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A Comparative Study on the Issues and Impacts of Land Use Planning in Indian and International Hill Cities

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Abstract

Land is the most important asset used by humans for existence and has been exploited since the dawn of civilization. Due to the unprecedently high rate of population expansion that has resulted in chaotic urban development, the land use pattern in most metropolitan areas has changed significantly in the recent past. The unplanned development and rapid urbanization are also occurring in India's hill cities, and thus land use planning is becoming increasingly important. Moreover, due to geography, terrain, slope, climate, susceptibility to natural disasters, and other factors, planning in the hills is very difficult. This has led to several problems in hill towns, all of which require a well-thought-out framework for systematic urban development.

The prime objective of the study is to get fully acquainted with the current processes of land use planning in India and abroad by examining a variety of instances, as well as analysing the efficacy of such processes in their respective hill cities. A comparative study of best land use practices being followed in hill towns in India and abroad is also carried out to identify any gaps and issues in the land use planning techniques being used in Indian hill towns.

Introduction

Humans use land for a variety of activities, including agriculture, mining, building homes and other structures, building roads, and establishing industries. Land is regarded as the most essential resource. However, as time went on, more people used the area because of their growing needs and population growth, which led to the land developing quickly, primarily as a result of numerous construction activities [1]. The idea of land use planning originated in India when the need for planned towns and cities became apparent. Planning was based on social conventions, site preferences, preferences for the caste and class systems, and other factors because the population was not large enough [2], [3]. Today, most land uses are assigned based on the economic, social, and technological projections that different planners have made based on their knowledge. Every state has its own procedures for allocating resources, and there are no set guidelines or procedures for this process [4]. Because land use planning involves so many different factors, it is impossible to address them all, and so urban planning decisions become very difficult [5]. As the population of metropolitan regions rises, the burden on the land is increasing quickly [6]. The ecology and society are negatively impacted by the rising demand for land and the state's inefficient land use planning policy and management [7]. Due to unprecedently high population increase and chaotic urban development, India's land use pattern has undergone significant change in recent years. The problem of unprecedently high growth is particularly noticeable in India's hill cities. Inappropriate land use is

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the root cause of the unplanned development issue in the hills, posing a number of difficulties for hill cities. Due to a lack of adequate spatial planning techniques, the land in hilly places is allocated without appropriate surveys that would determine factors like topography, slope direction, sun orientation, vegetation, soil type, etc. [8], [9]. It is necessary to monitor and plan land use and expansion in the hills in a way that both addresses the difficulties posed by the hills and preserves the distinctive character of those areas.

I. Methodology

Systematic research has been done to understand the current land use planning strategies used in hill cities in India and abroad. The focus is on studies that support the analysis of the hill towns' current land use planning procedure. The Web of Science, SCOPUS, and various official documents are used for systematic search operations. Social sciences, geography, architecture, and urban planning are the fields of study. "Land use", "India", "Nepal", "Bhutan", "the United States", and "land use planning" were among the search terms. The best-case scenarios for land use planning in the Indian hills – New Tehri, Uttarakhand; Lavasa, Maharashtra; and Bilaspur, Himachal Pradesh – have been the study's main focus.

Similarly, in order to comprehend the land use planning procedures followed in these hill cities, an analysis is conducted on the land use planning methods utilized in the following hill towns: Thimphu (Bhutan), Kathmandu (Nepal), Santa Clarita, Anchorage, and Boone County (United States). Since there was no documentation or records of the land use planning in Bilaspur town, information was obtained by speaking with several district authorities and surveying those who had lived there for the previous 30 to 50 years. The Indian hill cities (case examples) were visited to observe the land use pattern of these towns, with a focus on land use planning and the urban character of the hills. Additionally, images taken in the area serve as additional illustrative material. In order to compare the practices of hill towns in India and other countries, the analysis used qualitative data. These case studies highlight the different impacts of land use planning in the Indian hills that point the country toward better, planned development of its vulnerable areas and aid in a better understanding of the procedures that must be followed for land use planning.

II. Issues and Their Impacts Relevant to Land Use in Hill Towns of India

- Hills face numerous issues and challenges because of rapid urban development, imbalanced land use distribution and inappropriate urban development regulatory regimes, including F.A.R, ground coverage, minimum lot size, minimum buildable width, plinth height, floor height building height, roof height, projections, setbacks and so on [10]. The ever-increasing growth of population results in high and extensively competitive demand for land by different land uses. This kind of prevalent phenomenon governed by a strong consumerism- based economic market leads to uncontrolled and random development patterns in hill towns [11].
- Due to their topographical profile, hilly areas used to have a limited quantity of developable land, resulting in high prices of land for development in built areas or an increase in demand for forced conversion of agricultural land on the outskirts to carry out building operations often triggering environmental degradation, unplanned urban sprawl, and other consequential extended problems [12].
- In Indian hill towns, land use allocation techniques are highly conventional and arbitrary/subjective; thus, they are insufficient and lead to rapid inconsequent growth in built-up areas, resulting in ecosystem degradation [13].
- There is an issue of having scientific/quantitative and objective land use policy formulation and strict regulations to follow in the hills. As per URDPFI guidelines, hills require land use optimization in view of limited land availability. Contrarily, the use of the land is still not assigned, conforming to the land carrying capacity status of the area or land use suitability analysis [14].
- There are unplanned land uses in the hills due to a lack of systematic land use assigning practices leading to rapid cancerous growth in built-up areas, which in turn accelerates environmental degradation processes like deforestation and soil erosion [13], [15].
- The land plots in the hills are also small and geometrically irregular in shape, which calls for an appropriate and scientific approach to land use planning [16].
- There is inadequate information on land use planning in the hilly areas of India, which is leading to unplanned development in these areas [17].
- The land use planning in the hilly areas is more restrictive than it is in the plains due to the different topographical conditions. Their fragile ecosystem requires a systematic process for land use allocation to have planned development in the hills. However, identical regulations are implemented both in the hills and plains [12], [18].

It is now clearly established from the above literature study that there is no scientific method or process for the land use allocation in the hills; on the other hand, there is a rapid increase in the population, density and built-up areas, which together are resulting in the unstandardized

Fig. 1. Existing development in Bilaspur [photographs by the authors, 2021].

Fig. 2. Existing development in Lavasa [photographs by the authors, 2021].

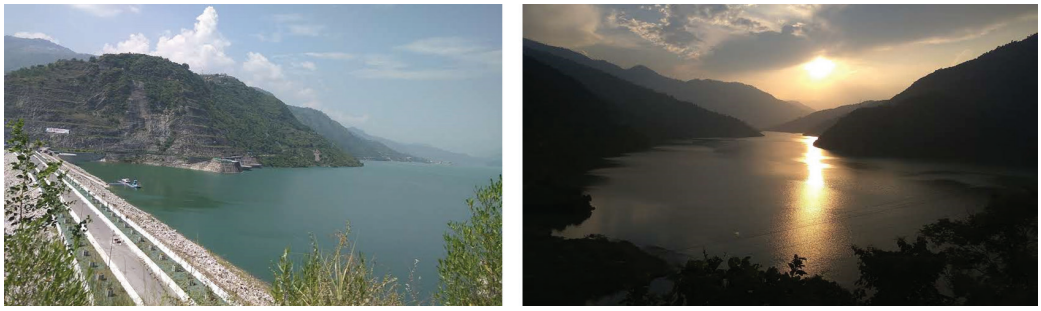

Fig. 3. Scenic view of Tehri Dam [photographs by the authors, 2019].

development in these areas. These sorts of issues of land use allocation are universally observed in most of the hill towns. In fact, hill towns need a structured and holistic framework for appropriate urban development. Land use planning is an essential component for the development of hilly areas, which requires a dedicated land use plan covering the socio-economic, physical, cultural and environmental issues. To validate the above-mentioned problems pertaining to land use allocation established from the literature review, a detailed analysis of case studies of Bilaspur, New Tehri, and Lavasa towns are presented in the following section.

III. Study of Existing Land Use Planning in Indian Hill Towns

A specific land use plan that addresses socioeconomic, physical, cultural, and environmental challenges is necessary for the development of hilly areas, and it is a crucial component of that process [19]. In order to comprehend the problems associated with land use planning, the article includes an analysis of case studies of Bilaspur, New Tehri, and Lavasa cities which all are hill towns (Fig. 4). These towns (Bilaspur, Lavasa and

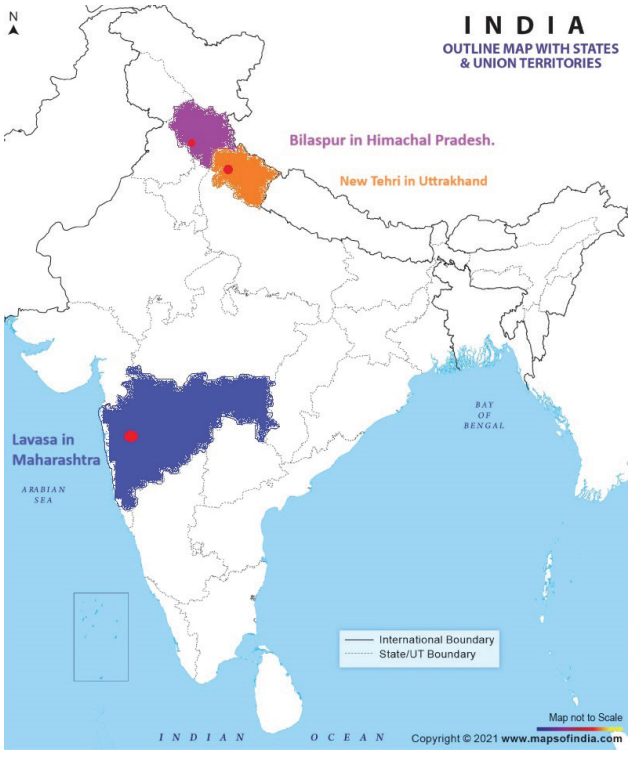

Fig. 4. Location of the best hill town case examples in the study [by the authors].

TABLE I

Comparative Analysis of Bilaspur, New Tehri, and Lavasa Cities [compiled by the authors and extracted from [20], [21], [22]]

	Bilaspur, Himachal Pradesh	Lavasa, Maharashtra	New Tehri, Uttarakhand
Year of establishment	Planning was done in the 1960s when the sectors were divided inside the Nagar Parishad area and were part of a rehabilitation project	Planning of the town was done in 1999 as a part of a rehabilitation project due to the construction of the dam	Tehri Dam's construction forced many people to leave their homes; therefore, a new town, New Tehri, was established to house them, and the development was completed in 1993
Planning authority	The sectoral plans have been prepared by TCPO, Delhi	Lavasa Corporation Ltd. Planned for the development of a new hill town	The planning has been done by the Government of Uttarakhand
Major achievement	Bilaspur is known as the first planned town in Himachal Pradesh	The first planned hill city in Maharashtra	The Prime Minister's Award for Excellence in Urban Planning and Design
Area	Nagar Parishad's area is 388 hectares	The development of the new hill town covers 10 000 hectares	The town covers an area of 3705 hectares
Planning concept	The development was done in the sectors (sector planning)	Developed the concept of walkability by reducing the distance from the work place of the residents. Based on the principle "transect model", in which the core has high density and the outer layers have low density	Developed based on egalitarian ideology (improving the urban structure)
Criteria for land use planning	Factors that were considered for land use planning: available developable land in each sector; surrounding land uses; threshold population; locational attributes of amenities; site characteristics; workplace relationship and land values	Information for preparation of land use maps: various surveys, such as ground survey, ecological survey, contour survey, and terrain and hydrological information	There were five main criteria considered by the government for planning of New Tehri town: functionality; sustainability of environment; urban design with cost-effectiveness; social and democratic factors

New Tehri) were planned and developed as a part of rehabilitation efforts due to the construction of dams, as shown in Figs. 1, 2, and 3. The following is a thorough analysis to comprehend the Indian government's efforts in these new hill towns' physical planning.

Three Indian hill towns –Bilaspur, Lavasa, and New Tehri are located as shown on the map in Fig. 4.

These hill towns were built on newly created contour sites for rehabilitation as a result of dam building. Sectoral planning forms the background for land use planning in Bilaspur; upgrading the urban structure is the idea behind New Tehri; and accessibility and walkability formed the basis for Lavasa. The case studies made it easier to comprehend the problems that arise when urban growth occurs in vulnerable hill regions. These hill towns are created, constructed, and planned with a set population in mind. However, the strain of population expansion and development is always there in these places. The major issue still faced by all three towns is related to inappropriate land-use allocation without looking into the context of the site. In the case of Bilaspur town, data was not available for land use planning. Therefore, a semi-structured interview survey with various town planning officials of Bilaspur and people who had lived there for a long period of time was conducted to understand how the town developed. The unstructured development of Bilaspur town and New Tehri town resulted from the professionals' lack of consideration for the interrelationships between the abutting land uses when allocating land for land use. This lack of use of proper scientific methods or models was also evident in the method of population projection for future development.

IV. Comparison of Land Use Planning at the National and International Level

Case studies of hill regions in Bhutan, Nepal, and the United States are used to better understand how hill towns are planned globally. The study compares planned Indian hill cities with these nations' diverse land use planning initiatives, as shown in Table I [23]–[28].

A comparison of land use methods is made using literature sources about several hill cities in India and abroad. The land use planning procedures used in hill cities in India, Bhutan, Nepal, and the United States are compared in Table II.

A. Cities

Since they are regarded as India's planned hill towns, the hill cities of New Tehri in Uttarakhand, Lavasa in Maharashtra, and Bilaspur in Himachal Pradesh were examined.

In order to understand the land use planning procedures used in these hill cities, the hill cities of Thimphu (Bhutan), Kathmandu (Nepal), Santa Clarita, Anchorage, and Boone County (United States) are analyzed for the international hill cases.

TABLE II

Comparison of the Land Use Planning Process between India, Bhutan, Nepal and the United States [created by the authors]

Country	India			Bhutan	Nepal	United States
City	Bilaspur (Himachal)	Lavasa (Maharashtra)	New Tehri (Uttarakhand)	Thimphu	Kathmandu	Santa Clarita
Guidelines	#	#	#	*	*	*
Docume ntation	#	#	#	*	*	*
Data availability	#	#	#	*	*	*
Criteria	*	0	*	*	*	*
Technique	0	0	0	*	*	*
Tool	*	*	*	*	*	*
Referred document	0	0	0	*	*	*

* – The characteristic is present or followed in the city.
0 – The characteristic is not present or followed for the city.
– The characteristic is present in the city but the information in the documents is incomplete.

B. Guidelines

India follows the URDPFI guidelines for planning land uses. India's hill regions need special provisions tailored to their needs because there aren't any criteria for hill development in these vulnerable locations. On the other hand, particular papers such as the Land Use Resource Guide, National Land Use Project (NLUP), and National Land Use Zoning (NLUZ) guidelines can be used as a reference for land use planning in the hills of Bhutan, Nepal, and the United States. They also take into account the recommendations made by the Food and Agriculture Organization (FAO) for efficient land use planning.

C. Documentation

The growth trend (GIS maps) in the development plans of the major towns illustrates the documentation of the land use process in India. Understanding the process used to prepare land use plans is crucial for vulnerable places so that one may comprehend how the land use for a certain area is determined. The methodology used for land use planning, such as statistical evidence or any other study, the criteria taken into consideration, etc., to guide the future planned development of these hill towns, must all be clearly documented. This includes the basis on which the land uses are distributed.

The land use planning process is briefly documented at the international level. In order to facilitate a better understanding of the planning process and to guide future development, the documents include explanations and specifics of the procedures or methodologies utilized for land use planning.

D. Data availability

Data on land use, including socioeconomic, land use trends, occupation distribution, disaster risk, multi-hazard, and geographical data, is lacking. Other issues include a lack of financing, local experts and professionals, and a lack of resources.

Finding data in international documents was easy because the land use planning procedure was well recorded in the cases. The documents make the planning process more open by including information on land use patterns and procedure details.

E. Criteria

Many factors are taken into account when planning land uses, including the amount of developable land that is available in each sector, the surrounding land uses, the population threshold, the location of amenities, and site characteristics. Workplace relationships and land values in the Bilaspur example of practicality, environmental sustainability, economic urban planning, and democratic and social standards in the instance of New Tehri. But in the instance of Lavasa, Maharashtra, the requirements were vague. Only the surveys used for the town's planning and growth were mentioned in the records. The criteria for Bhutan include national parks, tourism, mining, heritage sites, heritage forests, and institutional infrastructure (health, education, and other institutions), all of which are categorized under the headings of social, economic, cultural, and environmental aspects. Wetlands, abandoned land, sloping terrain, watersheds, high mountains, river banks that are prone to flooding, barren areas, underutilized or unused land, and, if feasible, the sides

of highways, canals, etc. are all taken into consideration in Nepal The following factors are considered in the case of Santa Clarita, USA: topography, accessibility, infrastructural closeness, environmental limits, the kind of surrounding development, economic feasibility, etc.

F. Technique

While the transact model method is used in Lavasa, sector-based planning is used in Bilaspur. By building terraces (levels), New Tehri's planning aims to improve the town's viability and walkability.

The multi-criteria analysis and situational analysis are conducted as a scientific way to distribute land uses at the international level, which makes the planning in these towns efficient after the criteria for the hill towns have been chosen.

Table I makes it evident that India does not have a structured or methodical approach to land use planning. Understanding and analysis of the land-use allocation process are necessary, and they must be documented to maintain process transparency and to have a record of the proceedings. Several theories, instruments, and tactics for allocating land use are described in the international context. On the other hand, land use planning in India lacks documentation and technique. Official documents and master plans do not explain the basis for land use allocation or provide information on the techniques or methods used for land use allocation despite the fact that numerous researchers, academics, and institutions have expressed concerns about India's land use allocation process [29].

Since the documents do not provide a precise set of guidelines or methods, it is difficult to understand how the optimal use is decided. An extensive list of these practices or processes that have been implemented in several Western countries but were not taken into account in India may be found in the study materials from international organizations. The aforementioned documents for India contain either no information at all or very little regarding the procedures taken into account prior to or during the allocation process, the standards used to identify the best use for a specific land parcel, the kind of analysis carried out, or the expert opinion used to distribute land uses.

Since the documents now lack any established standards or procedures, it is challenging to determine the best use of the property for a given land piece. Prior to allocating resources, it is critical to have knowledge of past, present, and anticipated land use. Additionally, a national land use policy is necessary to monitor the nation's land usage overall and act as a standard document. The significance of land use planning and management is made clearer by aforementioned initiatives. Problems with land in many sections of the national territory, particularly in hill towns and urban areas, indicate deficiencies in planning. India won't have the resources and equity that these vulnerable communities have if these trends keep up. Land serves a variety of natural and human purposes, and it is vital that it be used as efficiently as possible. Planning for land uses also needs to be done in a methodical and scientific way.

Conclusions

The development in the hills is increasing, and there are limited property pieces available. The improper use of land and the absence of land use planning have left the hills with a number of problems and difficulties. The concepts used in the development of the three planned Indian hill cities – Bilaspur, Lavasa, and New Tehri – are described in the study. However, the allocation system and technique are not included in the documentation. Due to a lack of data, inadequate documentation, a lack of a scientific foundation for land use allocation, and the absence of a standardized process, land use planning in the Indian Hills is ineffective.

In contrast, the hill cities of Thimphu (Bhutan), Kathmandu (Nepal), Santa Clarita, Anchorage, and Boone County (United States) show that a methodical process is followed along with the necessary documentation, which results in the planned development of these places, ultimately improving the efficiency of planning in these hill cities.

Due to improper land use and a lack of land use planning, the hills of India confront a variety of issues and challenges, such as a rapid increase in unplanned built-up areas leading to deforestation, soil erosion, depletion of green spaces, overcrowding, etc., leading to the deterioration of the natural as well as built environment of hill towns. The lack of documentation regarding the land use processes for the hills and the absence of plans containing mechanisms for distributing land uses are concerning. There is no specific process for allocating land use that can be repeated throughout the hills. It is impossible to determine how the best use is selected or determined because the records and documents related to the planning of land use in the hills lack any criterion or methodology. In the Indian hills, the process of allocating land use is influenced by urban development or growth trends. However, planners should understand that the land use allocation process should determine the growth trends of specific regions.

Therefore, since land use planning is becoming increasingly urgent in India's hill towns due to rapid urbanization and unplanned development, a system or approach that might be used as a reference point for land use allocation must be designed.

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