Criteria 3 – Research, Innovations and Extension (110)

3.3- Research Publication and Awards (25)

3.3.2. Number of books and chapters in edited volumes/books published and papers published in national/ international conference proceedings per teacher during last five years (15)

NO	List of Book/Chapter
2022-23	
1	Planning and management of temporary emergency healthcare centers - a case study of peri urban areas of Nashik
2	Socio-economic aspect of urbanization a case of Nashik city
3	Effects on land use transformation of urban frontier due to fringe area quantum leap: A case area of Wardha city
4	Kalanurup Badlat Gelele bhartiya vananche swarup: Tyatil Sanklpanache Punrjivikaran kalachi garaj

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Architecture, Loni

PERI-URBAN ARCHITECTURE AND PLANNING

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CONTENTS

PLANNING AND MANAGEMENT OF TEMPORARY EMERGENCY HEALTHCARE CENTRES - A CASE STUDY OF PERIURBAN AREAS OF NASHIK.

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Abstract : The World Health Organization (WHO) defines primary healthcare as "a whole-of-society approach to health and well-being, centred on the needs and preferences of individuals, families, and communities." "Primary healthcare, "the WHO explains, "ensures people receive comprehensive care. It is necessary to have an access to people for prompt health care in areas where economic, geographic, or cultural barriers limit access to affordable services especially during disasters. This paper attempts to address issues like accessibility, the immediacy of care, economical deploy ability and affordability, to health and well-being of individuals, and communities during disasters. The study will follow a qualitative research methodology where data will be collected from a comprehensive literature review. The comparison matrix shall be derived from the existing literature review and suitable case studies.The research will be a review of existing materials and systems of construction and study of new materials and technologies to arrive at a strategy to be used in selection of materials and systems for temporary shelters .A comprehensive strategy for selection and implementation of building materials and systems will optimize operatability and help support development of emergency shelters during mass casualties

Keywords: Temporary structures, primary health care centre, Prefabricated, portable construction, criteria for slection of temporary structures, medical facilities construction

1. Introduction :

Health care centres are central to provide emergency care and hence when a disaster strikes, the society falls back upon the health care centres to provide immediate aid in the form of emergency medical care.

At disaster sites, an immediate response is needed. Natural and manmade disasters are of immense concern throughout the globe. Primary health centres (PHCs) represent the first tier of the Indian health care system, providing a range of essential outpatient services to people living in the rural areas. Limited public health infrastructure and lack of medical and support resources contribute the vulnerability of existing facilities in developing country like ours with limited resources.

In India, a network of over 25,000 primary health centres (PHCs), the first and lowest health tier, provide essential preventive, promotive, and curative health services in the rural areas.But any serious case has to be referred to a bigger hospital in the nearing city.

However when a disaster strikes, or in any emergency situation the facilities provided by the PHC'S are insufficient to tackle the rise in number of patients. Also, the location and accessibility of PHC'S is far

off and patients have to travel long distances to avail services or in perurban areas too the hospitals could be inaccessible . There is not only an urgent need to increase the preparedness of healthcare centres in mass casualties, but also the local administration have to expand their focus on providing immediate facilities to step up the preparedness of such centres.Facilities should be developed in a central accessible city location to cater to the villages and periurban areas of the city.

Some calamities can cause major disruptions to emergency services owing to failure of roads, bridges etc. Response to such emergencies should therefore be quick, easily accessible, procurable, erectable and flexible.

Hence healthcare buildings demand flexibility and adaptability in use and which can be constructed rapidly to meet tight programmes.

Buildings have been built in one place and reassembled in another throughout history. The world's first prefabricated, pre-cast panelled apartment blocks were pioneered in Liverpool. The idea of modular buildings constructed from prefabricated materials and parts has been around for a few thousand years. Roman armies carried their forts in prefabricated sections for easy installation once they arrived at their destination, and since then modular construction has only grown. The tent structures were designed as “instant dwellings” where traditional construction techniques for shanty settlements and squat are too slow.

Erection of temporary structures has been an answer for rapid erection of facilities in times of distress. Such temporary shelters ensure the safety of affected communities and also help prevent secondary events such as the spread of diseases. This has to be done both swiftly and efficiently.

1.1Aim: To understand challenges and opportunities of healthcare centres in India and to suggest a response plan and procedure for its up gradation in disasters.

1.2 Research Question: What should be the emergency response strategy for temporary healthcare preparedness in disasters at rural level ?

1.3 Hypothesis: An organised response strategy for construction of temporary structures to support healthcare systems in emergencies will provide effective and optimal support in disaster management.

1.4 Objectives:

- To examine emergency care systems in India and to explore its scope and limitations.
- To study and analyze capacity building and preparedness measures for healthcare .
- To understand , identify risks and mitigation methods, resource management and nature of extended facilities required for setting up of temporary medical facilities.
- to establish a flowchart for setting up, support and control of healthcare facility.
- To incorporate community participation in this process.

1.5 Scope and limitation:

This study aims to provide a response plan for up gradation of rural healthcare centres among the various levels and types of hospital care .It will further look into the management of temporary structural system to support such healthcare facilities to give prompt , fast track solution in disasters.

2. Research Methodology

- A qualitative study, using questionnaires and case studies was used to investigate approaches towards provision of shelters during disasters.

- Data was collected through in-depth interviews of technical people involved in disaster management in Nashik area such as PWD and disaster management cell executives.The priorities are defined depending on the preferences of knowledgeable assessment of local experts like Architects, structural designers, contractors and government officials.

- An intensive literature review was conducted including disaster management and emergency response policy and practice and theory applied as a response to emergency healthcare in disasters.Using the results of the literature review, the criteria's were summarized and weightage was given to the priority of criteria's depending on case studies of different materials used as well as interviews and questionnaire surveys.

- Temporary shelter systems around the world and in India , in the past as well as future trends are studied.

- A study of materials that are used or can be used was done by studying brochures as well as actual applications.

- Also, an evaluation of merits and demerits of various materials and construction systems that can be used is done and evaluated with respect to the multiple criteria's to arrive at a strategy for selection of possible approach for such projects.

A study of building construction approaches in disasters like earthquakes, floods and fire was done to understand the challenges and approach for selection of material and construction system in Nashik area.

- Evaluation of local criteria's such as proximity of material supply from site, Strata of ground, climatic factors is also done and priorities are established along with global factors.

- Further specific approach in the selection of materials with respect to medical care and its criteria's are considered.

- Data analysis was done bythe AHP method by establishing priority amongst criteria’s and assigning weightages.Hierarchy was then refined based on the assessment and feedback given by a group of 15 experts in the questionnaire survey. The experts were technical people like architects, structural designer's and contractors who have studied and worked in the temporary construction techniques and medical facility buildings.

3. Data Analysis:

Priorities of criteria for consideration of materials and systems of construction for medical facilities were established from the response of experts in the field. Specific preferences for use in Nashik region considering local factors was also analyzed from the survey.

Material preference with respect to the priorities was established from the material comparison matrix. Complete bucket list of data collection was differentiated into existing systems in use and Alternative systems catering to more parameters.

Table -1: Priority Analysis table for Materials

Analysis		
1	**Puff Panels**	Most Preferred
2	**PVC Sheets**	
3	**Metal or Asbestos**	More Preferred
4	**Recycled Ply**	
5	**Aerocon**	Less Preferred
6	**Cloth**	
7	**MDF**	Not Preferred
8	**Bamboo Mat Board**	
9	**Mass Timber**	
10	**Precast**	

Table -2: Priority Analysis table for Materials

Priority depending on Percentage			
Sr. No	**Criteria**	**Total**	**%**
1	Availability	61	5.54
2	Time required for erection is less	60	5.45
3	Fire safety	57	5.18
4	Economical	55	5.00
5	Can be erected with unskilled labour	53	4.81
6	Operational safety	53	4.81
7	Design and joining details	52	4.72
8	Strength and Tolerance	52	4.72
9	Waterproofing	50	4.54

10	Light weight	50	4.54
11	Modular construction possible	49	4.45
12	Standardization	48	4.36
13	Less maintenance and serviceability	48	4.36
14	Less labour intensive	47	4.27
15	Quality of material	46	4.18
16	Environmentally more suitable	42	3.81
17	Durability	42	3.81
18	Sustainability	41	3.72
19	Mechanized systems	41	3.72
20	Dimensional accuracy	41	3.72
21	In house production	40	3.63
22	Insulation properties	35	3.18
23	Life span	34	3.09
24	Transport	4	0.36
		1101	

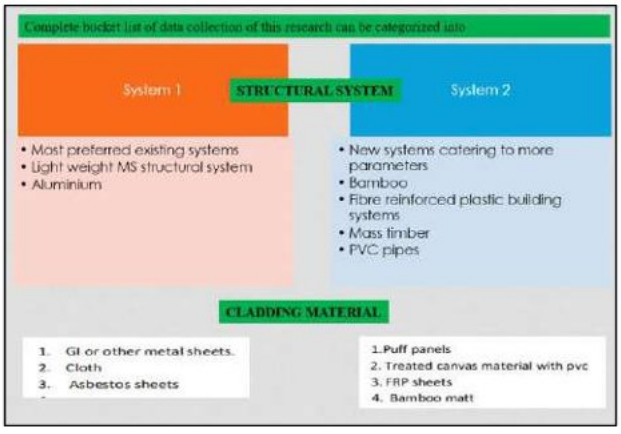

Fig: 1: Complete bucket list -1

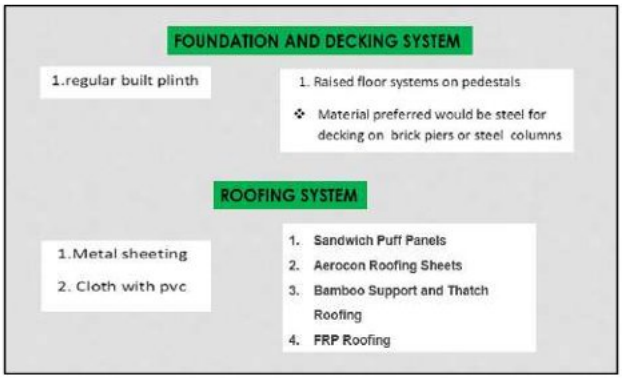

Fig- 2: Complete bucket list -2

4.Discussion

The emergency plan for smaller hospitals such as community health centre may actually only focus around providing either mobile emergency care on the site of incident or providing intermediate stabilization and forward referral of serious patients to the nearest networked hospital. Such small centres can provide immense help in case of mass casualty by providing definitive care to such victims who are not seriously injured.

4.1 Disaster Scenario in Nashik District:

Health care networking will be a necessary step in preparedness of such centres. Network essentially means a dynamic link between various health care facilities of a given geographical area for optimization of available resources.

The District of Nashik, is vulnerable to various kinds of hazards like flood, earthquake, fire hazard, drought, road & railway accidents, chemical hazard, communal violence, epidemic, hailstorm, heat wave & cold wave, stampede etc. The devastation caused by various kinds of natural and manmade hazards has posed a challenge before the Nashik district administration and other responsible bodies like NGO's to analyse each and every decision making process to gear up the rescue and restoration during such situations as well as building up the capacity to face calamities in future.

4.2 Response mechanism to disaster in India :

Disaster response mechanisms in India typically makes use of existing built facilities of bigger scale, like schools and mangal karyalaya for use as temporary shelters owing to the basic amenities of toilets, electricity and water etc already available.But this can be done only if such buildings have remained unaffected by the disasters themselves and are in close proximity to the area affected with respect to accessibility by the affected people as well as facility givers. Also the availability of such ready facilities in the vicinity may not be there.

4.3 Proposed alternative response:

Temporary facilities can be erected on open lands close to the primary health care centres of the area, or on land close to the disaster-prone region and easily accessible. Also being temporary and reusable nature, the same unit can be used in multiple closely spaced regions on various occasions. Vacant land can be used for other purposes when not in use for such centres.

In this sense, the selection and location of collective temporary shelters is a decisive factor in the response to disasters. While the response has to be timely, it should not be hasty. There are multiple issues that arise with hasty erection of temporary shelters such as incomplete beneficiary selection, poor site selection, contextually inappropriate choice of shelter designs, materials and construction

technology, inflated costs, lack of community consultation or participation leading to inappropriate shelter and dissatisfied families.
Rapid needs assessment should be undertaken before deciding on type of shelter solution to evaluate their usability and contextual relevance over other forms of shelter support.
The temporary shelters should be constructed with a plan which guides the dismantling of temporary shelters while promoting maximum salvage and reuse of the materials.
This study therefore evaluates for temporary facilities to add to primary healthcare centres, and the deficiency of systematic approaches that support decision-makers in the selection analysis of temporary constructions for healthcare facilities.
Adoption of pre-fabricated shelters requires careful and detailed needs assessment so as to consider issues like suitability of standardized design , climatic performance, durability of materials, ability of local community to repair and maintain, need of external aids such as cranes, disposal of degraded shelter material in environmentally safe manner.
With respect to healthcare facilities additional criteria's of selection will be included such as

- Toxicity
- fungal and bacterial attack and decay
- Antimicrobial
- Sterile
- VOC's from materials
- recycling or biobased
- reusing
- Flexibility to accommodate health infrastructure such as gas piping and air conditioning.
- Material selection should be prioritized on the above criteria's for optimum use for the purpose for which they are essentially selected.

5.Findings

The initial results of this study comprehend the definition of the primary evaluation elements used to compose the criteria.The choice and availability of construction materials is one of the key factors that determine the design of the temporary shelters.

As a response to increasing health facility in mass casualty, practical approach will be to erect temporary facilities whenever required and after the purpose is served, material should be dismantled, packed and transported to base where it can be maintained till further use.

Establishment of a local database or a protocol for erection of temporary structures for mass casualties will give a permanent guideline for approach at the time of casualty.At the strategic level, the model allows the collection of a diverse range of facilities to function as temporary structures and the prioritization of best alternatives in the case of a disaster.

Modular systems of construction using light weight structural systems and variety of roofing and cladding systems depending on priority of criteria's is best suited for temporary construction.

The best materials to be used for temporary construction from the point of view of reuse & recycling will be manmade materials that can be reused such as steel sections and galvanized iron or FRP sheets or other recycled materials boards. Natural materials like bamboo can be an alternative subject to availability

Light weight steel or aluminium is the most preferred material for use as structural system for temporary sheds in Nashik region. Bamboo or PVC pipes is the second best alternative

Useof prefabricated systems with predefined cladding roofing and flooring options will improve levels of quality , reduce material wastage and construction period.

Basic foundation system using ready steel members or brick piers and floating floor construction system with steel beams and flooring is recommended instead of conventional plinths

Identify and ensure resources of labour and transport along with the criterias discussed for speedy construction of systems.

Trainings could be given to dedicated staff by officials for erection of selected systems in an area.

6. Strategy.

- To identify and categorize hazards in the region where temporary shelters are proposed.
- risk assessment of the hazards
- Assess climatic condition and geography of the area
- Check on material and labour availability
- Evaluate the material on priority based on weightages.
- Evaluate application of structural system based on recommendations in the study and hazard category.
- Evaluate non-conventional materials available in the region and systems if any based on priority and material comparison matrix.
- Identify resources such as equipment, labour and transport for the materials selected.
- Identify location and resources for storage and maintenance of material when dismantled and stored for further use.

7. Conclusion

This study helps address one phase of the disaster management cycle . It attempts to organize the selection and construction of healthcare facility which is a preliminary step considering challenges facing the built environment from disaster perspective. It proposes a guideline and systematic approach to support the decision process of selecting temporary shelters. New materials and systems can be evaluated based on the multicritertia model and considered for use.

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CONTENTS

SOCIO-ECONOMIC ASPECT OF URBANIZATION A CASE OF NASHIK CITY

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Abstract : With a population of roughly 2.18 million in 2022, Nashik is the fourth largest city of Maharashtra. The city is a potential investment city because of its favourable climatic conditions, strong industrial presence, renowned educational institutions, and social and cultural environment. Based on these characteristics, the real estate market in the 25-kilometer radius surrounding Nashik City is booming. The District's GDP has doubled in the last ten years. This has influenced people's purchasing power, and the real-world rise in the vehicle market, real estate, and retail is evidence of this. This research focuses on the farmers of Peri-urban areas and the impact of real estate development on their lives. An attempt has been made in the present study to understand the socio-economic changes in the lives of fringe area landowners. The methodology followed was a questionnaire survey, and interviews of the farmers of Chandshi, Jalalpur, and Mahadeopur which are on the fringes of Gangapur road which is the prime area of real estate. The main aspects studied were to understand the diversification of the income generated through the conversion of their farmland, and willingness to relocate to farther farmlands. It was noted that even though on government records we see agricultural land, the landowners are agriculturists and not native farmers of that village. The farmers view this opportunity of urbanization as a way to change their day-to-day hardships due to a lack of funds. We find a positive and negative impact of the eviction or displacement of the peri-urban farmers in terms of the livelihood that they earn through farming. The chosen few farmers with educated backgrounds were able to diversify their income and benefit from urbanization. Whereas the other population could secure jobs either through their education or proximity of the urban neighbourhood.

Keywords: Socio-Economic Development, Urbanization, Peri-urban land owners.

1. Introduction :

Maharashtra's northern region encompasses the city of Nashik. It is around 190 kilometers north of Mumbai, the state capital. Nashik ranks fourth largest in Maharashtra after, Mumbai, Pune, and Nagpur. Located on the banks of the Godavari River which flows from Trimbakeshwar to vijaywada. Nashik serves as the district's administrative headquarters as well.

Nashik is regarded as "the third most industrialized city in Maharashtra after Mumbai and Pune," mostly because of recent significant industrial growth. National Treasury Printing Press and a significant thermal power plant (Eklahare) are located here. The region around Nashik and its environs is divided into five "Industrial Zones" (Satpur, Ambad, Sinnar, Igatpuri, and Dindori).

There are several sugar mills in the district. White onions and pomegranates of the region are two other top exports from the country. Although Nashik has industrialized, the district's primary industry remains agriculture. Approximately 90% of Indian wine comes from the Nashik Valley. Given that, more than half of India's vineyards and wineries are located here, the city is also known as the "Wine Capital of India" or "India's Napa Valley." Locally renowned wine labels like "Sula" have won recognition on a global scale.

1.1 Population Growth

The population of the city has increased dramatically over the past two decades, going from 1.49 million as of the 2011 Census to nearly 2.18 million in 2022. By 2035, Nashik's population is projected to increase to 3.2 million.[1]

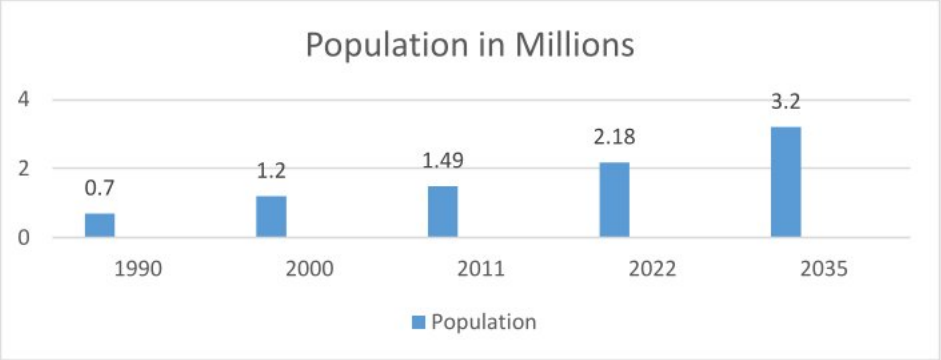

Fig 1 Population Growth of Nashik City (World Census)

1.2 Nashik District Tehsil

Fig 2 Tehsil under Nashik District (Source- Maps of India)

1.3 Nashik City Development

The city has been divided into three sections by the passing of the highways (NH3, NH50). The main development initially took place alongside these highways. The Godavari River's course also split the city in two. Due to its railway and highway connectivity, the city growth was most noticeable along the southern bank of the Godavari River. On the opposite bank of the river, there was agricultural area that was used to grow a variety of crops, including wheat, jawar, bajra, rice, as well as fruits like grapes and vegetables like tomatoes and onions.

Total villages that come under Nashik District - 1960

Small Farm Landowners of the District - 3, 50,956 (54%)

2. Aim

The primary goal of this research study is to concentrate on the farmland owners in the peri-urban areas of Nashik City, their growth, and the opportunities they have with urbanization and the relocation or eviction from their ancestral farms, which is based on the sector analysis.

2.1 Objective

- To study, how urban growth has affected Peri-Urban farmers.
- To examine changes in the economic standing of Peri-Urban farm owners.

2.2 Methodology

The primary and secondary data used in this descriptive and quantitative study were gathered from a number of sources. In the current study, an effort has been made to conduct a systematic analysis of changes in the economic standing of landowners in peripheral areas. This analysis can help in understanding how shifting from rural to urban land use affects the peri-urban interface's economic characteristics. For this research study, a research sample was chosen (based on the proximity to the area under the jurisdiction of Nashik Municipal Corporation) for data collection and analysis. The chosen sample had an initial social setup of a more number of uneducated population.

2.3 Limitation

This study is limited to the developments and landowners of Chandshi, Jalalpur, and Mahadeopur. The reason for selecting these 3 villages is the dwellers of these villages were uneducated for generations and considered to be underdeveloped for ages. Now with the proximity to the Urban city, they were exposed to urbanization and Urban life.

3. Current Real Estate Development

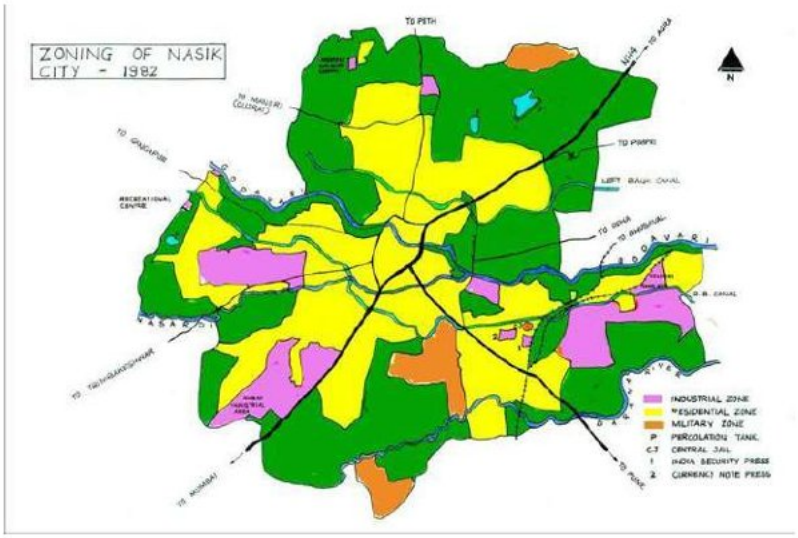

Figure 3: Geographic Map of Nashik (Source- Maps of India)

Nashik is a promising investment location due to its favourable climatic conditions, strong industrial expansion, educational institutions, and social and cultural environment. Based on these characteristics, the real estate market in Nashik City, which has a perimeter of around 25 km, is booming in all directions.

The city's College Road and Gangapur Road neighbourhoods, which have the largest commercial centers, banks, educational institutions, and entertainment facilities, are the most popular and have the highest saleable prices.

In the past, compared to other areas of the city, the Panchavati neighbourhood had not experienced considerable growth in the property sector due to the lack of industries there. New townships are being built on both sides of the 100-foot ring road, which connects Panchavati to the city's busy Gangapur Road in only a few minutes.

3.1 Drivers of the Economy

In recent years, the demand for both residential and commercial space is rising. Established builders, developers like Raheja Group, DLF, DSK Group, Nirman Group, and Bagad Properties are developing projects of apartments, villas, and commercial complexes in the city. This affects the growth of suburbs on the outskirts of the central city.

The announcement of Metro project has made access to markets, employment and, administrative possibilities, medical, and educational services easy. The amount of time spent commuting would be reduced, which would boost population productivity overall.

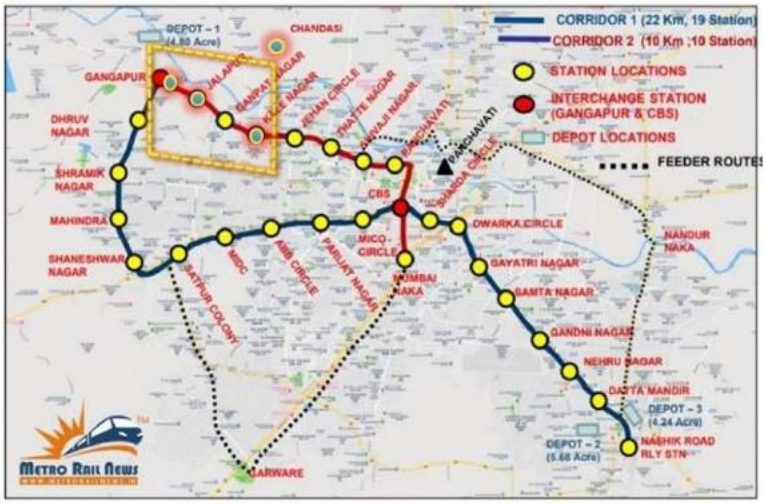

Fig 4 Metro Route of Nashik (Source-Nashik Metro Project)

3.2 Government Policy

With the new Town planning model, and the Regional plan the developers grasped the peri-urban areas' potential for the growth of the city and purchased sizable agricultural land parcels near the developed land, for instance, in the riverside villages of Chandshi, Jalalpur.

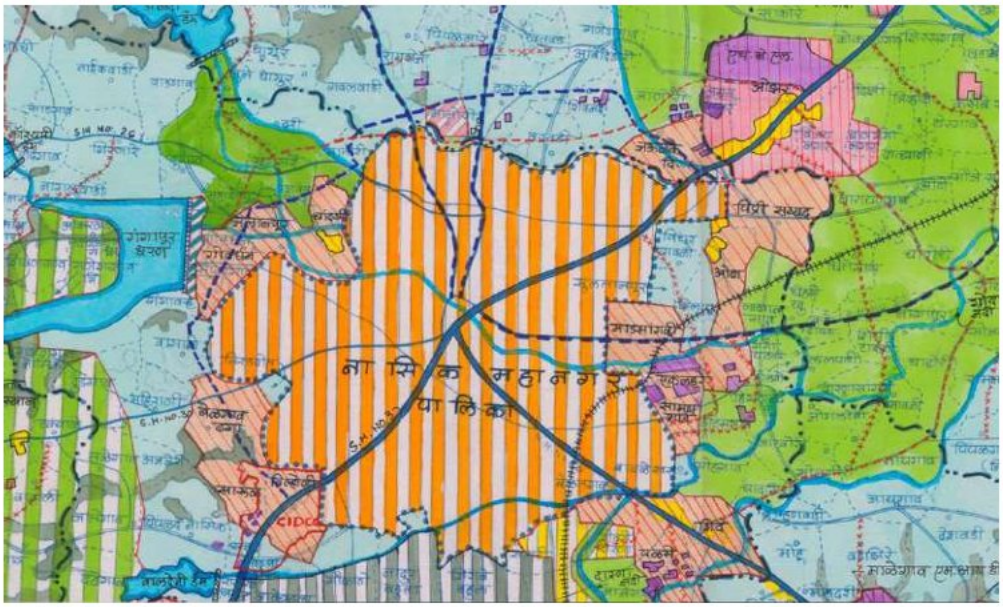

Fig 5 Regional Plan of Nashik District (Source- Regional Plan Nashik)

4 Data of Chandshi, Jalalpur, And Mahadeopur

Table 1 Demographic data

Village	Geographic area in Hec	Net Area in Hec	Total Population	Male	Female	No. of land-owners	Agricultural area	Non-Agricultural
Chandshi	491.15	429.78	2047	1053	994	1317	292.905	136.875 (31.8%)
Jalalpur	1069.09	857.83	2940	1540	1400	1777	857.3	0.53866 (0.06%)
Mahadeopur	334.65	274.02	1708	908	800	321	273.74	0.28 (0.10%)

4.1 Connectivity to Gangapur RoadC

Legends- 1. Anandwalli, 2. Gangapur village, 3. Jalapur, 4. Chandasi village, 5. Mahadeopur

Fig 6 Connectivity from Anandwalli Gangapur Road (Source Nashik City Map)

4.2 Chandshi

Chandshi farmers cultivate wheat as kharip crop along with tomatoes, green leafy vegetables, coriander. Alongside these there are rose, guava, and grape farms.

The Regional Plan proposed the Chandshi village in Yellow zone. Due to its connectivity to Gangapur road (which is just 2.7 kilometres) on one side and Mhasrul-Makhamalabad road on the other side, farmland was converted to non-agricultural land at a faster rate than Jalalpur or Mahadeopur. This further initiated the developers and agriculturists (People whose previous generations were farmers) to start buying land in this village. Though data does not show a change in land uses the native farmers of the village are replaced by agriculturists. The outsiders in the village are approximately 80-85%.

The developers started building apartments or developing layouts of bungalow plots and selling at a lesser rate than the city. The urban dweller who could not buy a dwelling unit in the urban area opted to buy bigger units here. Due to the SmartCity project, the development happens in these areas under the guidelines of NMRDA. The MSRTC connectivity and seater rickshaw made it possible for the children of the village to approach the schools, colleges in the city easy. The younger generation was lured to work in malls, and started considering working in farm below dignity. The girls of the village could get easy access to education which changed the psychology of the family. The developed residential layouts provided opportunities for the villagers of Jalalpur, Mahadeopur to work as drivers, house help, gardener, etc.

The rates of farmland in Chandsi are high as compared to Jalapur and Mahadeopur. As per RR, 1.5 times to Jalalpur.

4.3 Jalalpur

Compared to Chandshi Jalalpur is 4.2 kilometres from Gangapur road. Major crops of this village are Wheat, soybean, cabbage, cauliflower, green leafy vegetables, and capsicum. Many of the farmers have irrigation systems installed; few have wells in their farms. Farmers with accessibility to river water lift the water or farms adjacent to the canal have benefits of farming throughout the year.

Jalalpur also comes under yellow zone in the Regional Plan. As per the data received at present one third of the farmers are agriculturists. The percentage of outsiders is approximately 30-35%.The conversion of non-agriculture land use is limited or negligible 0.06%.

The connectivity by MSRTC bus and seat rickshaws made it easy for the younger generation to get jobs in the urban areas like house help maids, drivers, etc. Most of the land is under contract with the developers or bought by the agriculturist. As per RR, 10% more than Mahadeopur.

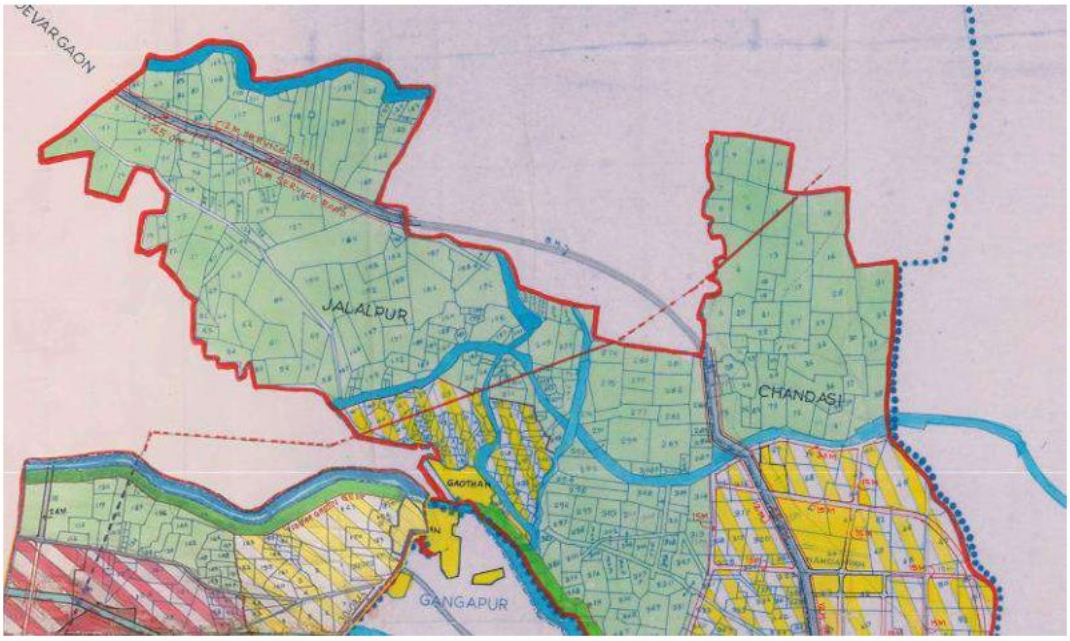

Fig 7 Regional Plan showing Chandshi, Jalalpur, Mahadeopur (Source Regional Plan Nashik)

4.4 Mahadeopur

Compared to Chandshi, and Jalalpur Mahadeopur is farther from Gangapur road (9.6 kilometres) and that is the reason that urbanization has not affected this area at present. The main crops taken in this area are vegetables like tomatoes, bottle gourd, ridge gourd, sponge gourd, green leafy vegetables, coriander, and Capsicum. There are a few grape vineyards in this village.

The Regional plan does not show Mahadeopur under yellow zone yet. This is the reason the farms in the radius of 500m from the urban boundary only could be benefitted. The outsiders are approximately 10-15%. Though the developers have done initial investments with farmland owners, the farmers of this village continue to do their farming activity.

5. Observations

The farmers owning up to 2-acre land on their names used to earn with kharip crop of wheat and other crops like tomatoes and vegetables around 1.5 lakh per acre annually. However, with the uncertainty of rainfall and other weather conditions and hardships involved, it is not the same every year. A few examples of demographic and socioeconomic factors are age, education, farmland, family size, and access to infrastructure. These were the primary determinants of these farmers' future

The farmers in Chandshi and Jalalpur recognized the potential of their farmland in light of urbanization trends. Either on their own or in partnership with other developers, they began converting their

farmlands to create layouts. Following this development, the farmers' financial situation changed due to the good prices they obtained.

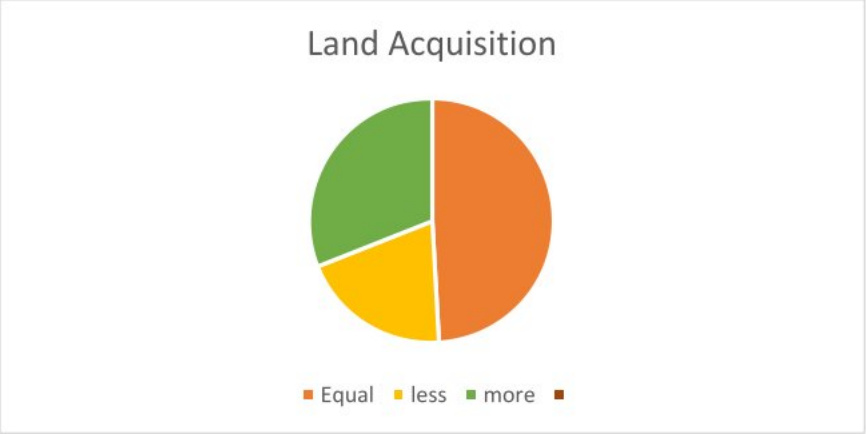

Fig 8 Farmers acquisition of New land (Source- This study)

It was observed that when the farm was divided into more siblings each got a smaller piece of their ancestral land. Thus there was seen a trend to convert the land at these prime locations and move away to the periphery of the district where they could claim a bigger piece of land on their name. Most of the farmers in these areas who have converted their property have purchased larger farmlands 35 to 50 Kilometres away from these villages. Along with investing in bigger farms, they also invested in cars, and home improvements. One of the respondents informed that they had a native land of 8-acre and four siblings after converting the land they could purchase approximately 50 acres of land in Rasegao village on Vani road. This is evidence of the positive impact of urbanization.

More than half of the farmland owners were able to acquire the same amount of land about 21% less since they had more title owners (number of siblings), but they were still able to improve their homes and buy themselves cars. The educated farmers were able to diversify and supplement their income by operating small businesses like transportation, fabrication, dairy, and venturing into construction to earn rent.

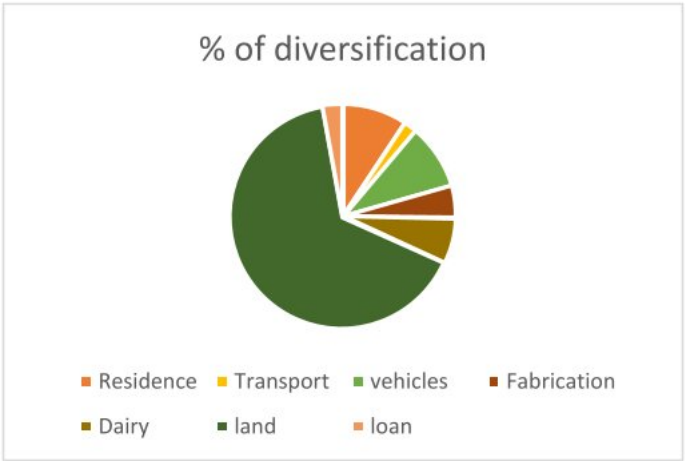

Fig 9 Percentage Diversification of Income (Source- This study)

The less fortunate ones had to repay the loans secured for bore wells' marriages, education, hospitalization etc. and had to move further away for survival. They have bitter sweet feelings about urbanization. The small and less educated farmers are the ones who always face issues to earn a humble living. It is observed that against an expense of Rs.1,00,000/- for an acre for the crop of tomato the farmer might earn up to Rs.3,00,000/- in a year and another year he might not even get Rs.50,000/-. These kind of uncertainties compels the farmer to consider selling his land for a price that he might earn in his full lifetime.

The Adivasi farmers rely mostly on rainfall for their crops and then rest of the year they work on other farmers lands to earn a living. After selling their farmland, they have earned employment on construction sites. This has given them a surety of income.

6. Conclusion

The economic characteristics of the peri-urban interface are impacted by changes in land use from rural to urban activity. An open countryside with peri-urban areas primarily populated by agricultural villages defines the urban perimeter, from which urban settlement spreads. Urban growth typically occurs by intruding on productive agricultural land. The farmers in this peri-urban area are consequently evicted.

The majority of rural residents rely on agriculture for their living. The community in peri-urban areas adopts a variety of livelihood choices to meet their needs depending on how rural and urban the place is. The small and Adivasi farmers work on other farms or as labour on construction site to complete their daily needs. According to the impact assessment estimation, peri-urban farmers' socioeconomic condition is significantly impacted by urban growth. It was observed that due to urbanization, the psychology of the farmers of particularly these 3 villages has changed considerably. The literacy rate has increased which has changed the habits of the rural dweller.

It has been noted that prime agricultural property is purchased for the development of residential communities, commercial structures, and educational facilities. Opportunity, affordability, and location of the farmland all play a significant role in the decision to sell the farms for conversion to urban use or amenity. This puts pressure on the peri-urban farmer to move to another location where they may continue to rely on farming for their living. Some farmers could grow economically by moving away from these villages and further away from the city. Many smaller farmers with less than or up to 2 acre of land have moved to Rasegaon, Umrale and Pimpalnere. Farmers' economic decisions are influenced by their social environment in addition to market conditions. They frequently view these chances as ways to improve their financial situation and leave farming behind (the younger generation). Currently almost all farmers younger generation is educated few with higher education. The educated younger generation does not intend to work in the farm by themselves and needs labour, which are now difficult to find. Many of them do not wish to live in a rural background and wish to be part of an urban community.

The study's main motivation was to comprehend how the farmers in these regions think and how they view numerous advantages and disadvantages of urbanization. Farmers, do not benefit from the urban setup in place of their lands, because majority of them are relocated from their traditional homeland to far periphery areas. The decision to leave their ancestral property behind and move to a new farm is difficult for the farmers. When they leave, a different sociological setup of households will occupy that space. Due to their rural upbringing, farmers are aware that it would be challenging for them to lead a lifestyle comparable to urban dwellers.

We could conclude that urbanization has a positive as well as negative and considerable impact on the peri-urban farmers' economic well-being and social psychology. Due to urbanization, a lesser number

of farmers continue to do farming. The younger generation has got jobs in all other sectors. At the same time, we could also conclude that the farmers who did not have land but had the money against it could survive the pandemic in a better way. Planners need to deliberate on the displacement of farmers and farmland by considering setting up new satellite towns instead of expanding the boundary of the city into the green zone.

Acknowledgements

I take this opportunity to thank Ar. Sulakshana Mahajan madam for all the valueable time spent to discuss with me and give direction to this research work. I would also like to thank the Talathi Mr. Sanjay Kapadnis for sparing valuable time and sharing all the official data with me. Further this reaesrch would not have been possible without the help of Mr. Jagdish Gulave resident of Chandshi village and my friend Ar. Ashish Patil who is an agriculturist and investor in these villages.

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Regional Plan of Nashik

Development plan of Nashik

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CONTENTS

Effects on land use transformation of urban frontier due to fringe area quantum leap- A case of Wardha city

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Abstract:

The conversion of Earth's land surface to urban uses is one of the most irreversible human impacts on the global biosphere (Seto KC), 2011. With rapid urbanization and industrialization across the globe, urban and rural planning-related problems are increasing especially in the Rural-urban interface. The urban age is not just beginning in cities; suburban villages are also being impacted by this worldwide phenomena. As a result of this trend, peri-urban areas have grown. These regions are dealing with significant issues and dynamics for planning and implementing land use transition that was formerly dominated by agriculture.

Further research on the rural-urban interface is crucial since peri-urban areas in major cities are expanding quickly. A sustainable Municipal city also depends on the planned growth of its fringe areas. Thus, it is important to encourage the planned and sustainable urbanization of peri-urban areas. The population under migration is located on cheap land. Densification of the peri-urban area may help the central city's congestion. Additionally, it might be a solution for urban slums. For appropriate and efficient land use we need to study peri urban areas, the small settlements at the rural urban fringe usually are shifted when the development starts (Ar. Manita Saxena).

As a result, this study focuses on examining how land use transformation is affected by spatial changes in a dynamic rural-urban interface. This paper aims to understand the existing land use pattern, composition, and land cover categories in peri-urban areas. This research intends to recognize the main trends and drivers influencing urban borders and rural change and to comprehend the main issues that arise in the rural-urban interface and to identify solutions using sustainable planning principles (A. R.-G.-S.-C.-G.-O.-C. R. Rojas-Caldelas).

The study took advantage of satellite imagery to generate a LULC 3 map for the Peri-Urban area of Wardha city at decadal intervals. Polygons were traced where LULC change has happened by superimposing Landsat pictures on top of each other. The mapped data was evaluated using picture interpretation on-screen. This spatial data analysis was carried out with the help of the ArcGIS tool.

Keywords: Urban Frontiers, Rural Transformation, Peri-Urban, Spatial Analysis, LULC

1. Introduction:

1.1. Background

Urban and rural planning-related issues are getting worse, particularly in the rural-urban interface, as a result of the world's fast industrialization and urbanization. The study "Urban Frontiers and Rural Transformation" focuses on examining how social and physical changes in dynamic rural regions are causing this move from a rural to an urban system. This study also focuses on analysing how spatial changes in a dynamic rural-urban interface affect land use transition. Understanding land use change trends and taking the required steps to lessen its detrimental effects on the city and its surrounding area will be made possible by decades of LULC research. The research paper will also discuss the subject's key concepts, theories, and ideas.

1.2. Urban frontiers and rural transformation

"Urban frontier" refers to spaces in or around a city in which resettlement and new forms of economic development are emerging, often as a result of incoming capital investment associated with an often racialized political struggle between long- standing and newly settled residents (BURT).

"Rural transformation" is a process of change in rural regions that is dependent on a variety of variables and processes. In general, it has been described as modernization, rural development, changes in economic structure, and the movement of people from the farming sector to non-farming sectors of the economy.

Transformation from rural to urban system: The urban age is not just beginning in cities; suburban villages are also being impacted by this worldwide phenomena. In nations around the world, the connection between urban and rural areas is shifting. Other components of the process are particular to certain nations or locations, while other of the problems, like shifting agricultural systems, are universal. As a result of this trend, periurban areas have grown. For the planning and implementation of land use reform, these areas are dealing with significant issues and dynamism.

1.2.1. Effect of social and spatial transformations

As new types of urban, suburban, and exurban development affect community development patterns, migration and settlement patterns are shifting. Conflicts over land use and lifestyle caused by much of this development take place in peri-urban areas that were formerly predominately agricultural. Many policies like AMRUT and SPMRM continue to focus exclusively on rural or urban areas and fail to address the connections between the two. Secondary schools, post offices, telephones, credit, services for agricultural expansion, farm equipment, hospitals, and government services are all dependent on urban regions for rural areas. Both rural and urban populations benefit from strong connections in terms of living circumstances and work prospects. The success of the interaction between urban and rural areas rests on domestic trade, adequate infrastructure, and infrastructure that is both cost-effective and effective.

1.3. Need of the Study

Inadequate infrastructure, a low degree of economic activity, and poor land use planning are some of the fundamental issues caused by peri-urban growth. People frequently have issues with moving, buying land, encroachment, substandard living in slums, psychological breakdowns, problems with the law and order, the lack of a political structure, and social and environmental issues. All the factors leads to the creation of a ‘degenerated periphery". Many policies continue to focus exclusively on rural or urban areas and fail to address the connections between the two.

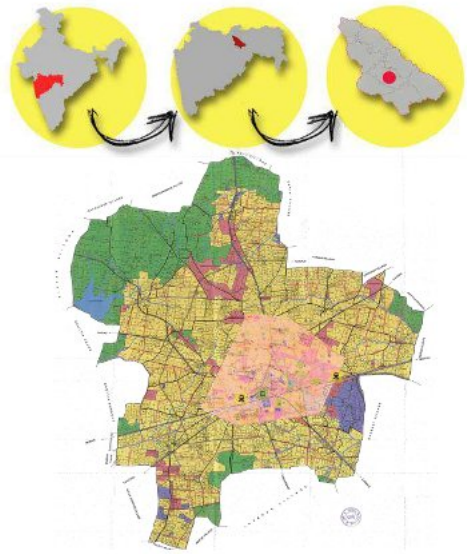
In order to promote inclusive, mutually beneficial, and sustainable urbanisation, rural stakeholders must be involved. Only when cities are surrounded by prosperous rural areas, particularly those with a resilient, fruitful, and lucrative agricultural industry, can cities be sustained. Thus, it is important to encourage the planned and sustainable urbanization of peri-urban areas.

2. Study Area and Data Collection

2.1. Selection of Study Area

The study area is Wardha City located between 20°44′30″N and 78°36′20″E, with a total area of approximately 75 km2 (7500 Ha) and an altitude of 234 m in Maharashtra State. Wardha is a municipal council in the Central Indian state of Maharashtra, which gets its name from the River Wardha. As per provisional reports of Census India, the population of Wardha Muncipal Concil (WMC) and 7 more Census towns around the city area in 2011 is 2,12,602; of which WMC population is 106,444. Wardha's average temperature is about 28°C, however it can range from about 21°C in the winter (December) to about 37°C in the summer (May). May has the highest average temperature of the year, ranging from 30.4°C to 44.4°C. December is the coldest month of the year, with ranges from 11.9°C to 27.8°C.

Table 1 Census towns around wardha city and their population



Sr. No	*Wardha City and its Peri- Urban Areas*	Population
1	Wardha Municipal Council	106444
2	Pipri Census Town	23661
3	Sindi Turf Hindnagar Census Town	20956
4	Borgaon Census Town	19759
5	Sawangi Census Town	14394
6	Nalwadi Census Town	12119
7	Masala Census Town	8883
8	Warud Census Town	6386
	Total Population	**212602**

Figure 1:The geographical location of the study area

2.2. Data Collection

In this study, the influence of peri-urban areas' changing land use and cover over a ten-year period is discussed. The USGS Earth Explorer website allows users to download Landsat satellite photos. Zone 44N for Landsat 8 OLI-TRIS for WGS 84 Date: 01.02.2011 is gathered. Image has sensors called Operational Land Imager (OLI) and Thermal Infrared Sensor (TIRS). Landsat 5 MSS for WGS 84, Zone 44N, Date: 03-Feb-2022 is collected. Image has sensors called Multispectral Scanner System. Here, the spatial resolution of the Landsat 8 satellite is 30 m, so each band pixel is multiplied by 30 m X 30 m to get area covered, while the spatial resolution of the Landsat 5 satellite is 60 m, so each band pixel is multiplied by 60 m X 60 m to get area covered. The location, shape, and properties of geographic features are stored in shape files, a vector data storage format developed by Esri.

Table 2:List of the Landsat data used

Seasons	Year	Satellite	Date of acquisition
Winter	2022	Landsat- 8	2022/02/01
Winter	2011	Landsat- 5	2011/02/03

3. Methodology :

Each image was downloaded as a WRS tile and includes information in 7 distinct bands. A layer stack of these 7 band pictures is required to construct a land use map, and once that layer stack has been completed, an administrative boundary for the city of Wardha was added. Land use maps are classified using 'Interactive Supervised Image Classification' techniques. Present study focuses mainly on four land use class i.e. Barren Land, Urban Area, Water body and Vegetation.

Table 3: LULC Classes

Sr. No.	Land Cover Class	Description
1.	Barren Land	Fallow Land Arid or poorly vegetated regions that most frequently feature bare ground or soil
2.	Urban Area	Includes all construction in the commercial, residential, Public and industrial sectors.
3.	Water Body	All bodies of water, including marine habitats as well as freshwater lakes, rivers, and streams.
4.	Vegetation	Agricultural grasslands, recreational greens and all sorts of forest vegetation, including dense forest and open forest.

Detail methodology followed to generate LULC for 2011 & 2022 is as follow:

Step1- Download landsat data from USGS website of the study area in terms of 7 bands and import those band in GIS platform. Use Composite tool from Data Management tool set to create a composite file of all the 7 bands combined. Natural Colour – 432.

Step2- Open Image Classification toolbar from customize ribbon to perform image classification on composite file. Open Training sample manager, and use draw polygon tool to select pixel values on the map of different areas for 4 aspects i.e. for Barren Land, Urban Area, Water Body & Vegetation.

Step3- Select 10 or more samples of each pixel value from the map with the help of different false colour composition. Then merge the sample points by using Merge training samples and create samples for each aspect.

Step4- After creating all samples use Interactive Supervised Classification Tool from Image Classification toolbar to generate LULC. Select a study area by creating a polygon shape file & extract the study area from the LULC layer, by using Extract by mask tool or clip tool. Now convert the raster result into polygon using conversion tools and calculate the areas for each class defined.

Detail methodology followed to generate change in area of each aspect.

Step1- After getting LULC map for both years 2011 and 2022 using supervise classification method raster files converted into vector files by using raster to polygon tool. Projected cordinates need to set from UTM zone for area calculation. (Wardha- 44N northern hemisphere, WGS 1984)

Step2- All the polygons from shape files categories into 4 classes using dissolve of geoprocessing tool for both shape files. Calculate areas of both shape files in new field by calculate geometry.

Step3- Create changes between years using intersect of geoprocessing tool to get 16 attributes. Now add 2 new field i.e. change and area change, for change use field (calculator change = {(class 2011) + "-" + (class 2022)},) by using this we will get 16 classification like vegetation - barren land, vegetation - urban area, etc. Then use Geometry calculator to get respective areas for each fields.

The methodological algorithm will show the LULC images as well as the percentage of the region that each of the different specified classes covers. The algorithm is applied to the colour class cluster in order to extract the feature. The resulting LULC images produced using the aforementioned process are then used for analysis.

4. Analysis :

Land use land cover map of Wardha city for 2011 and 2022 were prepared (Fig. 2) and results showed that in 2011, the area covered under Urban Area was about 7% (456 Ha); 73% (4972 Ha) Barren Land; 20% (1406 Ha) Vegetation and only 0% (17 Ha) covers under Water Bodies. Similarly, in 2022, area covered under Urban Area was about 24% (1602 Ha); 62% (4255 Ha) Barren Land; 14% (973 Ha) Vegetation and only 0% (20 Ha) covers under Water Bodies.

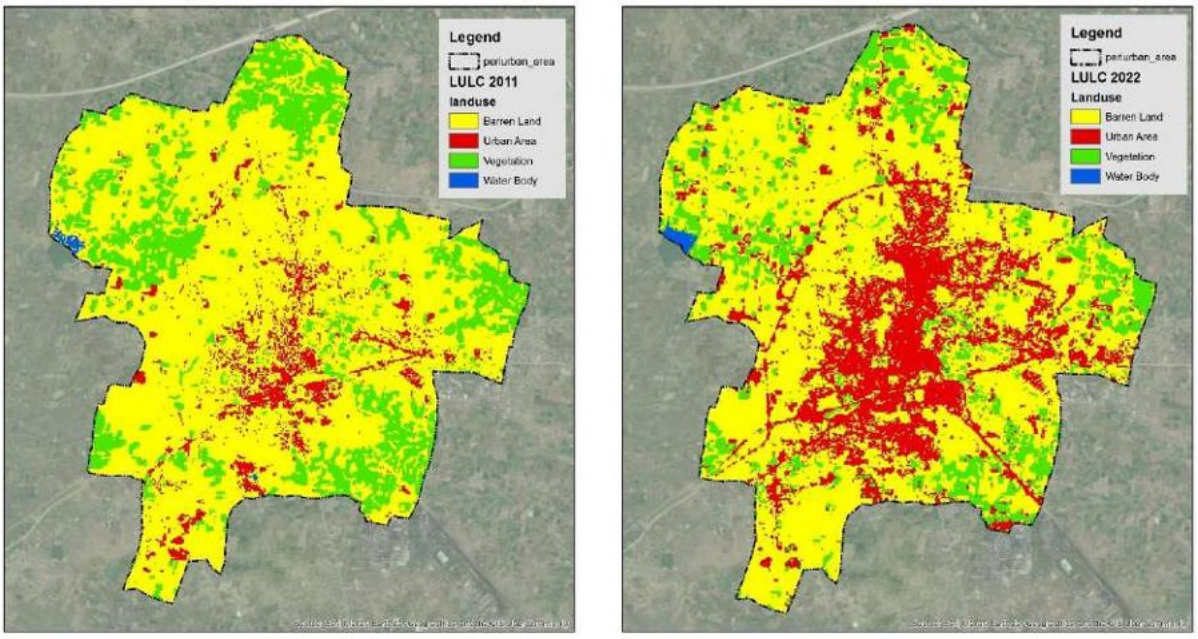


Figure 2: Land Use Land Cover Map of Wardha City 2011 & 2022

Table 4:Statistics of Landsat classification area for 2011 and 2022

Sr. No.	Land use	2011 Area in %	2011 Area in Ha.	2022 Area in %	2022 Area in Ha.	Difference In %	Difference In Area
1	Urban Area	7	456	24	1602	17	1146
2	Water body	0	17	0	20	0	3
3	Vegetation	20	1406	14	973	-6	-433
4	Barren Land	73	4972	62	4255	-11	-717

As a result, it was noted that the area covered by vegetation decreased by 6% over the ten-year period 2011–2022. Due to rapid urbanisation, particularly on the outskirts of the city, forest land has diminished as a result of deforestation and must be turned into built-up territory. As a result, the area classified as an urban area in 2022 has grown by 17% from 2011. However, it was discovered that the region that was barren in 2011 had shrunk by 11% and appeared to be replaced by a built-up area, as shown in Figure 3.

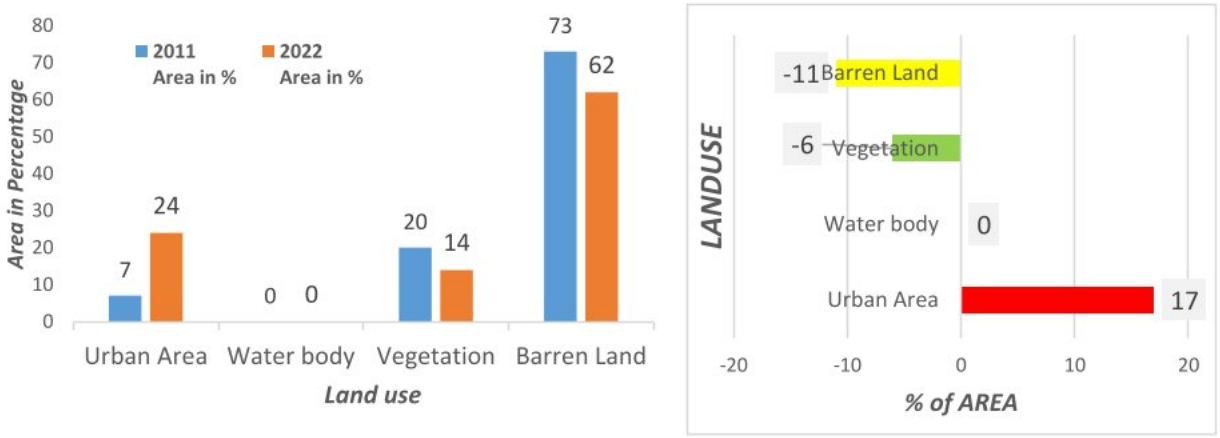


Figure 3: Percentage of different land-use/land-cover classes from 2011 to 2022

Land use land cover map of two decades was dissolved and intersect to get the change in landuse from one class to another. Final change in areas of each attribute is given in Table 4.

The processes of land-use transformation is possible in number of ways, like, Land acquisition for industrial, commercial, real-estate and infrastructure development, land acquisition for the creation of special economic zones 5 (SEZs) and selling of agriculture land by farmers for the construction of houses by individual owners. Since agriculture is less valued than other industries, some farmers "give up" land without protest as land prices increase as infrastructure and development projects are announced.

Table 5: Change in Land Use from one class to another

Sr. No.	Change (2011-2022)	Change Area in Ha.
1	Barren Land-Barren Land	3441.83
2	Barren Land-Urban Area	1164.31
3	Barren Land-Vegetation	354.08
4	Barren Land-Water body	5.68
5	Urban Area-Barren Land	116.26
6	Urban Area-Urban Area	327.23
7	Urban Area-Vegetation	12.17
8	Urban Area-Water body	0.33
9	Vegetation-Barren Land	691.15
10	Vegetation-Urban Area	108.36
11	Vegetation-Vegetation	603.59
12	Vegetation-Water body	0.18
13	Water body-Barren Land	0.21
14	Water body-Urban Area	1.05
15	Water body-Vegetation	1.72
16	Water body-Water body	13.82

Figure 3 Chart showing change in Land use of all 16 classes

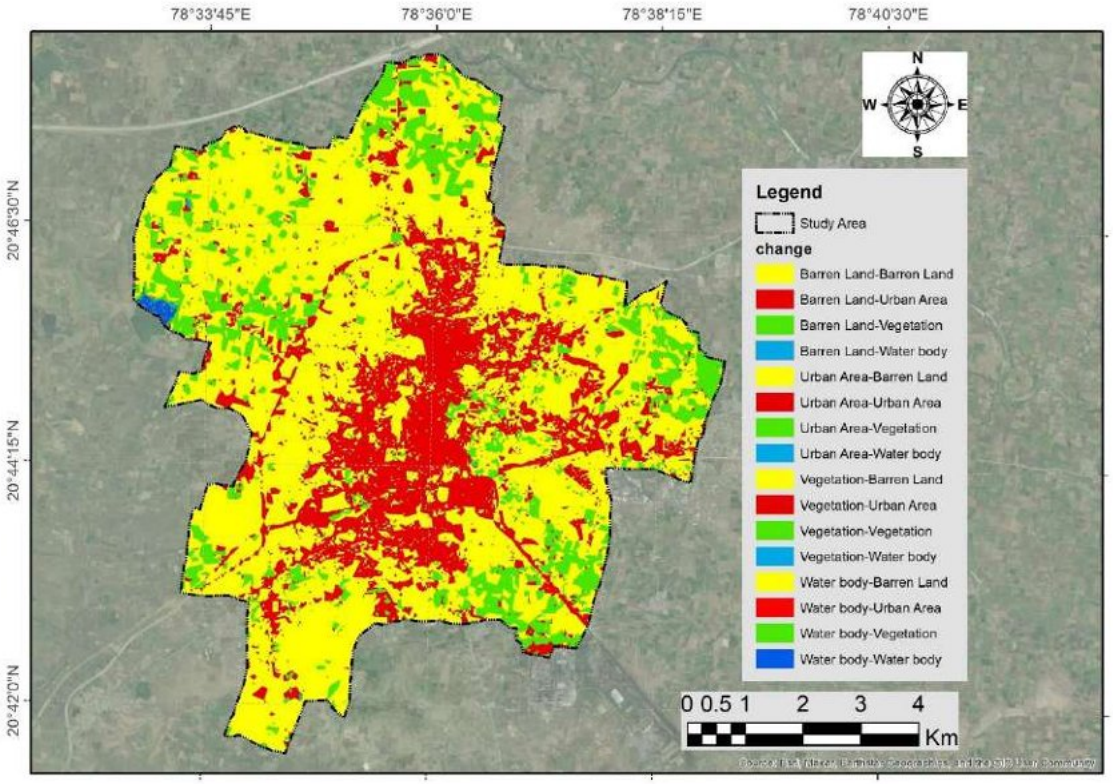


Figure 4: Change in Land Use from one class to another over the decade

The magnitude of the LULC alterations at Wardha City over a 10-year period have been discernible because to the application of remote sensing and GIS methods (2011-2022). The survey also revealed that the Wardha city has grown significantly in size. The newly constructed ring-road NH-361 Nagpur-Aurangabad Highway encircling the northern to western limits of the city is the major cause propogating peri-urbanization. This comprises of three villages namely Pipri, Sindi and Sawangi Meghe. The key-factor of development here becomes the rapid thorough transit of the ring road following a linear development of commercial activities. This further invites the housing sector causing conversion of agricultural land-use into residential land use in and around the commercial zones. However, the requirements of physical and social infrastructure are not well developed or planned for the projected population in such peri-urban areas. Need for inclusive and sustainable planning of these zones is very critical to mitigate negative development impact.

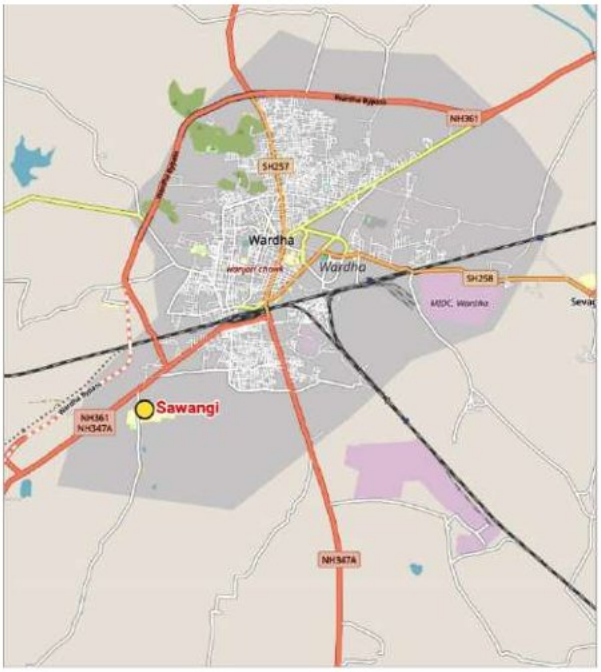


Figure 5 Nagpur- Aurangabad NH 361 Ring road

5. Observation and findings:

5.1. Observations

Growing rural-urban interdependencies: Interdependencies are expanding as borders become more hazy. Food, clean water, environmental services, and raw materials are just a few of the commodities and services that urban centres rely on from rural areas, including agriculture and natural resources.

Lack of coordination: There is a tendency for new building to take place in places where there are few laws or insufficient ones, and there is little to no coordination with the government. There is a problem with unlawful land ownership, and the levels of urbanisation in these settlements vary substantially.

Planning & Management: A jurisdictional conflict results from municipal growth. Planning and management are complicated as a result of the involvement of multiple agencies and their lack of coordination in the area.

Core city identity: Whether through migration or because of industrial or housing development projects, the process of population expulsion towards the hinterlands causes difficulties with decadence in the city's centre districts.

Conflict between two policies: On the one hand, there are those who support economic growth in these areas through the relocation of risky enterprises or new land uses. On the other side, we have lax agricultural and environmental preservation rules that make it difficult for productivity and environmental quality to compete with the financial pressures that come from developers driving up land values.

5.2. Findings

Due to land use changes, land grabbing, and environmentally negligent development aimed at growth by unsustainable means, the water supply in periurban areas, which was once secured by multiple water bodies in and around cities, is now in danger. Therefore, in the absence of any formal service provisions, people turn to a variety of informal ways or coping mechanisms to meet their requirements. Because traditional village ponds that were refilled by rainwater are disappearing due to development and other water sources are becoming less accessible, the peri-urban communities that are still engaged in smallholder farming frequently rely on recycled wastewater, which is becoming more and more contaminated. Indian rural-urban changes produce complicated, diversified, and risky conditions for agri-food systems, but they can also open up new opportunities if they are effectively planned.

6. Recommendations and conclusions:

6.1. Recommendations

Due to the importance of urban fringe areas to development, it is necessary to implement effective measures for reducing conflicts, enhancing the rural-urban interface, and gradually integrating urban and periurban areas into the process of urban growth and development. There is a need to design a model to limit and manage settlement growth in peri-urban areas at both the local and regional levels. Urban fringe definitional ambiguity results in subpar policy design, implementation, and policy/program evaluation. Therefore, it is vital to clear up any ambiguity in governance bylaws and agency jurisdiction.

Need for a suitable planning mechanism which would take care of the interactive process between various local bodies, and agencies of state & central government and also to plan and study the pattern of transformation. The planned growth of its periphery areas is essential to the sustainability of the metropolitan city model. Therefore, it is necessary to develop a framework for spatial planning that takes into account the principles of the 1992 Constitution (74th CAA). It is primarily necessary for all agencies' duties in governance and coordination to be completely clear. Social capital and the local initiative's role must be clearly defined and successful.

Control environmental deterioration: As cities grow, they destroy neighbouring green spaces, which has a negative impact on the ecological sustainability of urban and periurban areas. Control urban sprawl – a high rate of urban sprawl is caused by unauthorised and haphazard growth. It is possible to stop these haphazard expansions by studying Peri urban regions.

The supply of basic amenities and efficient transportation links into the city centre must go hand in hand with the construction of cheap housing in suburban areas. In order to overcome the difficulties of sustainable urbanisation, it is important to recognise the peri-urban interface and its marginalised residents as a vital frontier. Agri-food system support should be gradually combined with urban environmental management, health, nutrition, and poverty alleviation measures. Agricultural land use must be fully and efficiently incorporated into planning processes.

6.3. Conclusion

For a better understanding of the dynamics of urbanisation and urban transition, the urban periphery areas of India are among the most active places. Planning and policymaking work hand in hand to improve the quality of life in these places and address issues with the urban infrastructure of upcoming cities. India presents a distinctive condition of population growth and movement from rural to urban areas as well as from one state to another. This indicates that new settlers will be moving into cities for almost the next 50 years.

The constant and crucial concern for Indian planners would be the spatial transition of rural land into urban agglomeration. The effective management and transformation of periurban areas is crucial to the sustainability of both the economy and society. For greater growth, there should be more public participation.

The interface is a challenging area to plan for and administer in a way that will guide actions toward shared goals and objectives across stakeholders in the public, private, and social sectors. The interface is a complicated area with its own issues and plenty of development prospects. It is critical to keep in mind that these areas will, over time, integrate into the cities, and that they will need to adjust to the economic, social, and environmental dynamics of the metropolis to which they will eventually belong.

Due to its thorough understanding of the environment and its research of various interactions within the city-region system, sustainable development has emerged as a useful framework for addressing the rural-urban interface. The execution and oversight of management plans, however, presents a significant difficulty in the context of intricate governmental administrations.

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आयोजक

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पुणे

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('ऑनलाईन' प्रणाली द्वारे)

मराठी भाषा गौरव दिनानिमित्त सोमवार दिनांक २७ फेब्रुवारी २०२३ रोजी राज्यस्तरीय वास्तुकला मराठी परिषदेचे आयोजन करण्यात येत आहे. वास्तुकला विषयाशी निगडीत माहिती व साहित्य समृद्ध तसेच व्यापक आहे. परंतु तुलनात्मक दृष्ट्या, मराठी भाषेत या विषयावर पुरेसे संदर्भ, पुस्तके उपलब्ध नाही. परिषदेचे आयोजन मराठी भाषेत करून, पुढाकार व प्रोत्साहनाचा हा एक महत्त्वाचा प्रयत्न व सुरुवात ठरेल असा विश्वास आहे. वास्तुकला क्षेत्रातील यशस्वी मान्यवर प्राध्यापक वर्ग विद्यार्थी तसेच व्यवसायिक या साऱ्यांनाच व्यासपीठ उपलब्ध होऊन, त्या संबंधिचे लिखाण, सादरीकरण व चर्चा यास उत्तम प्रतिसाद लाभेल अशी खात्री आहे. विविध विषयांवरील उत्तम लिखाण शोधनिबंध पुस्तिका रूपाने प्रकाशित केले जाईल.

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काळानुरुप बदलत गलेले भारतीय वनांचे स्वरुप : त्यातील संकल्पनांचे पुर्नजिविकरण काळाची गरज

प्रा.दिपीका आरबट्टी
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भारतीय संस्कृतीमध्ये वृक्ष आणि वने या दोन्ही गोष्टींना वैज्ञानिकदृष्ट्या, पौराणिकदृष्ट्या, धार्मिकदृष्ट्या अनन्य साधारण महत्त्व आहे. पौराणिक काळातल्या अनेक कथा प्राचिन भारतीय भूदृष्यशास्त्राचे वर्णन दर्शवतात. शहर विकास आराखडे नसतांनाही, भूदृष्यशास्त्राच्या काही संकल्पना सिंधू संस्कृतीपासून उदयास पावलेल्या आहेत याचे पुरावे आपल्याला अनेक साहित्यांमधून वाचावयास मिळतात. हिंदू पुराणामधील व साहित्यांतील वनांचे महत्त्व, पर्यावरण, पर्यावरणशास्त्र, भूदृश्य वास्तूशास्त्र, गावाची रचना व वने यातील सहसंबंध यांचा आढावा घेणे या शोधनिबंधाचे प्रमुख उदिदष्ट आहे. शोधनिबंध सिंधू खोऱ्यातील संस्कृती ते स्वातंत्रोत्तर भारत यादरम्यान वनांचे बदलत गेलेले स्वरुप व त्याच्या अभ्यास या पुरते मर्यादित आहे. हा शोधनिबंध पुर्ण करण्यासाठी विविध साहित्य, पौराणिक कथा वाचन या पध्दतीचा वापर करण्यात आलेला आहे. या अभ्यासामुळे भारतीय संस्कृतीतील भूदृश्य वास्तूशास्त्रातील ऱ्हास पावलेल्या संकल्पनांचे पुर्नजिविकरण करण्यासाठी उपयोग होणार आहे.

परिचय :

सिंधू नदीच्या पात्रात उगम पावली ती हिंदू संस्कृती, पुढे ग्रीक लोकांनी हिंदूचे रुपांतर इंडस मध्ये केले, इंडस चे रुपांतर इंडिया मध्ये आणि मुस्लीम आक्रमणानंतर त्याचे झाले हिंदुस्तान ! आपली संस्कृती आणि देशाच्या नावामध्ये एवढा बदल होत गेला, तर स्थावर वने, जैवविविधता, नैसर्गिक संपत्ती या सर्वांवर विविध परकीय राजवटींचा किती मोठा परिणाम होऊ शकतो ? प्राचिन हिंदू संस्कृतीत जोपासत आलेले वन संरक्षण, वन सुरक्षितता, वने आणि गाव यांची सांगड, वनांवर आधारीत परंपरा, गावांची रचना हे सर्व परकिय आक्रमणानंतर बदलत गेले. सदर शोधनिबंधामध्ये लोप पावत चाललेल्या भारतीय वनांमधील भूदृष्यशास्त्रांच्या व शहर आराखड्यांच्या संकल्पना पुर्नजिवित करण्यासाठी त्यावर प्रकाश टाकण्यात आला आहे.

विभाग :

सिंधू संस्कृती :

जगातील प्राचीन संस्कृतीपैकी ओळखली जाणारी एक संस्कृती म्हणजे, सिंधू नदिच्या खोऱ्यात उदयास आलेली "सिंधू संस्कृती" (Indus vally civilization) कोणतेही गाव वृक्षांशिवाय पूर्ण होऊच शकत नाही असे सांगणारी ही संस्कृती ! म्हणूनच गावात आणि गावाच्या आजूबाजूला जंगलात

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आढळणाऱ्या काही विशिष्ट वृक्ष लावण्यात यायचे आणि जतन केले जायचे. या वृक्षांमध्ये पंचमहाभूते दर्शवणारी पंचवटी (पाच झाडे) असणे बंधनकारक होते. मानवी गरजा आणि कामकाज यांना लक्षात घेता वनांचे वर्गीकरण केलेले असे. वनांमधील मुख्य प्रकार म्हणजे, संरक्षित वनक्षेत्र, गावालगत असणाऱ्या या वनांना महावन म्हणत असत. एकाच जातींची विविध वृक्ष किंवा विविध जातीच्या वृक्षांची लागवड करुन उत्पादनासाठी आणि उत्पन्नासाठी असणाऱ्या या वनांना श्रीवन किंवा बनवारी असे म्हणत. गावापासून दूर अंतरावर असणारे वन म्हणजे, तपोवन, या वनांमध्ये एकही वृक्ष, वन्य पशु-पक्षी यांना इजा होणार नाही याची दक्षता घेतली जायची. या वनांचा उपयोग ध्यान-धारणा तपश्चर्या यांसाठी केला जात असे.

वैदिक संस्कृती :

संपूर्ण विश्वच जंगल आहे, असे माणनारी संस्कृती म्हणजे इसवी सन पूर्व १२००-५०० या दरम्यान आलेली वैदिक संस्कृती. या काळात, हिंदू संस्कृती जपणाऱ्या भूद्रुव्य वास्तूशास्त्राच्या (cultural landscapes) माध्यमातून देवराई (देवाच्या नावाने राखला जाणारा डोंगर), परिस्थितीकी विज्ञान (ecosystems) अश्या संकल्पना मांडण्यात आल्या, आजही आपल्याला काही देवराई पहावयास मिळतात. प्रि वैदिक संस्कृतीची ही काही ठळक वैशिष्टये पोस्ट वैदिक काळातही चालू ठेवण्यात आली. जंगलांबरोबरच, गावातील घरालगतच्या छोटया छोटया जागांचे देखिल जंगलात रुपांतर करण्यांत येत असे. मंदीर वने (Forest temple), मठ वने (monasv forest), पवित्र वृक्ष (socread tree) अश्या संकल्पना या काळात मांडण्यात आल्या, ज्या आपल्याला आजही काही प्रमाणात पहायला मिळतात. विविध सणावारांना पुजले जाणारे वृक्ष म्हणजेच पवित्र वृक्ष हे वैदिक काळापासून चालत आलेली परंपरा आहे. चरक आणि सुश्रुत संहिताही याच काळात लिहीला गेला.

मौर्यन राजवट :

इसवी सन पूर्व ३२२-१८८५ म्हणजे चंद्रगुप्त मौर्य राजाचा काळ. या काळात जंगल व्यवस्थापन आणि वनांचे संरक्षण यावर भर देण्यात आला. फळबागा, वने यांचा वापर मनोरंजनापेक्षा उत्पन्नाच्या वस्तु आणि महसुलासाठी केला जावू लागला. चंद्रगुप्त राज्याच्या राजदरबारातील कौटिल्य हया एका मंत्र्याने अर्थशास्त्र नावाचे एक पुस्तक लिहिले, त्यामध्ये पाणीपुरवण्याचे तंत्रज्ञान, मृदसंधारण, पर्जन्यवृष्टी आणि भौगोलिक माहीती यांचा समावेश आहे. यावरुन त्या प्राचीन काळातील या गोष्टिंना दिले गेलेले महत्त्व स्पष्ट होते. यापुढील राजवट म्हणजे राजा अशोकाची, इसवी सन पूर्व २७३-२३७ चा दरम्यान होऊन गेलेल्या या राजाच्या राजवटीमध्ये वन संरक्षंण, वन्य प्राणी, वन संरक्षण आणि त्यांचे जतन यावर काम करण्यात आले. याशिवाय मोठया प्रमाणावर वृक्षलागवडीचा उपक्रम अशोक राजाने राबवला आणि हाच उपक्रम पुढे, गुप्त राजांच्या राजवटीतही सुरुच राहीला.

मुस्लीम राजवट :

इसवी सन १०००-१७५० पासून भारतात मुस्लीम राजवटींनी सत्ता प्रस्थापीत करण्यास सुरुवात केली. निष्णात शिकारी असणारी ही मंडळी, जंगलात शिकारीसाठी जावू लागली. पुढे तेथेच छावण्या

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टाकून शिकार केली जावू लागली. त्यासाठी जंगलतोड सुरु झाली (छावण्या बसवण्याच्या उद्देशाने). हिंदू राजांवर त्यांची आक्रमणे चालूच होती, परिणामी, मुस्लीमांच्या हमल्यांपासून वाचण्यासाठी स्वत:च्या संरक्षणासाठी सामान्य नागरिक जंगलांमध्ये स्थलांतरीत होऊ लागले आणि हयाच काळात नागरिकांच्या स्थलांतरामुळे आणि मुस्लिम छावण्यांमुळे मोठया प्रमाणात जंगलतोडीस सुरुवात झाली.

मुघल राजवट :

इसवी सन १४८३-१७५७ च्या दरम्यान आलेली मुघल राजवट. या काळात, मुघलांचा कल जास्त प्रमाणात बगीचा तयार करणे, त्यांचा विकास करणे आणि त्यांच्या सजावटीवर होता. अकबर राजाने त्याच्या काळात मोठया प्रमाणात वृक्षारोपण करा असे आदेश दिले खरे, परंतु त्याचा अधिक कल बगीचांकडेच होता. पुढे, सुंदर बगीचे आणि त्यात काही प्रमाणात वृक्षारोपण करणारा राजा म्हणुन, राजा जहांगिराची ओळख झाली.

ब्रिटीश राजवट :

इसवी सन १७५०-१९४७ म्हणजे ब्रिटिश राजवटीचा काळ. वनांचा ऱ्हास व्हायला सुरुवात झाली तो हा काळ. परिणामांचा काहीही विचार न करता साल, साग, चंदन अश्या देशी वृक्षांची तोड होऊ लागली. या वृक्षांच्या लाकडांचा उपयोग जहाज बांधणीसाठी करण्यासाठी याची मोठया प्रमाणावर निर्यात होऊ लागली. सामान्य जनता, जैवविविधता या कशाचाही विचार न करता ही जंगले आपल्याच मालकीची असल्याच्या भावनेतून ही जंगलतोड सुरुच होती. सागाचे उत्पादन आणि जहाजबांधणीसाठी उपयुक्त असणाऱ्या इतर (लाकडांच्या) वृक्षांचा उत्पादनावर लक्ष घालण्यासाठी मद्रास सरकारने इसवी सन १८०६ मध्ये जंगल अधिकारी म्हणून वॅटसन या गोऱ्या अधिकाऱ्याची नेमणूक केली. इसवी सन १८५५ मध्ये मलबर टेकडीवर सागाच्या आणि निलगिरी डोंगररांगांवर बाभळीची अधिक प्रमाणात लागवड करण्यांत आली आणि याचा जैवविविधतेवर दुष्पपरिणाम होऊ लागला.

साधारणत: वनस्पतींना आधारित ठेवून, जंगल तीन स्तरांमध्ये विभागलेले असते. जमीनीपासून साधारण एक फुट अंतरापर्यंत वाढणारा म्हणजे सर्वांत खालचा वनस्पती स्तर. यामध्ये विविध किटक, सरपटणारे प्राणी यांची वस्ती असते. त्यानंतर जमीनीपासून दोन ते तीन फुट उंची पर्यंत वाढणारा स्तर म्हणजे झुडपांचा. यामध्ये फुलपाखरे, लहान आकाराचे (लाजाळु) पक्षी यांचा प्रामुख्याने समावेश असतो. यापुढील स्तर म्हणजे जमीनीपासून आठ ते दहा फुटापर्यंत वाढणारी लहान झाडे. या स्तरामध्ये वस्ती करणारे जीव म्हणजे मध्यम आकाराचे पक्षी. शेवटचा आणि जंगलातील सर्वात वरचा स्तर म्हणजे मोठे वृक्ष. यावर वस्ती असते ती मोठया आणि बलाढय पक्ष्यांची. अश्याप्रकारे विविध प्रकारच्या वनस्पती जिवांवर जंगल साखळी अवलंबुन असते. एकाच प्रकारच्या वृक्षलागवडीने जंगलांचा समतोल बिघडतो. त्यामुळे ब्रिटीश काळात केले गेलेल्या सारख्याच जातीच्या वृक्षलागवडीमुळे भारतीय जंगलांचा समतोल बिघडण्यास सुरुवात झाली.

इसवी सन 1865 ते 1894 च्या काळात राजघराण्यांना लागणाऱ्या साधनांसाठी आणि जंगल उपयुक्त वस्तुसाठी वने आरक्षित करण्यात आली. वनांच्या पुनरउत्पादनासाठी, कापणी साठी आणि वने

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टिकवण्यासाठी 18व्या शतकापासूनच शास्त्रोक्त पध्दतीने जंगल व्यवस्थापनाची सुरुवात करण्यात आली. इसवी सन १९२६ ते १९४७ च्या दरम्यान पंजाब आणि उत्तर प्रदेशामध्ये मोठया प्रमाणावर वृक्ष लागवड करण्यात आली तर इसवी सन १९३० च्या सुरुवातीला जनतेने वन्य प्राण्यांच्या संरक्षणासाठीच्या उपाय योजनामध्ये भाग घेण्यास स्वारस्य घेतले.

दुसऱ्या महायुध्दाच्या दरम्यान जंगल व्यवस्थापन आणखिन शास्त्रोक्त पध्दतीने करण्यासाठी आणि जंगलांचा बराचसा प्रदेश पुर्नउत्पादीत करण्याच्या दृष्टिने आखणी करण्यात आली. परंतु अजुनही भर मात्र जंगल संरक्षण नसुन, जंगलांमधुन अधिकाधिक महसुल उपलब्ध व्हावा हाच होता. ब्रिटनला युध्दकाळात मदत व्हावी म्हणून जहाज बांधणी आणि रेल्वेच्या कामासाठी अधिक लाकुड निर्यात होवू लागले आणि त्यामुळे जंगलतोडही अधिक प्रमाणात होवू लागली आणि जंगलांची खुप मोठया प्रमाणावर हानी झाली.

स्वातंत्र्योत्तर काळ :

स्वातंत्र्योत्तर काळामध्ये 1952 च्या नवीन धोरणाप्रमाणे वनांच्या संरक्षणाच्या उद्देशाने, भारतातील एक तृतियांश भाग वनांखाली असावा अशी तरतूद करण्यात आली, परिणामी जंगलातील काही क्रियाकलाप आणि गुरांचे चरणे यांवर बंधने घालण्यात आली. ब्रिटीश काळात रिझर्व फॉरेस्ट खाली प्रोटेक्टेड फॉरेस्ट हे वर्गीकरण जसेच्या तसे ठेवण्यात आले. १९७६ मध्ये वन्य संरक्षण वाढवणे आणि वनविकासाच्या माध्यमातून आदिवासींना रोजगार मिळावा यासाठी उपक्रम सुरु करण्याचा निश्चय करण्यात आला.

निष्कर्ष :

सिंधू संस्कृतीत सांगितलेले वनांचे प्रकार आणि त्यांच्याशी निगडीत असणाऱ्या क्रियाकल्प विलोप पावले. वैदिक काळातील मठ वने, मंदिर वने या संकल्पना लोप पावलेल्या असुन, या काळात घरालगतच्या छोट्या जागांवर वने बसवण्यात येत असत ती पुर्नजिवित करणे काळाची गरज आहे. चंद्रगुप्त मौर्याच्या काळात ज्याप्रमाणे उत्पन्नाचे साधन म्हणुन वनांकडे बघण्यात आले त्याप्रमाणे आजही वृक्षारोपण करतांना फळझाडांना प्राधान्य दिले तर उत्पन्नवाढीसाठी सरकारला याची मदत होईल. मुस्लीम राजवटींच्या काळात जंगल तोडण्यास सुरुवात झाली व मुघल राजवटींचा जास्त कल बगीचा सुशोभिकरणाकडे असल्यामुळे वनांकडे असल्यामुळे जंगलव्यवस्थापन, संवर्धन मागे पडू लागले. ब्रिटीश काळात बिघडत गेला आणि आपल्या भारतिय संस्कृतीशी वनांशी निगडित असलेल्या संकल्पना लोप पावल्या आणि देशी, औषधी आणि संस्कृती जपणाऱ्या आपल्या वृक्षांची जागा विदेशी वृक्षांनी घेतल्यामुळे जंगल साखळी आणि पर्यावरणाचा समतोल बिघडत गेला. आपली संस्कृती जपण्यासाठी, आपल्या संस्कृतीचा वसा पुढे नेण्यासाठी आणि आपली गावे, शहरे संस्कृतीक दृष्ट्या संपन्न बनवण्यासाठी, संस्कृतीक भूदृष्य वास्तुशास्त्राच्या मदतीने गावांची रचंना करणे गरजेचे आहे. आपल्या पूर्वजांनी सांगितलेल्या देशी वृक्षांचा समावेश वृक्षारोपनांमध्ये करण्याबरोबरच, पुर्वापार चालत आलेल्या वनांमधील सांस्कृतिक संकल्पनांचा समावेश शास्त्रोक्त पध्दतीने करणे गरजेचे आहे. वन, वाटीका, उपवन, उदयान,

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आरण्य, अभयारण्य, तपोवन, महावन, श्रीवन, देवराई, मंदिर वने, मठ वने अश्या संकल्पना पुन्हा आणि अधिक प्रमाणात प्रत्यक्षात उतरवून ऱ्हास पावत चाललेल्या आपल्या मौलिक संस्कृतीचा वसा अश्या प्रकारे जतन करण्यांत हातभार लावणे गरजेचे आहे.

संदर्भ :

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