



# Leveraging Satellite Data and AI for Pipeline Risk Monitoring:

A Basic Guide



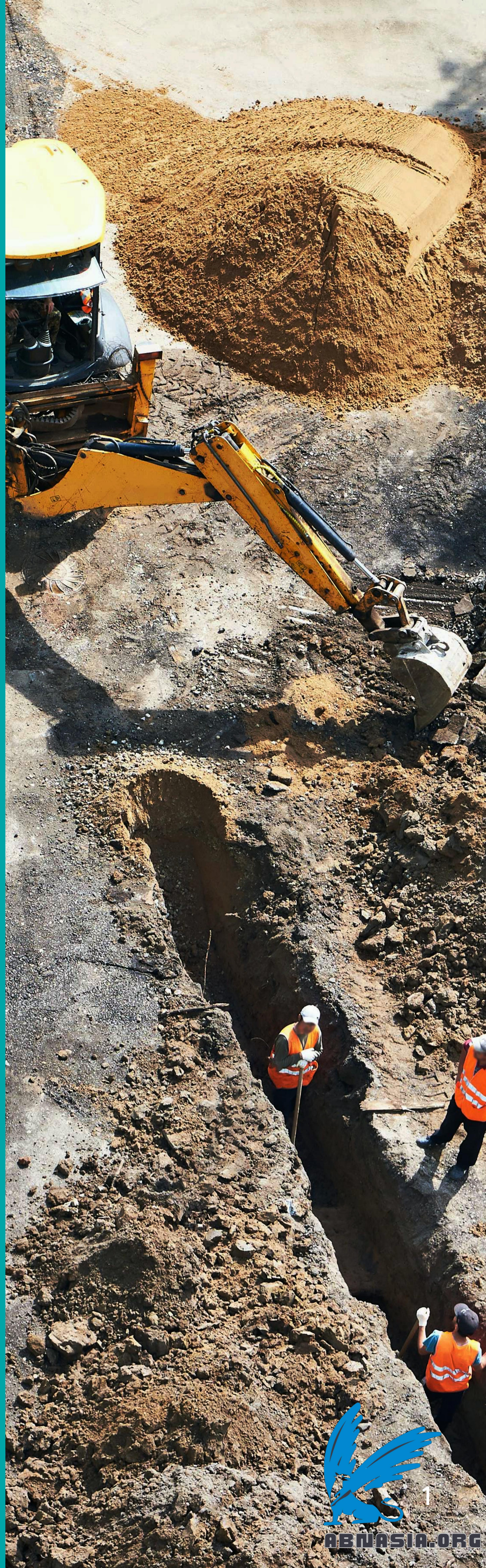
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In today's rapidly evolving landscape of oil and gas pipeline management, staying ahead of potential risks is paramount. Traditional monitoring methods like aerial or ground patrols often fall short in providing comprehensive risk assessments, leaving operators vulnerable to threats against their critical infrastructure. However, the advent of satellite data and artificial intelligence (AI) has ushered in a new era of pipeline risk monitoring, offering a more efficient and effective solution.

This guide aims to explore the fundamentals of leveraging satellite data and AI to empower pipeline operators with actionable insights for risk mitigation, particularly concerning third-party interference. A robust risk monitoring system is essential for safeguarding infrastructure integrity by preventing pipeline failures or incidents that could result in severe financial, legal, social, and/or environmental consequences.





# Understanding the Fusion: Satellite Data and AI

## Satellite Data: A Bird's Eye View

Satellite technology offers an unparalleled perspective of the Earth's surface. With high-resolution imagery and frequent updates, satellite data provides comprehensive coverage of pipeline networks, even in remote or inaccessible areas. This aerial vantage point enables operators to monitor vast stretches of pipelines with greater precision and efficiency.

## The Power of AI: Transforming Data into Insights

Artificial intelligence algorithms unlock the potential of satellite data by analyzing massive amounts of information rapidly and accurately. By employing machine learning techniques, AI can detect patterns, anomalies, and potential risks within the pipeline corridor. This transformative capability enables proactive decision-making and targeted interventions to mitigate threats before they escalate.

## Application in Pipeline Risk Monitoring

Satellite data combined with AI can identify encroachments, construction activities, or unauthorized developments near pipeline routes. By detecting changes in land use and monitoring proximity to infrastructure, operators can assess third-party risks and take preemptive measures to mitigate potential threats and avoid pipeline incidents.

# Implementing an AI-Powered Satellite Monitoring Solution: The Essentials

Implementing a solution like this is streamlined by companies like LiveEO, which handle the entire value chain, from image acquisition to the delivery of insights. Nevertheless, it's crucial to understand several key aspects to make a well-informed decision.



**Resolution:** Satellite imagery resolution determines the level of detail captured in each pixel, enabling precise identification of ground features. This is paramount for pipeline monitoring, allowing detection of even subtle changes that may signal potential third-party risks along the route. LiveEO utilizes both medium- and high-resolution satellite data to cater to customers' diverse needs. Whereas medium-resolution data enables binary change detection, indicating whether a change occurred or not, high-resolution imagery provides classification, identifying specific types of changes.

**Types of changes detected:** Satellite data combined with AI can detect various changes along the pipeline route, including ground disturbances, encroachment, and changes in land use. Customers should understand the range of changes that can be identified and how these relate to potential risks to pipeline integrity. LiveEO's solution detects over 10 distinct activities encompassing a wide range, including vandalism, excavations, construction works, building demolitions, and agricultural/farming activities, among others.

**Frequency of inspections:** The frequency of satellite inspections determines how often updates on the pipeline's status are obtained. Regular inspections provide timely information on any changes or developments, allowing for proactive risk management and swift responses to incidents or threats. LiveEO's solution can perform inspections as often as weekly, or even faster depending on geographic factors, facilitating continuous monitoring of evolving risks.





**Lead time to information:** Lead time refers to the duration between capturing satellite imagery and delivering actionable insights to the customer. Short lead times are essential for quick decision-making and response to emerging risks or incidents along the pipeline. Thus, customers should be aware of the time it takes for data processing, analysis, and reporting, as well as any delays that could impact the effectiveness of risk mitigation efforts. At LiveEO, we can deliver the analytics within as little as 24 hours, enabling immediate access to critical information.

**Reliability of insights:** The reliability of insights generated from satellite data and AI algorithms are crucial for making informed decisions. A high accuracy rate assures customers that the detected changes are genuine, while a high relevancy rate ensures that the insights are meaningful and useful. LiveEO excels in both areas, delivering a 95% accuracy rate to avoid overlooking any issues and facilitating field visits only when necessary. Additionally, LiveEO achieves a relevancy rate of over 80%, ensuring that the insights gathered are relevant and valuable to the customer.

**Ease of configuration:** The ease of configuring the monitoring system according to specific requirements and preferences of the customer is essential for the efficient use of the technology. LiveEO's solution has the flexibility to adhere to the company's risk model based on various attributes such as distance to the centerline, number of insights per case, and change type, among others.



**User friendliness:** An intuitive interface and streamlined workflows are essential for maximizing the efficiency of a monitoring system. Customers should be able to navigate the platform effortlessly, access relevant information, and interpret insights without extensive training. LiveEO seamlessly delivers the analytics through user-friendly web and mobile applications, enabling efficient management of thousands of tasks within a centralized system. It facilitates hassle-free progress tracking and provides instant updates, featuring robust tools for organizing work orders and prioritizing tasks.

**Integration options:** Seamless integration with existing systems and workflows enhances the utility of the monitoring solution. Customers should have the flexibility to integrate satellite data and insights with other relevant data sources such as GIS platforms, asset management systems, or risk assessment tools. Compatibility with industry-standard formats and protocols ensures interoperability and ease of data exchange. LiveEO's solution offers direct integration with existing third-party software, ensuring minimal disruption to internal processes.

# Realizing Value: Benefits of Combining Satellite Data and AI

## 1 Improved Risk Visibility

By combining satellite data with AI, pipeline operators gain unprecedented visibility into potential risks along their infrastructure. This proactive approach enables early detection of threats and empowers operators to implement preventive measures, reducing the likelihood of costly downtime and environmental damage.

## 2 Enhanced Safety Standards

Employing satellite data and AI introduces a proactive method for pipeline risk monitoring, bolstering safety across the infrastructure network by promptly detecting and mitigating potential risks caused by third-party sources. This approach significantly decreases the likelihood of incidents leading to injuries or fatalities, safeguarding the well-being of both personnel and neighboring communities while upholding the integrity of pipeline networks.

## 3 Operational Efficiency

Remote network monitoring significantly reduces expenditure on manned patrols and surveys. Moreover, precise identification of areas of concern enables optimization of field visits, ensuring resources are directed precisely where they are most needed. These measures yield substantial improvements in operational efficiency.

## 4 Sustainability

A proactive approach to mitigating risks using satellite data and AI contributes to sustainability efforts by reducing incidents of leaks or spillage of hazardous materials resulting from third-party activities. By minimizing such threats, it helps prevent environmental damage and lowers the associated cleanup costs, thereby promoting a more sustainable approach to infrastructure management.

# How To Get Started

We offer a pilot program which involves an analysis of a subset of your network, field validation, and a thorough business case analysis. This pilot aims to demonstrate the technical and business feasibility of the use of satellite analytics for a full rollout.



If you want to learn how our solution works, sign up for a free demo by scanning the QR code.



## Satellite-Based Infrastructure Monitoring

LiveEO is a leading provider of Earth Observation technologies and solutions that revolutionize asset monitoring. We use artificial intelligence to generate actionable insights from satellite data to safeguard linear infrastructures such as power grids, railway networks, and pipelines against potential risks, enhancing their safety and reliability.

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