



## Effect of Extreme Weather Conditions on Delivery Services of India Post and Private Couriers in Uttar Pradesh

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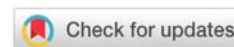
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### Abstract

The impact of extreme weather conditions on delivery services, including India Post and private couriers, is increasingly becoming a concern in Uttar Pradesh, India. This paper explores how severe weather events such as heavy rains, floods, heat waves, and storms disrupt the logistical operations of these services. The study highlights that extreme weather can lead to delays, damaged goods, and operational inefficiencies due to road blockages, infrastructure damage, and health risks for delivery personnel as per *Pekka L. et-al (2014)*. India Post, with its extensive rural reach, and private couriers, which focus on urban areas, both face challenges in maintaining timely deliveries. While technological interventions like GPS tracking and route optimization are being used, infrastructure improvements and weather-resilient planning are needed to mitigate these disruptions. The study is an attempt to understand the probable impacts on delivery service and the company of India Post and private courier companies due to various weather conditions such as delay in delivery, concern about safety of shipment, and delivery person, financial losses, risk of accidents, blockage of roads, time sensitivity of parcel etc. These challenges may be faced by both India Post and private courier service companies. Apart from ascertaining the effects and impacts, this study also emphasizes the necessity for adaptive strategies to ensure the continuity of delivery services and to safeguard the safety of parcel and staff involved in delivery amidst climate uncertainties in Uttar Pradesh.





**Keywords:** Courier Service, Delivery, Climate, Finance, Transportation, Consumer Preferences, India Post, Private Courier Services

## 1. Introduction

Extreme weather conditions, including heavy rainfall, floods, heat waves, and storms, have increasingly disrupted various sectors globally (*Met Centre Lucknow*). The efficiency of courier services and postal deliveries is critical for economic and social activities. In Uttar Pradesh, India, the delivery services of India Post and private couriers are significantly affected, impacting both businesses and consumers. This research paper explores the extent of these impacts, comparing the performance and responses of public and private delivery services. In the recent time in 2024 during the months of May and June, Uttar Pradesh experienced extreme hot summers. People were reluctant to move out of their house due to heat wave. In such a situation delivery agent of India Post and private courier companies were still performing their duties and were on road moving for deliveries. Despite their different operational models, both systems are significantly affected by weather-induced challenges. during extreme weather events can lead to As climate change intensifies the frequency and severity of extreme weather conditions, it becomes crucial to examine the specific impacts on delivery services in Uttar Pradesh. This study aims to explore the nature of these disruptions and their consequences for both India Post and private couriers, shedding light on the adaptive strategies that can be employed to enhance the resilience of delivery networks in the face of such challenges. By understanding these dynamics, policymakers, logistics companies, and stakeholders can work together to develop infrastructure and operational improvements that minimize service disruptions and ensure continued efficiency.

## 2. Literature Review:

The impact of extreme weather conditions on logistical operations, particularly delivery services, has been a growing area of concern globally. In India, where diverse climate conditions exist, the delivery services sector is especially vulnerable. This literature review explores key studies that have analyzed the effects of extreme weather on postal and private courier services, with a focus on India Post and private couriers in Uttar Pradesh.

### 2.1 Extreme Weather and Supply Chain Disruptions

Several studies have highlighted the relationship between extreme weather events and disruptions in the supply chain. According to *Chopra and Meindl (2016)*, extreme weather can cause significant delays in transportation and logistics, impacting the timely delivery of goods and services. In India, where rural infrastructure can be less developed, these effects are often exacerbated. *Sarkar et al. (2019)* also point out that frequent flooding during the monsoon season disrupts road networks, leading to operational inefficiencies in delivery services, especially in states like Uttar Pradesh.





## 2.2 Impact on Postal Services

India Post, the government-run postal network, has a broad and deep reach across rural and urban areas. Studies show that during extreme weather conditions such as floods, heatwaves, and heavy monsoons, postal services are delayed, and sometimes halted, due to infrastructure damage and road blockages. *Kaur and Kumar (2020)* noted that India Post often faces the challenge of ensuring continuity in rural areas, where alternative routes and access to technology are limited. The authors further argue that India Post, while resilient due to its extensive network, lacks the necessary resources to respond quickly to extreme weather disruptions, *Kidwai A.G., Maqbool, A (2024)*.

## 2.3 Impact on Private Couriers

Private courier services, while technologically advanced and quicker in urban areas, are also vulnerable to extreme weather conditions. *Prasad and Sharma (2018)* found that private courier services in India, such as Blue Dart and DTDC, are highly dependent on road and air transport, both of which are severely impacted by weather extremes like heavy rainfall, heatwaves, and fog during winter. The reliance on time-sensitive logistics systems makes private couriers particularly susceptible to delivery delays and damaged parcels when weather conditions become unpredictable. *Srivastava (2021)* further argues that while private couriers have invested in GPS technology and route optimization, these solutions are insufficient when physical infrastructure is compromised due to weather-related events.

## 2.4 Regional Context: Uttar Pradesh

Uttar Pradesh, due to its geographical location, experiences a wide range of weather extremes, from floods in the northern and eastern parts to heatwaves in the central and western regions. Studies such as *Mishra et al. (2017)* have documented the seasonal disruptions caused by the monsoon, particularly in rural areas where road infrastructure is inadequate. This significantly affects both India Post and private couriers, making it difficult for them to maintain consistent delivery schedules. Additionally, the study by *Gupta and Singh (2020)* highlights how climate change is likely to increase the frequency of extreme weather events, further stressing the need for adaptive logistical frameworks in states like Uttar Pradesh.

## 2.5 Technological Interventions and Adaptation Strategies

To mitigate the impact of extreme weather, both public and private delivery services have started employing technological solutions. GPS tracking, route optimization, and real-time weather forecasting are increasingly being used to reroute deliveries during extreme weather events (*Bhattacharya & Choudhary, 2021*). However, research suggests that these measures alone are insufficient. According to *Rai (2022)*, a more comprehensive approach is needed, including infrastructure investment, better disaster preparedness, and improved coordination between public and private entities. The literature also suggests that there is a gap in understanding the full extent of extreme weather impacts on delivery networks in specific regions, such as Uttar Pradesh, which demands further localized research.





### 3. Conclusion from Literature

The literature suggests that extreme weather events have a profound impact on the delivery services of both India Post and private couriers, particularly in regions like Uttar Pradesh where infrastructure is vulnerable. While technological interventions have been introduced, they do not fully address the challenges posed by these weather conditions. In comparison to private courier companies, India Post deliveries are impacted more which needs to be addressed by the concerned authorities.

### 4. Methodology

The study includes descriptive research design to evaluate the effects of extreme weather on delivery of India Post and private courier services through collecting both primary and secondary data, questionnaire was distributed to the subjects for primary data. For analysis of data, regression analysis and ANOVA statistical tools were used. The data is analyzed using SPSS V26.

#### 4.1 Data Collection:

4.1.1 Primary data were collected via surveys and interviews with India Post employees and private courier staff of DTDC, First Flight Couriers, Blue Dart and Dhelivery.

4.1.2 Secondary data from weather reports, company performance data, and scholarly sources were used for additional context.

#### 4.2 Sample Size:

4.2.1 The survey was conducted across several major cities of central Uttar Pradesh like Lucknow, Barabanki, Kanpur, Unnao and Raebareilly to ensure a comprehensive analysis. Sample of 500 respondents was considered.

### 5. Findings:

#### 5.1 Operational Challenges:

5.1.1 **India Post:** Due to its reliance on traditional methods and extensive rural reach, India Post is more susceptible to disruptions caused by weather extremes. It was found that lack of technological adaptability, was one of the factors which restricted India Post in technological advancements to cater the need of deliveries during bad weather conditions.

5.1.2 **Private Couriers:** While private companies benefit from more advanced logistics and technology, their rural coverage remains limited.

#### 5.2 Service Delays and Disruptions:

5.2.1 During extreme weather events, delivery times increased, and there were more reports of damaged or lost parcels. India Post experienced more delays compared to private courier services, based on the data collected *Rebeca Wheeler (2021)*.





### 5.3 Economic Consequences:

**5.3.1** The financial impact was felt through increased fuel costs, delayed deliveries, and damaged goods.

**5.3.2** Small businesses and rural areas, heavily dependent on reliable delivery services, were particularly affected.

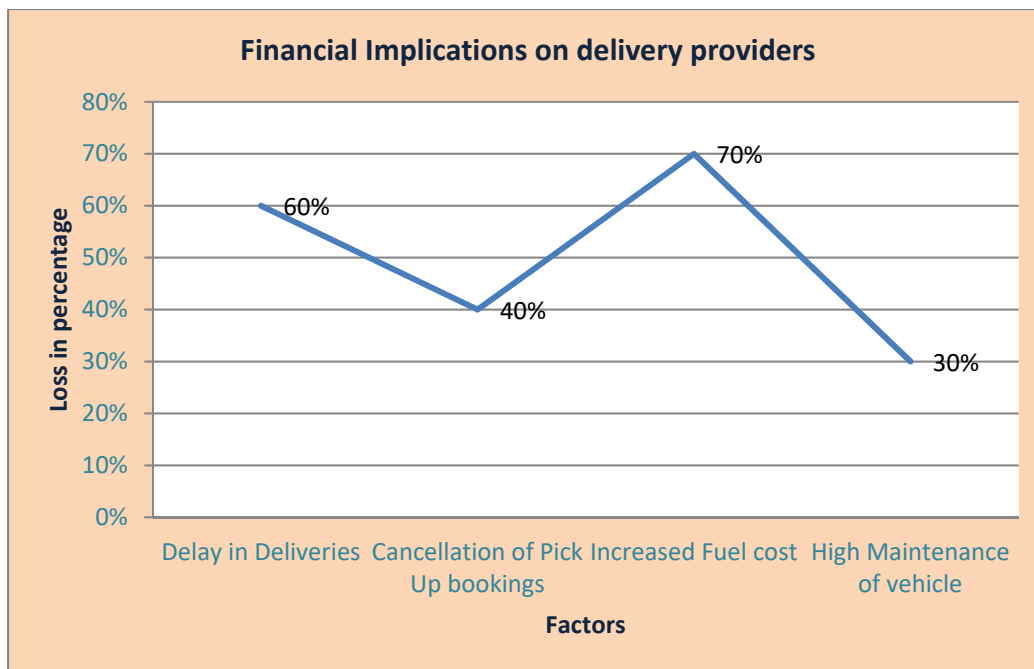


Figure 1: Impact of bad weather on financial condition of delivery organizations

### 5.4 Accident Risks:

**5.4.1** Hazardous weather conditions heightened the risk of accidents for delivery personnel, as slippery roads, poor visibility, and strong winds created dangerous driving conditions. This not only delayed services but also increased the risk of damage to packages.

### 5.5 Equipment Malfunctions:

**5.5.1** Extreme weather also led to equipment failures. For instance, heavy rains caused GPS devices to malfunction, complicating navigation, while high temperatures contributed to vehicle breakdowns *The Economic Times* (2023).

### 5.6 Safety Concerns:

**5.6.1** Delivery staff were exposed to significant risks, with severe weather posing threats such as heat exhaustion during extreme temperatures and unsafe road conditions during storms.



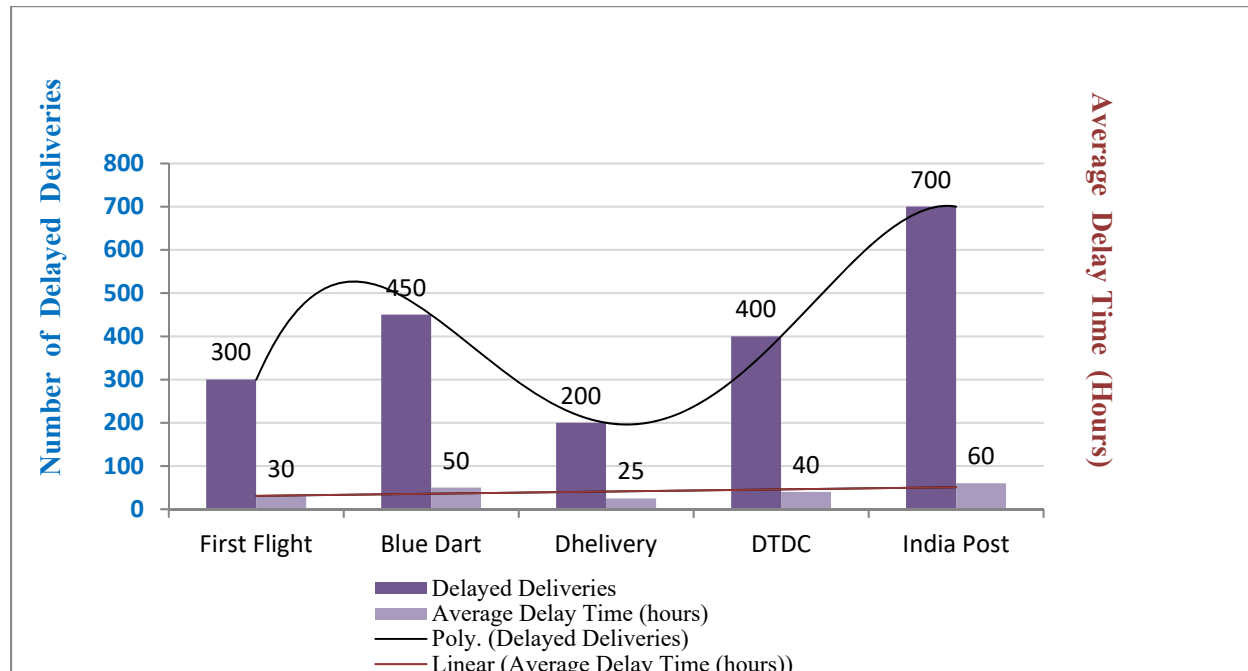


Figure2: Delivery delays due to bad weather by different companies

## 6. Discussion:

### 6.1 Adaptation and Resilience:

6.1.1 Current measures such as rerouting and the use of weather forecasting technology were evaluated, alongside suggestions for improving infrastructure to withstand extreme weather conditions, *Johan Lindgren et al. (2008)*.

### 6.2 Policy Recommendations:

6.2.1 There is a pressing need for collaboration between the public and private sectors to develop more resilient infrastructure and technological solutions. Investing in weather-resilient packaging, equipping vehicles for adverse conditions, and providing training on safety and efficiency in extreme weather should be priorities *Eliahu Stern, Yocheved Zehavi (1990)*

## 7. Conclusion

Extreme weather conditions pose significant challenges to the delivery services of India Post and private couriers in Uttar Pradesh. While private couriers exhibit more adaptability due to advanced logistics, India Post's extensive reach requires enhanced resilience measures. Courier companies often have contingency plans to deal with adverse weather conditions. These can include using weather-resistant packaging to protect the contents of deliveries, equipping vehicles with weather-appropriate tools like snow tyres, and training drivers to handle severe weather driving.





Advanced tracking and communication tools are also pivotal, enabling couriers to update customers in real-time about the status of their deliveries and expected delays *Kidwai A.G., Maqbool A (2023)*. Delivery companies should invest in flood-resistant vehicles and alternative delivery solutions to prevent long-term disruptions *Sophia Z. (2021)*. Private courier companies have started using Radio Frequency Identification (RFID) to track and monitor the delivery packages, organizing delivery schedules. Collaborative efforts should be made with local governments to improve road infrastructure and gain access to accurate weather forecasting systems can help reduce delays. Companies should explore more comprehensive insurance packages to mitigate potential financial losses due to weather-related risks. Collaborative efforts and strategic investments are essential to ensure reliable delivery services amidst increasing climatic uncertainties. It's important for customers to understand that some delays or cancellations may be outside of their control *Marj.K., Piet R, (2009)*. By working together and staying informed, both couriers and customers can help ensure that packages are delivered safely and on time, regardless of the weather conditions.

Multimodal transportation services should be adopted by both India Post and private courier companies to transfer the goods during bad weather conditions which are eco-friendly method of delivery.

## 8. Abbreviations

GPS	:	Global Positioning System
RFID	:	Radio Frequency Identification

## 9. Acknowledgment

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## 10. Conflict of Interest

The authors declare no conflicts of interest

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