Applications of remotely sensed data within the insurance industry

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Science & Technology Facilities Council KITE Club
Commercial Applications of Satellite Data Meeting
Wednesday 28th January 2009, 76 Portland Place, London

Outline

Past perceptions

The insurance industry's objective when using remotely sensed data

Current use of remote sensing data by the insurance & reinsurance industry

Challenges of using such data for insurance purposes

Future applications

Current status

Past perceptions

BNSC report – April 2001

"Analysis of Earth Observation Uptake by the Insurance Sector" - BNSC National Earth Observation (EO) Programme, Sector Studies Programme (BNSC Project OB 3/41/26) – Infoterra, **April 2001**

Key findings:

1. Conservative industry – unwilling to change
2. Reinsurance is cheap
3. Claims / customer data are more valuable
4. Higher resolution is not always better
5. Too expensive, inaccurate and complicated
6. Not valuable unless converted into quantitative tools for risk assessment
7. The insurance industry is not convinced of the extra value provided by EO
8. Will only be used if linked to existing systems at the post-code level
9. Competitive industry - companies are unlikely to work together to develop new technologies or fund research
10. Already too many models available and the value of these is questionable. Even more difficult to sell new products to the insurance industry

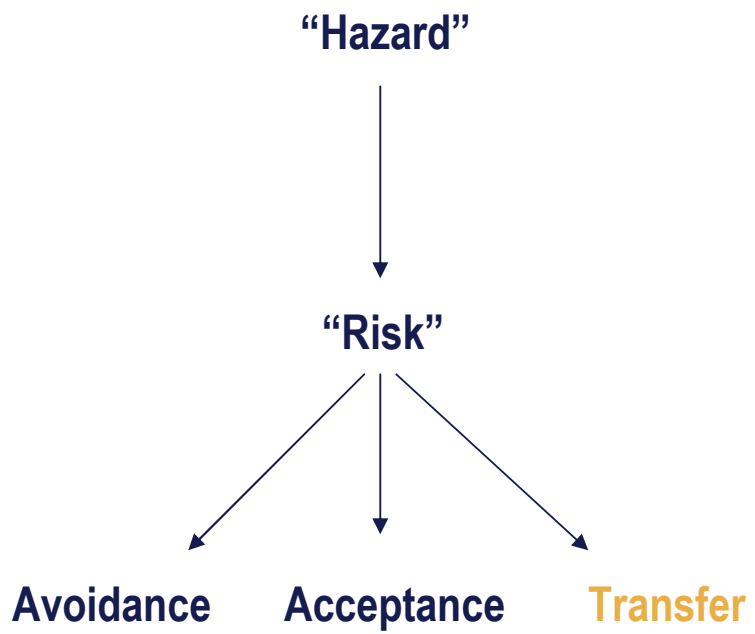
What is the insurance industry's objective in using remotely sensed data?

Risk identification

Risk assessment

Risk quantification

- Risk transfer

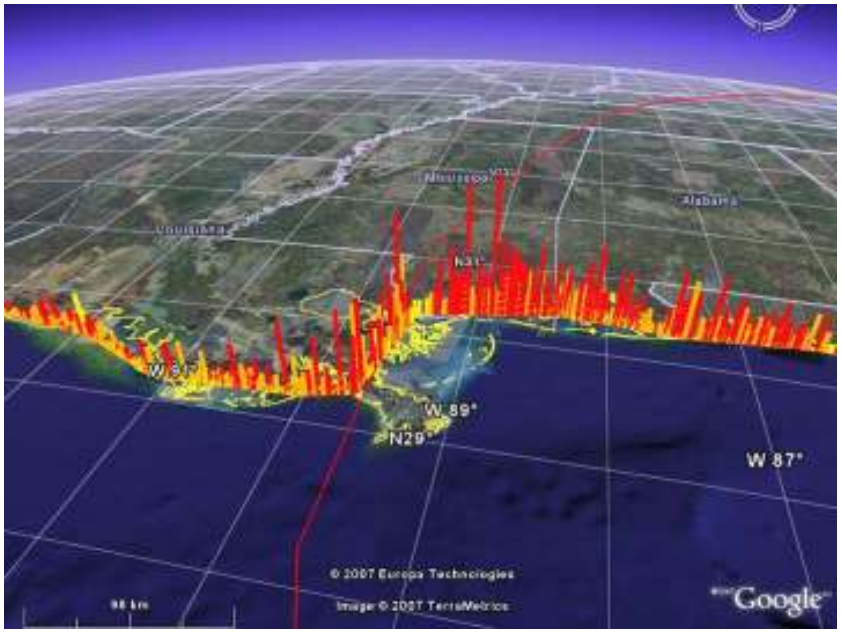


Current use of remote sensing data

The key areas where certain remote sensing / Earth Observation products have been successfully applied to insurance applications are:

- Exposure mapping and classification
- Post event monitoring and damage assessment
- Environmental monitoring and risk parameterisation
- Hazard model calibration and validation

Visualisation of hurricane exposure using Google Earth



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Post event monitoring and damage assessment

Better post-event damage investigation using satellite images: visual approach

Comparison of before and after images of Ahmedabad, India

Building damage classification map of Bhuj, India

- *Keiko Saito PhD - Proved that high-resolution optical satellite images have good enough spatial resolution for building damage mapping using visual interpretation*

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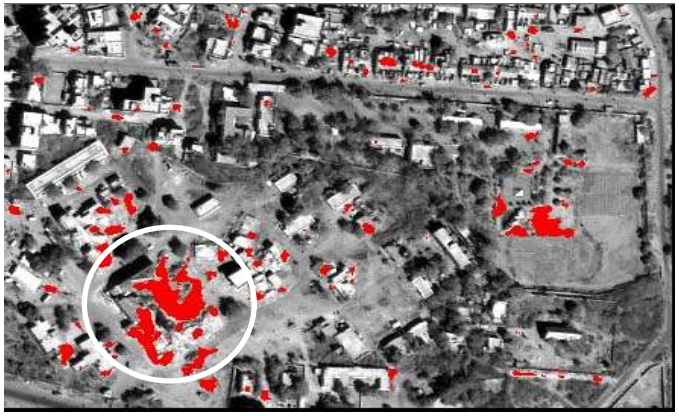
Post event monitoring and damage assessment

Original image:
Bhuj, Gujarat



After processing the Image, “Rubble” is shown in red

Photograph of the collapsed hospital (circled white in the left image)

Better post-event damage mapping using satellite images: automated damage recognition using texture analysis

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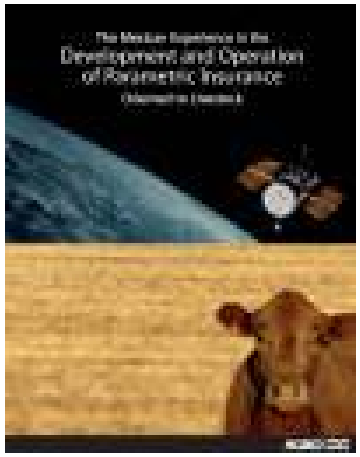
Environmental monitoring and risk parameterisation

Parametric insurance – ‘catastrophe bonds’

Loss payment – reference to a recorded measurement of the physical characteristics of a natural event – ‘parametric trigger’

‘Event’ is not dependent on claims incurred

Requires robust, statistically valid time series of measured values for index construction and threshold setting – de-trended, stationary



Example: AGROASEMEX - Mexican National Insurance Institution – agricultural risks

Livestock feed insurance for cattle
http://www.agroasemex.gob.mx/media/publicaciones/ganaderia_in.pdf

NDVI biomass index

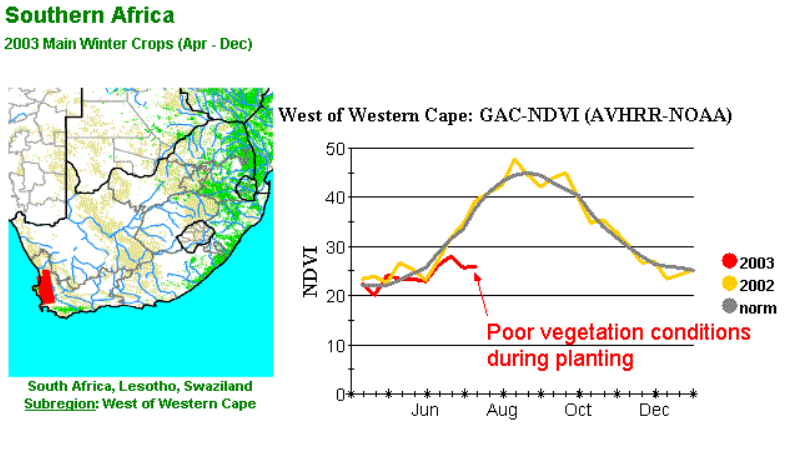
AVHRR – 20 year + data series

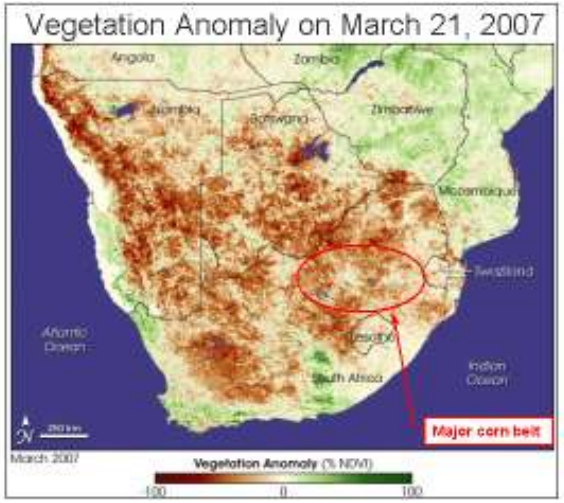
Repeatable, measurable, open methodology

Crop insurance

- Drought and yield
- Low rainfall conditions and impact on crop yields
- Remote sensing methods for crop yield forecasting
- Normalised Difference Vegetation Index (NDVI)
- Uses red and near infra-red bands of earth observation satellite images to estimate plant vigour / biomass and yield – can compare to ‘average’ conditions – anomaly maps
- WRN and Willis Analytics are researching applications of remote sensing data to improve risk assessment for crop yields

NDVI time-series show poor planting conditions at the Cape.





Source: USDA Foreign Agricultural Service

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Remotely sensed data for catastrophe modelling

Catastrophe modelling requires data for each component:

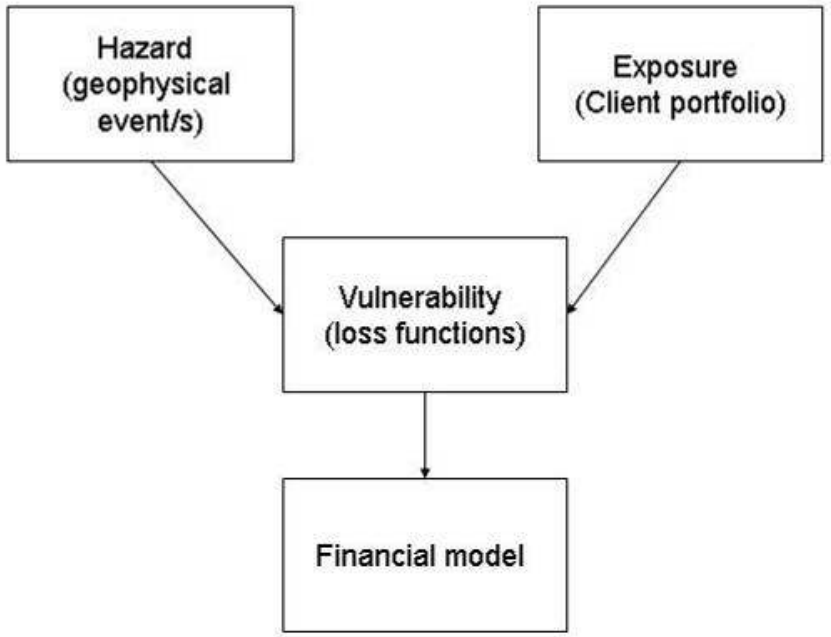
Remote sensing can be a viable method of data collection in all components

Exposure: Identification of exposed property locations / construction (roof type)

Vulnerability: Classification of roof types, property types (terraced, detached, number of floors)

Hazard: example: Digital Terrain Models for flood risk modelling

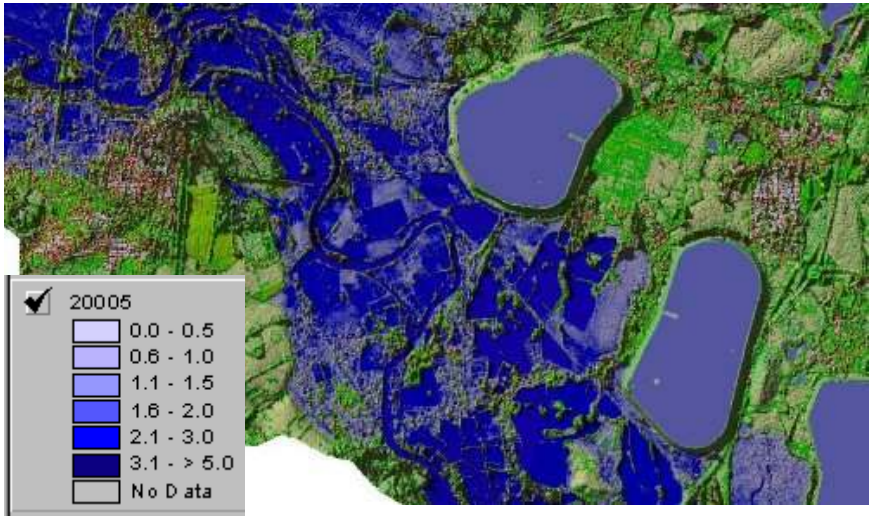
- Flood propagation models require a reasonable representation of the ground surface
- Conventional mapping sources tend not to provide the required horizontal or vertical resolution



Willis use of satellite / remotely sensed data

Early use of remotely sensed data:

- Airborne SAR data for Flood Modelling of the River Thames - pilot project for a UK model using IFSAR data from Intermap Technologies.
- Pilot triggered consultancy project with a UK insurer for national flood mapping for insurance purposes



More recent use of NASA's Geocover Landsat 7 series captured in 2000:

- Cyclone model rebuild and post Cyclone Larry analysis (2007)
- Terrain classification for wind grid project (2008)
- Bushfire mapping (2006).

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Challenges of using remotely sensed data

Financial cost

The cost of licensing sufficient data for an entire country or region at a high resolution is often prohibitive. Cost/benefit always a consideration.

Availability / coverage

Consistent national data sets not always available for every territory covered by a global insurance programme.

Data quality / resolution

Insurance applications of EO tend to make use of data from platforms designed for other purposes

High resolution and horizontal / vertical accuracy needed especially for flood insurance.

Licensing issues

Licence terms often not sufficiently flexible for insurance usage e.g. in relation to onward distribution of derived products.

Likely future applications

Satellite rainfall estimation for index-based agricultural insurance schemes (replacing rain-gauge measurements)

Post event damage assessment to reduce loss assessments costs (image analysis replacing on the ground surveyors)

Communication and visualisation via geo-browsers and geospatial technologies

Identification of more detailed characteristics of insured properties e.g. building footprints, roof types, building heights, tree heights and tree distance to properties

Mapping non-modelled risks e.g., global flood risk

real time event monitoring

Terrorism / conflagration risk assessment in densely populated areas

Identification of fraudulent claims

Use of satellite data by insurance industry is increasing

1. Conservative industry – unwilling to change
2. Re-insurance is cheap
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1. Change – both from within and imposed from outside
2. Reinsurance price varies
3. Past claims may not reflect future losses
4. There is a drive towards increasingly high resolution (postcode - address)
5. EO data are inherently visual
6. GI and geovisualisation is embedded into risk modelling and pricing
7. Post event analysis from EO data is increasingly valued for gauging extent of loss potential in the immediate aftermath
8. Models and insurance systems are more sophisticated and can apply multi-dimensional, varying media information in a common delivery mechanism
9. Still very competitive – but collaborative projects are more common and research is a commodity
10. There is never enough information, but it must be properly integrated and communicated

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Summary conclusions

Satellite data has the potential to improve insurance risk management

There is some evidence of increased uptake within catastrophe risk management since 2001

- Exposure data
- Post event analysis
- Parametric indices
- Hazard modelling

New tools / data sources will provide more relevant data – but the same issues need to be addressed:

- Timeliness
- Resolution
- Coverage
- Temporal consistency
- Data fusion
- Price and format

There is still work to do - EO data still requires proper integration into insurance risk assessment tools and services

Ongoing research – to develop the tools and products of most use to the insurance industry

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