Rezatec

Lessons from Edenville and Sanford: Preventing Dam Disaster

The dramatic failure of both Edenville and Sanford dams on 19th May 2020 led to widespread displacement and devastation, with nearly 11,000 Midland County residents forced to evacuate at a moment's notice as their homes and businesses were threatened.

Several days of excessive rainfall had caused the aging and fast deteriorating Edenville dam to collapse, flooding the Sanford dam and sending water rushing down the Tittabawassee and Saginaw rivers, destroying everything in its path.

Described as a "500-year event" with predicted long-term environmental impact, the Edenville breach caused flooding of contaminated sites and chemical facilities - including one containing a federally-regulated nuclear research reactor. The continued threat to public safety caused by this event will be tracked and monitored for many years to come.

The stark reality is that across the US, thousands of dams are in a similar precarious condition. In Michigan alone, an additional 172 dams are currently designated as high hazard potential, with five of these receiving a poor condition warning. Independent experts like Dr. Duane Hampton from Western Michigan University are calling for dams with poor condition warnings to be immediately "fixed or torn down", much to the alarm of dam owners, who are expected to remedy years of neglect, with limited time, resources and budgets.

As more dams exceed their intended lifespan, and expensive repair works become increasingly urgent, dam safety managers are turning to Geospatial analytics, a satellite-based continuous monitoring solution, to help them predict and prevent catastrophic failure.

An Accident Waiting to Happen

Why couldn't Edenville's dam owners prevent failure from occurring? What led to the collapse? Examination of the dam's condition reveals that it had received a high hazard potential and poor condition warning over fifteen years ago in 2004, when a report concluded that the Edenville dam would not survive a "probable maximum flood event" and that it needed either a bigger spillway or better protection against damage from overtopping. The earthen embankments, about 2km long and up to 17m high, had exceeded the lifespan they were designed for and become inadequate to resist severe floods.

As the almost-100-year-old structure continued to age, repair works were not sufficient to meet regulatory requirements. This led to the Federal Energy Regulatory Commission revoking the dam owner's operating license in 2018, because of a "longstanding failure to increase the project's spillway capacity to safely pass flood flows".

Alarmingly, the average age of the 90,580 dams in America is 56 years.

By 2025, seven out of ten dams in the United States will be over fifty years old, approaching or exceeding their intended lifespan. How can safety engineers face this threat of imminent failure head-on and address it before it occurs? The answer lies in better monitoring and repair prioritization, which will allow for the necessary groundwork to be undertaken before it is too late.

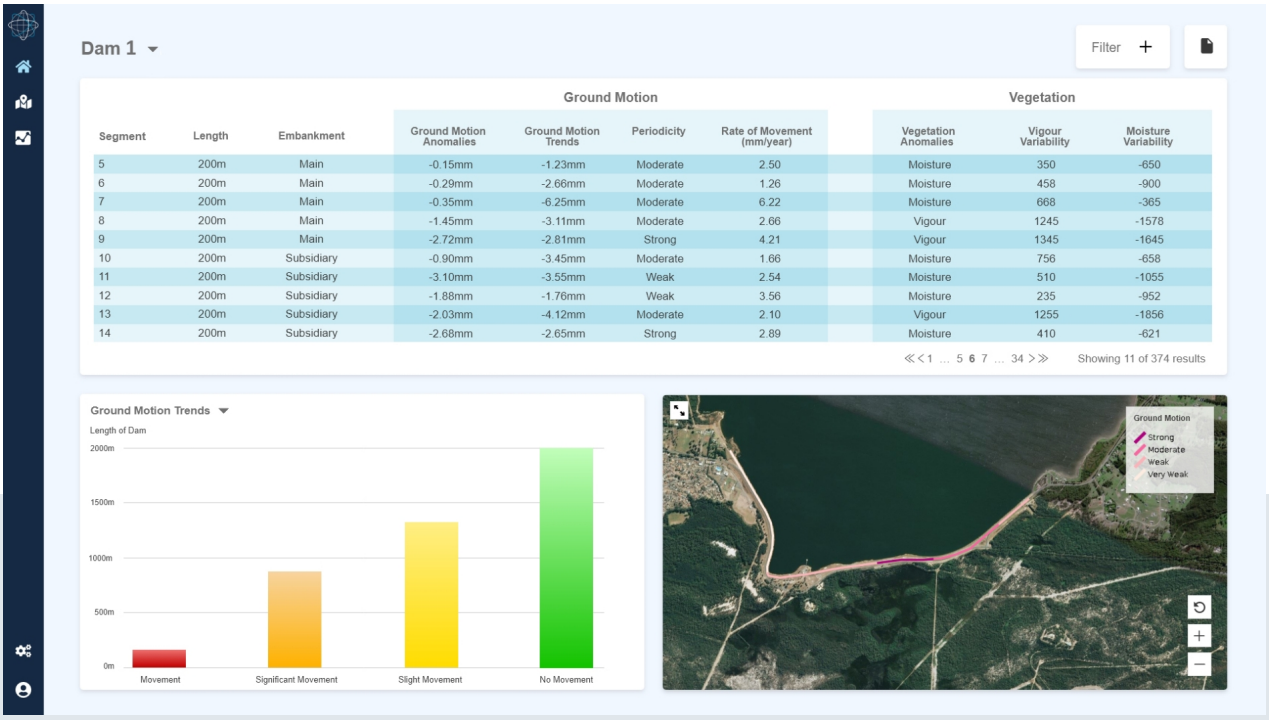
The Dangers of Inadequate Dam Monitoring

Many site engineers still rely on manual inspections as their primary method of preventing dam failure. While in-person surveys are essential when following up any flagged potential weaknesses, they are infrequent and this makes it easy to miss problems, especially where damage lies hidden underneath a spillway or is not easily visible to the human eye. Inspectors will look for cracks, subsidence, green spots, degradation, and other signs of potential weakness, but the low frequency of monitoring means that there is little historical data to help them locate hidden faults and guide improvements.

Data from manual inspections is often supplemented by drones and LiDAR technology. These technologies are very costly to deploy and do not measure movement with pinpoint accuracy or offer retrospective data, making them unsuitable for use in continuous asset monitoring. Satellite-based geospatial analytics solutions, on the other hand, are comprehensive and cost-effective enough to provide continuous oversight of all assets. In addition, they provide powerful retrospective analysis that helps dam safety managers to predict and prevent failure.

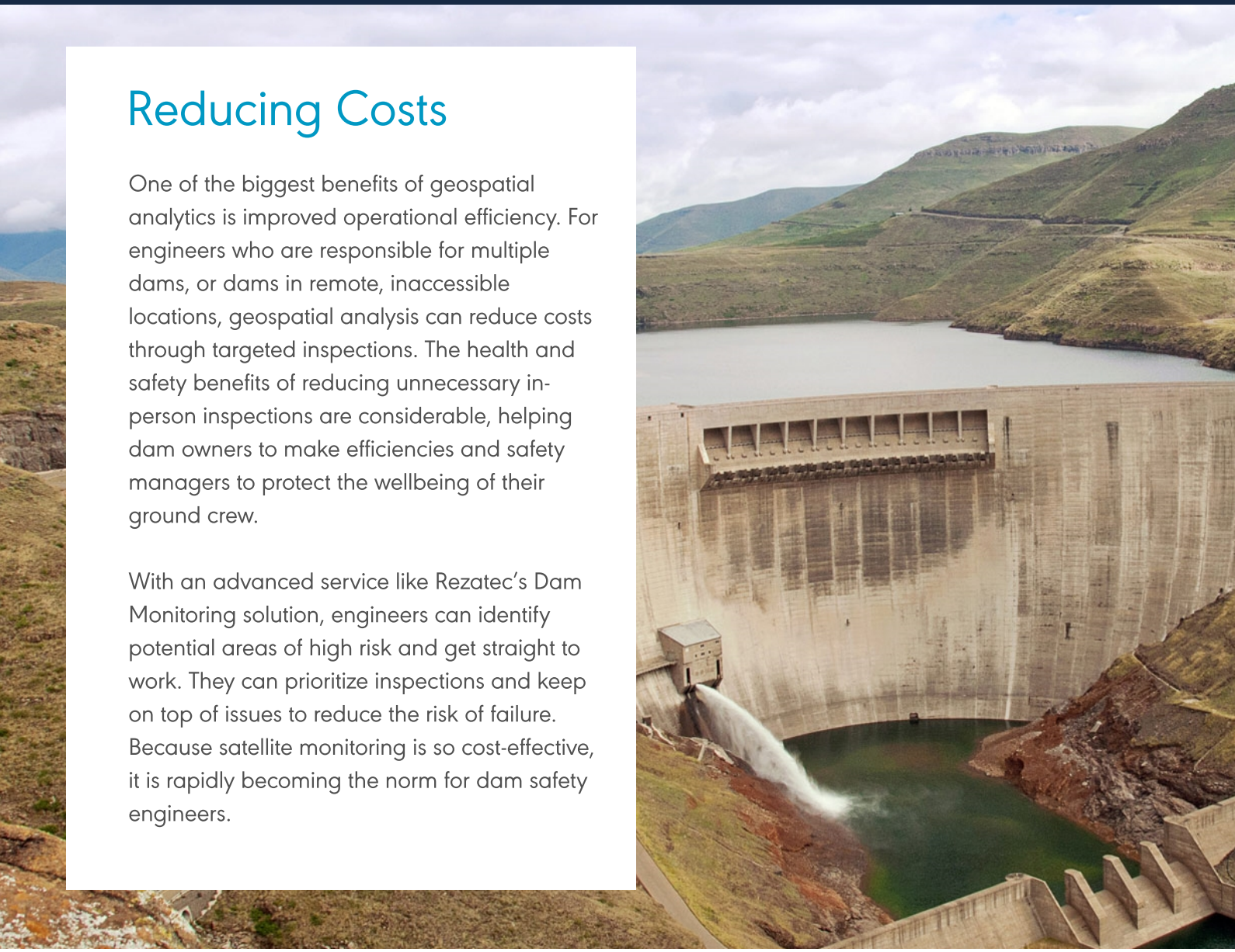
Constant Monitoring: Filling the Data Gaps Before It's Too Late

With 15,500 dams in the United States being classified as high-hazard potential, and the estimated cost of rehabilitating dams whose failure would threaten human life currently approx. $45 billion, it is clear that dam safety managers can no longer afford to ignore the gaps in their inspection data. Fortunately, modern technology provides new data sets and approaches to dam inspection. One of these advances is geospatial satellite analytics, provided by companies such as Rezatec. A number of industries already use this cutting-edge technology to monitor infrastructure, and dam safety engineers are following suit. Data is collected remotely and does not require input from the dam owner, allowing for optimal efficiency.



This cost-effective subscription service empowers dam and reservoir operators to dynamically manage the integrity and safety of their entire asset base remotely, at scale. Its satellite and multiple data feeds combine with advanced analytics to continuously monitor unusual changes in ground motion and vegetation. Retrospective and current analysis build a unique picture over time, allowing dam owners to receive the most frequent, accurate insights and be notified of anomalous activity without the need for site inspections.

Geospatial analytics provides retrospective monitoring data, plot trends over time, and highlights any potential movements, helping engineers to fill the gaps in the record. Of course, this type of monitoring cannot replace manual inspections, and assessing damage that could lead to catastrophe still requires an experienced engineer. Rezatec's solution is complementary and therefore bridges the gap from ground inspections to new ways of remote monitoring.



Reducing Costs

One of the biggest benefits of geospatial analytics is improved operational efficiency. For engineers who are responsible for multiple dams, or dams in remote, inaccessible locations, geospatial analysis can reduce costs through targeted inspections. The health and safety benefits of reducing unnecessary in-person inspections are considerable, helping dam owners to make efficiencies and safety managers to protect the wellbeing of their ground crew.

With an advanced service like Rezatec's Dam Monitoring solution, engineers can identify potential areas of high risk and get straight to work. They can prioritize inspections and keep on top of issues to reduce the risk of failure. Because satellite monitoring is so cost-effective, it is rapidly becoming the norm for dam safety engineers.

Supporting Targeted Investment

Major civil projects involved with strengthening, repairing, and improving dams can be extremely expensive. Accordingly, dam owners turn to experienced structural engineers to decide where and when to spend money effectively. However, if an engineer does not have access to data, how can they offer advice without an element of guesswork? With the additional insights provided by geospatial analytics, engineers can undertake necessary mitigation work to prevent failure that could be caused by ground movement, water seepage, and vegetation growth.

They can prioritize work based on urgency and take a targeted approach, pointing their inspection and maintenance teams to precisely the right place. This targeted approach not only lowers the health and safety risk to crews, by reducing the amount of work necessary in dangerous locations, it also optimizes productivity when they get there and helps dam owners to prevent unnecessary OPEX spend on non-essential groundwork.

Satellite Monitoring Technology: The New 'Norm'

As this technology becomes more widely adopted, it will become the new norm due to a number of unique advantages that it offers. Safety engineers, aware that they need more data to help stave off disasters, understand the advantages of geospatial technology with its easy-to-use data insights.

Rezatec's advanced dam monitoring solution provides a cost-efficient solution for monitoring assets. The advanced geospatial analytics platform uses cutting-edge satellite data to provide detailed situational information, and continuous monitoring means that engineers no longer have to piece together data and extrapolate into gaps.

The service supports dynamic decision-making. It enables engineers to react faster to changing situations and helps them to proactively manage relatively minor problems before they escalate and become a catastrophic failure like Edenville.

Rezatec's high-tech approach helps dam operators and safety engineers to:

- Build a full risk profile of all dams using historic & current data
- Track changes between routine structural surveys
- Deploy resources to the right place at the right time

Rezatec's Dam Monitor solution is the only service of its kind that remotely provides a detailed historical and current view of structural movement for all your dams – even across inaccessible locations. With this guidance and a wealth of detailed information provided on the Rezatec platform, you really can take action and prevent a near disaster like Edenville from occurring.

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