

IAF EARTH OBSERVATION SYMPOSIUM (B1)
Earth Observation Societal and Economic Applications, Challenges and Benefits (5)

Author: Mr. Talha Noor
Space Generation Advisory Council (SGAC), Pakistan

Ms. Anupam Kumar
Space Generation Advisory Council (SGAC), Germany

Mr. Muhammad Najeeb Ahmad
NUST, Pakistan

Ms. Sonalli M
Heriot-Watt University, United Arab Emirates

Mr. Md. Nazmus Sadat
Space Generation Advisory Council (SGAC), Bangladesh

Mr. Andrea Staffieri
Politecnico di Bari, Italy

Mr. Zain Ahmad
Space Generation Advisory Council (SGAC), Pakistan

Mr. Roshaan Nadeem
Institute of Space Technology (IST), Pakistan

FLOOD RISK ASSESSMENT AND EARLY WARNING SYSTEMS
INTEGRATING EARTH OBSERVATION TECHNOLOGIES FOR IMPROVED RESILIENCE IN
PAKISTAN

Abstract

Floods pose a significant threat to the socio-economic fabric of Pakistan, emphasizing the critical need for effective flood risk assessment and early warning systems. The 2022 floods submerged one third of the country, affecting 33 million people, half of whom were children. This research paper delves into the development and implementation of an integrated framework that leverages Earth Observation (EO) technologies to enhance flood resilience in Pakistan. The study conducts a comprehensive flood risk assessment, utilizing EO data to analyze topographical features, land cover changes, and hydrological patterns. Through the integration of satellite imagery and remote sensing techniques, the research captures dynamic spatial information crucial for identifying vulnerable areas prone to flooding, with a particular focus on the diverse terrains of Pakistan. Building upon the risk assessment, the paper outlines the design and deployment of an advanced Early Warning System (EWS). The system integrates real-time EO data streams, weather forecasts, and hydrological models to provide timely and accurate flood alerts. The research further emphasizes on the incorporation of machine learning algorithms to enhance prediction accuracy and reduce false alarms, contributing to the reliability and efficiency of the EWS. The paper evaluates the effectiveness of early warnings in mitigating the economic losses and human casualties associated with flooding events. Additionally, it explores community engagement strategies, assessing the resilience-building potential of an informed and prepared population. Furthermore, the research highlights the scalability and adaptability of the proposed framework to varying geographical and climatic conditions within Pakistan, ensuring its applicability to different regions. The paper concludes by offering recommendations for policy enhancements, infrastructure development, and international collaboration to fortify the nation's resilience against future flood events. This comprehensive and holistic

approach to flood risk management, integrating cutting-edge EO technologies, not only contributes to the scientific understanding of disaster resilience but also provides actionable insights for policymakers, disaster management authorities, and communities striving to mitigate the impact of floods in Pakistan.