



# Anthropogenic causes of recent floods in Kashmir Valley: a study of 2014 flood

Ishfaq Hussain Malik<sup>1</sup> 

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## Abstract

The global processes interact to produce unanticipated hazards and an infinite number of risks. As a politically and ecologically vulnerable region in Asia, Kashmir necessitates a distinct understanding of its political and physical geography to understand its disaster risks. It experienced the worst flood in the last 100 years in the year 2014, resulting in widespread loss and damage. The current study looks at disaster management in Kashmir, with a special emphasis on the anthropogenic causes of the 2014 flood in the Valley. The data sources include both primary and secondary sources, which were analysed using Geographic Information System (GIS) and remote-sensing techniques. The primary data included the field survey and interviews of the people and experts of disaster management. The current study examines how factors such as urbanization, loss of wetlands, climate change, deforestation, encroachment and so on contributed to the worst flood in the Kashmir Valley's history. The study concludes that the 2014 flood was the result of different anthropogenic factors that acted over the years to create the large-scale destruction, and recommends several measures like control on encroachment on the Jhelum River's banks as well as proper development practises and construction of an alternate flood channel for the Jhelum River to control the floods in future.

## Introduction

The most common type of disaster is flooding (40% of all cases) and it occurs frequently in the Third World, especially if the storm surges associated with tropical cyclones are considered (Alexander 2018). High winds, heavy rain, and rising sea levels associated with cyclone landfall endanger approximately 15% of the world's population, the majority of whom live in developing countries. Impacts are often profound: death tolls in excess of 200,000 have been recorded when cyclones have made landfall at the Asian river deltas; and during year 1985-6 coastal and river

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✉ Ishfaq Hussain Malik  
mulikishfaq@gmail.com

<sup>1</sup> Department of Geography, Aligarh Muslim University (AMU), Aligarh, India

flooding affected 1.6 million people in six countries (US National Research Council 1987). The damage to crops, infrastructure and housing, and the negative impacts on health and sanitation caused by floods and cyclones are particularly severe in the populous floodplains and coasts of many Third World states. For example, one in 20 people in India is vulnerable to flooding (Alexander 1993). According to the Emergency Events Database, floods killed approximately 50,000 people and affected approximately 10% of the world's population between 2009 and 2019 (CRED 2019). According to the global disaster dataset, the number of disasters, particularly food disasters, has increased in recent years, with South Asia experiencing a dramatic increase in food disasters (Saharia et al. 2021). People not only have the ability to amplify the negative effects of floods, but they are also responsible for causing such damaging events, to a greater or lesser extent, through their actions (Malik 2021).

Kashmir Valley is located in the Himalayas, one of the world's highest mountain ranges (Malik and Najmul Islam Hashmi 2020). Because the Kashmir Valley is surrounded on all sides by Himalayan ranges, the Himalayan ranges have a significant impact on the climate and its variations (Malik and Hashmi 2021).

Flooding is not new to Jammu and Kashmir, especially in the Kashmir Valley. The Kashmir Valley is one of the most flood-prone Himalayan regions (Malik 2022a, b). The geology and geography of Kashmir Valley including the Jhelum River make it vulnerable to different types of disasters especially floods, and throughout the history the frequency of floods has been high (Dar et al. 2014). Floods primarily affect the floor stretching from Anantnag in South Kashmir to Baramulla in North Kashmir, and significant flooding has been observed in the Kashmir Valley in 1903, 1929, 1948, 1950, 1957, 1959, 1992, 1996, 2002, 2006, 2010, and 2014 (Bhatt et al. 2013) and 2015, 2017, 2019, and most recently in 2020 and 2022 (Malik 2022a, b). The 2014 flood was the worst in the last 100 years, killing 287 people in Jammu and Kashmir (Malik 2022b).

There was some initial disagreement among officials and experts about the causes of the 2014 flood in Kashmir, and officials from the J&K Irrigation and Flood Control establishment proposed the theory of 'cloud burst', or 'flash floods' in South Kashmir as the cause of the sudden rise in water level in the Jhelum River on September 6th–7th (Ali 2014), which caused the flood in September 2014. This viewpoint was unsubstantiated and contradicted by satellite and meteorological evidence, but it bolstered and aided the 'natural inevitability' perception of the flooding, emphasising official convalescence because the "water was beyond anyone's control." The flood in Kashmir in September 2014 had a 109-year return period.

The current study is significant because it examines the 2014 flood through the lens of social geography and provides ground truth about what caused the flood, which no previous study has done. The study is significant because it thoroughly explains the causes of the flood and puts them in one study, thus making it an important study to understand the general and particular causes of the flood in Kashmir Valley so that a proper planning and policy could be adopted to reduce the impact of floods in Kashmir Valley. The study's significance can be understood in light of the fact that it was the Valley's worst flood in the last 100 years, affecting every aspect of society and leaving a legacy that is still felt today.

The study is based on the following objectives;

- (i) To investigate the anthropogenic factors that contributed to the massive flood disaster in Kashmir in 2014.
- (ii) To examine the nature of the state's disaster response.

## Materials and methods

### Study area

The Kashmir Valley (Fig. 1), known as "paradise on Earth," is the current study area due to its breath-taking beauty. Kashmir Valley is located in the Indian subcontinent's north-western corner. "Kashmir" means "a land devoid of water." It is an oval-shaped valley that spans 15,853 km<sup>2</sup> and has a well-developed drainage system led by the Jhelum River (Bhatt et al. 2013). Kashmir Valley is divided into ten districts, with a population of 7.5 million in 2021 (Unique Identification Authority of India 2020).

The Pir Panjal Range to the south and the Great Himalayan Range to the north, both of which are the origins of major rivers such as the Indus, Sutlej, Jhelum, and Chenab, encircle the Valley that flow directly into the alluring valleys, decorated amazingly by lily-laden lakes and forests (Malik and Najmul Islam Hashmi 2020).

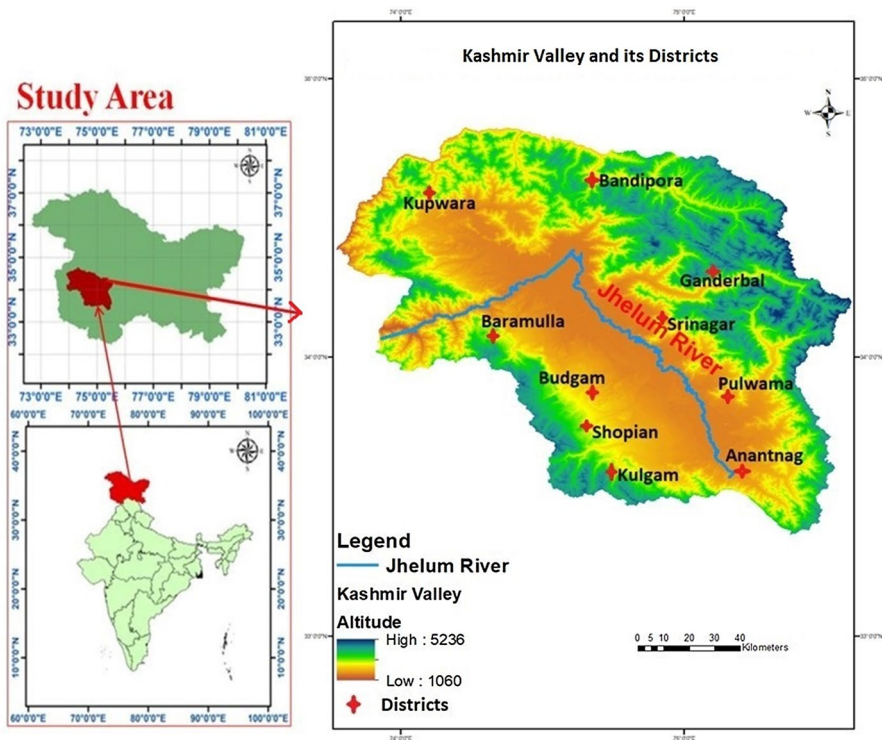


Fig. 1 Kashmir Valley map (study area)

People have written zillions of words to best describe Kashmir's beauty, but the truth is that the power of words can never comprehend the valley's mysticism. It has a rich cultural heritage and is known as the "Land of Sufis" because Sufism has had a significant influence on its culture.

### **Data base and methodology**

Primary and secondary data sources were used in the current study. Extensive field surveys and interviews were used to collect primary data. To know the perception of the people regarding the causes of the 2014 Kashmir Flood, the purposive sampling technique was used to identify the experts and acquire the primary data with the help of field survey and the interviews of 200 people which included experts on the disaster management in Kashmir Valley. The experts included the researchers from different universities and colleges across Jammu and Kashmir along with the officials of the Flood Control Department, J&K. The interviews were asked questions about the causes of the 2014 flood in Kashmir valley and why such flood had such a huge impact on the Kashmir Valley. Several field-based anecdotes gotten from the population to better buttress some of the causes are presented in the study. Secondary data were provided by the Indian Meteorological Department, the Department of Ecology, Environment, and Remote Sensing in J&K, the J&K Irrigation and Flood Control Department, and NASA. Arc GIS 10.2 and R were used in this study. The R programming language was used to analyse climate change over the last 30 years to understand the pattern of temperature.

## **Results and discussion**

### **Anthropogenic causes of the 2014 flood in Kashmir**

Disasters are portrayed as natural calamities and tragedies in the Kashmir Valley's entire framework of thought, study, organisation, forecasting, and relief distribution, with natural phenomena acting as the agents of death and devastation. The causes are linked together because they have a collect impact on the vulnerability of Kashmir Valley in terms of floods.

The following are the anthropogenic causes of the 2014 flood in Kashmir Valley;

1. Encroachment on the banks of Jhelum River.
2. Rapid, unplanned, and accelerated urbanisation.
3. Conversion of Wetlands into Agriculture and Built-up Areas (Loss of Wetlands).
4. Degradation of floodplain along the Jhelum River.
5. Deforestation.
6. Construction of Railway line.
7. Administrative laxity and slow official response.
8. Breaching of dikes and installation of water pipe line in the Jhelum Bund.
9. Tourism Industry.

10. Inadequate flood channel for the Jhelum River.
11. Climate change.

### **Encroachment on the banks of Jhelum River**

Human population growth, horizontal settlement expansion, encroachment on water-courses and floodplains, and agricultural reclamation of Jhelum's low-lying floodplains (Rather et al. 2016; Rashid et al. 2017), wetland depletion, and river siltation are all factors (Zaz and Romshoo 2012) that have contributed to increased flooding risk in the Jhelum basin. The Jhelum River overflows its natural banks during floods, and at times of extreme intensity, the water flows over the artificial embankments built on either side of the Jhelum. Projects for development are not without risk. If they are poorly formulated or implemented, or if they cause significant environmental damage, they can exacerbate vulnerabilities and increase the number of hazards. Encroachment on the Jhelum River's banks, particularly in some parts of Srinagar such as Raj Bagh, has reduced the river's water holding capacity, and the flood has severely damaged the structures along its banks. A respondent while explaining the encroachment on the banks of Jhelum River said, "there were very few houses along the Jhelum bank almost twenty years ago, but now the bank is flooded with houses, hotels, and restaurants, and the number is increasing year by year, causing the river to shrink."

### **Rapid, unplanned, and accelerated urbanisation**

Flooding rate can be ten-fold increased as a result of urbanisation (Hollis 1975). Flooding occurs as a result of the interaction of rainfall, surface run-off, sea level, catchment size, and topography in a specific area. These factors can be influenced by land use, urbanisation, deforestation, agricultural practises, irrigation, dams, and water storage (Jamal et al. 2022; McMichael et al. 2006).

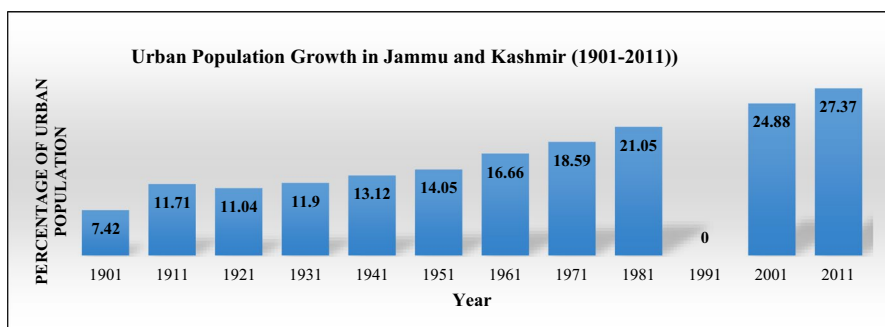
Over the last decade, the rate of urbanisation in Kashmir has increased, particularly in the Srinagar district. Srinagar is the fastest growing city in the Himalayan region. Unplanned urbanisation has occurred in many areas of the Srinagar district, including Lal Chowk, Raj Bagh, Jawahar Nagar, Maisuma, Chanapora, and Nati-pora. Srinagar's unplanned urbanisation has resulted in the city's horizontal growth. Due to clogged infrastructure and poor drainage, flood water inundated areas such as Lal Chowk, Raj Bagh, Jawahar Nagar, Ali Jan Road, Gulshan Nagar, Soura, Natipora, Safa Kadal, Mehjoor Nagar, Eidgah, Gogji Bagh, Bemina, and Wazir Bagh in Srinagar. It wreaked havoc on people and infrastructure. The 2014 Kashmir Flood inundated Kashmir's urban areas, including Anantnag, Kulgam, Bijbehara, Pulwama, and Srinagar, because urban areas are vulnerable to flooding due to unchecked urbanisation, which generates more runoff.

Urbanisation was confined to the Dal Lake region and some parts of Srinagar city in 1972, but by 2013, it had spread to other parts of Srinagar and the Jhelum floodplain, including Anantnag, Pahalgam, and Kulgam. The urban population of

Jammu and Kashmir has increased from 18.59 million in 1971 to 27.37 million in 2011 (Fig. 2).

An area having 5000 population with the population density of 400 persons per square kilometre and 75 per cent of the male workforce employed in the non-agriculture sector is regarded as an urban place in India (Census of India 1961, 1981). According to Census 2011, 27% of Jammu and Kashmir's population (3.4 million) lives in urban areas. In the last ten years, the urban population has grown by 36.42%, outpacing the national average of 31.1% and outpacing the 19.42% decadal growth rate in rural areas at the state level. The State's urban population is expected to reach 8.2 million people at the current annual growth rate of 3.6%. The Kashmir Region has 32% of its population living in cities and towns, followed by the Ladakh Region with 23% and the Jammu Region with 22%. In 2011, the Kashmir Region accounted for 63% of the total urban population of the state, followed by the Jammu Region (35%), and the Ladakh Region (2%). Srinagar city accounts for 55% of the 2.2 million urban population in the Valley, while the Srinagar Metropolitan Region, which includes the Local Area, accounts for more than 75% of the Valley's urban population. This is a case of macrocephaly, or distorted urbanisation. According to population estimates from 2015, the Kashmir Valley has 65 towns, 48 of which have municipalities, and 20 of which have populations of more than 20,000 people (Census of India 2011). Srinagar is the only city with a population of more than one million people, with the 'city region' having 1.9 million people, whereas three urban areas—Anantnag, Baramulla, and Sopore—are class I towns with a population of more than 100,000 people. According to Census of India, 2011, figures, five towns with populations ranging from 50,000 to 99,999 people and eleven communities with populations ranging from 20,000 to 49,999 people make up the Valley (Draft Master Plan, Srinagar Metropolitan Region-2035, 2017) (Fig. 3).

Several historic towns and cities line the Jhelum River's banks, including Awantipora, Anantnag, Srinagar, Varmul and Parihaspura. The Jhelum Basin has 5.4 million people living in 34 towns and 2846 villages. According to 2001 census estimates, the Jhelum River's banks are home to 91% of the urban population (Comprehensive Management Action Plan for Wular Lake, Kashmir, 2007), thus make



**Fig. 2** Decadal urban population growth in Jammu and Kashmir. Note: No Census recorded in Jammu and Kashmir in 1991 due to conflict. *Data Source* Census of India (1981, 2001, 2011)

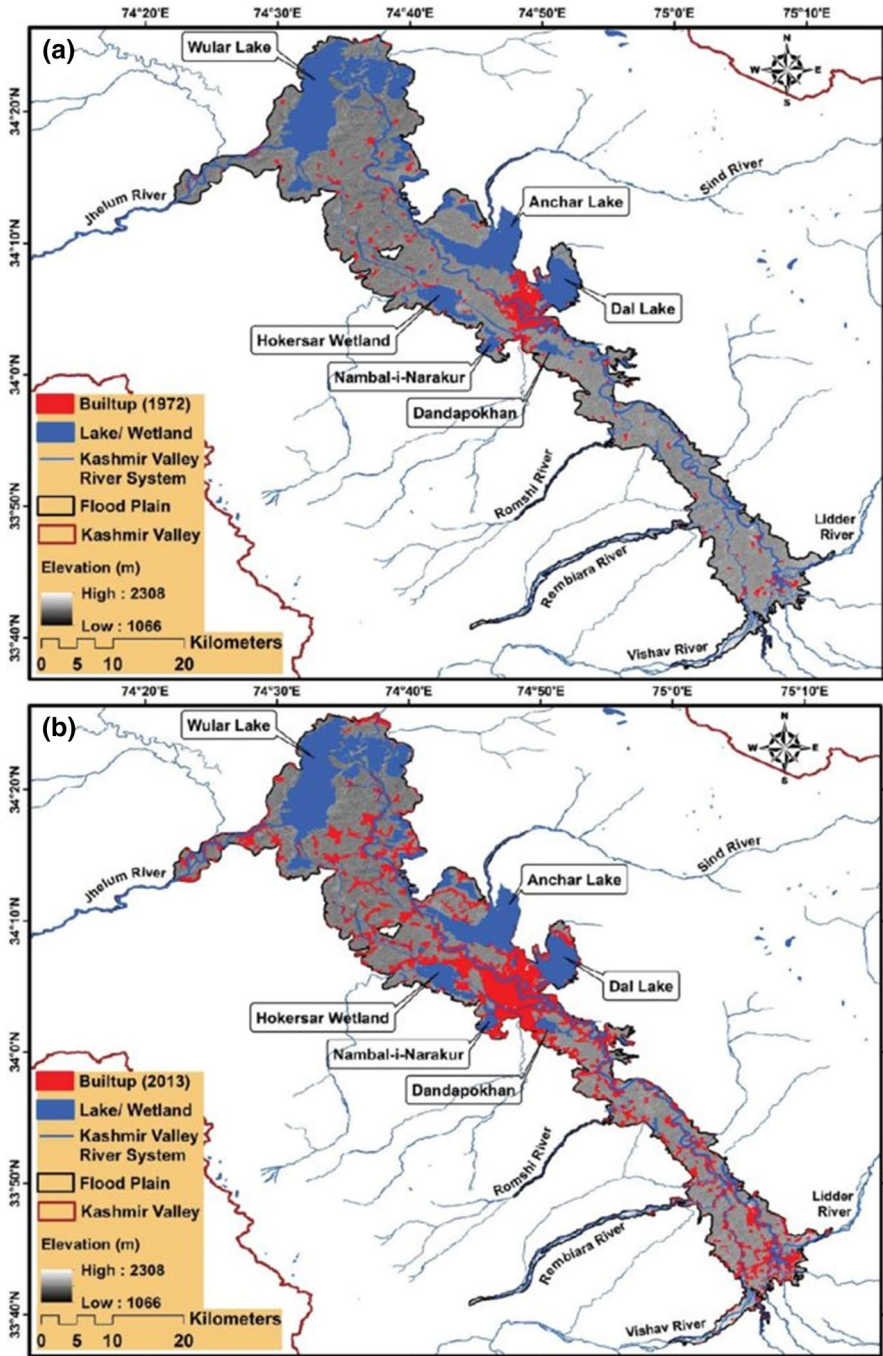


Fig. 3 Urbanization in the Jhelum River floodplains between 1972 and 2013. *Source* Romshoo et al. (2018)

these areas highly vulnerable to floods. The respondents claimed, “Urbanization has resulted in less greenery in Srinagar City and Anantnag, as well as the construction of more buildings in urban areas. Simultaneously, the urban population is growing, causing more congestion and the conversion of forest and uninhabited land into urban areas, amplifying the impact of excess water during floods.”

### Conversion of wetlands into agriculture and built-up areas (loss of wetlands)

Kashmir is home to a plethora of wetlands known locally as "Dembs," which act as sponges during floods and share the waters of the Jhelum River. Due to encroachment, urbanisation, and excessive siltation, these wetlands have lost their water absorption capacity, reducing their ability to assist during floods. Over the last two decades, the wetlands of Hokersar, Shalabugh, and Haigam have been converted into agriculture and built-up areas, increasing the vulnerability of the flood in 2014. Approximately half of the wetlands have been lost in the last 100 years. The total area of marshy water bodies in 1911 was 356.85 km<sup>2</sup>, but it has since decreased to 158.54 km<sup>2</sup> in 2011 (DEERS 2014) (Table 1, Fig. 4).

The floods in Kashmir in 2014 were an ecological disaster. The catastrophic loss of life and property could have been avoided if the valley’s numerous wetlands had been preserved. Wular Lake, which used to cover 20,200 hectares, has now been reduced to just 2,400 hectares (Bombay Natural History Society 2014). A researcher while explain the urbanisation scenario in Kashmir Valley, narrated, “the rate of urbanisation is currently rising quickly. Everyone wants to live in an urban area and enjoy its amenities, but many don’t realise how destructive urbanisation is to the environment. Urbanization in the Kashmir valley has resulted in the conversion of large tracts of agricultural land, wetlands and the Jhelum flood plain into urban areas, which has decreased the Jhelum flood plain’s capacity to hold water and reduced the amount of uninhabited land, which has decreased the area that can absorb water during floods, particularly the recent 2014 flood.”

### Degradation of floodplain along the Jhelum River

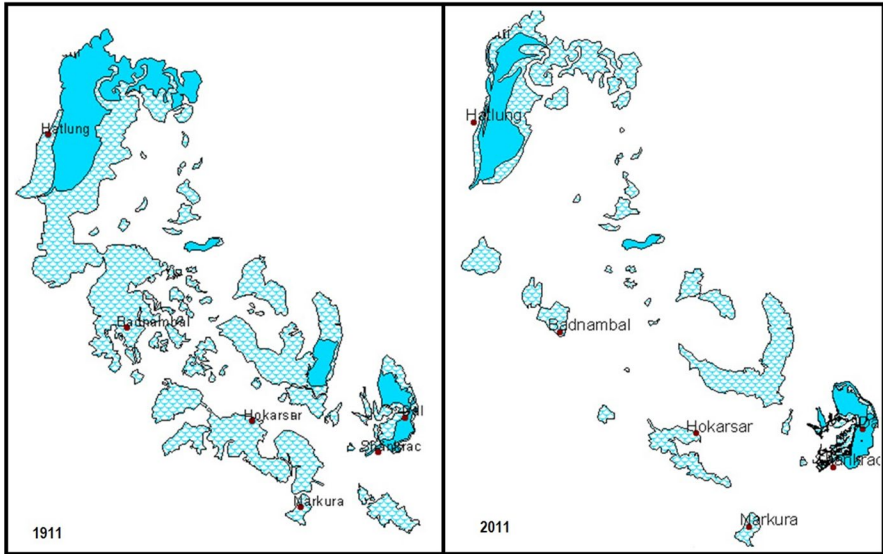
Between 1961 and 2001, the upper Jhelum basin’s marshy areas (wetlands) decreased by half. Swamps covered an area of 209 km<sup>2</sup> in Kashmir between 1911

**Table 1** Size of Kashmir’s wetlands and lakes (1911–2011)

Year	Category		Total area (Km <sup>2</sup> )
	Marshy (Km <sup>2</sup> )	Water body (Km <sup>2</sup> )	
1911	271.7	85.15	356.85
2011	117.43	41.11	158.54
Loss in spatial extent	154.27	44.04	198.31

Source Department of Ecology, Environment and Remote Sensing, J&K Govt., DEERS (2014)





**Fig. 4** Size of Kashmir's Wetlands and lakes (1911–2011) Source: (DEERS 2014)

and 1946. Due to the expansion of built-up areas and cropland, these swampy areas shrank by 14.8% between 1946 and August 25, 2014. (Tali 2011). Many areas along the Jhelum floodplain have been developed into agricultural lands and urban areas, particularly in Anantnag and Srinagar. As a result, Jhelum's capacity to hold water has decreased. The Jhelum flood plain, which served as a physical barrier during the 2014 flood, shrank as a result of the construction of an elevated railway track and a newly constructed highway from South Kashmir to North Kashmir.

### Deforestation

Floods and deforestation are inextricably linked; one causes the other. Since 1992, Kashmir has experienced a massive loss of forest cover. Smuggling of timber is at an all-time high in Anantnag and Shopian. Currently, forest cover covers only 13.09% of J&K's total geographical area, including tree cover outside of forest areas. Jammu and Kashmir has a forest cover of 22,539 square kilometres, accounting for 10.14% of the total geographical area, according to official data from the Jammu and Kashmir Government, while outside of the forest area, there is a tree cover of 6550 square kilometres, accounting for 2.95% of the former state's total geographical area. Due to illegal forest tree cutting, nearly 20 to 30% of the forest cover has been lost, indicating that forests' ability to retain water has been diminished. As a result, additional rains entered the Jhelum River immediately, creating flooding in Kashmir. In the last 30 years, Kashmir has lost around 10% of its deep forest cover, indicating that trees' ability to absorb water has deteriorated. More rains fell directly into the Jhelum River, causing floods (DEERS 2014).

## Construction of railway line

Rapid human settlement expansion in the Jhelum basin, as well as major infrastructure development projects such as railway and highway expansion, serve to divert or constrain the Jhelum and its tributaries' natural pathways (Romshoo et al. 2018). In 2008, the intra-Kashmir railway line was completed. Flooding occurred in Srinagar's Lasjan and Nowgam, as well as Pulwama's Kakpora. When the Indian Railways built tracks, they built a bund but did not provide drainage. As a result, it aided flooding by obstructing the flow of water. Nobody cared or was aware that the hydrography of Kashmir necessitates proper drainage. The respondents, while explaining the impact of railway line in Kashmir Valley, said, "although the railway line has improved the transportation system in the Kashmir Valley and reduced the distance between different locations within the valley, it has also resulted in the encroachment of a large amount of agricultural and pasture land, which has been used for the railway line. This disrupted the Jhelum flood plain by acting as a barrier in several places, resulting in water accumulation in the districts of Anantnag, Srinagar, and Baramulla during the 2014 flood in Kashmir."

## Administrative laxity and slow official response

The flood waters inundated the army's 15th Corps headquarters in Srinagar, filling it with more than 6 m of water. The offices and residences of the civil administration were also submerged. In the Jammu and Kashmir Valley, high and low, rich and poor, military and civilians, tourists and locals were all affected. It took 2 weeks to determine the full extent of the devastation caused by landslides in Reasi and Udhampur, as well as floods in parts of Rajouri and Poonch. When the floodwaters receded, the situation in Jammu improved, but it left a trail of devastation and loss in its wake. However, due to the submergence of large parts of Srinagar, the key to coordinating rescue and relief efforts in the Valley, the civil administration and military were unable to respond adequately (Navlakha 2014).

Any calamity is a great leveller that spares no one. There is no proper administrative structure in place in Jammu and Kashmir to deal with disasters. The government's response to the floods in Kashmir was insufficient to mitigate the damage. The authorities were unsure how to save people and did not make sufficient efforts to do so. Locals were in charge of the rescue operations. The water pumps used to pump water out of Srinagar city were insufficient, and the water became stuck for several days, silting the areas and houses. This resulted in a slew of water-borne diseases, including diarrhoea.

## Breaching of dikes and installation of water pipe line in the Jhelum Bund

As part of its MPIR project in 2009–2010, ERA installed water supply pipes along stretches of the Jhelum bund. The deterioration of the bund was blamed on faulty and unsafe pipe laying, as well as nine large breaches along the stretch, which caused

unprecedented flooding and water logging in Srinagar's Central Business District and administrative offices during the recent floods. The exposed 600 mm pipeline served as a perilous pedestrian bridge over the breaches for several weeks after the flooding while the embankments were repaired. Local residents of Lal Chowk and Abi Guzar recall objecting to the pipes' location when they were being laid, fearing that the pipe line would cause damage to the bund and neighbouring buildings, including mud-cemented and timber-framed shops and homes (JKCCS 2015). The Jhelum River dikes are porous and brittle. These dikes were breached due to the high-water intensity, allowing water to flood the residential areas.

### **Tourism industry**

Unplanned urban growth and tourism and pilgrimage-related construction, such as in the forests surrounding Pahalgam and on the banks of the Lidder River, have all contributed to the environment's poor performance (Navlakha 2014), and as a result, they have become some of the major contributors to the flood in Kashmir Valley. As a result of neoliberal policies, several hotels and restaurants have been built along the banks of the Jhelum River and Dal Lake to attract more tourists, resulting in severe environmental degradation and thus floods (Malik and Hashmi 2021). Over a million visitors visit Kashmir each year (Malik 2015), degrading the ecosystem. Deforestation has occurred along the Lidder River in Pahalgam and Srinagar, as well as the construction of hotels, restaurants, and pilgrimage-related constructions have put an increasing pressure on the environment.

### **Inadequate flood channel for the Jhelum River**

Padshahibagh, a flood channel on the Jhelum River in Srinagar, had a capacity of 17,000 cusecs but has been reduced to around 6000 cusecs due to encroachment and siltation. South Srinagar would be flooded if this flood channel overflows. The garbage has filled the flood channel, which has reduced its capability to move water. The main Jhelum's drainage capacity and the flood spill channel's capacity were insufficient to handle the large floodwater discharge of over 120,000 cubic metres (Romshoo and Rashid 2014). In the year 2021, the flood channel is still in a degraded state as is filled with silt and debris, which could aggravate the floods in future. The respondents explained the dilapidated condition of the Jhelum flood channel and narrated, "the Jhelum River's flood channel has deteriorated due to waste material from households, hospitals, and other commercial buildings, which has reduced its carrying capacity during floods. It was evident during the massive flood of 2014, when the flood channel overflowed and inundated the surrounding areas."

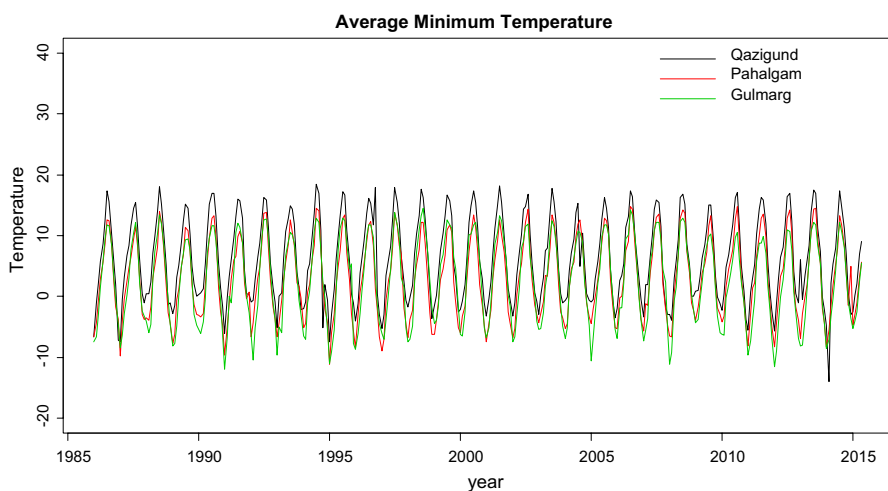
### **Climate change**

Flooding and drought are two extreme disasters linked to climate change. According to PRECIS forecasts, annual rainfall in Kashmir will increase by up to 50% by

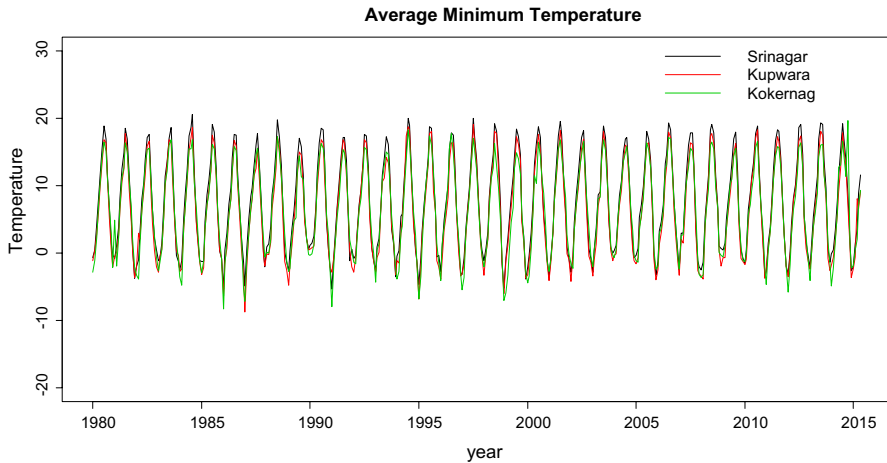
2030. (SAPCC 2013). The Jhelum River is fed by the Kolahoi Glacier in Kashmir's West Lidder Valley, commonly known as the "Goddess of Light." In the Kashmir Himalayas, satellite data and mass balance measurements suggest an increasing pace of melting. Using satellite images, the glacier area changes for Kolahoi from 1980 to 2015 shows a 10% decrease in length, an 18% decrease in volume, and a 13.5% decrease in glacier boundary. Since the year 2000, the Jhelum River basin has lost nearly 7.4% of its Snow Cover Area (SCA). From 1980 to 1990, the glacier lost about 1% of its length, and from 1990 to 2000, it lost 1.1% of its length. The Kolahoi glacier supplies approximately 62% of the water to the Lidder River (a tributary of the Jhelum River in Pahalgam). Kashmir's average low temperature has risen over the last three decades and continues to grow (Figs. 5, 6, 7 and 8).

Climate change indicators can be seen over the Himalaya (Romshoo et al. 2011), and these changes have accelerated glacier retreat (Akhtar et al. 2008). One of the major concerns about glacier retreat in the Kashmir Himalaya is the effect of changing climate on stream flows (Miller et al. 2012). Kolahoi, the valley's largest glacier, is receding, as evidenced by glacio-geomorphological evidence in the field, as well as the use of satellite images and topographic maps (Mayewski and Jeschke 1979).

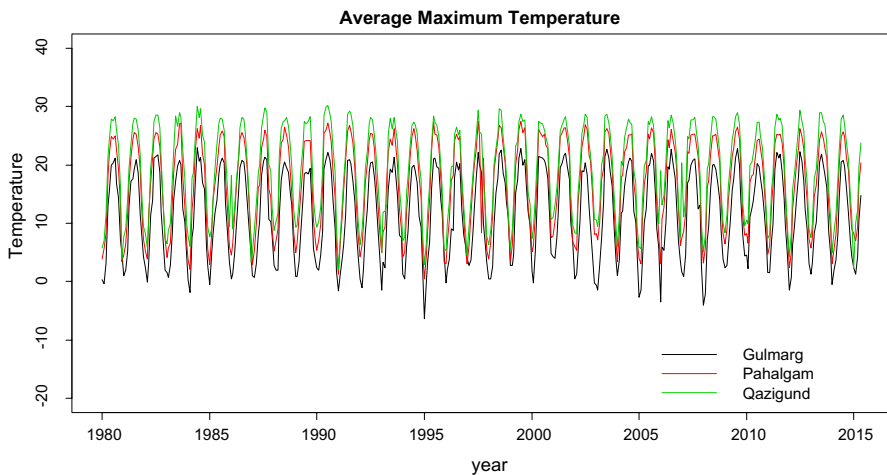
In the Himalaya, 218 glaciers representing climatically diverse terrains were mapped and monitored. Glaciers from the Karakoram, Himachal Pradesh, Zaskar, Uttarakhand, Nepal, and Sikkim ranges can be found here. 1752 glaciers (86.8%) had stable fronts (no change in snout position or ablation zone area), 248 (12.3%) retreated, and 18 (0.9%) advanced. In 2018, the net loss of glaciers in the 10,250.68 square km area was calculated to be 20.94 square km, or 0.2% (2.5% of 20.94 sq. km) (Bahuguna et al. 2014), which exacerbated the flood situation in Kashmir in 2014.



**Fig. 5** Minimum average temperature in Gulmarg, Qazigund and Pahalgam, Kashmir (1986–2015)



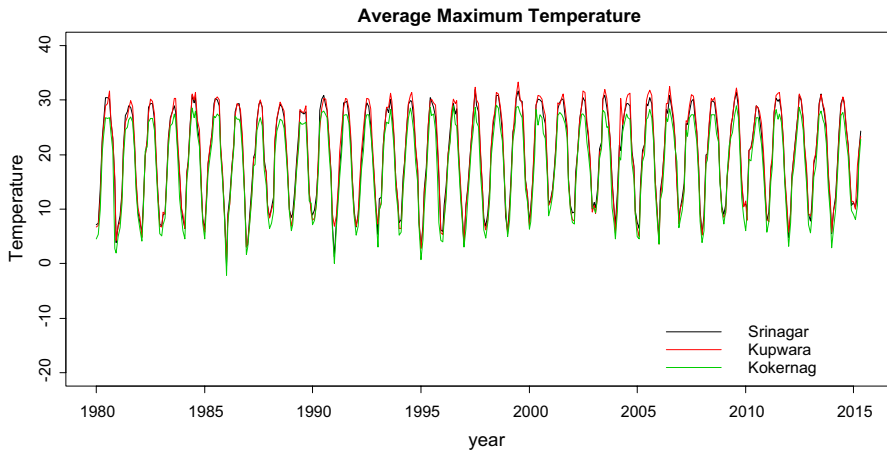
**Fig. 6** Minimum average temperature in Kokernag, Kupwara and Srinagar, Kashmir (1980–2015)



**Fig. 7** Minimum average temperature in Gulmarg, Pahalgam and Qazigund, Kashmir (1986–2015)

## People's perception of the causes of 2014 Kashmir flood

People who live in flood-prone areas gain knowledge and experience about flood causes and management. The perception gained over time is critical in understanding the causes and consequences of the flood. People's perceptions of the causes of the 2014 flood in the Kashmir Valley provide critical information about the various problems caused by unplanned urbanisation and poor development methods. The 2014 Kashmir Flood field survey and interviews revealed that most people believed the devastating flood was caused by anthropogenic activities such as increasing human greed and neoliberal development activities that collaborated with



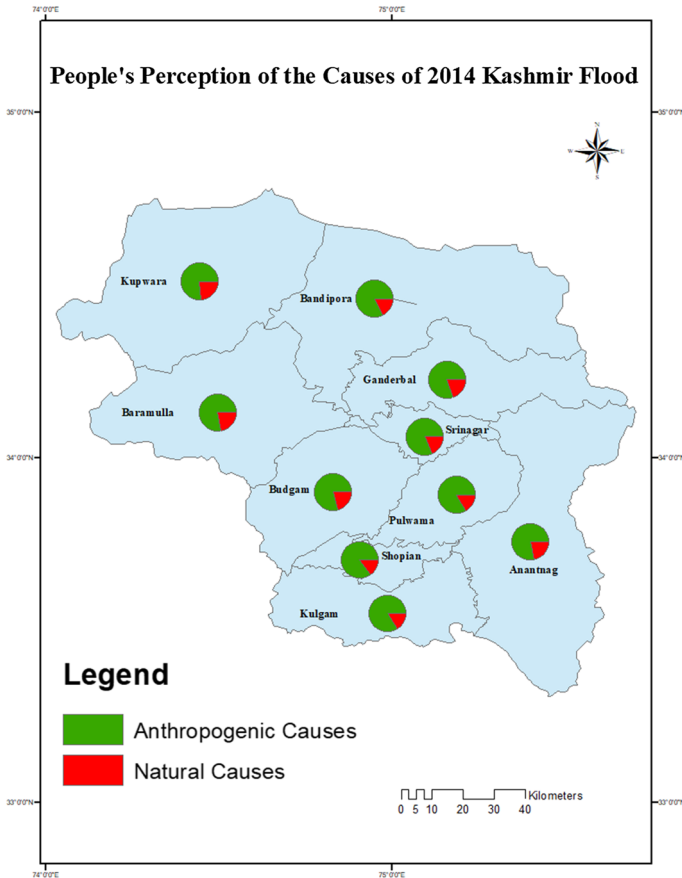
**Fig. 8** Average maximum temperature in Srinagar, Kupwara & Kokernag, Kashmir (1980–2015)

encroachment on wetlands and green spaces. According to the respondents, the 2014 Kashmir Flood occurred as a result of encroachment on the Jhelum River banks caused by increasing population, particularly in areas near the river. According to the respondents, the flood was unavoidable because people had disrupted the natural balance by converting green spaces into built-up areas, and more construction had occurred over the years and also due to climate change. They discovered that the Jhelum River had become severely polluted as a result of the dumping of waste materials from homes, hospitals, and industries. Some respondents narrated the natural causes of the flood (19.4% respondents) and blamed the flood on God’s wrath, while others claimed it was caused by people’s sins and excessive rainfall. However, the majority of people believed that anthropogenic factors (80.6% respondents) were to blame for the 2014 floods in the Kashmir Valley (Table 2 and Fig. 9).

The respondents gave interesting explanations about the causes of the 2014 flood in Kashmir Valley. One respondent said, “in 2014, the Kashmir valley experienced the most devastating flood in recent memory due to our own mistakes. Because of our careless development, our damaging way of life, and our frightening rate of environmental degradation, Kashmir has increasingly become vulnerable to floods.” Another resident of Srinagar said, “the flood was caused by the hasty construction of buildings along the Jhelum River. In the districts of Srinagar, Anantnag, and Baramulla, the river has been increasingly encroached upon. People built houses, hotels, shops, and other structures along the Jhelum bank, and when the flood came, they were the first to be affected.” One respondent explained the phenomena of unplanned urbanization and said, “the unplanned urbanization has resulted into the horizontal expansion of the urban areas and has resulted into construction of more buildings, thus reducing the open spaces that could accommodate more water during the flood.” Some people believed that the flood happened because of their sins as one respondent said, “we are sinful people. We believe that whenever people commit too many sins, God sends a natural disaster to punish them. Kashmir was once known as the Valley of Saints, but in recent years,

**Table 2** People’s perception of the causes of 2014 Kashmir flood

District	Anthropogenic causes (%)	Natural causes (%)
Anantnag	78	22
Ganderbal	80	20
Bandipora	82	18
Kupwara	76	24
Baramulla	78	22
Pulwama	83	17
Shopian	85	15
Srinagar	81	19
Budgam	79	21
Kulgam	84	16
Total	80.6	19.4



**Fig. 9** People’s perception of the causes of 2014 Kashmir flood

the people have become sinful and committed various errors, so the 2014 flood was an act of God punishing us for our sins.” Although some respondents believed that the flood was an act of God but most of the people believed that the flood occurred due to encroachment, unplanned urbanization, dumping of waste material in the Jhelum River and other anthropogenic causes.

## Conclusion

The 2014 flood in Kashmir Valley was the result of several anthropogenic causes that acted over the years to create the massive devastation. Anthropogenic factors such as unplanned urbanisation, poor development policies, encroachment on the Jhelum flood plain and lakes, ill-conceived dredging, human greed and breaching of dikes contributed significantly to the 2014 flood in the Kashmir Valley. These factors combined to wreak havoc on the people and environment of Kashmir. It is clear from the preceding discussion that visible signs of a massive flood were looming over Kashmir, which finally occurred in the year 2014 and caused widespread devastation. Unplanned urbanisation and encroachment on the Jhelum River bank and wetlands were among the important causes of the flood. Since the flood, not much attention has been given to the factors that caused the flood, and there is a need to give a dedicated focus to the problems related to floods. To save people and the environment, a proper future trajectory is required. Kashmir requires a special attention to the peace process in order to develop appropriate policies for the regulation and protection of the Jhelum River and wetlands. There is a need to control encroachment on the Jhelum River’s banks as well as poor development practises. There is also an urgent need for an alternate flood channel for the Jhelum River to contain excess water during floods. The flood was mainly caused by the anthropogenic activities which had created the flood situation over the years, thus it becomes imperative to act on these activities to reduce the vulnerability of Kashmir Valley to devastating floods.

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## Declarations

**Conflict of interest** No conflict of interest whatsoever is in the paper.

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