Frequently Asked Questions

What Operating Systems and Platforms are needed?
DAMSAT is designed to run on cloud or on-premises computers. DAMSAT interface can be accessed from any computer with an internet connection and Google Chrome.

How is the Data from different modules integrated?
Freely available satellite images, weather forecasts and data from any on-site instruments are automatically downloaded, processed and displayed in the system. The display of information from higher resolution images requires some intervention from the operator.
Information from different modules is checked against a set list of thresholds and warnings are displayed in the Warning module.

What are the System Requirements to host DAMSAT?
4GB of memory and 250GB of disk space. A Siemens MindSphere IoT account is required for collecting real-time data from on-site sensors. MindSphere provides state of the art security during data acquisition in the field, transmission and storage in the cloud.

Can we have training?
Yes, we provide training to the operators and users of DAMSAT.

Is there a user manual?
Yes, there is a user manual. The manual details all the components and provides an explanation of their functions. In addition to this there is an operational manual to support the technical day-to-day running of the system.

Can we tailor DAMSAT to our needs?
Yes, you can. Please, contact us and we will be happy to discuss the best way DAMSAT can support your work.

Platform flow chart

Space-data Production · Pollution · Hydrological forecast · Consequence modelling · In-situ measurements · Movement · Data integration & assessment · Visualisation · Product
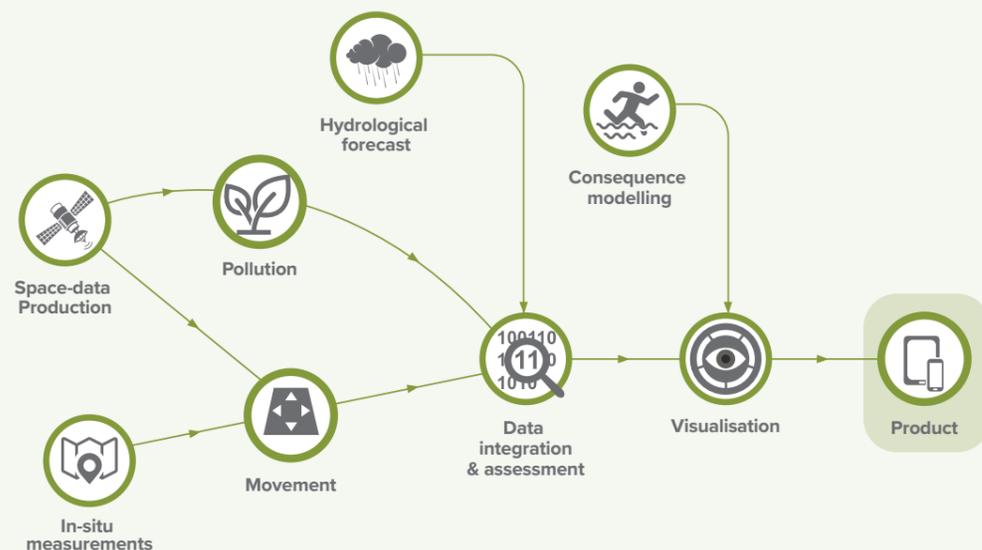
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DAMSAT

Minimising the risk of failure of water and tailings dams using satellites

Dam monitoring from satellites **(DAMSAT)** is a system which uses satellite technology to remotely monitor water and tailings dams and other tailings storage facilities. The system helps to reduce the risk of failure of these structures and the consequent risk to population and damage to ecosystems downstream upon which many vulnerable communities rely for both their source of water and livelihoods.

damsat.org

ABOUT DAMSAT

DAMSAT is funded by the UK Space Agency under the International Partnership Programme (IPP). The programme aims to use space solutions to make a positive and practical impact on the lives of those living in emerging and developing economies. IPP is funded by the Global Challenges Research Fund, a fund from the UK Government which supports cutting-edge research and innovation strengths to deliver sustainable economic or societal benefits to emerging and developing countries around the world.

DAMSAT uses a combination of Synthetic Aperture Radar (InSAR) and Global Navigation Satellite System (GNSS) technologies combined with real-time in-situ devices to monitor infrastructure displacements. It also uses optical satellite data to monitor pollution indicators, integrates weather forecasts and information about possible impacts downstream if there is a failure.
In order to support asset managers to take preventative actions DAMSAT generates warnings when abnormal behaviour or weather conditions occur. The system is being implemented in two areas of the mining regions of Cajamarca and Pasco in Peru, monitoring several operational and non-operation water and tailings dams and tailings storage facilities.

Benefits of DAMSAT include:

- Increased monitoring capacity to provide frequent monitoring information over wide areas and across remote locations.
- Supports preventative interventions to reduce the risk of failure and damage to population and ecosystems downstream by raising abnormal behaviour and weather forecast alerts.
- Consistent access across sites to monitor regardless of the inaccessibility and hazardous nature of the terrain.
- Wide area coverage to detect issues in areas where they might not be expected, areas that are not currently monitored or difficult to access.
- Allows to plan and prioritise efficient use of resources for site visits.
- Better understanding of consequences of dam failures downstream to inform emergency planning and incident management.
- Flexibility to adapt to the sources of information that best suit users' needs (high/low resolution, in-situ devices, etc).

Customers commenting

"More frequent pictures would mean a better chance in spotting changes that might be linking to a failure",
OSINERGMIN *Interview 2018.*

"We do not know if there is a leak from a mine, we have no data from the mine",
RENAMA *interview 2018.*
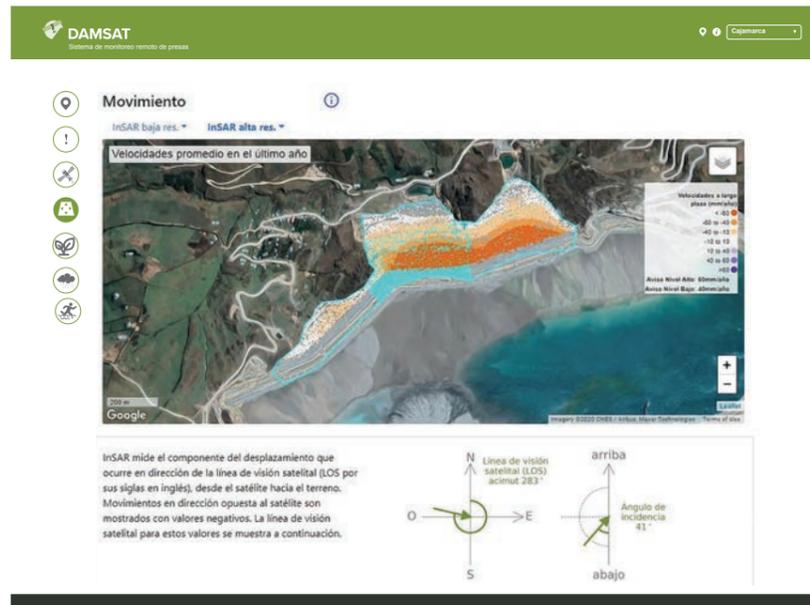
Solutions DAMSAT provides:

CHALLENGE	SOLUTION
To have up to date reliable weather data (e.g. live data on rainfall).	The hydrometeorological forecasting module of DAMASAT provides 4 rainfall forecast every day coupled with hydrological models to estimate the increase of water levels towards the tailings ponds and water reservoirs.
To get data on sites that are in remote locations, especially in adverse weather.	DAMSAT provides monitoring for all locations however isolated by using satellite technology.
The need to work more in collaboration and efficiently with other organisations sharing information and assessing situations quickly and objectively.	DAMSAT is a web-based application that allows for multiple users from the same organisation or from different ones to share data and manage warnings raised within.

SPECIFICATIONS SUMMARY	
General Information	Presents information about observed site: name, location including grid reference of the site.
Warnings	Shows warnings generated by the Movement Detection, Leakage and Hydrometeorological modules. Warnings are generated when anomalies are detected and thresholds are reached.
Visualisation	Allows users to do visual inspection of sites by comparing current and past images to detect possible changes in the areas of interest such as changes in populated areas or infrastructures.
Movement Detection	Provides information about movements at the sites of interest and nearby areas. Information sources: • Automated InSAR analysis of Sentinel-1 satellite imagery • Supervised InSAR analysis of COSMO-SkyMed satellite imagery • GNSS based motion monitoring system DAMSAT uses the SUMMIT SHM, a Telespazio's Vega UK monitoring system based on "GNSS" technology that delivers 3D motion monitoring up to millimetre-level accuracy in real-time. The system is composed of two elements: the "GNSS" monitoring stations with a reference station, with Real-Time Kinematic processing that are installed on the points of interest, and the SUMMIT SHM central processing unit.
Leakage	Provides information about changes in two indicators: iron oxide and vegetation health in areas downstream of the sites of interest. The analysis of the changes by the DAMSAT user can help to identify possible seepage or pollution incidents from the sites.
Hydrometeorological Forecast	Presents the rainfall forecast for the site and, when applicable, the estimated water discharge and change in water levels in the ponds behind the dams.The meteorological forecasts and analysis are produced every 6 hours. The rainfall forecasts are obtained from NOAA GFS and ECMWF (with 4 daily predictions up to 10 days).
Emergency Planning	Produces information to support the development of emergency plans, helping to improve the understanding of the risks downstream if a failure of the dam occurs. The approach followed considers the simulated scenarios demonstrate the outflow from the water or tailings dam if a failure occurred; its spread downstream and the impact on people living in the area shown. With this information, estimations of economic and environmental damages are also quantified.