



# ROLE OF DRONES IN DISASTER MANAGEMENT

**Author -1****Dr. Vipin Kumar**

Teaching Cum Research Assistant (TCRA)  
Police Administration  
Rashtriya Raksha University (RRU)  
An Institute of National Importance  
Pasighat Campus, Arunachal Pradesh

**Author -2****Dr. Moirangmayum Sanjeev Singh**

Head of Department & Assistant Professor  
Police Administration,  
Rashtriya Raksha University (RRU)  
An Institute of National Importance  
Pasighat Campus, Arunachal Pradesh

**Author -3****Mr. Rajkumar Meiraba Singh**

Teaching Cum Research Officer (TCRO)  
Police Administration,  
Rashtriya Raksha University (RRU)  
An Institute of National Importance  
Pasighat Campus, Arunachal Pradesh

**ABSTRACT:**

India faces significant vulnerability to natural disasters, including floods, droughts, cyclones, tsunamis, earthquakes, landslides, and forest fires. This research paper explores the critical role of drone technology in disaster management, covering surveillance, mapping, logistics, and communication restoration. It examines the latest advancements in drone technology, such as intelligent flight, broadband transmission, and diversified functions, and how these innovations can be applied throughout all phases of disaster management: prevention, mitigation, response, and recovery. By integrating drone technology, India can enhance its disaster preparedness, response, and recovery efforts, ultimately saving lives and reducing damage.

**Keywords:** Drone technology, Importance, Disaster Management.

**Introduction**

India's unique climatic and socioeconomic characteristics make it vulnerable to many natural Disaster, such as floods, droughts, cyclones, tsunamis, earthquakes, urban flooding, landslides, avalanches, and forest fires. The National Disaster Management Authority's (NDMA) Annual Report for 2020–2021 states that 12% of India's landmass is at risk of flooding and river erosion and that 58.6% of the country is susceptible to

moderate to very high-intensity earthquakes. A 5,700 km section of India's 7,516 km coastline is susceptible to cyclones and tsunamis. Furthermore, 15% of India's landmass, including its mountainous regions, is susceptible to landslides and avalanches, while 68% of its fertile land is prone to drought.

India is more vulnerable to disasters due to several factors, including changing demographic and socioeconomic conditions, unplanned urbanization, development in high-risk areas, environmental degradation, climate change, geological hazards, epidemics, and pandemics. India's population, economy, and sustainable development are all extremely vulnerable to natural disasters as a result of these variables. It is essential to manage resources and duties for handling all humanitarian aspects of emergencies, including preparedness, response, and recovery, to decrease the hardships of such disasters.

The nation's approach to disaster management has greatly improved under the government, moving from a relief-centric strategy to one that emphasises preparedness, prevention, response, recovery, mitigation, and capacity building. Development planning must incorporate Disaster Risk Reduction (DRR) according to the Disaster Management Act of 2005. The country's efforts to reduce the risk of disasters are reinforced by the National Policy and National Plan on Disaster Management.

In order to provide people with improved tools for handling disasters, modernization in the field of disaster management and control is also required as a result of technological improvements. Technology thus permeates the core of disaster management as a normative practice, providing innovative approaches to disaster prevention, mitigation, assistance, and relief. In terms of disaster management, drone technology has made tremendous strides. Drones and unmanned aerial vehicles (UAVs) provide thrilling benefits including accurate data collection and rapid results. These benefits can be applied to disaster management, helping to prevent damage and save lives. Drone technology is a viable option to increase the efficacy and efficiency of India's disaster management operations due to its important qualitative attributes of agility and flexibility.

According to the Directorate General of Civil Aviation (DGCA), a drone is an aircraft that can fly on its own or be controlled remotely without a pilot. Drones, also known as flying robots, use onboard sensors and GPS to navigate. Common features include accelerometers, gyroscopes, magnetometers, and barometers.

Drone technology is advancing rapidly, and drones are being used in many industries. They offer low-cost access, easy data collection, high efficiency, fewer risks to humans, and logistical support. Key trends include intelligent flight, broadband transmission, and diversified functions, potentially leading to the internet of drones. Drones are driving new and transformative applications with many benefits. Some applications include:

- Military
- Research
- Space exploration
- Product delivery
- Agriculture
- Weather forecasting
- Livestock monitoring
- Search and rescue

## Types of Drones

### Based on weight:

- **Nano drones:** Weigh up to 250 grams, have a flight time of about 5 minutes (up to 30 minutes with batteries), a range of 60-100 meters, a speed of up to 15 m/s, and can reach a height of about 15 meters.
- **Microdrones:** Weigh more than 250 grams but less than 2 kilograms. They can be launched by hand or take off vertically, requiring little to no runway. They can fly autonomously and gather information with minimal human intervention. They are useful in various applications such as precision agriculture, first responder assistance, and infrastructure inspection.
- **Small drone:** Weighs more than 2 kg and up to 25 kg.
- **Medium drone:** Weighs more than 25 kg and up to 150 kg.
- **Large drone:** Weighs more than 150 kg.

## Importance of Drones in Disaster Management

Disaster can strike anytime whether it is natural or man-made, causing severe damage to lives and infrastructure. In such situations, a quick response is crucial. Drones offer a smarter way to manage these emergencies. Drones are versatile and can be used for many purposes, from hobbies to confidential missions. They are used for crime scene surveillance, border security, coastal surveillance, and forest management. Drones are also used in mapping, agriculture, mining, and surveying. But drones are especially valuable in disaster management situations. They can quickly gather critical information, assist in search and rescue, and support relief operations, making them essential tools in times of crisis.

Preventing disasters, especially those affecting infrastructure like bridges, power lines, and gas pipes, is a crucial investment. Manual inspections are often inadequate. Autonomous drones can monitor and scan for potential issues. A network of drone-in-a-box solutions in critical areas can conduct regular inspections,

collecting data on wear and tear to forecast potential disasters. This drone infrastructure can operate continuously, providing valuable data for disaster prevention.

Traditionally drones are used in specific roles, and are now being extensively used in new sectors due to their agility and quick deployment. Beyond their common applications, drones are proving to be valuable in disaster management. They can quickly gather critical information after a disaster, saving lives and reducing the impact of damage. For example, JOUAV, an aircraft manufacturer, reports that their drones can take off and land in just 7 minutes and have covered 100,000 sq. km of aerial photography, which is crucial for post-disaster rescue efforts.

Drones are also essential for disaster preparedness and mitigation. They provide high-resolution images and real-time data, helping authorities identify vulnerable areas, assess infrastructure, and plan for future disasters. This data can inform more effective disaster management strategies, ultimately reducing disaster impact and saving lives. While drones are mainly used in disaster response, a new report highlights their benefits throughout all four stages of the disaster life cycle: prevention, mitigation, response, and recovery. Drones offer significant advantages in each of these stages, making them valuable tools in disaster relief efforts.

### Applications of Drones in Disaster Management

- **Search and Rescue Operations:** Drones with thermal imaging cameras detect body heat, locating survivors in hard-to-reach or hazardous areas quickly.
- **Mapping Disaster-Affected Sites:** Drones create detailed 3D maps and models of affected regions, aiding in understanding the terrain and planning reconstruction.
- **Supply and Aid Delivery:** Drones transport medical equipment, food, water, and communication devices to areas inaccessible due to damage, ensuring prompt delivery of life-saving resources.
- **Initial Assessment and Damage Evaluation:** Drones provide real-time imagery to assess damage extent, helping responders prioritize actions and allocate resources effectively.
- **Real-Time Environmental Monitoring:** Drones monitor flood patterns, water levels, and potential breaches, providing crucial data for predicting and mitigating natural disaster impacts.

### Benefits of Using Drones in Disaster Management Process

- **Rapid aerial assessment** of affected areas.
- **Enhanced safety** for responders by accessing hazardous zones remotely.
- **Increased efficiency** in search and rescue operations.
- **Quick delivery** of essential supplies to hard-to-reach locations.
- **Real-time data collection** for informed decision-making and resource allocation.

Disasters cause chaos and urgency. In such situations, Unmanned Aerial Vehicles (UAVs) or drones can be lifesavers, aiding in search and rescue, delivering essentials, and mapping disaster zones. These versatile tools enhance efficiency, safety, and effectiveness across various stages of disaster response. Drones are not just gadgets; they become essential tools for alleviating suffering, improving preparedness, and ensuring community safety during crises.

## Conclusion

Drones are indispensable tools in disaster management, offering precise details that enhance preparedness and expedite recovery. Given the immense human and economic toll of global disasters each year, the urgency for effective disaster management tools is clear. Drones help bridge gaps in communication, overcome transportation disruptions, and address widespread damage with their swift aerial capabilities. Their role in alleviating suffering, improving preparedness, and ensuring community safety during crises is paramount, making them essential in all phases of disaster management in India. Integrating drone technology can significantly improve the nation's ability to save lives and reduce damage in disaster-prone areas.

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