PAWRESCUE: Animal Emergency Response and Welfare System

Nishi Singh
Dept. Information Technology
SRMCEM
Lucknow, India
nishisingh0304@gmail.com

Priyanka
Dept. Information Technology
SRMCEM
Lucknow, India
yadav.prabhat@gmail.com

***Abstract*-Animal welfare and emergency response have become critical global concerns due to the increasing number of stray animals, urbanization, natural disasters, and inadequate rescue infrastructure. Existing systems for animal rescue, adoption, and welfare management are often fragmented, lacking real-time coordination, technological integration, and effective communication among stakeholders such as NGOs, veterinarians, and the public.**

This review paper presents a comprehensive analysis of existing research in the domains of animal rescue systems, web-based adoption platforms, livestock welfare management, and disaster-response frameworks such as the One Health approach. The study examines various technological solutions including mobile-based rescue applications, web-enabled adoption systems, and sensor-based welfare monitoring platforms, highlighting their key contributions and limitations.

The findings reveal significant gaps in current systems, including the absence of real-time tracking, lack of AI-based decision-making for case prioritization, poor integration of veterinary and rescue services, and minimal incorporation of disaster preparedness mechanisms. Additionally, existing ethical and policy frameworks emphasize the need for coordinated, multi-sectoral approaches but lack practical digital implementation. Based on the analysis, this paper identifies the need for a unified, intelligent, and technology-driven animal emergency response system that integrates real-time reporting, geolocation tracking, artificial intelligence, veterinary support, and multi-stakeholder collaboration. Such a system has the potential to enhance rescue efficiency, improve animal survival rates, strengthen community participation, and contribute to sustainable animal welfare management.

Keywords: **Animal, Artificial Intelligence, Veterinarians**

I. INTRODUCTION

Animal welfare and emergency response have emerged as critical concerns in recent years due to rapid urbanization, increasing stray animal populations, environmental changes, and the rising frequency of natural disasters. Animals, particularly those living on streets or in vulnerable conditions, are frequently exposed to road accidents, diseases, abandonment, and extreme environmental conditions. Despite the growing awareness of animal welfare, existing rescue mechanisms remain largely unorganized, relying on informal communication channels such as social media, local volunteers, and delayed manual reporting systems.

The advancement of digital technologies has brought out fresh opportunities to improve animal welfare through mobile applications, web-based platforms, and data-driven monitoring systems. Various studies have put forward solutions such as automated rescue applications, online adoption platforms, and livestock welfare management systems. For instance, mobile-based rescue systems enable users to report injured animals using images and geolocation, facilitating faster communication with animal welfare organizations. Similarly, web-based adoption platforms aim to streamline the adoption process by providing centralized databases and improving accessibility for potential adopters. In the context of livestock management, digital systems incorporating veterinary support and health monitoring has been developed to enhance productivity and animal care.

In addition, emerging concepts such as Precision Livestock Farming (PLF) utilize sensors, data analytics, and automated monitoring continuously assess animal health and behavior, enabling early detection of welfare issues. On a broader scale, frameworks like the One Health approach emphasize the interconnectedness of human, animal, and environmental health, particularly during disasters and public health emergencies. These frameworks emphasize how essential it is to integrate animal welfare into plans for catastrophe preparedness and response.

Moreover, in spite of these advancements, existing systems remain fragmented and limited in scope. Most solutions focus on specific aspects such as adoption, welfare monitoring, or basic rescue reporting, without providing a unified platform that supports real-time emergency response, multi-stakeholder coordination, and intelligent decision-making. Critical limitations include the absence of AI-based case prioritization, lack of real-time rescue tracking and verification, insufficient integration of veterinary services, and minimal incorporation of disaster management features. Furthermore, although ethical and policy frameworks provide valuable guidance, they lack practical technological implementations that can be applied in real-world scenarios [1].

Therefore, there is a growing need for a comprehensive, technology-driven solution that integrates rescue operations, adoption processes, veterinary support, and disaster preparedness within a single unified system. This review paper aims to analyze existing research in animal welfare and emergency response systems, identify key technological and operational gaps, and highlight the potential of intelligent digital platforms in transforming animal rescue and welfare management. The study also provides a foundation for the evolution of a smart, scalable, and integrated animal emergency response system that can enhance efficiency, improve coordination, and contribute to sustainable and humane animal welfare practices.

II. REVIEW OF LITERATURE

Design of an Automated Animal Rescue and Adoption Management System: This paper proposes a mobile-based system that enables users to report injured or distressed animals by uploading images along with location details. The system forwards the information to nearby organizations, improving rescue response time. It also promotes collaboration among users and animal welfare agencies. However, the system lacks advanced features such as AI-based case prioritization and real-time rescue tracking.

Animal Welfare Management in a Digital World: This study explores the use of digital technologies, especially Precision Livestock Farming (PLF), for continuous monitoring of animal health and behavior. It underline the role of sensors, data analytics, and automated systems in improving welfare assessment and early disease detection. However, the focus is mainly on farm animals and

productivity, with limited application in rescue or emergency response systems [2].

Animal Herd Welfare Management System (AHWMS): This paper introduces a comprehensive digital platform designed for livestock management, integrating health monitoring, veterinary consultation, emergency services, and access to government welfare schemes. The system improves animal care and supports farmers in decision-making. However, it does not include real-time rescue features or intelligent emergency response mechanisms.

Animal Rescue and Welfare Wellness Web Application: This study presents a web-based application that supports animal rescue, adoption, donation, and volunteer management. It provides detailed animal profiles and helps connect users with welfare organizations. While it improves shelter management and adoption processes, it lacks real-time features such as GPS tracking, emergency alerts, and rapid response systems.

Pet Adoption System Using Web Technology: This paper proposes a centralized web platform to simplify and standardize the pet adoption procedure. It provides detailed information about animals and improves communication between shelters and adopters. The system enhances accessibility and reduces manual effort. However, it is limited to adoption processes and does not support rescue operations or emergency response functionalities.

One Health Animal Disaster Management: An Ethics of Care Approach: This research emphasizes the One Health framework, which integrates human, animal, and environmental health in disaster management. It underline the importance of ethical decision-making, care-based approaches, and multi-sector collaboration. However, the study is mainly theoretical and does not provide a technological system for implementation.

Animal Welfare, One Health and Emergency Preparedness and Response in the Asia-Pacific Region: This paper underline the importance of including animals in disaster preparedness and response planning, especially in regions where livestock plays a pivotal role in livelihoods. It emphasizes the One Health approach and the need for coordinated emergency strategies. However, the study is policy-focused and lacks a practical digital solution.

From the above studies, it is evident that existing systems focus on specific areas such as adoption, livestock management, or welfare monitoring, but lack a unified, intelligent, and real-time emergency response system.

III. IDENTIFIED RESEARCH AND POLICY GAPS

Based on the review of present literature, many significant gaps have been identified in current animal welfare and emergency response systems [3]. These gaps underline the need for a better integrated and intelligent approach.

A. Technological Gaps

1. Lack of Real-Time Emergency Response
    a. Most systems focus on adoption or welfare management
    b. No immediate rescue mechanism for injured animals
2. Absence of AI-Based Decision Making
    a. No use of Artificial Intelligence for:
        i. Injury severity detection
        ii. Case prioritization
    b. Leads to delayed or inefficient rescue response
3. No Real-Time Tracking and Verification
    a. Existing systems do not track rescue progress
    b. No confirmation whether the animal has been helped
4. Limited Use of GPS and Smart Technologies
    a. Some systems use location, but lack:
        i. Live tracking
        ii. Automated responder dispatch
5. Lack of Centralized Data Management
    a. Data is scattered across platforms
    b. No unified database for:
        i. Animal records
        ii. Medical history
        iii. Rescue cases

B. System Integration Gaps

1. No Unified Platform
    a. Separate systems exist for:
        i. Rescue
        ii. Adoption
        iii. Veterinary services
    b. No integrated solution combining all
2. Poor Multi-Stakeholder Coordination
    a. Weak connection between:
        i. NGOs
        ii. Veterinarians
        iii. Volunteers
        iv. Government agencies
3. Lack of Veterinary Integration

a) Rescue systems aren't directly connected to veterinary services.
b) Delays in medical assistance

C. Policy and Governance Gaps

1. Animals Not Included in Disaster Planning
    a. Disaster management policies focus mainly on humans
    b. Animal welfare is often ignored
2. Lack of Implementation of One Health Approach
    a. One Health is discussed theoretically
    b. Not implemented in digital systems
3. Absence of Standard Regulations
    a. No standardized process for:
        i. Animal rescue
        ii. Adoption
        iii. Welfare management

D. Ethical and Social Gaps

1. Limited Public Awareness and Participation
    a. People are willing to help but lack proper platforms
2. No Ethical Decision-Support Systems
    a. No tools for humane prioritization during emergencies
3. Lack of Trust and Transparency
    a. Users cannot verify rescue outcomes
    b. Leads to reliability issues

E. Overall Gap (Most Important Point)

There is no unified, AI-enabled, real-time, and multi-stakeholder animal emergency response system that integrates:

- Rescue operations
- Adoption processes
- Veterinary services
- Disaster management
- Ethical frameworks

IV. FRAMEWORK FOR ANIMAL EMERGENCY RESPONSE AND WELFARE SYSTEM

A comprehensive AER system includes:

- *Preparedness:* Risk mapping, shelter establishment, vaccination drives.

- *Response:* Rapid rescue, first aid, temporary sheltering, feed management.
- *Recovery:* Rehabilitation, disease control, livelihood restoration.
- *Mitigation:* Policy integration, insurance mechanisms, community sensitization.

Effective systems also rely on early warning technologies and public–private partnerships to enhance rapid response.

V. PROPOSED SYSTEM FEATURES VS EXISTING SYSTEMS

Features	Existing Systems	Proposed Framework
Real-time Reporting	Partial	Yes
GPS Tracking	Limited	Advanced
AI-Based Analysis	No	Yes
Rescue Verification	No	Yes
Veterinary Integration	Limited	Yes
Adoption System	Yes	Yes
Disaster Management	Conceptual	Integrated
Centralized Database	No	Yes

VI. GLOBAL AND NATIONAL BEST PRACTICES

Animal emergency response and welfare systems across the world are increasingly guided by integrated, collaborative, and technology-driven approaches. One of the most important global practices is the adoption of the One Health framework, which emphasizes the interconnectedness of animal, human and environmental health. This approach promotes coordination among governments, veterinary services, public health agencies, and environmental organizations to ensure effective disease prevention, disaster preparedness, and emergency response. It highlights the need for multi-sector collaboration and shared responsibility in addressing animal welfare challenges, especially during large-scale emergencies such as pandemics and natural disasters.

Additionally, global practices focus on the execution of integrated surveillance and early warning systems, which enable real-time monitoring of animal health and environmental conditions. These systems utilize technologies likely sensors, data analytics, and centralized databases to detect diseases and risks at an early stage, allowing timely intervention and minimizing large-scale impacts. Furthermore, global organizations emphasize standardization and accreditation of animal shelters and rescue centers to ensure ethical practices, transparency, and quality care for animals [5].

At both global and national levels, multi-stakeholder coordination plays a pivotal role in effective animal welfare management. Collaboration among NGOs, veterinarians, volunteers, and government agencies ensures efficient resource utilization, faster response times, and improved communication during rescue operations. Additionally, nations are realizing how crucial it is to incorporate animals into plans for disaster preparedness and response in order to save both companion animals and livestock during crises. Animal welfare is being integrated into the preventive, readiness, response, and recovery phases of the disaster management cycle.

At the country level, various countries have developed veterinary emergency response systems, including mobile veterinary units and rapid response teams, to provide instant medical assistance during crises. Governments are also promoting public awareness and community participation, encouraging citizens to report injured animals and engage in rescue activities through digital platforms and campaigns. The use of digital technologies, such as mobile applications, web-based adoption systems, and centralized data platforms, has significantly improved coordination and efficiency in animal welfare services.

Moreover, government policies and welfare schemes play a pivotal role in strengthening animal welfare systems. These include vaccination programs, livestock health services, financial assistance for farmers, and initiatives aimed at improving animal care and protection. Such measures not only enhance animal welfare but also support economic stability and livelihoods, particularly in rural areas [4].

In conclusion, global and national best practices clearly demonstrate that an effective animal emergency response system requires an integrated approach that combines technology, policy support, ethical considerations, and multi-stakeholder collaboration. While significant progress has been made, there is still a need to develop unified, intelligent systems that can bridge the gap between policy frameworks and real-time implementation, ensuring efficient, transparent, and sustainable animal welfare management.

VII. DISCUSSION

The reviewed literature highlights the increasing awareness of animals in disaster policy, but it also underline significant gaps between practice and policy. Institutional fragmentation and inadequate training hamper effective field response. Developed nations have strong frameworks, but emerging countries need affordable, locally flexible solutions. Additionally, incorporating One Health and

Climate resilience principles into AER planning is crucial. The two reviewed studies highlight a growing global consensus that animal welfare must be recognized as an essential part of emergency preparedness and disaster management. Both Gongal & Ofrin (2020) and Anthony & Vieira (2022) emphasize the deep interdependence between human, animal, and environmental health a concept central to the One Health framework. Their work collectively suggests that a sustainable and humane approach to emergency response requires a shift from human-centered disaster management to a multi-species, ethically inclusive system.

Gongal and Ofrin (2020) focus on the Asia-Pacific region, one of the world's most disaster-prone areas, where floods, earthquakes, and epidemics cause severe human and animal suffering. They reveal that, although livestock and companion animals are integral to livelihoods, food security, and emotional well-being, they are rarely included in national disaster preparedness or recovery plans. The absence of clear policy guidelines, lack of veterinary infrastructure, and weak coordination among government agencies have led to enormous animal losses during disasters such as the 2015 Nepal earthquake, where millions of animals died. Their findings highlight the practical and economic necessity of incorporating animal welfare into emergency systems not merely as an ethical issue but as a livelihood and community resilience concern [6].

In contrast, Anthony and Vieira (2022) extend the discussion from practical management to ethical and philosophical dimensions through the Ethics of Care (EC) approach. They argue that disaster response often treats animals as secondary or replaceable, ignoring their sentience and social value. The Ethics of Care perspective promotes empathy, relational responsibility, and shared vulnerability between species. When integrated into the One Health Animal Disaster Management (OHADM) model, it ensures that decision-making during disasters reflects compassion, moral obligation, and mutual interdependence rather than economic utility alone. Their framework encourages policymakers and practitioners to embed humane values within every stage of disaster management from preparedness and mitigation to response and recovery.

Together, the two studies converge on several critical insights. First, disaster preparedness must adopt a One Health perspective that aligns human and animal welfare under the same emergency

management strategy. Second, interdisciplinary collaboration among veterinarians, health professionals, environmental scientists, and policymakers is essential to build resilient communities. Third, public participation and education play a key role in changing societal attitudes toward animals, ensuring that citizens understand their role in reporting, rescuing, and rehabilitating animals during crises. Finally, both papers underline the need for institutional reforms and funding mechanisms that officially include animal welfare in national disaster frameworks and local emergency response systems [7].

In the context of the proposed Animal Emergency Response and Welfare System (AERWS), the findings from these two papers provide both scientific justification and ethical grounding. From the WHO (2020) study, AERWS can draw lessons on policy integration, multi-sectoral coordination, and livelihood protection. From Anthony & Vieira (2022), it can adopt the Ethics of Care as a guiding philosophy that transforms emergency response from a technical procedure into an act of shared humanity and compassion. By combining the operational strength of the One Health framework with the moral depth of the Ethics of Care approach, AERWS can evolve into a holistic model capable of protecting animal lives while reinforcing human values of empathy, cooperation, and responsibility.

VIII. RECOMMENDATIONS

Based on the analysis of existing systems and identified gaps, several recommendations can be proposed to improve animal emergency response and welfare management. Firstly, there is a strong need to develop a unified and integrated digital platform that combines animal rescue, adoption, veterinary services, and disaster management into a single system. Such integration will reduce fragmentation, improve coordination among stakeholders, and ensure faster and more effective response to emergencies.

Secondly, the incorporation of advanced technologies such as Artificial Intelligence (AI), Internet of Things (IoT), and geolocation services is highly recommended. AI can be used for injury severity detection and case prioritization, while IoT-based sensors can support real-time monitoring of animal health. Geolocation technologies can enable accurate identification of rescue locations and facilitate quick dispatch of nearby responders.

Another important recommendation is to strengthen multi-stakeholder collaboration among NGOs, veterinarians, volunteers, and government agencies. Establishing a well-connected network will ensure efficient communication, resource sharing, and coordinated rescue operations. Additionally, the integration of veterinary services into digital platforms will ensure timely medical assistance and improve survival rates of rescued animals.

It is also recommended to enhance data management and security systems by developing centralized databases that store animal records, medical history, and rescue information. This will improve transparency, enable better decision-making, and support large-scale operations. Along with this, implementing proper authentication and verification mechanisms will help reduce false reporting and improve system reliability.

Furthermore, governments should focus on strengthening policy frameworks and regulatory support by including animals in disaster management plans and implementing the One Health approach at the operational level. Clear guidelines, standard procedures, and financial support schemes should be developed to ensure effective animal welfare management during emergencies.

Public awareness and participation should also be encouraged through education campaigns and user-friendly reporting platforms, enabling citizens to actively contribute to rescue efforts. Training programs for volunteers and responders can further improve the efficiency and effectiveness of rescue operations.

In conclusion, adopting these recommendations will help in developing a smart, scalable, and efficient animal emergency response system that ensures better coordination, faster response, improved transparency, and enhanced overall animal welfare.

IX. CONCLUSION

This review paper examined existing research and systems related to animal rescue, adoption, welfare management, and disaster response. The study highlights that although significant efforts have been made through mobile applications, web-based platforms, livestock management systems, and conceptual frameworks such as the One Health approach, most existing solutions are limited in scope and operate in isolation. These systems primarily focus on specific areas such as adoption, monitoring, or basic rescue reporting, without providing a comprehensive and integrated solution.

The analysis reveals several critical gaps, including the absence of real-time emergency response mechanisms, lack of AI-based decision-making, poor integration of veterinary services, limited coordination among stakeholders, and insufficient inclusion of animals in disaster management frameworks. Additionally, while global and national best practices emphasize collaboration, ethical responsibility, and technological adoption, their practical implementation through unified digital systems remains limited.

To address these challenges, this paper focuses on the need for a smart, integrated, and technology-driven framework that combines real-time reporting, geolocation tracking, artificial intelligence, veterinary support, and multi-stakeholder coordination. Such a system can significantly improve response time, enhance transparency, strengthen collaboration, and ensure better care and protection for animals, especially during emergencies and disasters.

In conclusion, the development and implementation of an intelligent and unified animal emergency response and welfare system is essential for achieving sustainable and humane animal welfare management. By bridging the gap between technology, policy, and ethical practices, such systems can play a pivotal role in improving animal survival, supporting communities, and creating a more responsible and compassionate society.

REFERENCES

[1] S. R. Uttarkar, T. K. Soni, and S. G, “Design of an Automated Animal Rescue and Adoption Management System,” International Journal of Engineering Research in Computer Science and Engineering (IJERCSE), vol. 11, no. 5, pp. 166–168, May 2024.

[2] H. Buller, H. Blokhuis, K. Lokhorst, M. Silberberg, and I. Veissier, “Animal Welfare Management in a Digital World,” Animals, vol. 10, no. 1779, Oct. 2020.

[3] A. Sattigeri, U. S. A., T. M. S., T. G. H. R., and T. D. N., “Animal Herd Welfare Management System (AHWMS),” International Journal of Creative Research Thoughts (IJCRT), vol. 13, no. 7, July 2025.

[4] V. D. Gadade, G. S. Aulakh, A. Bhargave, and S. Deore, “Animal Rescue and Welfare Wellness Web Application,” International Journal of Advanced Research in Science, Communication & Technology (IJARSCT), vol. 3, no. 4, June 2023.

[5] D. Bhadane, P. Khirude, O. Chavan, and A. Lokare, “Pet Adoption System Using Web Technology,” International Journal of Scientific Research in Engineering & Management (IJSREM), vol. 7, no. 5, May 2023.

[6] R. Anthony and A. De Paula Vieira, “One Health Animal Disaster Management: An Ethics of Care Approach,” Journal of Applied Animal Welfare Science, vol. 25, no. 2, pp. 180–194, 2022.

[7] G. Gongal and R. H. Ofrin, “Animal Welfare, One Health and Emergency Preparedness and Response in the Asia-Pacific Region,” WHO South-East Asia Journal of Public Health, vol. 9, no. 1, pp. 50–51, Apr. 2020.