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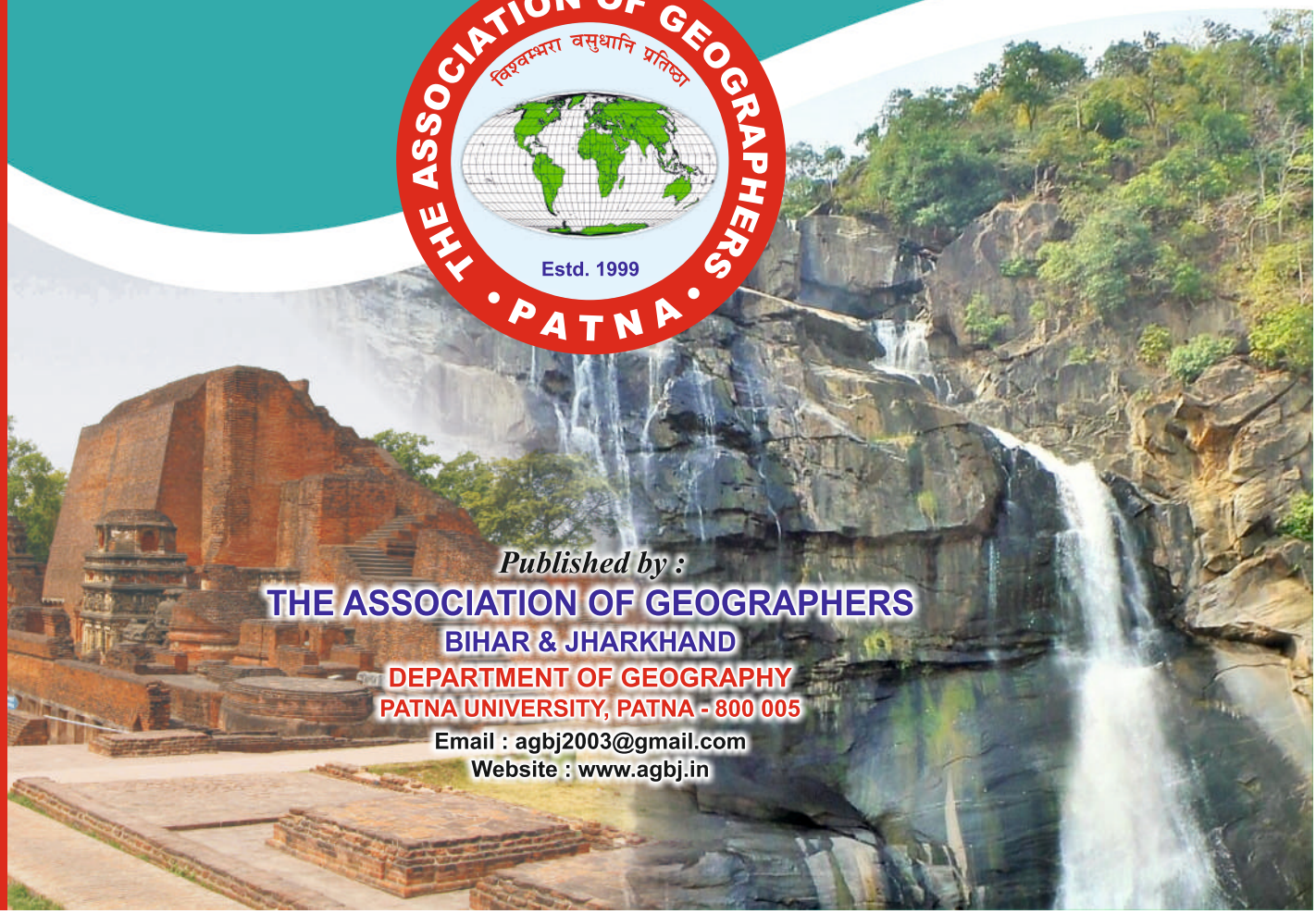

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The Association of Geographers, Bihar and Jharkhand was first established as The Bihar Association of Geographers (BAG) in 1999. After the partition of the state into Bihar and Jharkhand, the association was renamed as `The Association of Geographers, Bihar and Jharkhand (AGBJ) in 2001. The association performs various activities to promote geography as an inter-disciplinary subject of pragmatic relevance in order to strengthen the importance of the study of space for the betterment of society and to bring sustainable development as an integral part of earth system. `The Geographical Perspective' is an annual bilingual journal, published since 2000 AD, and the basic objective of its publication is to promote the above mentioned objectives. The membership of the association is open to any person who keeps interest in geography and the allied subjects. Its headquarters is situated in the Department of Geography, Patna University, Patna, Bihar (India)

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Enquiry, Subscription and Mailing Address

Dr. Manoj Kumar Sinha, *General Secretary*
The Association of Geographers, Bihar and Jharkhand (AGBJ)
Department of Geography, Patna University, Patna - 800005, Bihar (India)
Mob : 9939501556 | E-mail : agbj2003@gmail.com

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CONTENTS

Volume: 22 ISSN 0970-809X October, 2021

CONTENTS

Volume: 22 ISSN 0970-809X October, 2021

Hindi Section

Editorial Column

Dear Fellow Members

It is not easier to edit a research journal where every contributor has his own academic field of domain. The editorial board has responsibility to edit the paper in such a way that the original idea of the researcher remains in his own style and at the same time the paper is brought under the publication guidelines of "Geographical Perspective".

I am happy to inform the reader that my burden is eased out to a great extent by the Peer reviewers, Advisory committee members and the members of the Editorial Board.

There are 15 research papers in this volume of the journal. The contributors have both disciplinary and inter-disciplinary approaches in presenting their research papers. Moreover, this volume has received research papers from all over India exhibiting its pan-India acceptability. This volume has topics addressing industrial problem, urban system, agriculture and land use, environment problem and issues related to water resources, labour etc. Papers are written in both English and Hindi languages. One paper is on language geography. The author of this paper belongs to the discipline of English but approach is geographical. The research documents of National Education Policy, 2020 gives immense priority to this kind of research. Even at global level, social scientists are being promoted to adopt interdisciplinary approach so that the very social science remains relevant. I am placing this kind of reference here to simply aware the new generation geographers to new challenges in the coming years.

I further wish to seize this opportunity to express my sincere thanks to the members of advisory committee, Editorial Board and office bearers of the AGBJ for their timely and constructive support in the publication of this Journal. At the same time, I extent invitation to the readers to share your critical opinion with editorial board members so that necessary corrections may be brought in the next volume of the Journal.

Rash Bihari Pd. Singh.

(Rash Bihari Pd. Singh)
Editor-in-Chief

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PRESIDENTIAL ADDRESS

REVIVAL OF VILLAGE INDUSTRIES: THE HOPE FOR THE FUTURE OF STRONG AND SHINING INDIA

Devendra Prasad Singh*
Email : devendrasingh1953@gmail.com

ABSTRACT

History of village industries of India is glorious and vibrant. A series of industries had been developed in our villages, which made them prosperous and self sufficient, which also created such a positive impact that India also become vibrant and was called as the Golden Bird all over the world. But with the influx of manufactured goods of Britain even in our ruralities our village industries started vanishing. After 1960s and 1970s the entire village industries of the country were vanished completely. It transformed our prosperous villages into centers of poverty, unemployment and misery. It was resulted into the stampede from our villages towards urban centers. Ofcourse our villages have been transformed from prosperity to poverty, from heaven to hell and from self dependant to dependant. This paper intends to evaluate the glorious status of village industries of the country in the past and also to investigate the reasons of plight of our village industries in the present. It is also meant to formulate strategies for revival of Indian village industries in the future.

Keywords : Artisan, Golden bird, commodities, community, system, stampede vanishing and collapse

Introduction

History of Indian Village and Cottage industries has been glorious and shining. Our village artisans were diligent, experienced and of high artistic talent. Our villages had series of cottage industries, which were engaged in producing all types of commodities required for the villagers. So our villages were self sufficient. It was also found on all India basis. As each and every village of the country was prosperous and self-sufficient, so India as a nation was also self-sufficient. It was not only self-sufficient but was the leading exporting country of the contemporary world. Commodities produced in village industries had also a great export value all over the then known contemporary world and it was known as the Golden Bird.

Now our village industry have completely been collapsed and our village become poor and poorer. They are now centers of unemployed youths, who are migrating to urban centers for jobs and livelihood. The journey of our village from ancient prosperity to the modern poverty is very pathetic and invites scholars for critical appraisal and solutions. Here, the glorious scenario of the village industries in the past, the pathetic conditions of the present and the prosperous picture of the future have been tried to be painted.

* Dr. Devendra Prasad Singh is Retd. Professor of geography, A.N. College, Patna, Patliputra University and Director of Researches, IERARD, Patna. This paper was presented as the Presidential Address in the 22nd Annual Conference of AGBJ at T.M. Bhagalpur University, Bhagalpur.

Meaning of Industry

As mentioned in the Britannica: Ready Reference encyclopedia (2005 vol. 5, 123) "group of productive organizations that produce or supply goods, services or sources of income" is called industry. Industry is actually a process, which includes the transformation of shape, size, characteristics and quality of commodities produced during the primary and even in the course of secondary stage of economic occupation of man. He adds that industry itself falls in the group of secondary type of economic activities of human being. In industrial process man develops such qualities in the products so that it may be useful for himself. Gautam (2010) ascertains that "secondary activities involve transforming raw materials into usable products, giving them form utility. It also reduces the extra weight, size and shape of the commodities and makes the products beautiful and costlier. We take an example of iron. In its natural form it is known as iron ore, which is not useful for man directly, in industrial process it reduces its weight and is being transformed into finished iron.

The basic concept behind manufacturing industries is that the more material is changed in its form, it will be of a greater value and utility. There are, therefore, three characteristics of the manufacturing. Firstly, a raw material is transformed into a new material, such as iron ore is transformed into iron or iron into machines and tools. Secondly, the utility of the transformed commodity is changed, such as iron is transformed into vehicles and the utility of iron is changed. Thirdly, the manufacturing increases the quality and value of a products, as for example railway locomotives manufactured from iron and steel are costlier than the original ore.

With due course of the historical evolution and degree of complexity, manufacturing can be classified into three categories, as complex large scale modern industry, workshop industry and cottage industry.

The large scale industry involves the use of a variety of raw materials, enormous amounts of power, huge capital, highly skilled labours, production of standardized products, mass production, methods of assembly line techniques and automation.

In many countries the workshop industry was natural outgrowth of household or cottage industry. Organization of skilled craftsman into guilds gave birth to workshop industry, which in early stages used only hand power.

"The Cottage industry manufacturing wholly or partly carried on in home of the workers" (Clark, 2003). It is characterized by hand manufacture of local raw materials in the home and consumption of the finished products in the same household or in exceptional cases, sale of it in local markets".

Cottage or house hold industry is thousands of years old, which reached its greatest development in eastern and south eastern Asia and is still important than in any part of the world. It involves the production with hands or simple tools by members of the family from local raw materials. Such products are consumed by the household, bartered or sold to neighbours or in nearby village markets.

While defining cottage industry, Jones & Darkenwald (1965) described that "cottage industry is characterized by hand manufacture of local raw materials in the home and consumption of finished produce in the same household or, in exceptional cases, sale of it in local markets. Transportation and capital wield no influence on this type of industry and it has little commercial importance. Among primitive people this is the first type of manufacturing to develop. Until recent centuries all manufacturing was of this type. As people become more advanced the household type decreases in relative importance".

Glorious history of Cottage industry in India

In India cottage industry has been in existence since time immemorial. Kulkarni (1971) remarked in this regard that "ever since ancient times our economic activities have been intimately interwoven into the religious and cultural fabric of our society. The economic organization and pursuits of the Indian people cannot be understood except in the context of the joint family, the caste system, the self sufficient village community and the religious and social inhabitations coupled with various injunctions and taboos. It was a close-knit social order well adopted to the needs of the changing times because it could weather all kinds of upheavals in society till it was exposed to the inroads of the modern European industrial system, which began in the 18th century. The Indian economy if such an expression can be used for what obtained then was characterized by a plurality of self sufficient village societies with little or no outside contact".

It can be observed that within the Indian frame work of the caste system, the son followed in the footsteps of his father, as the design and station in the life of each were believed to be the pre-ordained. It was said to be their *Karma* (occupation/work). Caste of a person in Indian society was closely related to one's occupation or *Karma*. It was the best form of labour division and expertise of the concerned occupation.

In Indian villages some people were cultivators and the rest were artisans. Each of the village dwellers had to follow his or her hereditary occupation, which was actually depending on the caste he or she belonged to. The caste was decided by one's occupation or Karma, i.e., the economic activity to which one was attached with. This was actually the best form of division of labour, though their needs were few and simple and the main artisans in a village comprised mainly the carpenters, the smiths, the oil crushers, the sweet preparers, the salt and washing powder makers, the potters, the tanners, the shoe makers, the mat and rope makers and several others. The bigger villages had their own weavers and spinners and their own gold smiths, tailors and oil crushers also. These artisans were not paid in cash but received traditionally fixed share of the produce after the harvest. This resulted into the self sufficient life style of the village community. It was also the fact in the Indian system that most of the village artisans were servants of the village, who used to perform routine jobs of the village community as a whole all the year round for the fixed payment in kind. Some were highly specialized in their profession having the highest level of specialization of their artisanship.

They were actually working on the locally available raw materials and with the skills and tools received by them through the traditions of their families. The village artisans turned out products with efficiency and of considerable aesthetic quality. In India generations of such artisans have provided with a long, glorious and proud tradition of artistic and beautiful handicraft of varied nature and vivid quality, which were also durable. The Indian cotton textile industry has perhaps the most significant historical records. Cotton cloth has been playing a great role in our history. It has also been of paramount importance in relations with the outside world.

Gautam (2006) remarked that "Indian Muslin, Cotton and silk fabrics, Calicoes, artistic wares etc. were in great demand world over." ".... The cotton textile industry was most firmly rooted in the country before the modern machine industry made its beginning during the ninetieth century. The *Muslins* or *Mulmulkhas* of Dacca, *Chintzes* of Masulipatnam, *Calicoes* of Calicut and the gold wrought piece goods of Burhanpur and Surat were famous all over the world" (Sharma et. al, 1978).

Cotton is also mentioned in the writings of *Manu* in 800 B.C. We have enough proofs to mention that the Indians knew weaving some 500 years before the Christ. It is also very fantastic to note that till then the Europeans were covering themselves with animals' skins and barks of trees. In contrary to it the Indian textiles were touching the horizon. "Pyrard, the 17th century Portuguese writer had recorded that every one from the Cape of Good Hope to China, every man and woman, was clothed from head to foot in Indian-made garments..... It was the high workmanship that earned India a name for her fabrics." (Kulkarni, 1971).

Iron and steel were also very well known in ancient India, though it never formed an important industry. The iron pillar near Qutub Minar in Delhi erected by king Vikramadiditya is supposed to be of over 1500 years old and it is still standing without any decay and stain. It will continue to stand till eternity without any doubt. Again to quote Kulkarni (1971) it can be noted that "it is a proud monument to the forging and fabricating ingenuity of ancient India. It has also been said that the famous Damascus blades were made from steel imported from India. *Lohars*, i.e.; the village black smiths were so expert in their professions that they were having the technology of something traditional in their primitive iron smelter and turned out goods for household use. They also used to make simple agricultural tools and implements. It is also to be found that the ancient Indian was also a master of manipulating metal.

Cottage industries in Indian villages continued to be surviving till a few decades latter of the India's Independence. Actually, they were existing in our villages even till the sixties and seventies of the last century. Afterwards they started vanishing and now only their remnants can be noted in the Indian villages.

Vanishing Indian Cottage Industries

"Before the rise of the modern industrial system India had a flourishing state of cottage and household industries and Indian manufacturers had a world wide market "(Tiwari, 2003). But it started declining after the establishment of British rule in India. Singh (1994) also can be referred as "British and Indian people had roughly similar per capita level of industrialization at

the on set of the industrial revolution (1750). India's level was only one hundredth of the United Kingdom's by 1900 and this, because of the fact that the Indian states have been unable to resist Britain's East India Company. This is also because of the fact that the British machine made textiles were not only cheaper but of better quality than native clothes. Similar were the case of iron and steel goods and also of the other manufactured commodities. As a result, the traditional domestic products were left out". Singh (1994) again remarks that "one of the most powerful reasons responsible for the decay of indigenous cottage industries of India was the industrial revolution to which process Indian economy has to pass through a period of great strains and stress". Protective English legislation against the imports from India, harnessing Indian funds to provide the main base for industrial expansion in England and India serving a permanent and captive market for British manufactured goods were also responsible for the decline and vanish of the Indian cottage industry. "Not only the Indian handicrafts failed to match the machine made goods in quantity and quality but the British policy of encouraging the import of manufactures and export of raw materials from India shook the very foundation of the traditional industries" (Tiwari, 2003). As a result our village or cottage industries were started vanishing during the British Rule in India. But even after Independence of the country on the 15th of August 1947 many of our cottage industries survived in rural India. Every Indian village had one or two or even more types of cottage industry.

Cottage industry in every rural household

It is a bare reality that the every household of the rurality of our country might have several types of cottage industry even till the 1960s and 1970s. It was a common case on all India level in general and in the South Bihar Plain in particular. The author himself has observed this ground reality in more than 50 villages of the Magadh plain, which includes the districts of Magadh and Patna divisions. On his personal experiences and observations he has prepared the chart (Figure 1), which represents the functioning of cottage industries in each and every household of the village.

The chart (Figure 1) portrays a glimpse of the cottage industry in each and every household of rurality of Magadh Division of the state of Bihar. This was the scenario before 1980s. But after that the picture has completely been changed and our village industries or cottage industries have completely been vanished due to the large scale influx of goods manufactured by large industries firstly from the foreign countries and secondly from large scale Indian factories.

Indian Handicrafts

Large number of our cottage industries are related to the handicrafts, though there is a little difference between general cottage industry and the handicrafts. The major difference between them is related to their consumption and market. Products of general types of cottage industry are consumed by local people and have no or a little commercial value, where as products of handicrafts have a global market. Indian handicrafts are also ancient and traditional. Such Indian handicrafts ranging from brocades to delicate ivories, wood carvings, jewelleries, glazed potteries, silver work, fine silks Muslins, carpet and shawls. These handicrafts had been

patronized by kings, rulers and wealthy people in our country since time immemorial. Their products had been purchased by wealthy people or by merchants for the admirers of the other countries. Such artistic industries were located mostly in the provincial capitals or in the court towns in the past. Many of them are also located in some rural areas. Pathalkati village near Atri of Gaya district of Bihar is very famous for stone carvings. Brocades (Kinkhab) of Ahmedabad, Murshidabad and Varanasi and Silks of Mysore, Varanasi, Lucknow, Surat and Ahmedabad are very renowned. Kashmir made carpets and shawls are world famous. Glass bangles made at Firozabad are known throughout India. "Enamelled (Minakari) jewellery of Jaipur has no parallel in India. Minakari is done on copper, gold and silver by highly skilled workers at Jaipur, Varanasi, Delhi, Lucknow, Alwar and Srinagar (Kashmir). Engraved brassware from Moradabd, Varanasi and Jaipur find market throughout India" (Singh, 1985).

Carving of walnut wood in the vale of Kashmir, Sandal wood in Mysore and Kanara are artistic, charming and marvelous. Carving on ivory and stone, particularly on marble are traditional in a number of centers, especially at Jaipur, Delhi and Agra.

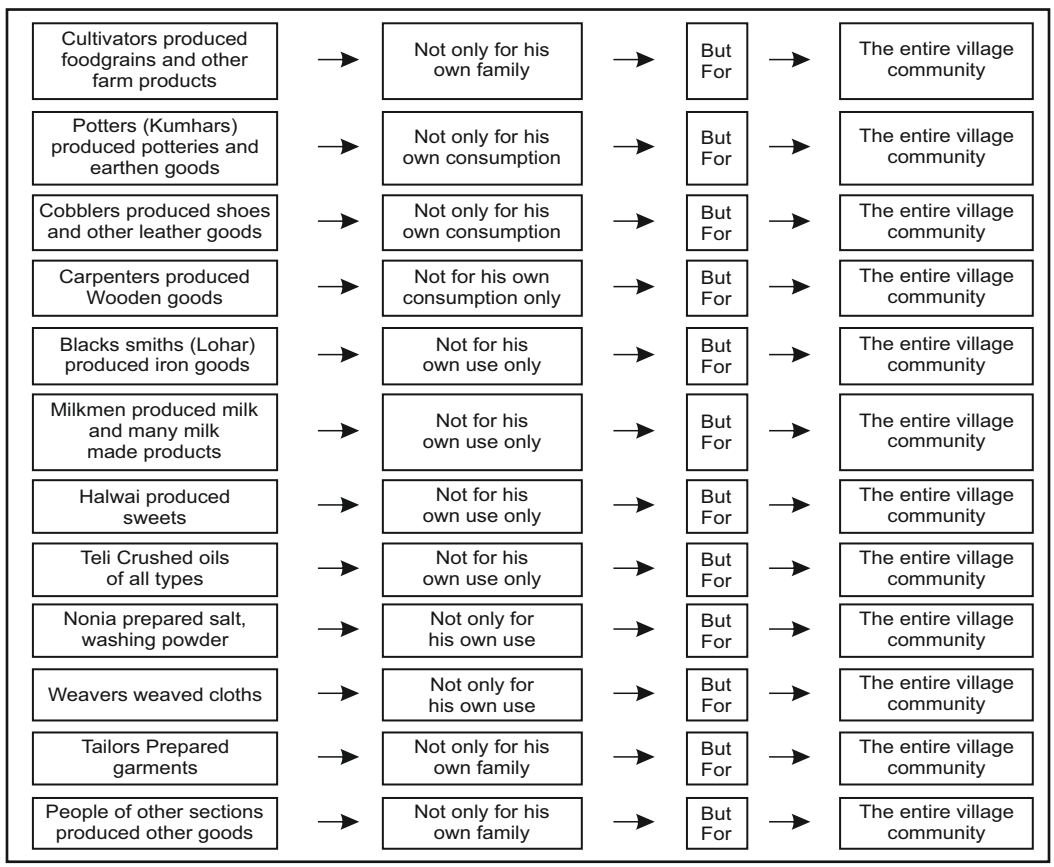

Figure 1 : Economic Interdependance of village community (one produced goods for all of his co-villagers : So our villages were self sufficient) : A scenario in Indian village before the 2nd World War

These handicrafts had brought jobs and money for the workers, prosperity and self sufficiency for the villages and places concerned and pride for the country for centuries; but they also suffered similarly as to the other cottage industries of the country after the Industrial Revolution in England. The seizure of the country, i.e., India by Britain had caused elimination to a great extent the patrons, admirers, purchasers and lovers of the Indian handicrafts by the mid 19th century due to the heavy influx of machine made commodities from outside to our domestic markets. The increasing development of transportational facilities in the form of roads and railways network helped the machine made foreign goods to penetrate even into the ruralities of the country. It proved to be fatal for the indigenous cottage industries and handicrafts. It brought unemployment and several other adversities to our society. It also brought misery, environmental degradation, large scale migration from villages to urban areas and poverty to the villages. It, therefore, brought multifaceted socio-economic problems to our country.

Adverse impact of vanishing cottage industries

Above discussion proves that the base of the self sufficiency of Indian villages; i.e.; the net of cottage or villages industries of Indian ruralities has been completely vanished or on the verge of complete disappearance. It brought a large scale unemployment to the large size of rural working force. It created stampede from Indian ruralities. It also caused social unrest and collapse of the complete village system of the country. It can, therefore, be stated that the negative impact of the vanishing of the village industries are very many, which can be observed as such :-

Vanishing of Social harmony

Our villages had an interwoven life style as each member was interdependent to each other for their sustenance and survival. It was because of the fact that the every house of Indian villages was engaged in producing one, two or more commodities not only for his own consumption but for the entire village community. For example, cultivators used to produce grains not only for his own family but for the whole village. Similarly carpenters used to produce wooden commodities for the entire village. Blacksmiths were also producing commodities of iron for the entire villages community. Potters or *Kumbhkar* also used to prepare earthen utensils and pots for each and every villager. *Teli* (oil crusher) likewise processed edible oil and other oils for the whole village community. *Halwai*, producer's of sweets, used to prepare sweets for the whole village. It means that one family was expert of the production of a single commodity and they used to produce that very commodity for the use of the entire village community. Every body of a village, thus, was engaged in producing a single commodity for every villager. So, they were dependant for their existence upon every member of the village. Every villager, therefore, was dependant upon each member of the village for his or her survival. Such a typical and specific type of coexistence was the root cause for social harmony of the villages. Everybody of a village used to survive by the support of the entire village community. This caused social harmony Indian villages. Previously economic interdependence of the Indian villagers was responsible for love, affection, regards and respect for each other, which caused sentimental attachment for each other person of the village concerned But collapse of village

industries and the growing dependence upon the the strong economic ties with each other have industrial goods, supplied from outside, weakend and thus, the socio-economic relationship has also been weekend, which ultimately destroyed the social harmony of Indian villages. Because sentimental attachment of villagers to each other has been destroyed due the absence of an economic interdependence.

Generation of large scale rural unemployment

The complete collapse of the village industries has created a large scale rural un employment in the country in general and South Bihar Plain in particular. It is because of the fact which has been mentioned earlier that the cottage industries made available employment, jobs and services to every citizen of the village. In contrary to it the large scale influx of industrial goods in our villages caused large scale unemployment as our village industries have been collapsed, which had provided jobs to each and every villager. Mahatma Gandhi (1934) also asserted that "mechanization brought unemployment and created a large scale unemployment...Mill made cloth producing large scale unemployment to the village weaver's. Rice mills and flour mills are also snatching employment of thousands of rural women." Certainly collapse of rural cottage industries of all types has snatched jobs from millions of rural people of India.

Mass stampede of people of working age group from villages

Generation of such a large scale unemployment and joblessness in rural India has actually created a big flow of out migration from Indian villages. It has just taken a shape of stampede from rural areas to urban areas of the country. As a whole large number of rural unemployed people influx into the urban centers of the country for employments and livelihood. It creates overcrowding in urban areas, which also causes over population in our urban centers. It is also responsible for the growing slums, pollution, scarcity of every sort of commodities and also for several other problems on the one hand and in villages it has created labour problems and there are an acute paucity of labour force on the other in our villages.

Collapse of village economy

Closure of village industries is also responsible for the collapse of village's economic system. During the period of cottage industry before 1980s our villages were really self sufficient because every necessary and useful commodity, required in our villages, were produced locally there in the village industries, which were flourishing till then and the products were ranging from food, cloth, shoe, washing powder, herbal medicine, salt, biomanure, rope, mat, sandal (though wooden) and every thing needed by the villagers. In this way our villages were self reliant and prosperous, because every village had its own economic system and network. But with vanishing net of cottage industries our villages become dependant to the industrial goods and they are now deficit and problematic villages. They are now poor and trouble ridden also.

Machine based economy

Our villages are now largely dependant upon modern machines, which are based on fuel and electric driven engines. Formerly every activity of the village was based on manual or animate

energy. Our village industries were mainly based on human hands or by animate energy. Now our rice, floor, oil and cane crushing mills are mechanized. Even our agriculture is based upon electric or diesel engines, which were basically animal based. These machines have brought a large scale unemployment to our villages on the one had and pollution of all types along with environmental degradation on the other.

Environmental degradation and pollution

Prior to the large scale application of machines our agricultural activities were mainly based on animals, which were really the pillars of our agrarian economy. Our agriculture and livestock rearing were interdependent. Animals were not only used in agricultural activities but also supplemented our farms in various forms and used to add fertility with their dung and urine, which supplied raw materials for the preparation of composts, which were the best form of organic fertilizer. It was prepared in compost peats, which was also a form of cottage industry. On the other hand animals were reared on the farm products. Thus, our agriculture and live stock rearing were interdependent, which were practiced side by side.

After the disappearance of hand and animal driven economic activities in our rural areas and large scale appearance and use of engine driven activities our villages are started suffering of all sorts of pollutions and stage of an environmental degradation become a normal phenomena in our villages also. Petrol and diesel driven engines brought sound and air pollution, where as chemical fertilizers and pesticides have brought the soil and water pollution. Prior to that there exited ecological balance and non pollution stage.

Collapse of village system

A system actually can be said an arrangement of various types of useful and necessary components in such a manner to perform a typical type of function of a machine or an institution. Clark (2003) defines it as "a set of related elements organized for a particular purpose, whole being identifiable by the inter connexion of the elements." On the basis of these definitions Indian villages can be identified as system also. Every Indian village has its own system, whose components can be identified as its area, buildings, streets, lanes, drains, farms, orchards, castes, people and occupations etc. The village industries formed an important component of an Indian village system, which provided large scale employment to the dwellers. Hence, it controlled the economic system of the village and decided the caste and occupational structures and played a vital role in integration, cohesion and unification of the villages concerned as a single, self sufficient and coherent socio-economic-historical and religious unit. Such an interdependence of socio-economic-cultural bounding of the villagers of the villages concerned had also been reflected in their common sentimental feelings and attachment. It created them proud for their villages. But with the decline or almost complete disappearance of village industries, the village system has completely been collapsed. As these industries had been acting as a strong binding for all the components of the Indian village system. Hence, with disappearance of this cementing element all other elements of the so called Indian village system have been disintegrated and disbanded. Hence, our villages are now no more united and a heaven, rather they are worst even than a hell. Our villages are now

capitals of quarrels, litigations, violence, discontent, non-cooperation, distress, distrust and all sorts of negative human approaches. All these negative features have caused the disappearance of self sufficiency of our villages.

Disappearance of self sufficiency of the Indian Villages

All the above said factors have played a combined role in the disappearance of self sufficiency of an Indian village, which was previously the basic and significant characteristic of our villages. Now, our villagers are being pulled into debts, miseries and economic backwardness. The avenues of employment have been diminished in our villages. So our villagers are becoming poor and poorer day by day and rural people, particularly of working age group are, being forced to migrate far away from their homeland in search of employment, peace, comfort, pleasure, luxury, happiness and felicity.

It is, therefore, situation in our villages is very critical, grim and horrible. It is in the country like India for which it is often said that it is a country of villages and soul of India dwells in its villages. So, it is the high time to formulate compliant, sustainable and formidable strategies for restrengthening our villages.

Strategies for repowering Indian Village Industries

It is the call of the our to formulate strategies for the restrengthening of our village industries. For which following suggestions can be put forward :-

Mass awareness- Mass awareness drive should be initiated to convince rural people for their growing interests for the village industries. They should also be motivated for establishment of their own units of village industries.

Government protection- Government should also provide protections to such industries. Fortunately, Indian Union Government has created a new ministry under the name of Micro, Small and Minimum enterprises. This ministry not only "plays a crucial role in providing large employment opportunities at comparatively lower capital cost than large industries but industrialization of rural and backward areas. ... The micro and small ... Enterprises Development notified in 2006 to address policy issues affecting minor, small and medium investment ceiling of the sector ... The role of the ministry is to assist the states in their efforts to encourage entrepreneurship employment and livelihood opportunities ... in the changed economic scenario (India, 2021).

The Union Government of India has also formed a board in the name of Coir Board. This board has been established under the Coir Industry Act, 1953 for promoting overall development of the coir industry. This board is also meant to promote cottage industries related to coir, particularly in coastal areas, where coconut plantation is being done on a large scale.

The Union Government of India has also established Khadi and Villages Industries Commission (KVIC) under the Act of Parliament (No. 61 of 1956) and as amended in 1987 and 2006. It is a statutory organization under the Ministry of MSME. It is engaged in promoting and developing Khadi and villages industry for providing a large scale employment

opportunities in the rural areas. The KVIC undertakes activities like skill improvement, generating employment and self employment opportunities in rural areas.

With reference to the above examples, it can be said that the Union Government of India is providing reasonable support to rural industries but these are not sufficient enough. Many more schemes are needed to be launched to make Indian villages self-sufficient.

Subsidies on products of village industries

As the products of village industries are costlier in comparison to the products of large scale industries, so Government should have sufficient provisions of subsidies for the products of village industries. So that they may compete in the markets. There must be provisions of subsidies on local products. Hence, Government protection like subsidies and other are required.

Cooperative Systems

Cooperative System should also be promoted on a large scale for establishment of village industries in more and more in numbers. Such cooperative societies should provide technological, financial, conceptual and marketing support to such industries.

Insured Market

Marketing facilities are of very much importance and consideration for any type of industry. Products of cottage industries face much hurdles in the market, so far as their marketing is concerned. It is because of the fact that these are non organized type of industrial sectors, which suffers promotion, publicity and many other types of difficulties. Their products are also costlier than the products of large scale industries. So they fail to compete them in the consumer markets. Hence, Government should purchased such goods, which should be sold out through public stores.

Organization of emporiums

A large number of emporiums also needs to be organized frequently at many places to promote marketing facilities of the products of village industries. Such emporiums should be patronized by the Government and many facilities should be provided to such emporiums. Such marts should have free supply of electricity and several other facilities. So that to attract buyers in large number.

Training for village industries should be included in the syllabus

Training related to the cottage industries should be the part of syllabus from the primary to the higher level of education. So each and every citizen of the country must have sufficient knowledge, efficiency, mental preparation and physical orientation for the establishment of cottage industries. So that many people must have consideration and preparedness for the start of many such industries.

Training for craftsmanship

Training of craftsmanship should be provided to the rural people, who intend to establish their own cottage industry. There is a need to start training for craftsmanship institutes at district level.

Provisions of assemblage of small machines and tools

Rural youth should also be patronized to start their own assemblage units in the villages. These units may be of electronic goods, watches and other small machines and tools. Their parts should be brought from the nearby urban centers and assembled goods should be sold in the local emporium or at market centers. This kind of rural industries also needs training centers to train the new generation.

Financial, technical and all sorts of supports

All types of supports, protection and patronage including financial, technical, legislative and other should be provided to the persons, who are willing to establish units of cottage industry in respective villages.

Use of non-conventional and renewable energy

Solar and other forms of non-conventional and renewable energy should be generated locally to operate small machines, which are to be used in such village industries to make products cheaper and attractive. Bio-gas and bio-energy should also be promoted in the village and their large scale use should be patronized to operate small industrial units.

Application of modern technologies

Modern technologies should also be applied in such village industries for better result and cheaper products. It also may cause a large scale production.

Establishment of Industrial Parks

In every village, industrial parks should be established by the Government, where all the units of cottage and village industries should be housed. Such parks must have banking, emporium and all other types of needed facilities. Such parks may have links with the emporium of bigger urban centers. A good transportational and communicational networks should also be developed.

Conclusion

On the basis of the above discussions it can be concluded that revival of village industries is the need of the hour. It is necessary for making our villages once again self-sufficient. It will provide jobs to all the members of the village. The stampede from our villages in search of employment and livelihood will also be thus checked, which will be resulted into transforming our villages peaceful, harmonious, prosperous and self-sufficient. It ultimately will be resulted into a powerful, strong, self-sufficient and prosperous India. Hence, it is the high time to promote village industries to a great extent.

But such a herculean task can not be performed only by the Government's protection and support, rather awakening of masses by the intellectuals, social activists and political workers should also be taken as a drive and mission. The task is very difficult but not impossible. It can be made possible only by the mass enolvement and consciousness.

In fact, once the target of revival of the village industries is achieved, India will once again become capable to retrain its past glory and will certainly be turned into *the golden bird* as it during the ancient time.

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SPATIO-TEMPORAL PATTERN OF FEMALE PARTICIPATION IN ASSEMBLY ELECTIONS OF 2015 AND 2020 : A CASE STUDY OF ELECTORAL GEOGRAPHY OF BIHAR

Prerna Bharti*
Email: prernasikka1993@gmail.com

Debjani Sarkar Ghose**
Email:debjanipwc@gmail.com

ABSTRACT

It is argued that women need to be empowered in the realm of political decision –making so as to facilitate their real empowerment. The growing participation of women in elections indicates a silent movement of women empowerment. The process of this empowerment is neither abrupt nor have similarities with western countries. There is a growing idea among women in the region that social transformation is much slower than political change so they prefer to play a decisive role in elections. Bihar is economically backward region and male migration to rich state of the federation is a common phenomenon. This factor gives female a responsibility to look after herself and her family in the absence of male members. There is rising trend in the voting behaviour of women in the study area but their representation is still very low. Although variation in women's participation have been observed. Gender ratio in the electoral roll gives us the idea of gender disparity in voter's registration.

Keywords: Empowerment, Social transformation, Federation, Migration, Voting behaviour

Introduction

Participation in electioneering process is not only confined to voting right but it is also related to representation, political activism, political consciousness and many more (Begum, 2015). The electoral participation gives women the ability to analyze, organize, and mobilize for social change. In this paper, the study area is Bihar which is considered as one of the most backward states in India but when it comes to women's political participation it is one of the leading states in the country. From the last two consecutive assembly elections women's voters outnumber males. There is an increase in women voters but women are still marginal in representation. There were only 34 women MLAs out of 243 assembly constituency seats whereas only 28 women were elected in 2015 assembly election. Women's participation in election is closely related to their level of empowerment. Women empowerment is closely related to the equal status of women, providing them equal opportunity, and freedom for their development. The focus of women empowerment is in the process of decision making. Few

* Dr. Prerna Bharti is Guest Faculty, Dept. of Geography, B. N. College, Patna.
** Dr. Debjani Sarkar Ghose is Associate Professor & Head, Dept. of Geography, Patna Women's College, Patna.

decades back women would rarely go and vote as per the instruction from their menfolk. Now a day's scenario is changing, women are going in group for voting. The problems, demands and aspirations of women are different from men. In the resent years political parties are considering women-centric issues in their election manifesto such as liquor ban etc. There have been hundreds of studies on the geography of election, voting behavior, political consciousness of voters in different parts of India. But the research works on voting behavior and electoral representation of women are highly limited. The present study aims to analyze the spatial pattern of women's electoral participation, electoral population ratio and electoral gender ratio of Bihar at district level.

Aims and objectives

1. To study the nature of women voters' turnout in successive assembly elections since 1951 with more emphasis on 2015 and 2020 election.
2. To analyze the spatial pattern of women voters' turnout in 2010, 2015 and 2020 assembly elections.

Methodology and Data Sources

The main objective of the present study is to aggregate voting behavior of women in Bihar. For the purpose of analysis, aggregate data analysis approach has been taken. Data is principally collected from secondary sources, for the identification of voting pattern electoral participation of women is taken as an indicator. In the electoral participations, percentage of women voters polled has been taken for the purpose. Districts have been divided in the four categories on the basis of women voters' turnout percentage to examine the regional variations of electoral participation in Bihar.i.e., *very high women voters' turnout, high women voters' turnout, moderate women voter turnout and low women voters' turnout.* Cartographic technique mostly bar graph, line graph and choropleth shades have been used is used to portray various electoral phenomena. The determination of regional pattern of voter's participation probability has been done through content analysis of different newspapers (Times of India, The Hindu, Dainak Jagran and Hindustan) reporting on women voter's participation in 2015 and 2020 assembly elections.

Geographical Profile of the Study Area

Bihar is situated between 24˚20'N to 27˚ 31' N latitude and 83˚20' E to 88˚ 28'E longitude. The landscape of Bihar is almost flat and comprises fertile plain of Ganga and its major tributaries such as Gandak, Bagmati, Kosi. On 15 November 2000, state of Jharkhand was carved out of Bihar. The state is divided into 38 districts under 9 divisions with 101 sub- divisions and 534 Blocks. The state has 40 parliamentary constituencies and 243 assembly constituencies. In terms of economy, Bihar has agriculture based economy. More than 2/3rd of the population of the state is involved in agricultural activities.

In the assembly election of 2010 the total numbers of electors were 55120656 in which number of women electors were 25464746 and the total number of voters were 29034705 in which number of women voters were 13875175. The total polling percentage was 52.67%. The polling percentage of men was 51.10% whereas the polling percentage of women was 54.49%. In the assembly election of 2015 the total numbers of electors were 67056820 in which numbers of male electors were 35782181 and numbers of female electors were 31272523. The total numbers of voters in the assembly election 2015 were 37993173 in which numbers of male voters were 19078453 and numbers of women voters were 18914687. The total polling percentage was 56.6%. The polling percentage for men was only 53.32% whereas the polling percentage for women was 60.48%.

Voters' Turnout

Voting is the most common and important act of political participation. Increasing awareness among women voters about their rights began to influence the political scene (Fadia 2014). Electoral participation is a process in which the electorates participate in choosing their representatives. Voting turnout has been measured as the percentage of registered votes in each constituency who has cast their votes. Bihar is one of the states that have shown progress in women's political empowerment over the last decade. Women's turnout was more than men turnout in the previous three consecutive assembly elections of 2010, 2015 and 2020.

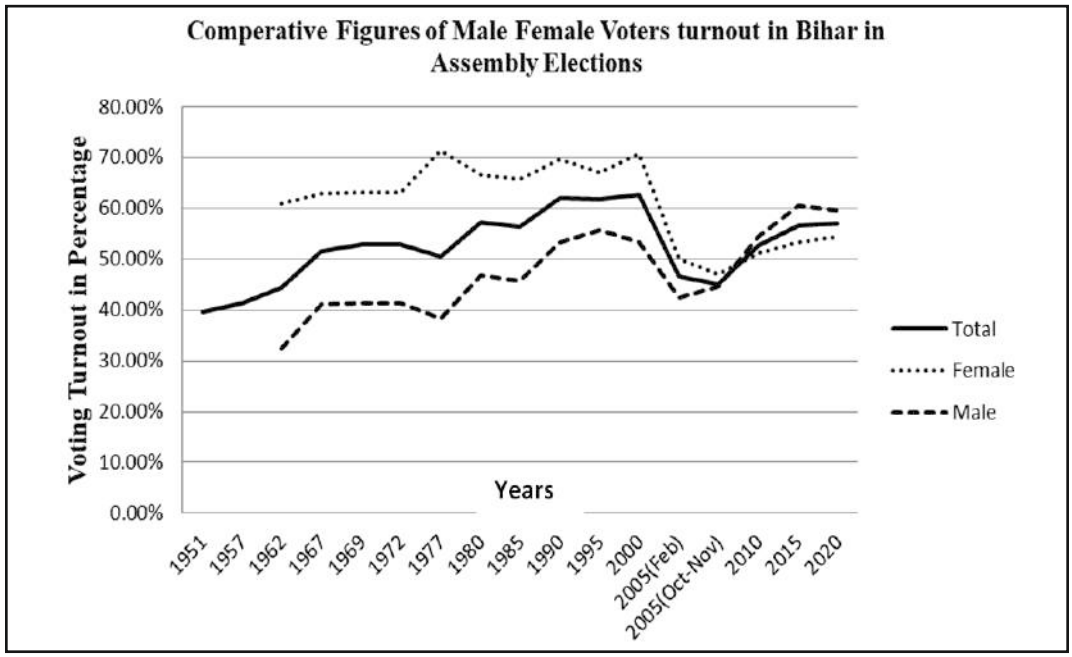

Figure 1 : Comparative Figure of Male Female Voters turnout in Bihar in Assembly Elections

Source: *www.eci.gov.in*

Comparative Figures of Male-Female Turnout in Bihar in Assembly Elections

It is clear from the figure 3 that there is a gradual increase in the participation of women in elections. However, in all assembly elections before 2010, the turnout among men was always higher than turnout among the women. In the 2010, election the trend changed and women voted more than men. The women turnout in 2010 election was 54.5% whereas the men turnout was 51.1%. In 2015 assembly election, the women voter's turnout was 60.48% whereas men voter's turnout was 53.32%. In 2020 assembly election women voter's turnout was 59.69% and men voter's turnout was 54.54%. There is a slight decrease in the voting participation of female voters due to the threat of Covid-19. The gender gap in voters' turnout was around 20% till the year 2000. The basic reasons were insecurity, lawlessness, booth capturing, and violence etc. The gender gap in voter's turnout reduced for the first time in 2005 assembly elections. In 2010 Assembly election women voter's turnout was more than men's voter turnout for the first time in elections. Improved law and order situation, violence free election and empowerment of women like 50% reservation in local bodies, cycle poshak yojna etc. were some factors which influenced women's electoral participation in the state.

Spatial Pattern of Women Voters Turnout in Assembly Elections 2015 and 2020

Geographers and researchers have considered electoral geography as the study of human behaviour towards voting patterns of elections in context to the particular area and time (Thakur and Singh, 2017). The assembly elections of 2015 and 2020 recorded variation in voting turnout across the state. Spatial variation is found from one district to another district as well as from one assembly constituency to other constituency. Voter's turnout describes the fluctuations in electoral participation within the state. To know the regional variation of electoral participation of women in Bihar the districts and assembly units have been divided in the four categories on the basis of women voter turnout percentage. Then four categories are as following:-

i. Very High Women Voters' Turnout – Where more than 70% of women voters participated in election.

ii. High Women Voters' Turnout - Where participation of women was between 60% and 70%.

iii. Moderate Women Voters' Turnout- Where participation of women was between 50% and 60%.

iv. Low Women's Voters Turnout- Where participation was below 50%.

Very high voting among women were observed during the 2020 assembly election in only two districts of Bihar. These districts were Kishanganj and Katihar. In 2015 assembly election Supaul, Ararea, kishanjang, Purnia , Katihar, Madhepura, Muzaffarpur, Samastipur, Begusarai, Khagaria have recorded high voter turnout.In 2015 West Champaran, Sitamarhi Madhubani, Supaul, Araria, Purnia, Madhepura, Sahara, Darbhanga, Muzaffarpur, Vaishali, Samastipur, Begusarai, Khagaria, Bhagalpur, Banka have registered high women voters' turnout.The districts with moderate womens' turnout were Pashchim Champaran, Purba Champaran, Sheohar, Sitamarhi, Madhubani, Saharsa, Darbhanga, Gopalganj, Siwan, Saran, Banka, Vaishali, Buxar, Kaimur and Gaya. In 2020 assembly election the districts with moderate

women voters' turnout are Purba Champaran, Sheohar, Saran, Munger, Lakhisarai, Shekhpura and Nalanda, Patna, Bojpur, Kaimur, Rohtas, Arval, Jahanabad, Aurangabad and Gaya.

There were twelve districts in 2015 which have recorded less than 50% voting among women. These districts were Jamui, Nawada, Aurangabad, Jahanabad, Arwal, Rohtas, Kaimur, Bojpur, Patna, Nalanda, Lakhisarai, Munger, Bhagalpur whereas there is no district having less than 50% of voting among women in the assembly election of 2015. This shows that there is an increasing trend of voting pattern in the districts of Bihar. In 2015 the turnout was highest in Thakurganj assembly constituency (70.4%) of Kishanganj district and the lowest in Sahebpur Kamal assembly constituency (43.2%) of Begusarai district. Whereas in 2020 the turnout was highest in Pranpur assembly constituency (75.7%) of Katihar district and lowest in Barhara (47.5%) in Bhojpur district.

On the whole the level of electoral participation being 54% was quite low in 2015 assembly election. About 53% of the assembly constituencies recorded a turnout below the average. Just 28% of assembly constituencies recorded a fairly high turnout of over 60%. In 2020 there was increase in the average turnout. Only 6 assembly constituencies had less than 50% turnout. These districts were Bhagalpur, Danapur, Paligang, Barhara, Jagdishpur and Gaya Town. There were 19 assembly constituency in which turnout was more than 70%. These were Motihari, Dhaka, Nirmali, Chhatapur, Sikti, Thakurgangj, Kishanganj, Kochadhaman, Baisi, Kasba, Pranpur, Barari, Korha, Minapur, Sakra and Masauri.45% of total assembly constituencies had women voters' turnout between 60% and 70% in 2015 assembly election, whereas 36% of total assembly constituencies had women voter turnout between 50% and 60%.

Spatial Pattern of Women Voters' Turnout in Assembly Elections of 2010 and 2015

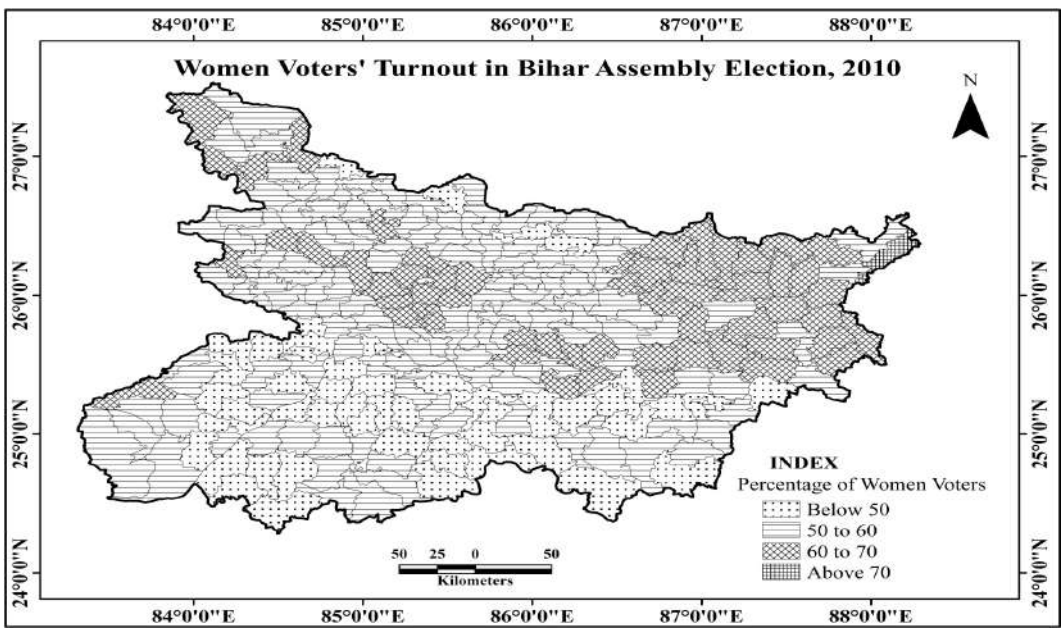

Figure 2 : Women Voters' Turnout in Assembly Elections, 2010

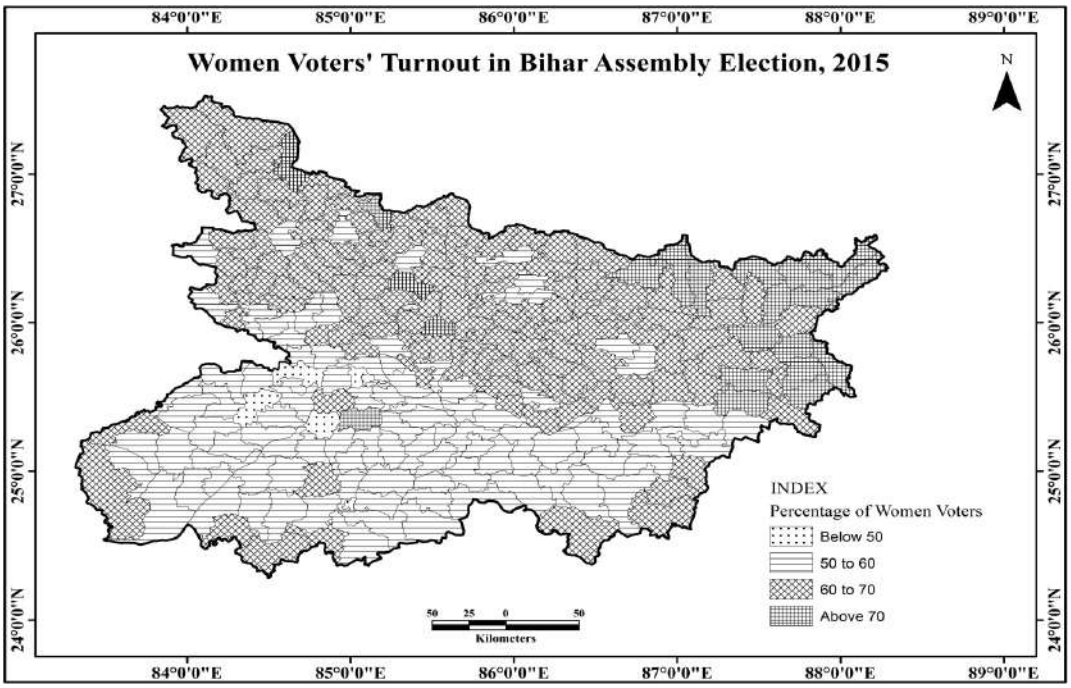

Figure 3 : Women Voters' Turnout in Assembly Elections, 2015

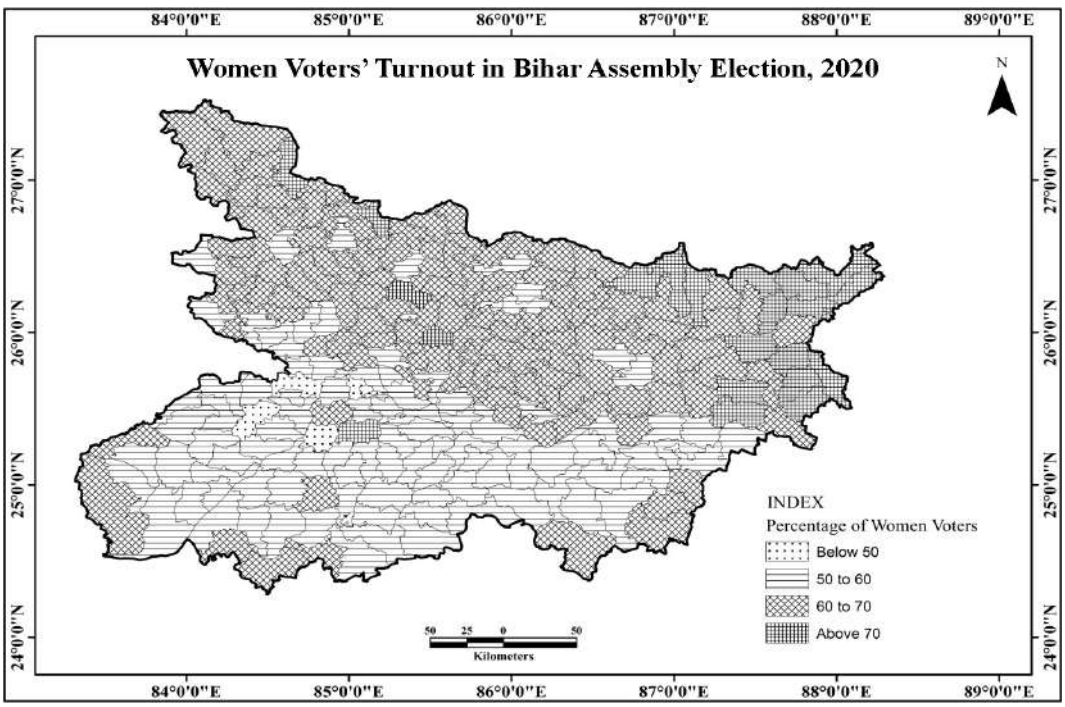

Figure 4 : Women Voters' Turnout in Assembly Elections, 2020

Challenges of Electoral Empowerment of Women

The biggest challenge is the less representation of women in political parties. Bihar is least literate state in the country as per census 2011. The literacy rate among the women is 53.3%. The level of awareness among electors is closely associated with level of education (Dahlerup 2005). Nevertheless Bihar is having patriarchal society, where women are often seen as subordinate and inferior to man.

Apart from this, there is a big gap in the registration of women in electoral roll. Enrollment of women is not given priority due to the lower status of women in the society. The roll gender ratio is not inconsonance with the census gender ratio. The census gender is 918 whereas the roll gender ratio is 875 in 2015 assembly election. Cultural inhibition is also included in the challenges of women's electoral empowerment. Women do not come out of their home without the permission of the head of the family. In general women still want a male member to go outside or to polling station.

Conclusion

The 2010 Assembly elections in Bihar witnessed the remarkable rise in women's voting across the state followed by 2015 assembly election. However, there is almost same voting in assembly election of 2020 by women. The percentage of women's turnout was 54.5 in 2010 and in 2015 assembly election it was about 60 and in 2020 it was 59.69%. The electoral roll gender ratio is not inconsonance with the census gender ratio. Regional disparity is observed in electoral population in the state as well as in the voting participation of women.

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ASSESSING INDO-AFGHAN RELATIONS THROUGH KASHMIR ANGLE

Satya Raj*
Email: satyaraj@ignou.ac.in

Rash Bihari Pd. Singh**
Email: singh.rbp@gmail.com

ABSTRACT

Afghanistan, a sovereign state and Jammu and Kashmir, a federal unit of India are geographically situated in the realm of central Asiatic mountain system where topography is highly treacherous and the society is divided into different tribal groups. Territorially, both have a common international boundary (Durand Line) for about 106 kms but in the present situation the common boundary area is under the Pak-occupied Kashmir.

Presently, Afghanistan is under the complete control of Talibanees who are organised militants and work on the dictates of Islamic rules of governance. The organised terrorist groups have established links with many terrorist groups working from the land of Pakistan.

As Jammu and Kashmir is also dominated by Muslim population and Pakistan has not only occupied about one-third area of Jammu and Kashmir but has always been sending militants to create violence and disorder in Jammu and Kashmir. Taliban has governed land of Afghanistan has also became a safe ground for terrorist and there are evidence of foreign terrorists coming to Jammu and Kashmir through Afghanistan. However, the present regime of Taliban in Afghanistan has made it clear on different occasions that its territority will not be allowed for terrorist and militant groups to create violence and unstability in any other country. This regime has also taken steps to work for development purposes with India. However, India needs to be watchfull along. The L.O.C and activities of terrorist groups in Pakistan and Afghanistan.

Keywords : Mujahideen, Taliban, Geo-strategic overstepping, Operation Border, Al Queda.

Introduction

The locational personality of the Union Territory of Jammu and Kashmir has placed it in geographical proximity to Pakistan's north-west province of Waziristan, which is virtually ungoverned, remote and having badland topography. It is this region which provides refuge to numerous Mujahidin ("holy warriors" or "freedom fighters") moving from Afghanistan to the state of Jammu and Kashmir and is one of the most important causes of insurgency, tension, sufferings and poverty in the state. In fact, the new age of terrorism began when Soviet Union was defeated in Afghanistan which became a centre for terrorist and extremist activities. They introduced violent anarchy and an aggressive version of Islam, producing Islamic volunteers

* Dr. Satya Raj is Assistant Professor, Discipline of Geography, School of Sciences, IGNOU, New Delhi.
** Dr. Rash Bihari Pd. Singh is Professor (Retd.) of Geography, Patna University, Patna.

who exported terrorism from Kashmir to Chechnya and from Xinjiang to New York. So the problem in Afghanistan is very much related to insurgency problem in the state of Jammu and Kashmir.

The Taliban are one of the *Mujahidin* groups that formed during the war against the Soviet occupation of Afghanistan (1979-89). After the withdrawal of Soviet forces, the Soviet-backed government lost ground to the *mujahidin*. In 1992, Kabul was captured and an alliance of *mujahidin* set up a new government with Burhanuddin Rabbani as interim president. However, the various factions were unable to cooperate and fell to fighting each other. Afghanistan was reduced to a collection of territories held by competing warlords.

Figure 1 : Locational Personality of the Study Area

Overview of Afghan crisis

In fact, during the Afghanistan crisis, the United States provided significant military assistance to Pakistan in order to expand the scope of its policy of containment of communism. The US military and economic aid strengthened Pakistan's defence capability and bargaining position over India. During General Zia ul Haq's military regime, Pakistan armed forces were well equipped and in some areas of armour, they may even have gained superiority over India. During the Afghan crisis, Zia made a clandestine plan to use Muslim militants to liberate Kashmir. For this purpose, a close nexus was formed between Pakistani religious groups, particularly the Jammati Islamai, Jamiat ul Islam (Fazal ur Rehman group), Jamia-i-Islamia and the Afghan mujahideen and thousands of volunteers from Muslim countries to execute jihad in Afghanistan and Kashmir. Zia wanted to bleed India, and he saw in the Afghan crisis a window of opportunity to take revenge of the 1971 war with India, and liberate Kashmir. He also realized that guerrilla warfare offered the best chance of bleeding India by using well trained manpower, who had initially fought against the Soviet Union, and were now fighting for Kashmir. Actually after the withdrawal of Russian troops from Afghanistan, the importance of Kashmir for the US was reduced. Thus the weapons meant for the Afghan rebels were intelligently rerouted to Kashmir by Pakistan.

After a decade of war and the defeat of the Soviets, the United States and the rest of the world abandoned Pakistan and the Mujahideens. The resulting power vacuum plunged Afghanistan into a bitter civil war. Pakistan then tried to secure a friendly government in Kabul as a prize for its support for liberating Afghans from the Soviets. Mujahideens found their way into Pakistan causing internal problems, and further into Indian-held Kashmir. Pakistan supported the Kashmir struggle at one end and also attempted to forge a broad-based alliance to settle the Afghanistan problem. Groups of *taliban* ("religious students") were loosely organised on a regional basis during the occupation and civil war. Although they represented a potentially huge force, they didn't emerge as a united entity until the *taliban* of Kandahar made their move in 1994. In late 1994, a group of well-trained *taliban* was chosen by Pakistan to protect a convoy trying to open a trade route from Pakistan to Central Asia. They proved an able force, fighting off rival *mujahideen* and warlords. The *taliban* then went on to take the city of Kandahar, beginning a surprising advance that ended with their capture of Kabul in September 1996. Thus Taliban under the leadership of Mullah Muhammad Omar overthrew the Rabbani government and got hold of 90 per cent of the Afghan territory. The Taliban, under the direction of Mullah Muhammad Omar, brought about a very strict interpretation of *Sharia*, or Islamic law. Public executions and punishments (such as floggings) became regular events at Afghan soccer stadiums. Frivolous activities, like kite-flying, were outlawed. In order to root out "non-Islamic" influence, television, music, and the internet were banned. Men were required to wear beard and many of them were beaten if they didn't do so. Most shocking to the West was

the Taliban's treatment of women. When the Taliban took Kabul, they immediately restricted the girls from attending schools. Moreover, women were barred from working outside the home, precipitating a crisis in healthcare and education. Women were also prohibited from leaving their home without a male relative and those who disobeyed, had the risk of being beaten, even shot, by officers of the "ministry for the protection of virtue and prevention of vice." A woman caught wearing fingernail polish may have had her fingertips chopped off. All this, according to the Taliban, was to safeguard women and their honour. It was around this period that Osama bin Laden and others quietly arrived as "guests" of Mullah Omar. Soon Pakistan found that it was unable to manage Taliban. In 1998, Osama Bin Laden struck U.S. embassies in East Africa, and the United States responded with cruise missile attacks. Meanwhile the Taliban's incivility culminated in the destruction of the Buddhist statues in Bamyan. In September, 2001, the U.S. placed significant pressure on the Taliban to turn over Bin Laden and Al-Qaeda in response to the September 11, 2001, terrorist attacks. On October 7, after the Taliban refused to give up Bin Laden, the U.S. began bombing Taliban military sites, aiding the Northern Alliance. By November 21, the Taliban had lost Kabul and by December 9 they were completely ousted of power.

An interim government was agreed upon by representatives of Afghanistan's various factions during talks held in Bonn (Germany). On December 22, 2001, Hamid Karzai, an Afghan tribal leader, was sworn in as interim chairman of the government. While many of the Taliban's most radical leaders and supporters were killed, taken prisoner, or fled the country, many former Taliban returned to their homes and continued to work for the Taliban's goals. The Taliban leader, Mullah Muhammad Omar has continued to elude capture. The Taliban now funds its insurgency through the drug trade, and in 2006 Afghanistan's opium harvest reached record levels, increasing by 50 percent and representing 92 percent of the world's supply. Democratisation of Afghanistan was favoured by many western countries along with India but the recent report shows that there has been resurgence of Taliban and Al Qaeda as the year 2006 became the deadliest year of fighting since the 2001 war. Throughout the spring, Taliban militants infiltrated southern Afghanistan, terrorizing villagers and attacking Afghan and U.S. troops. It has also been reported that Osama bin Laden, the Al Qaeda commander and the Taliban leader Mullah Omar are suspected of hiding along the Afghanistan-Pakistan border and this remote, lawless tribal region has become a major haven for Islamic militants. The Pakistani government has proven unwillingness and incapability of clamping down on the religious militia, despite the fact that the headquarters of the Taliban and its key allies are located in Pakistan. According to a senior U.S. military official, not a single senior Taliban leader has been arrested or killed in Pakistan since 2001—nor have any of the top leaders of the militias headed by Gulbuddin Hekmatyar and Jalaluddin Haqqani, who are fighting U.S. forces alongside the Taliban.

Today Islamic fundamentalists, active in Afghanistan, Pakistan and Iran, seek to spread their influence and control into Kashmir. Kashmiri Pundits (Hindu), living within war-torn Kashmir Valley, claim that Islamic terrorists are carrying out a bloody campaign of ethnic cleansing against the Hindu population of the state of Jammu and Kashmir. The Kashmiri insurgency has been radically transformed in the last decade with the introduction of better armed and better trained jihadis (holy warriors) based in Pakistan and fuelled by Islamist movements in Afghanistan and beyond. Thus, the Kashmir Valley has been gripped by freedom fighters or insurgents and with time, the conflict has grown in size and seriousness. Thus the Afghanistan problem has close links with the state of affairs in Jammu and Kashmir.

American presence in Afghanistan

The overriding factor shaping the foreign policies of all countries is their respective national interests, as perceived by them, rather than any disinterested desire on their part to benefit any other country. The US presence in Afghanistan clearly illustrates this. It is an undeniable fact that before the incident of 9/11, the United States did not treat Al-Qaida and the Taliban's religious extremism as a threat to the West. Nor did they object to Muslim liberation movements in the world, including Kashmir, and showed no serious concern towards their activities, training, techniques and tactics. Even during Soviet invasion of Afghanistan in 1979, United States and their entire Western ally supported Pakistan and also recruited Afghani religious freedom fighters or Jihadis to check the advance of Soviet Union in Afghanistan. The situation changed when Bin Laden targeted the US embassies in Kenya and Tanzania in 1998 and, later, the 9/11 attack proved the ambitious objectives of the Bin Laden and the Al Qaida network.

On September 11 (2001), United States was subjected to a complex, coordinated and devastating, terrorist attack. In less than 2 hours, New York's World Trade Centre and a portion of the Pentagon were destroyed, and four commercial airlines were lost with all passengers and crew. Assessing the attack's physical consequences in terms of damage and casualties will take years. On the international front, the United States then declared war on terrorism and President George W. Bush clearly defined the national strategic objective as eliminating terrorist groups "with global reach".

The US placed significant pressure on the Taliban government to hand over Al Qaeda and its chief Osama Bin Laden. As the Taliban refused to do this they were ousted from power in December 2001 and an interim government of Hamid Karzai was sworn in, who was later elected democratically. The US global war on terrorism was welcomed by many countries in the world including India who had suffered a lot due to terrorist activities since a long time. Close on the heels after September 9, 2001, India suffered a massive terrorist attack on its parliament on December 13, 2001. On October 2001, there had also been suicidal attacks on the legislative assembly of Jammu and Kashmir which took a toll of 38 lives. India blamed that

these deadly acts of terrorism were committed by Pakistani based Kashmiri Separatist groups like Lashkare Taiba and Jaishe-Muhammad. Even United States condemned the attack on Indian parliament as 'an assault on Indian democracy'. Soon the international pressure increased on Pakistan to ban and crack down different terrorist organisations operating from its soil. Thus Pakistan had no option but to side the US on its war on terrorism. Initially the Musarraf government banned five major extremist groups, viz, Lashkare Jhangvi, Spahe Muhammad, Sipahe Sahaba, Tehrike Jafria, Lashkare Taiba and Jaishe Muhammad and imposed restrictions on religious schools (madrassas) who were teaching fundamentalist versions of Islamism. Pakistan also declared that no organisation would be allowed to indulge in any activities in the state of Jammu and Kashmir. Western observers along with India believe that many extremist groups operating from Pakistan had direct links with Al Qaeda and are directed not only towards the West but also to all the non-Muslims around the world.

Thus all these events gave India an opportunity to use its forces to crush the separatist elements in the state of Jammu and Kashmir. Indian diplomats were also successful in linking the Kashmiri separatist movement with the Taliban regime in Afghanistan and gained a strategic victory over Pakistan. Several separatist groups were declared as terrorist organisations by United States and Pakistan was also persuaded to disband them. On the other hand, Pakistan, in order to avoid isolation from the world community, had to become an important ally of United States to help in the war against terrorism. So the incidents of 9/11 and the proclaimed global war against terrorism and American presence in Afghanistan have all gone into favour of India as it provided India an opportunity to counter the problems of Jihadi terrorism going on within its territory. The United States already has a military base at Diego Garcia at the southern Indian Ocean where US soldiers were initially stationed to prevent the Chinese and Russian advance in the Indian Ocean during the Cold War. However the technology that was used during 9/11 seems to have outdated the technology that was used in Diego Garcia. The attacks on Afghanistan were carried out by planes and carriers based in Diego Garcia, but America prefers to have a base closer to the likely areas of future action, which is the southern shores of the Asian sub-continent specially Sri Lanka. Some years ago the very thought of an American base in the Indian Ocean, too close to its own shores, would have set off alarm bells in New Delhi. But now after September 9, things have changed and now India favours American presence close at hand to insure itself against the day that Pakistan is taken over by a Jihadist regime and to protect itself against Jihadism from within its own territory.

Although not satisfactorily, Afghanistan under its President Hamid Karzai had made serious efforts to reconstruct itself. Some positive results had also come out. Some 4.5 million refugees came home and 6.5 milliom children were back to school. A National Army of 35,000 soldiers had been built from scratch, along with a Police Force of 55,000 Constables. Some 4,000 health posts and 10,000 km of roads had been built or rebuilt. But the real truth was that, the Afghanistan's leader, President Hamid Karzai had only marginal control over large swaths of

his country, which was rife with warlords, militants, and drug smugglers. The Taliban funded its insurgency through the drug trade, and in 2006 Afghanistan's opium harvest reached record levels, increasing by 50% and representing 92% of the world's opium supply. In 2003, after the United States shifted its military efforts to fighting the war in Iraq, attacks on American-led forces intensified as the Taliban and Al-Qaeda began to regroup. In 2005 and 2006, the Taliban continued its resurgence and 2006 became the deadliest year of fighting since the 2001 war. Throughout the spring, Taliban militants infiltrated southern Afghanistan, terrorising villagers and attacking Afghan and U.S. troops. In May and June, 2006 'Operation Mount Thrust' was launched, deploying more than 10,000 Afghan and coalition forces to the south. In August 2006, NATO troops took over military operations in southern Afghanistan from the U.S.-led coalition, which put a total of 21,000 American troops and 19,000 NATO troops on the ground. In September 2006, NATO launched the largest attack in its 57-year history. About 2,000 Taliban fighters were killed in military operations during the year. The Western intelligence believed that Taliban still had their headquarters at Quetta, the capital of Baluchistan province of Pakistan. After being evicted from Afghanistan the Al Qaeda took shelter in the Waziristan area of Pakistan where they continued to run a network of terrorist camps. Taliban and Al Qaeda videotapes released in 2006 on jihadist websites also demonstrated that the camps in Pakistan's tribal areas were training new recruits. So in the present circumstances, American presence in Afghanistan is needed utmost so as to deal with the resurgent Taliban and Al Qaeda groups. This also goes in favour with India's security concerns from the terrorist groups based in Pakistan and Afghanistan.

Geostrategic Positioning of Afghanistan and Jammu & Kashmir

Spatial relation of the state of Jammu and Kashmir with Afghanistan is a very important matter of discussion due to Afghan-Pakistan-Kashmir Jihadi linkage. Located at the confluence of great mountains and with a turbulent history, the Afghanistan-Pakistan region was once, referred to as the 'Cockpit of Asia' by Lord Curzon. Partition and the creation of Pakistan in the year 1947, robbed India of its own geostrategic position. Overnight, India lost to Pakistan its location on the southern border of Afghanistan, its western flanks adjacent to the Persian Gulf and the Middle East, and its eastern boundaries abutting Southeast Asia, becoming immediately involved in the draining and still unresolved conflict over Kashmir.

The state of Jammu and Kashmir has been the victim of combined Jihadi terrorism of Afghanistan and Pakistan ever since its accession to India. Ethnic politics in Pakistan's North West Frontier Province (NWFP) that borders Afghanistan was the biggest threat to Pakistan's internal stability just after the partition. It had become known that agents of the King of Afghanistan were arousing the Pathan (Pashtuns) tribes of NWFP seeking their support for the expansion of his kingdom to Peshawar and the banks of River Indus leading to the creation of a 'Greater Pashtunistan'. Figure 2 shows the Pathan (Pashtun) areas in Pakistan and Afghanistan.

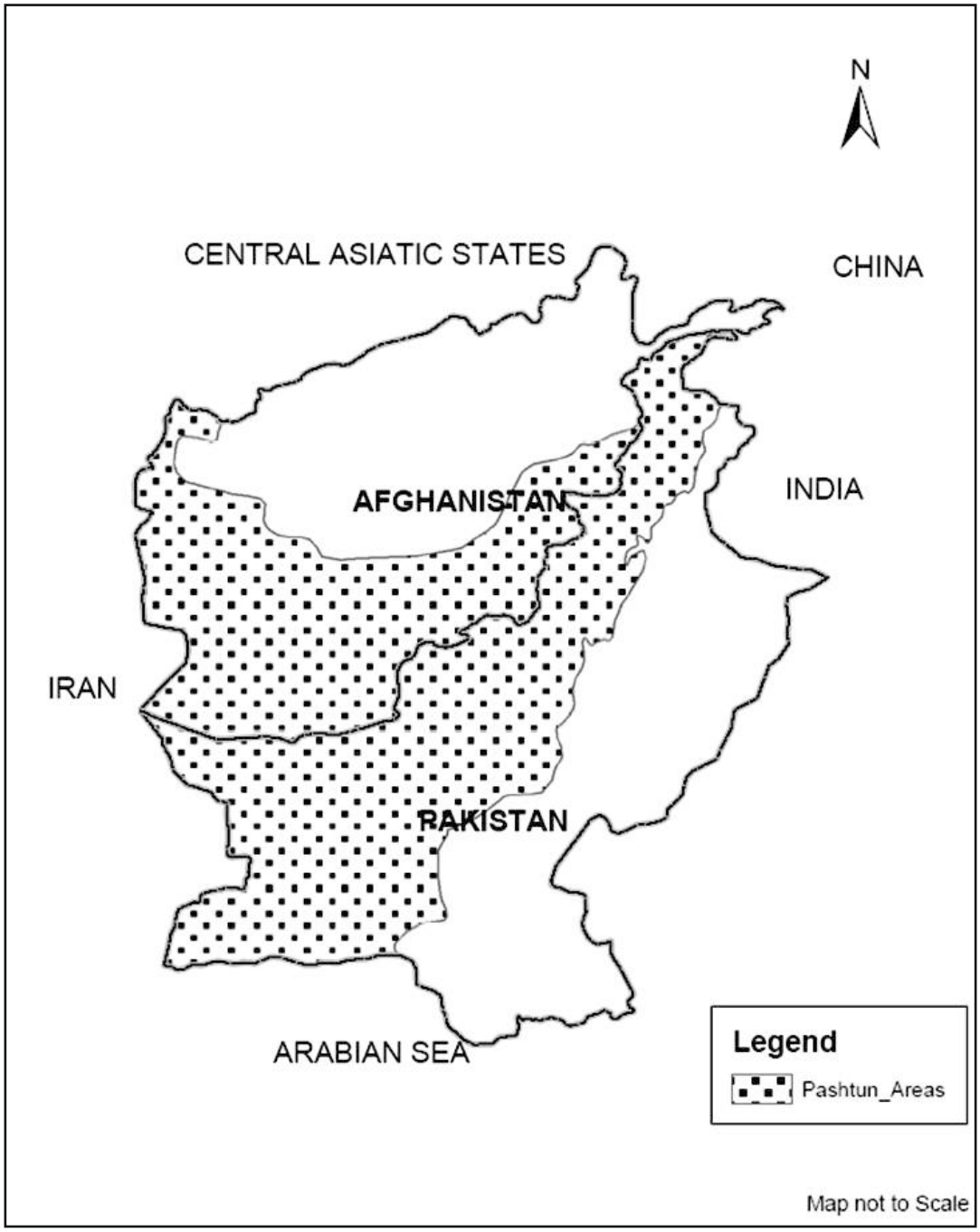

Figure 2 : Map Showing Pashtun Areas in Afghanistan and Pakistan

Source: http://www.ccc.nps.navy.mil/si/jan03/southAsia.pdf

So Pakistan tactfully diverted the attention of Pastun tribes from Peshawar to Kashmir. Pakistan wanted the Maharaja of Jammu and Kashmir to accede to Pakistan forcefully. They also knew that an outright invasion could lead to greater war. So they tried to arouse the religious sentiments of the Pathans to go for a Jihad against the infidel maharaja of Jammu and Kashmir who was crushing millions of Muslims of his kingdom under his tyrannical rule. The invasion began on the 21st October 1947 in which a large number of Pakistani army officers in the guise of Pathans merged with the tribesmen (Lashkar). The Pathans killed innocent people, raped women and looted bazaars wherever they went. Despite best efforts of Pakistan Army officers and men to make these Pathans reach Srinagar, they were beaten back by the Indian Army landing at Srinagar airfield in early hours of 27 October, 1947 after the Maharaja of Jammu and Kashmir had signed the 'Instrument of Accession'. The Afghanistan connection with Kashmir did not end there. In 1979, the Soviet invasion of Afghanistan made Pakistan a front-line ally of the Western World in its battle against Communism. This presented Zia Ul Haq, the Military Dictator of Pakistan, a golden opportunity to kill two birds with one stone, that is, remove the problem of 'Greater Pashtunistan' and also ensure control over Afghanistan's affairs. In addition, Pakistan got billions of dollars in aid and military equipment.

Pakistan's Islamisation drive (through madrassas) and call for Jehad became a cornerstone of its policies in Afghanistan and Kashmir. Young boys from all over Pakistan, Afghan refugees and Kashmiris (JKLF) were indoctrinated, trained and made to fight in Afghanistan against the Red Army. Even after the Soviets' left in 1989, Pakistan did not let go of the reins in Afghanistan. After experimenting with one favourite or another, it finally backed the Taliban. The Taliban—student militias—came from seminaries (Madrassah) mainly based in the tribal areas in South and Eastern Afghanistan and in the Pashtun belt of Pakistan—NWFP and Baluchistan, being notorious for their ferocious independence. With the reins of Afghanistan firmly in the hands of Pakistani rulers, foreign fighters, who had fought in Afghanistan, were inducted into Jammu and Kashmir. By the end of 1998, with the Taliban capturing ninety percent of Afghanistan, a push was planned to upgrade the level of proxy war in Kashmir, which by then had started to wane. The plan came in the form of 'Operation Badr', in which the Pakistani soldiers of its Northern Light Infantry units were sneaked in to capture the unmanned heights in the Kargil Sector in the months of March-April 1999. As the Indian Army reacted to recapture these heights, leaving large portions of the Jammu and Kashmir Sectors porous, thereby hundreds of battle hardened foreign fighters mostly Pakistanis and Afghans of Harkat-Ul-Mujahideen, Harkat-Ul-Jehad-e-Islami (both from erstwhile Harkat-Ul-Ansar), Lashkar-e-Toiba and Al Badr groups, taken from the Taliban forces, were pushed into these Sectors. This upgraded the level of proxy war in Kashmir and brought it back into international focus. Another incident which brought the Kashmir - Afghan connection to focus was the hijacking of an Indian Airlines Plane- IC 814 to Kandahar in December 1999. The training of the terrorists fighting in Kashmir was another area of cooperation and connection. All recruits from Pakistan, Kashmir, POK and Afghanistan were sent to the battle front in Afghanistan for battle

inoculation and also for advanced training in the camps run jointly by Pakistan's ISI and Osama Bin Laden's Al Qaeda, in the areas of Khost, Jalalabad and Kandahar. After September 11, the US fight against the Taleban ousted them of power in the year 2001and contributed to India's strategic objective of a nationally consolidated Afghanistan. Despite all precautions by the Pakistanis, the killing of a large number of cadres belonging to Harkat-Ul- Mujahideen, Jaish-e-Mohammed, Lashkar-e-Toiba and Al Badr in Afghanistan brought the focus of the international community onto the Kashmir and Afghan connection once again. After September 11, United States also made Pakistan an important ally in its war on terror. Pakistan also boasted that they have done everything to uproot the Taliban from their sanctuaries in tribal areas and has lost 600 soldiers in the operation. But the truth is that the training camps for terrorists still exist in the Pakistan-Afghanistan border. Even the most dangerous outfits, such as Lashkar-e-Toiba (the Army of the Pure), have been banned, only to reappear under new guises.

Another matter of concern regarding the study of spatial relations of Jammu and Kashmir with Afghanistan is that the government of Hamid Karzai seems to be weak and ineffective. Much of Afghanistan, outside the big cities, is in the grip of bandits and warlords. The dismantling of pan-Islamic terror machine in Afghanistan is a strategic gain for the state of Jammu and Kashmir. Further the state is looking forward to healthy democratisation of Afghanistan to ensure peace and security in the region that has suffered so much due to terrorism.

Present Status

Presently, Afghanistan administration is fully in the control of Taliban militant groups. American & NATO forces were withdrawn in the light of an agreement between the American administration, Afghan administration and Taliban. As per Doha (Qatar) Agreement, American and NATO forces were to be withdrawn by August 30, 2021 and the deadline was followed by the Americans & NATO. However, liberal administration of President Karzai failed to keep control on administration and he himself left the country in the midst of uncertainly. Consequently, Taliban took over the control over entire Afghanistan. The second generation Afghan administration of Taliban is yet to receive global recognition. Although it is also committed to administer the country on the lines of Islamic Sheriyat, approach towards India has definitely been different. It needs to look into the situation in light of :

1. Its detereoting relation with Pakistan. There has been frequent clashes on the border between the militants of both countries.
2. Several project as like construction of Parliament House, road construction by droelectricity etc. of the Government of India have been under execution in Afghanistan. The Taliban regime has ensured safety.
3. Whenever Hindus and particular Sikhs and Gurudwaras are attacked by the militants, the government has taken care and ensured the people to continue to live in Afghanis as fars they are living. Even at one time, it requested Sikhs not to carry on Gurugranth Sahib of the Gurudwaras as it is the historical legacy of the country.

4. Ensured India that the land of Afganistan would not be used for any kind of militant activity.

These points give an impression that the Afghans may not side Pakistan on Kashmir issue through providing unlawful support. This conclusion however, may not be taken as a guarantee letter. Present Afghanistant is watching the situation of Ukraine and the role of Chechanya militants in that war. They are also trying to get recognition of important countries including India. In face, Afghanistani of today has two faces. First, is the liberal attitude towards global issues and second is the hard Islamic Shariyat rule for administration the country, under which females are being made devoid of education, job and moving outside the house without accompanying a male relatives. Recently male employees are directed not to wear tie in the neck. There are many other barberic imposition.

Conclusion

It is a well-substantiated facts that the central Asiatic mountain terrain consisting political territories of Jammu & Kashmir (India), North-West Frontier (Pakistan) and Afghanistan are violent, militant and unstable for different reasons for a long-time. It has given windows and spaces to self-declared out-lawed outfits to operate and create geostrategic overstappings. It was this situation when soviet power intervened first in 1979 and then the USA and NATO forces India, China, Pakistan and Iran had also their strong concern on this issue. At present, there may be low profile linkages between the terrorist groups of Afghanistan and Jammu and Kashmir but this can not be taken as permanent peace in the territory of Jammu and Kashmir. India needs to be politically and strategically keenly watchful over the open and secret activities of terrorist goups in this region and timely operations must always be taken as one of the fittest approaches towards bringing peace and development in Jammu and Kashmir.

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LANGUAGE GEOGRAPHY: ITS RELEVANCE AND UNIFICATION IN HUMAN GEOGRAPHY

Shaweta Singh*
Email: singh.shaweta856@gmail.com

ABSTRACT

The aim of this paper is to explore the geography of world languages i.e. how language changes with the change of landscape or terrain and its study should be unified and incorporated in human geography. Recently, linguists have discovered how geography and terrain influences language. In tropical regions with heavily forested landscapes, the languages and dialects spoken tend to use more vowels and softer consonants than the dialects spoken by people in colder and drier areas. A dialect is regarded as a geographical variety of a language, spoken in a certain area, and being different in some linguistic items from other geographical varieties of the same language. Language is used as central medium for action and meaning transfer and geography is concerned with the study of language as the medium through which inter-subjective meaning is communicated, and in the power relations intrinsic to such meaning. Understanding of the variations of languages due to geography will lead to the understanding of culture which is directly proportional to language, and develop better communication opportunities in the globalized world. Many languages worldwide have come in the list of endangered language. Incorporation of language geography in Human Geography will create awareness, respect of others culture and it is also anticipated that endangered languages can be rescued.

Keywords: language geography, human geography, dialect, pidgins, creole, isogloss, cultural identity

Introduction

Geography of languages deals with the distribution through history and space of languages, and/or is concerned with the analysis of the distribution patterns and spatial structures of languages in contact. Another field of study within the geography of language is principal. Geolinguistics, when used as a sub-discipline of geography, it is the study of the political, economic and cultural processes that affect the status and distribution of languages. When perceived as a sub-discipline of linguistics that incorporates contact linguistics, it has been defined as the study of languages and dialects in contact and in conflict with various societal, economic, ideological, political and other contemporary trends with regard to a particular geographic location and on a planetary scale. Various other terms and sub-disciplines have been suggested, but none gained much currency including:

- Linguistic Geography which deals with regional linguistic variations within languages, also called **dialect geography**, which some consider a subdivision of geolinguistics

* Dr. Shaweta Singh is Assistant Professor, Department of English, St. Columba's College, Hazaribagh, Vinoba Bhave University.

- a division within the examination of linguistic geography separating the studies of change over time and space

Many studies in what is now called contact linguistics have researched the effect of language contact, as the languages or dialects (varieties) of peoples have interacted. This territorial expansion of language groups has usually resulted in the overlaying of languages upon existing speech areas, rather than the replacement of one language by another. For example, after the Norman Conquest of England, Old French became the language of the aristocracy but Middle English remained the language of a majority of the population.

Research Proposition

This research paper is addressed to seek answer of the following research propositions:

1. Should Geography of Languages be incorporated in the Human Geography?
2. Will its incorporation in Human Geography open new field of sub-discipline studies like dialect geography or linguistic geography?
3. Will it open space for interdisciplinary research works or projects?
4. Will it help in rescuing the dying languages worldwide?
5. Will the study of Geography of Languages incorporate better understanding of culture and create universal brotherhood?

Objectives

Following are the objectives of the present research paper:

1. To open new domain of sub-discipline of studies or research work ingeolinguistics, dialect geography, and linguistic geography
2. To identify the importance of these sub-disciplines in language policies and linguistic rights globally
3. To help in restoring the dying languages all over the world
4. To help better understanding of culture through these sub-disciplines
5. To help the world overcome the cultural identity loss of population, a chronic problem of modern age

Methodology

This paper is based on the secondary data sources, print and electronic media and web based sources. Government documents like treaties, records, maps and published reports have been consulted and analysed. Intensive library work has been carried out to study various research works published in books, journals worldwide.

Study of Language Geography and its sub-discipline Linguistic Geography and its Cultural Relevance

Language geography is one of the branches of human geography that studies the geographic distribution of language(s) or its constituent elements. Linguistic geography can also refer to studies of how people talk about the landscape. For example, toponomy is the study of place names. Landscape ethnoecology, also known as ethnophysiography, is the study of landscape ontologies and how they are expressed in language.

Linguistic geography, as a field, is dominated by linguists rather than geographers. Charles W.J. Withers describes the difference as resulting from a focus on *"elements of language, and only then with their geographical or social variation, as opposed to investigation of the processes making for change in the extent of language areas."* Peter Trudgill says, *"linguistic geography has been geographical only in the sense that it has been concerned with the spatial distribution of linguistic phenomena."* Greater emphasis has been laid upon explanation rather than mere description of the patterns of linguistic change. That move has paralleled similar concerns in geography and language studies. Some studies have paid attention to the social use of language and to variations in dialect within languages in regard to social class or occupation. Regarding such variations, lexicographer, Robert Burchfield notes that their nature *"is a matter of perpetual discussion and disagreement"* and notes that *"most professional linguistic scholars regard it as axiomatic that all varieties of English have a sufficiently large vocabulary for the expression of all the distinctions that are important in the society using it."* He contrasts this with the view of the historian John Vincent, who regards such a view as,

> "a nasty little orthodoxy among the educational and linguistic establishment. However badly you need standard English, you will have the merits of non-standard English waved at you. The more extravagantly your disadvantages will be lauded as 'entirely adequate for the needs of their speakers', to cite the author of *Sociolinguistics*. It may sound like a radical cry to support pidgin, patois, or dialect, but translated into social terms, it looks more like a ploy to keep Them (whoever Them may be) out of the middle-class suburbs."
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> — John Vincent, The Times, 1983

Burchfield concludes, *"Resolution of such opposite views is not possible.... future of dialect studies and the study of class-marked distinctions are likely to be of considerable interest to everyone."* In England, linguistic geography has traditionally focused upon rural English, rather than urban English. A common production of linguistic investigators of dialects is the shaded and dotted map showing to show where one linguistic feature ends and another begins or overlaps. Various compilations of these maps for England have been issued over the years, including Joseph Wright's *English Dialect Dictionary* (1896–1905), the Survey of English (1962–8), and *The Linguistic Atlas of England* (1978).

Similarly, Language and region are two essential cultural characteristics for human geographers to study. Geographers describe the historical and spatial distributions of language and region across the landscape as a way of understanding cultural identity. Furthermore, when geographers study region, they are less concerned with region and more concerned with the diffusion and interaction of regional ideologies across time and space and the imprint it has on the cultural landscape.

Societies often share a single language, and many languages contain the same essential elements. An alphabet is a written system made of symbolic shapes that refer to spoken sound. Taken together, these symbols convey specific meanings. The English alphabet uses a combination of twenty-six letters to create words; these twenty-six letters make up over 600,000 recognized English words (OED Online 2011).

Rules for speaking and writing vary even within cultures, most notably by region. Do you refer to a can of carbonated liquid as "soda," pop," or "Coke"? Is a household entertainment room a "family room," "rec room," or "den"? When leaving a restaurant, do you ask your server for a "check," the "ticket," or your "bill"?

Language is continuously evolving as societies create new ideas. In this age of technology, people have adapted almost instantly to new nouns such as "e-mail" and "Internet," and verbs such as "downloading," "texting," and "blogging." Twenty years ago, the general public would have considered these nonsense words.

Even while it continually evolves, language continues to shape our reality. This insight was established in the 1920s by two linguists, Edward Sapir, and Benjamin Whorf. They believed that reality is culturally determined, and that any interpretation of reality is based on a society's language. To prove this point, the geographers and other social scientists argued that every language has words or expressions specific to that language. In the United States, for example, the number thirteen is associated with bad luck. In Japan, however, the number four is considered unlucky, since it is pronounced similarly to the Japanese word for "death."

In addition to using language, people communicate without words. Nonverbal communication is symbolic, and, as in the case of language, much of it is learned through one's culture. Some gestures are nearly universal: smiles often represent joy, and crying often represents sadness. Other nonverbal symbols vary across cultural contexts in their meaning. A thumbs-up, for example, indicates positive reinforcement in the United States, whereas, in Russia and Australia, it is an offensive curse. Other gestures vary in meaning depending on the situation and the person. A wave of the hand can mean many things, depending on how it is done and for whom. It may mean "hello," "goodbye," "no, thank you," or "I am royalty." Winks convey a variety of messages, including "We have a secret," "I am only kidding," or "I am attracted to you." From a distance, a person can understand the emotional gist of two people in conversation just by watching their body language and facial expressions. Furrowed brows and folded arms indicate a serious topic, possibly an argument. Smiles, with heads lifted and arms open, suggest a lighthearted, friendly chat.

Origins and Diffusions of Language

All modern languages originate from an ancient language. The origin of every language may never be known because many ancient languages existed and changed before the written record. Root words within languages are the best evidence that we have to indicate that languages originated from pre-written history. The possible geographic origin of ancient languages is quite impressive. For example, several languages have similar root words for winter and snow, but not for the ocean. This indicates that the original language originated in an interior location away from the ocean. It was not until people speaking this language migrated toward the ocean that the word ocean was added to the lexicon (a catalog of a language's words).

There are many layers within the Indo-European language family, but we will focus on the specifics. Though they sound very different, German and English, come from the same Germanic branch of the Indo-European language group. The Germanic branch is divided into High German and Low German. Most Germans speak High German, whereas English, Danish, and Flemish are considered subgroups of Low German. The Romance branch originated 2,000 years ago and is derived from Latin. Today, the Romance languages are Spanish, Portuguese, French, and Italian. The Balto-Slavic branch uses to be considered one broad language called Slavic in the 7th Century, but subdivided into a variety of smaller groups over time. Today the Balto-Slavic branch is composed of the following groups: East Slavic, West, Slavic, South Slavic, and Baltic. The Indo-European language branch spoken by most people around the world is Indo-Iranian with over 100 individual languages.

Distribution of Language Families

The next question that must be asked is why languages are diffused where they are diffused? Social scientists, specifically linguistics and archaeologists, disagree on this issue because some believe that languages are diffused by war and conquest, whereas others believe diffusion occurs by peaceful/symbiotic means such as food and trade. For example, English is spoken by over 2 billion people and is the dominant language in 55 countries. Much of this diffusion has to do with British imperialism. The primary purpose of British imperialism was to appropriate as much foreign territory as possible to use as sources of raw materials. Imperialism involves diffusion of language through both conquest and trade.

The linguistic structure of the Sino-Tibetan language family is very complex and different from the Indo-European language family. Unlike European languages, the Sino-Tibetan language is based on hundreds of one-syllable spoken words. The other distinctive characteristic of this language is the way it is written. Rather than letters used in the Indo-European language, the Chinese language is written using thousands of characters called ideograms, which represent ideas or concepts rather than sounds. Sino-Tibetan language family exists mainly in China—the most populous nation in the world—and is over 4,000 years old. Of the over 1 billion Chinese citizens, 75 percent speak Mandarin, making it the most common language used in the world.

There are a large variety of other language families in Eastern and Southeast Asian. There is Austronesian in Indonesia, Austro-Asiatic that includes Vietnamese, Tai Kadai that is spoken in Thailand and surrounding countries, Korean and Japanese. In Southwest Asia (also called the Middle East), there are three dominant language families. The Afro-Asiatic languages are spoken by over 200 million people in several countries in the form of Arabic and are the written language of the Muslim holy book called the Quran. Hebrew is another Afro-Asiatic language and is the language of the Torah and Talmud (Jewish sacred texts).

The largest group of the Altaic language family is Turkish. The Turkish language used to be written with Arabic letters, but in 1928 the Turkish government required the use of the Roman alphabet in order to adapt the nation's cultural and economic communications to those in line with their Western-European counterparts. Finally, the Uralic language family originated 7,000 years ago, near the Ural mountains in Siberia. All European countries speak Indo-European languages except Estonia, Finland, and Hungary, which speak Uralic instead.

The countries that make up Africa have a wealthy and sophisticated family of languages. Africa has thousands of languages that have resulted from 5,000 years of isolation between the various tribes. Just like species that evolve differently over thousands of years of isolation, Africa's languages have evolved into various tongues. However, there are three major African language families to focus on. The Niger-Congo language family is spoken by 95 percent of the people in sub-Saharan Africa. Within the Niger-Congo language is Swahili, which is the official language of only 800,00 people, but a secondary language is spoken by over 30 million Africans. Only a few million people in Africa speak languages from the Nilo-Saharan language family. The Khoisan language family is spoken by even fewer, but is distinctive because of the "clicking sounds" when spoken.

In a world dominated by communication, globalization, science, and the Internet, English has grown to be the dominant global language. Today English is considered a lingua franca (a language mutually understood and commonly used in trade by people who have different native languages). It is now believed that 500 million people speak English as a second language. There are other lingua franca such as Swahili in Eastern Africa and Russian in nations that were once a part of the Soviet Union.

Pidgins and Creoles

Pidgins, also called contact languages, which develop out of contact between at least two groups of people who do not share a common language. A pidgin language is a usually a mixture of two or more languages, contains simplified grammar and vocabulary in, and is used for linguistic communication between groups, usually for trading purposes, who speak different languages. Pidgins are not first/native languages and are always learned as a second language. Many pidgins developed during the European colonization of Asia, Africa, and other areas of the world during the seventeenth to nineteenth centuries.

Creole languages are stable languages that develop from pidgins. Different from pidgins, creole languages are primary languages that are nativized by children. Additionally, creoles have their formal grammar and vocabulary. The grammar of a creole language often has grammatical features that differ from those of both parent languages. However, the vocabulary of a creole is primarily taken from the language of the dominant contact group.

Endangered Languages and Preserving Language Diversity

An **isolated language** is one that is unrelated to any other language. Thus it cannot be connected to any language family. These remote languages, and many others, are experiencing a mass extinction and are quickly disappearing off the planet. It is believed that nearly 500 languages are in danger of being lost forever. Think about the language you speak, the knowledge and understanding acquired and discovered through that language. What would happen to all that knowledge if your language suddenly disappeared? Would all of it be transferred to another language or would major components be lost to time and be rewritten by history? What would happen to your culture if your language was lost to time? Ultimately, is it possible that the Information Age is causing a Dis-information Age as thousands of languages are near extinction?

Conclusion

Thus, the study of Language Geography and its sub-disciplines as part of Human Geography opens another domain of study or research i.e. Linguistics Landscape. Linguistic landscape is the *"visibility and salience of languages on public and commercial signs in a given territory or region"*. Linguistic landscape has been described as being *"somewhere at the junction of sociolinguistics, sociology, social psychology, geography, and media studies"*.The study of language in post-war and conflict-ridden areas has also attracted the interest of scholars who applied the Linguistic Landscape approach as a method to explore how language use in the public space represents ethnic groups, reflects territorial conflicts, expresses statehood and projects ideologies and socio-cultural identities. Themistocleous (2019) for instance explored the use of Greek and Turkish on public signs in the centre of Nicosia (Cyprus) and found that traditional discourses of separation and conflict are dominant in the public space but at the same time new discourses of unification, peace and integration slowly begin to surface.

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ASSESSMENT OF TEMPORAL CHANGE OF LAND USE / LAND COVER (LULC) IN GHAZIPUR DISTRICT OF UTTAR PRADESH

Vinod Kushwaha*
Email: iasvinod1994@gmail.com

Md. Nazim**
Email:dr.nazim2011@gmail.com

ABSTRACT

Land use/land cover change is one of the primary determinants of global environmental changes and a significant issue in the discussion of sustainable development. Understanding landscape patterns, changes, and interactions between human activities and natural phenomena is crucial for effective land management and decision enhancement. Land usage provides an overview of how various land pockets are employed for various activities. In recent years, the district of Ghazipur has experienced significant land use changes. On the one hand, although there is a progressive loss in agricultural land, urban land has grown exponentially. Similarly, the area covered by waste, woods, and fallow land has decreased. Remote Sensing through space technology has given us with a useful instrument for assessing such changes. The present paper highlights the changing trends of land use in Ghazipur district of Uttar Pradesh through timeframe data set of 1990, 2000, 2010 and 2020 collected through satellite. The results obtained from this study suggest marked reduction in the agricultural and vegetation area in the district which is of great concern for the livelihood as well as for the ecological sustainability of the area.

Keywords : Landuse, Land Cover, Remote Sensing, Sustainability

Introduction

In several countries including India, urbanization and industrialization disrupt the natural environment and destroy biodiversity. Planning and management of land use are essential to achieve sustainable development. The increasing number of industries and population density in urban regions accelerate the growth of urban areas. Migration from rural to urban regions has raised the demand for more homes, schools, hospitals, and other service facilities. All of these facilities have occupied and continue to occupy agricultural land in rural areas, resulting in environmental damage. Changes in land use and land cover (LULC) are the result of natural and socioeconomic factors. Human activities are one of the primary agents of changes in land use and land cover, and in the natural environment in general (Spruce et al., 2020; Xu et al., 2020). The disparity in land utilization has exacerbated the tension between urban,

* Vinod Kushwaha is Research Scholar, Department of Geography, Patna University, Patna
** Dr. Md. Nazim is Professor & Head, Department of Geography, Patna College, Patna

agricultural, and natural spaces. Land-use, one of the key factors of global change, is at the center of land planning and land management, with substantial environmental effects.

The interface between biophysical and anthropogenic influences, according to Lantman et al. (2011), causes changes in land use and land cover (LULC). Although changing processes among land use classes are influenced by biophysical factors, humans and their land use practices exert the most influence. Moreover, Rawat and Kumar (2015) noted that the natural and socioeconomic variables of a region, as well as their spatial and temporal influences are reflected in the LULC of the region. Numerous scholars viewed LULC change as a significant phenomenon that is influenced by socioeconomic conditions and the natural environment at the local, regional, and global levels (Butt et al., 2015; Foley et al., 2005; Wubie et al., 2016).

Understanding LULC transformation has evolved from simplicity to realism and complexity during the past few decades. In recent years, LULC classification has been the subject of intensive research for a range of applications. This is because, according to Lambin et al. (2003), land use patterns will play a significant role in shaping the global environment in the next decades. Land use change is a dynamic and anthropogenic as well as natural phenomenon. Every country has a unique pattern of LULC which can also be reflected in terms of India. As a result of the rapid population growth in India, the construction of new buildings and urban expansion have resulted in constant variations in LU/LC throughout time and space (Rahman et al., 2012). For environmental management and the assurance of better living circumstances, reliable information regarding the changing pattern of LULC is becoming increasingly important.

For the identification of change over time, information on land use and land cover for a number of years is required, and subsequent analysis enables the researcher to comprehend the existing landscape's settings, as well as its changing pattern and direction of change. Remote sensing (RS) and Geographic Information System (GIS) have evolved as useful technologies for mapping and monitoring land cover and analyzing changes over a specified time period by integrating spatio-temporal data of a specific area.

It is commonly recognized that multi-temporal and multispectral satellite data can generate significant information about LULC and the mechanisms of change with worldwide coverage (Hathout, 2002; Herold et al., 2003;Lambin et al., 2006; Mandal and Dharanirajan, 2017; Saadat et al., 2011). Throughout the world, researchers have utilized a range of LULC mapping and change detection techniques during the past few decades (Jia et al., 2014; Zhang et al., 2014; Zhu and Woodcock, 2014; Phiri and Morgenroth, 2017; Sekertekin et al., 2017; Jin et al., 2017; Wu et al., 2018; Lv et al., 2018). The most frequent technique, however, is the post-classification comparison, in which each LULC category is compared from separately

classified satellite photos at various temporal scales (Bayarsaikhan et al., 2009). Post-classification comparison has an advantage over other methods because it provides comprehensive information, including statistical data on quantitative changes in LULC class, and has the capacity to reduce the effect of atmospheric and ecological variances between multi-temporal images by pre-processing satellite data (Lu et al., 2004). In addition, it aids in comprehending and evaluating previous management decisions, on the one hand, and predicting all potential outcomes of their current decisions prior to their implementation, on the other (NOAA, 2015).

For better planning and sustainable management of natural resources, it is vital to analyze LULC and its changing pattern, as it serves as the baseline for this type of investigation (Verburg et al., 1999; Lambin et al., 2000; Petit et al., 2001; Read and Lam, 2002). These scientists have argued that land use has large effects on the functioning of environmental and socioeconomic systems, resulting in serious risks to food safety, sustainability, biodiversity, and the socioeconomic vulnerability of people and their ecosystems.

Study Area

Ghazipur district extends between 25^0 19' North to $25^0$25' North latitude and 83^0 4'East to 83^0 58'East, longitude (Figure 1) in the eastern part of Uttar Pradesh, covering an area of 3,337 km^2 and total population of the area is 3615515 persons according to census 2011. In its total population 1852623 are males and 1762892 females. The district is one of the densely populated area in the eastern Uttar Pradesh with density of 1071 persons per km^2. The district has a sex ratio of 952 (females per thousand males) and literacy rate of 71.78 per cent with 82.8 percent males and 60.30 percent females literacy as per census 2011.

The district is a part of the Ganga–Ghaghara doab east, which is chronically flood prone area. It is bounded in the north- west by Azamgarh district, in the north and north- east by Ballia and Mau district respectively, in the west by Jaunpur district and in the south by the Varanasi district – all in Uttar Pradesh and in the south- east by Bihar state. Here the district is separated from Bihar by Karamnasa river. Its maximum east-west length is 90km.

Ghazipur district of Uttar Pradesh, is situated in the north of India. According to Koppen's climatic classification, the district has Cwg type of climate which is a monsoon type climate with dry winters. The maximum temperature of the district reaches more than 40 degrees Celsius in the month of May with mean maximum temperature of around 32 degrees Celsius. The coldest month of the district is December with mercury dropping below 9 degrees Celsius. The average annual rainfall of the district is around 1100 mm of which bulk of rainfall is received during monsoon time i.e., between June to September. August is the rainiest month of the district.

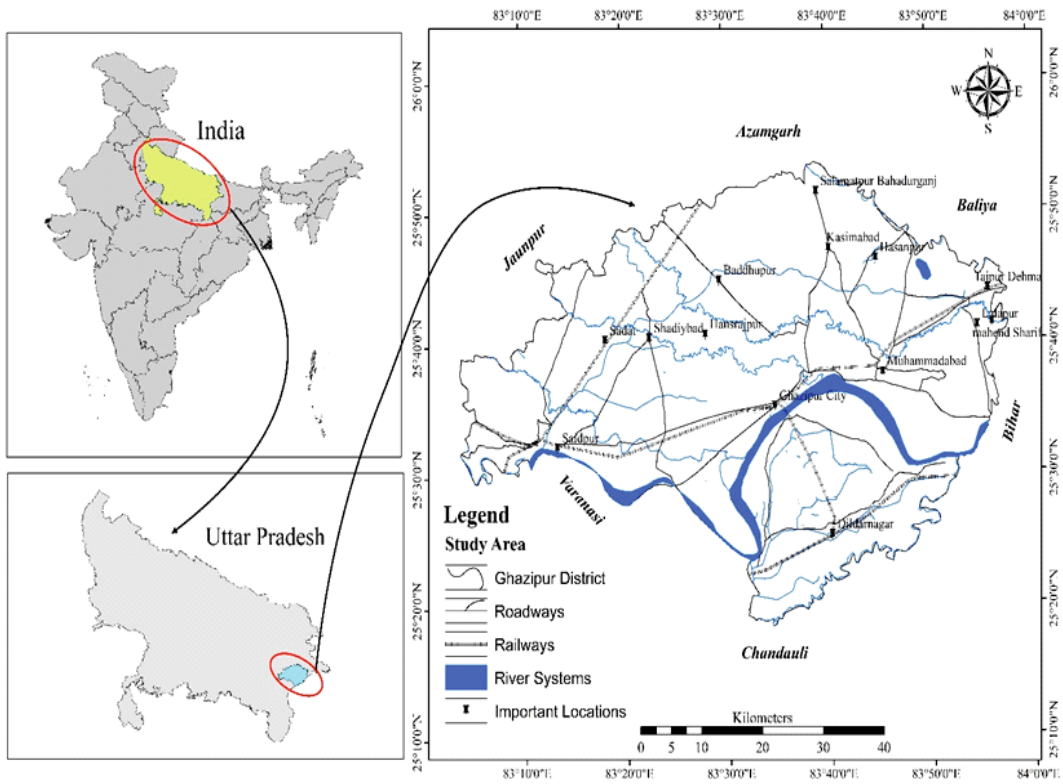

Figure 1 : Location Map of Ghazipur district

Aims and Objectives

The purpose of this study is to apply Remote Sensing (RS) methods to determine the predominant LULC categories in the Ghazipur district of Uttar Pradesh and to assess the dynamics of change in these categories over the previous three decades. Nonetheless, the specific objectives are as follows:

1. Mapping of major LULC classes within the administrative boundary of Ghazipur district;
2. Detecting temporal changes in LULC categories in the study area from 1990 to 2020; and
3. Determining the impact of LULC on the district's economic development.

Data Collection and Geospatial Techniques

Two types of data were used in this work. Satellite data comprising of three years multi- temporal satellite imageries (LANDSAT 5, 7, & 8 imageries of 1990, 2000, 2010, & 2020) for the month of February to March have been acquired from the USGS GLOVIS data-hub (Table 1). The

ground truth data in the form of reference points collected using Geographical Positioning System (GPS) for 2020 image analysis, used for image classification and overall accuracy assessment of the classification results.

Table 1 : Description of data collected from remote sensing satellites

Name	Date	Date of collection	Cloud coverage	Resolution (Meters)
Landsat-5	12-Feb-1990	07-Sept-2022	Less than 5%	30
Landsat-7	18-Feb-2000			
Landsat-8	25-Mar-2010			
Sentinels-2B	08-Feb-2020			10

Pre-Processing of Image and Classification

Pre-processing of satellite pictures is a crucial step before change detection and has the special goal of establishing a more direct correlation between the physiological processes on the ground and the collected data. For georeferencing, mosaicking, and subsetting the image based on the Area of Interest, data were normalised in ERDAS envision (AOI). To extract relevant thematic information, the primary goal of image classification is to group all of the pixels in an image into LU/LC classes.

To assign various spectral signatures from the LANDSAT & Sentinels-2B datasets to various LULC, image classification was performed. Based on the reflectance traits of various LULC object classes, this was done. To make it easier to see various things on the images, several colour combinations were employed. In order to distinguish between various colors of foliage and identify different stages of growth, infrared colour composite NIR (4), SWIR (5), and Red (3) were used. Other colour composites that are sensitive to differences in moisture content, such as the Short Wave Infra-red (7), Near Infra-red (4), and Red (2) combinations, were used to detect built-up areas and bare soils Additional field trips allowed for the identification of the primary land use and land cover types. Training samples were chosen for each of the specified LU/LC types by drawing polygons around typical sites. The pixels contained by these polygons were used to record the spectral signatures for the relevant LU/LC classes obtained from the satellite imagery.

When there is "minimum confusion" among the land covers that need to be mapped, a spectral signature is considered to be satisfactory. By using 189 training sample sites for the five main LU/LC classes, the Maximum Likelihood Classifier (MAXLIKE) scheme with decision rule

was applied for supervised classification. Depending on how simple it was to identify them and how much variability there was, different LU/LC classes had a different number of training sites. The most popular per-pixel technique is the Maximum Likelihood Classification, which analyses spectral data from various land cover groups. According to the table, the demarcated LU/LC classes include settlement areas, aquatic bodies, agricultural regions, natural vegetation, and barren plains.

Post classification

Post-classification refinement is done to improve classification accuracy and reduction of misclassifications. After classification, ground verification was done in order to check the precision of the classified LU/LC map. After ground verification necessary correction and adjustments were made. To obtain the LU/LC changes detection for this study areas MARLULCC technique was applied to delineate different years on classified LULC map. All the procedure followed for the completion of this project has been described through the flow chart (Figure 2).

Results and Discussion

Table-2 and Figures-3 and 4 show the pattern of LULC change under each category of land use in Ghazipur district during year 1990 and 2000. Following the land use classification developed by NRSA, five LULC classes viz. agriculture area, settlement area, natural vegetation, barren land and rivers have been delineated. Again, after comparing data in Table-3 and Figure- 4 and 5, we can identify the pattern of LULC changes between the years of 2000 and 2010. At the same time, by observing Table-4 and comparing Figure-5 and 6, LULC change between the years of 2010 and 2020 can be identified.

Table 2 : Description of LULC classes between 1990 and 2000.

LULC Classes	1990	2000	Changes	In percent Change
Agriculture Area	305276.89	289587.64	-15689.25	5.14
Settlement Area	11856	38387.9	26531.9	223.78
Natural Vegetation	8878	7943	-935	10.53
Barren Land	4163	4152	-11	0.26
Rivers	7558	7653	95	1.26

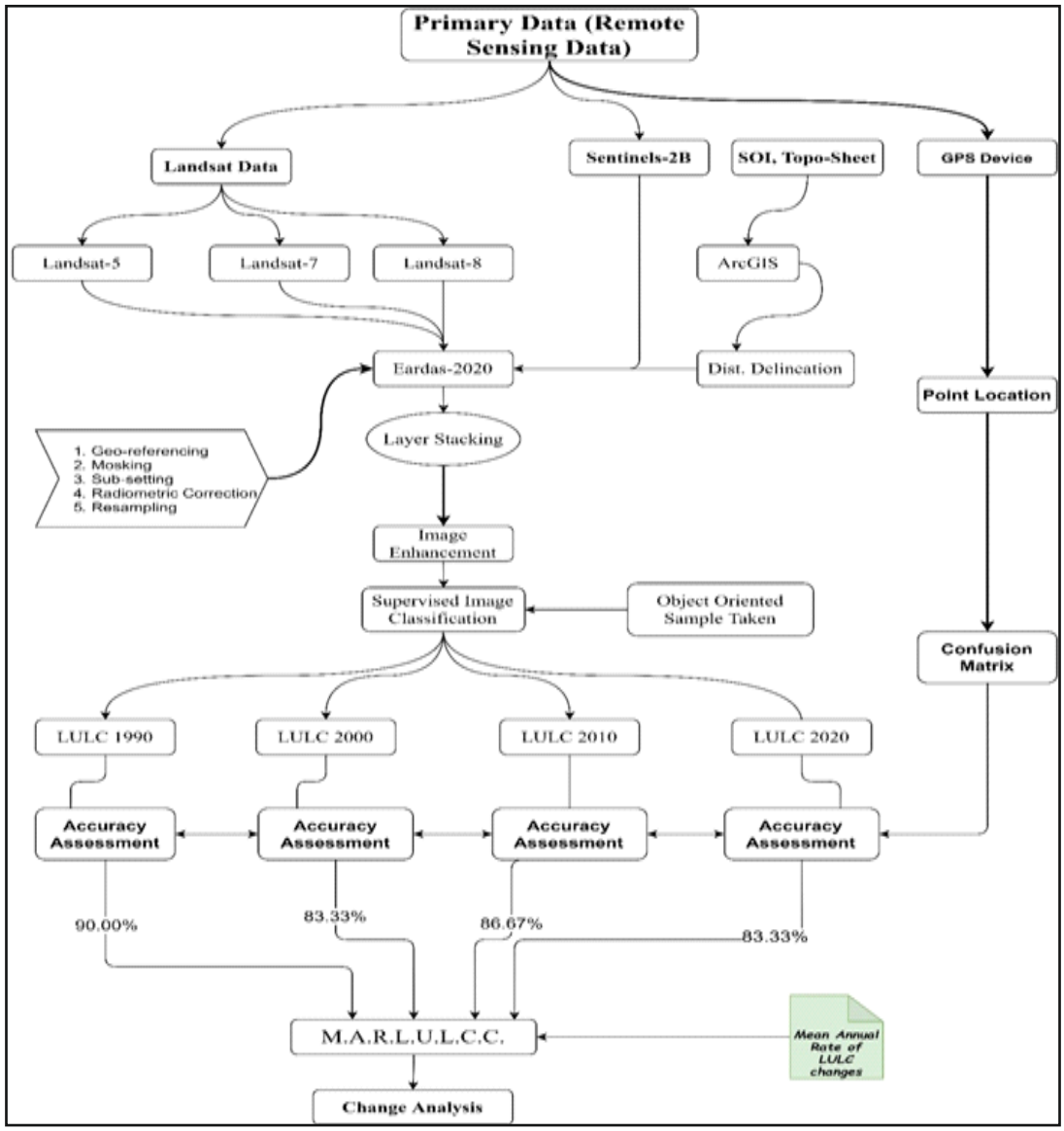

Figure 2 : Methodology flowchart

Agriculture and allied sectors constitute the major economic activity in the study area as 90% of the total area of the district was under agriculture area in the year 1990. It can be observed from the given Table-2 and Figure-3 and 4 that there is 5.14 % reduction of agriculture land between year 1990 and 2000. At the same time, the settlement area in the district has increased tremendously (223%) between the years of 1990 and 2000. Further, natural vegetation in the district has also seen a negative change of around 10% between these two years.

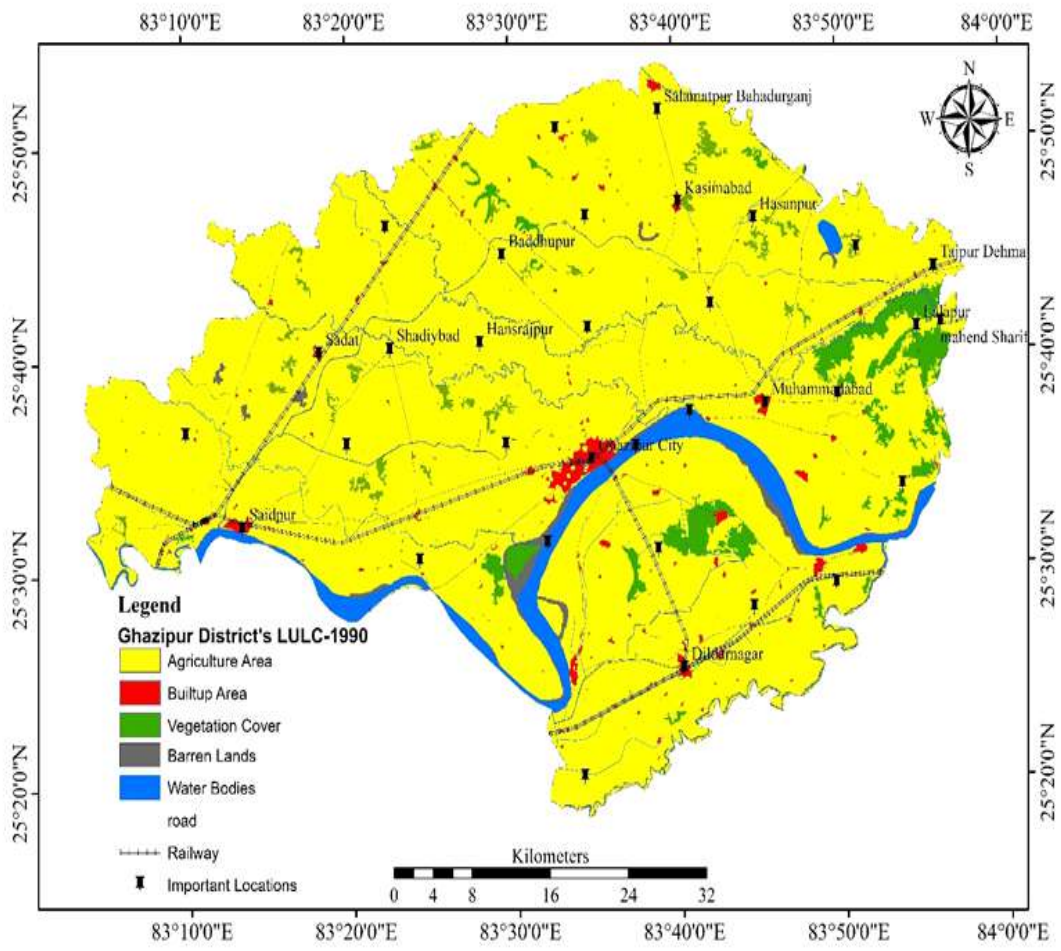

Figure 3 : LULC classes of Ghazipur district in year- 1990

Table 3 : Description of LULC classes between 1990 and 2000

LULC Classes	2000	2010	Changes	Change in percent
Agriculture Area	289587.64	266214.32	-23373.32	8.07
Settlements Area	38387.9	52398	14010.1	36.50
Natural Vegetation	7943	7134	-809	10.19
Barren Lands	4152	4247	95	2.29
Rivers	7653	7623	-30	0.39

Further, it can be observed from Table-3 that there is again reduction in the agricultural area between the years of 2000 and 2010. There is more than 8% of reduction in the agriculture area in Ghazipur district between the specified duration. On the other hand, it is also observed that settlement area for the same period has increased by 36%. At the same time, there is large (10.19%) negative change in natural vegetation of the area.

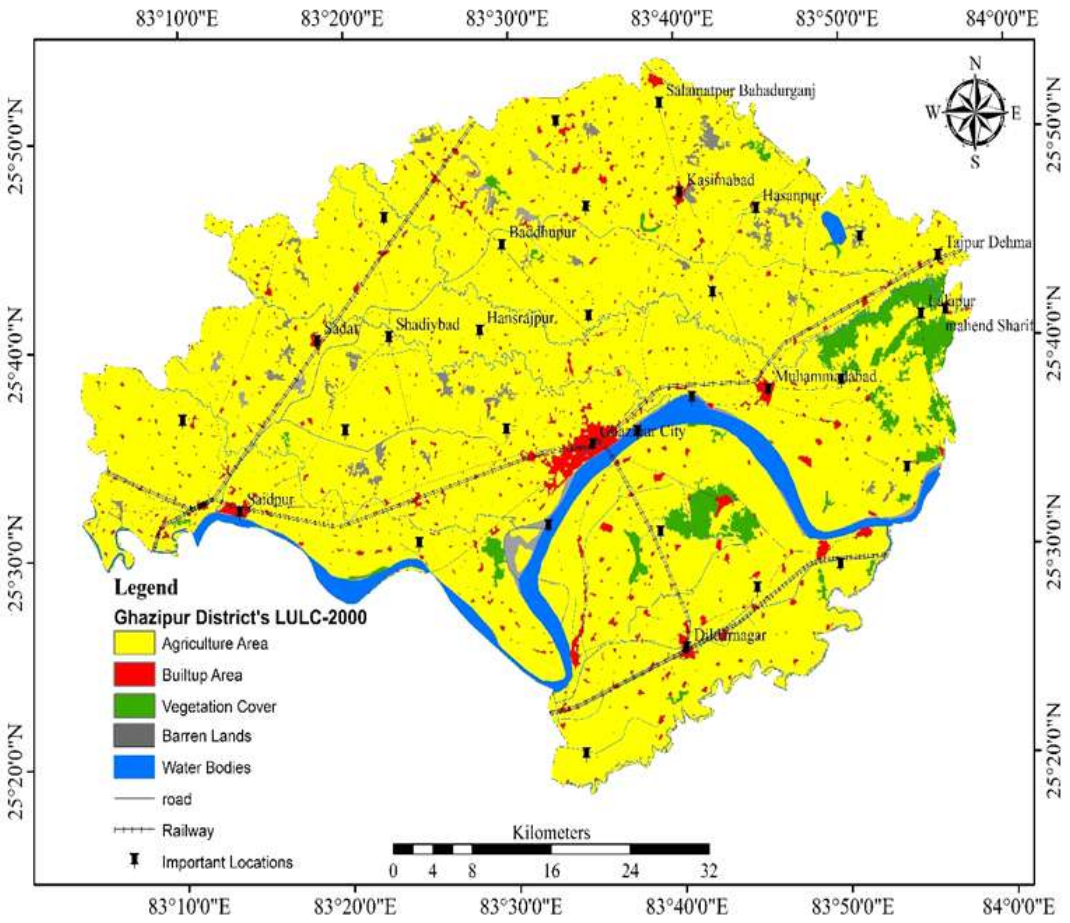

Figure 4 : LULC classes of Ghazipur district in year-2000

By observing the given Table-4, it can be identified that there is continuous decrease in the agriculture area, natural vegetation and barren land in Ghazipur district. It can be observed that there is around 3% decrease in the agriculture area, 2.53% decrease in natural vegetation and 10.39% decrease in barren land in the district between the years of 2010 and May 2020. At the same time settlement area in the district has increased by 16% in the same period.

Table 4 : Description of LULC classes between 1990 and 2000

LULC Classes	2010	2020	Changes	Change in percent
Agriculture Area	266214.32	258074.6116	-8139.71	-3.06
Settlements Area	52398	61213.2818	8815.28	16.82
Natural Vegetation	7134	6953.6765	-180.32	-2.53
Barren Lands	4247	3805.7387	-441.26	-10.39
Rivers	7623	7750.8089	127.81	1.68

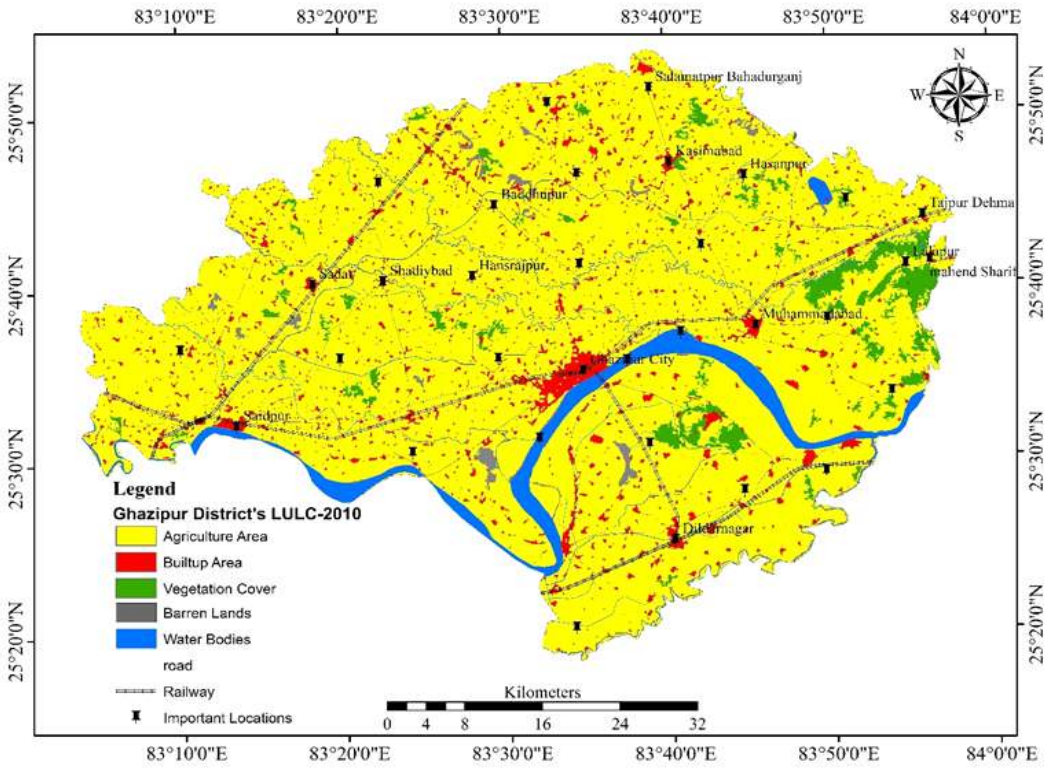

Figure 5 : LULC classes of Ghazipur district in year 2010.

Here, when LULC class data is compared between the years of 1990 and 2020, it can be observed that there is more than 15% reduction in agriculture lands. At the same time, settlement area has increased by more than 400% during last 30 years in the Ghazipur district. Further, it can also be observed that, there is reduction in the natural vegetation of the area. The data given in Table-5 and Figure-6, suggests that there is more than 21% reduction in the natural vegetation of the district.

Table 5 : Description of LULC classes changing between year 1990 and 2020

LULC Classes	1990	2020	Changes	Changes in percent
Agriculture Area	305276.89	258074.6116	-47202.28	-15.46
Settlements Area	11856	61213.2818	49357.28	416.31
Natural Vegetation	8878	6953.6765	-1924.32	-21.68
Barren Lands	4163	3805.7387	-357.26	-8.58
Rivers	7558	7750.8089	192.81	2.55

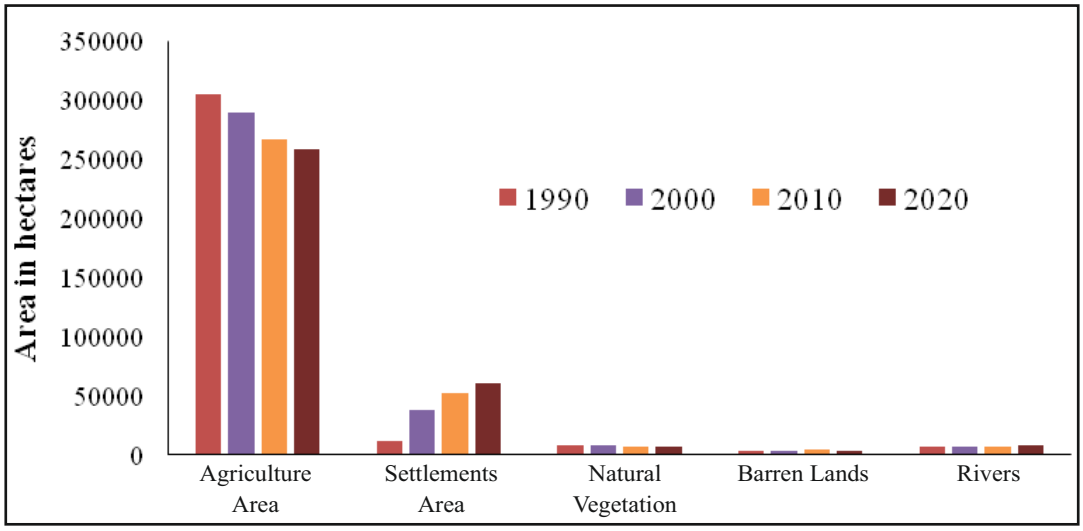

Figure 6 : Overall LULC change in Ghazipur district between 1990 and 2020.

Table 6 : Description of mean annual rate of LULC change (MARLULCC).

LULC Classes	1990	2000	MARLULCC	2000	2010	MARLULCC	2010	2020	MARLULCC
Agriculture Area	305276.89	289587.64	0.0003	289587.64	266214.32	0.0003	266214.32	258074.61	0.0004
Settlements Area	11856	38387.9	0.0084	38387.9	52398	0.0026	52398	61213.28	0.0019
Natural Vegetation	8878	7943	0.0113	7943	7134	0.0126	7134	6953.68	0.0140
Barren Lands	4163	4152	0.0240	4152	4247	0.0241	4247	3805.74	0.0235
Rivers	7558	7653	0.0132	7653	7623	0.0131	7623	7750.81	0.0131

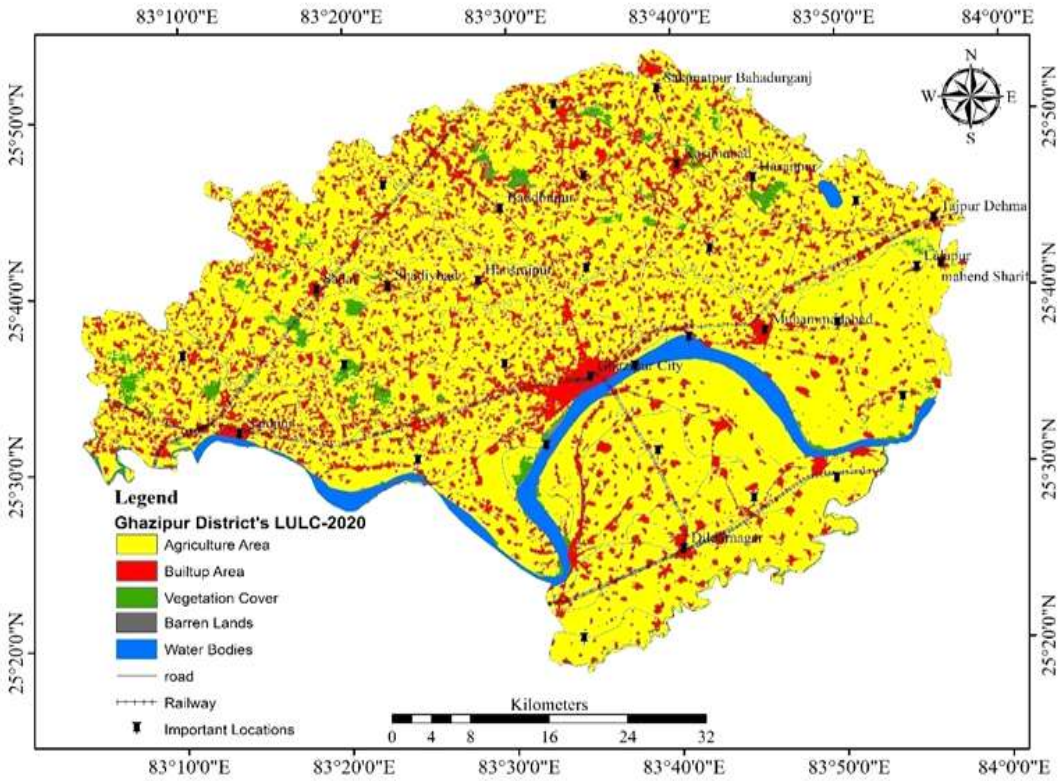

Figure 7 : LULC classes of Ghazipur district in the year, 2020

Accuracy Assessment

Table 7- Comparison between reference point, classified pixels and total correctly classified pixels for LULC classes(1990-2020).

	Reference Total				Classified Pixel				Correctly Classified			
LULC Classes	1990	2000	2010	2020	1990	2000	2010	2020	1990	2000	2010	2020
Agriculture Area	6	6	6	6	7	8	8	8	6	5	6	6
Builtup Area	6	6	6	6	7	7	7	8	6	4	4	6
Vegetation Cover	6	6	6	6	5	5	6	4	5	5	6	4
Barren Lands	6	6	6	6	6	5	4	5	5	5	4	4
Water Bodies	6	6	6	6	5	7	6	5	5	6	6	5
Total	30	30	30	30	30	32	31	30	27	25	26	25

The categorization of an image is considered complete when its accuracy is being evaluated. To determine the accuracy of classification, a sample of testing pixels from the classified image is picked up and compared to the reference data (ground truth). The selection of an acceptable sampling technique and the determination of an adequate sample size for testing data play a crucial role in the evaluation of classification precision.

Table 8 : Accuracy assessment (in percent)

LULC Classes	Producer Accuracy				User Accuracy			
	1990	2000	2010	2020	1990	2000	2010	2020
Agriculture Area	100.00	83.33	100.00	100.00	85.71	62.50	75.00	75.00
Builtup Area	100.00	66.67	66.67	100.00	85.71	57.14	57.14	75.00
Vegetation Cover	83.33	83.33	100.00	66.67	100.00	100.00	100.00	100.00
Barren Lands	83.33	83.33	66.67	66.67	83.33	100.00	100.00	80.00
Water Bodies	83.33	100.00	100.00	83.33	100.00	85.71	100.00	100.00

For the assessment of the accuracy of the present study, a total of 30 reference points from each year have been selected on the basis of stratified random sampling in ERDAS. Sample or reference point assigned to each class of classified images was verified with reference to image (ground truth) to derive the producer and user accuracy and overall classification accuracy has been depicted in Table-7, 8 and 9. The overall classification accuracy stands at 90% for 1990, 83.33% for the year 2000, while it was 86.67% for the year 2010 and again 83.33% for the year 2020. The high accuracy of the results shows that the study is rational and could be useful for the planning and development of the study area.

Table 9 : Overall accuracy obtained for LULC classification (1990-2020).

LULC years	Overall Accuracy in %
1990	90.00
2000	83.33
2010	86.67
2020	83.33

Conclusion

Remote sensing is an effective tool for mapping natural resources at a regional level. The present study utilizes change dynamics over the past 30 years of Ghazipur district which provides information about the pronounced changes in the agricultural land, fallow and barren land as well as water bodies and built-up area. The results discussed in the present paper will be of great help to local administration for future planning and development and technical know-how about the landscape changes in the district.

The study aptly brings to light the changing trends in the pattern of land utilization of the study area. Among different categories of land use, area under cultivation is predominantly occupying more than 75 percent of the total area of the district from 1990 to 2020 followed by settlement area covering only 4 percent in 1990 but 18% in 2020. The coverage area of natural vegetation in 1990 was 3 percent of the total area of the district but in 2020 it was reduced to around 2 percent of the total geographical area of the district. It is also observed that there is a marked decrease in the barren land but not corresponding to the agricultural land. Barren land in this district is being converted to the settlement area or built-up land.

Growth in the built-up (settlement area) areas around the urban centers and decline in the vegetation and cropland is a matter of significant concern. This is because reduction in farm area means loss of fertile land and additional strain will exist upon the existing agriculture land to meet the additional food requirement of the rising population in future, ecological sustainability and development.

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ASSESSMENT OF URBAN SPRAWL IN GURUGRAM CITY, HARYANA: 1981-2021

Indraj*
Email: geoinder@gmail.com

Vishal Warpa**
Email: vishalwarpa@ignou.ac.in

ABSTRACT

When a region's population grows, so does the demand for space. For meeting the needs of sufficient space, a general tendency may be seen to expand into and occupy city's surrounding and peripheral lands, thus giving rise to the phenomenon of urban sprawl. Urban sprawl is a complex phenomenon that affects social life as well as becoming a major environmental problem. Environmental problems tend to occur because of the change in the land function of agriculture and forests into residential areas and commercial purposes. This study aims to conduct trend analysis of the spatial and temporal dynamics of urban built-up areas during the time periods of 1981-2021. To collect information about the dynamics of change in the study area, an integrated approach of remote sensing, GIS, and Shannon's entropy statistical technique was applied. The trend of Shannon's entropy value of urban built-up area shows that the built-up area is expanding. Shannon's entropy value is increasing in the order of 0.925, 0.937, 0.981, 0.987 and 0.998 during the time period of 1981, 1991, 2001, 2011 and 2021 respectively. Based on the region's urban built-up area, the relative entropy value is equal to 0.807 in 1991, with an increase to 0.871 in 2021. The findings may be useful in developing sustainable land use plans and strategies to reduce the risks of disasters and urban flooding in residential areas.

Keywords: Urban Sprawl, Remote Sensing, Shannon's Entropy, Urban Built-up.

Introduction

In the present scenario, the Indian cities are facing rapid and unplanned urbanization and are expanding rapidly. The unprecedented speed of expansion is a major challenge for urban planners and policy makers due to unavailability of the current database and the lack of appropriate analysis of unplanned urban expansion (Shukla et al. 2019). Population increase has spurred development in several countries. The emergence of cities shows the acceleration of developmental activities. The global urban system is quickly developing and will continue to grow in the future. It is a complicated phenomenon in the management of urban expansion (Cohen, 2004). The development of the city that has exceeded the use will grow the surrounding land use. One of the most significant effects of changes brought on by the population agglomeration in urban centers is urban sprawl (Xu et al., 2019). Unprecedented land use and land cover (LULC) shifts in and around urban centers have been brought about by the phenomenon of urban sprawl. Because of its significant impact on LULC classes,

* Indraj is Ph.D. Scholar, Discipline of Geography, Indira Gandhi National Open University, New Delhi, India

** Dr. Vishal Warpa is Assistant Professor, Discipline of Geography, School of Sciences, Indira Gandhi National Open University, New Delhi, India

particularly agricultural land, urban sprawl is significant from the perspective of LULC transformation (Viana et al., 2019; Sharma and Kumar, 2022).

The degree and rate of urbanization typically determines the land use and land cover of any region. A city is forced to take or absorb the population that travels and migrates in pursuit of jobs and other urban amenities as a result of considerable industrial growth and economic activities. The economy is diversified and the periphery gets encroached upon by this process of diversification. In order to meet the food demands of region's population, it places further pressure on the area to practice intensive farming over the available agricultural fields (Sharma and Kumar, 2022). It is a complex phenomenon that has social and environmental impacts. Social development of the city and urban sprawl led to social segregation that fosters social homogeneity (Altinok and Cengiz, 2008).

Land use and land cover is information related to the socio-economic processes in terms of land development, agricultural, natural resources, and the function of ecosystems that influence global change (Munroeaic et al., 2002). The interaction between nature and humans has changed the condition of the earth's surface as an impact of land use resulting from the people's necessities of life (Betru et al., 2019). Increasing population and urban expansion have resulted into the large areas of open space, forests, and agricultural land being converted for land construction due to the increasing demand for transportation facilities, along with commercial and residential land. In addition, the demand for various types of agricultural products has also led to the conversion of some forest land into agricultural land (Wan et al., 2015; Deng et al., 2019). Urban built-up expansion areas are part of land use land cover, which can have a positive impact in the form of progress in modernisation, industrialisation, and strengthening of economic conditions globally, leading to increased urban population. However, existence of urban built-up areas can also have a negative impact on environmental conditions, such as ecosystems, hydrological systems, biodiversity, and climate. These negative impacts can result in the reduction of recharge areas that function as infiltration zones in absorbing rainwater, and can also increase runoff in surface and sub-surface hydrological systems in river basin environments (Wilson et al., 2003).

Remote Sensing (RS) and the Geographical Information System (GIS) play important roles in providing spatial analysis and temporal archive data that can be used to monitor environmental conditions, especially developments of urban built-up areas (Sun et al., 2013). In addition, remote-sensing data can also cover large areas and are spatially and temporally consistent, for urban planning, urban environmental degradation, urban heat island monitoring, urban air quality and urban green space mapping (Rahayu et al., 2018, Chen et al., 2018). In addition, remote-sensing data can also cover large areas and are spatially and temporally consistent (Jat et al., 2008; Sun al., 2013). There are two different types of urban city forms: compact and sprawling. A compact city has a number of significant characteristics, such as mixed land use patterns with high employment and residential densities, contiguous development, multimodal transportation, low open space ratios, and perhaps even greater energy efficiency than a sprawling city because of the close connectivity in the urban core. The sprawling city

has a divided pattern of land use, a low residential density, an infinite potential for outer extension of population, and a far higher reliance on private mobility. It is debatable which one of the two urban types is more sustainable (Jain 2016). Urban sprawl is the term for the rapid geographic growth of towns, suburbs, or metropolitan regions. Urban sprawl is an artificial factor that may change the shape of an urban landscape and is highly powerful and obvious. It cannot be controlled to slow down (Singh et al., 2019).

Shannon's entropy statistical method is a robust statistical approach in describing the strength of the development of an urban built-up area. Shannon's entropy is the most widely used technique for measuring urban sprawl levels, and has now been proven to be the most rigorous and reliable technique (Manesh et al., 2021). Using entropy helps measure the level of development of an area and its activities. Shannon's entropy is an equation formulated to be able to explain the degree of irregularities in the spatial phenomena. Furthermore, with Remote Sensing, GIS, and Shannon's entropy statistical methods, data can be integrated to provide information related to the dynamics of change of urban built-up areas (Al Mashagbah, 2016; Shenbagaraj et al., 2019). Several researchers conducted studies on urban sprawl across the world (Aburas, 2018; Shukla et al., 2019).

Study Area

The study area is located in the NCR, south-east Haryana, India (Fig. 1), which has experienced a variety of dynamic changes in land use and land cover. The phenomenon of urban sprawl that occurred in the study area, one of which relates and is the results of changes in land use land cover. The increase in urban built-up area can reduce recharge area, which provides functions of infiltrations in the dynamics of the hydrological cycle. In addition, the need for the increasing number of residents to fulfil their needs, and use of agricultural land have also resulted in the conversion of land from forest to agriculture. Reduced vegetation canopies can accelerate the erosion process in the study area. The study area has been divided into thirteen circle zones, namely, Zone 1, Zone 2, Zone 3, Zone 4, Zone 5, Zone 6, Zone 7, Zone 8, Zone 9, Zone 10, Zone 11, Zone 12 and Zone 13.

Gurugram city is one of the most progressive cities of Haryana, having its location in the south-east portion of the state. Gurugram Metropolitan Development Authority (GMDA) has been established through Haryana Ordinance No. 2 of 2017. With this Ordinance, the Governor of Haryana established the area with the boundary as specified in the Schedule Ist and Schedule IInd, and containing the area falling within the limits of controlled areas in Gurugram district. It lies between $28^0$15'0"N, $28^0$32'30" N latitude and $76^0$46'20" E, $77^0$10"20" E longitude, covering 675 sq. km. of area. It is recognized as a cyber city due to the location of various Cyber Parks, Industrial Development Learning Institutes and Management Centres. The city has the vantage of proximity (approximate 32 km. far) to the nation's capital, Delhi and is one of the important satellite cities of the National Capital Region (NCR). Apart from the state level initiatives, the city also tends to derive benefits from the regional development plans run by the National Capital Region Planning Board (NCRPB) for the balanced and sustainable progress. One such most recent proposal of 2021 offers an opportunity to the contiguous cities

like Gurugram to make the strategy for residential, commercial, and industrial investment according to its resource potentials and provisions. This approach has helped the city's emergence as the hub of manufacturing and service activities and a destination for the job seekers to the vast number of migrants from adjoining villages, smaller towns, and other states. Thus, such a massive migration of the population from nearby or distant places for various interests has started putting a pressure and consequently burden on the already existing public facilities of the satellite city of Gurugram, NCR, Delhi. Increasing demand for land in order to cater to the ever-expanding horizon of anthropogenic spatial economic activities has resulted into the alterations of land use land cover and their functions.

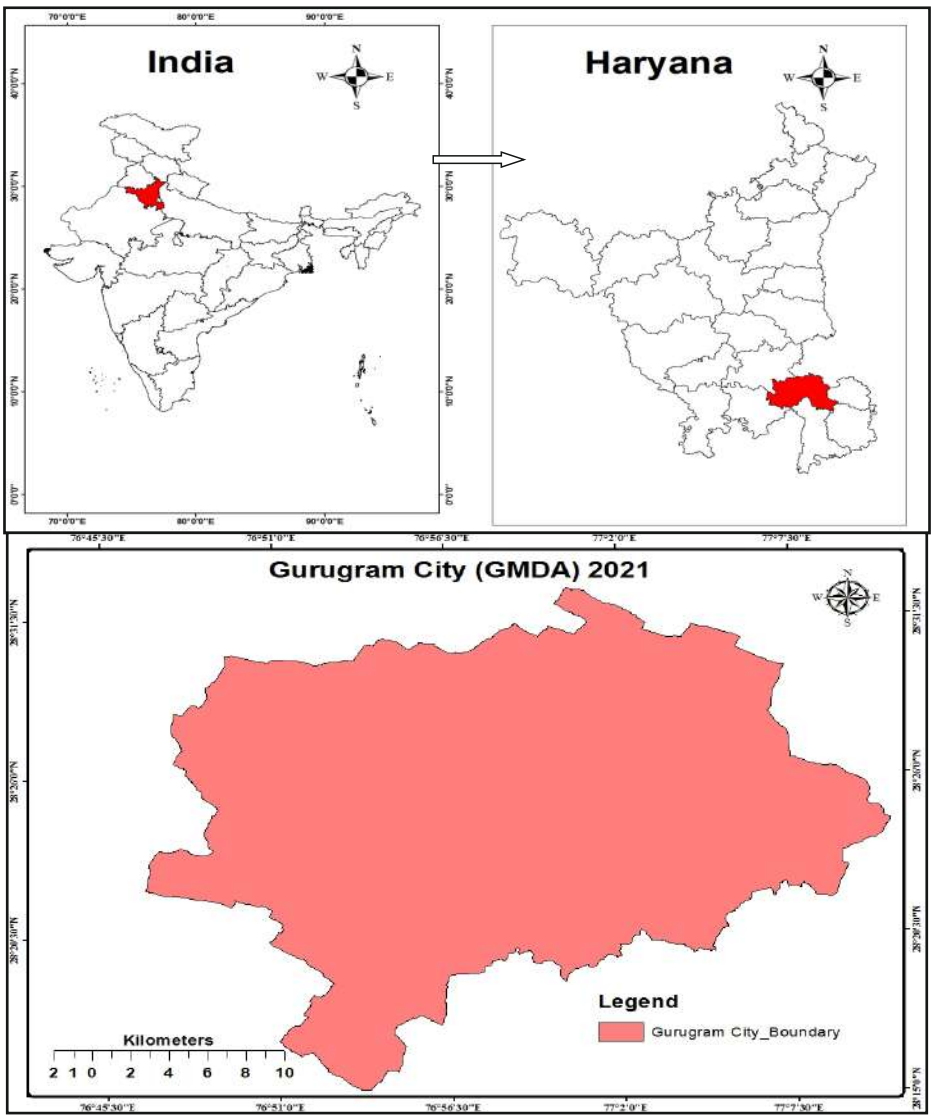


Figure 1 : Location of Study Area

The objectives of the present research work are:

- To assess the trend of urban sprawl of Gurugram city.
- To present a relative analysis of urban growth and built-up area statistics.
- To identify the determinants or factors responsible for the phenomenon of urban sprawl.

Materials and Methods:

Multi-temporal Landsat data were obtained from the Remote-Sensing Technology and Data Centre, United State Geological Survey (USGS), and Haryana Space Application Centre (HARSAC). This study is based on the utilization of both spatial and non-spatial data acquired from many sources for various time periods. The physical enlargement and reconfiguration of the city's natural zoning and land management are measured using Landsat satellite data for different time periods i.e., April 5, 1981, February 20, 1991, February 28, 2001, March 5, 2011, and April 5, 2021 (Table 1).

The objective of employing temporal satellite data is to highlight the trend of urban sprawl of Gurugram city. Urban built-up area information was obtained based on land use and land cover classes for different time periods from 1981 to 2021. The urban built-up area is taken from 6 classes of land use of the study area, namely agricultural land, built-up area, water body, vegetation, rocky land, fallow land, as shown in Table 2. Furthermore, the findings of urban built-up area extraction were employed as input for Shannon's entropy statistical approach, which included thirteen areas within a 2 km radius of Gurugram city (GMDA).

Shannon's Entropy Method

Shannon's entropy index values have been computed considering the urban growth in different zones to detect the form and type of urban growth phenomena. The Thirteen zones from the city centre are taken as the base for evaluation of the urban growth patterns spanning from 1981 to 2021 time periods.

The below mentioned approach was used to determine the growth rate of the built-up area:

$$\text{Growth Rate} = \frac{\text{Latest year value - Base year value}}{\text{Base year value}} \times 100$$

Shannon's entropy (H_n) helps to determine whether a geographical variable (x_i), among n zones, is either clustering or diffusing spatially (Theil, 1967; Thomas, 1981). Shannon's entropy (H_n) is expressed with the help of following formulae:

$$H_n = \sum_{i=1}^{n} P_i \log\left(\frac{1}{p_i}\right)$$

Where Pi, is the proportion of a variable occurring in the *i*th zone

$$\left(P_i = \frac{x_i}{\sum_{i=1}^{n} x_i}\right)$$

x_i is the observed value of the phenomenon in the *i*th zone and *n* is the total number of zones in the study area.

In entropy model, the value lies between 0 to log n. The value closer to zero indicates towards the occurrence of homogeneous urban growth. The distant value from zero or near to log *n* signifies the dispersed distribution of the urban sprawl which means heterogeneous land use of individual spatial units of land. The change in entropy is used to know the direction of urban growth whether it is moving towards more diffusion or compression (Sharma and Kumar, 2022).

The degree of change in urban sprawl may be determined by comparing entropy values between two time periods (t1 and t2).

$$\Delta H_n = H_n[t_2] - H_n(t_1)$$

The relative entropy (H'n) rearranges the entropy values from 0 to 1 (Yeh & Li, 2001). It is (Thomas, 1981) computed as:

$$H'_n = \sum_{i=1}^{n} P_i \log_e \left(\frac{1}{p_i}\right) / \log_e$$

Table 1: Details of the satellite data.

Sr. No.	Satellite ID	Acquisition date	Path/Row	Spatial Resolution/Cell size (m)
1	Landsat_MSS_1981	05-04-1981	147/040	30
2	Landsat "TM+5"	20-02-1991	147/040	30
3	Landsat 7 "ETM+"	28-02-2001	147/040	30
4	Landsat 7 "ETM+"	05-03-2011	147/040	30
5	Sentinel-2	05-04-2021	110/110	10

Source: 1. https://www.usgs.gov. 2. https://scihub.copernicus.eu.

Results and Discussion

Urban Built-Up Area Information Extraction

The results of the multi-temporal query filters for urban built-up area classes for different time periods i.e., 1981, 1991, 2001, 2011, and 2021 in the thirteen circle zone locations, within a radius of 2 km from the centre of Gurugram city are presented in Fig. 2 (A, B, C, D, and E). Total area of the urban built-up areas, based on the thirteen zones of GMDA, is shown in below Table 3. In addition, total area of the urban built-up area based on the radius of 2 km from the city centre is presented in this table, with detailed calculations, are shown in Tables 7 to 11.

Table 2: LULC Categories and their Distribution, 1981-2021

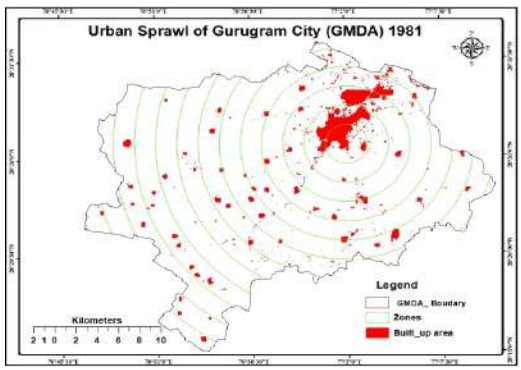
Sr. No.	Class Name	1981		1991		2001		2011		2021	
		Area (in Hectares)	%	Area (in Hectares)	%	Area (in Hectares)	%	Area (in hectares)	%	Area (in Hectares)	%
1	Agriculture	44141.56	65.33	43436.76	64.29	38371.88	56.79	25066.80	37.10	18340.82	27.15
2	**Built-up**	**3735.80**	**5.53**	**8347.49**	**12.35**	**16647.8**	**24.64**	**27563.23**	**40.79**	**34653.88**	**51.29**
3	Water body	181.08	0.27	115.74	0.17	163.85	0.24	173.57	0.26	256.03	0.38
4	Vegetation	462.60	0.68	1605.78	2.38	718.83	1.06	1011.78	1.50	732.48	1.08
5	Rocky	6553.44	9.70	6027.06	8.92	5622.71	8.32	5507.90	8.15	8142.33	12.05
6	Fallow	12491.48	18.49	8033.13	11.89	6040.89	8.94	8242.68	12.20	5440.42	8.05
Total		**67565.96**	**100.00**	**67565.96**	**100.00**	**67565.96**	**100.00**	**67565.96**	**100.00**	**67565.96**	**100.00**

Source: *Calculated from the satellite data.*

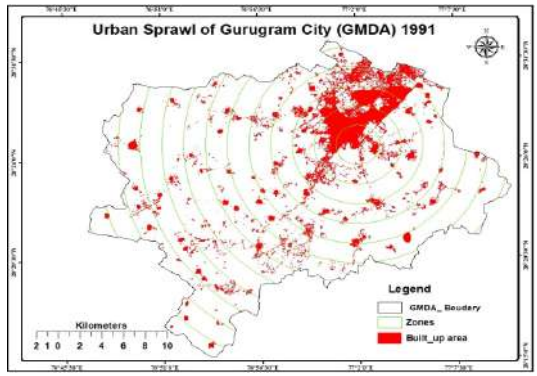
Table 3: Urban Built-up Areas based on the Thirteen Zones of Gurugram city during 1981-2021 (Area in hectares)

Zones	Years									
	1981		1991		2001		2011		2021	
	Built-up	%	Built-up	%	Built-up	%	Built-up	%	Built-up	%
1	486.00	13.01	633.57	7.59	940.26	5.65	1193.24	4.33	1239.51	3.58
2	869.93	23.29	1593.77	19.09	2551.45	15.33	3615.24	13.12	3729.99	10.76
3	758.53	20.30	1784.92	21.38	2914.25	17.51	5159.27	18.72	5969.15	17.23
4	551.85	14.77	1585.91	19.00	3281.76	19.71	5206.00	18.89	6779.24	19.56
5	267.91	7.17	920.33	11.03	2064.40	12.40	3606.41	13.08	4996.88	14.42
6	223.18	5.97	408.35	4.89	903.50	5.43	1817.16	6.59	2681.65	7.74
7	176.46	4.72	375.64	4.50	913.94	5.49	1944.88	7.06	2390.75	6.90
8	53.59	1.43	212.18	2.54	622.74	3.74	1523.88	5.53	1806.94	5.21
9	38.87	1.04	181.81	2.18	997.12	5.99	948.89	3.44	1333.50	3.85
10	130.85	3.50	293.72	3.52	584.69	3.51	963.71	3.50	1294.85	3.74
11	102.08	2.73	250.13	3.00	591.55	3.55	983.28	3.57	1413.38	4.08
12	39.86	1.07	62.28	0.75	181.24	1.09	414.71	1.50	700.38	2.02
13	36.70	0.98	44.85	0.54	100.91	0.61	186.57	0.68	317.66	0.92
Total	**3735.80**	**100.00**	**8347.49**	**100.00**	**16647.80**	**100.00**	**27563.23**	**100.00**	**34653.88**	**100.00**

Source: *Calculated from the satellite data.*



A)



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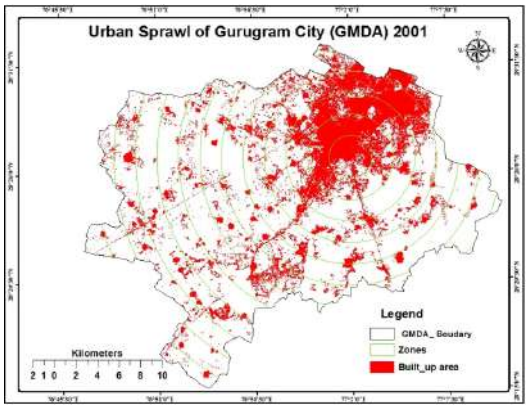
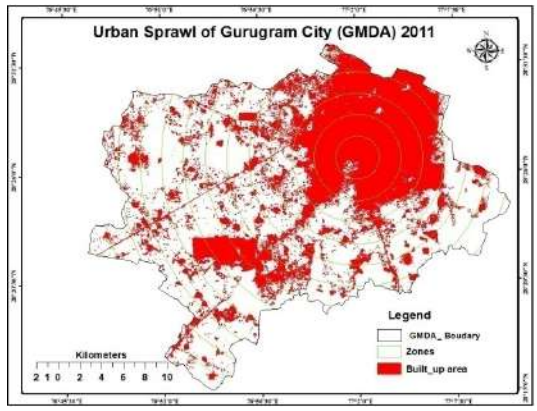


C)



D)

E)

Figure 2: Urban sprawl area information for different time periods within a radial distance of 2 km from the centre of Gurugram city: **A)** 1981 **B)** 1991 **C)** 2001 **D)** 2011 **E)** 2021.

Urban Built-up Area (1981 to 2021)

The availability of satellite data plays an important role in providing multi-temporal urban built-up area development information (Bhatta et al., 2010; Nazarnia et al., 2019). Analysis of changes in land use land cover both spatially and temporally is an effective way of assessing the environmental status of an area. This is an important aspect in detecting environmental changes caused by the influence of one class on the other class of land use land cover. The dynamics of change in urban built-up area is one aspect that can affect the environmental quality (El Garouani et al., 2017).

Table 3 shows the urban built-up area based on the thirteen zones of the study area. It can be seen that zone 2, with an area of 869.93 ha in 1981, has the highest proportion of urban built-up area distribution. The urban built -up area of Zone 2 was 869.93 hectares (23.29%) in 1981 and that of Zone 3 was 1784.92 hectares (21.38%) in 1991. Zone 4 registered 3281.76 hectares (19.71 %) of urban built-up area and which substantially increased to 5206 hectares in 2011, and 6779.24 ha (19.56 %) in 2021, respectively. The lowest proportion of urban built-up area in the study area of the Gurugram city have been concentrated in Zone 6, Zone 7, Zone 8, Zone 9, Zone 10, Zone 11, Zone 12, and Zone 13. The zone thirteen of the study area registered lowest proportion of urban built-up area during all the time periods spanning from 1981-2021, with 36.70 ha (0.98 %) in 1981 and 317.66 ha (0.92 %) in 2021.

The urban built-up area is depicted in the above table 3 is based on the radial distance of 2 km from the city centre of Gurugram. The total share of built-up area increased considerably as a result of this expansion, increasing from 3735.80 ha in 1981 to 34653.88 ha in 2021.

Shannon's Entropy Statistical Method

The results of Shannon's entropy calculations for different time periods i.e., 1981–2021, are calculated based on the region's urban built-up area and radial distance from the centre of Gurugram city. In addition, the results of the relative Shannon's entropy calculations for the same time periods are shown in Table 5.

Table 5: Results of Shannon's entropy and relative entropy calculations, 1981–2021

1981		1991		2001		2011		2021	
En	**E'n**	**En**	**E'n**	**En**	**E'n**	**En**	**E'n**	**En**	**E'n**
0.925	0.807	0.937	0.817	0.981	0.856	0.987	0.861	0.998	0.871

Source: Calculated from the satellite data. (En - Shannon' entropy, E'n - Relative entropy)

Urban sprawl extended in all directions of the study area, with larger development leading to areas with agricultural land and along with roads towards the southern and south-western sides of the city, such as Sohna road, Jhajjar road, Pataudi road and along Jaipur highway. In addition, the value of relative entropy of Gurugram city derived from the radial distance from the city centre was 0.807 in 1981 and 0.871 in 2021. Based on the entropy value calculations,

the use of radial distance from Gurugram city is more sensitive in describing changes in entropy trends and relative entropy. In general, the trend of urban development and change in shannon's entropy and relative entropy from 1981 kept increasing further and tended to continue to increase up to 2021.

Table 5 depicts the results of Shannon's entropy value and relative value which shows a constantly rising trend over the succeeding decades based on the urban built-up area in the study area. With reference to the radial distance from the city centre of Gurugram city, the relative entropy value results are 0.925 in 1981, 0.937 in 1991, 0.981 in 2001, 0.987 in 2011 and 0.998 in 2021. According to the results as shown in above table, the relative entropy values were 0.807 in 1981, 0.817 in 1991, 0.856 in 2001, and 0.861 in 2011, with an increase to 0.871 in 2021, based on the urban built-up area of the Gurugram city.

Table 6: Change in Shannon's Entropy and Relative Entropy Values of Gurugram City

Years	En	Change	E'n	Change
1981	0.925	------	0.807	------
1991	0.937	0.012	0.817	0.010
2001	0.981	0.044	0.856	0.039
2011	0.987	0.006	0.861	0.005
2021	0.998	0.011	0.871	0.010

Source: Calculated from the satellite data.

Table 6 shows the change in Shannon's entropy and relative entropy values in terms of urban sprawl of Gurugram city for 1981 to 2021 time periods. These values were calculated and are shown in the above table. On the one hand, the Shannon's entropy value changed gradually and increased from 0.012 to 0.044 during 1981–1991 and 1991–2001 time periods. On the other hand, it shows a gradual decrease from 0.006 and 0.011 during 2001-2011 and 2011-2021 time periods.

However, the change in relative entropy value increased to the order of 0.010 and 0.039 during 1981–1991 and 1991–2001 time periods. The change in relative entropy value shows a slight decrease from 0.005 and 0.010 during 2001–2011 and 2011–2021 the time periods, respectively. The overall trend of urban sprawl in Gurugram city is found to be haphazard, apparently spreading out in all directions from the city centre.

Limitations and Potential Applications of the Study

This research does not incorporate several supporting attributes or elements, such as population and economic growth, in characterizing the evolution of urban built-up regions. These might be crucial inputs for additional research or information on the development of

urban built-up regions in the study area to foster environmentally sustainable development. One potential use is to forecast the entropy and relative entropy values over the following years, assuming that changes proceed linearly. Furthermore, the findings of this study might be useful in planning of residential areas for the upkeep of environment in the study region.

Conclusions

The results of trend analysis of the radial distance from Gurugram city shows an increase in entropy values that are more sensitive than urban built-up areas that was applied to 13 zones. It shows Shannon's entropy values in the order of 0.925, 0.937, 0.981, 0.987, 0.998 respectively and also shows relative entropy values in the order of 0.807, 0.817, 0.856, 0.861 and 0.871 for 1981 to 2021 time periods. This pattern tends to show the spread effect. Zone 4 seems to have played a significant role in the development of urban built-up area and made the most significant contribution towards the increase in proportion of built-up area in the study area. In 2021, this region recorded the largest proportion of area under the urban built-up area category i.e. 6779.24 hectares (19.56%). This shows that there is a fairly high growth rate, which necessitates the planning and implementation of effective management strategies to achieve the tenets of sustainable development. In addition, there are other driving factors, such as increasing population, economic growth, and implementation of land use planning, which may lead to the possibility of a serious impact on the surrounding environment of the city. This study can provide clues related to spatial planning in the study area. The results can also provide input for sustainable land use plans and strategies to reduce the risks of man-made disasters and hazards, especially urban environments and floods.

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Appendices

Table 7: Results of Shannon's Entropy Statistical Method Calculation (1981) based on the Thirteen Zones of Gurugram City

Zone	1981 (n)	Pi	log*1/pi	Pi*log*1/pi	En	E'n
1	485.999	0.130	0.886	0.115	0.925	0.807
2	869.933	0.233	0.633	0.147		
3	758.529	0.203	0.692	0.141		
4	551.848	0.148	0.831	0.123		
5	267.909	0.072	1.144	0.082		
6	223.176	0.060	1.224	0.073		
7	176.462	0.047	1.326	0.063		
8	53.587	0.014	1.843	0.026		
9	38.874	0.010	1.983	0.021		
10	130.845	0.035	1.456	0.051		
11	102.079	0.027	1.563	0.043		
12	39.861	0.011	1.972	0.021		
13	36.696	0.010	2.008	0.020		
Total	**3735.798**	**1.000**		**0.925**		

Source: Calculated from the satellite data.

Table 8: Results of Shannon's Entropy Statistical Method Calculation (1991) based on the Thirteen Zones of Gurugram City

Zone	1991(n)	Pi	log*1/pi	Pi*log*1/pi	En	E'n
1	633.574	0.076	1.118	0.085	0.937	0.817
2	1593.771	0.192	0.717	0.138		
3	1784.924	0.215	0.668	0.143		
4	1585.910	0.191	0.719	0.137		
5	920.327	0.111	0.956	0.106		
6	408.353	0.049	1.308	0.064		
7	375.640	0.045	1.345	0.061		
8	212.180	0.026	1.593	0.041		
9	181.813	0.022	1.660	0.036		
10	293.724	0.035	1.452	0.051		
11	250.132	0.030	1.521	0.046		
12	62.284	0.007	2.125	0.016		
13	44.854	0.005	2.268	0.012		
Total	**8347.486**	**1.000**		**0.937**		

Source: Calculated from the satellite data.

Table 9: Results of Shannon's Entropy Statistical Method Calculation (2001) based on the Thirteen Zones of Gurugram City

Zone	2001(n)	Pi	log*1/pi	Pi*log*1/pi	En	E'n
1	940.259	0.056	1.248	0.070	0.981	0.856
2	2551.448	0.153	0.815	0.125		
3	2914.249	0.175	0.757	0.132		
4	3281.757	0.197	0.705	0.139		
5	2064.404	0.124	0.907	0.112		
6	903.504	0.054	1.265	0.069		
7	913.939	0.055	1.260	0.069		
8	622.739	0.037	1.427	0.053		
9	997.117	0.060	1.223	0.073		
10	584.686	0.035	1.454	0.051		
11	591.546	0.036	1.449	0.052		
12	181.239	0.011	1.963	0.021		
13	100.908	0.006	2.217	0.013		
Total	**16647.795**	**1.000**		**0.981**		

Source: Calculated from the satellite data.

Table 10: Results of Shannon's Entropy Statistical Method Calculation (2011) based on the Thirteen Zones of Gurugram City

Zone	2011(n)	Pi	log*1/pi	Pi*log*1/pi	En	E'n
1	1193.238	0.043	1.364	0.059	0.987	0.861
2	3615.236	0.131	0.882	0.116		
3	5159.270	0.187	0.728	0.136		
4	5205.995	0.189	0.724	0.137		
5	3606.410	0.131	0.883	0.116		
6	1817.159	0.066	1.181	0.078		
7	1944.881	0.071	1.151	0.081		
8	1523.878	0.055	1.257	0.070		
9	948.893	0.034	1.463	0.050		
10	963.707	0.035	1.456	0.051		
11	983.282	0.036	1.448	0.052		
12	414.713	0.015	1.823	0.027		
13	186.568	0.007	2.169	0.015		
Total	**27563.230**	**1.000**		**0.987**		

Source: Calculated from the satellite data.

Table 11: Results of Shannon's Entropy Statistical Method Calculation (2021) based on the Thirteen Zones of Gurugram City

Zone	2021(n)	Pi	log*1/pi	Pi*log*1/pi	En	E'n
1	1239.511	0.036	1.447	0.052	0.998	0.871
2	3729.985	0.108	0.968	0.104		
3	5969.154	0.172	0.764	0.132		
4	6779.239	0.196	0.709	0.139		
5	4996.881	0.144	0.841	0.121		
6	2681.650	0.077	1.111	0.086		
7	2390.749	0.069	1.161	0.080		
8	1806.944	0.052	1.283	0.067		
9	1333.499	0.038	1.415	0.054		
10	1294.854	0.037	1.428	0.053		
11	1413.376	0.041	1.389	0.057		
12	700.384	0.020	1.694	0.034		
13	317.657	0.009	2.038	0.019		
Total	**34653.883**	**1.000**		**0.998**		

Source: Calculated from the satellite data.

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MAJOR URBAN CHALLENGES CAUSED BY TRAFFIC CONGESTION IN PATNA CITY

Md. Imran Rizvi*
Email: irizvi7@gmail.com

Satya Raj**
Email: satyaraj@ignou.ac.in

ABSTRACT

Patna, the capital city of Bihar in India, is one of the oldest cities in the world and has been the seat of many great dynasties of India. However, the present-day Patna is facing various urban challenges as far as urban sustainability is concerned. The city has been growing haphazardly since the independence of India in 1947, with unplanned development leading to filth and mismanagement in every corner of the city. Amongst the various challenges, the issue of traffic congestion is one of the most crucial, as it affects the overall quality of life of the citizens. According to Ghosh (2018), traffic congestion is on top of the list among various challenges of Patna.

Traffic congestion is a great issue for a developing city like Patna, and it gives rise to several other urban challenges. The impact of traffic congestion is significant and can lead to various negative effects, such as air pollution, longer travel times, increased fuel consumption, and higher transportation costs. The adverse effects of traffic congestion also hamper emergency services and impede the mobility of goods and services, further exacerbating the urban challenges. The thorough study of these challenges is crucial for the development of Patna.

The study of the urban challenges in Patna, particularly traffic congestion, is crucial to addressing the issues of sustainability in the city. To mitigate traffic congestion and its adverse impacts, a comprehensive and sustainable approach is needed, involving all stakeholders, including citizens, policymakers, and businesses. The approach should focus on improving the public transportation system, expanding the road network, and implementing traffic management and control measures. Additionally, public awareness campaigns and community participation can play a significant role in reducing traffic congestion. By addressing the traffic congestion issue, Patna can promote sustainable development and enhance the quality of life for its citizens.

Keywords : Urban Traffic Congestion, Sustainability, Public Transportation, Community Participation

Introduction

Patna, Bihar's capital, grapples with persistent traffic congestion, presenting urban challenges that hinder economic growth and citizens' well-being. Population growth and inadequate infrastructure, including narrow roads and limited public transit, contribute to this issue. Traffic congestion harms the environment, economy, and society. Vehicle emissions lead to air

* Md. Imran Rizvi is Research Scholar, Discipline of Geography, School of Sciences, IGNOU, New Delhi.
** Dr. Satya Raj is Assistant Professor, Discipline of Geography, School of Sciences, IGNOU, New Delhi.

pollution and health problems, while longer commutes increase fuel costs and economic losses. Emergency services and goods mobility are also hampered.

Efforts to combat congestion, such as road expansion and public transit introduction, have been hindered by poor implementation and lack of awareness. A comprehensive, sustainable approach is needed, involving citizens, policymakers, and businesses. Improving public transit, expanding roads, and enhancing traffic management are essential. Public awareness campaigns and community involvement can play vital roles.

Ultimately, traffic congestion in Patna causes severe urban difficulties, hurting the environment, economy, and society. To properly solve this issue, promote sustainable development, and improve inhabitants' quality of life, a coordinated approach is required.

Study Area

Patna, the capital of Bihar in eastern India, boasts a rich cultural heritage and historical significance, having served as the capital of various ancient Indian empires. Situated on the southern bank of the river Ganges amidst the fertile plains of the Ganges basin, Patna covers an area of about 136 square kilometers and is home to over 2.5 million residents. It stands as the second-largest city in eastern India, serving as a vital economic center, ranging from agriculture to manufacturing. Patna experiences a tropical climate, characterized by hot summers and mild winters, with monsoon rains from June to September.

The city enjoys robust connectivity through road, rail, and air networks, featuring a major railway station and international airport. Notable cultural and historical landmarks, such as the Mahavir Mandir, the Patna Museum, and the Golghar monument, enrich Patna's cultural tapestry.

However, rapid urbanization and population growth have led to unplanned expansion, causing various urban challenges, with traffic congestion as a major issue. Factors like surging population, an increasing number of vehicles, inadequate infrastructure, and deficient public transportation systems contribute to severe traffic snarls, extended travel times, and elevated transportation costs. The environmental toll, including air and noise pollution, further affects public health.

Nonetheless, Patna has taken proactive measures to address these issues, encompassing road network expansion, enhanced public transportation, and traffic management strategies. Initiatives like the "Safe City Project" and "Smart City Project" aim to foster sustainable development while raising awareness and community engagement to mitigate traffic congestion and promote sustainable mobility solutions.

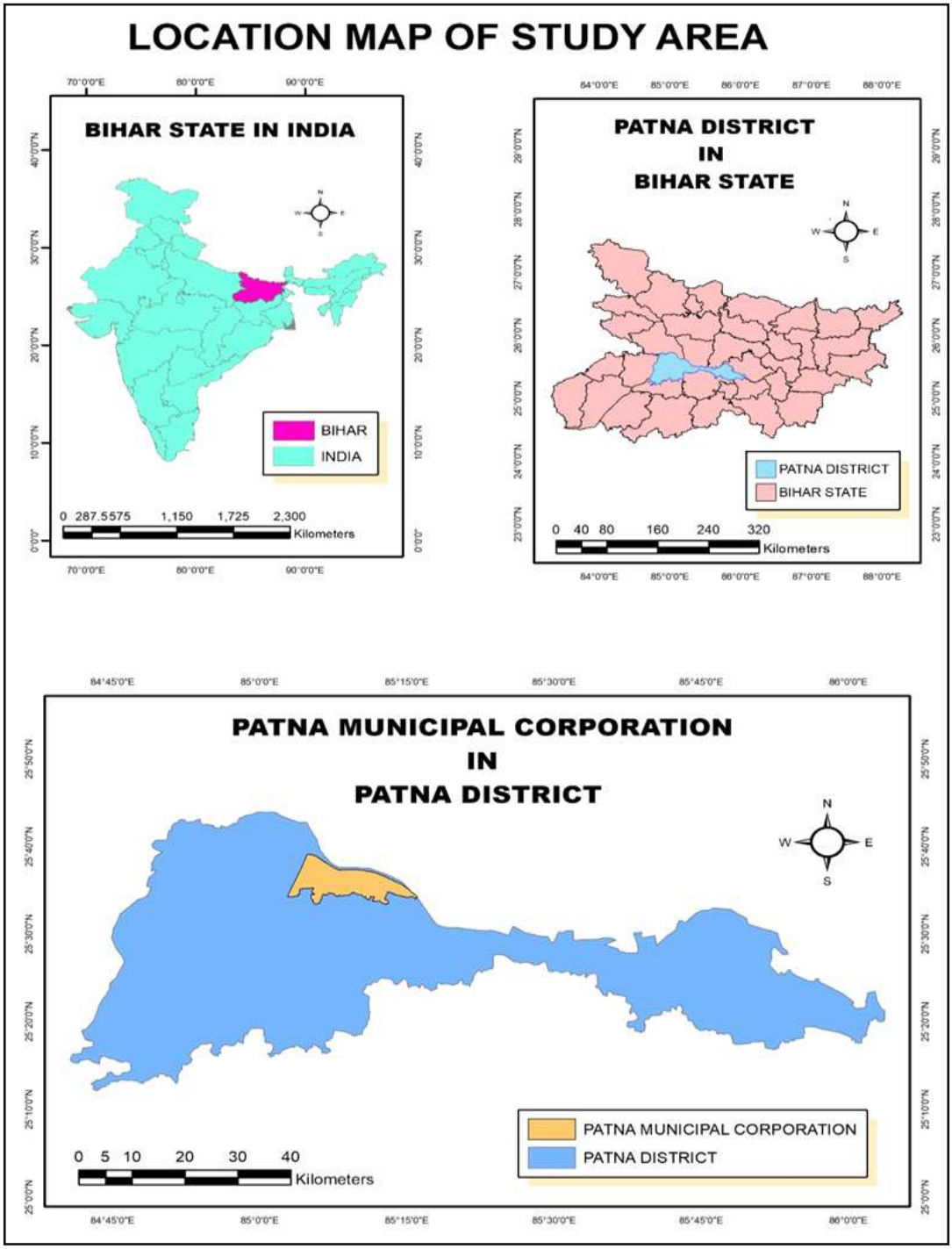


Figure 1: Study Area

Objectives of the Study

1. To identify the impacts of traffic congestion in Patna city and its associated urban challenges
2. To propose and evaluate potential solutions for mitigating traffic congestion and addressing its associated urban challenges in Patna city

Database and Methodology

For the research study on the urban challenges caused by traffic congestion in Patna, a comprehensive database was created using a mix of primary and secondary sources. Primary data was collected through a survey conducted among the city's residents to gather information about their travel patterns, modes of transportation, and perceptions of traffic congestion. Secondary data was collected from government reports, academic articles, and other relevant sources to gain a deeper understanding of the urban challenges facing the city.

The methodology used for this research study included both quantitative and qualitative approaches. The quantitative approach involved statistical analysis of the data collected through the survey, using tools such as SPSS to identify trends and patterns. The qualitative approach involved a critical analysis of the secondary data collected, using a range of theoretical frameworks and concepts to understand the underlying causes of traffic congestion and other urban challenges in Patna. The study also employed a case study approach to gain a deeper understanding of specific instances of traffic congestion in the city.

Overall, the research study employed a rigorous methodology to analyse the urban challenges caused by traffic congestion in Patna. By using a combination of primary and secondary data sources, as well as both quantitative and qualitative approaches, the study was able to provide a comprehensive understanding of the issue and identify potential solutions to address the challenges faced by the city.

Result and Discussion

The following are the major urban challenges caused by traffic congestion in Patna city region:

- **Travel time delay**

Traffic congestion can cause delays when the volume of traffic on a road exceeds its capacity (Kumar et al. 2021). According to a 2020 report from the Association for Commuter Transportation (ACT) in partnership with the U.S. Department of Transportation (USDOT), in USA, 'In 1982, the average person living in one of the country's 75 largest cities faced seven hours of travel delay per year'. By 2001, that figure had shot to 26 hours of delay per year, and the most severely congested periods of the day — once known as the 'rush hour' — stretched to

cover nearly six hours of each day … with the average 'rush hour' trip taking nearly 40 percent longer than the same trip at other times of the day.'

A study by the World Bank found that traffic congestion in Indian cities can increase travel time by up to 50%, leading to economic losses and reduced productivity (World Bank, 2010). Another study conducted in Patna itself, found that traffic congestion on the city's main roads can cause travel time delays of up to 45 minutes during peak hours (Singh et al., 2004). Traffic congestion causes travel time delays in city by slowing down traffic, reducing the efficiency of road infrastructure and traffic management systems and increasing the likelihood of accidents. During the morning commute there is additional stress because delays caused by traffic can make people late for work or others places. Then, at the end of the day, the afternoon rush hour is again a frustrating time because the workday is done and people want to get home to relax and traffic is preventing it (Shiva Kumar, 2016). Traffic congestion in the city area often lead to longer commute times, making it difficult for people to reach their destinations on time. Travel time budget becomes impractical because 'congestion involves slower speeds, queuing and increased trip times' (Kumar and Singh 2017). Inability to forecast travel time/unpredictive journey time is experienced by commuters in the city.

- **Interference with the passage of emergency vehicles**

Traffic congestion in Patna poses a substantial challenge for the timely response of emergency vehicles, including ambulances, fire trucks, and police vans, which are crucial for swift assistance during critical situations. The presence of traffic jams significantly hampers the rapid arrival of these vehicles, potentially leading to life-threatening delays (Dugas et al., 2017).

Several factors contribute to the interference of traffic congestion with the passage of emergency vehicles in Patna. Firstly, blocked roads due to traffic congestion can obstruct the direct route to emergency scenes, forcing these vehicles to navigate through heavy traffic, causing substantial delays (Liu et al., 2018). Additionally, Patna's narrow streets, especially during rush hours, create difficulties for emergency vehicles to maneuver effectively. In some cases, the pathways for emergency vehicles are obscured by vehicles parked on the side of the road or other obstructions, impeding their access. Furthermore, not all drivers on city roads consistently yield to emergency vehicles, occasionally causing erratic maneuvers that exacerbate the situation.

Studies conducted in the United States and China have confirmed that traffic congestion significantly prolongs emergency response times (Dugas et al., 2017; Liu et al., 2018). In the US, congestion was found to increase ambulance response times by up to 50%, underscoring the life-threatening consequences of delays in emergency situations. Similarly, the Chinese study emphasized the importance of efficient emergency response management and traffic congestion reduction to enhance response times.

While specific studies on Patna may be lacking, given its high population density and traffic volume, it is reasonable to assume that similar challenges persist in the city. Therefore, mitigating traffic congestion and enhancing emergency response management are critical for ensuring timely assistance during emergencies and ultimately saving lives. Consequently, addressing traffic congestion emerges as a significant urban challenge in Patna, particularly concerning the unobstructed passage of emergency vehicles.

- **Occurrences of 'Rat running' as an alternative to avoid traffic congestion**

Traffic congestion in Patna has given rise to the practice of "rat running," where commuters seek alternative routes through residential areas and side streets to evade congested main arteries. This tactic, common in urban areas with severe traffic problems, is driven by the desire to save time and bypass frustrating traffic situations (Transport, 2000).

Patna, Bihar's capital, has witnessed a significant reduction in vehicular speed, averaging only 10-15 kmph, primarily due to high vehicle volumes and insufficient road infrastructure (The Times of India). Consequently, many motorists have turned to rat running as a means of reaching their destinations more swiftly.

However, rat running carries several adverse consequences. Increased traffic in residential zones poses safety risks for pedestrians and children and contributes to air and noise pollution. Transport 2000 notes that in some areas, rat-runners disrupt residents' quality of life, creating traffic congestion right at their doorstep.

To address this issue, the Bihar government has undertaken measures like constructing new roads, expanding existing ones, and implementing traffic management systems. The success of these initiatives, however, hinges on the cooperation of motorists who must adhere to traffic regulations and refrain from rat running practices.

In conclusion, rat running in Patna has emerged as a response to the city's traffic congestion, offering a temporary means to save time. Nonetheless, it brings negative consequences for residential areas. Thus, reducing traffic congestion and promoting responsible driving practices are vital for addressing this challenge effectively.

- **Pollution (air, sound and water)**

'Environmental risks, severe air and sound pollutions and serious loss of public health are the end results of Dhaka's traffic jam' (Rahman and Hoque, 2018). This finding holds true for the majority of cities in Southeast Asia, including Patna. Traffic congestion contributes to an increase in the severity of various types of pollution, including air pollution, noise pollution, and water pollution. However, the most significant and commonly observed pollution that occurs due to traffic congestion is air pollution.

Table 1 : Typical greenhouse gas emissions

Sources	Tonnes per capita per year
Bus, rail, trams	0.1
Car	1.2
Air travel	1.8
Other direct emissions	0.6

Source: Goodall, 2007.

Patna's air pollution is considerably exacerbated by traffic congestion. 'In a recent report released by the World Health Organisation (WHO), Patna has been ranked at sixth place out of 795 cities in 67 countries across the globe in terms of air pollution' (Rizvi and Raj, 2022). According to Bihar State pollution Control Board (BSPCB), 'it has been estimated that 60% of the urban air pollution has been caused by vehicular traffic flow (BSPCB, 2010-11). According to Guttikunda, S.K. and Jawahar, P., 2014 'the main share of emissions in the urban parts of Patna city are dominated by vehicle exhaust and resuspended road dust due to the movement of vehicles on the road, followed by domestic and industries'. The increasing number of vehicles on the roads leads to slow-moving traffic, causing more fuel to be burned, resulting in higher emissions of pollutants. Another aspect of vehicular air pollution in urban areas is: 'an increase in the number of high-rise buildings in urban areas causes stagnation of the vehicular emissions to the ground level' (Sood, 2012). Thus, traffic congestion has direct link with pollution in a city region.

Total PM_{10} emissions for the Greater Patna region 2010-2030 considering business as usual

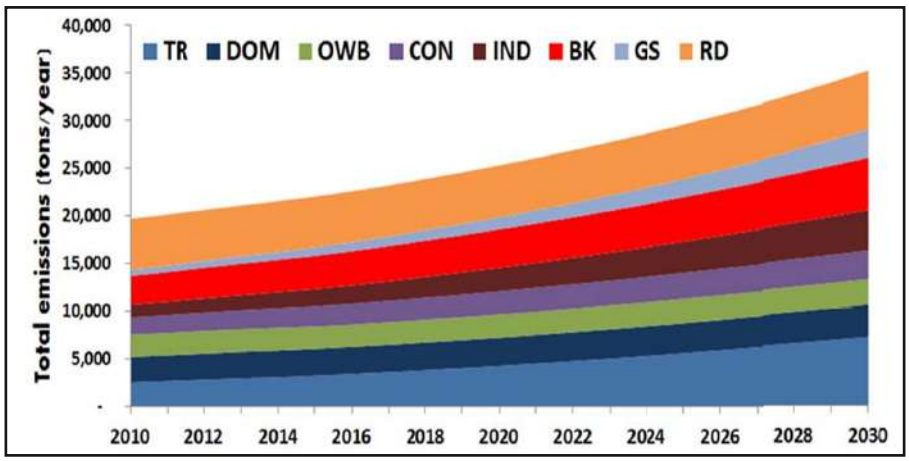


Figure 2: Deterioration of air quality in Patna due to different factors in which transport related factors are predominantly prevalent

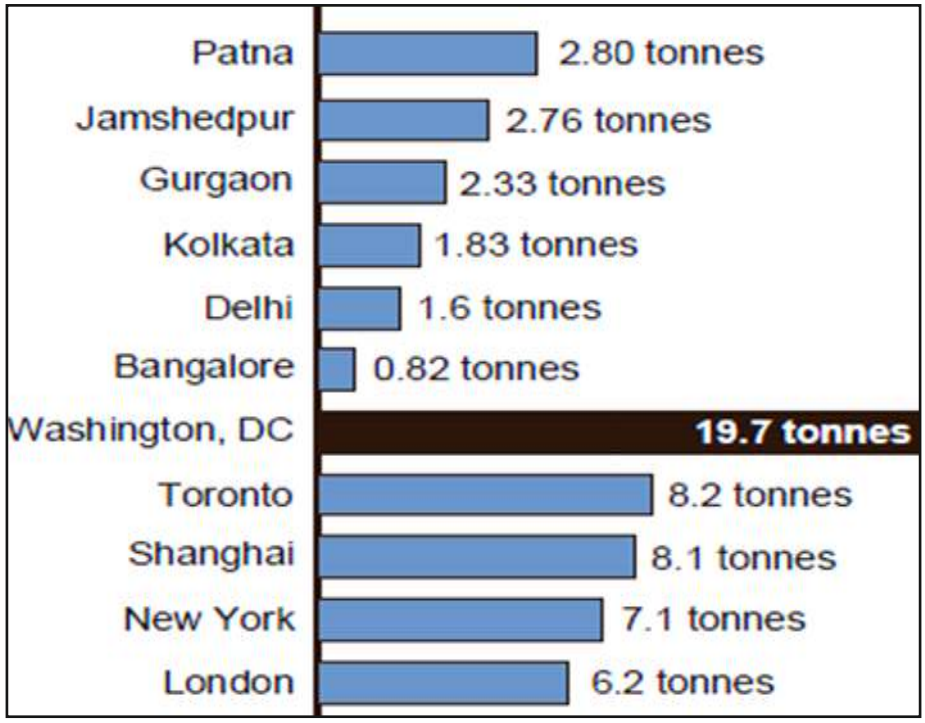
Source: *Guttikunda, S.K. and Jawahar, P., 2014*

Notes: TR = transport (including road, rail, and air); RD = road dust; DOM = domestic (including household and kiosks); GS = generator sets; OWB = open waste buning; IND = manufacturing industries (other than brick kilns); BK = brick kilns; CON = construction activities.

Traffic congestion in Patna has significant implications for air quality, particularly concerning major vehicle-emitted pollutants like nitrogen oxides (NOx), particulate matter (PM), carbon monoxide (CO), and volatile organic compounds (VOCs). These pollutants pose health risks, especially for vulnerable groups such as children, the elderly, and individuals with pre-existing health conditions. In 2019, a study by the Centre for Science and Environment (CSE) highlighted severe air quality degradation in Patna due to traffic congestion, resulting in elevated levels of PM2.5—a fine particulate matter linked to respiratory and other health problems.

Additionally, NOx levels in Patna exceeded permissible limits set by the National Ambient Air Quality Standards (NAAQS). Bihar State Pollution Control Board's action plan and an independent study by Guttikunda and Jawahar (2014) further substantiate the correlation between increased traffic and worsened air quality.

Furthermore, traffic congestion encourages vehicle idling, a common practice in Patna due to congestion, which emits additional pollutants. In conclusion, addressing Patna's traffic congestion



Source : *Jain, A.K.2013*

Figure 3: Per capita greenhouse gas/carbon emissions in selected cities in India as compared to some cities across the world, 2007–2008

is crucial for mitigating pollution, reducing emissions, and improving air quality, subsequently safeguarding public health. Promoting alternative transportation modes like public transit, carpooling, and cycling can contribute to this effort.

'Traffic related noise pollution accounts for nearly two-third of the total noise pollution in an urban area'(Tandel, Macwan, and Ruparel, 2011). 'The influence of vehicle traffic flow is responsible for the majority (up to 80%) of the noise pollution in cities'(Mavrin, Makarova, and Prikhodko, 2018). More specifically 'the sound level within the interval from 0 to 41 meters from the road exceeds the maximum acceptable level and that location in this interval can have negative impact on human health' (Mavrin, Makarova, and Prikhodko, 2018). Since Patna is a densely populated city with a large number of vehicles on the roads which results into a high level of noise pollution as described by Ranjan et al.(2023) 'road traffic noise is a major environmental issue that has been faced by many people around the world including Patna city'.

Traffic congestion in Patna contributes significantly to noise pollution through several mechanisms. Firstly, excessive horn honking by frustrated drivers is a prevalent issue, with Times of India's 2016 article emphasizing its prominence on major thoroughfares. Secondly, the stop-and-go traffic pattern, common in congested areas, leads to amplified noise levels, particularly from larger vehicles like buses and trucks with loud engine noise. Thirdly, congestion results in more idling motorists, notably at traffic lights, where idling engines generate substantial noise. Lastly, daytime construction activities on roads, flyovers, and buildings in Patna, as highlighted by Ranjan et al. (2023), further escalate noise pollution, impacting nearby residents and commuters.'

All these factors contribute to the high level of sound pollution in Patna. 'Patna city suffers from high noise levels because of its narrow roads, dense population, and many individual vehicles' (Ranjan et al. (2023). The World Health Organization (WHO) recommends that the average noise level in a city should not exceed 70 decibels during the day and 60 decibels at night to avoid adverse health effects. However, 'the findings of the Bihar State Pollution Control Board reveal the fact that in all of its sampling zones of Patna, the average noise level is higher than the WHO standard' (Yadav, 2018). Thus, the noise level in several places of Patna frequently surpasses the limitations set forth by the government and the World Health Organization (WHO), 'the equivalent continuous noise level (Leq) measured at different locations in the commercial cum residential zones of Patna city varies from 77.7 dBA to 92.5 dBA, which is higher than the prescribed noise level limit of the CPCB. Other noise indices, such as the NPL and TNI, are found to range from 88.2 dBA to 111.5 dBA and 77.9 dBA to 125.9 dBA, respectively, at various sampling locations in Patna, and are also higher than the prescribed limit of the CPCB' (Ranjan et al. 2023). More specifically, Ranjan, et al. have found 'higher noise levels were found at Mahendru Post Office in the evening due to higher traffic

volumes'. Furthermore in Patna, 'even at the sampling points located within the silence zones marked by the BSPCB, the average noise levels are found out to be distinctly higher than the normal. These points included the hospitals like PMCH (Patna Medical College and Hospital), IGIMS (Indira Gandhi Institute of Medical Science) and Holy Family Hospital; educational institutions like DAV School, BSEB Colony, Loyala High School, Patna Science College and A.N. College as well as the heritage sites like Patna High Court and Patna Museum campus' (BSPCB, 2010- 11). This is the worst situation that cause severe health problems and high level of discomfort for the residents.

In Patna, traffic congestion exacerbates water pollution, also in several ways. Vehicle emissions containing nitrogen oxides (NOx), particulate matter (PM), and volatile organic compounds (VOCs) settle on roads and wash into water bodies during rainfall, altering water pH, depleting oxygen, and contaminating it. Engine wear and tear during congestion lead to oil and fuel leaks, further polluting water when washed away by rain. Drivers and passengers often discard waste on roads, including food packaging, cigarette butts, and plastic bottles, which rain carries into water bodies. In areas with poor drainage systems, waterlogging mixes pollutants and fosters disease vectors. Addressing traffic congestion is vital for reducing water pollution in Patna.

- **Decreasing public space**

Traffic congestion compounds Patna's challenge of dwindling public and open spaces, further limiting these areas in the city. Research by Rizvi and Raj (2022) highlights a stark decline in urban open spaces, shrinking from 60.87% in 1988 to just 42.38% in 2017. Traffic congestion exacerbates this issue.

Increased traffic, as noted by Rodrigue (2020), displaces vibrant street activities with automobiles, reducing spaces once bustling with markets, parades, and community interactions. Informal vendors occupying footpaths due to congestion erase open areas and hinder pedestrians (The Conversation, 2019). Government congestion-relief measures, such as road expansions and flyovers, also encroach on public spaces, including parks and playgrounds (Uddin et al., 2018).

Furthermore, traffic-related air pollution discourages open space use, leading to neglect and decay (Safi et al., 2020). Pedestrian safety concerns in congested zones hinder crossings and deter people from public spaces (The Conversation, 2019).

Ogunbodede (2007) emphasizes that automobiles consume urban land, including areas suitable for productive activities, compounding the shrinking space issue.

In conclusion, Patna's traffic congestion amplifies the challenge of diminishing public and open spaces, impacting social interactions, street vitality, pedestrian safety, and public health. Sustainable urban planning is crucial to address this multifaceted issue effectively.

- **Loss of productivity**

Traffic congestion in Patna leads to substantial productivity challenges for its residents (Rahman and Hoque, 2018). Delays caused by congestion significantly impede daily routines, especially during peak hours. Commuters often spend hours stuck in traffic, arriving late for work, missing important meetings, or struggling to meet deadlines, resulting in productivity losses for businesses. The stress of congestion also takes a toll on mental health, further affecting focus and productivity. The Times of India reports that traffic congestion can cause a 30% reduction in worker productivity in Patna. Additionally, congestion poses logistical challenges for businesses, causing delays in goods and service delivery, impacting project timelines, and reducing revenue. Cumulatively, these challenges result in substantial financial losses, hampering competitiveness and growth.

To address these issues, Patna must prioritize solutions such as enhancing public transportation, promoting carpooling, and implementing congestion pricing schemes to alleviate traffic congestion. These steps are vital for improving productivity and sustaining economic growth in the city.

- **Increased road accidents**

Traffic congestion in Patna not only stands as a significant urban challenge but also contributes to another pressing issue: urban road accidents. Road traffic injuries are poised to become the fifth leading cause of death by 2030 if no action is taken (Nachimuthu, 2016). These accidents are currently the ninth leading cause of global mortality, accounting for 2.2% of all fatalities, with more than half occurring among those aged 15 to 44. Patna's congested roads amplify the risk of road accidents due to the sheer volume of vehicles and associated factors.

Peak hours, characterized by severe congestion, are particularly accident-prone, as indicated by Chakraborty and Roy (2005). Frustrated drivers may take risks during these times, leading to accidents, injuries, and fatalities. The National Crime Records Bureau reported a 21% increase in road accidents in Bihar in 2019, with Patna registering the highest number (NCRB, 2019).

A study by the Bihar State Road Development Corporation identified traffic congestion as a significant cause of accidents in Patna (BSRDC, 2021). Intersections and road junctions with long queues due to congestion are highly accident-prone. Drivers attempting to navigate these queues may resort to shortcuts, illegal turns, and signal jumping, leading to collisions.

The Patna Traffic Police Department reported 3,725 accidents in 2020, resulting in 1,472 injuries and 514 fatalities, with traffic congestion playing a substantial role (Patna Traffic Police, 2021). Another study in 2019, published in the Journal of Traffic and Transportation Engineering, found a strong correlation between traffic congestion and accidents in Patna.

Singh and Mishra (2004) underscored that traffic congestion on Patna's roads is a primary reason for its high accident rate, particularly at intersections and roundabouts. The lack of efficient traffic management systems and personnel exacerbates congestion and accident risks. Implementing intelligent traffic signal systems can alleviate congestion and reduce accidents.

Furthermore, the study by Singh and Mishra revealed that increased personal vehicle use and inadequate public transport contribute to congestion and accident risks. Promoting alternative transport modes like cycling and walking can reduce road congestion.

In summary, tackling traffic congestion in Patna holds paramount importance for ensuring road safety. Implementing effective strategies like enhanced traffic management, improved public transportation, and the promotion of alternative modes of travel can help alleviate accident risks associated with congestion. The identification of accident-prone zones, a practice undertaken by the Patna traffic police, enables focused safety initiatives within the city.

- **Decreased accessibility**

Traffic congestion in Patna profoundly hinders accessibility, making it challenging for individuals to reach crucial destinations (Litman, 2017). It primarily affects accessibility by elongating travel times, as congested roads result in slower vehicular movement and frequent traffic jams, ultimately leading to extended journeys (Hall, 2019). This, in turn, complicates commutes to workplaces, schools, hospitals, and other vital locations.

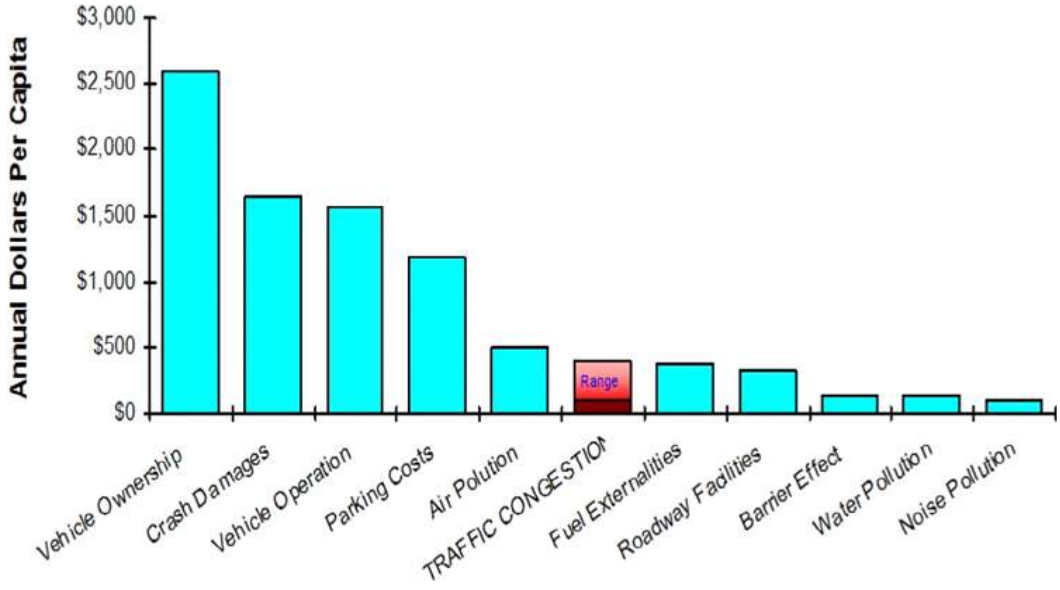
Additionally, congestion reduces road capacity, impeding the smooth flow of vehicles and, in severe cases, causing complete blockages, rendering certain destinations unreachable (Levinson and Krizek, 2018).

Furthermore, congestion diminishes access to alternative transportation options, affecting buses and trains, which may experience delays, reduced frequency, and reliability. This particularly impacts those residing in areas with limited transportation alternatives (Banister, 2018).

Lastly, congestion restricts mobility for individuals reliant on personal vehicles. In the face of congestion, they may be unable to drive, necessitating less convenient transportation modes or even hindering travel altogether. This curtails their ability to access essential destinations and activities, ultimately diminishing overall accessibility (Vickrey, 2019).

- **High infrastructure maintenance costs**

Traffic congestion is a common issue faced by many cities across the world, especially in developing world and so, Patna city is also not an exception. The high number of vehicles on the roads of Patna city has resulted in traffic congestion, which has led to several problems. One of the significant urban challenges caused by the phenomenon of traffic congestion is the high infrastructure maintenance costs. Litman (2009) estimated the cost of traffic congestion alongwith other transport costs:



Costs Ranked by Magnitude (Litman,T. 2009)

Figure 4: Congestion cost estimates range between $110 and $390 annually per capita, depending on assumptions. Even the highest estimate is moderate compared with other transport costs.

Cities like Patna, with aging transportation infrastructure, grapple with escalating maintenance costs and the pressure to modernize. Heavy traffic congestion exacts a toll on essential infrastructure like highways, bridges, flyovers, and parking facilities. The continuous vehicular flow subjects these structures to wear and tear, leading to issues like cracks, potholes, and potential accidents. Consequently, the city faces recurring repair and maintenance expenses, straining its finances. Moreover, traffic congestion places extra strain on automobiles, necessitating frequent repairs and maintenance, compounding the need for roadwork due to vehicle-induced damage.

Additionally, congestion disrupts the movement of goods and services, escalating expenses for businesses. Delays in deliveries increase transportation costs, subsequently inflating the prices of commodities and services, impacting the city's economy. Truck deliveries, for example, suffer setbacks in traffic, resulting in business losses and price hikes, affecting residents' purchasing power. Maintenance and repair activities also hinder vehicular circulation.

To address the challenge of high infrastructure maintenance costs prompted by congestion, city authorities can adopt multiple measures. Investment in alternative transportation options like mass transit systems can reduce road traffic, alleviating wear and tear on infrastructure. Enforcing strict traffic regulations during peak hours can further alleviate congestion.

In conclusion, traffic congestion presents a substantial challenge for cities like Patna, leading to increased infrastructure maintenance expenses. City authorities should undertake proactive measures, such as investing in alternative transport modes and implementing stringent traffic regulations, to alleviate this issue, improving both the city's financial outlook and residents' overall quality of life.

- **Physical and mental health disorders**

Traffic congestion in urban areas like Patna significantly impacts the well-being of residents, both physically and mentally, primarily due to increased carbon emissions and stress-inducing conditions. Research indicates that heavy traffic-related emissions directly affect the health of Patna's inhabitants. Exposure to traffic-related air pollutants like particulate matter and nitrogen dioxide increases the risk of respiratory and cardiovascular diseases, exacerbating conditions like asthma (Smith et al., 2005). Furthermore, traffic congestion contributes to psychological stress, a factor linked to hypertension, heart disease, and mental health disorders (Evans, 2003).

The adverse consequences of traffic congestion extend beyond physical health, encompassing mental well-being. Exposure to traffic-related air and noise pollution heightens anxiety levels, potentially leading to mental health issues such as anxiety, depression, and pessimism (Brink et al., 2016). The frustration, anger, and irritability stemming from congestion further deteriorate mental health and escalate road rage incidents (Shiva Kumar, 2017). Road rage is notably prevalent in congested areas like Patna, posing significant safety challenges.

Research substantiates that traffic congestion in Patna adversely affects both physical and mental health. Raju and Mohanty (2019) found that long commutes in congested traffic increased stress and anxiety levels among commuters. Khan et al. (2018) established a direct link between air pollution caused by congestion and respiratory issues like coughing and wheezing. Singh et al. (2004) highlighted that congestion promotes physical inactivity, elevating the risk of chronic health conditions such as obesity and cardiovascular diseases.

However, it's essential to acknowledge that factors like poverty, limited healthcare access, and exposure to other pollutants can also influence residents' health in Patna. Establishing a direct causal relationship between traffic congestion and physical and mental health remains complex due to these multifaceted factors.

To sum up, traffic congestion in Patna presents a complex health challenge, impacting the physical and mental well-being of its residents due to elevated emissions, stress, and air pollution. While research highlights these issues, addressing their health consequences requires a holistic approach that takes into account the intricate interactions of multiple factors within the city's context.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Conclusion

The study has shown that the impact of traffic congestion on the city's life is significant. The lost time and productivity resulting from congestion leads to economic losses for businesses, while the extra fuel consumption and emissions contribute to increased operating costs and environmental damage. This highlights the need for a more efficient and sustainable transport system to support the city's economic growth.Furthermore, the study has demonstrated that traffic congestion has negative impacts on the environment, including increased air pollution and greenhouse gas emissions. This not only affects the health and wellbeing of the city's residents but also contributes to climate change. The findings of the study suggest that it is crucial to address the issue of traffic congestion in a holistic manner that takes into account its impact on the environment.

In conclusion, the study highlights the importance of taking a comprehensive and integrated approach to address the urban challenges caused by traffic congestion in Patna. This requires the development of sustainable transport policies and infrastructure, as well as the promotion of sustainable urban practices and public awareness. It is essential to address the underlying causes of traffic congestion and ensure the long-term sustainability of the city for the benefit of its residents and the wider environment. By taking these steps, it is possible to build a more sustainable and resilient city that can meet the challenges of the future.

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EXPLORING THE ECOLOGICAL DYNAMICS: LAND USE, WATER RESOURCES, AND AGRICULTURE ANALYSIS OF BALH WATERSHED IN HIMACHAL PRADESH, INDIA

Ajay Kumar*
Email: ajayberdhan@gmail.com

Navneet Kaur**
Email: navneet_pu@yahoo.co.in

Manu Raj Sharma***
Email:fakeersharma@gmail.com

ABSTRACT

The term "watershed" refers to a land area that directs water flow into a specific body of water. Each watershed possesses distinct physiographic and other features, necessitating tailored approaches to natural resource conservation and management. The Balh watershed, situated in the Mandi district of Himachal Pradesh, is a sub-watershed within the Suketi river basin. It stands out due to its abundance of freshwater sources, forests, and agricultural activities. These characteristics facilitate the implementation of conservation and management initiatives within any given watershed. Therefore, this study examines various aspects such as land use, land cover, water sources, and agriculture to better understand and analyse the Balh watershed.

Keywords: Land use, land cover, water resources, agriculture, balh watershed, landholdings.

Introduction

In spite of having more than 400 small and large rivers India faces shortage of water for drinking and irrigation purpose. A small amount (20 percent) of available fresh water sources in India were also harnessed till 2010 (Brown, 2013). The most pressing problem of present time being faced by humanity is not the fear of outbreak of war, epidemic or the collapse of civil administration but the daunting problem of short supply of drinking water (Arora, 2007). Environmental degradation refers to the process of deterioration or depletion of the natural environment, including various ecosystems, natural resources, and ecological processes. It involves the negative impact of human activities, such as pollution, deforestation, habitat destruction, overexploitation of resources, climate change, and other forms of environmental stressors. Forests play vital role in atmospheric water cycle by maintaining balance between surface and groundwater. However increased population, industrialization, urbanization etc. has led to increased rate of deforestation. This increased rate of deforestation has led to reduced access to clean water, higher rainfall variability, soil erosion, etc. (Cannon, 2019).. Rainfall uncertainty also impacts water resources as lack of rainfall leads to decline in groundwater

* Dr. Ajay Kumar is Guest Faculty, Department of Geography, Panjab University Chandigarh.
** Dr. Navneet Kaur is Associate Professor, Department of Geography, Panjab University, Chandigarh.
*** Dr. Manu Raj Sharma is Assistant Professor, University Department of Geography, L.N Mithila University, Darbhanga.

recharge, shrinking surface water flows and high intensity rainfall leads to floods, soil erosion and contamination of water sources. The changing availability of fresh water resources is likely to be one of the most important consequences of 21st century for both human and natural systems (Kingston, 2010). The prevailing dry conditions in Himachal Pradesh are threatening perennial water sources as it affects around 700 water supply schemes out of which 32 are in district Mandi, which might dry up completely in near future (Bisht, 2021). The Himalayan basin experiences flooding in few months especially monsoons and water scarcity in others (Goyal, 2014). It results in soil deterioration, which in turn reduces productivity and consequently increases poverty. Conversely, ecological sustainability promotes productivity and ensures a secure means of livelihood. With India's population surpassing 100 million people and a projected food demand of over 252 million tonnes by 2025, the country's dependence on agriculture will further intensify. This poses a significant challenge to India's limited land and water resources. Therefore, to meet the growing food demand, it becomes crucial to implement a suitable strategy for watershed development.

In Himachal Pradesh, the majority of the population relies on natural resources for their livelihood. Around 80 percent of household consumption is derived from biomass, which includes essential items such as food, fodder, fuel, and fibre. While there has been an increase in the productivity of food grain crops, the cultivation of pulses has experienced a sharp decline in both area and production. Lower Himalayan Mountain ranges composed of steep slopes, high seismicity, deleted forest cover, large scale road construction, mining, cultivation on steep slopes, erratic monsoon pattern of rainfall, low water retention and high soil loss due to runoff which intensified the impacts of erosion (Jain, 2003).Kanwar (2018) investigated Himachal Pradesh's indigenous water conservation system. The locals had evolved several indigenous techniques/structures in order to appropriately use both ground water and precipitation. It has been observed that farmers in various parts of the state are now inclined towards diversifying their crops. In the Mandi district, farmers are cultivating more than two crops per year, including valuable vegetable crops. The reduction in vegetative cover is particularly concerning due to increased human interference, leading to significant runoff and soil erosion.

The groundwater table in several valley areas of the state has significantly deteriorated due to excessive exploitation and inadequate recharge. The condition of traditional water sources especially in hilly areas is poor as compared to valley areas whereas quality of water is poor in valley areas as compare to hilly areas (Kumar and Kaur, 2020). The main reason of poor water quality is the excessive use of chemicals in agriculture activities. Heavy rainfall is causing seasonal streams to widen and deepen, leading to the destruction of agricultural land, forests, and grasslands. There is scarcity of water resources due to absence of constant natural sources in some parts of the Suketi river basin. On the other hand, some areas are prone to soil erosion during rainy season. Total soil loss estimations for watershed soils are to the tune of 10-15 t/ha/year (Bala and Singh, 2017). To address the challenge of feeding the continuously expanding global population, it is crucial to adopt watershed conservation and management

practices that utilize accessible natural resources effectively. Land use has more complicated aspect as it involves social sciences and management principles and is defined as the social and economic purposes and contexts for and within which lands are managed (Ellis, 2007). Human activities have made small to large scale changes on the hydrology and current scenario of water extraction from surface and groundwater sources which has resulted into water crisis (Mishra et al., 2017). Rana et al. (2014) investigated the influence of shifting climatic conditions on the mountainous state of Himachal Pradesh. The water balance was found to be decreasing in all the agro-climatic zones in this study. Compared to an agro- climate zone located at a higher altitude, the water balance at lower altitude exhibited lesser decreasing trends. The present study aims to incorporate an analysis of land use, land cover, agricultural characteristics, and water resource availability in the Balh watershed of the Mandi district. Additionally, recommendations for implementing proper conservation and management practices in this area have been proposed to ensure its sustainable development.

Study Area

The present study was conducted in the Balh watershed of Himachal Pradesh, which is a part of the Suketi river basin. This watershed is situated in the Balh block of the Mandi district and comprises 13 panchayats: Bairi, Balt Chahri, Galma, Kothi, Malthehr, Netned, Panyali, Riur, Sidhyani, Samlon, Sayora, and Troh. It spans an approximate area of 54.59 square kilometres and is located between 76°48'40"E to 76°54'20" E longitudes and 31°33'40"N to 31°40'20"N latitudes. According to Census 2011, the total population in this watershed is 32,886, residing in 9,150 households with an average household size of 3.5 persons. Agriculture and animal husbandry serve as the primary occupations in this area; however, there is a lack of irrigation facilities available.

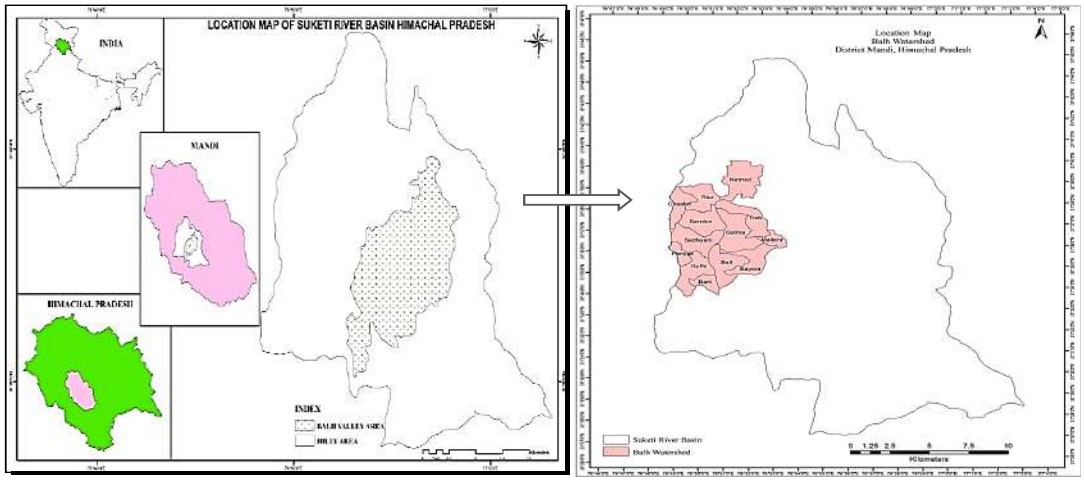


Figure 1 : Location of Balh Watershed

Source : *District Census Handbook, Mandi, 2011.*

Objective of the Study

To investigate the land use, land cover, agricultural practices, and the condition of water sources in the Balh watershed.

Data Sources and Research Methodology

The present research encompasses both primary and secondary data. Primary data related to agriculture and irrigation was collected directly from reputable panchayat secretaries, and fieldwork was conducted to assess the different water sources within the watershed. Land use and land cover analysis were performed using satellite images (secondary data) obtained from the United States Geological Survey's (USGS) Earth Explorer for the year 2018. Images were classified using supervised or unsupervised image classification techniques. Maps were generated using Arc GIS software, while charts and graphs were prepared using MS Excel.

Results and Discussion

The following section discusses different aspects pertaining to land use, land cover, agriculture, and water resources.

Land use land cover characteristics of Balh watershed

Land use and land cover investigations play a crucial role in identifying the diverse purposes for which land is utilized within a specific region. By conducting an analysis of land use and land cover, one can gain a comprehensive understanding of waterbodies, forests, agricultural areas, settlement patterns, and other characteristics present in the area. This information facilitates the implementation of suitable measures for achieving sustainable development in the region, guided by the findings of the land use and land cover studies.

Table 1 : Balh Watershed : Land Use Land Cover Classification

Sr. No.	Classification of Land Use	Area (In Hectares)	Area (In Percentage)
1.	Forest Land	2909.25	**53.23**
2.	Agricultural Land	1737.18	**31.90**
3.	Built Up Area	88.2	**01.61**
4.	Other Area	723.96	**13.26**
5.	**Total Area**	**5458.59**	**100**

Source: *United States Geological Survey (USGS) Earth Explorer, 2018.*

Using satellite imagery from 2018, the current investigation examined the land use and land cover within the Balh watershed. The findings indicate that forested land encompasses over 50% of the total area, while agricultural land accounts for more than 30%. Open areas constitute approximately 13% of the watershed, and built-up areas occupy less than 2% (refer to Table 1 and Figure 2). Analysing the forest cover at the panchayat level reveals that two panchayats have forests covering less than 50% of their land, seven panchayats have forests covering 50 to 55% of their land area, and four panchayats possess forests on more than 55% of their land area. (refer to Table 02).

Table : 2 Balh Watershed : Panchayat Wise Land Use Land Cover Classification (Area in Percentage)

Panchayats	Forest Area	Agricultural Land	Built up Area	Other Area
Bairi	59.91	25.75	1.46	12.88
Balt	54.39	31.34	1.19	13.09
Chahri	50.76	32.62	1.22	15.40
Galma	58.19	29.17	1.02	11.62
Kothi	50.64	33.03	2.81	13.52
Malthehr	48.66	44.96	4.25	2.13
Netned	56.44	26.22	1.04	16.30
Panyali	54.93	27.07	1.40	16.59
Riur	58.26	27.33	2.40	12.02
Sadhyani	52.72	31.91	0.82	14.56
Samlon	40.67	38.92	1.34	19.07
Sayora	52.49	41.16	3.05	3.31
Troh	53.30	31.82	1.62	13.26

Source : *District Census Handbook, 2011*

The distribution of forests is primarily concentrated in the upper and mid hills, while grasses dominate the lower hill and valley regions. The vegetation composition varies significantly across these different hill levels. In the upper hills, the prevalent species include Pinus, Quercus, wild apricot, and various shrubs. The mid-hills are characterized by Celtris australis, Prunus cerasoides, Sapindusmukorossi, and Ficus. As for the lower hills, Ficus, Celtis australis, Grewia optiva, Bauhinia variegate, Toona ciliate, Bombax ceiba, and other similar species dominate the area. Additionally, the Balh watershed is also home to various grasses such as Dactylis, Glomerate, Sarloo, Bainju, Imperatacylinderica, Kumroo, Hetropogoncontortus, among others.

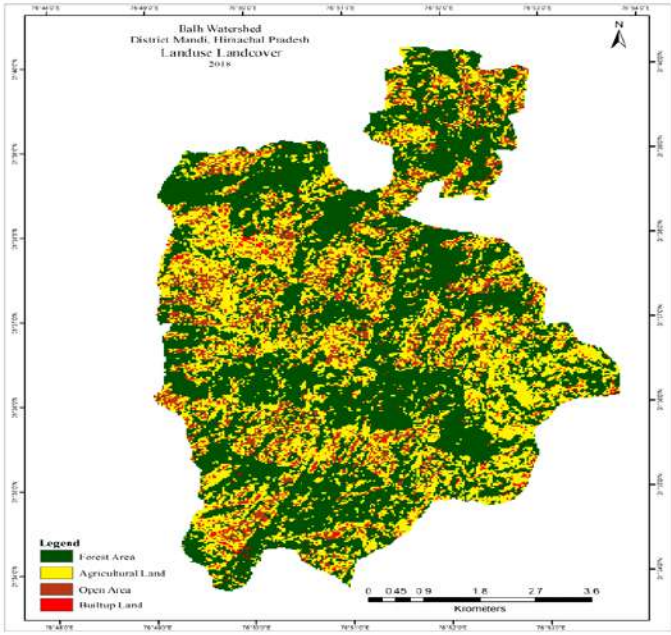


Figure 2 : Balh Watershed : Land Use Land Cover

Source: *USGS Earth Explorer and District Census Handbook, 2011.*

The examination of land use and land cover further reveals that, following forest cover, agricultural land occupies the largest portion of the watershed. Approximately 32 percent (equivalent to 1737.18 hectares) of the land within the watershed is dedicated to agricultural activities. In addition to agricultural and forested areas, significant expanses of open spaces are also present, accounting for around 13 percent of the watershed's total area.

These open spaces encompass barren land, wasteland, and other unused areas. Utilizing these spaces for horticulture, fodder cultivation, and the planting of trees with medicinal properties could be a viable option.

Upon analysing the panchayats individually, it is evident that two panchayats have less than 10 percent of their land occupied by open spaces, while seven panchayats have open spaces covering 10 to 15 percent of their area. Additionally, five panchayats have more than 15 percent of their land classified as open spaces. Aside from this, a small portion of the watershed is designated as built-up areas, encompassing roads, settlements, as well as various structures like hospitals, schools, panchayat offices, and marketplaces. Specifically, approximately 88.2 hectares (equivalent to 1.61 percent) of the Balh watershed falls within the built-up category. With the continuous growth of the population in the watershed, the built-up area is expected to expand, potentially leading to adverse effects on the agricultural and forested regions of the watershed. Consequently, it becomes crucial to effectively implement watershed development programs within the area.

Agricultural Characteristics of Balh Watershed

The majority of agricultural land in the watershed is concentrated in the low hills and flat areas. The main food grain crops cultivated in this region are wheat, maize, and paddy, alongside the cultivation of various pulses. Additionally, the watershed is known for the cultivation of vegetables such as peas, tomatoes, and cucurbitaceous crops. In addition to cereals, pulses, and vegetables, a variety of fruits including mango, emblica, citrus, pomegranate, plum, and papaya are also grown in the area.

The sowing of crops like maize, paddy, chari, and cucurbits takes place during the months of May, June, and July, with harvesting occurring in September and October. On the other hand, crops like wheat, barley, mustard, chickpea, berseem, and peas are sown in October, November, and December, and harvested in April and May. The watershed primarily practices an agriculture pastoral farming system.

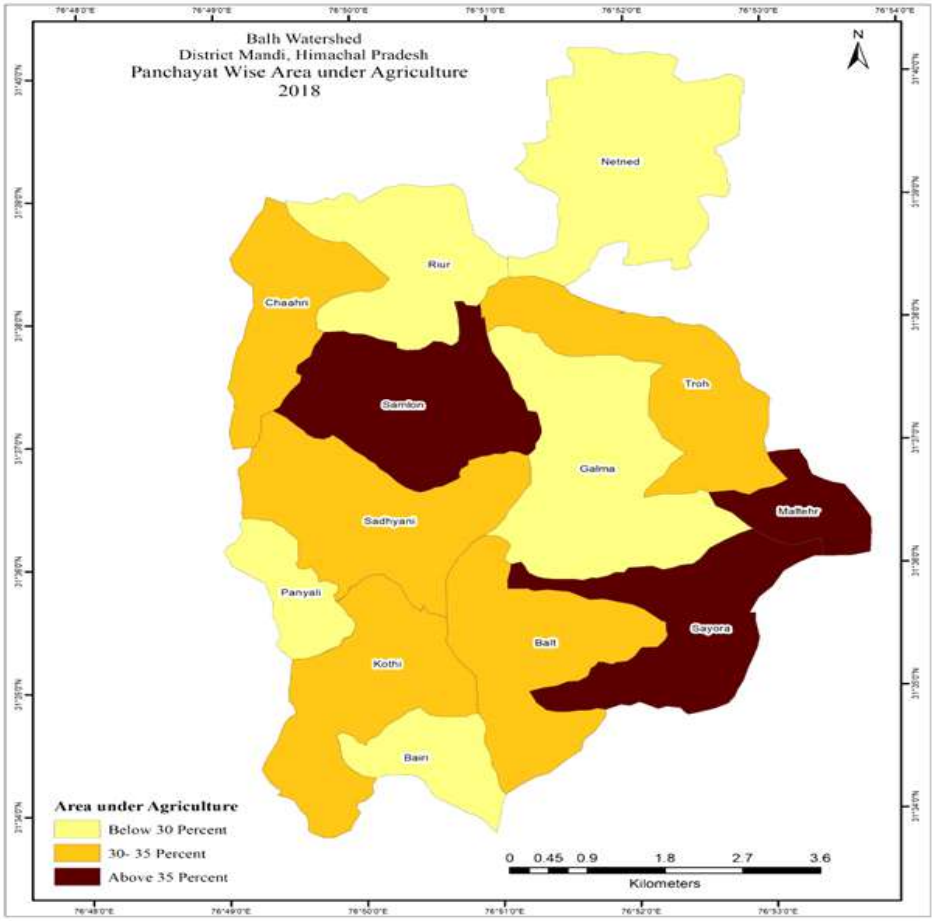


Figure 3 : Balh Watershed : Panchayat Wise Area under Agriculture

Source: *District Census Handbook, 2011*

From the analysis it is evident that three panchayats have agricultural areas encompassing more than 35 percent of their total area (Figure 3). Additionally, five panchayats have agricultural areas ranging from 30 to 35 percent, while the remaining five panchayats have less than 30 percent agricultural land. The hilly, mountainous, and rugged topography of the region has resulted in the uneven distribution of agricultural land, characterized by small and fragmented landholdings.

Based on data obtained from various panchayat secretaries within the watershed, it has been found that over 80 percent of households possess marginal landholdings, which are below 1 hectare in size. Around 14 percent of households have small landholdings, ranging from 1 to 2 hectares, while 4 percent of households have medium-sized landholdings, measuring between 2 and 4 hectares. A minority of households possess larger landholdings (Figure 4).

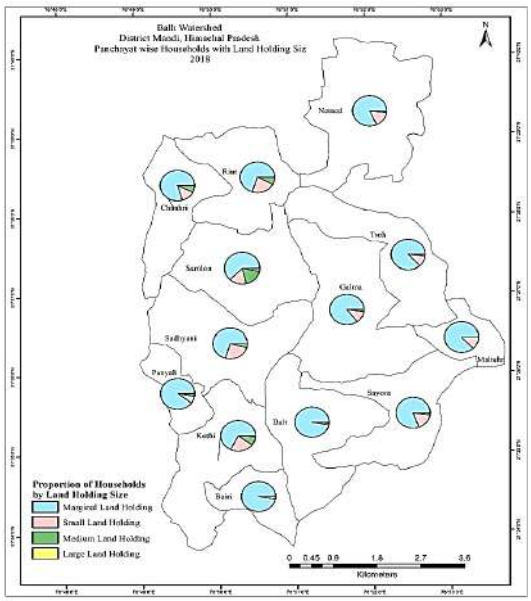


Figure 4 : Panchayat Wise Landholding Size

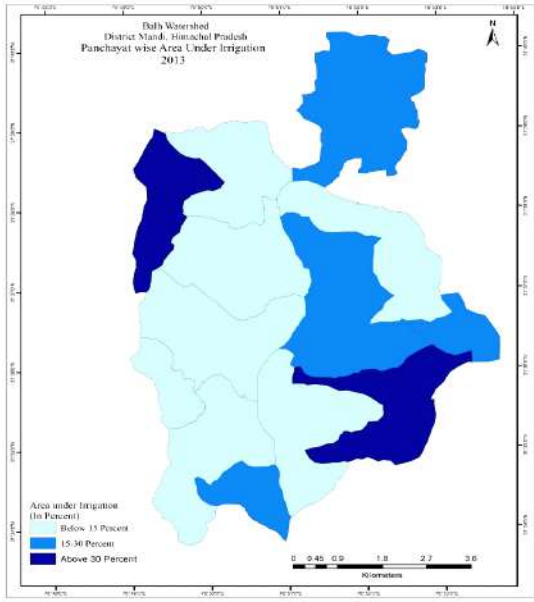


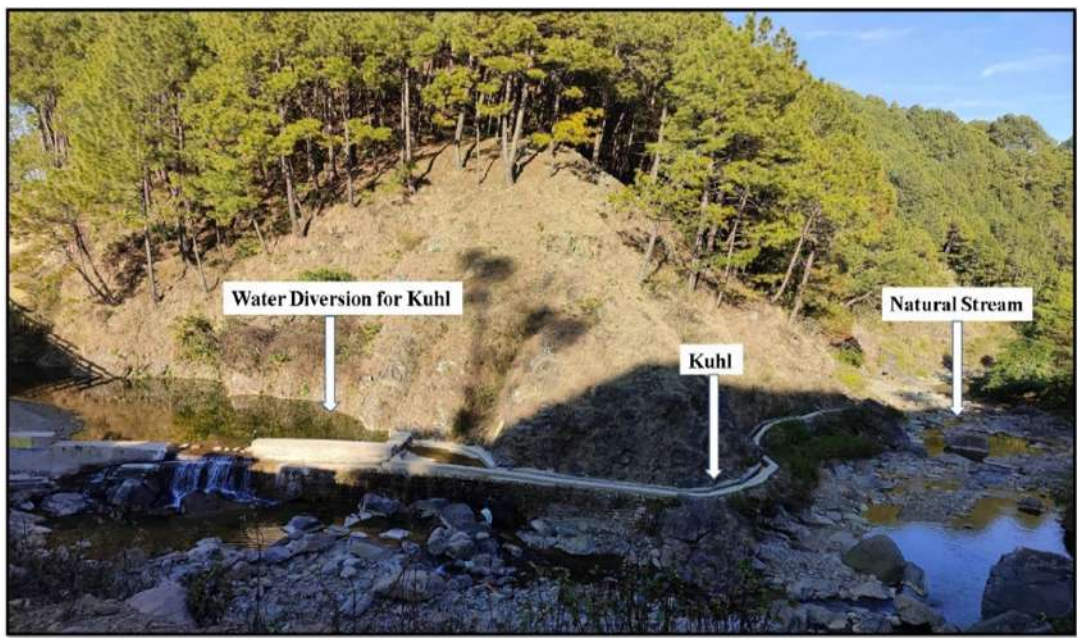
Figure 5 : Panchayat Wise Area under Irrigation

Source: *District Census Handbook, 2011.*

The study clearly indicates that there is a lack of sufficient irrigation facilities within the watershed. It has been observed that approximately 17 percent of the agricultural area is covered by irrigation, while the remaining approximately 83 percent relies solely on rainfall for cultivation (rainfed). Further analysis reveals that out of the total number of panchayats, only two panchayats have more than 30 percent of their agricultural land benefiting from irrigation facilities. Additionally, four panchayats have irrigation coverage ranging from 15 to 30 percent of their agricultural area, whereas the remaining seven panchayats have irrigation facilities on less than 15 percent of their agricultural land. (Figure 5)

The primary irrigation sources in the watershed consist of kuhls and tanks. Kuhls are small channels constructed along main rivulets or streams, diverting a portion of the water to flow through these channels and irrigate the fields (Plate 1). In areas where construction of kuhls is challenging, irrigation is carried out using tanks. These tanks serve as storage reservoirs for rainwater or tap water, which is then utilized for irrigation purposes. However, it is evident that these existing irrigation facilities are insufficient to meet the overall water requirements of the region. Therefore, it becomes necessary to introduce area-specific irrigation schemes tailored to the needs of the watershed.

Plate 1 : View of a Kuhl in Balh Watershed



Source: *Field Work, 2019.*

Characteristics of water sources in Balh watershed

There is abundant availability of water sources in the basin which includes streams, khads, baories, ponds and tanks (Plate 2-5). Additionally, several drinking water supply schemes are operational in the area. Fieldwork indicates a total of 288 water sources within the watershed, consisting of 29 small streams, 10 khads, 96 baories, and 153 tanks and ponds. However, these sources are not evenly distributed across all panchayats. Among the 288 sources, Riur panchayat accounts for 49, Kothi has 41, Bairi has 29, Sayora has 26, Chahri has 24, Sidhyani has 22, and the remaining 97 are distributed across the other seven panchayats (see Table 3). While these water sources currently meet the water requirements of the watershed, their discharge decreases during the summer months, leading to water scarcity issues that occur annually.

Table 3 : Balh Watershed : Distribution of Water Sources

Sr. No.	Panchayats	Streams	Khad	Baories	Pond/Tank	Total
1	Bairi	3	1	9	16	**29**
2	Balt	3	1	5	6	**15**
3	Chahri	2	0	8	14	**24**
4	Galma	4	1	10	5	**20**
5	Kothi	2	1	4	34	**41**
6	Malthehar	3	1	4	0	**08**
7	Netned	1	1	7	2	**11**
8	Panyali	2	0	3	3	**08**
9	Riur	2	0	10	37	**49**
10	Sadhyani	1	1	8	12	**22**
11	Samlon	2	1	7	10	**20**
12	Sayora	2	1	12	11	**26**
13	Troh	2	1	9	3	**15**
	Total	**29**	**10**	**96**	**153**	**288**

Source: *Field Work, 2019.*

View of a Khad View of a Stream

Plate : 2 **Plate : 3**

Source: *Field Work, 2019.*

Plate : 4 **Plate : 5**

View of a Baori **View of a Tank**

Source: *Field Work, 2019.*

In addition to the above sources, numerous government water supply schemes are operational within the watershed. However, these supply schemes face challenges during the summer season due to decreased water levels in the sources. As a result, people heavily rely on traditional sources such as baories (stepwells) and ditches to fulfil their water needs during this period. These traditional sources play a crucial role in meeting the water requirements of the watershed during summers.

However, these traditional water sources are gradually deteriorating due to environmental degradation and human negligence. It is imperative to safeguard these sources from destruction, and this can only be accomplished through the effective implementation of water conservation initiatives. Local communities, panchayats, and other governmental authorities must shoulder the responsibility collectively. Only then, the sustainability of water resources can be established and preserved for the benefit of all.

Conclusion

It is clear from the above discussion that forests and agricultural land encompass over 85 percent of the watershed area. However, this proportion is expected to diminish as the population grows and built-up activities increase. A considerable portion of the watershed remains unutilized for agriculture, settlements, or other purposes. It is therefore advisable to ensure sustainability by planting trees of horticultural value along with fodder in these areas. The study reveals that agricultural land within the watershed is not evenly distributed across all panchayats, resulting in low productivity of food grain crops compared to the national average. The size of landholdings is notably small, presenting an opportunity for seasonal and off-season vegetable farming for commercial purposes, especially considering the presence of nearby marketplaces such as Mandi and Nerchowk. Additionally, the basin holds potential for greenhouse and organic farming, which could help farmers increase their income. Given the mountainous and uneven terrain, the availability of irrigation facilities is limited in the area. However, it is feasible to construct small-scale irrigation schemes utilizing accessible water sources. To ensure sustainability, it is essential to renovate traditional water sources and implement watershed initiatives such as drought-proofing, flood control and protection, and water conservation techniques within the watershed. By undertaking these measures, the overall goal of achieving sustainability can be realized.

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ASSESSMENT OF THE FLOOD VULNERABILITY OF PATNA CITY REFERENCE TO FLOOD 2019

Deepak Kumar Dipankar*
Email: dipankardeepak@gmail.com

Anuranjan**
Email: anuranjanjha1969@gmail.com

ABSTRACT

Phenomena of urban flood now a days it is a big issues especially in India. August 2019, in Patna it was surprisingly almost half city flooded for one week. As we know, flood is considered as natural disaster in this world, which is devastated both economy and life extensively. Therefore need to revisit the cities of India and redeveloped before we must go through the vulnerability assessment of the city. Present research paper has focused on to know socio economic vulnerability of Patna; the data has been taken of recent (2019) flood, occurred in Patna. The methodology is quite familiar; flood vulnerability index has been used. Secondary sources and field observation and focus group discussion method has fulfilled the requirements of research.

Keywords: Urban, Flood, Vulnerability, Disaster, Patna.

Introduction

Assessment of vulnerability of any geographical area is prime concern of sensitivity towards the place or space, where human beings are living and make a habitat for future generation as well. Flood vulnerability assessment is a vital tool for flood mitigation (Nasiri, Yusof, & Ali, 2016).

Also, it's a collective action of knowing disaster – risk (social, economic and spatial) and management of it. Rose and Killjen in his work he described and examined the vulnerability in 1983. The term vulnerability has been used in several disciplines. After 1990s, it was accepted and broadened with various subject like sociologic work, physical and psychological as well as several geocentric subject. It means it is a very important aspect to study and examine with reference to space or geography. Vulnerability of individual and community has required knowing the meaning of vulnerability and complex relationship between vulnerability and individual or community based (Social factors). It shows the fragile status of any geographic area or region and indicates the position of exposure, resistance and resilience of spaces.

When we talk about the meaning of vulnerable it can be correlated with disaster, which is preassumed disasterscape (Kapur, 2010). Assessment of vulnerability may be based on

* Deepak Kumar Dipankar is Research Scholar, Department of Geography, L. N. Mithila University, Darbhanga
** Dr. Anuranjan is Associate Professor, Department of Geography, L. N. Mithila University, Darbhanga

memories of loss, destruction and socio-economic harm. Various phenomena have been evaluated and documented by human, in parallel nature continuously act and react. Therefore various kind of vulnerability has been identified and defined like physical vulnerability, social vulnerability and cultural vulnerability as well. Justification and assessment of loss or destruction is only for future and betterment for society. Knowing the nature of earth and co-existence of human being is a prime subject of scientist who has been work on regular bases and documented the event of disasters (flood, cyclone, drought, earthquake etc.). But sometime, it is a matter of concern when these events of disaster are politicized by the national or international players or stockholders like politicians, businessman and scientists.

Now a days, a very common tendency has occurred that encroachment of disastrous spaces for commercial as well as residential purposes is done like making buildings, living spaces and working spaces, are commonly transformed into the land of flood prone or hazardous spaces. These things has been continuing thus because of unplanned urban growth and rapid migration of people toward city. In India, many cities have developed in unplanned and unjustified ways. Rural- Urban Fringe gradually transform into edged city then it comes into main part of the city. As a result urban communities are silently entered into high–risk conditions, being exposed to hazardous events like collapse of buildings, uncontrolled fire, earth quakes, flood due to heavy rain etc. Such phenomena damage properties/lives and livelihood; it makes uncertainty and vulnerable urban dwellers as result settlement are not considered as sustainable. Increasing spatial dimension of urban land and its uses not only treats space, it makes disaster scape (Kapur, 2010) of the city. Urban Flood is a major issue that arises every year in cities like Mumbai, Chennai, Patna is facing flooding issue, as it is very ancient city and has colonial impact on the infrastructural development. Migration process is very high and unplanned settlements also actively co-existed. Slums, unauthorized colony and unblamed fringe area are the most vulnerable spaces because here economic weaker section live and they don't have capacity to resilient disaster losses. These settlements are referred as the disaster scape (Kapur, 2010), a place where human life is being damaged, relationships ripped and source of livelihood disrupted. As we know, historically Patna is one of oldest city center of India, and development of urban area is quite different to the other ancient cities of India. Patna City has natural highland and has liner pattern of settlement on these high land area, situated near river Ganga, Sone and Punpun. But after 1990s, rate of migration has increased and expansion has been occurred towards the low land of area (South East and South West). After independence, Patna has become a prime city of Bihar as it is also the capital of state of Bihar. Natural canals and drainages have been encroached and public spaces are quite unplanned. After establishment of Patna Municipal Corporation, only 10 percent of Patna is planned. "Thus the city passed through many vicissitudes but has shown a remarkable capacity for survival and regrowth (Dayal, 1968) as result the urban influence can be notified with the change in stream channel of river as well as drainage system. The high rate of immigration in

the city especially unplanned area is very common. Recently in the year 2019, Patna city had faced worst situation when almost 70 to 80 percent land was flooded and majority are residential area where migrated population lived. A huge difference was found between 30th September 2019 to 1st October 2019, when Kankarbagh, Rajendra Nagar, Anishabagh and western part of Patna Urban region became a flooded zone. That time area become highly vulnerable and life came to a stand still. Therefore it is a primary concern to identify the reason behind and manage the issues like flood and other disasters.

Prediction about flood or natural hazard is may be based on probabilities, historical data of events and area that is concern for human settlement. Many scientists has been using model for describing flood which is frequency analysis and hydrological modeling, its helps to forecasts flood hazard conceptually and practically. But sometime it is very difficult to know the reality of occurrence of flood even if historical data available due to human error or unscientific planning of infrastructure of the city. Before planning, the city need to evaluate slope, contour map, physiography and demographic characteristics which is most influential element in the city. In case of Patna City, we rarely found any clue about occurrence of flood because it has been happened after very longtime. But it is a necessity to rethink about the structural development of urban morphology of Patna, keeping in mind the disasterscape and vulnerability of Patna. The present research paper attempts to know the spatio-temporal assessment of vulnerable spaces in Patna City, so that we know the pshychogeography of the city.

Concepts

Flood - According to the Oxford English Dictionary "flood is, an overflowing or irruption of a great body of water over land in a built up area not usually sub merged". Flood become an issues just because interruption of stream or runoff of water. Flooding problem is mainly resulting from runoff water, where increase an areas more urbanized or unplanned settlement.

Urban Flood - Urban flood has directly connection between urban governance and management of drainages within an urban, as well as surrounding area. Flood are affecting and distressing more urban area, where unplanned development, it is happen because of aging drainage infrastructure, increased paving and other impermeable surfaces.

Disaster - Generally disaster events is associated with damages of human, it is identified as terrible situation or event. The World Health Organization (WHO) defines a disaster as "a sudden ecological phenomenon of sufficient magnitude to require external assistance". According to the NIDM (National Institute of Disaster Management) "*A Disaster is an event or series of events, which gives rise to casualties and damage or loss of properties, infrastructure, environment, essential services or means of livelihood on such a scale which is beyond the normal capacity of the affected community to cope with*." Management of Disaster - Management of disaster has simple meaning; it is strategies based commitment to manage the damages.

Vulnerability - According to the IPCC (Intergovernmental Panel on Climate Change) vulnerability is the position in which 'the propensity or predisposition to be adversely affected (2022)'. UN Office Disaster Risk Reduction has defined vulnerability as the conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards (UNISDR, 2009)

Review of Literature

Selection of literature for the review has been selected according to the nature of research and requirement for justification.

Sharma, Khushbu (2017) has written an article on "the river Response to Urbanisation : A Study of Patna Regional Development Area" and evaluate the urbanization and growth of settlement near rivers (Ganga, Gandak and Sone). Study use LU/LC map and analyze overall river changes in Patna and surroundings (Sonepur and Hajipur town).

Sharma V. K. and Priya T. (2001) has tried to know the strategies of development for flood prone areas or flood plain in Patna. Research found, Patna City had own natural drainage system which has been disturbed or damage after development of new colonies. He used mathematical technique to know nature of land and flowage of water in the city. Runoff events, time of flow, discharge etc has been calculated and find out the role in development of Patna.

Watson, D. and Adams, M. (2011) has written a book on design for flooding, the book follows and evolving approach to architecture in USA. The book has describe the causes and consequences of flood and design the pattern of flooding

Ahern (2013) has described urban system and suggested that urban designer, urban dwellers, and governance, have must understand the science of urban functionality and urban ecosystem. Through this he suggested working methods for 'learn- by- doing" or adoptive design.

Bankoff (2006) has focused on community level events and suggested that local community has a knowledge that is spatially varied but culturally they are capable to handle it. He tried to mapping vulnerability that is based on local calamities.

Bora, J.(1993), in his thesis, he described the development of city functionality and expansion of urbanized spaces in a flood prone area of Guwahati, also he tried to see the drainage system of flood prone area within the city.

Schwarz, I., and Kuleshov, Y. (2022) has written an article based on flood and assessment of flood Vulnerability. He used remote sensing data and mapped with the help of spatial mapping tools QGIS. Through the article he tried to asses Flood Vulnerability (FV) and Risk in south eastern part of Australia (Hawkesbury – Nepean catchment region). In this assessment , four indicators were chosen which is representing environmental and socioeconomic characteristics i) elevation ii) degree of slope iii) hydrologic soil groups(HSGs) and iv) index

of relative socio-economic disadvantage (IRSD). Based on these four indicators researches tried to collect spatial information and mapped Hawkesbury – Nepean catchment region.

Deepak,S., Rajan, G. and Jairaj, P.G. (2020) has written article about Vulnerability to flood and asses the condition of socio-economic and physio-environemental vulnerability , also tried to give visual input with help of Geospatial approach. Researchers used clear methodology and secondary data from census and geo stationary.

Rashiq, A. and Prakash, O. (2023) wrote contemporary situation of Patna flood 2019, which was very heavy and disastrous rainfall, 48 hours rainfall, flooded almost every side of city Patna. After flood loss of property, damage structure and waterborne diseases was very common. Through this article he suggested to governance, need to deep study on disaster preparedness and mitigations etc.

Study Area

The study area of the research is the capital of Bihar; Patna has around 108 to 109 sqr. Kilometers area and situated along with three important river, Son in the west, Ganga in north, and Punpun inthe south all of them, Ganga which is main sources of water for city Patna, has natural levees (the southern levee of the Ganga and High land of city Patna) where maximum governmental institutes established.

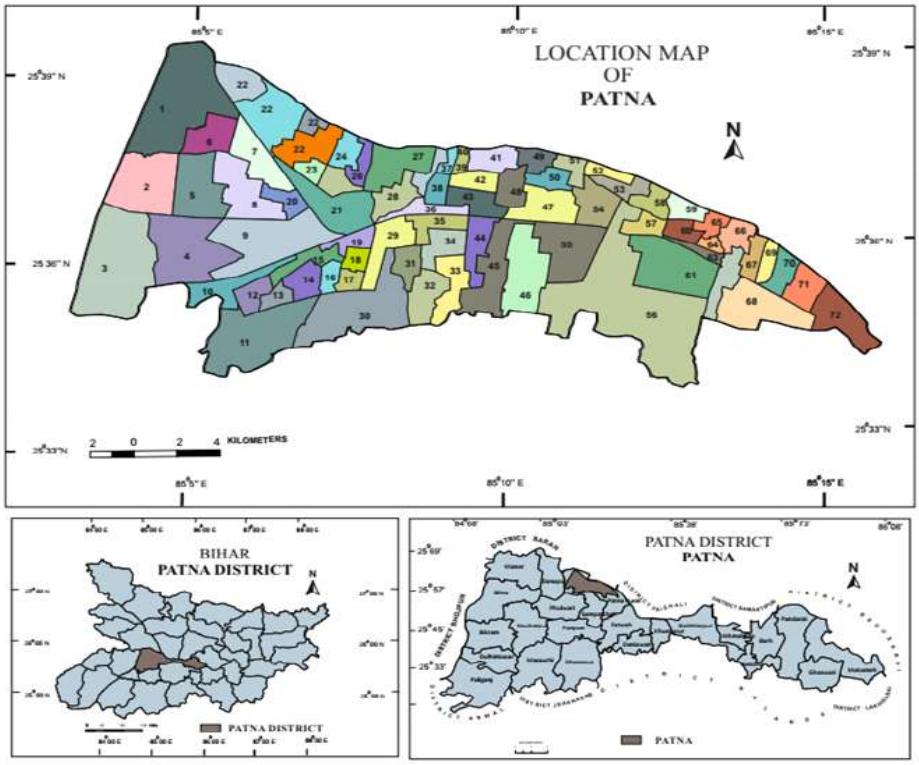

Figure 1 : Study Area, Patna

Central part of Patna City is administrative region again area is relatively high (near BPSC Campus, High Court and Rajiv Gandhi Botanical Garden). Rest of the area is residential cum commercial and highly dense. Geographical location of City Patna (see Figure 1) is ideal for Bihar, where most urbanized and a glocal (Global and Local Based) facilities available, has been suffered high rate of migration and has political importance. Therefore area needs better and micro scale research and details for betterment of the City Patna. Most of the area comes under the domain of PMC (Patna Municipal Corporation) and has 72 wards. As we know that Patna is the capital city of Bihar and has international connections thus the city Patna needs to have a good governance and sustainable city.

Objective

To assess the spatial and socio-economic flood vulnerability of Patna City, Bihar

Methods and Methodology

Methodology of the research is based on nature and requirement of the objective and subjects. Method of this research primarily focused on to get information about physical, social and economic losses of different wards of Patna. Selection and analysis of secondary data is based on authentication of information. For the assessment of Social and economic vulnerability during floods, selected FVI (Flood Vulnerability Index) with Social, Physical, Environmental and Economic Components has been taken into consideration. Survey, Questionnaire, Group Discussion and Interview, also field observations (Pre flood, during flood and post flood) are used in this research. Qualitative techniques has been used, its evolve the social and personal issues and through this techniques researcher tried to find qualitative aspect of flood and socio-physical phenomena. Through this research work, surface water and estimation of watering into city Patna has been estimated.

Results

Urban Flood is not a new concept but the rate of occurring urban flood is become high in last few years and as result a complex situation has been creating for urban dwellers and city planners and local governance. In India, where cities are the symbol of wealth and prosperity and people migrate here because they want better life and livable space. As we know that civilization has been occurred near to the river, thus water and water bodies are the helping hand of human being, now a days, it is quit painful due to heavy rain water and rapid flow of river water. It is one of the main causes of backwardness (Bihar) in wealth and other developmental activities. It is generally known statement that the effect of flood is quite similar for the whole citizen but the reality is not the same as we assumed because of economic and geographic dissimilarity, lower social position or status, restrictions of getting resources and socio cultural values in the certain groups, its create more susceptible to being harmed. In Patna, the month of July is very hot and its invited cloudy weather for rainfall, after July almost every part northern India getting rainwater. In case of Patna mostly rainfall occurred between July and September, as we know that Patna is safest place for flooding because of physical

settings. When we analyse the landscape of Patna, especially PMC, we found around 10 percent area where old Patna is situated, are known flood free zone where maximum height around 55 to 65 meters (from sea level).

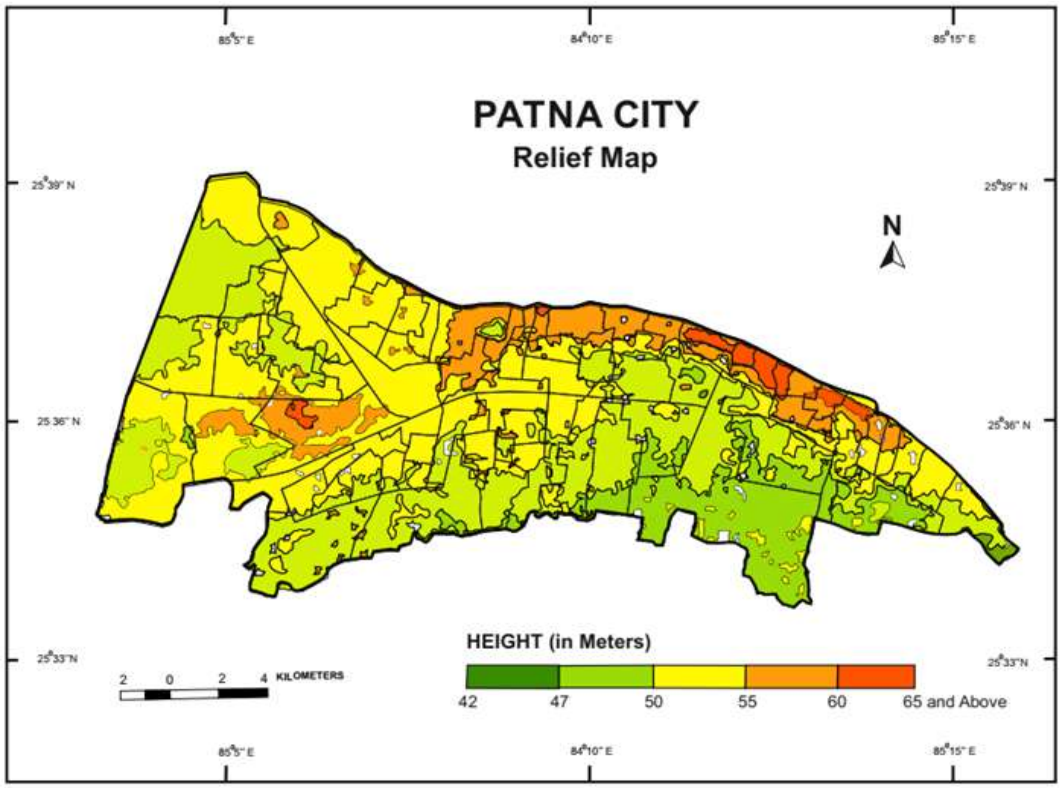

Figure 2 : Relief Map of Patna

Above map of PMC shows relief feature of Patna, more than 8 to 10 percent area comes in high land area (more than 55 meters - ward 27,39,37,38,52,53,58,59,65,66,40,9) where, many governmental institutions and government buildings has established. The north eastern part of the city is the oldest part of Patna. The middle or average relief (50 to 55 meters) of Patna wards (ward 1,2,5,3,4,8,22,23,24,25,26,38,35,21 of 62, 65,67 and some part of 70,71) are 45 percent it means maximum part of the Patna have less slope especially central part and western part of Patna. Low land of Patna situated in west and southern part of the city. Around 35 percent landscape is come under low land area (Ward- 6, 15,30,56,61,65,68,46 some part of 46 and 72). Rest around 10 percent area are very low land area (ward 72, 68, 56 and southern part of 46). Central Water Commission, estimated the water level of river for safest city around 48 to 50m. Above 50m, reporting under the dangerous or hazardous category for Patna. The relationship between landscape and settlement is quite interesting, high land area is more dense and unplanned where drainage system and other sources of services have been disturbed.

Spatial Distribution of Flood 2019 and Vulnerability

General definition of flood is associated with unusual waterlogged areas which is harm human settlement. In Patna, history of flooding is quite rare because frequency of water logging is not much. Only southern part of Patna has been watering almost every year (See Figure 3) due to low land area and water level of river Punpun and Sone. Southern and south east area generally flooded and area called Jhala (Ward 45, 56, 58 and 72). Many natural pond are existed and area is quite swamp. August 2019 to second week of October, Patna faced heavy rainfall and high level of river water. Before this month, Patna Municipal Corporation had worked for upcoming monsoonal rain, but nature of rainfall was unpredictable. Almost 35 percent of the PMC flooded and many areas (especially ward 63, 64, 67, 49, 50, 51) were totally blocked with water. Drainages were not work properly and water pump was down. Reverse water came from river towards the Patna via canals and drainage. Kankarbagh, Pahari, Gulzarbag, Patna city, Musroofganj, Sultanganj, Rajendra Nagar, Lohanipur, Mussullampur haat, Bazaar Samiti these areas had faced more stressful situation, water level was constant about a week.

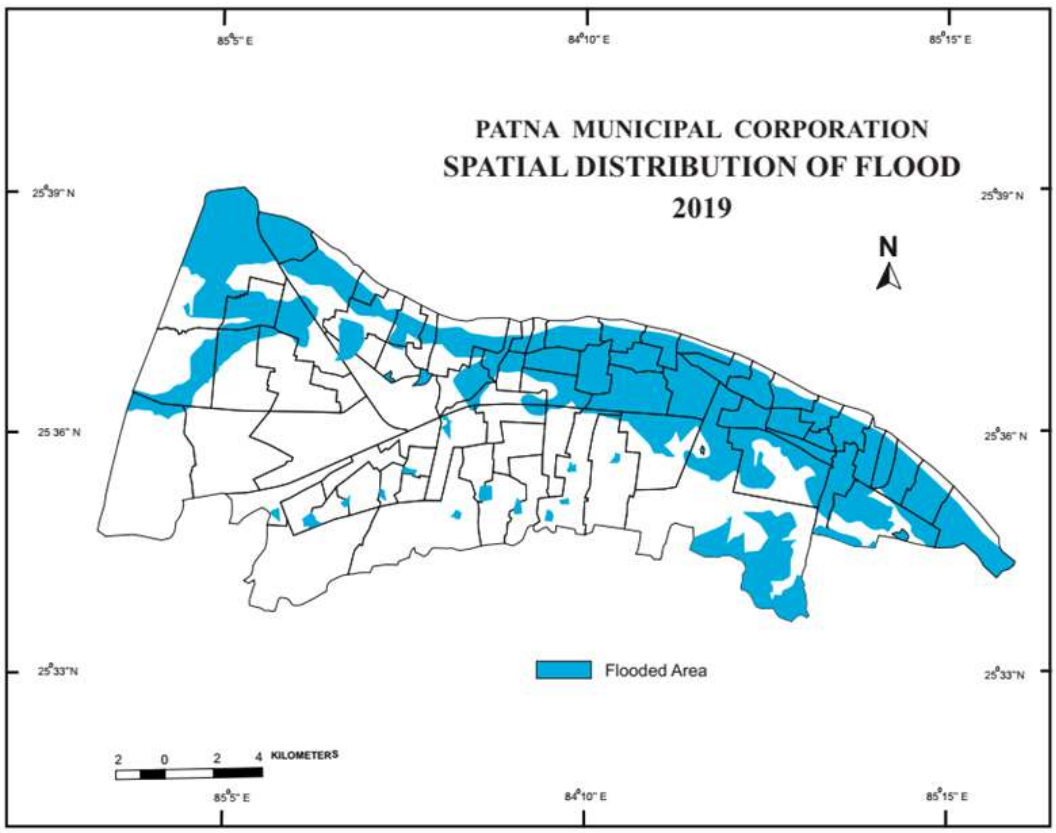

Figure 3 : Spatial Distribution of Flood, 2019

Above map shows the area which is northern part of Patna are flooded, when we trying to see the relational status between the slope or relief and flood 2019. These area are flood free area, frequency of occurring flood is very less, such type of phenomena repeated after 43 years (after 1985, such type of water logging occurred in Patna). As we know the waste water of Patna goes down southern shoreline of river Ganga, when level of Ganga river increases, Nala gates has been closed and the waste water is pumped out into the river. Many officers from PMC agreed that pump was not working properly as a result monsoonal rain water was not able to go out from city area.

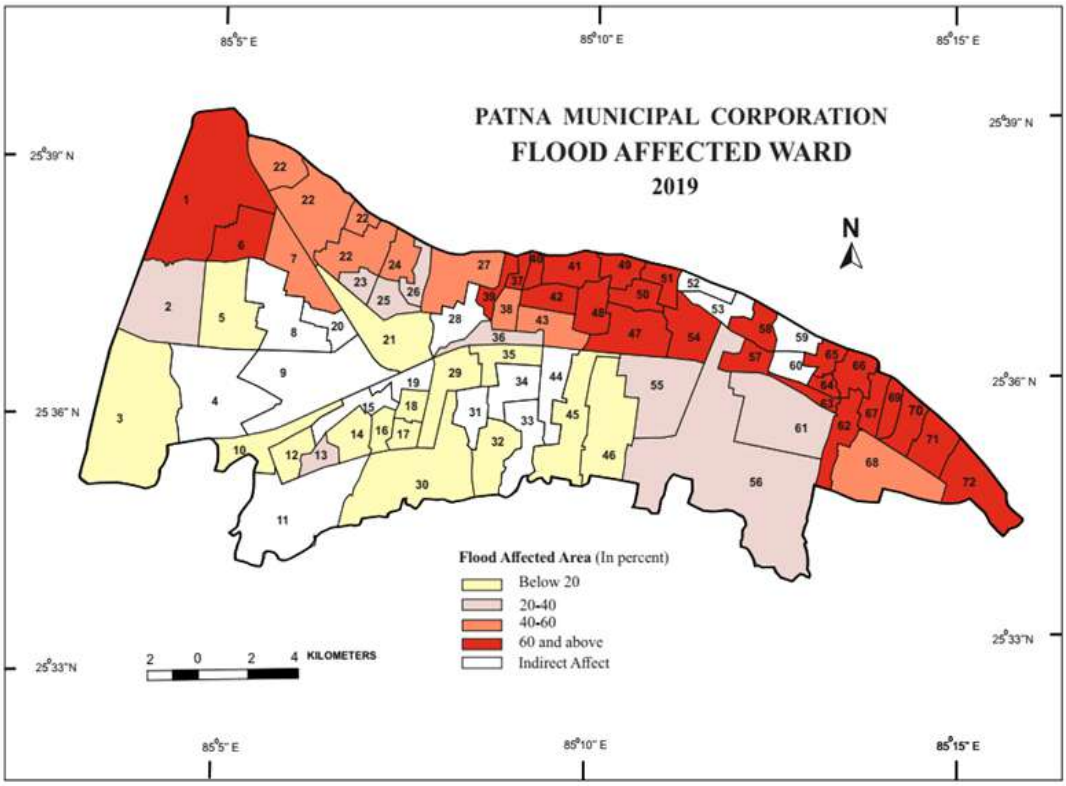

Figure 4 : Flood Affected Ward, 2019

When we see the flood occurrence, maximum flooded area was northern part of Patna, out of 72 wards, 8 wards was totally locked with water (almost one week- 1 September to 6 September, 2019), above 4 to 6 feet of surface area. Ground floor and parking area of many apartments logged with water. Ward 43 Rajendra Nagar had faced difficulties because of low land area, Khanjanchi Road, Arya Kumar Road and many residential cum commercial area had faced stressful environment. In the western part of PMC especially ward 1, 70 percent of wards was flooded; when we compare to the northern Patna these area was comidered quite safe and less stressful because of less density of settlement.

Vulnerable Patna 2019

Vulnerability can be defined according to the effectiveness and causal relationship between objects or agents and human being. Physical Vulnerability, Social and Cultural Vulnerability and Economic Vulnerability, these are the sub theme of vulnerability of any geographical area. In this research the researchers focused on the socio-economic vulnerability and calculate the effectiveness with the help of census data and spatial distribution of flood, information about flooded area collected form Bihar GIS based website iBhugoal, disaster and management section.

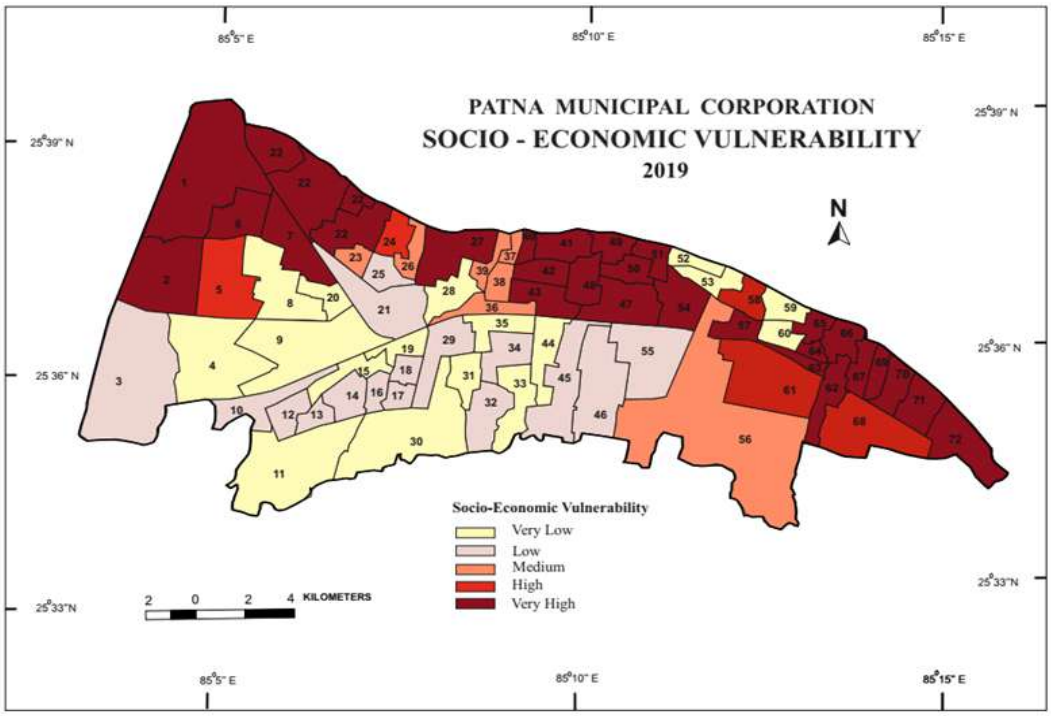

Figure 5 : Socio-Economic Vulnerability of Patna

The socio-economic status is most prominent measured characteristics for study of vulnerability of flood. It is determined by income or working population, access to resources and other economic assets for local community. In this study, assessment of floods of 2019 and its capacity to harm has been checked with affected households, affected women population and working population. These three basic attributes has been taken because during flood, old aged people, child and women (Old, Pregnant and Disable) are most suffered. In the month of august third week to second week of September 2019, the citizens of Patna faced hardest life as they were under the stress for food, medicines and incomes (especially daily wage workers, lower rank employee). Northern and middle Patna almost flooded, hospitals and transportation network were disturbed, shortage of electricity in many areas was very common in Patna.

Socio-economic vulnerability assessment clearly demarcated that flood affected equally almost 40 percent of Patna.

Conclusion

This research work has profiled the leading mechanism of vulnerability to flood. The findings or result highlighted the spatial and regional distribution of flood and tried to find out the reason behind the occurrence of 2019 flood of Patna. The research a finding can be treated as an alarm for upcoming disaster especially in urban areas of Bihar. Because Patna is a prime city of Bihar and source of prosperity, education and opportunity of Bihar`s people. Due to heavy load on Patna land use (migration and competitive development like smart city, techno city etc) as result natural topography has been disorganized and ignoring natural flow of water in developmental activities. Many buildings in Patna has established without plan or not able to cop up or not resilient. Displacements, gentrifications of urban dwellers are other big issues during the flood and after the flood many diseases arise, need to handle before.

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CHANGING TRENDS IN WATER AVAILABILITY AND USING IRRIGATION TECHNIQUES: A CASE STUDY OF MAHOBA DISTRICT UTTAR PRADESH

D.S. Yadav*
Email: devyadavgis@gmail.com

Krishna Kumar**
Email: dr.krishnakumar@ignou.ac.in

ABSTRACT

This research paper investigates the changing trend in water availability for irrigation in Mahoba District, Uttar Pradesh. The study addresses the objective of shifting water sources for irrigation and recommending suitable irrigation techniques for the region. Both primary and secondary data sources, including household surveys and data from government authorities, were used in the study to highlight the critical water-related challenges facing the region. It reveals a continuous decline in water availability, particularly in major dams and ponds, with a significant impact on agriculture. The analysis indicates that reliance on groundwater for irrigation has led to a substantial drop in the water table, exacerbating water scarcity issues. To address these challenges, the research suggests the adoption of suitable irrigation techniques such as sand dams, plastic buckets, drip irrigation, and rainwater harvesting, aiming to enhance agricultural productivity and water conservation. The study underscores the urgency of sustainable water management practices and community involvement in mitigating the water crisis and ensuring agricultural sustainability in Mahoba District.

Keywords: Water Scarcity, Groundwater, Irrigation, Agriculture, Water management, Community Involvement.

Introduction

Water is an indispensable resource for agriculture, and its availability plays a pivotal role in food security and the global economy. However, changing climatic patterns, population growth, and unsustainable water management practices have led to shifts in water availability, impacting agricultural productivity worldwide. In response to these challenges, new irrigation techniques are being developed and adopted to optimize water use efficiency everywhere but especially in water-scarce areas.

* Dr. D.S. Yadav is Assistant Professor, Department of Geography, C.R.S.University, Jind, Haryana, India.

** Dr. Krishna Kumar is Assistant Professor, Discipline of Geography (SOS), IGNOU, Delhi, India.

Water scarcity has emerged as a pressing global challenge, significantly impacting agriculture—a sector heavily reliant on abundant water resources. The dynamics of water availability have undergone transformational shifts in recent years due to various factors, including climate change and increased human demand for water resources.

Climate change remains a predominant driver of shifting water availability patterns throughout the world. The Intergovernmental Panel on Climate Change (IPCC) highlighted the repercussions of climate change, including altered precipitation patterns and heightened drought occurrences, which have drastically affected water resources for agriculture (IPCC, 2014). Furthermore, groundwater depletion poses a grave concern in numerous regions, where over-extraction for irrigation has led to dwindling water tables (Famiglietti et al., 2011). This overuse imperils the long-term viability of groundwater-dependent agricultural systems. In arid and semi-arid regions, such as California's Central Valley, water scarcity has become a harsh reality, necessitating immediate attention and innovative solutions (UNEP, 2018).

In response to these changing water availability dynamics, a range of innovative irrigation techniques has emerged as promising strategies for sustainable agriculture. Drip irrigation, for instance, has gained substantial popularity due to its water-saving attributes. This technique delivers water directly to the root zone of crops, minimizing wastage and maximizing efficiency (Hochmuth et al., 2018). Precision agriculture, another significant advancement, combines technology like GPS, sensors, and data analytics to optimize irrigation scheduling and minimize water use (Slafer et al., 2015). These cutting-edge methods not only address water scarcity issues but also contribute to enhancing agricultural productivity and reducing the environmental footprint of irrigation practices.

India has been also grappling with significant water challenges for years. The issue of water scarcity has become increasingly urgent, affecting millions of people. As of 2018, over 600 million Indians faced high to extreme water stress, according to the NITI Aayog's Composite Water Management Index (CWMI) report (NITI Aayog, 2018). Groundwater depletion has been a long-standing concern, with reports indicating that India was the largest user of groundwater globally as of 2010 (Shah et al., 2016). This over-extraction has resulted in declining water tables in many parts of the country. Furthermore, water pollution remains a pervasive issue. As of 2019, nearly 70% of India's surface water was reportedly polluted (Central Pollution Control Board, 2019).

Mahoba district in Uttar Pradesh has been grappling with severe water scarcity for years. The region primarily relies on groundwater for its water needs. However, over-extraction has led to a drastic decline in water levels. As of 2020, reports indicated that Mahoba was among the districts facing critical groundwater levels (Central Ground Water Board, 2020). This depletion has resulted in distress for farmers who depend on groundwater for irrigation, impacting agricultural productivity. Additionally, the region experiences erratic rainfall, exacerbating the water crisis.

To address these challenges, the government has implemented schemes like the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) to improve water-use efficiency in agriculture and the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) for water conservation projects (Office of the Chief Development Officer, Mahoba, 2019).

Naturally, there is less water available in the research area, but for a few years now, that availability has been declining continuously. This research paper tries to find out the changing trends of water availability for irrigation in the Mahoba district of Uttar Pradesh and for this purpose the paper has three objectives which are mentioned below:

- To analyse the changing trends of water availability in the research area.
- To assess the changing scenario of water sources for irrigation.
- To suggest the best modern irrigation techniques in the study region.

Research Methodology and Database

This study draws on both primary and secondary data. Primary data was collected by conducting a household survey at the village level. Respondents delivered a well-structured questionnaire to understand spatial and temporal changes in the scenario of water source availability for irrigation in the rural areas. Secondary data will be collected from a variety of sources including the executive engineer of dams and ponds; various websites, including the district census handbook; and town and village directories.

Selection of sample villages and households by simple random sampling to try to cover the whole area of the study region. The district is divided by the government on the basis of block divisions. For the analysis of the data tabulation method, different types of statistics will be used, like average, percentage, etc. and cartographic tools like maps, tables, diagrams, etc. will be used to represent the data.

Study Area

The study area (Mahoba district) extends from 25°01'30" to 25°39'40" North latitude and from 79°15'00" to 80°10'30" East longitude. It covers 3144 square kilometers, with an average elevation of 214 meters (702 feet). According to the 2011 Census, 8, 75,958 people live there. The area under study is located in the south-western part of the state of Uttar Pradesh. To its north is Hamirpur district, Madhya Pradesh. To its south are the districts of Banda and Jhansi, in the east and west respectively. The district is administratively divided into three tehsils: Mahoba, Charkhari, and Kulpahar. Four development blocks are also part of this district: Kabrai, Charkhari, Jaitpur, and Panwari. The study area covers a total area of 3116.1 square kilometers and the urban area covers 27.9 square kilometers. There are 247gram panchayats and 521 revenue villages in all, which include 435 inhabited villages and 86 uninhabited villages.

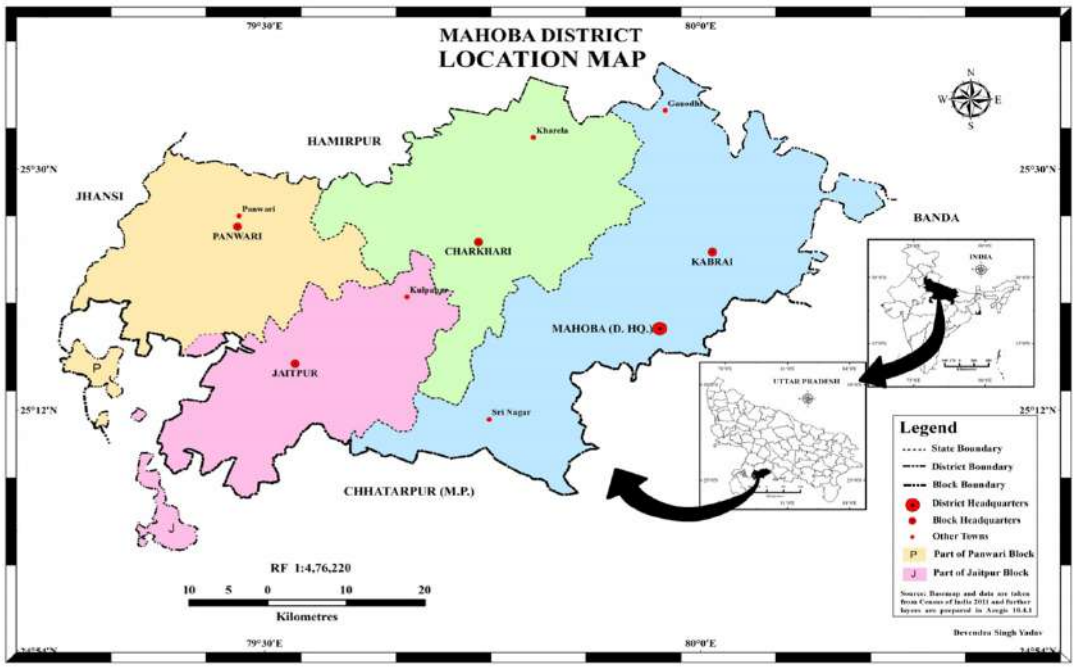

Figure 1 : Study Area

Source: *Census of India, 2011*

The topography of the Mahoba district is the hard rock surface. Because of this, the rainwater percolation process is very slow and not getting enough groundwater recharge. With an elevation of 500 feet above mean sea level, Aznar Hill is the highest peak in the study area. It is located in Jaitpur block. The forest cover in this area is 162 square kilometers, and seven rivers flow through it: Dhasan, Urmil, Chandrawali, Verma River, Arjun River, Sih River, and Shyam River.

Changing Trends in Water Availability

Changing trends in water availability pose significant challenges at both the global and national levels. Globally, the issue of water scarcity has become increasingly prominent. Many regions around the world are facing water stress, driven by factors such as population growth, urbanization, industrialization, and the impacts of climate change. This scarcity of freshwater resources can lead to competition among sectors like agriculture, industry, and domestic use, affecting food security and economic development.

Water scarcity was already a critical issue affecting various regions worldwide. According to the United Nations, around 1.6 billion people were living in areas with absolute water scarcity, and this number was expected to increase due to factors like population growth and climate change (UN, World Water Development Report 2019). Climate change was contributing to changing precipitation patterns, leading to more frequent and severe droughts and floods in

different parts of the world. The Intergovernmental Panel on Climate Change (IPCC) highlighted the impact of climate change on water resources in its reports. The retreat of glaciers in mountainous regions, driven by rising temperatures, was already affecting downstream water availability. Glacial meltwater is a significant source of freshwater for many rivers and communities (IPCC, Special Report on the Ocean and Cryosphere in a Changing Climate). Groundwater depletion was a widespread issue before 2020, with excessive extraction for irrigation and drinking water causing aquifer levels to drop. This over-extraction posed a long-term threat to water availability (World Bank, 2016).

Water availability, in the study area, is low and seasonal fluctuations are commonly observed. The main sources of water availability are rivers and ponds. Irrigation is done through a canal network of dams on the rivers flowing into and out of the district. There are five main irrigation dams in the study area: Urmil Dam, Majhgawan Dam, Kabrai Dam, Arjun Dam and Chandrawal Dam. The trends in irrigation water availability by major dams in the region can be seen as follows:

Table 1: Major Dams in the Study Region Providing Irrigation Water (in 000 Hectares)

Dams & Years	Urmil Dam	Majhgwan Dam	Kabrai Dam	Arjun Dam	Chandrawal Dam	Other Dams	Total
1998	5.26	7.51	4.52	23.24	6.85	29.03	78.41
1999	5.07	6.08	4.38	12.69	4.65	22.26	57.12
2000	3.54	4.89	1.53	9.63	4.48	16.95	43.01
2001	5.00	7.59	0.32	17.42	5.10	22.71	58.13
2002	5.54	6.74	0.34	4.09	1.11	11.82	29.64
2003	6.00	7.72	3.94	16.78	6.77	30.99	72.21
2004	5.51	5.65	0.39	9.68	3.50	11.11	35.84
2005	5.51	3.10	1.71	6.24	5.43	7.84	29.84
2006	5.01	4.27	0.30	9.57	4.17	5.88	29.19
2007	0.35	0.33	0.29	0.90	0.82	0.44	3.12
2008	5.43	6.51	1.18	7.49	2.75	14.85	38.21
2009	3.30	3.53	0.16	1.26	0.80	6.43	15.48
2010	2.36	0.70	0.16	4.58	1.66	5.04	14.51
2011	4.62	4.80	4.91	1.94	2.15	12.38	43.77
2012	2.83	1.95	0.75	11.48	5.79	10.51	34.30
2013	5.38	7.63	2.95	15.43	6.29	20.49	58.16
2014	3.20	3.43	0.17	1.16	0.80	6.33	15.08
2015	2.73	1.85	0.65	11.18	5.69	10.11	32.20
2016	4.52	4.70	4.81	10.94	2.05	11.38	38.40
2017	2.46	0.60	0.66	4.48	1.56	5.24	15.01

Source: *Office of The, Executive Engineer, Sichai Prakhand, District Mahoba, 2019*

After analysing this data, we can see that many fluctuations and variations can be observed. In 1998, these dams irrigated about 78.41 thousand hectares of land in the study area, which is the highest water availability year in two decades. The lowest water availability is the year 2007, in which only 3.12 thousand hectares of land were irrigated by these dams. According to 2015 data, these dams irrigate only 15.00 thousand hectares of land, indicating that their water irrigation potential has decreased by 50-80 percent.

(a) Arjun Dam (b) Urmail Dam

Figure 2 : Dams in Mahoba

Source: *Primary Survey, 2019*

Table 2: Total Usable Water Capacity of Ponds (in MCM)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
YEAR	**BELASAGAR**	**KULPAHAR**	**KAMALPURA**	**PAWA**	**BILKHI**	**URWARA**	**TIKAMAU**	**BADIBANDHI**	**CHHATARWARA**	**RAIPURA**	**SALARPUR**	**MADAN SAGAR**	**KIRAT SAGAR**	**KALYAN SAGAR**	**DASHRAPUR**	**VIJAY SAGAR**	**RAHELIYA**	**THANA**	**TOTAL**
1998	15.02	1.09	1.48	0.19	0.06	0.79	0.27	0.35	0.25	4.34	3.98	2.49	1.70	0.33	1.69	2.76	0.18	1.60	38.57
1999	21.25	2.77	4.98	1.01	0.52	1.75	0.27	0.56	0.28	3.63	4.02	2.70	1.70	0.42	1.60	2.96	0.50	1.60	52.52
2000	16.66	1.32	2.30	0.31	0.09	1.34	0.16	0.56	0.22	4.23	2.94	1.95	1.12	0.34	1.80	3.81	0.24	0.90	40.29
2001	20.92	2.77	4.90	0.99	0.42	1.05	0.15	0.24	0.30	4.88	1.51	1.89	1.70	0.39	1.57	2.06	0.26	0.38	46.38
2002	7.84	0.93	0.55	0.12	0.03	0.87	0.15	0.08	-	0.51	1.76	2.42	-	0.35	0.56	0.37	-	-	16.54
2003	21.25	2.77	4.98	1.01	0.52	1.74	0.34	0.90	0.31	6.63	4.02	2.70	1.70	0.50	1.84	5.02	0.59	2.10	58.92
2004	10.41	0.50	0.15	0.09	0.09	0.78	-	-	-	0.27	3.36	1.92	-	-	-	-	-	-	17.57

2005	3.60	0.20	0.18	-	-	-	0.27	0.19	-	2.26	2.03	1.35	-	0.13	0.98	0.81	-	0.06	12.06
2006	6.90	0.99	1.11	0.19	0.19	1.18	-	0.12	-	-	-	1.10	-	-	-	-	-	-	11.78
2007	-	-	-	-	-	0.25	0.08	-	-	-	-	-	-	-	-	-	-	-	0.33
2008	19.33	2.12	2.06	-	0.05	1.41	0.11	0.28	0.19	2.85	2.23	3.04	0.19	0.45	1.41	1.16	-	0.41	37.29
2009	8.46	0.52	0.95	-	-	-	-	-	-	1.06	1.63	1.19	-	-	-	-	-	-	13.81
2010	6.16	0.56	0.37	-	-	0.80	0.03	-	-	2.74	-	1.19	-	-	-	-	-	-	11.85
2011	9.09	0.82	0.79	0.50	0.41	1.18	0.30	0.75	-	3.83	1.45	1.72	-	0.28	1.10	0.69	0.31	0.24	23.46
2012	4.50	0.70	0.77	0.24	0.18	1.51	0.16	0.27	-	4.76	4.52	2.29	-	0.11	0.62	-	0.40	0.28	21.31
2013	19.67	2.77	4.99	0.52	0.52	1.75	0.36	0.90	0.28	7.76	4.24	3.00	1.92	0.50	1.87	3.45	0.58	0.90	55.98
2014	9.45	1.36	1.13	-	-	-	0.02	0.09	-	2.44	0.38	-	0.18	0.08	1.42	1.58	-	0.10	18.23
2015	10.41	0.50	0.15	0.09	0.09	0.78	-	-	`	0.27	3.36	1.92	-	-	-	-	-	-	17.57
2016	9.41	0.50	0.15	0.09	0.09	0.78	0.36	0.90	0.28	6.76	2.23	2.04	0.19	0.45	1.41	1.16	0.58	0.90	28.28
2017	7.09	0.32	0.59	0.50	0.41	0.68	0.30	0.75	-	2.83	1.05	1.72	-	0.28	1.10	0.69	0.31	0.24	18.86

Source: *Details of Uses of Water from Dam and Pond, Executive Engineer, Sichai Prakhand, District Mahoba*

Arjun Dam, located in the Charkari block of Mahoba district, contributes the most to irrigation in the study area. In 1998, it irrigated 23.24 thousand hectares of land, but in 2017, it irrigated only 4.48 thousand hectares, which is only 19.2 percent of the 1998 capacity. In these two decades the contribution of Urmil Dam has decreased by 50 per cent. Between 1998 and 2017, the maximum capacity loss at Majhgawan dam was 90%.The condition of the Kabrai dam's contribution is very poor. Every other year the irrigation contribution has been observed to be negligible as compared to the situation in 1998. In 1998, 6.85 thousand hectares of land were irrigated by the Chandrawal dam, but in 2017, it came down to 1.56 thousand hectares. Also, in 1998, the contribution of other dams was 29.03 thousand hectares of land, but in 2017, their contribution came down to 5.24 thousand hectares, which has seen a decline of 82 percent.

The other main source of water availability in the study area is ponds. There are many big ponds, namely, Bela Sagar Pond, Raipura Pond, Solarpur Pond, Madan Sagar Pond, Kirat Sagar Pond, Vijay Sagar Pond, etc., which hold a large amount of water. The changing trends in total usable water capacity of ponds in the study area are shown in the table 2.In this table, we can see that in 1998, these main 18 ponds held 38.5 mcm of water, but after two decades, their usable water capacity declined to 18.86 mcm. In the year 2007, almost all the ponds had dried

up. Only the Urwara talab and Tikamau ponds had 0.25 mcm and 0.08 mcm of water, respectively. Many fluctuations can be seen that are affected by the monsoon. The condition of ponds has been good in these 7 years (1998–2001, 2003, 2008, and 2013).

The largest pond in the study area is Bela Sagar, which held 15.02 mcm of water in 1998, but its water availability has decreased by 7.09 mcm over the last two decades. Chhatarwara pond, Kirat Sagar pond, and Rahelia pond have faced drought situations more than 10 times in two decades. Furthermore, the Pawa, Bilkhi, Badibandhi, Kalyan Sagar, Dashrapur, Raheliya, and Thana ponds had experienced drought more than five times in the last two decades. We can see that in the last 20 years, approximately half of the available usable water has decreased.

Changing Trends in Water Sources of Irrigation

Irrigation is the artificial application of water to the soil through various processes. Irrigation is done in those areas where rainfall is irregular or inappropriate for cultivation. Our study area is located in a water-deficit area. Due to the advancement of technology, water sources for irrigation change with time according to the local people, as shown in the following figure with the help of bar diagram.

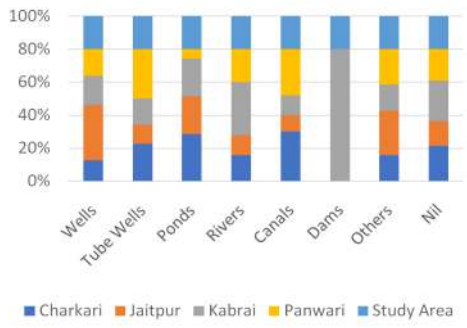

Figure 3 (a) : Source of Water 0-5 years ago

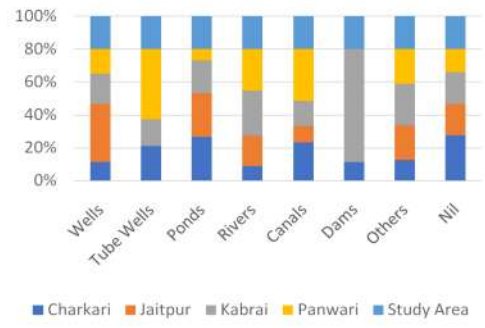

Figure 3 (b) : Source of Water 5-10 years ago

Source: *Primary Survey, 2019*

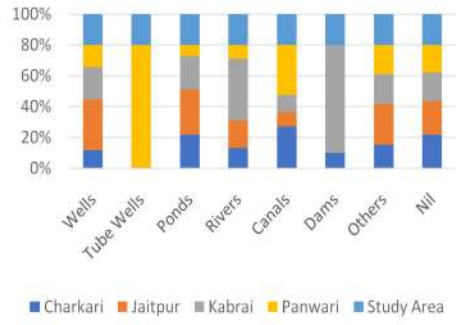

Figure 3 (c) : Source of Water 10-15 years ago

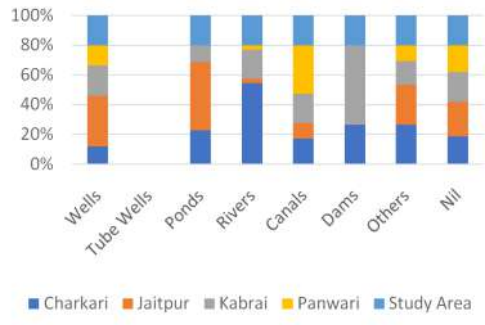

Figure 3 (d) : Source of Water 15-20 years ago

Source: Personal Field Survey,2019

If we talk about the response of the local people and farmers of Mahoba district, then the scenario of the irrigation water source has changed, as we can see from the above table. About 20 years ago, 11.75 percent of people used to irrigate their fields from wells, but now 31.25 percent of people use this water source for irrigation. Before two decades, no one used tube wells as a source of irrigation, but now 8.75 percent of people use this source. It appears that there has been some advancement and awareness of advanced techniques over the last two decades. Rivers as a source of irrigation have not seen so many changes. According to the people's perception, the use of canals and dams as a source of irrigation is already being reduced. Also, we can see that the number of people who were not able to use any source of irrigation is decreasing. The people of Charkari, Jaitpur, and Panwari blocks do not use dam water for irrigation, and the maximum development of wells and tube wells has been observed in Panwari and Kabrai blocks.

Need of Mixed Irrigation Techniques in Agriculture

As the study area is located in the drought-prone region of Bundelkhand. So, due to water deficiency, people should use both modern and traditional irrigation techniques for water conservation and management so that they can be capable of more agriculture production in low water availability situations. Implementing new irrigation techniques in agriculture is crucial for improving crop yields and addressing water scarcity issues in regions like Mahoba District in Uttar Pradesh. Here's a detailed exploration of new irrigation methods and their significance for Mahoba's agriculture:

- **Drip Irrigation:** Drip irrigation is an efficient technique that delivers water directly to the root zone of plants in small, controlled amounts. In Mahoba District, where water resources are often limited, drip irrigation can significantly reduce water wastage and enhance crop productivity. Farmers can install drip systems to irrigate crops like vegetables, fruits, and cash crops. This method not only conserves water but also optimizes nutrient delivery to plants, resulting in healthier crops and higher yields.
- **Sprinkler Irrigation:** Sprinkler irrigation is another effective method for water-efficient agriculture in Mahoba District. This technique involves spraying water over the crops, mimicking natural rainfall. It is particularly suitable for field crops like wheat, maize, and soybeans. By reducing water evaporation and ensuring even distribution, sprinkler irrigation can optimize water usage. In an area where monsoon rains are unpredictable, sprinkler systems can provide a reliable water source for sustaining crops during dry spells.
- **Rainwater Harvesting:** In rainfed agriculture regions like Mahoba, rainwater harvesting techniques can help capture and store rainwater for agricultural use. This can include building small reservoirs, check dams, and percolation tanks to recharge

Adopting mixed approach of new and traditional irrigation techniques in agriculture is imperative for addressing water scarcity challenges in Mahoba District. These techniques can help farmers optimize water usage, improve crop yields, and achieve greater agricultural sustainability. However, successful implementation requires a combination of farmer education, government support, and community participation to make the best use of available resources. By embracing these methods, Mahoba can work toward a more water-efficient and prosperous agricultural future.

Conclusion

The problem of water for irrigation in Mahoba district of Uttar Pradesh is a significant and longstanding issue. The district, located in the Bundelkhand region, faces severe water scarcity, which has had adverse effects on agriculture, the primary livelihood source for the local population. Mahoba district heavily relies on groundwater for irrigation due to the lack of major perennial rivers. Over the years, excessive extraction of groundwater for agricultural purposes has led to a substantial decline in the water table. This has resulted in a dire shortage of water for irrigation, affecting crop yields and the overall agricultural productivity of the region leading to economic distress among farmers. Many farmers in the region struggle to secure sufficient water for their crops, leading to reduced agricultural output and income.

In this research paper, we have discussed the trend of water availability in the dams and major ponds of the study area. We see that the area irrigated by major dams has decreased by 50–80 per cent in two decades, and the Arjun Dam is the backbone of the water supply in the study area. Secondly, we have observed the condition of major ponds in the study area. We have observed significant fluctuations in the usable water potential of the ponds every year. In 2007, almost all the ponds had dried up. After analysing the data, we observed that in five years, only one year of availability is sufficient for use and these ponds suffer from water scarcity conditions. Almost half of the water availability has been reduced in the past two decades.

It was observed that nowadays people mainly use tube wells and wells and by using these advanced facilities they get good production, but still about 31 percent of people do not use any source of irrigation. They do dry farming, which is completely dependent on rainfall. To solve these problems, we try to suggest some modern techniques like sand dams, plastic buckets, sprinkle systems, pitcher method, khet talab, drip irrigation, reuse of impure water, etc., so that they become helpful in improving agriculture production, water conservation, and management in the water deficit region. The water problem for irrigation in Mahoba underscores the need for sustainable water management practices, including rainwater harvesting, watershed management, and the promotion of efficient irrigation techniques such as drip and sprinkler systems. Additionally, community involvement and awareness are crucial in addressing this pressing issue and ensuring water availability for agricultural sustainability.

groundwater and provide a more reliable source of water for crops during dry spells. Rainwater harvesting not only conserves water but also contributes to groundwater replenishment, improving long-term water availability for agriculture.

- **Solar-Powered Pumps:** To overcome electricity shortages and reduce operational costs, farmers in Mahoba District can adopt solar-powered pumps for irrigation. These pumps use energy from solar panels to power water pumps, making irrigation more sustainable and cost-effective. Solar irrigation can be especially beneficial in remote areas with limited access to electricity, ensuring that farmers have a consistent water supply for their crops.
- **Pitcher irrigation** is a technique in which a clay pot is placed beneath the surface near the roots of the plant and filled with water, then its mouth is covered with stone to prevent evaporation, improve water hygiene, and maintain the percolation rate. In this process, we use perforated clay pots or pierce them to ensure that plant roots receive adequate water.
- **The Khet Talab** technique was launched by the U.P. government in 2013 for small farmers who were not capable of bearing the expense of tube wells etc. In this technique, two types of ponds are dug. A small pond of 22203 metres and a big pond of 35303 meters. Its purpose is to collect rainwater in this pond, which can be used for irrigation on dry days.
- **Sand dams** are a traditional technique in which a little sand dam is made in any small channel or stream. This dam is about 80–100 metres in length and 3–4 metres in height. In this process, channel water is diverted into the fields for irrigation. It is also helpful because it has a huge amount of water stored in it, which can be used for irrigation in the dry season.
- **Plastic bucket** irrigation is an extraordinary technique that helps to irrigate small or recently planted trees. This process is similar to the pitcher irrigation technique. In all this, a plastic bucket or container is taken, then one or two penetrate small holes on one side of the bucket for the percolation of water to irrigate the roots of the plant. It is mostly used in vegetable gardening. This technique can be processed in two ways: Firstly, put the container beside the plant, and secondly, a very thin pipe is connected from the bucket to the plant roots in the soil to gradually pour water, and then gravity itself does the rest of the work of irrigation.
- **Community-Based Water Management:** Encouraging community-based water management practices can be beneficial for Mahoba District. By working together to manage water resources, local farmers can allocate water more equitably and efficiently. Collective efforts can include equitable distribution of water resources, maintenance of irrigation infrastructure, and monitoring water use to prevent over-extraction from water sources.

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INDUSTRIAL CONTOURS OF PATNA DISTRICT: A GEOGRAPHICAL APPRAISAL

Uday Kumar*
Email: uday2117@gmail.com

ABSTRACT

Industries play an important role in the economic development of an area. When a unit of industry is established in an area, people move from an agrarian society to the industrial society. Industries provide numerous job opportunities for the people. Industries developed in Patna district are not based on minerals because the district is devoid of any mineral except sand quarrying in the nearby rivers like Ganga, Son and Punpun. Most of the industries are agro-based or demand based. In 2000, when industrially advanced and mineral-rich south Bihar was carved out to form the separate state of Jharkhand, the state faced setback due to a huge loss of revenue and had a strong impact on its development. In 2005, when the new government came into power, priority was given to create investment opportunity by improving law and order, infrastructure and introducing several laws to develop the industrial sector. Key organizations in Patna district are M/s Bharat Wagon and Engineering Company Ltd, Sudha Dairy Co-Operation, Software Technology Park, NTPC headquarters and Power Grid Corporation, SIS- Security and Intelligence Services, etc. Apart from these, many other micro and small enterprises and artisan units are found in the city.

The main objectives of this paper are (i) to assess the present status of industrial units in Patna district, (ii) identify the characteristics of various types of industries (iii) identify the problems faced by industries in its growth, and (iv) the main features of industrial policy of the government to solve these problems. It is an empirical study based on personal observation, collection of primary and secondary information and data obtained from DIC, Large Scale Enterprises, MSME- Development Institute and internet sources etc.

Keywords : Industry, Infrastructure, Opportunity, Economic development, Enterprises.

Introduction

Industries play an important role in the economic development of an area. When an industry is established in an area, people move from an agrarian society to the industrial one. Industries provide numerous job opportunities for the people. Industries developed in Patna district are not based on minerals because the district is devoid of any mineral except sand mining. Most of the industries are agro-based or demand based.

Patna District has potentialities for development of agro-based industries, especially polishing of pulse and rice; filtering, sieving of grains; preparation of mustard oil from oil seeds and flattening of rice as *chura* at Nohsa (Census Town), Kurthaur (Census Town), Bihta (Nagar Parishad) and Pareo (Census Town).

Textile Industries or related ones such as cotton thread and handloom clothes have developed at Mokama (Nagar Parishad), Janipur (Census Town) and Khagaul (Nagar Parishad).

* Dr. Uday Kumar, Assistant Professor (Guest Faculty), Department of Geography, T. P. S. College, Patna.

Phulwarisharif has dairy and furniture industry. In fact, the district is endowed with agricultural products therefore industries related to it, outspread in the region. Industries other than agro-based, are also found but not on large scale. Manufacturing of metallic pottery and utensils is done at Pareo, Masaurhi and Mokama, while at the state capital city i.e. Patna Municipal Corporation (PMC) Baidyanath ayurvedic medicines, hume pipe, orthopaedic instrument and glass item are manufactured. Shoes, iron rod and pipes are manufactured at Danapur Nizamat. Key organizations in Patna district are M/s Bharat Wagon and Engineering Company Ltd, Sudha Dairy Co-Operation, Software Technology Park, NTPC headquarters and Power Grid Corporation, SIS-Security and Intelligence Services, etc. Apart from these, many other micro and small enterprises and artisan units are found in the city.

Historical Legacy of Industries

Patna district has a glorious past of its excellence in the handicrafts which commanded respect of foreign markets on account of their finish, generally attributable to master craftsmen who have exhibited their skill from generation to generation. Besides, potter, carpenters, blacksmiths, coppersmiths and goldsmiths have been carrying on their traditional occupations both in rural as well as urban areas, to earn their living. The past glory of industries in Patna District, as like- Cycle industry at Phulwarisharif, Brass metal in Patna City, Laddo (Sweet) at Maner, Sugar industry at Bihta, Scooter industry at Fatuha and Railway (Bharat Wagon) at Mokama. Most of above industries are closed due to problems related to raw materials, marketing and non-supportive earlier policies.

The Bihar Government created Bihar Industrial Development Area at Phulwarisharif, Fatuha, Mokama, Bakhtiyarpur, Bihta and Digha but failed to achieve targets.

Patna district has potential and prospect of industrial development. An industrial complex is coming up around Barh (Super Thermal Power Station) & Mokama to avail facilities of power from Barauni and easy means of communication between North and South Bihar. Small industries have come up particularly of engineering type around Patna. Small Scale industries are therefore, likely to develop in future in Patna district particularly in around Patna town, according to the demand of the growing population.

Aims and Objective

The main aim and objectives of this paper are:

1. to assess the present status of industrial units in Patna district,
2. identify the characteristics of various types of industries,
3. identify the problems faced by current industries in its growth, and
4. the main features of industrial policy of the government to solve prevailing problems.

Methodology

The present study is an empirical study based on personal observation, collection of primary and secondary information, tabulation and cartographic representation of data and their analysis. Two types of information have been collected:

1. Secondary information collected from various sources such as DIC, MSME-Development Institute, Economic Survey Data and internet sources etc.
2. Primary Information has also been collected to explain the present status of the industries.

Study Area

Geographically Patna district is situated between 25°12' N - 25°44' North latitudes and 84°42' E - 86°04' East longitudes. It has an area of 3202 sq. km. Patna is the capital city of Bihar. Its northern boundary is marked by the river Ganga beyond which lie the districts of Saran, Vaishali, Samastipur and Begusarai. The southern boundary is marked by the districts of Arwal, Jehanabad, Nalanda and Lakhisarai. The eastern boundary of this district is delimited by the districts of Lakhisarai and Begusarai, where as in the west lies the Sone river beyond which lies Bhojpur district. Patna district has six sub divisions namely Patna Sadar, Patna City, Barh, Danapur, Masurahi and Paliganj, and the district has been divided into 23 Community Development Blocks -cum -Anchals. Figure-1 shows the location of Patna district in Bihar.

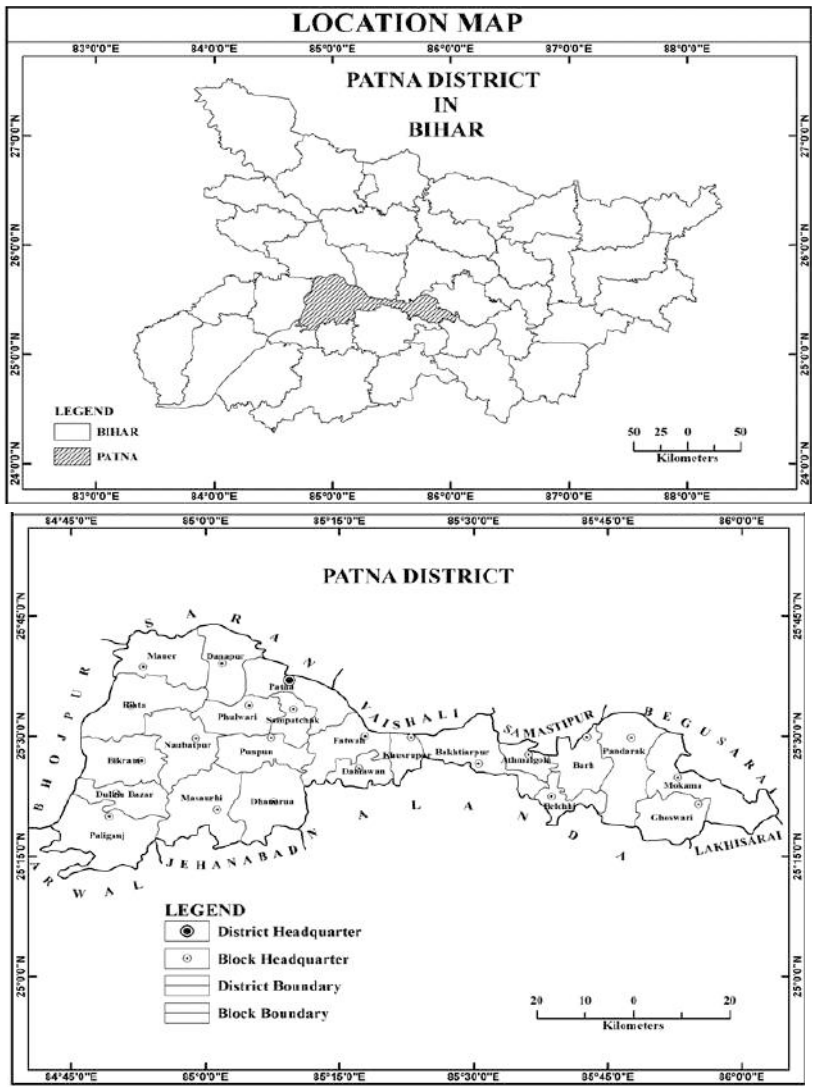

Figure 1 : Location Map of Patna District in Bihar

Industrial Scenario of Patna District

In past Patna district was famous for its excellent handicraft which commanded respect in the foreign market. But before independence these handicraft industries declined fastly due to the negligence of British government and rapid growth of modern economy, and the region failed to attract planners and entrepreneurs on account of non-availability of minerals. Patna district is situated at the bank of river Ganga blessed by fertile land which is suitable for agriculture rather than industrialization. But the pressure of population has compelled the region to develop industries related to consumer goods.

At present there are 30577 industrial units in Patna district, out of which 12231 are registered industrial units. In the district there are 3 large scale industries and 19 medium scale enterprises. They are as follows:

Table 1 : EXISTING LARGE SCALE ENTERPRISES IN PATNA DISTRICT

Sl. No	Name of the enterprises	Location	Products
1.	M/s Bharat Wagon and Engineering Company Ltd.	Mokama, Patna	Railways wagon
2.	M/s Patna Dairy Project (Sudha Brand)	Phulwarisharif, Patna	Milk and Milk Products (Cheese, Curd , Paneer and Sweets)
3.	Super Thermal Power	Barh, Patna	Thermal Energy (Coal Based)

Source : *DIC (District Industries Centre), 2018 Patna.*

Figure 2 : Existing Status of Industrial Area in Patna District by BIADA

Table 2 : EXISTING MEDIUM SCALE ENTERPRISES

Sl. No.	Name of the Medium Enterprises	Location
01	M/s Dadiji Steel Ltd	Patna City
02	M/s Sujata Hotel Pvt Ltd	Patna
03	M/s Patna Bihar Hotels Ltd	Patna
04	M/s J.M.D. Steel Pvt Ltd	Patna City
05	M/s RP- Beverages Pvt Ltd	Patna City

06	M/s Magadh Industries Pvt Ltd	Patna City
07	M/s Krishna Soft Extruction Pvt Ltd	Danapur, Patna
08	M/s Neel kamal Steel Pvt Ltd	Patna City
09	M/s J.M.G Steel Pvt Ltd	Fatuha
10	M/s Hotel Dayal	Patna City
11	M/s Sri Sri Dwarki Ji Agro Pvt Ltd	Patna City
12	M/s Bata India Pvt. Ltd	Digha Ghat, Patna & Mokamah
13	M/s Joyti Maulders Pvt Ltd	Patna City
14	M/s Meridian Buddha Hotels Pvt Ltd	Patna
15	M/s Paras Residency	Patna
16	M/s Maruti Mediteck Pvt Ltd	Patna City
17	M/s Iswar Raj Beverages Pvt Ltd	Fatuha
18	M/s Hotel Gargi Grand	Patna
19.	M/s Rantu Shyam Food Pvt Ltd	Fatuha

Source : DIC (District Industries Centre), 2018 Patna.

Table 3 : EXISTING MICRO & SMALL ENTERPRISES AND ARTISAN UNITS

Types of Industry	No. of Units
Agro based	177
Soda water	2
Cotton Textile	16
Woollen, silks and artificial thread based clothes	2
Jute and jute based	4
Readymade garments and Embroidery	39
Wood /Wooden based furniture	86
Paper and paper products	21
Leather based	59
Chemical/chemical based	46
Rubber, Plastic and Petro based	69
Mineral based	10
Metal based (steel fab)	104
Engineering units	66
Electrical machinery and transport equipment	24
Repairing and servicing	121
Others	94
TOTAL	**940**

Source : DIC (District Industries Centre), 2018 Patna.

Micro, Small and Medium Enterprises (MSME) contributes significantly to total output, export earning, employment generation and regional development of Indian economy.

Table 4 : Industrial Areas and Production Units in Patna District

Sl. No.	Industrial Area	No. of Units in Production	Land acquired (in hectare)
1.	Patliputra	73	42.14
2.	Fatuha	42	98.64
3.	MIP Bihta	01	269.50
4.	Bihta	01	41.37
	TOTAL	**117**	**451.65**

Source : *BIADA 2015.*

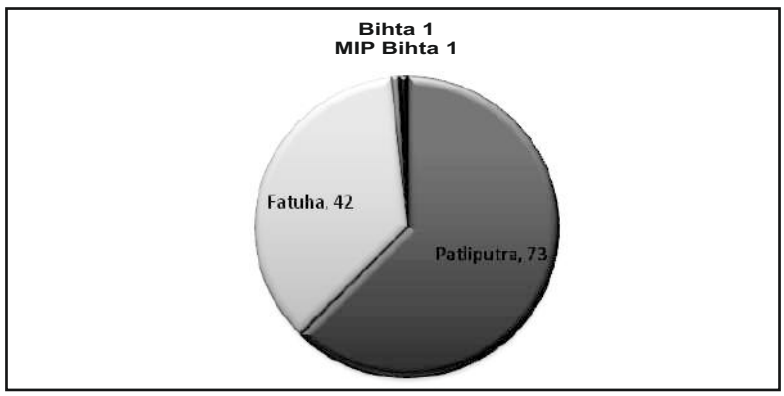

Figure 3 : Ratio of Industrial Areas & Production Units

Figure 4 : Patliputra Industrial Area and Udhyog Bhawan in Patna

The Industrial Areas of the district are Patliputra, Fatuha, MIP Bihta and Bihta, for which 451.65 hectares of land has been acquired under Bihar Industrial Development Authority.

Among all these industries there are a number of Brick kiln industry in existence in and around Patna. There are two important belts of brick-kilns. First is along the ganga side from Didarganj to Fatuha. Another one is from Danapur Cantt. area to Maner along side the river Son.

Figure 5 : Brick kilns lined along the Patna-Fatuha Road

There are also 9 micro and small enterprises clusters. Out of these 6 clusters are identified by DIC, Patna. They are as follows-

Table 5 : MICRO & SMALL ENTERPRISES CLUSTERS

Sl. No.	Name of the clusters	Location	No. of units
1.	Artificial Jewellery	Phulwarisharif	35
2.	Readymade Garments	Patna City	75
3	Lai Mithai (Sweet)	Barh	100
4.	Lai Mithai (Sweet)	Dhanarua	25
5.	Wooden Furniture	Phulwarisharif	45
6.	Zari and Embroidery work	Ranipur, Phulwarisharif	25

Source : *DIC (District Industries Centre), 2018 Patna.*

Three clusters are identified as major cluster by MSME- DIC Patna. They are as follows:

Table 6 : MAJOR CLUSTERS- MSME

Sl. No	Name of the Clusters	Location	No of Units (Approx.)
1.	Pareo belt metal cluster	Patna	300
2	Leather foot wear cluster	Patna city	1500
3.	GLS Lamp Cluster	Patna City	60

Source : *DIC (District Industries Centre), 2018 Patna.*

Characteristics of various industries

There are various industrial units existing in Patna district and they produce variety of items. Some important industries are being discussed as follows:

1. Agro-Based Industries

In Patna district there are 177 agro-based units. These units derive their raw materials from the agriculture within and outside the district. Products from these units include Dal, Rice, beaten Rice, Mustard oil, Chili powder, Mustard seed cake, Cattle feed, Wheat flour biscuits etc. Patna has long been a major centre of trade of agro-based products. Its most important exports are grain, sugarcane, sesame and medium- grained Patna rice. There are several food processing industries established in Patna .There are some sugar mills in and around the city.

2. Metal Based Industries

Out of the total existing industrial units of Patna district, 104 units belong to the metal based industries which are engaged in the production of alluminium and steel products Viz- Gate, Grills, Shutter, Furniture, Utensils etc. Other items manufactured with basic metal are boxes, buckets, tin container, tin trays, brass cylinder, tube-well fittings, water storages tanks etc. These items are market oriented. They also require better infrastructural facilities for bringing materials Viz- steel and alluminium ingnots and steel. Skilled labour is also required. Such units are situated within Patna urban area, which itself indicates the importance of infrastructure, market and labour in the establishment of these industries.

3. Hosiery and Garments Industries

There are many small scale units engaged in the productions of hosiery and readymade garments in Patna district. Most of these industries are situated in Patna Sadar developments block and few of these industries are in Danapur- Khagual, Bakhtiarpur and Mokama.

4. Chemical Based Industries

There are 46 chemical based industries in the Patna district, which are engaged in the manufacturing of Alcohol, Industrial gases, Sulphuric acid, Soda-ash, Caustic soda, Fertilizers and drugs. Many other chemical industries are to be setup, because raw materials utilized by these units are brought from outside the state easily.

5. Wooden Based Industries

Patna district is devoid of forest. In the district there are 86 wooden based industries. These include saw mills, furniture, toy and construction materials producing units. Timber and saw mills are widely distibuted in the anchals of Patna Sadar, Danapur- cum Khagaul, Paliganj Bakhtiyarpur, Barh Mokama , Fatuha, Phulwarisharif etc.

6. Paper Based Industries

In Patna district there are 21 units engaged in the production of items like- paper card board, boxes, paper envelop, hand bags, tele printer roll and waxed paper. These items are produced mainly in Patna City.

7. Leather Based Industries

There are 59 leather based units of small scale in Patna district. In the district there are 1500 units of clusters of foot wear engaged in footwear manufacturing. These units are situated in Patna City, Danapur- cum Khagaul, Barh, Fatuha and Mokama.

8. Rubber and Plastic Based Units

In Patna district there are 69 micro and small units of Rubber and Plastic based industries, which are engaged in the manufacturing of a variety of consumer goods like-Bottles, Jars, Covers, Pipes and tubes, Plastic boards, bangles tapes etc. Most of these units are situated in Patna Sadar where market is easily available.

9. Electronics and Electrical Goods Units

There are 24 micro & small electrical machinery and transport equipments industries and many tiny industries which are engaged in the production of T.V. Antenna, Radio, Transistors, Regulator, Remote etc. All these units are located at Patna, Fatuuha, Bihta, Phulwarisharif, etc.

10. Repairing and Servicing Units

In Patna district there are 121 micro and small units, which are engaged in repairing and servicing. This type of units is available in all the sub divisions of the district.

Miscellaneous Industries

Besides the above mentioned important groups of industries, there are some miscellaneous units engaged in the production of lubricating oil, bricks, thermometers, domestic or silver and German silver units. Most of these units are situated at Patna, Danapur and Bihta.

Major Problems of Industrial Development

1. Lack of infrastructural facilities, lack of developed markets and power supplies are the major constraints.
2. Inadequate supply of raw materials is a big problem. The small producers are always in shortage of raw materials. This adversely affects the growth.
3. Lack of Finance. The general dependence on agriculture has led to poverty in the district, which has arrested industrial development.
4. Lack of skill training, quality control, regulated markets, exhibition facilities of industrial products, etc are other problems faced by these industries. People also do not have the knowledge to identify the industries which can be set up on agricultural raw materials and agricultural waste materials.

Industrial Policy of Bihar State and solution of Industrial Development Problems

Bihar is endowed with resources such as surface and ground water, fertile land, disciplined and skilled man power etc., so very essential for the establishment of industries. The State

Government firmly believes in maximizing capital investment in the state for its accelerated economic development as also for generation of employment and incomes. The State Government is committed to create an environment conducive to growth of industries in the state. The Government is determined to encourage investment in the industries based on state's agro-climatic and mineral resources as also in development of infrastructure.

Under the State Reorganization Act, the bifurcation of the State of Bihar became effective from the 15th of November, 2000. A large number of medium/ large industries, minerals as well as mineral based units and important forest produce have gone to the newly created Jharkhand State. Under the circumstances, it is imperative that truncated Bihar adopts a resurgent industrial policy. Based upon the raw materials and resources available in Bihar, a renewed effort has to be made to establish small/medium and large industries as well as to rehabilitate the sick and ailing industries of the State. The local and outside entrepreneurial talent has to be tapped to give a fillip to industrial development in order to create employment opportunities and to increase individual incomes coupled with State revenues.

The state government has taken several steps to solve all these problems. These steps are being taken under the provision of Bihar Industrial Policy, 2006, 2016 and Industrial Incentive Promotion Policy 2020. Some important steps in the context of Patna district are as follows:

1. Incentives to export oriented industrial units based on Agro products, Medicinal plants and food processing and packing.
2. Identification of sick units and remedial measures by providing marketing, technology and row material availability guarantees.
3. Special incentives for sugar, tea and jute Industries.
4. Special incentives to knowledge based industries and those relating to information technology.
5. The Government has further decided to promote financial institutions and private sectors for industrial Growth Centers/ Industrial Area/ Export Promotion Industrial Park/ Export oriental Zones/ Special Economic Zones as well as infrastructure projects in the Grater Patna, Mokama industrial complex, Fatuha industrial area and other potential areas in Patna district.

Conclusion

Patna enjoys a unique location which connects it to the vast markets of eastern and northern India, access to ports such as Kolkata and Haldia and to raw material sources and mineral reserves from the neighbouring states. The district has a cheap and large number of industrial labour, making it an ideal destination for a wide range of industries.

Due to fertile soil, agriculture based industries like rice mills and processing mills of tomatoes, potatoes, and some other fruits and vegetables have also emerged. Vegetables are grown in outskirts and diara belt. Sudha Dairy is famous for milk products. Due to agro-based economy there is rising trend of growth in the food processing sector in Patna district. A vast market is

also available here. Therefore, the scope for ancillarisation of packaging industries is also available to meet the demand of the market. There are 121 repairing and servicing industries in the district. Potential areas for service industry are automobile, servicing of electrical and electronic items, computer hardware maintenance, printing, hotel industries, event management, technical consultancy, tourism, catering services fast food centres, educational institutions etc.

An increase in the number of projects and industrial ventures will provide better employment opportunities and increase per capita income of the district. There is tremendous scope for software or hardware sectors in capital Patna.

The proposed centre would deal with subjects like digital policing, training in cyber security and digital forensic among others. In the industrial policy of 2016 priority has been given to IT, food processing and readymade garments manufacturing. Youths are being encouraged to join the IT sector. Above facts make it clear that Patna district has immense prospect to emerge as an industrial district in near future.

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पश्चिम चम्पारण जिला में शुद्ध बोये गये क्षेत्र के प्रारूप में परिवर्तन (1991 - 2011) : एक भौगोलिक अध्ययन

मो० नाजिम*
Email: nazim2011@gmail.com

राहुल मौर्य**
Email: rahulgeog1991@gmail.com

सार

भूमि समस्त मानवीय गतिविधियों का आधार है। यह एक महत्वपूर्ण प्राकृतिक संसाधन है। अतः इसका उपयोग विभिन्न कार्यों में किया जाता है। जैसे–कृषि, वानिकी, खनन, सड़क निर्माण, उद्योग की स्थापना, अधिवास इत्यादि। भू–उपयोग को निर्धारित करनेवाले तत्वों में भौतिक कारक जैसे– भू–आकृति, जलवायु और मृदा के प्रकार तथा मानवीय कारक जैसे–जनसंख्या घनत्व, प्रौद्योगिक क्षमता, संस्कृति और परम्पराएँ इत्यादि शामिल हैं। भूमि उपयोग वर्गों में समय के साथ–साथ आंशिक या व्यापक परिवर्तन होते रहते हैं। प्रस्तुत शोध–पत्र में पश्चिम चम्पारण जिला के शुद्ध बोये गये क्षेत्र के प्रारूप में परिवर्तन का तार्किक अध्ययन किया गया है। यह अध्ययन द्वितीयक आँकड़ों पर आधारित है। उपलब्ध आँकड़ों को समुचित सांख्यिकीय विधियों द्वारा विश्लेषित कर परिणाम को विभिन्न आरेखों एवं मानचित्रों द्वारा प्रदर्शित किया गया है।

मुख्य शब्दावली : भूमि उपयोग, शुद्ध बोया गया क्षेत्र, सकल कृषि योग्य भूमि, चालू परती भूमि, फसल प्रारूप।

परिचय

भूमि एक महत्वपूर्ण प्राकृतिक संसाधन है। समस्त मानवीय विकास का आधार भूमि है, जिसका उपयोग मानव न सिर्फ अपनी सामाजिक–आर्थिक आवश्यकताओं की पूर्ति के लिए करता है बल्कि यह प्रत्यक्षतः पर्यावरण को भी प्रभावित करता है। मानव सभ्यता के प्रारंभिक समय में कम जनसंख्या और विस्तृत क्षेत्र के मध्य कोई नियोजित अन्तर्संबंध नहीं था। परन्तु आज संदर्भ में जनसंख्या में अप्रत्याशित अभिवृद्धि और विकासोन्मुख मानवीय गतिविधियों ने इस पृथ्वी पर भूमि क्षेत्र को अपेक्षाकृत परीसीमित कर दिया है क्योंकि जनसंख्या और मानवीय आवश्यकताओं की निरंतर अभिवृद्धि के साथ–साथ भूमि के रूप में प्राप्त सीमित संसाधन का विस्तार नहीं हो सकता है। बढ़ती जनसंख्या के कारण विशेषकर शुद्ध बोये गये क्षेत्र पर पोषण का दबाव तीव्र गति से बढ़ रहा है जबकि समय के साथ–साथ जनसंख्या के अनुपात में शुद्ध बोया गया क्षेत्र सिकुड़ता जा रहा है। वर्तमान वैश्विक परिदृश्य में इस संसाधन के अधिकतम उपयोग के द्वारा असीमित मानवीय आवश्यकताओं की पूर्ति एक कठिन कार्य साबित हो रहा है और इस दिशा में नई संभावनाओं को तलाशने में भूमि उपयोग प्रतिरूप का अध्ययन एवं विश्लेषण सकारात्मक

* डॉ॰ मो॰ नाजिम, प्रोफेसर एवं अध्यक्ष, भूगोल विभाग, पटना कॉलेज, पटना
** राहुल मौर्य, शोधार्थी (यू॰जी॰सी॰–जे॰आर॰एफ॰), भूगोल विभाग, पटना विश्वविद्यालय, पटना

परिणाम देता है। इसका अध्ययन जनसंख्या का अति विस्तार और मानवीय गतिविधियों की वृद्धि के दौरान भूमि संसाधन पर पड़ने वाले दबावों के आकलन के लिए भी काफी महत्वपूर्ण है।

उद्देश्य

प्रस्तुत अध्ययन में भूमि उपयोग के साथ–साथ शुद्ध बोये गये क्षेत्र का विश्लेषण किया गया है। इसका मुख्य उद्देश्य इस प्रकार है–

(i) पश्चिम चम्पारण जिला के भूमि उपयोग का अध्ययन करना।

(ii) जिले में विभिन्न भूमि उपयोग वर्गों के प्रारूप में परिवर्तन का अध्ययन करना।

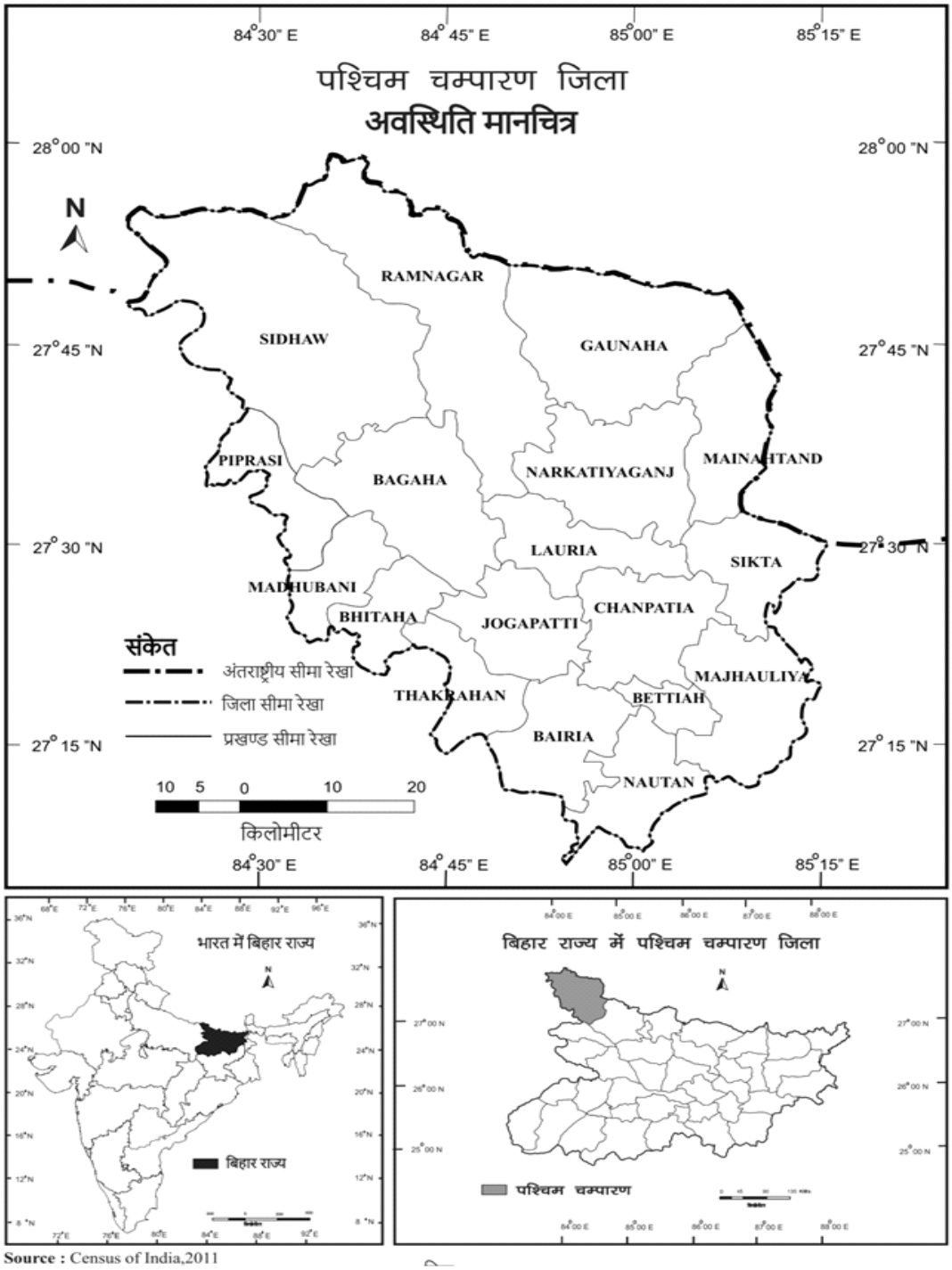
(iii) जिले में शुद्ध बोये गये क्षेत्र का प्रखण्डवार तार्किक विश्लेषण करना।

आंकड़ों का स्रोत एवं विधि तंत्र

प्रस्तुत अध्ययन द्वितीयक आँकड़ों पर आधारित है। इस शोध अध्ययन में पश्चिम चम्पारण जिला में भूमि उपयोग विशेष रूप से शुद्ध बोये गये क्षेत्र के प्रारूप में परिवर्तन जानने के लिए विभिन्न आँकड़ों का विश्लेषण उपयुक्त सांख्यिकीय विधियों द्वारा किया गया है। अध्ययन क्षेत्र से एकत्रित किये गये आँकड़ों से आवश्यकतानुसार सारणियों का निर्माण कर उसका विश्लेषण किया गया है तथा इसे विभिन्न आरेखों एवं मानचित्रों के द्वारा प्रदर्शित किया गया है। इस अध्ययन में रोचकता और विविधता लाने, तथ्यों की पहचान, विश्लेषण एवं व्याख्या का मार्ग प्रशस्त करने हेतु वर्णमात्री मानचित्र तथा वृतारेखों आदि का प्रयोग कर चयनित क्षेत्र का भूमि उपयोग एवं शुद्ध बोये गये क्षेत्र के प्रारूप की यर्थाथता का चित्रण करने का प्रयास किया गया है।

अध्ययन क्षेत्र

प्रस्तुत अध्ययन का क्षेत्र "पश्चिम चम्पारण" जिला है जो बिहार राज्य के मध्य गंगा मैदान में स्थित है। क्षेत्रफल की दृष्टि से यह जिला बिहार के सभी जिलों में सबसे बड़ा है। पूर्व का चम्पारण जिला सारण जिला का एक अनुमंडल था जो वर्ष 1972 में दो भागों–पूर्वी चम्पारण एवं पश्चिम चम्पारण जिलों के रूप में विभक्त हो गया। पश्चिम चम्पारण जिला का जिला मुख्यालय बेतिया है। जिसका विस्तार 4,84,256 हेक्टेयर भूमि पर है। इसका अक्षांशीय विस्तार 26°16′ उत्तर से 27°31′ उत्तरी अक्षांश एवं देशान्तरीय विस्तार 83°50′ पूर्व से 35°18′ पूर्वी देशान्तर तक है (चित्र–1)।



Source : Census of India,2011

चित्र-1 : पश्चिम चम्पारण जिला की अवस्थिति

भूमि उपयोग का वर्गीकरण तथा प्रतिरूप :

इस अध्ययन में पश्चिम चम्पारण जिले का प्रखण्डवार भूमि उपयोग प्रारूप से संबंधित आंकड़ों का संकलन बिहार राज्य के सांख्यिकी विभाग एवं पश्चिम चम्पारण जिला के सांख्यिकी कार्यालय से एकत्रित किया गया है। जनगणना विभाग द्वारा प्रकाशित District Census Handbook के आँकड़ों का उपयोग भी भूमि उपयोग के अध्ययन में किया गया है।

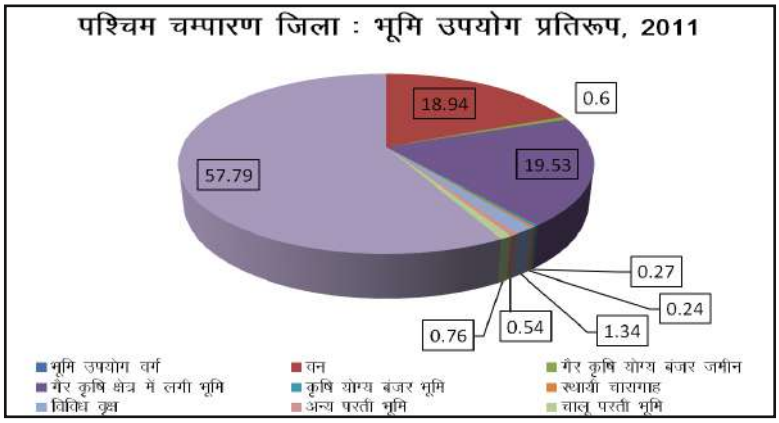
यहाँ की भूमि को निम्न प्रकार में विभाजित किया जा सकता है–

i) वन
ii) गैर कृषि योग्य बंजर भूमि
iii) गैर कृषि क्षेत्र में लगी भूमि
iv) कृषि योग्य बंजर भूमि
v) बाग–बगीचा के अन्तर्गत भूमि
vi) स्थायी चारागाह
vii) अन्य परती भूमि
viii) चालू परती भूमि
ix) शुद्ध बोया गया क्षेत्र।

तालिका-1: पश्चिम चम्पारण जिला में भूमि उपयोग प्रतिरूप, 2011

क्र.सं.	भूमि उपयोग वर्ग	क्षेत्र (एकड़ में)	कुल क्षेत्र का प्रतिशत
1	वन	226698.79	18.94
2	गैर कृषि योग्य बंजर जमीन	7207.80	0.60
3	गैर कृषि क्षेत्र में लगी भूमि	233701.51	19.53
4	कृषि योग्य बंजर भूमि	3212.26	0.27
5	स्थायी चारागाह	2836.67	0.24
6	विविध वृक्ष	15992.09	1.34
7	अन्य परती भूमि	6412.16	0.54
8	चालू परती भूमि	9132.69	0.76
9	शुद्ध बोया गया क्षेत्र	691620.95	57.79
10	कुल क्षेत्र	1196814.90	100%

स्रोत : जिला सांख्यिकी कार्यालय, पश्चिम चम्पारण।



चित्र-2 : पश्चिम चम्पारण जिला का भूमि उपयोग प्रतिरूप

वर्ष 2011 में भूमि उपयोग प्रतिरूप के विश्लेषण को तालिका–1 के अन्तर्गत दर्शाया गया है। जिले में सर्वाधिक भू–क्षेत्र (57.79 प्रतिशत) शुद्ध बोये गये क्षेत्र के अन्तर्गत आता है। गैर कृषि क्षेत्र में लगी भूमि के अन्तर्गत 19.53 प्रतिशत तथा वन क्षेत्र के अन्तर्गत 18.94 प्रतिशत भू–भाग आता है। गैर कृषि योग्य बंजर भूमि, कृषि योग्य बंजर भूमि, स्थायी चारागाह, विविध वृक्ष, अन्य परती भूमि एवं चालू परती भूमि के अन्तर्गत क्रमशः 0.60, 0.27, 0.24, 1.34, 0.54 एवं 0.76 प्रतिशत भूमि संलग्न है।

उपरोक्त भूमि उपयोग प्रतिरूप के विश्लेषण स्पष्ट होता है कि जिले में विषम भूमि– उपयोग मिट्टी की गुणवत्ता के कारण भिन्न प्रतिरूप मिलते हैं।

तालिका–1 में उल्लेखित भूमि उपयोग प्रतिरूप के आँकड़े जिले में भूमि उपयोग के स्थिर मानक नहीं है। जिले के औसत भूमि उपयोग के आँकड़ों में पिछले दो दशकों के दौरान भिन्नता देखी गयी है जिसे तालिका–2 में प्रदर्शित किया गया है।

तालिका-2: पश्चिम चम्पारण जिला में भूमि उपयोग प्रतिरूप, 1991-2011

(कुल क्षेत्रफल के प्रतिशत में)

क्र.सं.	भूमि उपयोग वर्ग	1991	2001	2011
1	वन	18.94	18.94	18.94
2	गैर कृषि योग्य बंजर भूमि	0.62	0.62	0.60
3	गैर कृषि क्षेत्र में लगी भूमि	16.23	19.30	19.53
4	कृषि योग्य बंजर भूमि	1.03	0.28	0.27
5	स्थायी चारागाह	0.56	0.24	0.24
6	विविध वृक्ष	4.50	1.26	1.34
7	अन्य परती भूमि	1.38	0.60	0.54
8	चालू परती भूमि	3.89	0.64	1.01
9	शुद्ध बोया गया क्षेत्र	52.85	58.07	57.53

स्रोतः जिला सांख्यिकी कार्यालय पश्चिम चम्पारण

उपरोक्त तालिका से यह स्पष्ट होता है कि 1991 से 2011 वर्ष के मध्य पश्चिम चम्पारण जिला के भूमि उपयोग प्रतिरूप में भिन्नता पाई गई है। तालिका–3 में विगत दो दशकों (1991–2011) के दौरान जिले के भूमि उपयोग प्रतिरूप में हुए परिवर्तन को दर्शाता है। वर्ष 2011 में गैर–कृषि क्षेत्र में लगी भूमि एवं शुद्ध बोया गया क्षेत्र में क्रमशः 20.27 प्रतिशत तथा 9.33 प्रतिशत की वृद्धि दर्ज की गई है, जबकि कृषि योग्य बंजर भूमि, स्थायी चारागाह, विविध वृक्ष, अन्य परती भूमि एवं चालू परती भूमि के क्षेत्रों में 50 प्रतिशत से अधिक का ह्रास हुआ है। सर्वाधिक कमी चालू परती भूमि (–80.40 प्रतिशत) में दर्ज की गई है जबकि वन क्षेत्र का प्रतिशत अप्रभावित रहा है।

तालिका-3 : पश्चिम चम्पारण जिला में विगत दो दशकों में भूमि उपयोग के प्रतिरूप में परिवर्तन, 1991-2011

क्र.सं.	भूमि उपयोग वर्ग	क्षेत्र (एकड़ में) 1990–91	क्षेत्र (एकड़ में) 2010–11	परिवर्तन (प्रतिशत में)
1	वन	226698.79	226698.79	00
2	गैर कृषि योग्य बंजर जमीन	7474.67	7207.80	–3.57
3	गैर कृषि क्षेत्र में लगी भूमि	194309.37	233701.51	+20.27
4	कृषि योग्य बंजर भूमि	12332.59	3212.26	–73.95
5	स्थायी चारागाह	6688.90	2836.67	–57.59
6	विविध वृक्ष	53899.19	15992.09	–70.32
7	अन्य परती भूमि	16246.60	6412.16	–60.53
8	चालू परती भूमि	46607.36	9132.69	–80.40
9	शुद्ध बोया गया क्षेत्र	632557.45	691620.95	+9.33

स्रोत : जिला सांख्यिकी कार्यालय, पश्चिम चम्पारण एवं शोधकर्ता द्वारा तथ्यों के आधार पर आंकलित

उपरोक्त तालिकाओं के विश्लेषण से पता चलता है कि पश्चिम चम्पारण जिले का भूमि उपयोग प्रतिरूप जिले के समस्त भागों में समान नहीं है। इस असमानता या विषमता के पीछे वहाँ की विषम धरातलीय संरचना, उच्चावच, विषम अपवाह तंत्र और इन कारको के अलावा सबसे महत्वपूर्ण यहाँ की जनसंख्या का असमान वितरण है।

शुद्ध बोया गया क्षेत्र (1991-2011) :

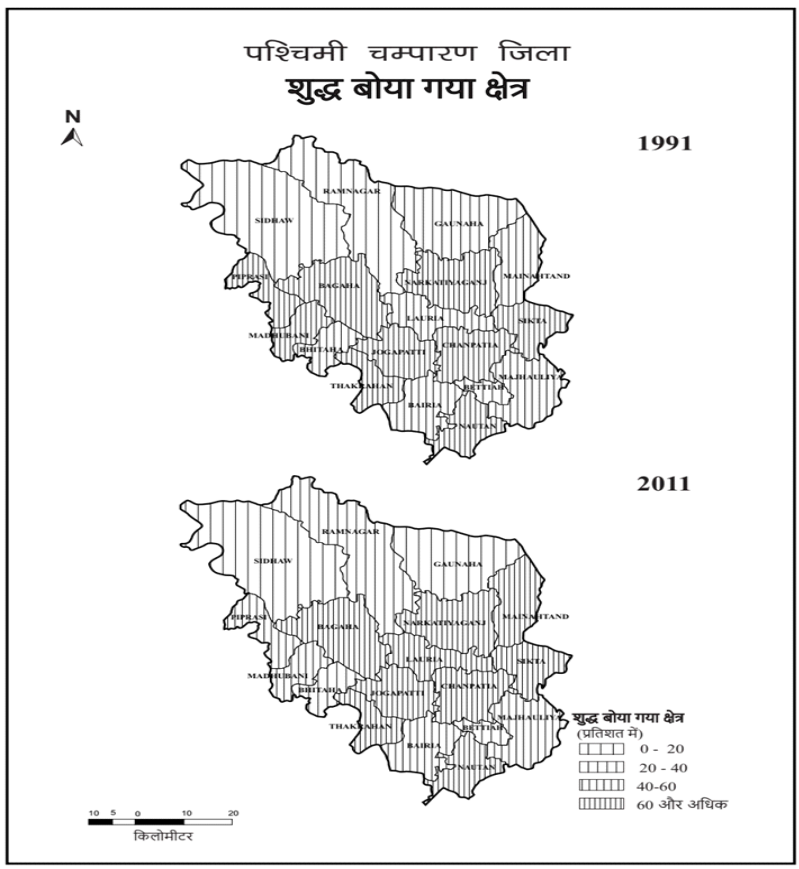
शुद्ध बोये गये क्षेत्र का तात्पर्य भूमि के उस भाग से है जिसका उपयोग प्रत्येक वर्ष फसल रोपण द्वारा कृषि उत्पादन के लिए किया जाता है। मैदानी क्षेत्र में स्थित प्रदेशों के भूमि उपयोग वर्ग में शुद्ध बोये गये क्षेत्र की व्यापक हिस्सेदारी होती है जो वहाँ की भूमि की प्रकृति और उच्च उर्वरा शक्ति के कारण संभव होता है। तालिका–4 में शुद्ध बोये गये क्षेत्र का प्रखण्डवार आँकड़ा प्रस्तुत किया गया है।

तालिका-4 : पश्चिम चम्पारण जिला में प्रखण्डवार शुद्ध बोया गया क्षेत्र, 1991-2011

क्र. सं.	प्रखण्ड	1991		2011		क्षेत्रफल में परिवर्तन (प्रतिशत में)
		क्षेत्रफल (एकड़ में)	प्रतिशत	क्षेत्रफल (एकड़ में)	प्रतिशत	
1	बेतिया	4370.10	26.55	4519.62	27.46	+3.42
2	मझौलिया	46515.71	53.02	47915.30	54.61	+3.00
3	नौतन	36112.32	69.01	34442.16	65.81	–4.62
4	बैरिया	25443.12	43.73	29549.30	50.79	+16.13
5	योगापट्टी	34122.03	60.75	35295.76	62.84	+3.43
6	चनपटिया	46501.32	70.40	40121.01	60.74	–13.72
7	नरकटियागंज	78223.52	81.85	80158.31	83.87	+2.47
8	लौरिया	45127.01	55.70	58668.59	72.41	+30.00
9	गौनाहा	26344.11	31.64	19275.41	23.15	–26.83
10	मैनाटाड़	35303.22	55.04	39652.91	61.82	+12.32
11	सिकटा	33434.10	63.47	39843.24	75.63	+19.16
12	बगहा	65322.75	65.27	88749.88	88.67	+35.86
13	सिधव	25113.62	15.73	40665.25	25.47	+61.92
14	रामनगर	44303.41	56.20	50235.17	57.38	+13.38
15	मधुबनी	21473.12	61.82	26539.82	76.41	+23.59
16	ठकराहां	22088.13	62.09	27780.25	78.09	+2.49
17	भितहां	15785.93	45.34	13309.23	38.23	–15.68
18	पिपरासी	26983.93	68.89	17726.28	44.77	–34.30
कुल		632557.45	52.85	691620.95	57.79	+9.33

स्रोत : जिला सांख्यिकीय विभाग, पश्चिम चम्पारण, 2012

पश्चिम चम्पारण जिला एक कृषि प्रधान जिला है। यहाँ की अधिकांश आबादी कृषि पर निर्भर है। समतल मैदानी भाग, सदानिरा गंडक नदी, अति उर्वर जलोढ़ मृदा, भूमिगत जलसंसाधन की सम्पन्नता आदि विशेषताओं के कारण इसका अधिकांश भाग शुद्ध बोये गये क्षेत्र के अन्तर्गत संलग्न है। भूमि उपयोग की यह श्रेणी इस जिला के सबसे बड़े भूमि उपयोग के अन्तर्गत आती है। वर्ष 2011 में पश्चिम चम्पारण जिला का 691620.95 एकड़ भूमि शुद्ध बोये गये क्षेत्र के अन्तर्गत है जो जिले के कुल भौगोलिक क्षेत्रफल का 57.79 प्रतिशत है। जिला में सर्वाधिक शुद्ध बोये गये क्षेत्र के अन्तर्गत बगहा (88.67 प्रतिशत) प्रखण्ड आता है। तत्पश्चात् नरकटियागंज (83.87 प्रतिशत), सिकटा (75.63 प्रतिशत), लौरिया (72.41), नौतन (65.81 प्रतिशत), ठकराहां (78.09 प्रतिशत), योगापट्टी (62.84 प्रतिशत), मैनाटाड़ (61.82 प्रतिशत), चनपटिया (60.74 प्रतिशत) एवं अन्य दूसरे प्रखण्ड आते है। बगहा से चनपटिया तक सभी प्रखण्डों में शुद्ध बोया गया क्षेत्र का प्रतिशत जिला औसत से अधिक है जबकि बेतिया (27.46 प्रतिशत), मझौलिया (54.61 प्रतिशत), बैरिया (50.79 प्रतिशत), गौनाहा (23.15 प्रतिशत), सिधव (25.47 प्रतिशत), रामनगर (57.38 प्रतिशत), मधुबनी (76.41 प्रतिशत), भितहां (38.23 प्रतिशत) तथा पिपरासी (44.77 प्रतिशत), प्रखण्डों में इस श्रेणी का प्रतिशत जिला औसत से कम है।



चित्र-3 : पश्चिम चम्पारण जिला के अन्तर्गत शुद्ध बोया गया क्षेत्र, 1991-2011

शुद्ध बोये गये क्षेत्र का प्रतिशत अधिक होने का मुख्य कारण जिले में विस्तृत समतल उपजाऊ जलोढ़ मैदान की उपस्थिति, सिंचाई सुविधाओं का पर्याप्त विस्तार, गहन कृषि, रासायनिक खादों का प्रयोग तथा जनसंख्या के अधिकांश भाग का कृषि कार्यों में संलग्नता है। वहीं जिले के विभिन्न प्रखण्डों के अन्तर्गत शुद्ध बोये गये क्षेत्र में संलग्न भूमि के प्रतिशत में कमी का मुख्य कारण उन क्षेत्रों में बलुई मिट्टी की प्रधानता, पहाड़ी क्षेत्रों का विस्तार, तराई क्षेत्रों का विस्तार, नगरीकरण का विस्तार आदि है। बेतिया प्रखण्ड में शुद्ध बोया गया क्षेत्र का प्रतिशत कम होने का प्रमुख कारण जिला मुख्यालय की स्थिति, औद्योगिकरण, नगरीकरण, सड़कों, रेलमार्गों का विस्तार तथा अन्य दूसरे कार्य में भूमि की संलग्नता है। गौनाहा एवं सिधव प्रखण्डों में इस श्रेणी का भूमि उपयोग पहाड़ी एवं तराई क्षेत्र, गंडक नदी क्षेत्र आदि की उपस्थिति के कारण जिले के सभी प्रखण्डों में न्यूनतम है।

वर्ष 1991 में जहाँ 632557 एकड़ भूमि शुद्ध बोये गये क्षेत्र के अन्तर्गत संलग्न था जो जिले के 52.85 प्रतिशत भू–क्षेत्र पर विस्तृत था, वहीं वर्ष 2011 में 691621 एकड़ हो गया जो जिला का 57.79 प्रतिशत है। इस प्रकार इन दो दशकों के दौरान जिले के शुद्ध बोये गये क्षेत्र में 9.33 प्रतिशत वृद्धि देखने को मिलती है। वृद्धि का यह प्रतिशत प्रखण्डवार अलग–अलग है जो तालिका–4 एवं चित्र–3 से स्पष्ट होता है। वर्ष 1991 की तुलना में वर्ष 2011 में शुद्ध बोये गये क्षेत्र में सर्वाधिक वृद्धि सिधव प्रखण्ड (61.92 प्रतिशत) में तथा इसके बाद बगहा प्रखण्ड (35.86 प्रतिशत) में देखने को मिलती है। वहीं दूसरी ओर पिपरासी प्रखण्ड में (34.30 प्रतिशत) तथा गौनाहा प्रखण्ड में (26.83 प्रतिशत) की कमी दर्ज की गई है।

निष्कर्ष :

उपर्युक्त आँकड़ों और उसके विश्लेषण के आधार पर यह स्पष्ट है कि पश्चिम चम्पारण जिला में कुल नौ प्रकार के भूमि उपयोग वर्ग हैं जिसमें सर्वाधिक भू–भाग शुद्ध बोये गए क्षेत्र के अन्तर्गत संलग्न है। विगत वर्षों (1991–2011) के दौरान शुद्ध बोये गये क्षेत्र एवं गैर कृषि क्षेत्र में लगी भूमि में वृद्धि हुई है। इस परिवर्तन का ऋणात्मक प्रभाव जिले के अन्य भूमि उपयोग वर्गों पर पड़ा है। इसका प्रमुख कारण इन दो दशकों में बढ़ी हुई जनसंख्या के लिए अतिरिक्त भूमि की आवश्यकता तथा पोषण के दबाव के कारण कृषि भूमि का विस्तार है। वाल्मिकीनगर राष्ट्रीय उद्यान के कारण जिले में वन क्षेत्र अप्रभावित रहा है।

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मधुबनी जिला के संदर्भ में श्रम प्रवास की प्रकृति और निर्धारण : एक भौगोलिक अध्ययन

सोनू कुमार दास*
Email: sonukumardas524@gmail.com

कृष्णकांत मिश्र**
Email: kkmishra18aug@gmail.com

सार

प्रवसन विकास की प्रक्रिया का एक अभिन्न अंग है। बिहार के ग्रामीण क्षेत्रों से प्रवसन पूरे देश में सर्वाधिक होता है। इनमें से छोटे कृषक, कृषक मजदूर, दैनिक मजदूर एवं बेरोजगार लोग बिहार से बाहर दिल्ली, मुंबई, कोलकाता, चेन्नई, पंजाब एवं सूरत जैसे औद्योगिक शहरों में प्रवास करते हैं। इनके प्रवास का सबसे प्रमुख कारण आजीविका के लिए रोजगार प्राप्त करना है। बिहार के मधुबनी जिले से प्रवास से संबंधित आंकड़ों को प्राप्त करने के लिए स्तरीकृत यादृच्छिक प्रतिचयन विधि का प्रयोग किया गया है। इसके तहत लगभग 100 प्रवासित परिवारों की प्रश्नावली विधि द्वारा जानकारी प्राप्त की गई है। प्राप्त आंकड़ों के विश्लेषण से पता चलता है कि मधुबनी जिले से प्रवास केवल भारत में ही नहीं बल्कि भारत से बाहर भी हुआ है जिसमें सऊदी अरब, दुबई एवं कतर प्रमुख अप्रवास क्षेत्र हैं। बिहार सरकार एवं केंद्र सरकार की योजनाओं एवं नीतियों का विफल होना भी इस क्षेत्र से प्रवास का प्रमुख कारण माना जाता है। जैसे– मनरेगा, प्रधानमंत्री ग्राम सड़क योजना, सार्वजनिक वितरण प्रणाली आदि। वर्तमान में गुणवत्तापूर्ण शिक्षा प्राप्त करने के लिए भी बड़ी संख्या में विद्यार्थियों का प्रवास दिल्ली, कोटा, बेंगलुरु, कोलकाता, हैदराबाद जैसे शहरों में होता है। गंभीर बाढ़ एवं सूखे सार्वजनिक क्षेत्र के उद्योग के बंद होने एवं राजनीतिक अस्थिरता ने इस क्षेत्र से प्रवास को बढ़ावा दिया है। यह अध्ययन नियोजकों, सरकारों एवं अन्य शोधकर्ताओं के लिए सहायक सिद्ध होगा जिससे प्रभावित होकर इस क्षेत्र से होने वाले प्रवास को रोकने का प्रयास किया जाएगा।

मुख्य शब्दावली : प्रवसन, स्तरीकृत यादृच्छिक प्रतिचयन, अप्रवास, गुणवत्तापूर्ण शिक्षा

परिचय

मानव इतिहास की शुरुआत से ही जनसंख्या का प्रवास एक आवर्तक घटना रही है। वर्तमान समय में लोग बेहतर रोजगार के अवसरों और सुरक्षा के दृष्टिकोण से अविकसित क्षेत्रों से विकसित क्षेत्रों की ओर पलायन करते हैं। इसलिए इसे एक जनसांख्यिकीय प्रक्रिया के रूप में भी देखा जाता है जो न केवल लोगों को अच्छे रोजगार के अवसर और बेहतर रहने की स्थिति प्रदान करती है बल्कि उन्हें आपदाओं के प्रकोप से बचने का भी अवसर प्रदान करती है। प्रवास के निर्धारकों, प्रकारों और प्रतिमानों को समझने के लिए कई सिद्धांत हैं (B Barman, 2019; Bogue, 1969; Nandan Kumar and R-B-Bhagat, 2012)। इसमें सबसे प्रभावी आकर्षक और प्रतिकर्षक सिद्धांत है जिससे यह स्पष्ट होता है कि

* सोनू कुमार दास, शोधार्थी, भूगोल विभाग, ललित नारायण मिथिला विश्वविद्यालय, दरभंगा
** डॉ॰ कृष्णकांत मिश्र, एसोसिएट प्रोफेसर एवं अध्यक्ष, भूगोल विभाग, एम.एल.एस.एम. कॉलेज, ल.न.मि.वि., दरभंगा

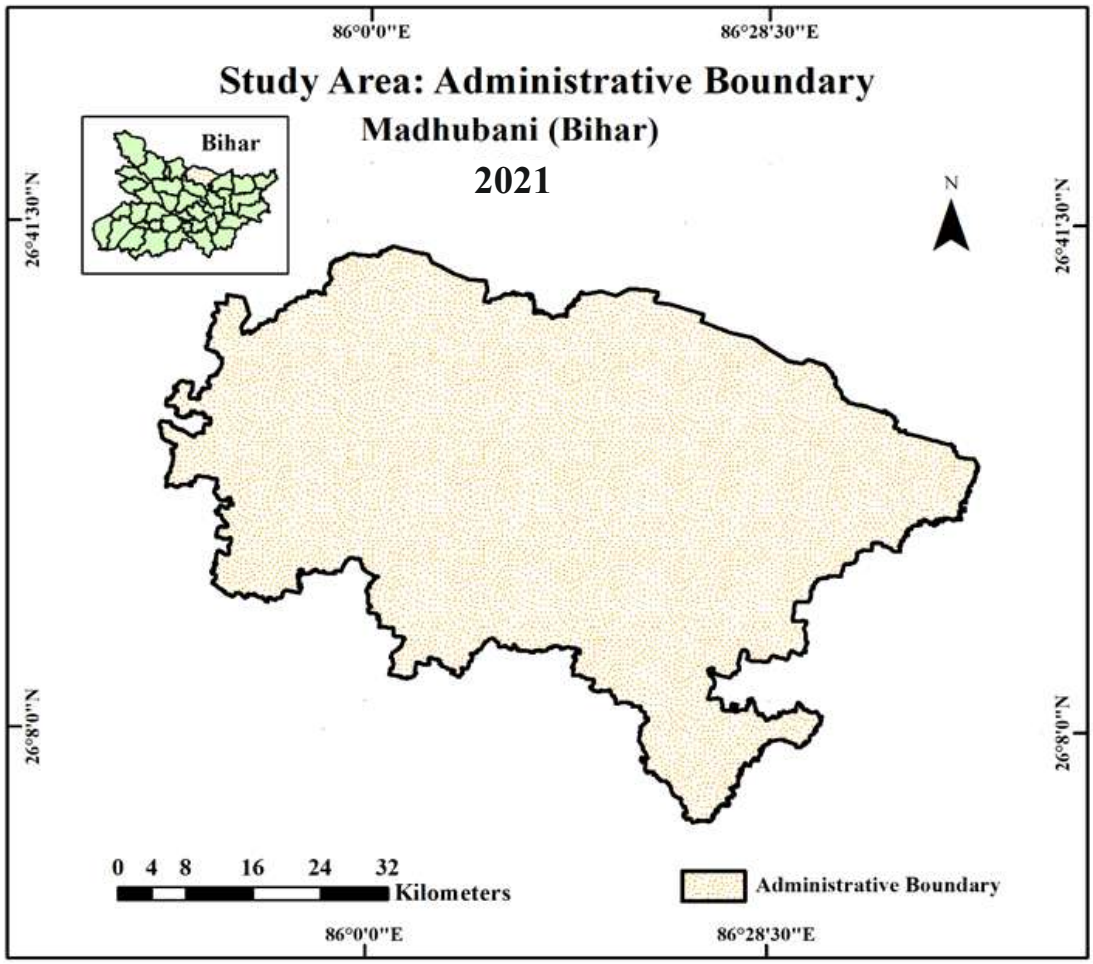
प्रवसन की धारा तब होती है जब गंतव्य स्थान पर सकारात्मक आकर्षण कारक मूल स्थान पर प्रतिकर्षक कारकों से अधिक हो जाते हैं। प्रवसन के विभिन्न कारकों जैसे–सामाजिक, आर्थिक, सांस्कृतिक, स्थानिक, जनसांख्यिकी, आदि में आर्थिक कारणों को प्रवास के लिए अग्रणी कारक माना जाता है (P Deshingkar, 2006; Roy et al., 2020)। चूंकि प्रवासियों में आबादी की सबसे अधिक उत्पादक शक्ति शामिल है, जो छूट गए हैं उनमें वृद्ध लोग, बच्चे और महिलाएं शामिल हैं। परिवार में सक्रिय पुरुष सदस्य की अनुपस्थिति में, आमतौर पर घर की महिलाएं ही घर की जिम्मेदारी और घरेलू मामलों से संबंधित निर्णय लेते हैं।

हमारे देश में औपनिवेशिक काल के बाद से अंतर्राज्यीय प्रवास का एक लंबा इतिहास रहा है, जहां उन्होंने शुरुआत में दैनिक वेतन भोगी श्रमिकों के रूप में काम किया और फिर बाद में ब्रिटिश शासन के उपनिवेशों में सेवा करने के लिए विदेशों में ले जाया गया, जैसे – अफ्रीका, कैरिबियन और मध्य अमेरिकी देशों में। जनसंख्या का उच्च घनत्व, बार–बार आने वाला सूखा, वार्षिक बाढ़, और जमींदारी व्यवस्था की कुप्रथाओं ने भूमिहीन किसानों, मजदूरों और अन्य किसानों को भोजन और बेहतर जीवन स्थितियों के लिए पलायन करने के लिए मजबूर कर दिया। स्वतंत्रता के बाद भी प्रवास की धारा जारी रही क्योंकि बिहार में सरकारी संस्थानों की विफलता और प्राकृतिक खतरें अभी भी मौजूद है। नालंदा और रोहतास जैसे दक्षिण बिहार के जिलों की तुलना में उत्तर बिहार के जिलों–पूर्णिया, अररिया, गोपालगंज और मधुबनी से पलायन अधिक हुआ है। दिल्ली, पंजाब, हरियाणा, महाराष्ट्र, कर्नाटक और गुजरात जैसे विकसित राज्यों में औद्योगिक केंद्र प्रवासियों के आकर्षण का प्रमुख कारण है (Nandan Kumar and R.B. Bhagat, 2012)। इन राज्यों में औद्योगिक विकास ने बिहार के विभिन्न जातियों, वर्गों और क्षेत्रों में बड़े पैमाने पर प्रवासियों को आकर्षित किया। उत्तर बिहार का मधुबनी जिला मुख्य रूप से अल्प विकसित कृषि अर्थव्यवस्था, उद्योगों की कमी और ढांचागत सुविधाओं में कमी पलायन में योगदान दे रहा है (Archana K Roy and Parveen Nangia, 2005; Roshania et al., 2022)। इन बाढ़ प्रवण क्षेत्रों से प्रवसन कोई नई बात नहीं है, क्योंकि गंभीर बाढ़ और सूखा, सार्वजनिक क्षेत्र के उद्योगों का बंद होना और राजनीतिक अस्थिरता इस क्षेत्र से बाहर प्रवास को बढ़ावा देने वाली विनाशकारी घटनाओं के रूप में काम किया। पहले सीमांत कार्यशील पुरुष को नेपाल के निर्माण उद्योग में कुलियों के रूप में रोजगार मिलता था, लेकिन बाद में सीमा पार बढ़ते राजनीतिक तनाव और विराटनगर में कई चावल मिलों के बंद होने से उनकी भागीदारी में उल्लेखनीय कमी आई। इस बीच बिहार के नरार, सकरी, रैयाम और लोहट में लगभग अठारह चीनी मिलों को बंद कर दिया गया, जिससे पलायन को बढ़ावा मिला। बाद के वर्षों में, संस्थागत और कानून–व्यवस्था संबंधी समस्याओं के कारण हजारों श्रमिकों को रोजगार देने वाली तीन बड़ी चावल मिलों को बंद कर दिया गया था। प्रारंभिक चरण में महिलाएं प्रवास नहीं करती थीं और स्थानीय रूप से अपने खेतों में जिम्मेदारियों को निभाती थीं। इन सभी समस्याओं के परिणामस्वरूप देश के अन्य हिस्सों के विकसित स्थानों पर प्रवासियों का भारी बहिर्वाह हुआ।

प्रस्तुत पत्र उत्तर बिहार के मधुबनी जिला में किए गए एक घरेलू सर्वेक्षण के माध्यम से निर्धारकों और उनके पैटर्न का पता लगाने का प्रयास करता है। यह रोजगार के क्षेत्रों पर शिक्षा के प्रभाव और प्रवसन के लिंग प्रभाव पर भी प्रकाश डालता है।

अध्ययन क्षेत्र

मधुबनी जिला बिहार के 38 जिलों में से एक है (चित्र संख्या 1) और इसे मिथिला संस्कृति के एक महत्वपूर्ण क्षेत्र के रूप में देखा जाता है। इसका कुल भौगोलिक क्षेत्रफल 3,501 वर्ग किलोमीटर है। यह पश्चिम में सीतामढ़ी, पूर्व में सुपौल, उत्तर में नेपाल और दक्षिण में दरभंगा से घिरा हुआ है। इसका संपूर्ण क्षेत्र नदियों द्वारा लायी गई अवसादों से निच्छेपित मैदान है जो उत्तर में हिमालय, पूर्व में कोसी, दक्षिण में गंगा एवं पश्चिम में बागमती नदी द्वारा घिरा हुआ है। यहां की मिट्टी अत्यंत ही उपजाऊ है जिसमें मुख्य रूप से धान, गेहूं, गन्ना आदि की गहन कृषि की जाती है। इसलिए यहां का जनसंख्या घनत्व उच्च है। यहां औसत वार्षिक वर्षा 100–150 सेमी होती है। 2011 की जनगणना के अनुसार यहां की कुल जनसंख्या 44,87,389 है जो बिहार के कुल जनसंख्या का 4.31% है। यहां का जनसंख्या घनत्व 1300 व्यक्ति प्रति वर्ग किलोमीटर है। इसकी साक्षरता दर 58.62% है जबकि इसका लिंगानुपात 926 है।



चित्र संख्या 1 : अध्ययन क्षेत्र की प्रशासनिक सीमा

उद्देश्य

जनसांख्यिकीय दृष्टिकोण से अध्ययन क्षेत्र बड़े पैमाने पर पलायन के साथ एक स्थानिक इकाई का निर्माण करते हैं। लेकिन इस कृषि क्षेत्र से लोगों के पलायन को अंतर्निहित निर्धारकों और स्थानिक परिवर्तन के प्रतिरूपों के गहन विश्लेषण की आवश्यकता है। इस पत्र का उद्देश्य निम्नलिखित उद्देश्यों के साथ बाह्य–प्रवास की समस्या का समाधान करना है:

- प्रवासियों के पसंदीदा स्थानों के प्रवास के प्रकार और स्थानिक पैटर्न का अध्ययन करना।
- प्रवासियों की शैक्षिक स्थिति और उनके रोजगार के क्षेत्र पर शिक्षा के प्रभाव का अध्ययन करना।
- लिंग आयाम और सरकारी कार्यक्रमों के बाह्य–प्रवास पर प्रभाव का मूल्यांकन करना।

आंकड़ा-स्रोत एवं शोध विधियाँ

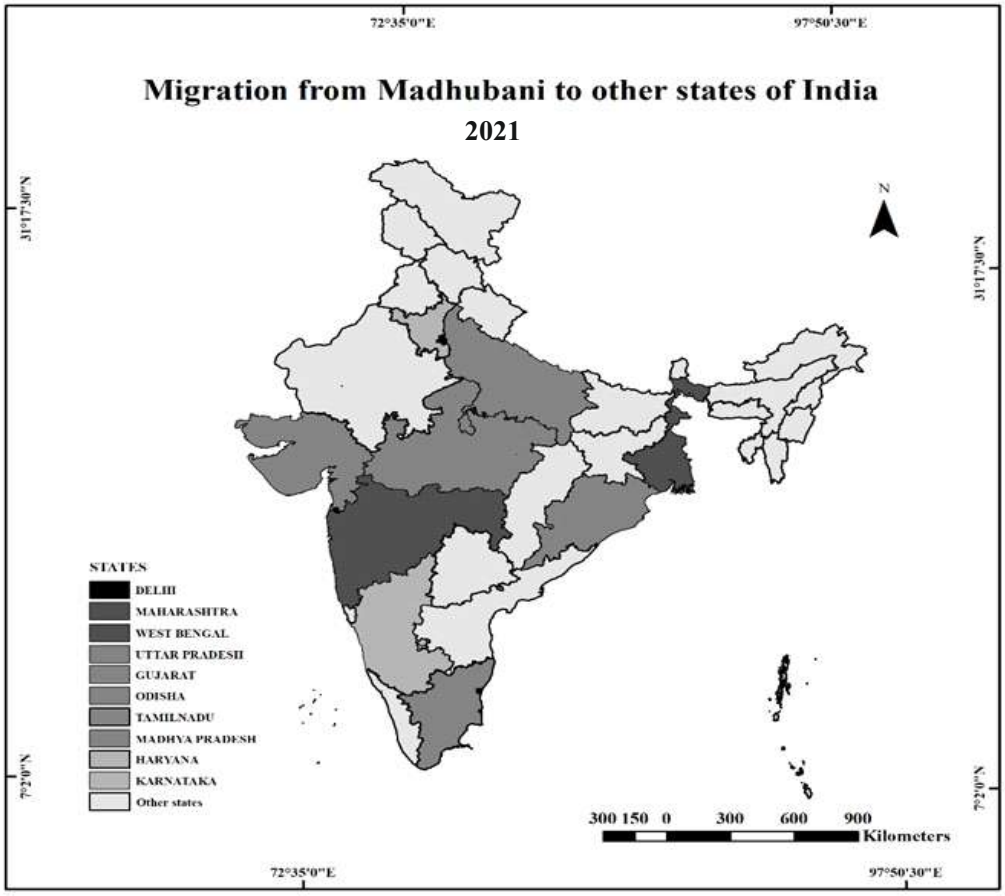
वर्तमान अध्ययन में परिवार आधारित प्राथमिक सर्वेक्षण किया गया है जिसका उद्देश्य प्रवास के प्रकार, स्थानिक पैटर्न और उनके रोजगार के क्षेत्र पर शिक्षा के प्रभाव का अध्ययन करना है। मधुबनी जिला में 21 प्रखंड में फैले 640 प्रवासियों से 120 घरों का आंकड़ा एकत्र किया गया है। श्रम और छात्र प्रवास का अध्ययन करने के लिए स्तरीकृत यादृच्छिक नमूनाकरण किया गया। उत्प्रवास के विभिन्न सरकारी कार्यक्रमों के लिंग आयाम और प्रभाव का आकलन प्रवासियों के परिवार के सदस्यों के साथ अवलोकन और प्रश्नावली के माध्यम से किया गया है। आंकड़ों को प्रवासियों की लिंग संरचना, रोजगार के क्षेत्र, शिक्षा के स्तर और पसंदीदा गंतव्यों जैसे संकेतकों को एकत्र किया गया है। संभावित उत्तरदाताओं तक पहुंचने के लिए स्तरीकृत उद्देश्यपूर्ण नमूनाकरण तकनीक का प्रयोग किया गया है। आंकड़ों का विश्लेषण SPSS सॉफ्टवेयर (Amrita Datta, 2016; Roy et al., 2020) के माध्यम से किया गया है। सूचना के प्रतिनिधित्व के लिए सांख्यिकीय तकनीकों जैसे– पाई चार्ट और दंड आरेख तैयार किए गए है। ArcGIS software से मानचित्र तैयार किया गया है। इस अध्ययन के दायरे को समझने के लिए जनगणना हैंडबुक 2011 के आंकड़ों का भी उपयोग किया गया है।

परिणाम और चर्चा

प्रवास : प्रकार, विशेषताएं और पसंदीदा स्थान

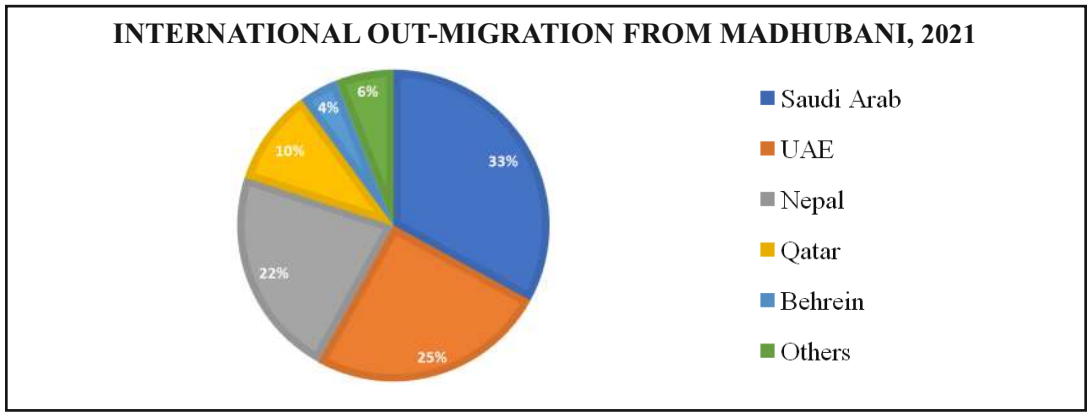
मधुबनी से प्रवास राज्य के भीतर, भारत के अन्य राज्यों और अन्य देशों में होता है। प्राथमिक घरेलू सर्वेक्षण मधुबनी में दो प्रमुख प्रकार के प्रवसन को दर्शाता है। पहला, मौसमी प्रवास जहां प्रवासी अल्प अवधि के बाद मूल स्थान पर लौटते हैं, और दूसरा स्थायी प्रवास जहां लोग अपने घर को स्थायी रूप से विस्थापित कर देते हैं और कभी–कभार मूल स्थान पर जाते हैं। मौसमी प्रवास मुख्य रूप से किसानों और खेतिहर मजदूरों के बीच होता है जो बुवाई और फसल कटाई के समय वित्तीय लाभ के लिए भारत के अन्य कृषि राज्यों में प्रवास करते हैं। जबकि स्थायी प्रवास में लोग अपने मूल स्थान को हमेशा के लिए छोड़ देते हैं और प्रवासित स्थान पर स्थायी रूप से रहने लगते हैं। यह पाया गया कि अधिकांश स्नातक, इंजीनियर, डॉक्टर और अन्य सरकारी कर्मचारी कार्यस्थल के आधार पर स्थायी रूप से पलायन करते हैं। हालाँकि, वे अपने गाँव से सामाजिक संबंध रखते हैं ताकि वे अपने लोगों से संप्रेषण कर सकें लेकिन

वे गाँव के मामलों में कम से कम सरोकार रखते हैं। मधुबनी में आबादी के विभिन्न स्तरों से एकत्र किए गए आंकड़ों का विश्लेषण करने के बाद, यह पाया गया है कि बिहार के भीतर प्रवसन 7% है जहां लोग मुख्य रूप से पटना (1.9%), दरभंगा (2.5%), भागलपुर (1.2%) और अन्य जिलों (1.4%) में बेहतर वेतन और काम के अवसर, रहने की स्थिति एवं बेहतर उच्च शिक्षा की सुविधा के कारण पलायन करते हैं। प्रवासियों के बीच प्रवास की अवधि काफी भिन्न होती है।



चित्र संख्या 2 : मधुबनी जिला से अन्य राज्यों में प्रवसन

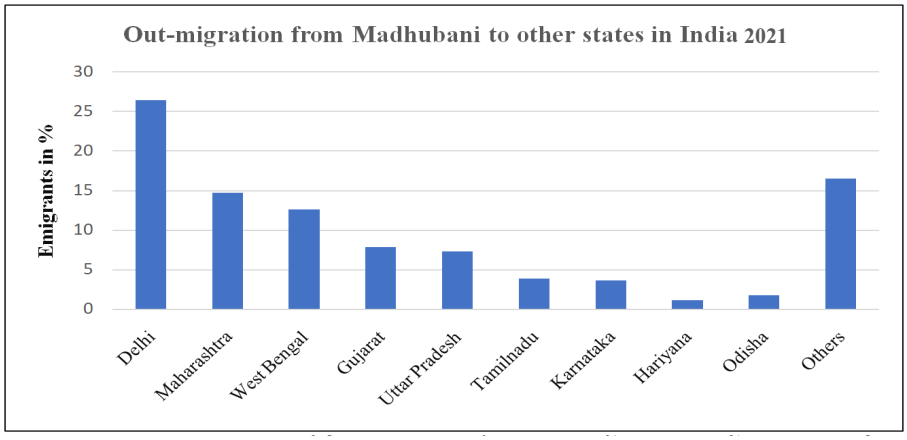
बिहार से पलायन के अन्तर्गत 65.7% पुरुष प्रवासियों के रूप में माना जाता है। प्रवसन आंकड़ों के स्थानीय विश्लेषण से पता चलता है कि ग्रामीण बिहार से 90% से अधिक प्रवासी श्रमिक भारत के भीतर अन्य राज्यों में जाने के लिए लंबी दूरी का प्रवसन करते हैं। उत्तर भारत में अपेक्षाकृत अच्छी तरह से संपन्न राज्य बिहार के प्रवासी श्रमिकों के लिए सबसे पसंदीदा स्थान हैं। दिल्ली, पंजाब और हरियाणा में बिहार के कुल प्रवासी श्रमिकों का लगभग एक–चौथाई हिस्सा है। भारत के पश्चिमी राज्यों की ओर, महाराष्ट्र और गुजरात वांछित गंतव्य पाए गए (चित्र संख्या 2)। हाल के वर्षों में, दक्षिणी राज्य भी महत्वपूर्ण हैं।



चित्र संख्या 3 : मधुबनी जिला से अन्तराष्ट्रीय प्रवसन

चित्र–1 मधुबनी से प्रवासियों के पसंदीदा गंतव्य को दर्शाता है जहां बड़ी संख्या में बाहरी प्रवासियों को दिल्ली (26.4%), महाराष्ट्र (14.7%),पश्चिम बंगाल (12.6%), गुजरात (7.9%), उत्तर प्रदेश (7.3%), तमिलनाडु (3.9%), कर्नाटक (3.7%), हरियाणा (1.2%), ओडिशा (1.8%) और अन्य राज्यों (16.5%) में स्थानांतरित किया गया। प्रवास का प्रवाह और दिशा समय के साथ बदल गई है और अधिकांश प्रवास भारत के उत्तर–पश्चिमी और पश्चिमी भागों की ओर हो रहा है। दिल्ली, महाराष्ट्र, पंजाब, हरियाणा और गुजरात जैसे राज्यों में प्रवासियों की संख्या लगभग 50% है। इससे बच्चों की आर्थिक स्थिति, जीवन शैली, स्वायत्तता, शिक्षा और स्वास्थ्य में सुधार हुआ है।

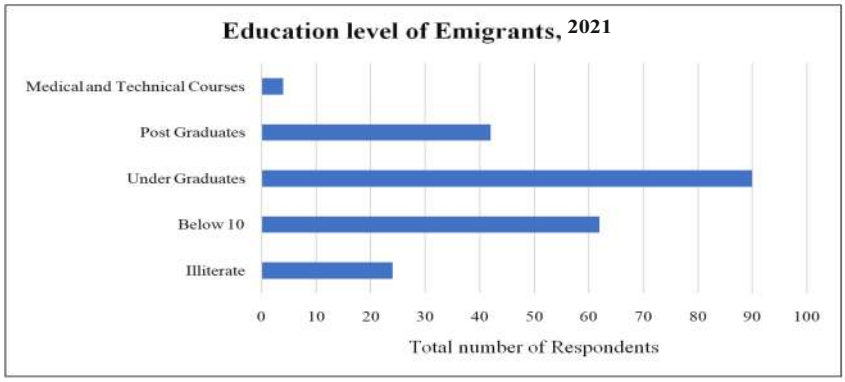
अंतर्राष्ट्रीय प्रवास ज्यादातर मुस्लिम समुदाय लेकिन हिन्दू समुदाय में भी देखा गया जो खाड़ी देशों में जाना पसंद करते हैं (चित्र–2) विशेष रूप से सऊदी अरब (1.7%), दुबई (1.3%), कतर (0.5%), बहरीन (0.5%)। उनके द्वारा भेजे गए धन से परिवार की संपत्ति में वृद्धि हुई है और बच्चों की शिक्षा और पोषण में संतोषजनक सुधार हुआ है।



चित्र संख्या 4 : अन्य राज्यों में मधुबनी से प्रवसन

प्रवास के स्थानिक पैटर्न

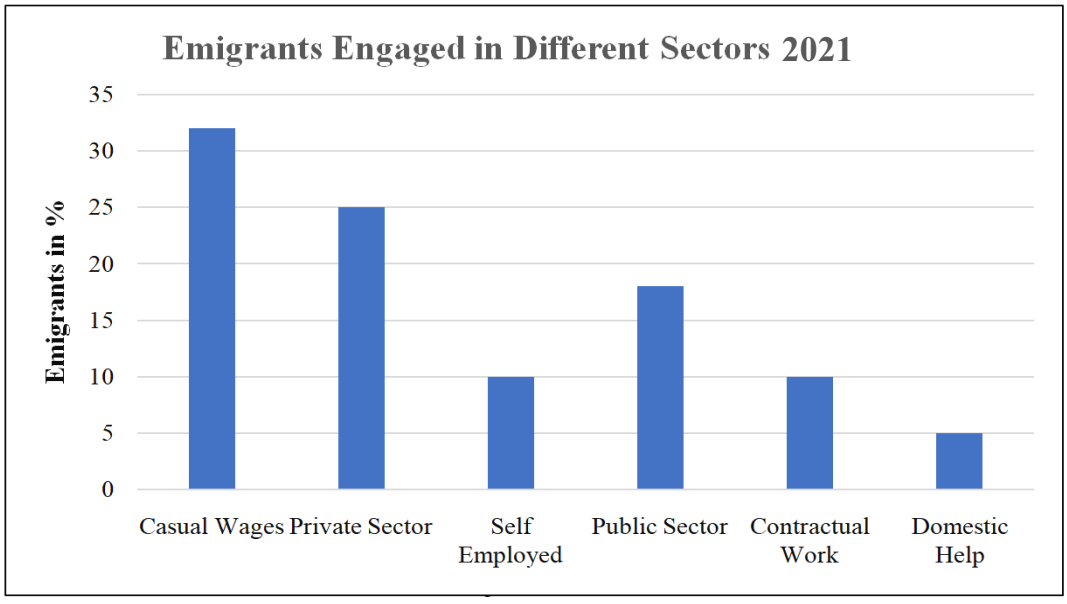
मधुबनी जिला चुनौतियों से भरा है, जिसमें व्यापक गरीबी और कम कृषि उत्पादकता के कारण आर्थिक गतिरोध, बाढ़ के कारण नुकसान, औद्योगिक विकास में निवेश की कमी शामिल है। इस प्राथमिक अध्ययन से पता चलता है कि प्रवासी श्रमिक राज्य के भीतर या बिहार के बाहर कृषि गतिविधियों में कम रुचि दिखाते हैं। यद्यपि भारत के विभिन्न शहरों में प्रवासी बसे हुए हैं, लेकिन अधिकांश प्रवासी दसलाखी शहरों, विशेष रूप से नई दिल्ली और मुंबई समूह में हैं। इन शहरों के लिए यह जुनून इन शहरों की धारणा के साथ पैदा होता है जो उच्च अवसरों और रोजगार के साथ देश के प्रमुख शहर और प्रमुख आर्थिक केंद्र के रूप में काम करते हैं। यह विश्लेषण किया गया कि मधुबनी से पलायन करने वाले मुख्य रूप से रोजगार के अवसरों और उच्च शिक्षा की आकांक्षा के लिए होते हैं। ग्रामीण प्रवासी जो या तो निरक्षर थे या जिनकी शिक्षा मैट्रिक से कम थी (चित्र संख्या 3) ने अपना कार्य कृषि से मुंबई और दिल्ली जैसे महानगरों तथा गुजरात, पंजाब और हरियाणा जैसे राज्यों में कारखाने के मजदूरों में स्थानांतरित कर दिया। जबकि उच्च शिक्षा में अच्छा प्रदर्शन करने वाले और चिकित्सा और तकनीकी पाठ्यक्रमों में कुशल लोग या तो दरभंगा और राजधानी पटना में तृतीयक क्षेत्रों में चले गए, जबकि बिहार के बाहर वे तेलंगाना, कर्नाटक और तमिलनाडु जैसे दक्षिणी भारत के राज्यों में चले गए। यह भी पाया गया कि प्रवासी धारा में मुख्य रूप से केवल पुरुष कार्यबल शामिल होते हैं जो प्रवास के बाद प्राथमिक क्षेत्र (16.8%), द्वितीयक क्षेत्र (16.4%), तृतीयक क्षेत्र (15.5%) में संलग्न हो जाते हैं। उच्च शिक्षा (18.7%) के लिए पलायन करने वालों में कोई परिवर्तन नहीं किया गया। उनमें से कुछ स्थायी सरकारी नौकरियों (3.1%) में चयन के कारण राज्य के भीतर के शहरों में चले गए। (चित्र संख्या 4) मधुबनी के प्रवासी कामगारों की क्षेत्रीय संरचना को दर्शाता है, जहां इसमें दिहाड़ी मजदूर (15.9%) शामिल हैं, इसके बाद निजी क्षेत्र में नियमित वेतन/वेतनभोगी (9.1%) शामिल हैं। उनमें से अल्पसंख्यक स्व–नियोजित (3.1%), सार्वजनिक क्षेत्र में नियमित वेतन/वेतनभोगी (4.1%), संविदात्मक कार्य (3.1%), और घरेलू मजदूर (1.8%) थे। प्रवसन केवल गंतव्य से संबंधित नहीं है बल्कि अर्थव्यवस्था के एक क्षेत्र से दूसरे क्षेत्र में जाने के रूप में कार्य की प्रकृति में परिवर्तन से भी संबंधित है। यह सांख्यिकीय रूप से गणना की गई थी कि अर्थव्यवस्था के क्षेत्रों के भीतर सबसे अधिक कार्यशील प्रवास प्राथमिक क्षेत्र से प्राथमिक क्षेत्र (50%), प्राथमिक क्षेत्र से द्वितीयक क्षेत्र (40%) और प्राथमिक क्षेत्र से तृतीयक क्षेत्र (10%) के बीच दर्ज किया गया। द्वितीयक क्षेत्र के बीच प्राथमिक या तृतीयक क्षेत्र में संचलन के लिए कोई परिवर्तन दर्ज नहीं किया गया।



चित्र संख्या 5 : प्रवासियों का शिक्षा स्तर

विभिन्न सरकारी योजनाओं के प्रभाव

बिहार में प्रवसन क्षेत्र में विशेष रूप से पुरुषों का ही वर्चस्व है। सभी उत्तरदाताओं में से केवल 22% महिला उत्तरदाताओं ने ही मधुबनी से प्रवास किया। विवाह के बाद राज्य के भीतर अधिक पलायन हुआ। 10% से कम उत्तरदाता केवल परिवार के हिस्से के रूप में बिहार से बाहर प्रवास किए। घर से पुरुषों के पलायन के कारण महिलाओं को ही परिवार के मुखिया के रूप में माता–पिता और बच्चों की देखभाल करने की जिम्मेदारियां मिलीं। अधिकांश महिलाओं ने खुद को प्राथमिक क्षेत्रों विशेषकर खेतों में भी लगाया है। हालांकि, ग्राम पंचायतों में उनकी भागीदारी नगण्य देखी गई है। प्रवासियों के लिए काम के अवसर विकसित किए। सरकार ने किसानों के स्थायी भविष्य को सक्षम करने के लिए झीलों के निर्माण और पीने के पानी के पाइप बिछाने के लिए "जल जीवन हरियाली" जैसी महत्वाकांक्षी परियोजना शुरू की है। मनरेगा (महात्मा गांधी राष्ट्रीय ग्रामीण रोजगार गारंटी अधिनियम) ने भूमिहीन लोगों को सड़कों और तालाबों के निर्माण जैसे दैनिक मजदूरी का काम प्रदान करके पलायन को रोकने में मदद की है। अज्ञानता और जागरूकता की कमी के परिणाम स्वरूप बुनियादी सामाजिक सुरक्षा जैसे पीडीएस, मनरेगा या विभिन्न सरकारी लाभ योजनाओं तक पहुंच कम हो गई। साथ ही, बुनियादी सेवाओं और बुनियादी ढांचे में निवेश की कमी ने ग्रामीण परिवारों को भी प्रभावित किया है, जिन्हें उच्च शिक्षा या प्राथमिक स्वास्थ्य सेवा तक पहुंचने में बाधाओं का सामना करना पड़ता है। अन्य समान मुद्दों के साथ ये सभी कारक प्रवासियों को सामाजिक सुरक्षा प्रदान करने में विफल रहे हैं। सार्वजनिक वितरण प्रणाली, मनरेगा और सामाजिक सुरक्षा योजनाओं जैसे बुनियादी अधिकारों को मजबूत करने से बाह्य प्रवास के प्रवाह पर महत्वपूर्ण प्रभाव पड़ सकता है। आंगनवाड़ी जैसी बाल देखभाल सुविधाओं तक पहुंच से महिलाओं और युवा लड़कियों पर काम का बोझ कम होने की उम्मीद है।



चित्र संख्या 6 : विभिन्न कार्यों में लगे प्रवासी

सारांश और निष्कर्ष

इस अध्ययन में मधुबनी में घरों के प्राथमिक सर्वेक्षण के आधार पर प्रवासियों के निर्धारकों और स्थानिक पैटर्न का विश्लेषण करने का प्रयास किया गया है। खराब ढांचागत सुविधाओं, कम सरकारी अवसरों और बाढ़ आपदा के प्रभाव से बिहार के उत्तरी भाग में पुरुष कार्यबल को पलायन करने के लिए मजबूर किया है। मधुबनी से भारत में कृषि और औद्योगिक केंद्रों और विदेशों में मुख्यतः खाड़ी देशों में मौसमी और स्थायी दोनों प्रकार के प्रवास देखने को मिलते हैं। अंतर्राष्ट्रीय प्रवास ज्यादातर मुस्लिम समुदायों द्वारा किया जाता है जो प्राथमिक और माध्यमिक श्रमिकों के रूप में मजदूरों और कुशल श्रमिकों के रूप में काम करते हैं। दिल्ली और मुंबई जैसे शहरों में लाखों से अधिक लोगों का भारी बाह्य प्रवाह उच्च वेतन, रोजगार के अवसर और बेहतर जीवन स्थितियों जैसे निर्धारकों द्वारा संचालित होता है। भारत के दक्षिणी राज्यों जैसे तेलांगना, कर्नाटक और तमिलनाडु में प्रवसन तृतीयक क्षेत्र में नौकरी चाहने वाले छात्रों और वेतनभोगी द्वारा किया जाता है। पंजाब और हरियाणा मौसमी श्रमिकों को किसानों और खेतिहर मजदूरों के रूप में आकर्षित करते हैं जो अपने खेतों और औद्योगिक इकाइयों में काम कर सकते हैं। बिहार राज्य के भीतर प्रवसन नगण्य है। मनरेगा और जल जीवन हरियाली जैसी सरकारी पहल इस क्षेत्र से पलायन को रोकने में विफल रही हैं। प्रवास के इस पूरे स्पेक्ट्रम में, महिलाओं को परिवार और सामाजिक बोझ के साथ छोड़ दिया जाता है और उन्हें अक्सर परिवार के मुखिया के रूप में कार्यभार संभालना पड़ता है।

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शिवानी सिन्हा*
Email: shivaniratnesh@gmail.com

प्रदीप कुमार**
Email: pkscoutnccnss@gmail.com

सार

जनसंख्या के प्रति मानव की जिज्ञासा विभिन्न उद्देश्यों को दृष्टिगत रखते हुए उसके अस्तित्व काल से ही रही है। आर्थिक विकास की ओर तीव्रता से उन्मुख वर्तमान गतिशील विश्व के समस्त देश अपने उपलब्ध संसाधनों का यथासम्भव अनुकूलतम उपयोग कर मानव संसाधन के विकास के प्रति सचेत हैं और अपने देश में उपलब्ध जनसंख्या के गुणात्मक एवं संख्यात्मक दृष्टि से जानकारी प्राप्त करना चाहते हैं। यह कारण है कि जनांकिकी आज अर्थशास्त्रियों, समाजशास्त्रियों तथा शिक्षाविदों के अध्ययन का व्यापक अंग बन गया है।

प्राचीन काल में जनसंख्या सम्बन्धी आंकड़े किसी–न–किसी उद्देश्य की पूर्ति हेतु एकत्र किये जाते थे और जनसंख्या सम्बन्धी अध्ययन का क्षेत्र जनगणना तक ही सीमित था। परन्तु, आधुनिक युग में जनसंख्या के आकार, संरचना तथा अन्य विवरण का अध्ययन तथ्यपूर्ण, सांख्यिकीय एवं गणितीय विश्लेषण के आधार पर किया जाने लगा है, और अध्ययन की सम्पूर्ण प्रक्रिया को एक विषय का स्वरूप प्रदान कर इसे 'जनांकिकी' (Demography) की संज्ञा दी गयी है। भूगोलशास्त्री जनांकिकी में जैविक तथ्यों एवं भौगोलिक वितरण का अध्ययन करते हैं।

मुख्य शब्दावली (Keywords) : जनसंख्या, जनांकिकी, शहरीकरण, जनगणना, गणितीय विश्लेषण

परिचय

मानव आबादी का जनांकिकीय अध्ययन विशेष रूप से आकार एवं घनत्व, वितरण और महत्वपूर्ण आंकड़ों के संदर्भ में किया जाता है, जो जनसंख्या से जुड़े हैं। जनसंख्या के प्रवृत्ति एवं प्रक्रिया को प्रभावित करते हैं, उसे जनांकिकीय प्रतिरूप कहा जाता है। 2011 के जनगणना के अनुसार, पूर्वी चम्पारण जिला मोतिहारी नगर परिषद की कुल जनसंख्या 1,26,158 है। जिसमें 67,861 पुरुष तथा 58,297 महिलाएं हैं। मोतिहारी नगरपरिषद 16.38 वर्ग किलोमीटर क्षेत्रफल पर 22,224 गृह निवास के साथ विस्तृत है। लिंगानुपात की बात करें तो जहां जिला में 902 है तो वहीं इस क्षेत्र का लिंगानुपात 859 है। आयु संघटन में 0–6 आयु वर्ग की कुल जनसंख्या 16,870 हैं, जो की कुल जनसंख्या का 13.7% भागीदारी रखता है। व्यवसायिक संरचना की बात करें तो कुल जनसंख्या में से 33,745 कामगार है और शेष 92,413 गैर–कामगार व आश्रित जनसंख्या है। मोतिहारी नगर परिषद क्षेत्र में साक्षरता दर 84.91% हैं। जिसमें पुरुष 88.13% तथा महिलाएं 81.18 प्रतिशत हैं। दशकीय–वृद्धि दर की बात करें तो सर्वाधिक दशकीय–वृद्धि दर 1971–81 के बीच 56.4% रहा, वहीं 1991–01 के बीच 30% रहा तो अंतिम उपलब्ध आंकड़ों के अनुसार 2001–11 के बीच दशकीय–वृद्धि दर 25.3% दर्ज की गई।

* शिवानी सिन्हा, शोध छात्रा (UGC-NET), भूगोल–विभाग, बी.एन.कॉलेज, पटना विश्वविद्यालय
** प्रदीप कुमार, स्नातकोत्तर छात्र, भूगोल विभाग, पटना विश्वविद्यालय

शोधकार्य का उद्देश्य

मोतिहारी नगर परिषद के जनांकिकीय संरचना के भौगोलिक विश्लेषण का प्रमुख उद्देश्य यह हैं कि जनांकिकी के प्रत्येक आयाम का बेहद सूक्ष्मता से अध्ययन के साथ एक विचारणीय शोध निष्कर्ष प्रतिपादन करने का भी प्रयास करना है। प्रस्तुत अध्ययन का मुख्य उद्देश्य निम्नलिखित हैंः–

1. मोतिहारी नगर क्षेत्र में उपलब्ध मानव संसाधनों की समीक्षा करना,
2. मोतिहारी नगर क्षेत्र में जनसंख्या वृद्धि के कारण, प्रभाव तथा नियंत्रण का आकलन करना, और
3. मोतिहारी नगर क्षेत्र में जनांकिकीय घटक के प्रत्येक पहलू को बड़ी ही गहनता से अध्ययन करना, विश्लेषित चुनौतियों की पहचान करना, लाभप्रद कार्यशैली को बढ़ावा देना तथा सतत् एवं समावेशी विकास हेतु लक्ष्य निर्धारित करना।

परिकल्पना

1. मोतिहारी नगर क्षेत्र जिला का नगरीय अंग हैं परंतु आसपास के क्षेत्र ग्रामीण होने के कारण अभी भी जनसंख्या और संसाधनों के बीच समन्वय की स्थिति बरकरार है।
2. वायु प्रदूषण सूचकांक में मोतिहारी नगर जिस प्रकार शीर्ष स्थान पर काबिज है तो आने वाले समय में यह नोएडा की तरह गैस चैंबर में तब्दील हो सकता हैं।
3. चीनी मील, मोतीझील जीर्णोद्धार, छोटे–बड़े उद्योगों की पुनर्स्थापना एवं संचालन से रोजगार में वृद्धि हो रही है।
4. मोतिहारी नगर क्षेत्र के प्रतिष्ठित नामचिन्ह शिक्षण संस्थानों में गुणवत्तापूर्ण शिक्षा मुहैया करा के शिक्षा क्षेत्र में व्यापक परिवर्तन संभव है।

विधितंत्र

किसी भी शोधार्थी को अपने शोध–कार्य को मुकाम पर पहुंचाने हेतु कई चरणों से गुजरना पड़ता हैं। इसमें शोध–कार्य हेतु विधि–तंत्र एक महत्वपूर्ण आयाम हैं। उपर्युक्त शोध–पत्र के अध्ययन में निम्न विधि तंत्रों का प्रयोग किया गया है–

1. पूर्वी चम्पारण जिला एवं बिहार राज्य के विभिन्न सरकारी और गैर–सरकारी संस्थानों से प्राप्त द्वितीयक आंकड़ों का संग्रहण एवं विश्लेषण।
2. विविध साहित्य, शोध–पत्रों, सर्वेक्षण–रिपोर्ट, आलेख एवं संकलनों का गहन अध्ययन कर तृतीयक प्रकार के आंकड़ों का संग्रहण एवं विश्लेषण।
3. सांख्यिकीय विधि के माध्यम से जनांकिकीय घटक के प्रत्येक पहलुओं की जाँच।

अध्ययन क्षेत्र का विवरण

मोतिहारी नगर परिषद मेरे शोध–कार्य का अध्ययन क्षेत्र हैं। यह बिहार के पूर्वी चम्पारण जिला के जिला मुख्यालय मोतिहारी का क्षेत्र है, जो अपने आप में ऐतिहासिक तथा जिला के सघन आबादी वाला क्षेत्र हैं। इस क्षेत्र को मोतिझील दो भागों में बांटती हैं। इसके भौगोलिक निर्देशांक का बात करें तो 26°39′ उत्तर अक्षांश और 84°55′ पूर्वी देशांतर पर अवस्थित हैं। इस क्षेत्र का क्षेत्रफल 16.38 वर्ग किलोमीटर हैं; इस के उत्तर में आदापुर, नरकटिया और बनकटवा प्रखंड; दक्षिण में कोटवा और पिपरा कोठी प्रखंड; पूरब में सुगौली और हरसिद्धि प्रखंड तथा पश्चिम में चिरैया और पकरीदयाल प्रखंड अवस्थित हैं। यहां आधिकारिक रुप से 22,224 गृह निवास करते हैं और आबादी 2011 के जनगणना के अनुसार, 1,26,158 व्यक्ति हैं, जिसमें 67,861 पुरुष तथा 58,297 महिला हैं। मोतिहारी नगर परिषद क्षेत्र 38 वार्डों में विभाजित है।

शहरीकरण को बढ़ावा देने के लिए, बिहार मंत्रीमंडल ने 25 दिसम्बर, 2020 को शहरी विकास विभाग (UDD) के प्रस्ताव को मंजूरी दे दी। अब मोतिहारी नगर निगम के रूप में अस्तित्व में हैं। जिसका क्षेत्र विस्तार करके 46 वार्डों (08 वार्डों का विस्तार) कर दिया गया है। नए परिसीमन के आधार पर मोतिहारी नगर निगम में 28 राजस्व ग्राम, जिसमें मोतिहारी सदर प्रखंड 17, बंजरिया प्रखंड के 07 तथा तुरकौलिया प्रखंड के 04 ग्राम को सम्मिलित किया गया हैं।

चित्र संख्या 1 : मोतिहारी नगर क्षेत्र की आधिकारिक मानचित्र

आर्थिक पृष्ठभूमि

कृषि

कृषि जिले के लोगों का मुख्य व्यवसाय है और आजीविका मुख्य स्रोत भी है। वर्षा अभी भी पूर्वी चम्पारण जिले की कृषि अर्थव्यवस्था को नियंत्रित करती हैं। चावल, गेहूं और दाल आदि जिले में उगाई जाने वाली प्रमुख फसलें हैं। गन्ना मुख्य नकदी है। सिकरहना नदी, जिसे बूढ़ी गंडक के रूप में जाना जाता है, इस जिला को उत्तर–पश्चिम से दक्षिण–पूर्व की ओर से पार करती हैं। इस नदी के उत्तर के हिस्से में मिट्टी, जिले का लगभग पांच भाग में दो भाग क्षेत्र मजबूत मिट्टी है। जिसे स्थानीय रूप से बांगर के रूप में जाना जाता है, जो बहुत अधिक उपज देती हैं। पर्याप्त वर्षा के कारण वर्ष में या उन इलाकों में जहां सिंचाई की जा सकती है, भारी चावल की फसलें उगाई जाती हैं। नदी के दक्षिण में मिट्टी मुख्य रूप से हल्की रेतीली दोमट है जो चावल के लिए उपयुक्त नहीं है, लेकिन अच्छी उपज देती है। जैसे–मक्का की फसलें और विभिन्न शीतकालीन फसलें, जैसे– गेहूं, जौ, सरसों, अलसी आदि।

मोतिहारी नगर परिषद क्षेत्र लगभग–लगभग पूर्णतः शहरी होने के कारण यहां पर कृषि से संबंधित कम काम होते हैं। यहां के स्थानीय लोग अधिकतर सेवा, सामाजिक व व्यवसायिक क्षेत्रों में काम करते हैं। शहर के काफी करीब गांव के लोग अपने रोजगार व जीविका चलाने के लिए यहां पर रोज जन–मजदूरी, सब्जी, फल, फुटकर दुकान आदि से अपना गुजारा करते हैं।

उद्योग

पूर्वी चम्पारण जिले में कोई महत्वपूर्ण व्यापार केंद्र या विनिर्माण शहर नहीं हैं। इसलिए उद्योगों के लिए गुंजाइश सीमित हैं। नील का निर्माण, जो पहले भारत का प्रमुख उद्योग था; अब समाप्त हो गया हैं। चीनी का निर्माण जिले में कुछ महत्व का एकमात्र उद्योग है क्योंकि यह गन्ना उत्पादक क्षेत्र हैं। चीनी कारखाने मोतिहारी, सुगौली और चकिया में स्थित हैं; मोतिहारी चीनी मिल बंद हैं और पुनः संचालित करने हेतु समय–समय पर आंदोलन और मांग होते रहते हैं।

मोतिहारी नगर परिषद क्षेत्र में मत्स्य विकास की अपार संभावनाएं हैं। केंद्र सरकार द्वारा 1995 में मत्स्य विकास की महत्वाकांक्षी योजना शुरू की गई। विश्व बैंक ने मोतिहारी शहर एवं उसके आस–पास के क्षेत्र के मोतीझील एवं कररिया झील में मत्स्य उत्पादन हेतु तालाबों को उपयुक्त बनाने हेतु मत्स्य विकास योजना हेतु 19 करोड़ रुपये की व्यवस्था की है।

जिला जनगणना रिपोर्ट, 2011 के अनुसार, मोतिहारी नगर परिषद क्षेत्र 03 सबसे महत्वपूर्ण वस्तुओं के निर्माण में अपना महत्वपूर्ण स्थान रखता हैं – गन्ना, जूट एवं सरसों तेल।

भौतिक आधारभूत संरचना

परिवहन साधन

सड़क मार्ग

मोतिहारी शहर में रोडवेज का एक सुविकसित नेटवर्क हैं, जो इसे आसपास के प्रमुख शहरों से जोड़ता हैं। राष्ट्रीय राजमार्ग 17 (NH–17) से इसकी निकटता बिहार के शहरों के साथ इसकी सम्पर्क सुनिश्चित करती हैं। मोतिहारी राष्ट्रीय राजमार्ग–28 (NH–28) द्वारा मुजफ्फरपुर, लखनऊ और काठमांडू जैसे शहरों से जुड़ा हुआ हैं। मोतिहारी शहर बेतिया से लगभग 48 किलोमीटर की दूरी पर हैं, मुसहरी से 86 किलोमीटर, छपरा से 116 किलोमीटर, पटना से 160 किलोमीटर, गोरखपुर से 203 किलोमीटर, फैजाबाद से 345 किलोमीटर, आजमगढ़ से 235 किलोमीटर, लखनऊ शहर से 473 किलोमीटर आदि दूर हैं। चकिया डी.के.एस बस स्टैंड मोतिहारी शहर के केंद्र से लगभग 8.4 किलोमीटर की दूरी पर है। बिहार राज्य सड़क परिवहन निगम (बी.एस.आर.टी.सी.) द्वारा संचालित बसों के साथ–साथ निजी बस सेवाएं भी नियमित अंतराल पर उपलब्ध हैं, जो मोतिहारी को आसपास के प्रमुख शहरों से जोड़ती हैं।

रेलमार्ग

मोतिहारी शहर का अपना रेलवे स्टेशन हैं। जिसका शुभारंभ सन् 1911 में हुआ था और नाम बापूधाम मोतिहारी रेलवे स्टेशन हैं। इस स्टेशन का समुद्रतल से ऊंचाई 72 मीटर (236 फीट) हैं तथा प्लेटफार्मों की संख्या –05 हैं। यह एक 'ए' ग्रेड रेलवे स्टेशन हैं, जो सभी आधुनिक सुविधाओं से सुसज्जित हैं और अच्छी तरह से बनाए रखा गया हैं। यह पूर्व मध्य रेलवे क्षेत्र में समस्तीपुर डिवीजन का एक हिस्सा है और इसे इस डिवीजन के सबसे व्यस्त स्टेशनों में से एक कहा जाता हैं। स्टेशन अधीक्षक राकेश कुमार त्रिपाठी के अनुसार, वर्ष 2018 में इसे 264वां स्थान मिला था और अक्टूबर 2019 में पूर्व–मध्य रेलवे के नए स्टेशनों सहित शीर्ष 100 स्टेशनों की सूची में समग्र स्वच्छता के लिए फिर से 23वां स्थान मिला था। पूर्व मध्य रेल हाजीपुर के मुख्य जनसम्पर्क अधिकारी राजेश कुमार ने बताया कि पूरे देश में तेजी से सुधार करने वाले शीर्ष 10 स्टेशनों में यह 9वें स्थान पर हैं। रेल मंत्री पीयूष गोयल द्वारा महात्मा गांधी की 150वीं जयंती के अवसर पर नई दिल्ली में स्वच्छ और हरित स्टेशनों की रैंकिंग के लिए जारी भारत के शीर्ष 25 रेलवे स्टेशनों की सूची में इसे भी शामिल किया गया हैं।

नियमित अंतराल पर मोतिहारी को हाजीपुर, पटना, कोलकाता, दिल्ली, मुंबई, पोरबंदर, लखनऊ, अमृतसर, कानपुर, गुवाहाटी, जम्मू, अहमदाबाद, बरेली, गुवाहाटी, मुजफ्फरपुर, जयपुर, दरभंगा जैसे शहरों से जोड़ने वाली नियमित ट्रेनें हैं।

सामाजिक आधारभूत संरचना

स्वास्थ्य सुविधाएं

मोतिहारी नगर परिषद क्षेत्र पूर्वी चम्पारण जिला का जिला मुख्यालय हैं। जिला में स्वास्थ सुविधाओं के नजरिए से एक प्रमुख केंद्रबिंदु हैं। जिला के अन्य स्वास्थ्य केंद्रों के मुकाबले यहां के स्वास्थ्य केंद्र थोड़ा बढ़िया हैं। 2011 के जनगणना के अनुसार, मोतिहारी नगर परिषद क्षेत्र में स्वास्थ्य संबंधित आंकड़े निम्नलिखित हैं–

सारणी संख्या :– 01 मोतिहारी नगर परिषद क्षेत्र में स्वास्थय संबंधित आंकड़े		
स्वास्थय संबंधित आंकड़े	**केन्द्रों की संख्या**	**उपलब्ध बेड की संख्या**
अस्पताल (एलोपैथिक व अन्य)	01	100
औषधालय	02	.....
स्वास्थ्य केंद्र	02	.....
परिवार कल्याण केन्द्र	04	.....
मातृत्व एवं बाल कल्याण केंद्र	06	.....
मातृत्व घर	06	.....
क्षयरोग अस्पताल/चिकित्सालय	01	25
नर्सिंग होम	06	50
दान/अनुदान सहयोग से संचालित अस्पताल	.....	.....
पशु अस्पताल	05	.....
दवा दुकान की संख्या	50	.....

स्रोत –जिला जनगणना पुस्तिका (2011)

शैक्षणिक सुविधाएं

बिहार का साक्षरता दर देश में सबसे न्यूनतम हैं। 2011 के जनगणना के अनुसार 61.80% हैं, जो कि राष्ट्रीय साक्षरता दर 72.9% से काफी कम हैं। वही हम पूर्वी चम्पारण जिला के साक्षरता दर की बात करें तो 55.79% है तो मोतिहारी नगर परिषद क्षेत्र की साक्षरता दर 84.91% है। जिसमें पुरुष साक्षरता दर 88.13% तथा महिला साक्षरता दर 81.18% है और लैंगिक साक्षरता अंतराल 6.95% का है।

सारणी संख्या :– 02 मोतिहारी नगर परिषद क्षेत्र के साक्षरता दर का पूर्वी चम्पारण जिला एवं बिहार से तुलनात्मक विवरण			
दर	**बिहार**	**पूर्वी चम्पारण**	**मोतिहारी नगर परिषद**
साक्षरता दर	61.80%	55.79%	84.91%
पुरुष साक्षरता दर	71.02%	65.34%	88.13%
महिला साक्षरता दर	51.5%	45.12%	81.18%
अंतराल	19.7%	20.22%	6.95%

स्रोत –जिला जनगणना पुस्तिका (2011)

जनसंख्या वृद्धि और वितरण

जनसंख्या का आकार

2011 के जनगणना के अनुसार, मोतिहारी नगर परिषद क्षेत्र का आबादी 1,26,158 व्यक्ति हैं। इसमें पुरुष आबादी 67,861 तथा महिला आबादी 58,297 हैं। इस क्षेत्र में अनुसूचित जाति का जनसंख्या 7373 व्यक्ति तथा अनुसूचित जनजाति का जनसंख्या 333 व्यक्ति सम्मिलित हैं। जनसंख्या घनत्व 7702 व्यक्ति प्रति वर्ग किलोमीटर हैं। 2011 के जनगणना के अनुसार, 2001 के तुलना में 4.7% (25.3%) जनसंख्या वृद्धि दर कम दर्ज किया गया हैं।

कुछ अन्य जनसंख्या आकार से संबंधित विवरण निम्नलिखित है–

सारणी संख्या :– 03

मोतिहारी नगर परिषद क्षेत्र से संबंधित जनांकिकीय विवरण एवं विश्लेषण

उल्लेखनीय विवरण	2001 के अनुसार	2011 के अनुसार	वृद्धि / ह्रास
जनसंख्या	1,00,683 व्यक्ति	1,26,158 व्यक्ति	25,475 व्यक्ति वृद्धि
पुरुष जनसंख्या	54,261	67,861	13,600 वृद्धि
महिला जनसंख्या	46,422	58,297	11,875 वृद्धि
जनसंख्या वृद्धि दर	30%	25.3%	4.7% ह्रास
जनसंख्या घनत्व	7,249 व्यक्ति प्रति वर्ग कि.मी.	7,702 व्यक्ति प्रति वर्ग कि.मी.	453 व्यक्ति प्रति वर्ग कि.मी.
क्षेत्रफल	13.9 वर्ग किलोमीटर	16.38 वर्ग किलोमीटर	2.48 वर्ग किलोमीटर वृद्धि
लिंगानुपात	856	859	3 वृद्धि
शिशु लिंगानुपात	912	837	75 बालिका प्रति हजार ह्रास
साक्षरता	78%	84.91%	6.91% वृद्धि
साक्षरता लैंगिक अंतराल	12.6%	6.95%	5.91 ह्रास
घरेलू परिवार की संख्या	15,275	22,224	6,949 घर वृद्धि

स्रोत –जिला जनगणना पुस्तिका (2001–2011)

जनसंख्या वृद्धि

विगत 2011 के जनगणना के अनुसार, मोतिहारी नगर परिषद की जनसंख्या 1,26,158 व्यक्ति हैं। दशकीय जनसंख्या वृद्धि दर 25.3% हैं; वहीं 1991 से 2001 के बीच 30% जनसंख्या वृद्धि दर दर्ज की गई है।

विगत कुछ जनगणना के प्रकाशित आंकड़ों के अनुसार, मोतिहारी नगर परिषद की जनसंख्या एवं दशकीय जनसंख्या वृद्धि दर निम्नलिखित हैं :

सारणी संख्या :– 04

मोतिहारी नगर परिषद की जनसंख्या एवं दशकीय जनसंख्या वृद्धि–दर

क्रम संख्या	आंकड़ा प्रकाशित वर्ष	जनसंख्या	दशकीय जनसंख्या विश्लेषण (वृद्धि/ह्रास)
01	1901	13730	.....
02	1911	14876	8.4%
03	1921	13828	7% ह्रास
04	1931	17545	26.9%
05	1941	20717	18.1%
06	1951	24489	18.2%
07	1961	32620	33.2%
08	1971	37032	13.5%
09	1981	57911	56.4%
10	1991	77432	33.7%
11	2001	100683	30%
12	2011	126158	25.3%

स्रोत –जिला जनगणना पुस्तिका (2011)

जनसंख्या का वितरण

वर्ष 2011 के जनगणना के अनुसार, मोतिहारी नगर परिषद क्षेत्र में वार्ड वार जनसंख्या निम्नलिखित हैं :

सारणी संख्या :– 05

मोतिहारी नगर परिषद की जनसंख्या विवरण

वार्ड सं.	जनसंख्या	वार्ड सं.	जनसंख्या	वार्ड सं.	जनसंख्या	वार्ड सं.	जनसंख्या
01	2181	11	2648	21	2909	31	5101
02	4026	12	3959	22	3279	32	4308
03	3316	13	2497	23	3174	33	1887
04	4430	14	6291	24	2038	34	2412
05	2169	15	3251	25	2971	35	2782
06	1963	16	2244	26	5355	36	2091
07	3213	17	3884	27	4613	37	4238
08	2348	18	5346	28	2932	38	4437
09	1407	19	2703	29	3282	**Total**	126158
10	4759	20	1726	30	3983		

स्रोत –जिला जनगणना पुस्तिका (2011)

व्यवसायिक संरचना

मोतिहारी नगर परिषद क्षेत्र की कुल 22.75% जनसंख्या मुख्य कामगार हैं वही 04% लोग सीमांत किसान कामगार हैं और सबसे ज्यादा जनसंख्या 73.25% लोग गैर–कामगार हैं। 2011 के जनगणना के अनुसार, मोतिहारी नगर परिषद क्षेत्र की व्यवसायिक संरचना निम्नांकित हैं :

सारणी संख्या :– 06 मोतिहारी नगर परिषद का व्यवसायिक संरचना				
विवरण		कुल जनसंख्या	पुरुष जनसंख्या	महिला जनसंख्या
मुख्य कामगार (Main Workers)	.....	**28,669 व्यक्ति**	**25,256**	**3,413**
	खेतिहर	1,268	1,156	112
	कृषि संबंधी	1,553	1,371	182
	घरेलू उद्योग	1,395	1,065	330
	अन्य कामगार	24,453	21,664	2,789
सीमांत कामगार (Marginal Workers)	-------	**5,076 व्यक्ति**	**3,693**	**1,383**
	खेतिहर	296	202	94
	कृषि संबंधी	628	492	136
	घरेलू उद्योग	473	235	238
	अन्य कामगार	3,679	2,764	915
गैर–कामगार Non-Workers)	-------	**92,413 व्यक्ति**	**2,764**	**53,501**

स्रोत – जिला जनगणना पुस्तिका सारांश, 2011

कामगारों की संरचना :-

2011 के जनगणना के अनुसार, मोतिहारी नगर परिषद में कामगारों की संख्या निम्नांकित हैं –

सारणी संख्या :– 07 मोतिहारी नगर परिषद क्षेत्र में कामगारों की संख्या	
विवरण	कामगारों की संख्या
मुख्य कामगार (Main Workers) 22.75%	28,669 व्यक्ति पुरुष–25,256 महिला–3,413
सीमांत कामगार (Marginal Workers) 04%	5,076 व्यक्ति पुरुष–3,693 महिला–1,383
गैर–कामगार (Non-Workers) 73.25%	92,413 व्यक्ति पुरुष–38,912 महिला–53,501

स्रोत –जिला जनगणना पुस्तिका (2011)

निष्कर्ष एवं सुझाव

उपरोक्त आंकड़ों के विश्लेषण उपरांत यह कहा जा सकता है कि मोतिहारी नगर क्षेत्र के जनसंख्या वृद्धि को नियंत्रित करना होगा। दशकीय जनसंख्या वृद्धि दर (2001–11) 25.3% हैं। जिसमें करीब 73.25% आश्रित जनसंख्या हैं। जिससे अनावश्यक आर्थिक बोझ बढ़ेगा और विकास गति धीमा/रुक सकता हैं। मोतिहारी नगर क्षेत्र के गैर–कामगारों को रोजगार संबंधी प्रशिक्षण प्रदान कर रोजगार के मार्ग प्रशस्त करना होगा। मोतिहारी नगर क्षेत्र में प्रदूषण को नियंत्रित करना होगा। जिसके लिए राष्ट्रीय एवं अंतर्राष्ट्रीय मानक के अनुरूप कार्य करने होंगे। ऐसा निरंतर होने से कुछ ही दिनों में मोतिहारी शहर दिल्ली नोएडा की तरह गैस चैंबर में तब्दील हो सकता हैं। मोतिहारी नगर क्षेत्र में चिकित्सकों की संख्या एवं चिकित्सकीय सुविधाएं, जैसे–दवा, जांच–तकनीकी प्रयोगशाला को बढ़ाना होगा।

मोतीझील का पुनः जीर्णोद्धार करना होगा। उसके जीर्णोद्धार से कुछ हद तक रोजगार सृजन की संभावना है; वही काफी हद तक प्रदूषण भी नियंत्रित होगी तथा शहर क्षेत्र के प्रवाह प्रणाली भी सुदृढ़ होगी। बंद पड़े चीनी मिल को पुनः चालू करना होगा, जिससे कि क्षेत्र के किसानों की आय में वृद्धि होगी। वही रोजगार सृजन से प्रवास भी रुकेंगे। नवनिर्मित महात्मा गांधी केंद्रीय विश्वविद्यालय में सभी प्रकार की डिग्री, डिप्लोमा, सर्टिफिकेट तथा रोजगारपरक कोर्स संचालित करना होगा। जिससे विद्यार्थी–वर्ग का प्रवास रुकेगा। ज्ञात हो कि पूर्व से सिर्फ मुंशी सिंह कॉलेज (M-S-College) में ही उच्चतर शिक्षा के स्नातकोत्तर, पुस्तकालय, विज्ञान आदि के डिग्री कोर्स मौजूद हैं।

सीमावर्ती क्षेत्रों से तस्करी को प्रशासकीय स्तर पर विराम लगाना होगा क्योंकि वहां से तस्करी किए गए वस्तुओं का अपेक्षाकृत मूल्य कम होता हैं। जिससे कि क्षेत्र के व्यवसायी वर्ग को काफी नुकसान का सामना करना पड़ता हैं।

कुल मिलाकर स्पष्ट रूप से मोतिहारी नगर परिषद क्षेत्र के जनसंख्या दशकीय वृद्धि–दर भौगोलिक एवं सांस्कृतिक दृष्टिकोण से काफी विचारणीय तथा पहल योग्य विषय है और वर्षों से बंद चीनी मिल का जीर्णोद्धार करने की आवश्यकता है, जिससे किसानों की आय तथा कामगार मजदूरों को रोजगार का नवसृजन हो सकता है। मोतीझील के सौंदर्यीकरण से भी अनेक प्रकार के जैसे मत्स्य पालन, सिंघाड़ा व मखाना आदि अन्य मनोरंजनात्मक गतिविधि के रूप में रोजगार सृजित हो सकते हैं।

सन्दर्भ सूची

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सेंटीनल 02 उपग्रह आंकड़ों की सहायता से हजारीबाग नगरनिगम के भूमि उपयोग प्रतिरूप का विश्लेषण

दीनानाथ ठाकुर*
Email: dinanaththakur008@gmail.com

सार

प्रस्तुत शोध प्रपत्र में हजारीबाग जिला के वर्ग–1 शहरी भूभाग हजारीबाग नगर निगम के भूमि उपयोग का अध्ययन शामिल है। इस प्रपत्र का मुख्य उदेश्य बढ़ती नगरीय जनसंख्या और भूमि उपयोग के बीच संबंध का पता लगाना तथा सेंटीनल 02 उपग्रह आंकड़ों की सहायता से हजारीबाग नगरीनगम के भूमि उपयोग प्रतिरूप का विश्लेषण करना है। इस अध्ययन को पूरा करने के लिए द्वितीयक आंकड़ा स्रोतों का सहारा लिया गया है। साथ ही कॉपरनिकस ओपन एक्सेस स्रोंत के सेंटीनल 02 उपग्रह आंकड़ों के माध्यम से सेटेलाइट चित्रण किया गया है। इसमें 1991, 2001, 2011 के जनसांख्यकीय आंकड़ों का सहारा लिया गया है।

अध्ययन के क्रम में यह स्पष्ट हुआ कि जनसंख्या वृद्धि और भूमि उपयोग में उल्टा संबंध है। अध्ययन क्षेत्र में 1991–2011 तक के अवधी में नगरीय जनसंख्या में 1.7 प्रतिशत जबकि 2001–2011 के दौरान 6.03 प्रतिशत वृद्धि रही। 1991–2011 के बीच कुल 7.73 प्रतिशत की जनसंख्या वृद्धि देखी गई। जनसंख्या वृद्धि के परिणामस्वरूप यहाँ की भूमि उपयोग क्रमशः शहरी हरित स्थल (5.21 प्रतिशत), नदी (0.9 प्रतिशत), निर्मित भूमि (38.09 प्रतिशत), खुली भूमि (14.82 प्रतिशत), कृषि भूमि (19.91 प्रतिशत), तालाब/झील (2.84 प्रतिशत), खेल का मैदान (1.61 प्रतिशत), बंजर भूमि (8.75 प्रतिशत) और सड़क (2.33 प्रतिशत) प्रर्दशित होता है।

मुख्य शब्दावली (Keywords): जनसंख्या वृद्धि, नगरीकरण, भूमि उपयोग, भूमि आवरण, नगरीय अधिवास, उपग्रह

परिचय (Introduction)

भूमि उपयोग प्रतिरूप और शहरीकरण में काफी गहरा संबंध है। शहरीकरण के मौलिक तत्वों में भूमि उपयोग महत्वपूर्ण स्थान रखते है। यह शहरों की आंतरिक स्वरूप और प्रकृति को दर्शाने वाली व्यवस्था है। यह समय के साथ शहर के विकास और परिवर्तन को भी दर्शाता है। शहर के आर्थिक विकास के स्तर एवं शहरी चरित्र को बतलाने में परिवहन और संचार नेटवर्क को योगदान है जो शहरों की एकीकृत, जटिल और विविध भूमि उपयोग व्यवस्था का स्पष्टीकरण करता है। (रामचन्द्रन 1989, पृ० 5–6) इसलिए भूमि उपयोग अनुसंधान, अनुमान और योजना की प्राथमिक रूची भूमि उपयोग में भूमि की मात्रा एवं उनका स्थानिक वितरण का गुणात्मक रूपों में अध्ययन करना है।

वर्तमान अध्ययन हजारीबाग सामुदायिक विकास प्रखण्ड (सदर) के हजारीबाग नगर निगम में भूमि उपयोग प्रतिरूप का विश्लेषण करना है। जिससे यहाँ विगत 30 वर्षो में हुए निर्मित क्षेत्र में बदलाव को जाना जा सके। जी० ई० चेरी (1997 ने अपनी पुस्तक "नगर नियोजन की समस्या" में शहर की परिभाषा

* दीनानाथ ठाकुर, शोधार्थी, भूगोल विभाग, विनोबा भावे विश्वविद्यालय, हजारीबाग, झारखंड

को तीन रूपों में स्पष्ट किया है –

i. औपचारिक :– शहरी उपयोग में सम्मिलित क्षेत्र को शामिल किया जाता है।

ii. कार्यात्मक :– यह व्यापक क्षेत्र है जो शहरी क्षेत्रों को सेवाएँ प्रदान करती है। साथ ही कार्यों के आधार पर व्याख्या होता है। जैसे– शिक्षा, छावनी, कृषि, औद्योगिक शहर इत्यादि।

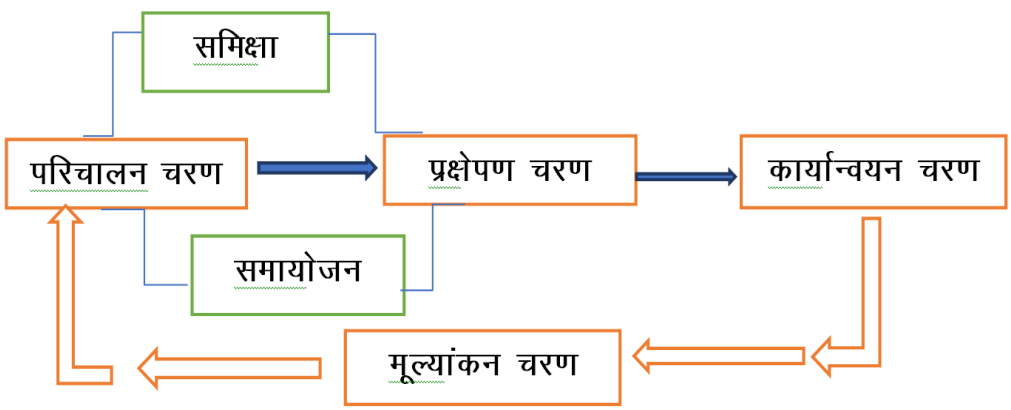
iii. प्रशासनिक :– स्थानीय प्राधिकरण द्वारा नियंत्रित क्षेत्र को इंगित करता है।

भूमि उपयोग शब्द केवल बस्ती के संबंध में ही नही बल्कि भूमि के उपयोग से संबंधित सभी तथ्यों का अध्ययन करता है। यह भूमि के सम्पूर्ण प्रकृति का प्रतिनिधित्व वस्तु या पूँजी ही नही बल्कि यह संपत्ति एवं स्वामित्व के रूप में भी स्पष्ट होता है। शहरी भूमि उपयोग शहरी भूमि के अन्तर्गत शामिल कुल क्षेत्रफल को बतलाता है, जिसका योजनाबद्ध तरीके से विकास होता है। शहरी भूमि उपयोग में सर्वाधिक मात्रा में कृषि का ही ह्रास होता है।

ब्लुमेनफेल्ड (1967, पृ०– 292–301) ने भूमि उपयोग का संबंध भूमि सतह के उपभोग से लगाया है। जिसमें केवल उत्पादन क्षमता को बतलाया जाता है।

शहरी भूमि उपयोग भूमि उत्पादन के कारक के बजाय एक स्थल है जो प्रशासनिक प्राधिकरण के माध्यम से शहरी क्षेत्र के अन्तर्गत भूमि के उपयोग को इंगित करता है। जैसे– एक वर्ग किमी० शहरी क्षेत्र में भूमि पर विकसित और खाली भूमि को दर्शाया जाता है। शहरी क्षेत्रों में निजी और सार्वजनिक भूमि पाये जाते है। निजी भूमि में लोगों के निवास और वाणिज्यिक प्रतिष्ठान और उद्योग को शामिल करते है, जबकि सार्वजनिक में परिवहन, मनोरंजन, अस्पताल, शैक्षणिक संस्थान और धार्मिक भवन को शामिल किया जाता है। शहरी भूमि उपयोग प्रतिरूप को चार चक्रीय चरण के माध्यम से स्पष्ट किया जाता है–

(क) परिचालन चरण। (ख) प्रक्षेपण चरण। (ग) कार्यान्वयन चरण। (घ) मूल्यांकन चरण।



चित्र संख्या 1 : भूमि उपयोग योजना प्रक्रिया का चैडविक मॉडल (1971)

परिचालन चरण को लक्ष्य निर्माण चरण कहा जाता है जो स्थानीय निकाय के नियोजित विकास के लिए लक्ष्य निर्धारित किया जाता है। इस चरण में दो से पाँच वर्ष की अवधि लगती है। इसमें मानव की बढ़ती आबादी के साथ भविष्य में भूमि उपयोग की आवश्यकता का आकलन सबसे पहले किया जाता है। साथ ही इसके उपयोग हेतु भौतिक मानकों का निर्धारण मात्रात्मक एवं गुणात्मक माध्यम से किया जाता है। परिचालन चरण सबसे महत्वपूर्ण माने जाते है क्योंकि यह न केवल क्रियान्वयन चरण के दौरान आने वाली समस्याओं को समझाता है बल्कि भविष्य में परिवर्तन होती परिस्थितियों के साथ समायोजन की गुंजाइश रखता है।

"प्रक्षेपण चरण" में भूमि उपयोग संबंधित प्रस्तावों को आगे बढ़ाकर क्रियान्वित की जाने वाली योजना से अपेक्षित परिणामों की भविष्यवाणी की जाती है। यह शहर के पोस्ट प्लान इमेज को चित्रित करता है। इसके बाद क्रियान्वयन चरण का व्यवहारिक चरण आता है जो यह स्पष्ट करता है कि योजना का परिणाम सकारात्मक है या नकारात्मक। साथ ही भूमि उपयोग के परिणाम को भी स्पष्ट करता है।

शहर वास्तव में छोटे आकार वाला नगरीय बस्तियाँ होता है। 1901 के इम्पीरियल जनगणना संहिता के अनुसार – नगरपालिका क्षेत्र, छावनी क्षेत्र, नगरपालिका के बाहर की स्थित सिविल लाइन क्षेत्र तथा 5000 से अधिक जनसंख्या वाला स्थायी निवास क्षेत्र इसके अंतर्गत शामिल होते है।

2001 की जनगणना के अनुसार शहर की परिभाषा निम्न है –

(क) वह स्थान जहाँ नगरपालिका, महापालिका, छावनी बोर्ड या नोटीफाइड एरिया समिति स्थापित हो।

(ख) जनसंख्या कम से कम 5000 हो।

(ग) कार्यशील पुरूष जनसंख्या कम से कम 75 भाग अकृषित कार्यो में संलग्न हो।

(घ) जनसंख्या घनत्व 400 व्यक्ति प्रतिवर्ग किमी से कम हो।

भारतीय जनगणना विकास के अनुसार 5000 से अधिक जनसंख्या वाले अधिवास का कस्बा (टाउन) तथा 10,000 से अधिक जनसंख्या वाले बस्ती को नगर कहा जाता है।

तालिका संख्या 1 : मानव अधिवास की श्रेणियाँ

श्रेणी	जनसंख्या
1	1 लाख से अधिक
2	50,000 से 99,999
3	20,000 से 49,999
4	10,000 से 19,999
5	5000 से 9999
6	5000 से कम

स्रोत – आर० सी० तिवारी, पृष्ठ–34

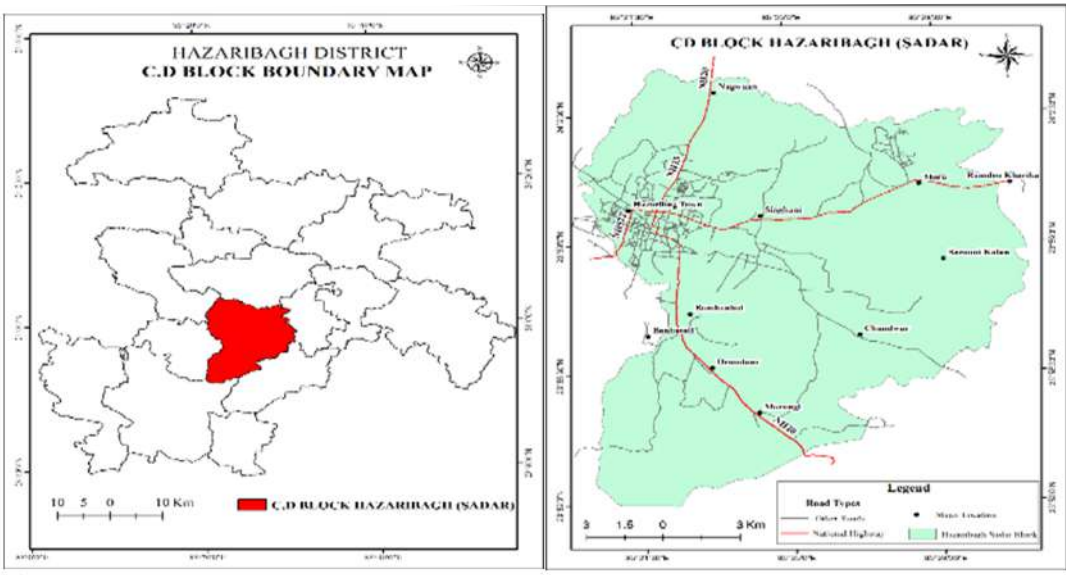
अध्ययन क्षेत्र :

हजारीबाग सी०डी० (सदर) हजारीबाग जिला का मुख्य शहरी क्षेत्र के अन्तर्गत शामिल होता है। इसी प्रखण्ड में हजारीबाग नगर पालिका स्थित है। यहाँ उ० छोटानागपुर प्रमण्डल का प्रशासनिक कार्यालय भी स्थित है।

नगरपालिका प्रशासन की प्रणाली हजारीबाग में 1885 ई० में शुरूआत हुई, साथ ही 1886 ई० में हजारीबाग नगरपालिका की स्थापना हुई। 2017 ई॰ में इसे नगर निगम के रूप में अधिसूचित किया गया। यह हजारीबाग जिला का सबसे बड़ा शहर है। यह भारतीय जनगणना विभाग के वर्ग–1 शहरों में शामिल होता है। जिस वर्ष इसकी स्थापना हुई थी संयोगवश उसी वर्ष ब्रिटिश शासकों द्वारा भारत में स्थानीय स्वशासन की भी स्थापना की गयी थी।

हजारीबाग नगर निगम के मुख्य हृदय स्थल का विस्तार 85°71′76.826″ पूर्व से 23°59′36.162″ उ० तक है। सम्पूर्ण नगर का आक्षांशीय विस्तार 23°57′10.27″ उ० से 24°2′18.106″ उ० तथा देशांतरीय विस्तार 85°19′18.098″ पूर्व से 85°24′8.436″ पूर्व तक है। इसका कुल क्षेत्रफल 43.87 वर्ग किमी० है। इसका विस्तार पूर्व से चानो–2, ओरिया, सिंघानी, जगदीशपुर, पश्चिम में मसरातु, सलगाँवा, कदमा, गदोखर, पेलावल, अलगडीहा, उ० में मडंईखुर्द, मेरावल, सिन्दुर, नवडीहा और द० में नयाखाप और खपरियाँवा तक चौहदी का निर्माण करती है।

2011 की जनगणना के अनुसार हजारीबाग नगरपालिका में 32 वार्ड शामिल थे , जो 2017–18 में नगरनिगम के अधिसूचित होते ही बढ़कर 36 वार्ड हो गए, जिसमें सदर प्रखण्ड के ओकनी–2, मंडईकला, मंडई, नवडीहा, कोलघट्टी–2, जबरा, लाखे, चानो–2, मासीपीढ़ी, कस्तुरीखाप, कदमा–2, रेवाली (रेवले स्टेशन का अंश), सिरसी–2 और दामोडीह शामिल है। हजारीबाग नगर निगम के अन्तर्गत विनोबा भावे विश्वविद्यालय, शेख भिखारी मेडिकल कॉलेज, 05 डिग्री कॉलेज तथा सैकड़ों विद्यालय स्थित है।



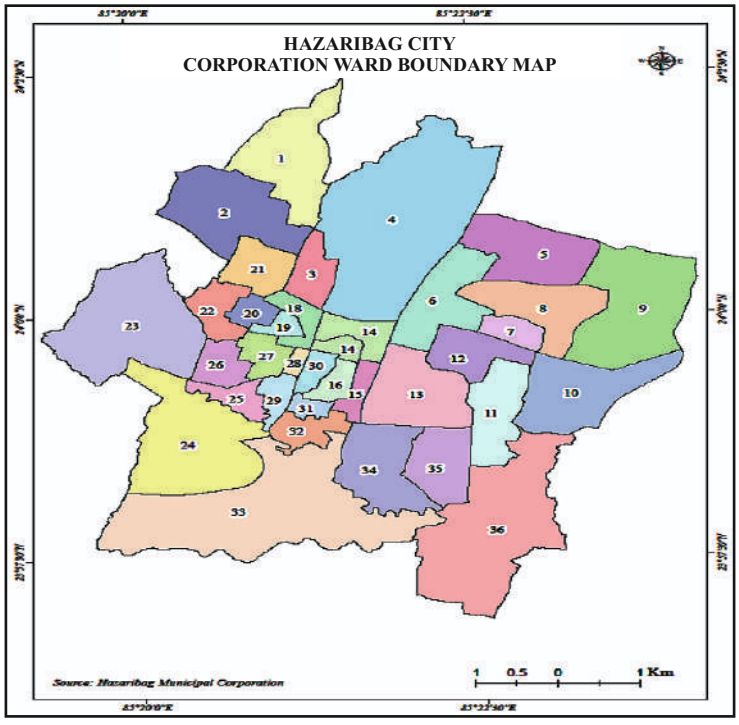
चित्र संख्या 2 : भौगोलिक स्थिति

तालिका संख्या 2 : हजारीबाग नगर निगम क्षेत्र के कुल वार्ड एवं क्षेत्रफल
(वर्ग किमी एंव प्रतिशत में)

वार्ड न०	प्रमुख क्षेत्र	वर्ग किमी०	प्रतिशत में
01	आन्नदपुरी, मंडईकला, मुस्लिम मोहल्ला, कोलघट्टी–2	1.804888	4.11
02	अल्फाह कॉलोनी, ओकनी–2, मंडईकला	1.918049	4.32
03	कोलघट्टी–2, झीलनगर, नुरा अंश, नुरा बस्ती	0.5211832	1.06
04	नवाडीहा, कोलघट्टी–2, झील, सेंट्रल जेल क्षेत्र	4.5363241	10.34
05	सारले, सिंचाई कॉलोनी, दीपुगढ़ा, कॉपरेटिव कॉलोनी	1.552205	3.52
06	हाउसिंग कॉलोनी, मटवारी अंश, चानो केन्ट, जुलू पार्क	1.2467996	2.84
07	मटवारी चौक	0.352299	0.80
08	मटवारी अंश, सारले अंश, जबरा अंश, बाबु चौक	1.336787	3.04
09	जबरा अंश, कोर्रा चौक, सरहुल नगर, भूईया टोला	2.5127769	5.72
10	कोर्रा अंश, लाखे बस्ती, हेठ टोला, भूईया टोला	1.71999	3.92
11	आन्नदपुरी, हरनगंज, आदर्श नगर, कॉपरेटिव कॉलोनी	1.105254	2.51
12	सुरेश कॉलोनी, साकेतपुरी	1.164945	2.65
13	फॉरेस्ट कॉलोनी, विवेकानंद स्कूल क्षेत्र	1.534171	3.49
14	नवादा, चापर	0.199778	0.45
15	ग्वाल टोली	0.473291	1.07
16	पंच मंदिर अंश, खानशामा रोड	0.294145	0.67
17	ओकनी (133)	0.385054	0.87
18	ओकनी, ओकनी–2, लोहसिंघना, पगमिल	0.347857	0.79
19	न्यू एरिया	0.189569	0.43
20	शिवपुरी, ओकनी	0.270205	0.61
21	ओकनी–2	0.682234	1.55
22	शिवपुरी, ओकनी, ओकनी–2	1.056609	2.40
23	कस्तुरीखाप, विष्णुपूरी, शिवदयाल नगर	2.945701	6.71
24	रेलवे स्टेशन, कदमा–2, रेवाली, कुद बस्ती, महावीर स्थान	2.726375	6.21
25	कुम्हारटोली, कदमा	1.19367	2.72

26	कदमा रोड न०—142, हजारी अंश	0.475301	1.08
27	मुनगाबगीचा, कुम्हारटोली नीचा	0.413261	0.94
28	कानीबजार, कुम्हारटोली उपर	0.105616	0.24
29	हबीबनगर, हरि नगर	0.303306	0.69
30	पंच मंदिर	0.246206	0.56
31	माली टोला, खिरगाँव, चीस्तिया मोहल्ला, खान रोड	0.169712	0.38
32	सिरका, हबीबनगर, यशवंत नगर	0.485268	1.10
33	शंकरपुर, कुद, दामोडीह, सिरसी , यशवंत नगर	4.3621961	9.92
34	हुरहुरू अंश	1.394716	3.17
35	हुरहुरू बस्ती,बाबा पथ	0.961216	2.19
36	मासीपीढ़ी, पतरातु चौक , चानो—1, पतरातु बस्ती	3.663837	8.35
कुल	————		100

स्रोतः— सेंटीनल 02 उपग्रह डाटा, 2021 तथा शोधार्थी द्वारा परिष्कृत



चित्र संख्या 3 : नगर निगम वार्ड वितरण

उद्देश्यः

इस शोध का मूल उद्देश्य निम्नलिखित हैं –

- नगरीकरण और भूमि उपयोग के बीच संबंध का पता लगाना।
- सेंटीनल 02 उपग्रह आंकड़ों की सहायता से शहरी/हजारीबाग नगर निगम के भूमि उपयोग प्रतिरूप का विश्लेषण करना है।

विधि तंत्र :

इस अध्याय का मूल उद्देश्य वर्त्तमान समय में शहर/हजारीबाग नगरनिगम के भूमि उपयोग प्रतिरूप का पता लगाना है जिसमें वर्ष 1991, 2001 से 2011 के दौरान जनसंख्या परिवर्तन का प्रभाव पड़ा है। इसमें जनसंख्या वृद्धि और शहरीकरण के साथ हुए परिवर्तन का आकलन शामिल है। इस अध्याय के आँकड़ों के संग्रहण में जनसंख्या विवरण, वार्ड मानचित्रण, टोपोशीट और उपग्रह आँकड़ा शामिल है।

इन आँकड़ों की प्रकृति और उनके स्रोतों को निम्न तालिका से दिखाया गया है–

तालिका संख्या 3 : शहरी भूमि उपयोग से संबंधित द्वितीयक आँकड़ों का विवरण

	हजारीबाग नगर निगम	स्रोत
1	टोपोशीट संख्या एफ45बी5, एफ45बी8, जी45टी12	भारतीय सर्वेक्षण विभाग मापनी – 1:50,000
2	सेटेलाइट चित्रण सेंटलिन 02 उपग्रह	कॉपरनिकस ओपन एक्सेस (Schihub.copernicus.eu)
3	1991, 2001 और 2011 का जनसांख्यकीय विवरण	जिला जनगणना पुस्तिका, भारत सरकार
4	वार्ड सीमा मानचित्र	हजारीबाग नगर निगम

स्रोत :– शोधार्थी द्वारा संकलित

उपरोक्त तालिका से स्पष्ट होता है कि टोपोशीट संख्या एफ45बी5, एफ45बी8, जी45टी12, मापनी 1:50,000 के आलोक में सेंटिनल 02 सेटेलाइट के माध्यम से हजारीबाग नगर निगम के भूमि उपयोग का मानचित्र तैयार किया गया है। यहाँ के भूमि उपयोग प्रतिरूप का वर्तमान स्वरूप 1991, 2001–2011 के जनसांख्यकीय स्वरूप के आधार पर निर्धारित होती है।

शोधलब्धि :

वर्त्तमान का युग नगरीकरण का युग है। नगरों की जनसंख्या में तीव्र गति से वृद्धि और नगरों की आकार में वृद्धि नगरीकरण कहलाता है। संयुक्त राष्ट्र संघ के अनुसार– ग्रामीण क्षेत्रों से जनसंख्या का शहरों में

प्रवास और वहाँ आर्थिक क्रिया में संलग्न होना ही नगरीकरण कहलाता है। वास्तव में नगरीय जनसंख्या में आनुपातिक वृद्धि "नगरीकरण" है। यह वृद्धि किसी विशेष दशक में होनी चाहिए। जैसे– अध्ययन क्षेत्र में 1991, 2001, एवं 2011 में देखा गया।

जी०टी० ट्रिवार्था ने नगरीकरण का परिभाषित करते हुए तीन विशेषता बतलाये हैं-

(क) कुल जनसंख्या का नगरीय स्थानों में रहने के अनुपात को नगरीकरण कहा जाता है।

(ख) नगरीकरण प्रक्रिया का तात्पर्य नगरीय क्षेत्रों में कुल जनसंख्या में वृद्धि से है।

(ग) नगरीय की दर से तात्पर्य निश्चित समय सीमा में कुल जनसंख्या में से नगरीय बस्तियों में रहने वाली जनसंख्या की दर से है। (नगरीय भूगोल, सुरेश चन्द्र बंसल, पृ० – 170)

अध्ययन क्षेत्र में विगत 3 दशक के दौरान जनसंख्या में तीव्र वृद्धि देखा गया जिसके परिणामस्वरूप नगरीय जनसंख्या में आनुपातिक वृद्धि हुई है।तालिका के माध्यम से हजारीबाग नगर निगम क्षेत्र जनसंख्या वृद्धि और शहरीकरण को दिखलाया गया है–

तालिका संख्या 4 : हजारीबाग नगर निगम में जनसंख्या वृद्धि (1991-2011)

वर्ष	1991	2001	2011
कुल जन० सी०डी० प्रखंड	202345	270664	290098
शहरी जनसंख्या	104245	144020	171822
नगरीय जनसंख्या (प्रतिशत में)	51.50	53.20	59.23

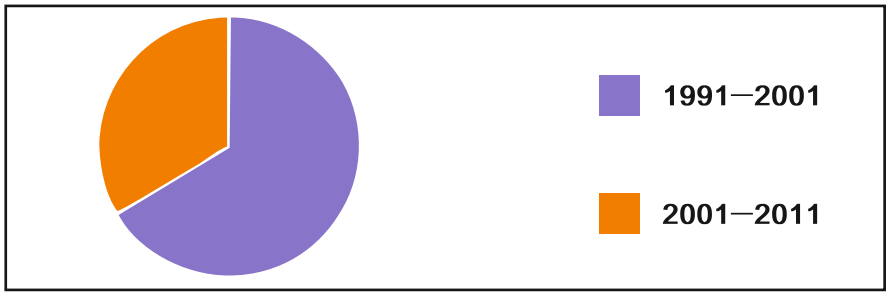
स्रोत :– जिला जनगणना पुस्तिका (2001–2011)

उपरोक्त तालिका से स्पष्ट होता है कि 1991–2011 तक के अवधी के दौरान हजारीबाग नगरनिगम में जनसंख्या तीव्र गति से वृद्धि हुआ। 1991–2011 के दौरान नगरीय जनसंख्या में वृद्धि दर 1.7 प्रतिशत रही, जो कि 2001–2011 के दौरान 6.03 प्रतिशत थी अर्थात् कहा जा सकता है कि 1991–2011 के दौरान 7. 73 प्रतिशत की जनसंख्या में वृद्धि देखी गई। वर्त्तमान में यह गति और तीव्र है।

तालिका संख्या 5 : हजारीबाग नगर निगम में दशकीय जनसंख्या वृद्धि दर (1991-2011)

वर्ष	कुल (प्रतिशत में)	शहरी (प्रतिशत में)
1991–2001	33.8	38.2
2001–2011	7.18	19.30

स्रोत : जिला जनगणना पुस्तिका, 1991–2011



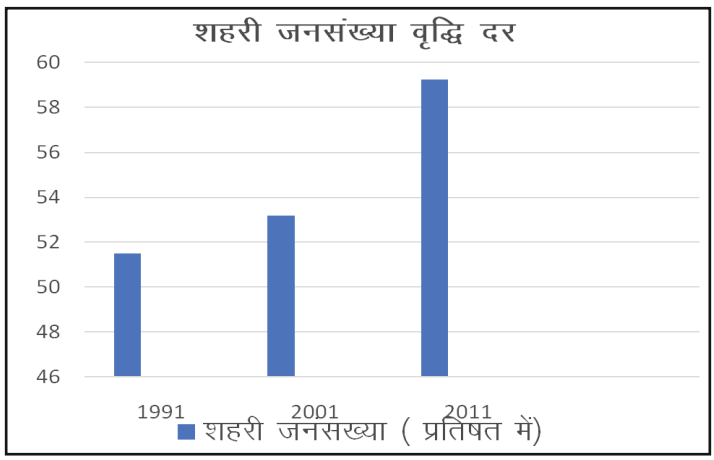
स्रोत : जिला जनगणना पुस्तिका, 1991–2011

चित्र संख्या 4 दशकीय जनसंख्या वृद्धि दर (प्रतिशत में)

उपरोक्त तालिका से स्पष्ट होता है कि वर्ष 1991–2011 के दौरान जनसंख्या वृद्धि दर शहरों में 12.12 प्रतिशत की रही। इतनी अधिक मात्रा में वृद्धि का कारण शहरी क्षेत्रों में शिक्षा, रोजगार, स्वास्थ्य, व्यवसाय और बुनियादी सुविधाओं का निरंतर विकास होना है। 1992 में हजारीबाग शहरी क्षेत्र में विनोबा भावे विश्वविद्यालय की स्थापना से अन्य जिलों से भी जनसंख्या का निरंतर गमनागमन हुआ, जो जनसंख्या के संकेन्द्रण में महत्वपूर्ण भागीदारी निभाई।

तालिका संख्या 6 : शहरी जनसंख्या वृद्धि दर का अंतर (1991-2011)

वर्ष	शहरी जनंसख्या (प्रतिशत में)	अंतर (प्रतिशत)
1991	51.50	–
2001	53.20	1.70
2011	59.23	6.03



स्रोत : जिला जनसंख्या पुस्तिका (2001–2011)

चित्र संख्या 5 : शहरी जनसंख्या वृद्धि दर

उपरोक्त तालिका से स्पष्ट होता है कि वर्ष 1991 –2011 के 20 वर्षो के अंतराल में हजारीबाग नगर निगम क्षेत्र में जनसंख्या का जटील संरचना का निर्माण हुआ है जो क्षेत्र के भूमि उपयोग प्रारूप के लिए विषम परिस्थितियाँ पैदा की है। वर्त्तमान परिदृश्य में हजारीबाग नगर निगम क्षेत्र निरंतर विस्तारित होते जा रहे है। वर्त्तमान समय में शहर में आवासीय भूमि का विकास निरंतर हुआ है।

हजारीबाग नगर निगम के भूमि उपयोग प्रतिरूप (2021):

हजारीबाग नगर निगम के भूमि उपयोग प्रतिरूप की व्याख्या सेंटिनेल 02 उपग्रह मानचित्र के माध्यम से किया गया है। इसमें संवेदक ओईओ, जिसका रिजोल्युशन 10 मी०, टेल प्रोपॉटी 45 क्यूयूजी है।

तालिका संख्या 7 : हजारीबाग नगर निगम के भूमि उपयोग उपग्रह छवि की विशेषता

मंच	संवेदक	वर्णक्रमीय बैंड	रिजोल्यूशन	टेल प्रोपॉटी	स्थानीय रिजोल्यूशन	स्रोत
सेंटिनेल 02	ओईओ	नीला–0.45–0.52 हरा–0.51–0.60 लाल–0.63–0.69 अवरक्त–0.97–0.90	10 मी॰	45 क्यूयूजी	16 दिन	कॉपरनिकस

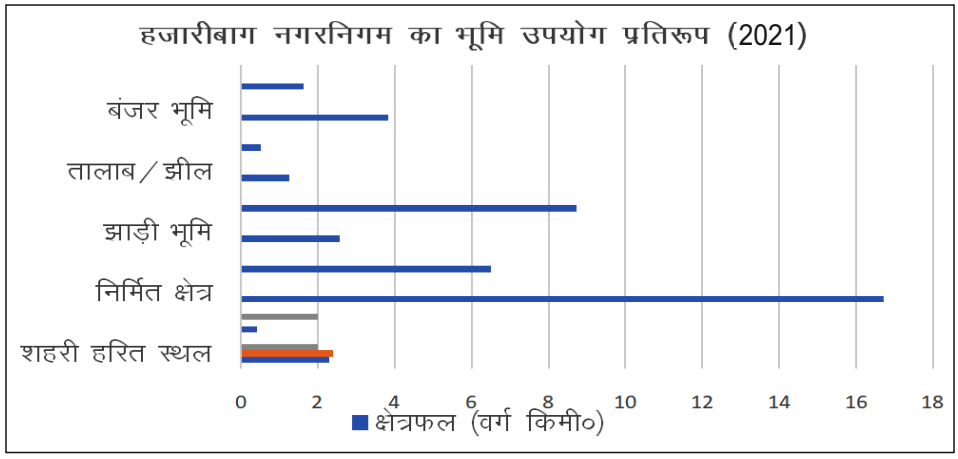
स्रोत : 02 सेंटीनल आंकड़ों द्वारा संसाधित / मात्राबद्व

उपरोक्त विशेषताओं के आधार पर हजारीबाग नगर निगम क्षेत्र के भूमि उपयोग प्रारूप को एराडास एमेजिन सॉफ्टवेयर के माध्यम से मात्राबद्ध किया गया है।

तालिका संख्या 8 : हजारीबाग नगर निगम का भूमि उपयोग प्रतिरूप (2021)

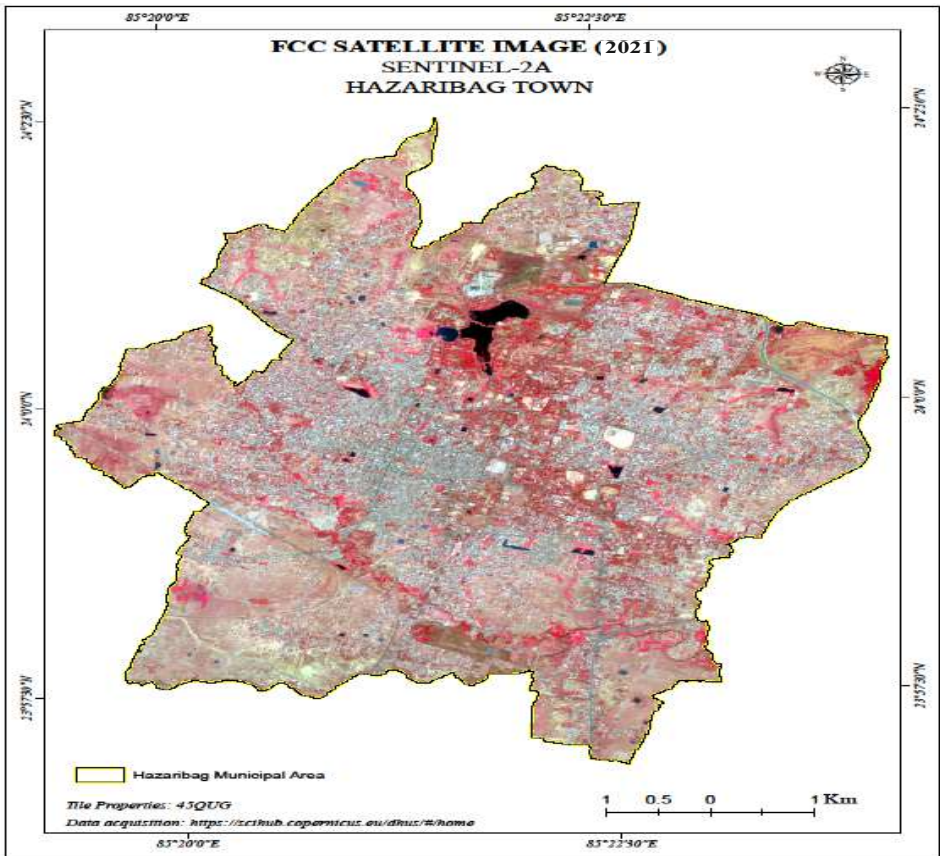
भूमि उपयोग का वर्ग	क्षेत्रफल (वर्ग किमी०)	क्षेत्रफल (प्रतिशत मे)
शहरी हरित स्थल	2.31	5.28
नदी	0.42	0.95
निर्मित क्षेत्र	16.71	38.09
खुली भूमि	6.50	14.82
झाड़ी भूमि	2.57	5.86
कृषि भूमि	8.74	19.91
तालाब / झील	1.25	2.84
खेल का मैंदान	0.51	1.61
बंजर भूमि	3.84	8.75
सड़क	1.62	2.33
कुल	43.87	100

स्रोत : सेंटीनल 02 उपग्रह आंकड़ों द्वारा मात्राबद्व

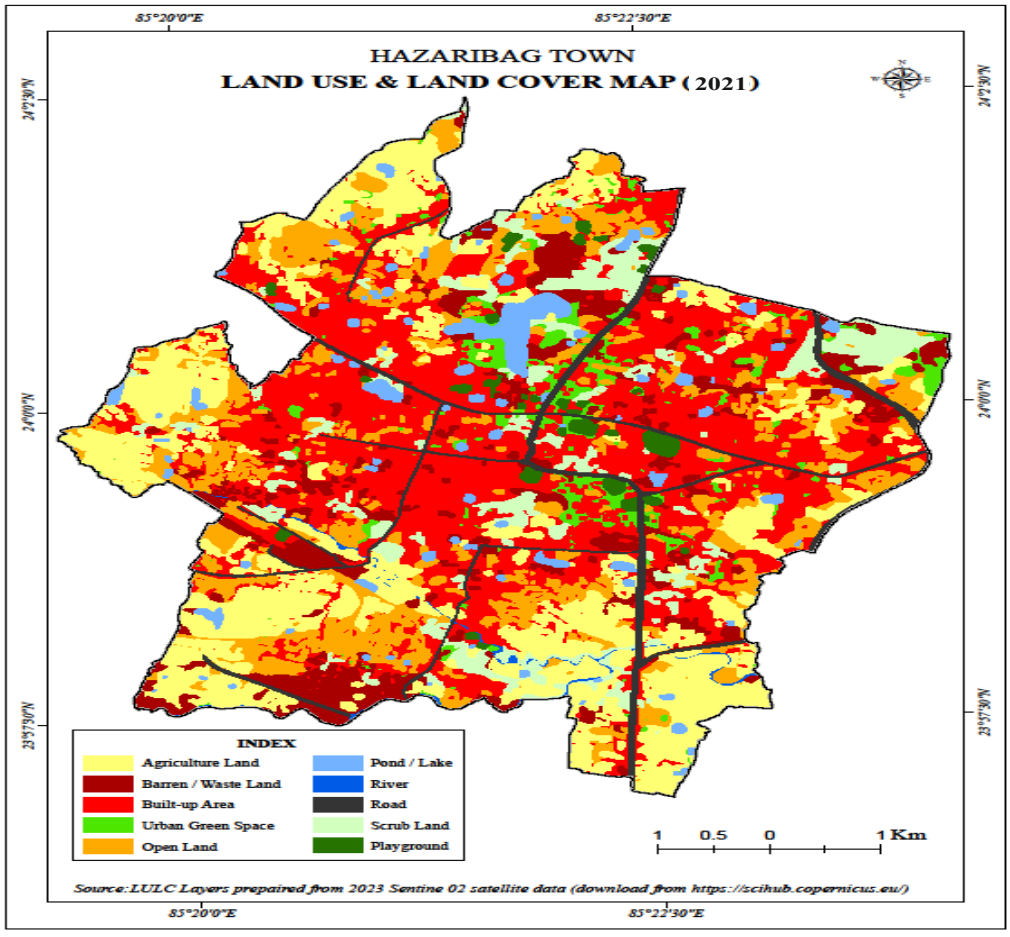


स्रोत : सेंटीनल 02 उपग्रह आंकड़ों द्वारा मात्राबद्व

चित्र संख्या 6 : नगरीय भूमि उपयोग प्रतिरूप



चित्र संख्या 7 : हजारीबाग का सैटेलाईट इमेज 2021



चित्र संख्या 8 : भू उपयोग एवं भू-कवर मानचित्र

हजारीबाग नगर निगम के वर्त्तमान भूमि उपयोग प्रतिरूप को निम्न रूपों में वर्गीकृत किया गया है –

1. शहरी हरित स्थल

इसे नीला स्थल भी कहा जाता है। यह शहर का हरे–भरे स्थान होते है जो शहर के वन भूमि, हरे घास क्षेत्र से खेल के मैदान से लेकर उच्च दबाव वाले वातावरण और भौतिक वातावरण को शामिल किया जाता है। इसमें हरित पार्क को भी सम्मिलित करते हैं। आमतौर शहरी हरित स्थल शहर के जनता के लिए खुला क्षेत्र माना जाता है। यह निजी स्वामित्व से लेकर सार्वजनिक क्षेत्र को शामिल करते है। इस क्षेत्र में उच्च शिक्षा परिसर, सामुदायिक पार्क, उद्यान और संस्थागत मैदान शामिल है। हजारीबाग नगरनिगम के कुल क्षेत्रफल 43.07 वर्ग किमी० मे से 2.31 वर्ग किमी० क्षेत्र में हरित स्थल है जो सम्पूर्ण क्षेत्र का 5.28 प्रतिशत घेरता है। नगरनिगम के वार्ड नं० 30, 31, 32 के अलावे सभी वार्ड मे हरित स्थल फैला हुआ है।

तालिका संख्या 9 : शहरी हरित स्थल

हजारीबाग झील परिसर	गाँधी मैदान
निर्मल महतो पार्क	कर्जन मैदान
सारले पार्क	वेल्स मैदान
स्वर्ण जयंती पार्क	संत कोलंबस मैदान
जय प्रकाश नारायण उद्यान	हिन्दु स्कूल मैदान
फ्रेड पार्क, विभावि	जिला स्कूल मैदान
सक्रिट हाउस हजारीबाग	आन्नदा हाई स्कूल मैदान
गुरू गोविन्द सिंह पार्क	पीटीसी पुलिस लाईन मैदान
वन विभाग पूर्वी हजारीबाग	सीआरपीएफ मैदान
जबरा पार्क	जैप–07 मैदान
जिला परिषद पार्क	सेन्ट्रल जेल मैदान
विनोदनी पार्क विभावि	होमगार्ड मैदान
जुलु पार्क	

स्रोतः– शोधार्थी द्वारा संकलित

2. नदी

हजारीबाग नगर निगम क्षेत्र के द० सीमा कोनार नदी बनाती है, लेकिन शहर के प० भाग से द०–पूर्व की ओर छोटी नदी बहती है जो आगे बढ़कर वार्ड नं० 36 से सिमाना के पास कोनार से मिल जाती है। शहर के वार्ड नं० 24 (2.20 प्रतिशत), 25 (0.42 प्रतिशत), 29 (0.28 प्रतिशत), 32 (0.22 प्रतिशत) और 36 (3.71 प्रतिशत) हिस्सा घेरते हुए गरी नाला और कोनार नदी प्रवाहित होती है।

हजारीबाग नगर निगम के कुल क्षेत्रफल में से 0.42 वर्ग किमी० या 0.95 प्रतिशत क्षेत्रफल में नदी विस्तृत है। वर्त्तमान परिदृश्य में गरी नाला शहरी अतिक्रमण के प्रभाव से त्रस्त है। यहाँ के मूल भू–भाग पर निरंतर आवास निर्माण और गंदगी का जमाव किया जा रहा है जिसका इसका घाटी क्षेत्र सिकुड़ रहा है। कोनार नदी का प्रवाह वार्ड 24 के द० में सीमा का निर्माण करते हुए प० से पूर्व की ओर प्रवाहित होती है। यह वार्ड 33 पार करती हुए एकाएक उ० की ओर मुड़कर रसौलीगंज और मासीपीढ़ी का सीमा साझा करती है। साथ ही प० से आनेवाली गरी नाला मिलती है फिर पुनः यह पूर्व की ओर मुड़कर मासीपीढ़ी (वार्ड–36) होते हुए नगर निगम से बाहर होकर गुड़वा, सलैमा, चहैला, पौता, मोरांगी, तरवा होते हुए चुरचू प्रखंड में प्रवेश कर जाती है।

3. निर्मित क्षेत्र

निर्मित क्षेत्र को आवास की उपस्थिति के रूप में परिभाषित किया जाता है। राष्ट्रीय सांख्यिकीय कार्यालय की परिभाषा के अनुसार– "निर्मित भूमि उस भूमि को कहते है जिनमें अपरिवर्तनीय रूप से शहरी चरित्र प्रकट होता है।"

हजारीबाग नगर पालिका क्षेत्र के कुल क्षे० में से सबसे अधिक 16.71 वर्ग किमी० पर आवासीय भूमि का विस्तार है जो कुल क्षेत्रफल में से 38.09 प्रतिशत हिस्सा में फैला हुआ है। सम्पूर्ण वार्ड का विश्लेषण करने से स्पष्ट होता है कि वार्ड नं० 20 सबसे सघन आवासीय क्षेत्र है। इसमें शिवपुरी और ओकनी–1 का क्षेत्र शामिल है। यह हजारीबाग नगर निगम का सबसे पुराना रिहाईशी क्षेत्र है। इसका वार्ड के कुल क्षेत्रफल मे से 94.30 प्रतिशत आवास भूमि है। जबकि रविनगर, हरिनगर का पूर्व भाग और पंच मंदिर का द० भाग अंसारी रोड तक वार्ड नं० 31 का विस्तार है। जहाँ मूलतः कुल क्षेत्रफल में से 92.86 प्रतिशत आवास को निर्माण है। नगर निगम का सबसे कम निर्मित क्षेत्र वार्ड 33 का है। जिसमें शंकरपुर, कुद–1, दामोडीह, सिरसी–1, यशवंत नगर शामिल है। वास्तव में यह नया वार्ड है जिसमें शहरी फैलाव का प्रभाव देखने को मिलता है।

4. खुली भूमि

शहरी खुली भूमि से तात्पर्य शहर का वैसा क्षेत्र जहाँ हरा–भरा हो, साथ ही यह निजी या सार्वजनिक स्वामित्व वाला हो सकता है जहाँ आवासीस उद्यान, पार्क या अन्य संरचना किसी प्रकार की नही दिखाई देती है। यहाँ प्राकृतिक खुली भूमि दिखाई देता है।

हजारीबाग नगर निगम क्षेत्र में कुल क्षेत्रफल में से शहरी खुली भूमि 6.50 वर्ग किमी क्षेत्र में फैला हुआ है जो 14.82 प्रतिशत क्षेत्र घेरता है। उपरोक्त तालिका से स्पष्ट होता है कि नगरनिगम के 36 वार्ड में से 32 वार्ड में कुछ मात्रा में खुला भूमि का संकेन्द्रण है। जिसमें से वार्ड नं० 02 में सबसे अधिक खुली भूमि है जो कुल क्षेत्रफल मे से 28.80 प्रतिशत हिस्सा रखती है। इसमें प्रमुख क्षेत्र अल्फाह कॉलोनी का हिस्सा शामिल है।

5. झाड़ी भूमि

इस प्रकार के क्षेत्र के अन्तर्गत घास, जड़ी–बूटी और जड़ प्रधान पौधे को शामिल किया जाता है। यहाँ वृक्ष कम और अधिक छोटे–छोटे झाड़ियो से ढकी होती हे। हजारीबाग नगर निगम के कुल क्षेत्रफल में से 2.57 वर्ग किमी० था 5.86 प्रतिशत क्षेत्र शामिल है। इनमें से वार्ड नं० 09 के कुल क्षेत्रफल में से 18.10 प्रतिशत भाग इसमें शामिल है। इसमें जबरा (भूईया टोला) का क्षेत्र सम्मिलित है।

6. कृषि भूमि

अध्ययन क्षेत्र में कृषि भूमि का आशय ''शहरी कृषि'' से है। इसमें नगर निगम क्षेत्र के अन्तर्गत फसल उगाने, पशुधन बढ़ाने एवं अन्य प्रकार के खाद्यान्न उत्पादन से संबंधित है। वास्तव शहरी क्षेत्र कृषि के

समक्ष सबसे बड़ी चुनौती यहाँ शहरी क्षेत्रों के आंतरिक भाग में भूमि की सीमित उपलब्धता है। यहाँ भूमि मूल्य अधिक होने के कारण खाद्यान्न उत्पादन के लिए आवश्यक स्थान की उपलब्धता संभव नहीं है।

अध्ययन क्षेत्र के कुल भौगोलिक क्षेत्रफल में से 8.74 वर्ग किमी० या 19.91 प्रतिशत हिस्सा कृषि भूमि का है। यहाँ नगर निगम के सम्पूर्ण वार्ड में कृषि संभव नहीं है। लेकिन फिर भी कुछ उपांत हिस्सों में कृषि प्रारूप देखने को मिलता है। अध्ययन क्षेत्र के वार्ड नं० 1 में कृषि का विस्तार काफी मात्रा में हुआ है। यहाँ के कुल क्षेत्रफल में से 49.00 प्रतिशत क्षेत्र में विस्तृत है। वार्ड नं० 1 वास्तव में नगर निगम के 30 भाग का उपांत पेटी है। यहाँ मंडई कला प्रमुख कृषि क्षेत्र है। इसके अलावे वार्ड नं० 23 (कस्तुरीखाप, विष्णुपुरी) में 44.05 प्रतिशत भाग में कृषि कार्य की जाती है। यह क्षेत्र भी शहर का प० उपांत क्षेत्र है।

7. तालाब या झील

हजारीबाग नगर निगम क्षेत्रों में जल निकाय या तालाब और झील शहरी दृश्यभूमि का मौलिक ढ़ाँचा है जल की स्थानीय उपयोग के लिए वर्षा जल का भंडारण तालाब और झील के माध्यम से किया जाता है।हजारीबाग झील के माध्यम से शहरी क्षेत्रों में जलापूर्ति की समस्या का समाधान किया जाता है। अध्ययन क्षेत्र के कुल क्षेत्रफल का 1.25 वर्ग किमी० या 2.84 प्रतिशत भाग पर विस्तृत है। यहाँ के वार्ड नं० 04 (झील नगर, कोलघट्टी–2) में 12.06 प्रतिशत भाग पर जल निकाय है। जिसमें हजारीबाग झील प्रमुख है।

तालिका संख्या 10 : प्रमुख जल निकाय

हजारीबाग झील	छठ तालाब, जबरा	लाखे तालाब
ओकनी तालाब	छठ तालाब	दीपुगढ़ा तालाब
जोड़ तालाब	हुरहुरू तालाब	कालीबाड़ी तालाब
मटवारी तालाब	धोबिया तालाब	इंटर साइंस कॉलेज तालाब
विभावि जोड़ा तालाब	कृष्णापुरी तालाब	जिला परिषद तालाब
खिरगाँव तालाब	पुराना तालाब	
लम्बा तालाब	राजा तालाब	

स्रोतः– शोधार्थी द्वारा संकलित

8. खेल का मैदान

नगर निगम क्षेत्र के कुल क्षेत्रफल में से 0.51 वर्ग किमी या 1.16 प्रतिशत क्षेत्र में खेल का मैदान का विस्तार है। नगर निगम में सबसे अधिक खेल के मैदान का विस्तार वार्ड नं० 12 के 8.24 प्रतिशत भाग में फैला है।

तालिका संख्या 11 : प्रमुख खेल के मैदान

संत कोलंबस कॉलेज ट्रेक	संत कोलंबस ग्राउंड
वेल्स ग्राउंड	कर्जन ग्राउंड
फ्रेंड पार्क विभावि	विनोदनी ग्राउंड विभावि
कारगील ग्राउंड	डीवीसी ग्राउंड
गाँधी मैदान	डी०ए०वी० स्कूल ग्राउंड
इंडियन खेल का मैदान	सैयद मिराज उद्यान

स्रोत : शोधार्थी द्वारा संकलित

9. सड़क :

किसी भी शहर के विकास की बुनियादी आधार सड़क मार्ग है जिससे सभी प्रकार की सुविधाओं का पहुँच बन पाता है। हजारीबाग नगर निगम क्षेत्र से एनएच 22 (पुराना एनएच–33) और एनएच 522 (पुराना एनएच 100) गुजरता है जो बाहरी क्षेत्रों से नगर निगम को जोड़ता है। साथ ही वार्ड स्तर पर भी अनेक सड़कों का निर्माण किया गया है जो शहरी आंतरिक विकास में सहायता प्रदान करते हैं। नगर निगम के कुल क्षेत्रफल का 1.02 वर्ग किमी या 2.33 प्रतिशत हिस्सा सड़का मार्ग में शामिल है। नगर निगम क्षेत्र में सबसे अधिक सड़क मार्ग से अधिकृत क्षेत्र वार्ड नं० 15 है, जो 7.22 प्रतिशत हिस्सा रखती है।

तालिका संख्या 12 : हजारीबाग नगरनिगम के प्रमुख सड़क मार्ग

क्र० सं०	सड़क मार्ग	कहाँ से	कहाँ तक
1	एनएच 522	बगोदर	चतरा
2	एनएच 22	राँची	पटना
3	कोर्रा रोड	निलांबर–पितांबर चौक	हेड पोस्ट ऑफिस
4	सदानन्द रोड	कोर्रा चौक	कॉलेज मोड़
5	एनएच 07	हजारीबाग	बड़कागाँव
6	एनएच 20	हजारीबाग बाईपास	जिला परिषद चौक होते हुए नगवाँ टोल प्लाजा

स्रोत : शोधार्थी द्वारा संकलित

10. बंजर एवं खुली भूमि

शहरी बंजर भूमि का आशय है कि शहर का वह भाग जहाँ पर शहरी अवसाद या गंदगी का जमाव होता है, जिससे वहाँ की भूमि अनुत्पादक हो जाती है। हजारीबाग नगर निगम के कुल क्षेत्रफल का 3.84 वर्ग किमी या 8.75 प्रतिशत भाग शहरी बंजर भूमि है। इस प्रकार की बंजर एवं खुली भूमि सबसे अधिक वार्ड नं० 33 (शंकरपुर, कुद, सिरसी–1, यशवंत नगर क्षेत्र) में 17.76 प्रतिशत में है।

निष्कर्ष

उपरोक्त सम्पूर्ण विवरणें से स्पष्ट होता है कि हजारीबाग नगर निगम सही अर्थों में हजारीबाग जिला का ह्रदय स्थल है। यहाँ जिला के सभी प्रदेशों से जनसंख्या का संकेन्द्रण होता है। यह संकेन्द्रण शिक्षा, रोजगार, व्यवसाय ,स्वास्थय, पर्यटन, आवास के दृष्टि से महत्वपूर्ण हैं। यहाँ 1991–2021 के दौरान 7. 73 प्रतिशत जनसंख्या वृद्धि दर रही हैं, जो नगर निगम को बढ़वा दे रहा है।

जनसंख्या वृद्धि का प्रभाव भूमि उपयोग प्रारूप पर पड़ रहा है। जिसके कारण आज आवासीय संरचना में त्रीव गति से विकास हुआ हैं। यह क्षेत्र वर्त्तमान समय में जनसंख्या गति की समस्या से जुझ रहा है। जिससे भीड़–भाड़, प्रदुषण की समस्या, उत्पन्न हो रही है। इसी का परिणाम शहरी फैलाव है, जिससे उपांत पेटी के कृषि प्रतिरूप प्रभावित हो रही है।

अतः यह कहा जा सकता है कि जनसंख्या वृद्धि का व्यापक प्रभाव भूमि उपयोग पर पड़ पहा है।

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