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Research Article

Environmental implications of the Recent growth in tourism in Chamoli district of Uttarakhand, India

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1. Introduction

Tourism is a key to enhancing the pace of economic growth and generating more employment opportunities in many countries of the world (Aryal, Cockfield and Maraseni, 2018). Recently, it has become an important factor for achieving the development and financial goals, especially in developing countries, at a much faster rate. In order to draw the maximum benefits possible, these countries are therefore now developing their tourism industry (Shiji, 2016).

The term tourism may include a plethora of activities involving travel, accommodation, sightseeing, shopping, and entertainment. Rapid expansion of the tourism industry means that it has led to rapid growth in the number of tourists and the services that cater them (Beaver, 2002). Tourists contribute to sales, profits, jobs, tax revenues, and income in an area. This, tourism can be a very important factor in uplifting the quality of life of the local population (Duffield, 1982). In the hilly terrain where soils are mostly poor and infertile, agriculture is not profitable, tourism offers the local population the income they need in order to improve their living standard (Tiwari, 2019). With this income, they buy more goods and services including healthcare and education to lead a healthy and happy life.

Unfortunately, rapid growth of tourism in an area also causes the unrestricted exploitation of the resources available in that area. This is particularly true for those places where resources are already scarce and the environment is fragile (Bist and Bhatt, 2011). Extreme seasonality, infrastructure unavailability, inefficient planning, and unrestricted interference with these frail ecosystems, particularly in the developing countries have made mountain tourism a rising environmental concern. Once tourism was considered to be a 'clean industry' as opposed, say, to heavy manufacturing, but this is no longer the case, especially in the developing countries where rules and regulation are strictly implemented due to various reasons (Sunlu, 2003).

Tourism thus may have huge negative environmental impacts (Sundriyal *et al.*, 2018). These include the depletion of local natural resources, traffic congestion, disease outbreak, air pollution, water pollution and scarcity, noise pollution, waste disposal problems, soil erosion, slope failure, loss of natural habitat due to deforestation, and more pressure on endangered flora and fauna (Yadav, 2014). According to an estimate, tourism contributes to more than five percent of global greenhouse gas emission, with transportation used for travel accounting for 90 percent of this (Al-Mulali, Fereidouni and Mohammed, 2015). It is often seen that relentless greed of various actors in tourism sector leads to depletion and destruction of the natural resources which its existence hinges on.

Ever since the establishment of Uttarakhand, the state has focused on tourism (Durgapal and Singhal, 2018). Tourism is considered so important to the state economy that the state has accorded tourism the status of an ‘industry’. About 27% of the state GDP is contributed by the tourism sector (Jaiswal, Bisht and Jaiswal, 2016). The aim according to the planning department of Uttarakhand government is to make the state one of the top 10 tourism destination states of the country by 2020, up from its present rank of 12, to acquire a place among the top 5 destination states by 2024, and finally to attain a position among the top 3 destination states by 2030 (Jaiswal, Bisht and Jaiswal, 2016). The state has

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enormous resources for cultural, pilgrimage tourism, ecotourism, nature tourism, wildlife tourism, and adventure tourism.

Tourism industry is a thrust sector in the state. The state, also known as *Devbhoomi* (the land of Gods), is already a well-known center of Hindu pilgrimage (Tiwari, 2019). Every year millions of pilgrim throng in Hindu sacred sites that are scattered across the state. Apart from religious tourism, the state government is also promoting wildlife tourism, eco-tourism, and adventure tourism. To this end, the state lured investors by announcing rebate in the taxes for new tourism units and tax holiday for five years for new amusement parks and ropeways (Government of Uttarakhand, 2018). Recently, the government has invested huge money in building new highway networks to connect major tourist destinations. The state government is promoting people to turn their houses in home stays for promoting rural tourism (Pioneer News Network, 2020).

While rapid increase in the tourist arrivals has propped up the economy of the state, it has been noted by many previous studies that this phenomenon has been causing a plethora of environmental issues as well. For instance, Sundriyal et. al (2018) in their study of negative impacts of the incessant upsurge in tourism development on the physical environment of Mussoorie found that increased volume of tourists has led to many environment problems in the city such as air quality deterioration traffic congestion, water scarcity during summers, substantial increase in waste generation and its improper disposal (Sundriyal *et al.*, 2018). Similarly, Kuniyal et. al (2003) found that in their study on the Valley of Flowers and Hemkund Sahib estimated that the disposal of solid waste was a huge problem in these areas. However, such studies are very few in number (Kuniyal, Jain and Shannigrahi, 2003). Similarly, Yadav (2014) found that growing tourist inflow was responsible for environmental degradation in Nainital district (Yadav, 2014). Mahapatra et al (2011) studied environmental impact of river rafting industry in Rishikesh and reported problems related to garbage disposal, habitat loss, various type of pollution and degradation of natural resources (Pandey, 2015).

However, none of the previous studies have explored environmental impact of growing tourism in the context of Chamoli district of Uttarakhand state. Therefore, the present study is an attempt to fill this gap. However, before delving deep into this issue, a brief introduction of the district is necessary. Subsequently, this paper describes the trends in tourist arrivals in Chamoli and the main tourist destinations of the district. It then discusses some of the important characteristics of tourism in Chamoli. The paper the shifts its focus to environmental impacts of tourism in Chamoli district with the help of secondary data that is available in various literature sources such as books, journals, reports, etc. The paper finishes with conclusion and a few recommendations.

2. The Study Area

District Chamoli is in the Central Himalayas and covers the area between 29º 55’ 37" to 31º 27’ 3" north latitude and 78º 54’ 3" to 80º 2’ 3" east longitude (Government of India, 2015). The area of district is 7692 square kilometres which is approximately 15 percent of the total geographical area of the state of Uttarakhand. To the east of districts are Pithoragarh and Bageshwar districts, in the South is Almora district, in the West lies the districts of Uttarkashi and Rudraprayag, and in the South-West is Pauri Garhwal district. The northern border is shared with the People’s Republic of China. This border has three mountain passes; viz. Mana Pass, Niti Pass, and Marhi La Pass (Government of India, 2015).

The district has a rugged topography with snow free valleys and tall peaks with perpetual snow and glaciers (Rizvi, 1979). The relief of the district varies between 600 and 7800 metres. The district is crisscrossed by several rivers and their tributaries. Alaknanda along with its tributaries the Mandakini and Pindar are the main rivers of the district. The general flow of rivers mainly originating from various Himalayan glaciers is from the northeast to the southwest. (Rizvi, 1979). As the elevation of the district ranges from 800 m to 8,000 m above sea level, the climate of the district varies largely depending on the altitude. About 60% of total geographical areas is under dense forests. There are 9 blocks and 1,246 villages in Chamoli.

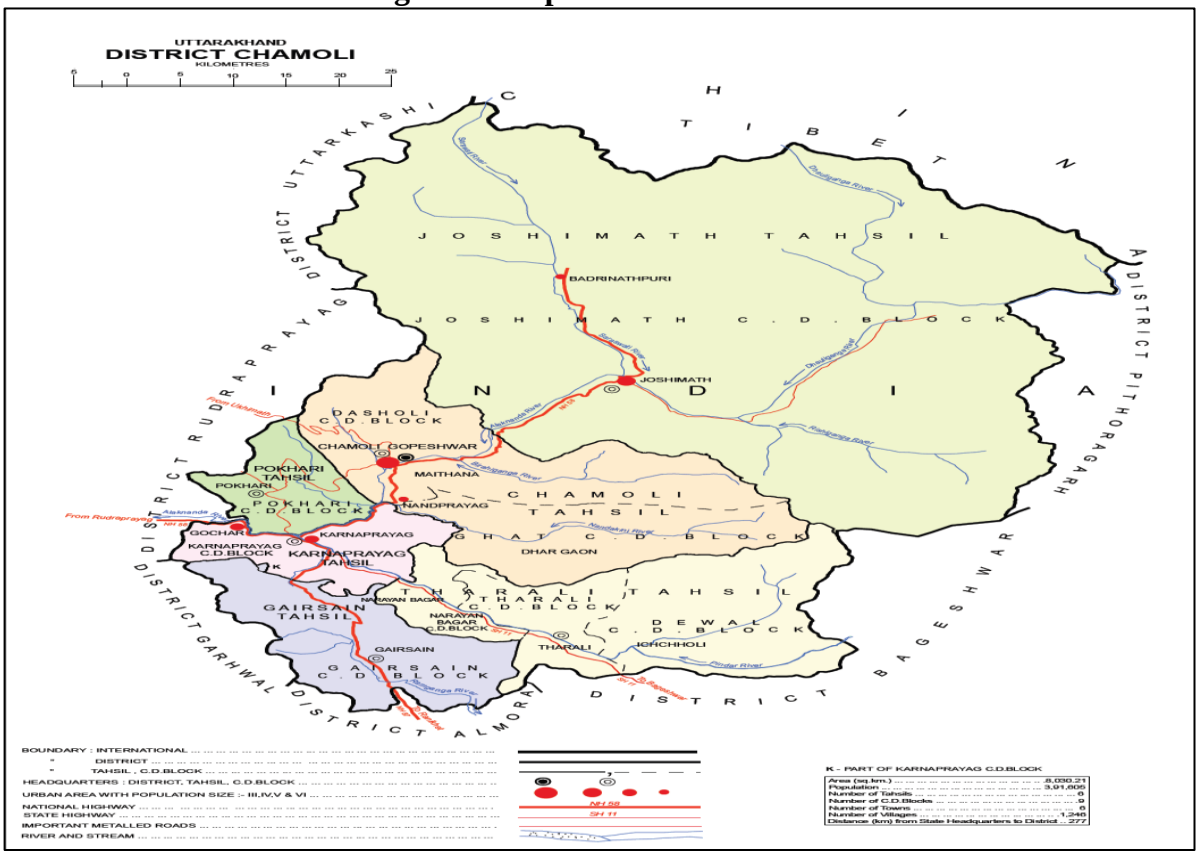
Chamoli is known for its natural beauty but it is also recognised as a religious and spiritual place (Tyagi, Dhar and Sharma, 2016). Chamoli is home to a number of Hindu religious sites including two of the Chota Char Dham temples: Badrinath and Kedarnath. Joshimath, the winter seat of Lord Badri, is also located in Chamoli. Joshimath is about 16 kilometers from winter ski resort of Auli. Three of the five *prayags*, namely Karnaprayag, Nandaprayag and Vishnuprayag, are also located in Chamoli (Tyagi, Dhar and Sharma, 2016).

As for the demography of the district, it is home to about four percent of the total population of Uttarakhand. With about four hundred thousand inhabitants, the district is ranked nineth in the list of most populous district of the state. Scheduled Castes and Scheduled Tribes represented about 20 and 3 percent of the total population the population respectively (Directorate of Census Operations Uttarakhand, 2011). In 2011, the district had a sex ratio of 1,021 females per 1,000 males, far better than the state average of 963 females per 1,000 males. The population density was only 50 person per square kilometres making the district of Chamoli the second least densely populated district of Uttarakhand (Directorate of Census Operations Uttarakhand, 2011).

According to the Human Development Report 2018, the multidimensional poverty of the district of Chamoli was highest in the state of Uttarakhand reflecting higher deprivation in education, health, and standard of living. According to Ministry of Panchayati Raj (2006), the district was one of the most backwards districts in India. This indicates towards the backwardness of district in terms of infrastructural gaps in drinking water, connectivity, health, education, social sectors, electrification, etc.

Apart from tourism which is seasonal in nature, agriculture is the mainstay of the economy of Chamoli. Only recently some cottage industries have come up, the chief being wool. The road network in the district has been extremely poor until recently due to topographic constraints. However, the government has taken token note of this and a number of all-weather highway projects are in progress, for example, Char Dham Highway Project (Mann *et al.*, 2020). Railway expansion under Char Dham Railway Project is also going on.

Figure 1: Map of Chamoli District



Source: District Census Handbook Chamoli, Census of India, 2011.

3. Data and methods

The data for this study comes from various secondary sources. Data has been obtained from various government and private reports available online. Author made a comprehensive search in Google Scholar using the terms such as 'tourism', 'social', 'impact', 'environmental', 'Chamoli', 'Valley of Flowers', 'Nanda Devi Biosphere Reserve', 'Auli', 'Gopeshwar', 'Char Dham Yatra', 'Char Dham', 'Ecotourism', 'Sewage', 'Solid Waste', 'Hemkund Sahib', and 'Joshimath', etc. Only a few relevant studies could be retrieved. Author has made use of the results of these studies to support the arguments of this paper. As for the analysis, this paper has used graphs to show trends and patterns of tourism and related phenomenon.

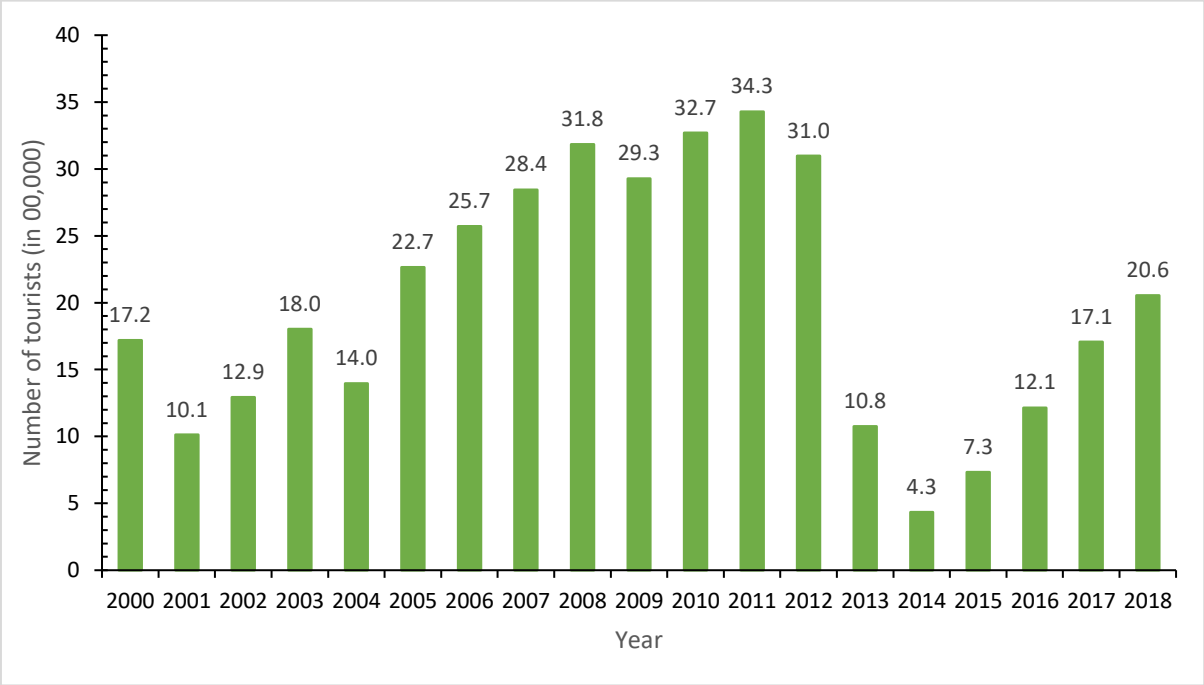
4. Main attractions in Chamoli

The main tourist attractions in Chamoli are – Badrinath, Hemkund Sahib, Valley of Flowers (VOF) National Park, Nanda Devi Biosphere Reserve, Auli, Chamoli-Gopeshwar, and Joshimath. Many other small destinations are becoming popular among tourists coming to Chamoli. Mana border village, Ghangharia, Govindghat, Gauchar, Niti are some of them.

5. Trends in tourist arrivals in Chamoli

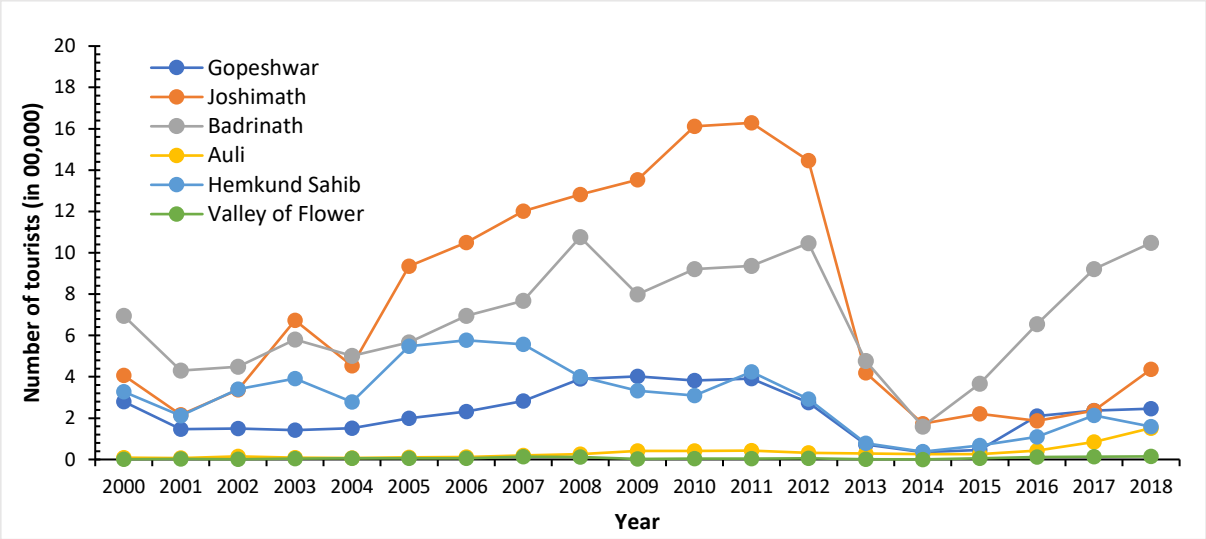
In the year 2000, Chamoli was visited by about 1.7 million domestic and foreign tourists (see figure 2). This number has gradually risen ever since except for the year 2013 when the number of tourist arrivals suddenly dropped to 1 million from 3.1 million in 2012 because of the devastating floods and landslides state witnessed that year. This disaster was so impactful that tourist arrival took almost two year to reach the previous record. Year 2014 proved to be the worst as the district had only 0.4 million tourists that year. Since then the number of tourists has been continuously growing. In 2019, tourist influx in Chamoli stood slightly above 2 million mark.

Figure 2: Number of tourists in Chamoli district, 2000-2018



Note: Line graph created by author.
Source of data: https://uttarakhandtourism.gov.in

Figure 3: Trends of tourist arrival at the main attractions of Chamoli district, 2000-2018



Note: Line graph created by author.
Source of data: https://uttarakhandtourism.gov.in

Figure 3 presents the trends in the tourist arrival at some important tourist destinations in Chamoli district. The graph clearly shows that Joshimath and Badrinath had received disproportionately higher number of pilgrims in the pre-disaster era i.e. 2013. The lowest number of tourists were received by Auli, which recently has been turned into a ski resort and winter sport destination, and the Valley of Flowers, which is a protect area and only a few tourists per year are allowed to enter. The post-disaster recovery was considerably quick in Badrinath. The number of tourists visiting Joshimath remained more or less same since the disaster struck the state in 2013. The number of tourists in Auli has been increasing rapidly in the last three years making it one of the important tourist destinations in Chamoli district. The Valley of Flower allows only a limited number of tourists every year and that is why the number of tourists is the lowest among all and that too is not increasing at a rapid rate.

5. Environmental impact of tourism in Chamoli

Tourism thus may have huge negative environmental impacts. These include the depletion of local natural resources, traffic congestion, disease outbreak, air pollution, water pollution and scarcity, noise pollution, waste disposal problems, soil erosion, slope failure, loss of natural habitat due to deforestation, and more pressure on endangered flora and fauna. In the next few paragraphs, we will discuss some of these impacts with reference to Chamoli district.

5.1 Solid waste: This is one of the major environmental issues in the urban areas of Uttarakhand and the urban areas of Chamoli district are not untouched by this issue. Rapid growth of urban population in the district fuelled by rural to urban migration in recent decades has led to an increased generation of municipal solid waste. With limited means to manage this ever-growing waste, the unmanaged waste including untreated disposal of bio-medical wastes from hospitals and clinics has been a contributor to pollution and turn out to be a public health hazard.

The peak of tourist arrivals in summer months is often linked with a spike in solid waste generation. A previous study in the district of Dehradun noted that solid waste generation during the peak months rose rapidly when lakhs of tourists visited this hill-town and dump their waste all over the place. According to this study, the waste generation was maximum (23 metric tons per day) during summer months (May to July) during which the town also experienced the highest inflow of tourists (1,069,267). In contrast, the volume of solid waste generated decreased in other months in correspondence of decreased inflow of tourists in the town. Similarly, various tourist destinations in Chamoli district witness a surge in solid waste generation during the summers when the tourist arrival in the district peaks.

Figure 3 shows that the amount of solid waste generated in various municipalities and urban areas located in Chamoli district. Chamoli-Gopeshwar and Gauchar were the largest producers, each producing about 10 metric tons (MT) of solid waste per day. Joshimath and Karnprayag were also in close range producing about 8 MT of solid waste per day. Gairsain, Badrinath, and Pokhri were producing less than 5 MT of waste per day.

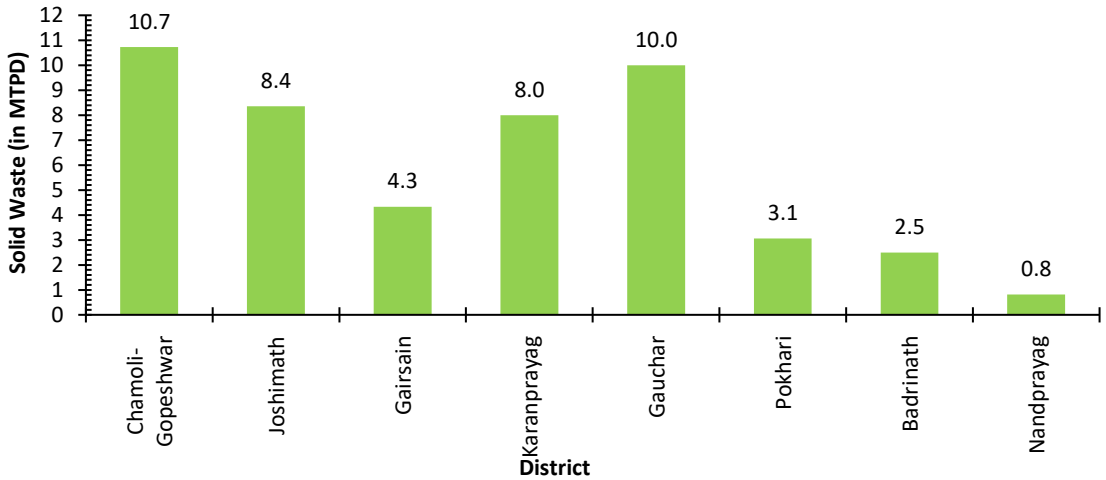
Figure 4 provides a glimpse into the source of solid waste generated in one of the main urban areas, Chamoli-Gopeshwar. This is also the headquarters of the district. An overwhelming proportion of the waste in Chamoli-Gopeshwar comes from households (about 87%, not shown in the figure), followed by road sweepings, shops, restaurants, and hotels.

During the peak season when tourist inflow increases, a considerable amount of the solid waste generated in these urban areas remains unmanaged. Waste bins overfilled with litter are a common sight. Littering during the peak season increases not only because of tourists but also because of uncaring attitude of local residents. It is often seen that even locals do not use these collection units during peak season and dump the garbage on the slopes.

Along the trek to Hemkund Sahib gurudwara and the Valley of Flowers National Park, used plastic bottles, food wrappers and remains of raincoats made of thin polythene, thrown by pilgrims and tourists is a common sight nowadays. The pathway that leads to these two places is heavily crowded during the peak season. A considerable number of tourist ride mules to reach these places. These mules also leave a train of dung making this area unclean in places. There is no space to collect mule dung and turn it into manure. Tourists and pilgrims also throw their plastic waste along this path. Mushrooming of illegal shop along the pathway has deteriorated the condition even further. The owners of these shops do not take responsibility of the waste they generate and dump it as per their whims and facies. Similar situation exists in small settlements such as Ghangharia and Govindghat that provide accommodation to tourist and pilgrims visiting Hemkund Sahib and the Valley of Flowers.

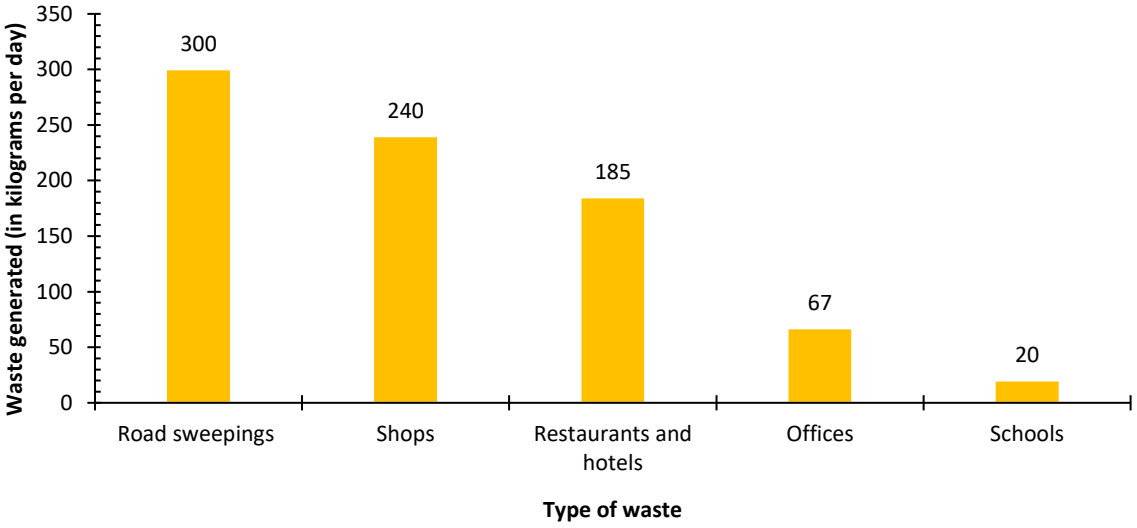
Auli was once a pristine area but due to increased tourist inflow in recent decades has created serious solid waste problems. Auli has been promoted as winter sports destination among the tourist. The alpine meadows of Auli are now interrupted by hotels and restaurants and other facilities and the increased inflow of tourists has led to an increase in the waste generation and much of this is not treated or disposed or recycled and ends up on hill slopes. Auli does not have a solid waste treatment plant yet. Hundreds of quintals of waste, including non-degradable plastic from Auli is often transported nearly 300 kilometers to Dehradun for final disposal. Similarly, Joshimath, which is about 16 kilometers from Auli, is also facing problem of solid waste management. The situation gets worse during the peak period.

Figure 3: Solid waste generation in various municipalities in Chamoli district, 2014



Data Source: Government of Uttarakhand (2015) Urban municipal waste management action plan for state of Uttarakhand. Urban Development Directorate, Dehradun. This graph was created by the author of this paper.

Figure 4: Solid waste generation in Chamoli-Gopeshwar urban area, 2014



Data Source: Kumar, V. (2015) Evaluation of Current Status and Recommendations to Plug in Gaps in Solid Waste Management at Chamoli Gopeshwar. Disaster Mitigation and Management Centre, Dehradun. This graph was created by the author of this paper.

If properly disposed and recycled, solid waste is not a problem. However, the district of Chamoli does not have a single functional solid waste management plant or sanitary landfill. According to the Central Pollution Control Board report published in 2018, Uttarakhand is among the worst states in the country in terms of Solid Waste Management. What can be done to deal with the issue is increase the number of waste collection bins and the frequency of waste collection to prevent overfilling and spillage, and implement a complete ban on the use of plastic items especially the disposable ones, and provide waste bins inside vehicles to prevent littering over the routes of tourist commute. Eco Development Committees need to be revamped.

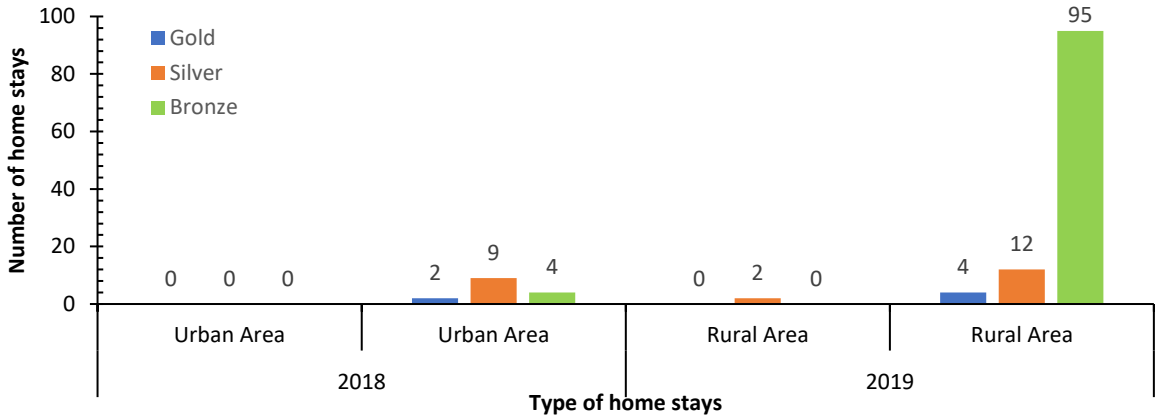
5.2 Water scarcity: An elevated tourist influx may lead to a situation known as water scarcity i.e. when water demand exceeds the water supply capacity (Gössling *et al.*, 2012). The scarcity of water in Chamoli district has become a regular phenomenon during the peak tourist season. According to report by Govind Ballabh Pant National Institute of Himalayan Environment and Sustainable Development, Almora in 2019, Springs (70.3%) are the most used water source in Chamoli district followed by streams (20.4%) and *Gadhera* (7.3%) (Kumar *et al.*, 2020). The Ghaat block of Chamoli district has the highest water dependency on Springs (84%). Their analysis reveals that Ghaat and Tharali blocks Chamoli district were the highest water scarce blocks in the entire state (Kumar *et al.*, 2020).

Tourism in Chamoli is both dependent on fresh water resources and an important factor in fresh water use. Tourists and pilgrims require and use water when washing or using the toilet, when participating in activities such as ski or golf tourism (snowmaking as in the Auli ski resort, and irrigation of grass carpet), when using spas, wellness areas or swimming pools. Fresh water is also required for upkeep of the gardens and landscaping of hotels and homestays and tourist attractions, and is thus part and parcel of tourism infrastructure development. Many recreational activities such as swimming, kayaking, canoeing, and diving, etc. also take place in certain places in Chamoli district and they are important elements of the landscapes visited by tourists. Many forms of tourism such as winter tourism (for instance white winter landscapes in Auli), agritourism or wildlife tourism in Chamoli are dependent on water availability. Therefore, any changes in the availability or quality of water resources can have serious implications for tourism itself.

It is estimated that a tourist coming to the state of Uttarakhand required 40 liters of water per capita per day. With growing number of tourists every year, this demand is going to grow over the period and will exert pressure on water resources in the state as there is rapid rise in the number of hotels and

homestays in the district (Pioneer News Network, 2020). The figure below provides a glimpse in the growing number of homestays for tourists.

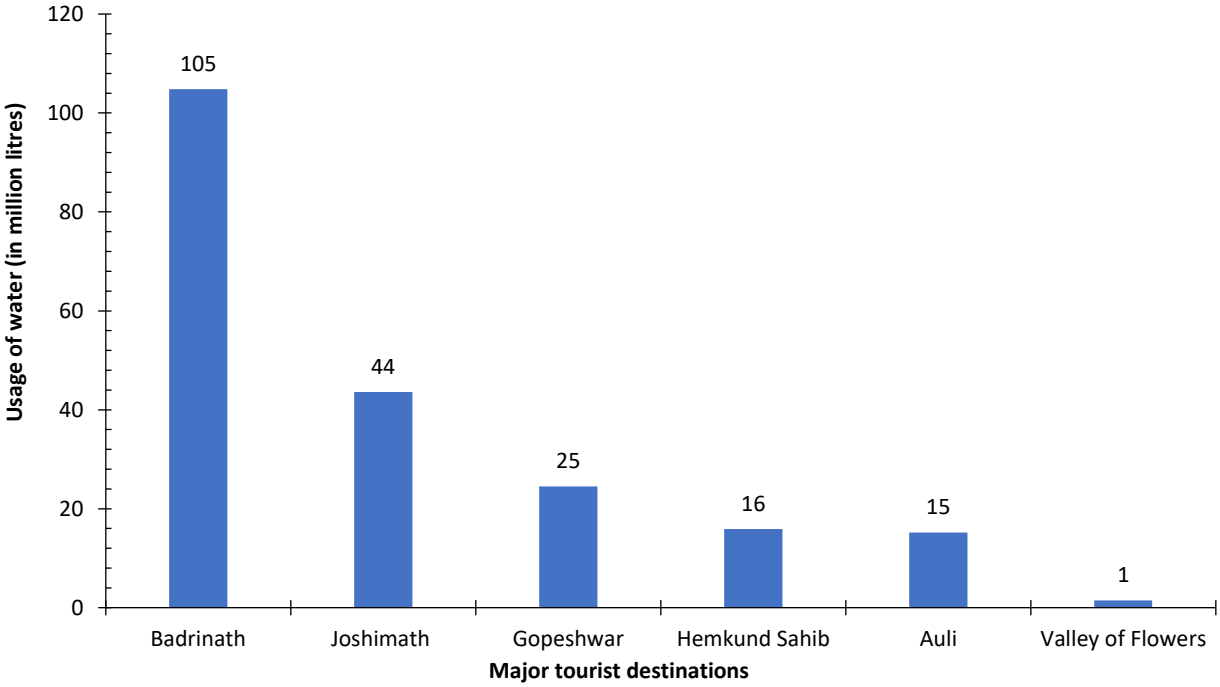
Figure 5: Growth of registered home stays under Guest Uttarakhand Home Stay Scheme between 2018 and 2019



Note: Bar graph created by author.
Data Source: https://uttarakhandtourism.gov.in

Looking at the number of tourist arrivals and assuming that a tourist stays about 2.5 days during his trip and uses about 40 liters of water per day, multiplying the number of tourists with 100 would provide us the quantity of water required for the tourists in Chamoli alone. Figure 6 given below suggests that about 150 million liters of water is used by tourists every year in Badrinath and Joshimath alone. The figure for Auli does not include the water that is used for snowmaking and other recreational purposes. Thus, tourists exert a great pressure on water resources of Chamoli district which is already a water scarce district and two of its blocks are among the worst water scarcity affected blocks in the state.

Figure 6: Usage of water by tourists in Chamoli district, 2018



Note: Bar graph created by author.
Data Source: https://uttarakhandtourism.gov.in

Due to high demand of water the natural sources of water such as springs are drying up. Most of the government schemes use water from springs. In fact, the hand pump scheme uses the same aquifers that keep spring alive. This is why springs are fast disappearing in the district, especially in the vicinity of towns and urban areas. With more and more homestays coming up in rural areas, the demand for water has risen there as well and led to a situation of water scarcity in many areas. Water scarcity may have many undesirable implications for the society especially women. While women spent a considerable time carrying water far from their house, girls are also asked to help their mothers which affects their studies and school attendance. Even boys have to spend a lot of their time collecting water from far away springs or rivulets for their animals.

5.3 Sewage: With increase in tourist arrivals, the district has witnessed a rapid rise in the construction of hotels, recreation and other facilities. However, due to unplanned constructions, the establishment of proper sewage system is often ignored and this leads to increased sewage pollution. This problem not only exists in urban areas but also in rural areas. particularly in those are where homestays are mushrooming. Wastewater not only pollutes surrounding tourist attractions but also damages the flora and fauna.

Joshimath, and Chamoli-Gopeshwar had many open drains the wastewater form which used to flow in the river Alaknanda directly without any treatment. However, the district was fortunate to have received copious amount of necessary fund under the Namami-Gange initiative which aims to clean Ganga. Joshimath and Gopeshwar have adopted interception and diversion mechanism through which they capture raw sewage flowing into the river Alaknanda. Then it is redirected towards the sewerage treatment plants that have been set up in Joshimath, and Chamoli-Gopeshwar for treatment.

5.4 Air and Noise Pollution: The quality of air on tourist routes, towns in which they stay and the places they visit get worse during the peak season when the number of vehicles, camp fires, and the smoke from increased activities in hotels and homestays increases manifold. Apart from this, burning garbage in open dumping grounds especially on the outskirts of towns and villages, especially those located on the main tourist routes to Badrinath is also a common site nowadays. Construction activities under Char Dham Highway Project involve blasting mountains and towing rubble to dump sites as well. This has caused serious air pollution in many parts of the district. Noise pollution from airplanes, cars, and buses, as well as recreational vehicles such as snowmobiles and jet skis, is a problem of modern life. In addition to causing annoyance, stress, and even hearing loss for humans, it causes distress to wildlife, especially in ecologically sensitive areas such as Valley of Flowers and Nanda Devi National Park.

5.5 Effects on local flora and fauna: With tourist arrivals increasing at an unprecedented rate, the pace of construction works have skyrocketed in the district. The government has contributed to this considerably, for example, by undertaking road widening and railway extension projects, and providing incentive to establish homestays in rural areas. In recent years, the construction of shopping establishments, hotels and restaurants in Chamoli has increased considerably. This is to cater the increasing tourist inflow. Many new shops and eateries in the major urban centers of the district have come up. Such construction has caused indiscriminate felling of tress and encroachment of ecologically sensitive forests and woods.

Government funded large development projects such as Chard Dham Railway and Highway Projects can be seriously fatal to the local ecological balance and the biodiversity in the region. It is estimated that about 25000 trees were chopped off for the widening of exiting motorway (Siddique and Pradhan, 2019). Felling of trees and large swathes of forests forces resident fauna or animals to invade the nearby human settlements which not only causes safety concerns but also have an adverse impact on farm productivity endangering the livelihoods of people. It has also been noted that the muck created by the road widening under this project is being dumped indiscriminately in farm land and thus affecting people's livelihoods (Siddique and Pradhan, 2019).

It has come to the fore that the slope instability has increased in the areas where this project is being run and many landslides have been witnessed. This may be because the cut made to the slope at made at very sharp angle increasing the possibility of slope failure in these parts of fragile Himalayas (Pandit and Sarkar, 2018). Flouting of environmental protocols, a lot of construction debris is being dumped

in the rivers. This debris is blocking the natural flow of streams and threatening the wildlife not only in the river ecosystem but also in the surrounding areas (Pandit and Sarkar, 2018).

Trampling due to increased tourist activity and cattle movement can lead to loss of flora and biodiversity. An example from the district would make it clear. Rudranath is one of the famous religious shrines of Hindus is located Chamoli district. Every year from May to October, large herds of sheep/goat (~50000), buffalo (~70), and horses/mules (~40) visit this place for summer grazing, creating a huge pressure over this pastureland (Bist and Bhatt, 2011). Apart from this, tourists who come trekking also trample this pastureland worsening the situation.

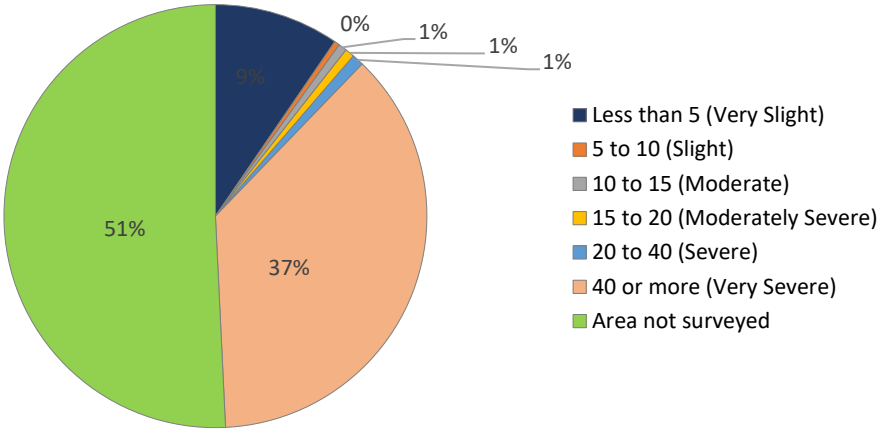
It has been seen that growing religious tourism to the state has caused many plant species which are considered holy and used for ritualistic purposes have become rare in Chamoli region. Most pilgrims use flowers and colorful herbs to offer to God at various religious shrines such as Badrinath and Hemkund Sahib. For example, Tulsi is offered to lord Badrinath Ji and Brahmkamal is offered to Goddess Nanda Devi at Roopkund (Ghosh, 2017). With rapid rise in tourists in the recent decades, many plant species which are part of our cultural and religious heritage are slowly getting wiped out due to excessive exploitation. Tourism department now organizes Roopkund Mahotsav on the day of Nanda Devi Jat which is a multi-destination religious trek lasting several days. Thousands of pilgrims and devotes offer Brahmkamal flowers to the deity (Ghosh, 2017). These flowers are supplied from nearby high-altitude pasturelands (also known as Bugyals) such as Bedni Bugyal and Ali Bugyal. Excessive plucking of these flowers without any conservation measure has made this plant rare in Chamoli district (Ghosh, 2017).

Rapid increase in tourist arrivals has also caused a problem of open garbage dump in and around the town and cities in Chamoli. These dumps also contain scraps of food and meat which attracts animals, so instead of hunting they start foraging in garbage dumps (Katlam *et al.*, 2018). A study conducted in the Himalayas and published in December 2018 in the journal Current Science found a diverse range of animals, from carnivores, primates, bulbuls, doves, to woodpeckers were frequenting garbage dumps in a Himalayan landscape (in Nainital district) and ingesting plastic leading to higher animal mortality than usual. unsegregated garbage near natural habitats as a result of increased tourism posed a huge conservation threat (Katlam *et al.*, 2018).

5.6 Soil erosion and landslides: Growing tourism has led to demand of smooth and rapid transportation. Char Dham Highway Project is a result of this pressure. However, the project involves removal of a lot of vegetal cover and cutting forested slopes. The process has removed the vegetation cover on hill slopes and exposed underneath soil and rocks to erosion along the slopes.

Figure 8 shows rate of soil loss in Chamoli district. It reveals that a considerable part of Chamoli district comes under the category ‘very severe loss’ (Mahapatra *et al.*, 2018). But construction activities in the district are going on unabated. Weak geological formation, active seismicity and deforestation are main causes of soil erosion in the district, the Char Dham road widening project is increasing the hazard potential (Mahapatra *et al.*, 2018). Road construction is being done hastily and in absence of any Environmental Impact Assessment, hill slopes are being cut at near 90-degree angles which when meet heavy downpours in monsoon season result in massive landslides (Pandit and Sarkar, 2018). According to a report, over 500 landslides have been reported across the Char Dham routes.

Figure 7: Rate of soil loss (tons per hectare per year) in Chamoli district, 2018



Note: Pie chart created by author.
Data Source: Mahapatra et al. (2018). Assessment of soil erosion in the fragile Himalayan ecosystem of Uttarakhand, India using USLE and GIS for sustainable productivity. Current Science, 115 (1): 108-121

6. Conclusion

District Chamoli is witnessing a rapid increase in tourist arrival recently. Most of this influx is of religious tourists but number of other tourists is also increasing. This has created a huge demand for various services and led to rise in construction and developmental activities across the major destinations in the district. However, the district still lacks the necessary infrastructure to cope with the increasing pressure of human activities. As a result, environmental degradation is a common sight across the district. High investment development projects that are supposed to cater increasing volume of tourist traffic are further increasing the hazard level by interrupting the normal functioning of the ecosystem in the district. The district is facing a number of environmental problems today which did not exist in the past. The district needs to adopt a new strategy that takes care of both tourism development and ecological balance.

7. References

1. Al-Mulali, U., Fereidouni, H. G. and Mohammed, A. H. (2015) 'The effect of tourism arrival on CO2 emissions from transportation sector', *Anatolia: An International Journal of Tourism and Hospitality Research*, 26(2), pp. 230–243. doi: 10.1080/13032917.2014.934701.
2. Aryal, S., Cockfield, G. and Maraseni, T. N. (2018) 'Globalisation and traditional social-ecological systems: Understanding impacts of tourism and labour migration to the transhumance systems in the Himalayas', *Environmental Development*. Elsevier B.V., 25, pp. 73–84. doi: 10.1016/j.envdev.2017.09.001.
3. Beaver, A. (2002) *Dictionary of Travel and Tourism*. Oxford University Press. Available at: https://www.oxfordreference.com/view/10.1093/acref/9780191733987.001.0001/acref-9780191733987 (Accessed: 14 July 2020).
4. Bist, A. S. and Bhatt, A. B. (2011) 'Effect of Human Activities, and Environmental Changes on an Alpine Vegetation of District Chamoli, Garhwal Himalaya, Uttarakhand, India', *World Rural Observations*, 3(1), pp. 64–71.
5. Directorate of Census Operations Uttarakhand (2011) *District Census Handbook Chamoli, Census of India*. Available at: http://www.censusindia.gov.in/2011Census/C-16_25062018_NEW.pdf.
6. Duffield, B. S. (1982) 'Tourism: the measurement of economic and social impact', *Tourism Management*. Pergamon, 3(4), pp. 248–255. doi: 10.1016/0261-5177(82)90046-2.
7. Durgapal, B. P. and Singhal, B. P. (2018) 'Tourism in Uttarakhand', *International Journal of*

Management Studies, V(Special Issue 5), p. 08. doi: 10.18843/ijms/v5is5/02.
8. Ghosh, D. (2017) 'Brahma Kamal', *Resonance*, 22(4), pp. 377–387. doi: 10.1007/s12045-017-0477-y.
9. Gössling, S. *et al.* (2012) 'Tourism and water use: Supply, demand, and security. An international review', *Tourism Management*. Elsevier Ltd, 33(1), pp. 1–15. doi: 10.1016/j.tourman.2011.03.015.
10. Government of India (2015) *Breif Industrial Profile of District Chamoli*. Nainital, Uttarakhand: MSME Development Institute. doi: 10.1017/CBO9781107415324.004.
11. Government of Uttarakhand (2018) *Uttarakhand Tourism Policy 2018*. Dehradun.
12. Jaiswal, B., Bisht, M. and Jaiswal, J. (2016) 'Tourism Sector and its Impact on Uttarakhand State Economy', *International Journal of Research in Social Sciences*, 6(10), pp. 987–998.
13. Katlam, G. *et al.* (2018) 'Trash on the menu: Patterns of animal visitation and foraging behaviour at garbage dumps', *Current Science*, 115(12), pp. 2322–2326. doi: 10.18520/cs/v115/i12/2322-2326.
14. Kumar, K. *et al.* (2020) *Water at a glance in Uttarakhand: An assessment of water scarcity*. Almora. doi: 10.1007/978-3-030-24962-5_1.
15. Kuniyal, J. C., Jain, A. P. and Shannigrahi, A. S. (2003) 'Solid waste management in Indian Himalayan tourists' treks: A case study in and around the Valley of Flowers and Hemkund Sahib', *Waste Management*, 23(9), pp. 807–816. doi: 10.1016/S0956-053X(03)00027-8.
16. Mahapatra, S. K. *et al.* (2018) 'Assessment of soil erosion in the fragile Himalayan ecosystem of Uttarakhand, India using USLE and GIS for sustainable productivity', *Current Science*, 115(1), pp. 108–121. doi: 10.18520/cs/v115/i1/108-121.
17. Mann, D. *et al.* (2020) 'Spatio-temporal variations in landscape ecological risk related to road network in the Central Himalaya', *Human and Ecological Risk Assessment*. Taylor and Francis Inc. doi: 10.1080/10807039.2019.1710693.
18. Pandey, R. (2015) 'Mountainous Eco-tourism and Environmental Impacts : Case Study of Rafting Industry on Ganges in Uttarakhand , Himalayas', *International Journal Of Environmental Sciences*, 1(5), pp. 751–777.
19. Pandit, K. and Sarkar, S. (2018) 'Stability assessment of cut slopes along Shivpuri – Kaudiyala road (NH-58), Uttarakhand Himalayas', in *IGC-2018 Indian Geotechnical Conference*. Bengaluru, pp. 1–6.
20. Pioneer News Network (2020) *Rs 10-lakh subsidy to start homestay in hills, The Pioneer*. Available at: https://www.dailypioneer.com/2018/state-editions/rs-10-lakh-subsidy-to-start-homestay-in-hills.html (Accessed: 14 July 2020).
21. Rizvi, S. A. (1979) *Gazetteer of India, Uttar Pradesh, District Chamoli*. Lucknow: Government of Uttar Pradesh.
22. Shiji, O. (2016) 'Economic impact of tourism in India', *International Journal of Social Sciences*. New Delhi Publishers, 5(1), p. 46. doi: 10.5958/2321-5771.2016.00013.2.
23. Siddique, T. and Pradhan, S. P. (2019) 'Road widening along National Highway-58, Uttarakhand, India', *Current Science*, 117(8), pp. 1267–1269.
24. Sundriyal, S. *et al.* (2018) 'Impacts of tourism development on the physical environment of Mussoorie, a hill station in the lower Himalayan range of India', *Journal of Mountain Science*, 15(10), pp. 2276–2291. doi: 10.1007/s11629-017-4786-0.
25. Sunlu, U. (2003) 'Environmental impacts of tourism Local resources and global trades: Environments and agriculture in the Mediterranean region Bari : CIHEAM Options Méditerranéennes : Série A ENVIRONMENTAL IMPACTS OF TOURISM', *Séminaires Méditerranéens*, 57, pp. 263–270. Available at: http://om.ciheam.org/article.php?IDPDF=4001977http://www.ciheam.org/%5Cnhttp://om.ciheam.org/.
26. Tiwari, P. N. (2019) 'Opportunities and Challenges in Tourism Industry of Uttarakhand', *Quest-The Journal of UGC-HRDC Nainital*. Diva Enterprises Private Limited, 13(3), p. 156. doi: 10.5958/2249-0035.2019.00023.8.

27. Tyagi, A., Dhar, R. L. and Sharma, J. (2016) 'Police culture, tourists and destinations: A study of Uttarakhand, India', *Tourism Management*. Springer Singapore, 52, pp. 563–573. doi: 10.1007/978-981-10-5628-4_10.
28. Yadav, A. S. (2014) 'Role of Tourism in Environmental Degradation and Disaster: A Case from Uttarakhand, India', *Quest-The Journal of UGC-ASC Nainital*, 8(2), p. 188. doi: 10.5958/2249-0035.2014.01083.3.