**DISSERTATION**

Vth Semester, B.A. Economics(Hons.)

# TITLE: Analysis of Dehradun – Infrastructure Development or Environmental conservation

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# DECLARATION/ UNDERTAKING OF ORIGINALITY

I, Kris Harris having Enrolment No R207221019 SAP ID 500091048 declare that the Dissertation/Synopsis titled *“Analysis of Dehradun – Infrastructure Development or Environmental Conservation”* is the outcome of my original work conducted under the supervision of Dr. Mohammad Younus Bhatt at School of Business, UPES Dehradun.

I undertake full responsibility of the contents of this Dissertation/Synopsis complying with the ‘Academic Integrity’ policy of UPES and I understand that if work is found in violation of the same, this may result in rejection of Synopsis/Dissertation and entail appropriate disciplinary proceedings as per Rules of the University.

Signature

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25/04/2024

Dehradun

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**ABSTRACT**

This research article intends to thoroughly analyse the delicate equilibrium between developing infrastructure and conserving the environment in Dehradun. Amid global urban growth challenges, the study focuses specifically on the unique context of Dehradun, India. Using a multifaceted approach, it evaluates how infrastructure projects impact the environment and assesses existing conservation strategies.

The investigation employs both quantitative and qualitative methods to explore the connection between infrastructure development initiatives and their ecological consequences, and ultimately tourism. Critical indicators such as air and water quality, green space coverage, and biodiversity will be examined to understand the environmental implications of urban expansion.

Furthermore, the research scrutinizes the policies and practices enacted by local authorities to harmonize development objectives with environmental sustainability. Through case studies of specific infrastructure projects, the goal is to offer insights into the effectiveness of current conservation measures and propose recommendations for more sustainable development practices.

This study contributes to the ongoing conversation about urban development by providing an enhanced understanding of how infrastructure and the environment interact in the distinctive setting of Dehradun. The results are expected to guide policymakers, urban planners, and environmental advocates, encouraging a more comprehensive and sustainable approach to city development.

**INTRODUCTION**

Nestled in the foothills of the Himalayas, Dehradun finds itself at a crucial crossroads in its development journey. The city is undergoing rapid urbanization and economic growth, making the delicate balance between building infrastructure and preserving the environment increasingly vital. This research aims to uncover the complicated dynamics at play in this comparision, highlighting the challenges and opportunities emerging in the evolving urban landscape.

The global conversation on sustainable development emphasizes the importance of cities harmonizing economic progress with the conservation of the natural environment. In the case of Dehradun, a city renowned for its rich biodiversity, clean fresh air, enchanting mountains and ecological significance, this challenge takes on added importance. Tourism in the district, which takes place as a result of these factors, plays a vital role in the revenue generation of the district, and a deterioration in the environment would potentially threaten this. The growing demands for enhanced infrastructure, encompassing transportation, housing, and commercial spaces, pose potential risks to the region's fragile ecosystems.

Dehradun has strict regulations pertaining to the protection of its forests and ecology, but this is also leading to a lack of infrastructure development in much needed areas, restricting investments from private individuals and businesses, leading to a decreased economic growth

The central question driving this study is: How can Dehradun progress with infrastructure development while safeguarding its environmental integrity and should the government relax its strict regulations and enhance economic growth and infrastructure development or keep them and safeguard its environment and ensure the tourism revenue? To address this query, the research employs a comprehensive approach, including environmental impact assessments, policy analyses, and case studies of specific projects.

By critically examining the current state of infrastructure development and environmental conservation in Dehradun, this research aims to offer valuable insights to the wider conversation on sustainable urban development. Subsequent sections delve into the methodology used, the key factors considered, and the anticipated contributions and implications of this study.

**STATEMENT OF PROBLEM**

Set against the backdrop of scenic landscapes and ecological significance, Dehradun stands at a pivotal juncture. The rapid urbanization and simultaneous infrastructure development raise significant concerns about the sustainability of this growth and its impact on the local environment. The central challenge is to find a careful balance between promoting economic progress through infrastructure development and preserving the unique ecosystems and biodiversity that define Dehradun.

As the city undergoes transformation with increased construction, transportation networks, and urban expansion, there's a growing worry about potential adverse effects on the environment. The task is to meet the pressing need for improved infrastructure without compromising the delicate ecological balance that Dehradun maintains. Dehradun, known to be a hot spot for tourists, receives a significant part of its income from tourism. A deterioration in the environment would lead to a reduction in the influx of tourists and this could potentially harm businesses like resorts, hotels, cafes, restaurants. The prominent question of this research remains – Should the government ease the strict environment protection laws or keep them, that is environmental conservation vs infrastructure development (economic growth).

This research aims to identify, analyse, and comprehend the specific challenges and dilemmas faced by Dehradun at the intersection of infrastructure development and environmental conservation. The problem statement highlights the urgency of addressing this dual imperative, calling for a nuanced examination of the trade-offs, conflicts, and potential synergies that arise when urban growth intersects with ecological preservation.

Key aspects of the problem involve assessing current infrastructure projects, understanding their environmental impacts, and evaluating the effectiveness of existing conservation measures. Additionally, the research seeks to identify gaps in policies and practices hindering the alignment of development goals with environmental sustainability.

Addressing this issue is crucial not just for the immediate well-being of Dehradun but also as a broader contribution to the discourse on sustainable urban development. By unraveling the difficulties of this dilemma, the research aims to offer actionable insights for policymakers, urban planners, and environmental advocates, fostering a more balanced and sustainable future for the city.

**LITERATURE REVIEW**

1. **Čábelková I, Smutka L, Mareš D, Ortikov A and Kontsevaya S (2023) Environmental protection or economic growth? The effects of preferences for individual freedoms. Front. Environ. Sci. 11:1129236. doi: 10.3389/fenvs.2023.1129236**

The relationship between economic development and environmental degradation usually follows a U-shaped curve known as the Environmental Kuzents Curve, where environmental degradation increases with increases in economic development upto a certain point and then starts decreasing with the increase in economic growth. In this research, 57.20% of the interviewed respondents believed that – environmental conservation should be given priority even if it leads to slower economic growth and loss of jobs, whereas 46.30% of the respondents believed that economic growth should be the top priority even if it means a certain level of environmental degradation.

1. **Eren BM, Taspinar N, Gokmenoglu KK. The impact of financial development and economic growth on renewable energy consumption: Empirical analysis of India. Sci Total Environ. 2019 May 1;663:189-197. doi: 10.1016/j.scitotenv.2019.01.323. Epub 2019 Jan 26. PMID: 30711585.**

Renewable energy consumption in the long run leads to increased economic growth and financial development. There is also an increase a mutual cause-and-effect relationship between renewable energy consumption and economic growth, meaning that as there is an increase in the economic growth, there would be more investment in the renewable energy sector for consumption, which would later lead to more renewable energy consumption.

1. **Ramakrishnan, Ramanathan & Black, Andrew & Nath, Prithwiraj & Muyldermans, Luc. (2010). Impact of environmental regulations on innovation and performance in the UK industrial sector. Management Decision. 48. 1493-1513. 10.1108/00251741011090298.**

Strict environmental regulations might impose additional costs and constraints on industries, potentially decreasing their ability to innovate and grow. In the short run, Strict environmental regulations can negatively impact economic performance in a country.

1. **Porter, M.E. & Linde, C.. (1995). Green and competitive: ending the statemate. Harvard Business Review. 73.**

There is a positive relationship between environmental regulations, competitive advantages and new innovations. The need to meet the environmental regulation standards may lead the firms to innovate, leading to the development of better technology, products or processes that are more effective, and they may also create competitive advantages.

1. **Dechezleprêtre, Antoine & Nachtigall, Daniel & Venmans, Frank, 2023. "The joint impact of the European Union emissions trading system on carbon emissions and economic performance," Journal of Environmental Economics and Management, Elsevier, vol. 118(C).**

The European Union’s Emissions trading system had no significant impact on the profits and employment levels of regulated firms and rather increases their profits and employment levels as firms actually found opportunities for generating more revenue and investing in fixed assets to meet with emission reduction requirements.

1. **Rafael Alvarado & Elisa Toledo, 2017. "Environmental degradation and economic growth: evidence for a developing country," Environment, Development and Sustainability: A Multidisciplinary Approach to the Theory and Practice of Sustainable Development, Springer, vol. 19(4), pages 1205-1218, August.**

This article, for a developing country, indicates that there is an inverse relationship between real GDP and vegetal cover. This suggests that as real GDP increases, there is a decrease in vegetal cover. There is also short-term equilibrium among the first differences of vegetal cover, real GDP, and the urbanization rate. An absence of the granger casuality is seen between these three variables that is, changes in one variable do not provide useful information for forecasting changes in another variable.

1. **Gene M. Grossman, Alan B. Krueger, Economic Growth and the Environment, The Quarterly Journal of Economics, Volume 110, Issue 2, May 1995, Pages 353–377,** [**https://doi.org/10.2307/2118443**](https://doi.org/10.2307/2118443)

After a certain level of economic growth, reaching a certain level of prosperity, the citizens demand that more attention should be paid to the noneconomic aspects of living. This leads to a rise in environmental quality. Therefore, after a certain level, Environmental degradation starts decreasing with economic growth.

1. **Sarkodie SA, Strezov V. A review on Environmental Kuznets Curve hypothesis using bibliometric and meta-analysis. Sci Total Environ. 2019 Feb 1;649:128-145. doi: 10.1016/j.scitotenv.2018.08.276. Epub 2018 Aug 23. PMID: 30172133.**

As a country or region experiences economic development, the relationship between economic activity and energy consumption becomes less intense, and there is an improvement in the efficiency with which energy is used.

**RESEARCH QUESTIONS**

1. Does an increase in the city population and number of tourists affect the environmental quality of Dehradun?
2. Is tourism an essential element of Dehradun’s economic profile? Does it contribute to the city’s economic welfare?
3. How is deforestation or reduction in green space coverage, and decrease in air quality and biodiversity, as a result of increasing urbanization and infrastructural growth affecting tourism?
4. If necessary, how to optimize the tourist sector while still ensuring infrastructural and economic development?
5. What would be a better choice for the district of Dehradun, to introduce stricter forest protection laws to prevent further environmental degradation or focus its resources on infrastructural development at the cost of environmental degradation?

**RESEARCH OBJECTIVES**

1. Measure changes in air and water quality, green space coverage and biodiversity, with regards to an increase in population and number of tourists.
2. To measure the impact of tourism of Dehradun’s economic growth.
3. Quantify the potential impact of afforestation or a reduction in green space coverage on air quality and biodiversity, and subsequently evaluate the effects (if any) of these environmental changes on tourism in Dehradun,
4. Analyse tourism-related economic indicators, such as revenue generation and employment. Propose strategies, if needed for optimizing the economic benefits while minimizing environmental impact.
5. To evaluate the potential economic and environmental impacts of stricter forest protection laws compared to infrastructural development in Dehradun, with the aim of recommending a balanced approach that prioritizes both sustainable development and the well-being of the community.

**DATA**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **YEAR** |  | **Tree cover loss in hectares** | **Forest cover loss from fires** | **Gross emissions of all greenhouse gases, expressed in megagrams (metric tons) of CO2 equivalent.** | **Population** |
| **2001** | **455495** | **4.588742** | **0.66408** | **4.588742303** | **5,35,000** |
| **2002** | **710190** | **30.21535** | **5.18297** | **30.21534982** | **5,51,000** |
| **2003** | **928992** | **4.795307** | **1.398979** | **4.795306608** | **5,67,000** |
| **2004** | **1024507** | **6.913203** | **0.663713** | **6.913202894** | **5,83,000** |
| **2005** | **1025971** | **16.70038** | **2.128604** | **16.70037972** | **6,00,000** |
| **2006** | **1034109** | **19.80741** | **5.643801** | **19.80740863** | **6,18,000** |
| **2007** | **1387716** | **17.64907** | **1.397261** | **17.64906835** | **6,36,000** |
| **2008** | **1441061** | **17.81477** | **4.518229** | **17.8147704** | **6,54,000** |
| **2009** | **1140766** | **26.6559** | **8.370374** | **26.65589879** | **6,73,000** |
| **2010** | **1422641** | **17.64336** | **1.330208** | **17.64336459** | **6,93,000** |
| **2011** | **1516001** | **24.09709** | **1.396303** | **24.09709113** | **7,13,000** |
| **2012** | **1708629** | **79.74973** | **10.23531** | **79.74972974** | **7,34,000** |
| **2013** | **1736985** | **24.98149** | **0.532387** | **24.98149191** | **7,55,000** |
| **2014** | **1785746** | **11.45774** | **0.266368** | **11.45773968** | **7,77,000** |
| **2015** | **1768652** | **8.279167** | **0** | **8.279167363** | **7,99,000** |
| **2016** | **1807383** | **27.14178** | **0.532505** | **27.14178338** | **8,23,000** |
| **2017** | **2146489** | **156.046** | **0.132988** | **156.0459747** | **8,47,000** |
| **2018** | **2484289** | **17.84054** | **0.331973** | **17.84053972** | **8,71,000** |
| **2019** | **2905303** | **7.196262** | **0.731199** | **7.196262384** | **8,95,000** |
| **2020** | **593467** | **6.249337** | **1.328776** | **6.249337476** | **9,19,000** |
| **2021** | **2867782** | **23.49094** | **0.199502** | **23.49093543** | **9,43,000** |
| **2022** | **5829659** | **27.29021** | **0.531** | **27.29021187** | **9,67,000** |
| **2023** | **6139686** | **73.62658** | **0** | **73.62657876** | **9,92,000** |

**DATA ANALYSIS**

***Impact of growth of population and tourism on the environmental quality of Dehradun.***

***Population Growth :-***

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
|  | ***Y Population*** | ***X Tree cover loss in hectares*** | ***X gross emissions of all greenhouse gases*** |
| **Y Population** | 1 |  |  |
| **X Tree cover loss in hectares** | 0.288378743 | 1 |  |
| **X gross emissions of all greenhouse gases** | 0.288378743 | 1 | 1 |

On running a correlation analysis, the correlation coefficient between population and tree cover loss, and population and gross greenhouse gas emissions comes out to be 0.288378743, indicating a weak but present correlation between population growth and environmental degradation, represented by tree cover loss and increase in greenhouse emissions.

A correlation coefficient of ~0.2883 indicates that an increase in population leads to an approximate 29% increase in tree cover loss and greenhouse emissions (environmental degradation).

***Growth in total number of tourists :-***

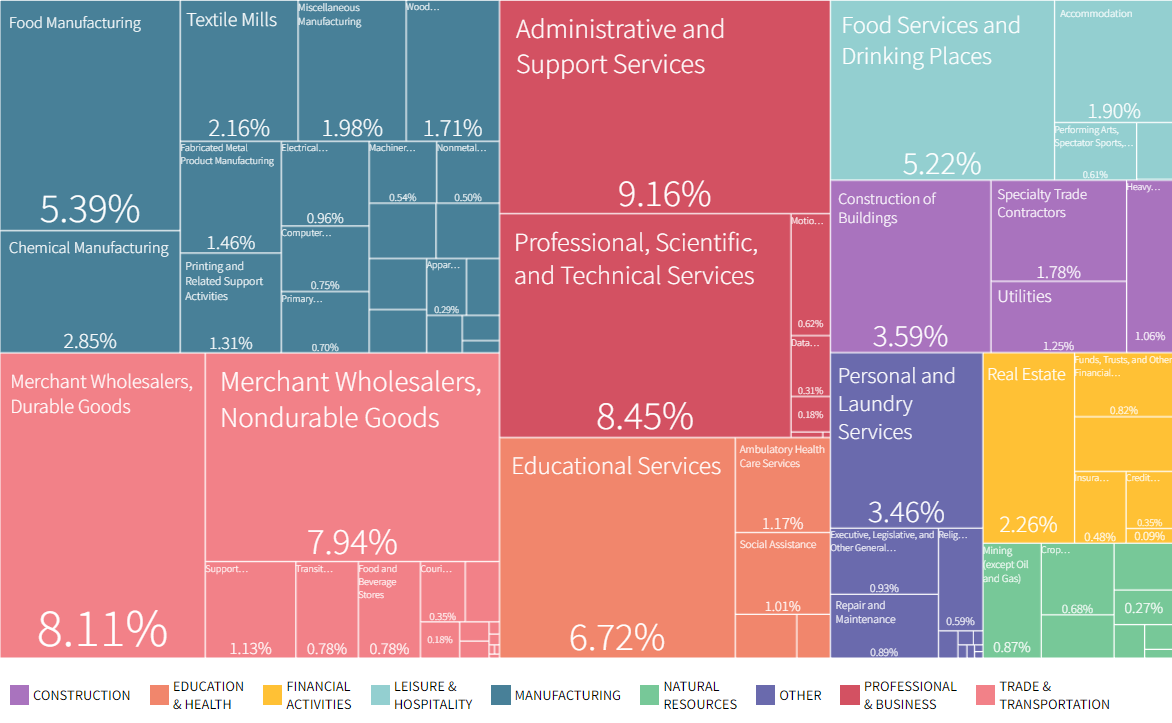
|  |  |  |  |
| --- | --- | --- | --- |
|  | **Y total tourists** | ***X Tree cover loss in hectares*** | ***X gross emissions of all greenhouse gases*** |
| **Y total tourists** | 1 |  |  |
| **X Tree cover loss in hectares** | 0.300804 | 1 |  |
| **X gross emissions of all greenhouse gases** | 0.300804 | 1 | 1 |

On running a correlation analysis, the correlation coefficient between the total number of tourists and tree cover loss, and the total number of tourists and gross greenhouse gas emissions comes out to be 0.300804, indicating a slightly weak but present correlation between tourism growth and environmental degradation, represented by tree cover loss and increase in greenhouse emissions.

A correlation coefficient of ~0.30 indicates that an increase in the total number of tourists visiting Dehradun leads to an approximate 30% increase in tree cover loss and greenhouse emissions (environmental degradation).

This is evident to the conclusion that an increase in population and tourism as a result of infrastructural development has lead to environmental degradation in the city of Dehradun.

***Is tourism an essential element of Dehradun’s economic profile? Does it contribute to the city’s economic welfare?***

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The chart above illustrates the economic composition of Dehradun, noted in various sectors.

Leisure and hospitality services, which are directly related to tourism, alone constitute 7.12% of the city’s economic composition. This leads to the understanding that an increase in tourism would have a direct impact on the economic growth of the city.

Also, merchant wholesalers, contributing to 16.05% of the economic activity, would be directly positively affected with any increase in tourism, since an increase in the number of tourists visiting the city would increase the sale of these products. Therefore, it is safe to say that tourism does have a significant weightage to the economic composition of the city of Dehradun.

|  |  |  |
| --- | --- | --- |
| **YEAR** | **District Domestic Product (constant prices)** | **Total tourists** |
| 2011 | 2221193 | 1516001 |
| 2012 | 2373347 | 1708629 |
| 2013 | 2567927 | 1736985 |
| 2014 | 2766166 | 1785746 |
| 2015 | 3056558 | 1768652 |
| 2016 | 3451800 | 1807383 |
| 2017 | 3662005 | 2146489 |

Above is a table illustrating the District Domestic Product (DDP) at constant prices and total tourists between the years 2011 and 2017. DDP is taken as a variable for economic growth.

District Domestic Product (DDP)" refers to the economic output or Gross Domestic Product (GDP) at the district level within a country. Here it is taken at constant prices to adjust for inflation. Measuring DDP at constant prices provides a clearer picture of real economic growth or contraction, as it eliminates the distortionary effects of inflation.

The correlation coefficient between the two is noted to be 0.854345, which denotes very high positive correlation. This indicates that an increase in total tourists increases the district domestic product by approximately 85%.

|  |  |  |
| --- | --- | --- |
|  | ***District wise domestic product (constant prices)*** | ***Total tourists*** |
| **District wise domestic product (constant prices)** | 1 |  |
| **Total tourists** | 0.854345 | 1 |

This Line chart indicates that increase in total tourists has a direct positive impact on the District Domestic Product, i.e., economic growth of the city.

Therefore, it is conclusive that tourism is an essential part of Dehradun’s economic profile and has a direct impact on the economic welfare of the city.

***How is deforestation or reduction in green space coverage, a decrease in air quality and biodiversity, as a result of increasing urbanization and infrastructural growth, affecting tourism?***

The line chart above indicates that with increasing environmental degradation, the total number of tourists is constantly increasing, following a trend line.

This scenario might seem counterintuitive, as one would expect tourists to be deterred by environmental degradation, but this might be explained by the factor that tourism has increased in Dehradun as a result of infrastructural development especially the construction of better roads, enhanced availability of leisure services, mainly food and drink related establishments and accommodation services. Increasing urbanization and infrastructural growth, despite contributing to environmental degradation, may also lead to the development of tourism-related infrastructure such as hotels, resorts, transportation networks, and amenities. Improved accessibility and facilities can attract more tourists, offsetting the negative impacts of environmental degradation.

Therefore, we come to the conclusion that environment degradation in Dehradun does not interrupt any tourism related activities.

***If necessary, how to optimize the tourist sector while still ensuring infrastructural and economic development?***

As stated by the findings above, environment degradation does not have any short-term impact on the tourisms sector, however, continuing environmental degradation might have a negative impact on the tourism sector, as well as the economy of Dehradun in the long run. Therefore, certain sustainable practices, wherever possible and not having any impact on economic growth, should be incorporated.

1. ***Waste management initiatives* –** Enhancing the waste management system by avoiding open dumping sites and avoiding using areas nears forests as dumping sites, installing more dustbins, including separate bins for recyclable and non-recyclable waste, establish recycling centers or material recovery facilities where residents can drop off recyclable materials such as paper, cardboard, plastics, glass, and metals, introducing some fine on littering and increasing vigilance on illegal dumping activities and organising cleanliness drives and public awareness campaigns by engaging schools, colleges, and youth groups to instill a sense of civic responsibility.
2. ***Initiating eco-friendly infrastructural development practices wherever* possible -** Invest in eco-friendly transportation options, energy-efficient accommodations, and green building practices to minimize the carbon footprint of tourism-related activities. Vikrams and public buses, which emit a lot of pollution should be replaced with electric buses and electric auto-rickshaws. Green building practices such as using scrap materials for construction of public buildings wherever possible can reduce environmental impact, conserve resources, and potentially lower construction costs. This initiative could also generate employment opportunities.
3. ***Cultural Preservation*:** With Dehradun becoming a hotspot for cafes, restaurants and other similar services, preserve and promote Dehradun's cultural heritage and natural landscapes as key attractions for tourists, as these serve as a unique selling proposition of Dehradun. Implement measures to protect cultural sites, traditional practices, and indigenous knowledge while offering authentic cultural experiences to visitors.
4. ***Promoting Responsible Tourism:***

Encourage tourists to embrace sustainable practices during their visit. This could involve:

Offering eco-tours that minimize environmental impact, educating tourists about responsible waste disposal in hotels and public spaces, supporting local businesses and artisans that prioritize sustainability, promoting carpooling or public transportation use by enhancing both the quantitative as well as qualitative features of the city’s public transportation system, highlighting the importance of water conservation and offering reusable water bottles, partnering with local NGOs and environmental organizations to develop responsible tourism initiatives and educational programs for tourists and/or implementing a certification system for hotels and tourism operators that adhere to sustainable practices, allowing them to attract eco-conscious tourists.

***What would be a better choice for the district of Dehradun, to introduce stricter forest protection laws to prevent further environmental degradation or focus its resources on infrastructural development at the cost of environmental degradation?***

It is clear from the data analysis above that infrastructural growth, be it at the cost of environmental degradation, has a positive impact on not only the tourism sector but also the economic growth of Dehradun. As stated by the Environmental Kuznets Curve, with increasing economic growth, there is first environmental degradation, which starts decreasing after reaching a certain level of high economic growth, or per capita income, and Dehradun follows this theory as well. Therefore, in the short run, in order for the city of Dehradun to achieve economic growth, infrastructural development is necessary and introducing stricter forest protection laws would only impede this process. However, increasing environmental degradation, especially a decrease in the green space coverage and an increase in pollution in the city’s environment could be problematic in the long run, not only in regards to standards of living of the residents, but also in the tourism sector in the long run. Therefore, a balancing mechanism must be put in place. Certain measures to prevent further environmental degradation, which do not hinder economic growth, especially eco-friendly initiatives should be introduced in the city.

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9. [*https://investuttarakhand.uk.gov.in/uttarakhandtourism/#resources*](https://investuttarakhand.uk.gov.in/uttarakhandtourism/#resources)
10. [*https://des.uk.gov.in/dpages/index-of-industrial-production,-uttarakhand*](https://des.uk.gov.in/dpages/index-of-industrial-production,-uttarakhand)
11. [*https://www.globalforestwatch.org/dashboards/country/IND/35/5/?category=forest-change*](https://www.globalforestwatch.org/dashboards/country/IND/35/5/?category=forest-change)
12. [*https://uttarakhandtourism.gov.in/sites/default/files/document/type/Tourist%20Statistics%20from%202000%20to%202020%20of%20Major%20Tourist%20Destinations.pdf*](https://uttarakhandtourism.gov.in/sites/default/files/document/type/Tourist%20Statistics%20from%202000%20to%202020%20of%20Major%20Tourist%20Destinations.pdf)
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