्नेचर शॉट आहे.

गोलंदाजीची कौशल्ये

तेजगती गोलंदाज ९० मैल प्रति तास (१४० किमी/तास) पेक्षा जास्त गतीने गोलंदाजी करतात आणि काही वेळा ते फलंदाजाला पराभूत करण्यासाठी केवळ वेगावर अवलंबून राहतात. कारण वेगाने आलेल्या चेंडूला प्रतिसाद देण्यासाठी फलंदाकडे फारच कमी वेळ असतो. तर काही तेजगती गोलंदाज वेळ आणि कपट या दोहोंचे मिश्रण करत गोलंदाजी करतात. काही गोलंदाज चेंडू हवेत वळविण्यासाठी (स्विंग) चेंडूच्या शिवणीचा वापर करतात. या प्रकारची गोलंदाजी फलंदाजाला फसवून चेंडू टोलवण्याच्या टायमिंगमध्ये गल्लत करण्यास भाग पाडू शकते, ज्यामुळे बॅटची कड घेऊन चेंडू यष्टिरक्षकाच्या किंवा स्लीपमधील फलंदाजाच्या हातात जावू शकतो किंवा यष्ट्यांवर आदळून फलंदाज बाद होऊ शकतो.

दुसऱ्या प्रकारच्या गोलंदाजीला 'फिरकी' गोलंदाजी म्हणतात. ज्यामध्ये गोलंदाज तुलनेने कमी वेगात गोलंदाजी करतो आणि चेंडू वळवून गोलंदाजाला चकवण्याचा प्रयत्न करतो. फलंदाजाला अशा गोलंदाजीपासून खूप सावध राहावे लागते. कारण सहसा असे चेंडू बरेचदा त्याच्या अपेक्षेप्रमाणे बॅटवर येत नाहीत आणि तो जाळ्यात अडकून बाद होण्याची शक्यता असते.

जलद आणि फिरकी गोलंदाजांच्यामध्ये असतात ते 'मध्यमगती गोलंदाज', जे सक्तीने अचूकतेवर अवलंबून असतात. धावांच्या गतीला चाप बसवणे आणि फलंदाजांची एकाग्रता भंग करण्याचा यांचा मुख्य हेतू असतो.

क्रिकेट गोलंदाजीच्या तंत्रात विविध प्रकारचे फिरकी गोलंदाज

१) **ऑफ स्पिन :** ऑफ स्पिन बॉलिंग म्हणजे जेव्हा एखादा चेंडू उजव्या हाताच्या फलंदाजाच्या शरीराकडे येतो.

२) **गुगली :** जेव्हा एखादा गोलंदाज फलंदाजास लेगस्पिन बॉल टाकत असेल व मधेच एखादा बॉल हा ऑफ स्पिन होतो तेव्हा सहसा तो 'गुगली' म्हणून ओळखला जातो. उदा. एखादा गोलंदाज मनगटाने किंवा बोटांनी गोलंदाजी करू शकतो.

३) **टॉप स्पिन :** जेव्हा एखादा चेंडू हा नेहमीपेक्षा अधिक बाउन्स घेतो त्यास टॉप स्पिन म्हणतात. बोटाच्या बॉलच्या सीमवर दोन नंबर बोट असणे आवश्यक आहे, अंगठा आणि मध्य बोट हे बॉलच्या विरुद्ध बाजूस असावे. टॉप स्पिन गोलंदाजी करणे खूप कठीण आहे. क्रिकेटमध्ये 'टॉप स्पिन' बॉल करण्यासाठी अचूक तंत्र असले पाहिजे.

४) **लेग ब्रेक :** लेग ब्रेक ही डाव्या हाताच्या फलंदाजासाठी फलंदाजांच्या शरीराच्या दिशेने येते आणि उजव्या हाताच्या फलंदाजाच्या शरीरापासून दूर जाते.

५) **इनस्विगर :** सहसा बॉल उजव्या हाताच्या फलंदाजासाठी आत येतो.

६) **आउटस्विगर :** हे त्याच्या शरीरापासून बॉल दूर सरकण्यासारखे आहे.

७) **स्लोव्हर बॉल :** गोलंदाज वेगात पळत येऊन बॉल हळूवारपणे टाकतो.

८) **यॉर्कर :** यॉर्करची एक अचूक डिलिव्हरी, फलंदाजांचे पाय आणि त्या भागात जोरदार चेंडू टाकणे.

क्षेत्ररक्षण (फिल्डिंग)

क्रिकेटमधील सर्वोत्तम क्षेत्ररक्षण हे विकेट घेण्यास आणि धावा वाचविण्यात महत्त्वपूर्ण भूमिका बजावते. एक परिपूर्ण फील्ड सेट दबाव निर्माण करते आणि फलंदाजांना चुकीचे फटके खेळण्यासही मदत करते. हे सर्व कर्णधारावर अवलंबून असते. तो संघाचा नेता असतो आणि त्याला क्रिकेटमधील सर्वोत्तम क्षेत्ररचनाबद्दल माहिती असणे आवश्यक असते. यापूर्वी ज्यांनी क्षेत्ररक्षण सत्रात लक्ष दिले नाही त्यांच्यासाठी दिवसेंदिवस क्षेत्ररक्षण हा क्रिकेटमधील महत्त्वाचा घटक बनतो. क्रिकेटच्या कायद्याकडे दुर्लक्ष करून खेळाडू क्षेत्ररक्षण करू शकत नाही.

१) **फर्स्ट स्लिप :** फर्स्ट स्लिप फील्डर विकेट कीपरच्या अगदी जवळ असतो आणि त्याचा मुख्य हेतू कॅच पकडणे हा असतो. क्रिकेटपटू विकेट कीपरच्या जवळ उभे राहून प्रथम स्लिप म्हणून ओळखला जातो.

२) **सेकंड स्लिप :** दुसरी स्लिप विकेट कीपरच्या अगदी पहिल्या स्लिपसारखीच पण दुसऱ्या स्लिपच्या पहिल्या स्लिपजवळ आणि फलंदाजांच्या मागे असते. दोन्ही स्लिप्स क्रिकेटमध्ये कॅचिंग फिल्डर म्हणून ओळखले जातात.

३) **थर्ड स्लिप :** तिसरा स्लिप हा स्लिप फील्डरच्या ओळीत येतो जो दुसऱ्या स्लिप फिल्डरजवळ उभा असतो. आणि तिसऱ्या स्लिपमध्येही क्रिकेटमधील आकर्षक स्थान असते.

४) **गली :** क्रिकेटमध्ये गलीचे एक स्थान आहे जो स्लिप फील्डरच्या एका रांगेत उभा असतो.

५) **लेग स्लिप :** क्रिकेटमध्ये लेग स्लिप एक स्लिप फील्डर आहे. तो फलंदाजांच्या मागे व लेग साईडला उभा असतो. म्हणूनच तो लेग स्लिप म्हणून ओळखला जातो.

६) **थर्ड मॅन :** थर्ड मॅन डीप पॉईंट जवळील क्रिकेटच्या मैदानाच्या अंतिम रेषेच्या बाजूला आणि ऑफ-साइडला उभा असतो.

- **डीप फाईन लेग :** डीप फाईन लेगने क्रिकेटमध्ये क्षेत्ररक्षणानंतरही चांगले स्थान मिळवले आहे. तो सीमारेषेवर उभा असतो आणि फलंदाजांच्या लेग साइडची जागा व्यापतो.

७) **सिली पॉईंट :** सिली पॉईंट फलंदाजाजवळ मुळात खेळपट्टीजवळ असतो. कॅच पकडणे हे त्याचे मुख्य उद्दिष्ट आहे.

८) **पॉइंट :** पॉइंट पोजीशन ही क्रिकेट मैदानाची ऑफसाइड फील्डिंग पोजीशन आहे आणि खेळाडू मैदानाच्या वर्तुळात उभा असतो.

९) **कव्हर :** क्रिकेट ग्राउंडमध्ये कव्हर पोजीशन ही ऑफसाइड फिल्डिंग पोजीशन देखील असते. परंतु खेळाडू मैदानाच्या वर्तुळात आणि पॉईंट फील्डच्या जवळ उभा असतो.

१०) **सिली मिड-ऑफ :** सिली मिड-ऑफ खेळपट्टीजवळ अगदी स्टॅल पॉईंट पोजीशनसारखेच असते जे गोलंदाजीच्या जवळ असते. आणि क्रिकेटमध्ये तो एक कॅचिंग फिल्डर आहे.

११) **अतिरिक्त (Extra) कव्हर :** अतिरिक्त कव्हर एक ऑफ साइड फील्डर आहे, जे क्रिकेटच्या वर्तुळात उभे आहे. तो फिल्डर आणि मिड-ऑफ फिल्डर कव्हर करण्यासाठीदेखील उभा आहे.

१२) **मिड-ऑफ :** मिड-ऑफ स्थिती ही वर्तुळाच्यामध्ये असते आणि ऑफ-साइड स्थिती असते (क्रिकेटचे सल्ले आणि प्रोत्साहन देण्यासाठी गोलंदाजाच्या जवळ असते).

१३) **लॉन्ग ऑफ :** क्रिकेटमध्ये लॉन्ग ऑफ ही एक ऑफ-साइड फील्डर पोजिशन आहे, जी सीमारेषेच्या अगदी जवळ असते.

१४) **मिड-ऑन :** क्रिकेटमध्ये मिड-ऑन ही वर्तुळाच्यामध्ये असते आणि मिड-ऑफ फील्डरच्या विरूद्ध बाजूस असते.

१५) **लाँग ऑन :** क्रिकेटमध्ये बाऊंड्री लाइन असून क्रिकेटमध्ये लॉन्ग ऑफ फील्डरच्या विरुद्ध बाजूस असते.

१६) **शॉर्ट लेग :** शॉर्ट लेग फलंदाजांच्या जवळ असतो आणि कॅच पकडणे त्याचे मुख्य उद्दिष्ट असते. क्रिकेटच्या स्थितीत सिली पॉईंट फील्डरच्या विरुद्ध बाजूस असतो.

यष्टिरक्षक (विकेट-किपर)

यष्टिरक्षक जो स्ट्राईकवर असलेल्या फलंदाजाच्या विकेटच्या मागे उभा राहतो. यष्टिरक्षण हे बहुधा तज्ज्ञाचे काम असते आणि तो मुख्यत्वे फलंदाजाने न टोलवलेले चेंडू पकडतो, जेणेकरून बाईजमुळे अवांतर धावा जाणार नाहीत. तो खास बनवलेले ग्लोव्ह्ज वापरतो (क्षेत्ररक्षकांपैकी फक्त यष्टिरक्षकच ग्लोव्ह्ज वापरू शकतो) आणि पायांवर पॅड्स वापरतो. तो एकमेव क्षेत्ररक्षक असा असतो जो फलंदाजाला यष्टीचीत करू शकतो.

पंच आणि गुणलेखक (Umpire & Scorer) :

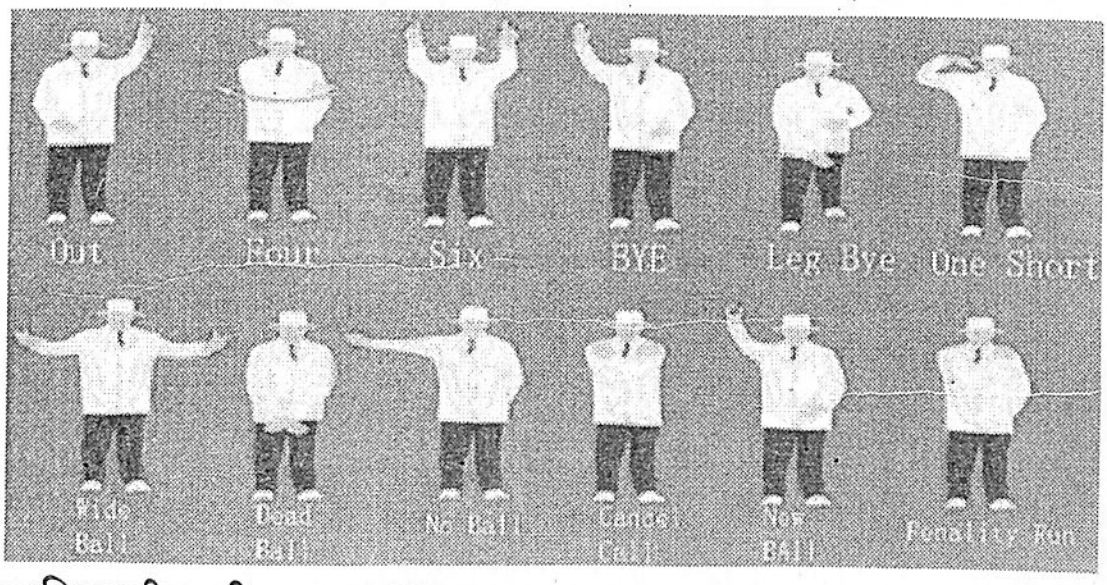
मैदानावरील खेळाच्या नियमनाची कामगिरी दोन पंच पाहतात. त्यामधील एक गोलंदाजी टोकाकडे विकेटच्या मागे उभा राहतो आणि दुसरा 'स्क्वेअर लेग' स्थानावर उभा असतो, हे स्थान 'स्ट्राईक'वर असलेल्या फलंदाजाच्या १५-२० मीटरवर असते. पंचांचे मुख्य काम असते ते विविध बाबींवर निर्णय देण्याचे. जसे चेंडू योग्य रितीने टाकला गेला आहे का (तो नो किंवा वाईड नाही), जेव्हा धाव काढली जाते आणि फलंदाज बाद झाला आहे की नाही (यासाठी क्षेत्ररक्षण करणाऱ्या संघाने पंचांकडे बहुधा 'हाऊज दॅट' म्हणून अपील करणे गरजेचे असते). मध्यंतर केव्हा होईल हे सुद्धा पंच निश्चित करतात. तसेच खेळण्यासाठी परिस्थिती योग्य आहे किंवा नाही आणि खेळाडूंसाठी ओलसर खेळपट्टी किंवा अपुरा सूर्यप्रकाश यासारख्या घातक परिस्थितीमध्ये खेळ थांबवणे किंवा रद्द करणे हे सुद्धा पंचांच्या हातात असते.

मैदानाबाहेर आणि ज्या सामन्याचे दूरचित्रवाणीवर प्रक्षेपण होते, त्या सामन्यामध्ये

बहुधा तिसरा पंच असतो. ज्या निर्णयांसाठी ध्वनीचित्रफितीच्या (व्हीडिओ) पुराव्याची गरज असते अशा वेळी ते निर्णय घेतात. संपूर्ण आयसीसी सदस्य असलेल्या दोन संघांमधील आंतरराष्ट्रीय कसोटी आणि मर्यादित षटकांच्या सामन्यात तिसरे पंच असणे अनिवार्य आहे. या सामन्यांमध्ये सामनाधिकारीसुद्धा असतात. खेळ क्रिकेटच्या नियमांनुसार चालू आहे का हे पाहणे त्यांचे काम असते.

स्कोअरकीपर : धावा आणि सामन्याच्या इतर तपशीलाची माहिती ठेवणे, हे दोन अधिकृत (प्रत्येक संघाचे प्रतिनिधीत्व करणारा एक) स्कोअरकीपरचे काम असते. पंचांनी हातांनी केलेल्या निर्देशांनुसार स्कोअरकीपर आपले काम करतात. जसे पंच तर्जनी वर करून फलंदाज बाद असल्याचे दर्शवतात व दोन्ही हात वर करून ते फलंदाजाने षट्कार मारल्याचे दाखवतात. क्रिकेटच्या नियमांनुसार धावांच्या नोंदणीकरता स्कोअरकीपर असणे गरजेचे आहे. धावांच्या मोजणीशिवाय खेळासंबंधित लक्षणीय प्रमाणात ते अतिरिक्त तपशीलसुद्धा नोंदवतात.

पंचाचे इशारे (Umpire Decision) :



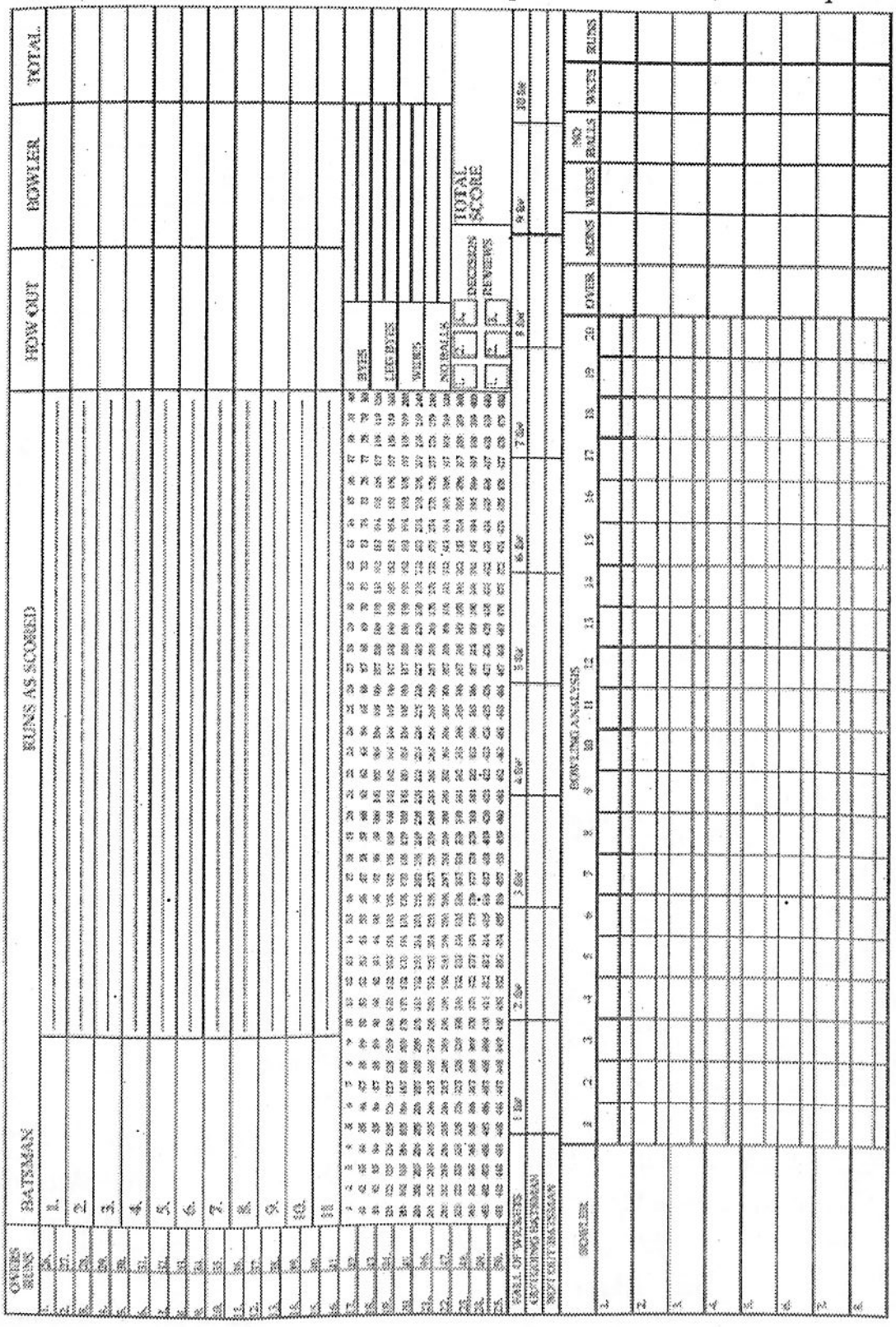
साहित्याची यादी (Check List) :

क्र	विशेष	संख्या	क्र	जनरल
१	मुख्य पंच	२	१	स्टेशनरी
२	स्कोअरर	१		पेन वेगवेगळ्या कलरमध्ये
३	तिसरा पंच	१		राईटींगं पॅड्स
४	सामनाधिकारी	१		पेपर
५	स्कोअर शिट	२		फाईल

क्र	विशेष	संख्या	क्र	जनरल
६	खेळण्यासाठी चांगली खेळपट्टी मार्किंग केलेली, ३० यार्ड व सीमारेषा यांचे मार्किंग	१		स्टेपलर, पिन, पंचिग मशीन
७	यष्टी (स्टम्प)	६	२	मोठा स्कोर बोर्ड
८	विट्या (बेल्स)	४		
९	मँच बॉल	१	३	बैठक व्यवस्था
१०	फलंदाज - बॅट, हेल्मेट, ग्लोज, पॅड्स, थाय पॅड्स, चेस्ट पॅड्स, एल्बो गार्ड, A/D गार्ड	१ नग		तिसरा पंच, सामनाधिकारी, खेळाडूं, प्रेक्षक
११	यष्टिरक्षक - इनरस, ग्लोज, पॅड्स, हेल्मेट.	१ नग		

स्कोअर शिट :

https://sport.unimelb.edu.au/pdfs/MU-Sport-Cricket-Scoresheet. pdf



टीम लिस्ट (Team List) :

Date : Time :

Team Name : Vs

No	Players Name	
1		Captain
2		Vice-Captain
3		Wicket-Keeper
4		
5		
6		
7		
8		
9		
10		
11		
12th Man	Reserve Player	
13	Reserve Player	
14	Reserve Player	
15	Reserve Player	
16	Reserve Player	
I		Coach
II		Manager

Team Manager Signature Captain Signature

संदर्भ (Reference) :

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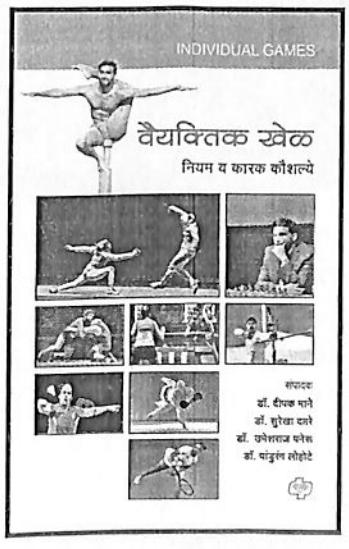
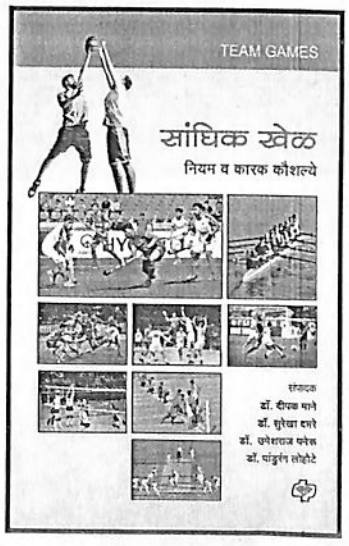
सांघिक खेळ (Team Games) हे जगाच्या पाठीवर सर्व ठिकाणी खेळले जाणारे खेळ आहेत. त्यांना 'लोकमान्यता', 'राजमान्यता' आणि 'जगन्मान्यता' असं सर्व काही लाभलं आहे. भारतात प्रादेशिक भाषेत क्रीडा विषयक पुस्तकांची मोठीच उणीव आहे. त्या दृष्टीने मराठी भाषेत हे पुस्तक प्रकाशित करण्याची जिद्द बाळगून या विषयावरचे साहित्य, छायाचित्रे, त्याशिवाय सांघिक क्रीडा प्रकारांवरील प्रसिद्ध नियतकालिके, वेबसाइटस् यांचा अभ्यास करून या पुस्तकाची रचना करण्यात आली आहे.

हे पुस्तक म्हणजे क्रीडा व शारीरिक शिक्षण या विषयावरील पाठ्यपुस्तक नाही कारण कोणत्याही विद्यापीठाचा क्रीडा व शारीरिक शिक्षण चा अभ्यासक्रम डोळ्यासमोर ठेऊन याची आखणी केलेली नाही. उलट अश्या अभ्यासक्रमासाठी एक उपयुक्त संदर्भग्रंथ असेच या पुस्तकाचे स्वरूप ठेवण्याचा प्रयत्न केलेला आहे. त्यामुळे मराठी भाषिक क्रीडारसिक हे पुस्तक संग्रही बाळगतील असा विश्वास वाटतो.





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