

REQUIREMENTS FOR EO SERVICE IN THE INSURANCE INDUSTRY



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CONTENT

1	INTRODUCTION	
2	REQUIREMENTS FOR EO SERVICES	3
2.1	BASIC GEODATA	5
2.2	FLOOD MAPPING	8
2.3	FIRE MAPPING	12
2.4	TROPICAL STORM TRACKING.....	14
2.5	HAIL DAMAGE ASSESMENT	16
2.6	STORM DAMAGE ASSESMENT	17
2.7	EARTHQUAKE DAMAGE ASSESMENT	18
3	CONCLUSIONS OF THE WORKSHOP	19

1 INTRODUCTION

A workshop hosted by Swiss Re was organized on September 16 2009 to collect requirements for EO satellite based products. The following insurance sector players participated to the workshop; Swiss Re, Munich Re, Allianz SE, Vereinigte Hagelversicherung VvaG, Gesamtverband der Deutschen Versicherungswirtschaft e.V., Guy Carpenter and EQECAT

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2 REQUIREMENTS FOR EO SERVICES

The requirements definitions were collected by experts from the insurance industry. Since information products are required and not basic/ raw satellite data, the requirements were grouped according to the application of the information products.

1. Basic Geodata
 - Land use / land cover
 - Digital terrain model
 - Population density
2. Floods
 - Maximum flood extent
 - Flood water depths
 - Flood impact mapping
 - Flood defence/ protection mapping
3. Fire
 - Shapes of burnt areas
 - Probability map of fire events
4. Tropical Storms
 - Tropical storm tracking
 - Tropical storm footprints
5. Hail Damage Assessment
6. Storm Damage Assessment
7. Earthquake Damage Assessment

After a collection of inputs from all experts, the rapporteurs for each product type finalized the requirements. They reflect the present view of the expert group and do not claim to be complete or exhaustive.

2.1 BASIC GEODATA

Requirement definition: Basic Geodata

Description of product or data
Land use / land cover A homogeneous land cover classification like CORINE is the minimum requirement for land use information. From the perspective of the insurance business, the land use classes should contain more classes than CORINE with a differentiation of residential, commercial and industrial in urban areas. Ideal would be a classification code like European NACE-Code. It is a system which is used in the European Community to group organisations according to their business activities. A unique 5 or 6 digit code is used to each industry sector.
Spatial resolution and spatial accuracy of product
A spatial resolution of 100 m x 100 m is reasonable with higher spatial resolution (30 m) desired in urban areas. Ideal would be a uniform spatial resolution of 30 m. The minimum mapping unit should be 1 ha. Patches smaller this unit are neglected.
Spatial extent of product
EU to global, starting with the EU (priority). The product should be extended beginning with industrialized countries (and areas).
Temporal frequency of product
Updates every 5 years needed especially in urban areas
Accuracy of thematic product
90 % overall accuracy
Requirements on availability
Land use product is not required in real time
Required reliability
one consistent source for EU
Requirements on delivery formats
GIS-Format (shape or raster)
Economic relevance of product
medium to high; it depends on resolution and reliability

Requirement definition: Basic Geodata

Description of product or data
High resolution Digital Terrain Model (DTM). This is not the same as a surface model as provided by SRTM for example. The DTM should be consistent, affordable and homogenous.
Spatial resolution and spatial accuracy of product
Variable resolution grids for urban, semi urban and non urban /industrial areas. The horizontal resolution should be differentiated according the land cover: urban areas = 1 - 10 m semi urban areas = 10 m non urban areas = 10 - 50 m open water = 1 km The vertical resolution should be: urban areas ≤ 50 cm non urban areas = 1 - 2 m
Spatial extent of product
EU to global, starting with the EU (priority). The product should be extended beginning with industrialized countries (and areas).
Temporal frequency of product
approx. 10 years
Accuracy of thematic product
90 - 100 %
Requirements on availability
DTM product is not required in real time
Required reliability
one consistent source for EU
Requirements on delivery formats
The format depends on the user: Insurer = WFS (Web Feature Service), GIS-Format Modeller = "RAW" data (Raster)
Economic relevance of product
high; use for climatic change and flood modelling

Requirement definition: Basic Geodata

Description of product or data
Population density (no. of inhabitants per km ²) differentiated into day and night time
Spatial resolution and spatial accuracy of product
1 km ² on global level unpopulated areas and open water might be excluded
Spatial extent of product
EU to global
Temporal frequency of product
2 years frequency is required in areas with very high population growth rate (e.g. areas in Asia or South America) 5 years update in all other areas
Accuracy of thematic product
90 % in the first year
Requirements on availability
The information layer should stay available and not vanish without notice.
Required reliability
one consistent source at least for EU
Requirements on delivery formats
GIS-Format (shape or raster)
Economic relevance of product
high on a global scale

2.2 FLOOD MAPPING

Requirement definition: Flood Mapping

Description of product or data
Rapid flood mapping product – classification of the maximum flood extent
Spatial resolution and spatial accuracy of product
For very rapid mapping products a low resolution of 1000 m or better should be reasonable. This product should be often updated (more frequently than daily). For the final product a spatial resolution of 30 - 100 m is reasonable. Ideal would be a spatial resolution of 10 m in agricultural and urban areas for the final product.
Spatial extent of product
Snap-shot extent during the event and the complete affected area (maximal boundary) after the event.
Temporal frequency of product
on request, event-driven
Accuracy of thematic product
90 %; classification of the maximum flood extent must be assured
Requirements on availability
Snap-shots are required every 24 h if the event lasts longer than some days. They could have a lower resolution and lower quality. A first product of the complete affected area (without high quality standards) should be available 1 - 3 days after the flood event happened. A final product with quality assurance should be available one to two weeks after the event.
Required reliability
90 - 100 %
Requirements on delivery formats
GIS-Format (shape or raster)
Economic relevance of product
high; use for loss estimation, claims handling as well as hazard validation and vulnerability assessment

Requirement definition: Flood Mapping

Description of product or data
Flood water depths
Spatial resolution and spatial accuracy of product
10 - 30 m
Spatial extent of product
Complete affected area
Temporal frequency of product
on request – per event at flood peak (although ideally monitoring depths throughout duration of event)
Accuracy of thematic product
± 50 cm
Requirements on availability
within one month of measurement
Required reliability
80 %
Requirements on delivery formats
GIS-Format
Economic relevance of product
medium, since this information would be used for vulnerability curves and such curves are only determined by the larger players (but for them it is a very helpful information)

Requirement definition: Flood Impact Mapping

Description of product or data
Flood impact mapping – quantitative damage assessment of insured objects with a differentiation of residential buildings, commercial buildings, industrial buildings, agriculture
Spatial resolution and spatial accuracy of product
10 - 30 m
Spatial extent of product
complete affected area
Temporal frequency of product
on request, event-driven
Accuracy of thematic product
90 %
Requirements on availability
available 3 weeks after event
Required reliability
80 %
Requirements on delivery formats
report, tables, GIS-Format
Economic relevance of product
Product can be used for loss estimation. The economic relevance is medium high because large insurers and re-insurers have their own GIS department and could develop such a map by themselves. Smaller players have not such possibilities and hence the value would be higher.

Requirement definition: Flood Protection Mapping

Description of product or data
Flood defence/ protection mapping: Identification of the location and course of dikes, dams, reservoirs and hydro-plants along rivers and lakes. Optional additional information like the height of a dike relative to the adjacent flood plain is required. Frequently flooded areas could be identified as reservoirs.
Spatial resolution and spatial accuracy of product
5 - 20 m
Spatial extent of product
along major rivers and lakes
Temporal frequency of product
every 3 years
Accuracy of thematic product
80 - 90 % of objects should be mapped
Requirements on availability

Required reliability

Requirements on delivery formats
GIS-Format (shape or raster)
Economic relevance of product
medium; high for Brokers and Modelling Companies who are working in model development

2.3 FIRE MAPPING

Requirement definition: Fire Mapping

Description of product or data
Post Event – shapes of burnt areas
Spatial resolution and spatial accuracy of product
ideal: 10 m reasonable: 50 - 100 m
Spatial extent of product
affected areas of the fire event
Temporal frequency of product
event-driven
Accuracy of thematic product
+/-50 m
Requirements on availability
One comprehensive product of burnt areas after the event. This should be available 3 days after the event. Additionally snap-shots are required at least every 3-7 days (this is required as loss estimates have to be made during the event – because such events can last several weeks)
Required reliability
very high 90 - 100 % Products should be reliably available independent of cloud cover and smoke.
Requirements on delivery formats
GIS-Format (shape)
Economic relevance of product
Economic relevance differs between re-insurers, insurers and brokers. However, generally medium economic relevance can be assumed. Costs can be saved with such a product when the loss estimation process gets accelerated and more accurate. The costs for the product must not exceed the medium economic relevance.

Requirement definition: Fire Mapping

Description of product or data
Pre/Post Event: probability map of fire events, considering the fire history and the hazard maps (burned areas from database)
Spatial resolution and spatial accuracy of product
ideal: 100 m seems to be adequate for underwriting decisions. The fire risk for policy locations can be valuated on street address level. reasonable: For accumulative scenario analysis (accumulative insured values within high fire risk zones) 1 km is a good scale for macroscopic scenarios.
Spatial extent of product
ideal: worldwide reasonable: the hot spots Mediterranean, California, Australia
Temporal frequency of product
annually updated
Accuracy of thematic product
+/- 100 m for products with 100 m spatial resolution +/- 250 m for products with 1 km spatial resolution
Requirements on availability
Available as risk map with certain probability per grid cell. Database accessible for historic fires.
Required reliability
very high 90 - 100 % Products should be reliably available independent of cloud cover and smoke.
Requirements on delivery formats
GIS-Format (shape)
Economic relevance of product
This product can be of economic relevance in two ways: a) as underwriting tool /map in order to assess the fire risk for certain policy locations on high resolution. b) as a zonation tool to determine accumulation of values in high risk areas (low resolution at 1 km). It will add value for portfolio management. The economic relevance to reinsurance estimation is medium. The costs for the product must not exceed the medium economic relevance.

2.4 TROPICAL STORM TRACKING

Requirement definition: Tropical Storm Tracking (hurricanes, typhoons)

Description of product or data
<ol style="list-style-type: none"> 1. Tracking of the hurricanes typhoons including spatial extent, and forecast position 2. Wind field of max. ground wind speed and direction over sea and over land 3. maximum wave heights map during the event (astronomical tide + surge)
Spatial resolution and spatial accuracy of product
<ol style="list-style-type: none"> 1. ideal 1 km / acceptable 10 km 2. ideal 500 m / reasonable 1 - 10 km within typical accuracy range for wind speeds (10 %) 3. ideal 10 km / acceptable 50 km
Spatial extent of product
Full tropical storm extent from formation until end.
Temporal frequency of product
Multitemporal event tracking during hurricane/typhoon season (June-October for North Atlantic)
Accuracy of thematic product
90 %
Requirements on availability
<ol style="list-style-type: none"> 1. Every 12 h a snap-shot during the event with forecast of the future position and strength of the hurricane typhoon 2. and 3. After the event, hourly data should be ideally available at most 20 business days after the event.
Required reliability
very high 90 - 100 %
Requirements on delivery formats
<ol style="list-style-type: none"> 1. image format (png, jpeg) for the snap shots 2. raster GIS universal format for the wind maps (ex: .bil) 3. raster GIS universal format for the wave height maps (ex: .bil)
Economic relevance of product
<p>The product allows a better estimate on hurricane/typhoon intensity; therefore better loss estimates and loss prediction are possible.</p> <p>The economic relevance of such product can be high.</p>

Requirement definition: Tropical Storm Tracking (hurricanes, typhoons)

Description of product or data
Tropical storm footprints show the affected damaged (and flooded) area during and after the event (on shore and off-shore). This ideally includes maximum gust wind speeds map, wind speed duration maps, maximum water depth maps and landslides occurring off-shore.
Spatial resolution and spatial accuracy of product
ideal: 250 – 500 m reasonable: ~500 m
Spatial extent of product
reasonable: Tropical storm landfall region (especially Golf of Mexico, Atlantic/Pacific coast US, West and South Pacific, Indian Ocean) ideal: additionally to the landfall regions the off-shore structures are required including bathymetry
Temporal frequency of product
event-driven
Accuracy of thematic product
90 %
Requirements on availability
Every 12 - 24 h snap-shots during the event. A comprehensive product of the affected region should be available at most one month after the event.
Required reliability
80 % during and 95 % after event
Requirements on delivery formats
A raster GIS universal format for the maps (ex: .bil)
Economic relevance of product
high

2.5 HAIL DAMAGE ASSESMENT

Requirement definition: Hail Damage Assessment

Description of product or data
Hail footprints after an event of the damaged crop fields. The footprint should be differentiated by crop type and degree of damage.
Spatial resolution and spatial accuracy of product
50 - 100 m
Spatial extent of product
ideal: world wide all affected areas within the hail storm reasonable: Germany, UK, France, Southern Europe, Australia, US & Canada
Temporal frequency of product
event-driven; daily during growing season
Accuracy of product
90 - 95 %
Requirements on availability
The product should be available 0.5 to 3 days after the event.
Required reliability
90 - 100 %
Requirements on delivery formats
GIS-Format (shape)
Economic relevance of product
medium – use for loss estimation and loss detection All models have a lack of information on loss extent; no available intensity parameter from ground measurements

2.6 STORM DAMAGE ASSESMENT

Requirement definition: Storm Damage Assessment

Description of product or data
Footprints of affected regions and degree of damage for buildings (roofs), agriculture and forest
Spatial resolution and spatial accuracy of product
50 - 100 m The minimum mapping unit of affected areas should be 0.5 ha. Patches smaller this unit are neglected.
Spatial extent of product
full storm extent
Temporal frequency of product
event-driven; - daily snap-shots during storm and a final analysis after storm if the event lasts longer than some days (e.g. Hurricane regions) - one final analysis after storm if the windstorm has a short duration (e.g. Europe)
Accuracy of product
90 %
Requirements on availability
Snap-shots are required every 24 h if the event lasts longer than some days. A final product of the complete affected area should be available 1 - 3 days after the storm event happened.
Required reliability
95 %
Requirements on delivery formats
GIS-Format (shape)
Economic relevance of product
high; in times of reductions of reliable ground measurement the economic relevance of the product is very important

2.7 EARTHQUAKE DAMAGE ASSESMENT

Requirement definition: Earthquake Damage Assessment

Description of product or data
Damaged area of an earthquake and degree of damage. The level of destruction should be differentiated into 3 - 5 classes.
Spatial resolution and spatial accuracy of product
reasonable: 50 - 100 m ideal: variable spatial resolution with a better resolution in urban areas - non built-up areas no data are required - build-up area 50 - 100m, ideally per building
Spatial extent of product
affected area from earthquake
Temporal frequency of product
A final product of the complete affected area after the event which shows the level of destruction. Ideal would be additionally a satellite image before the event (acquired approx. 6 months before) to understand or to check how the damage levels were obtained.
Accuracy of product
90 - 95 %
Requirements on availability
Images should be taken as soon as possible after the event. Final product either 2 - 5 days after the event (for loss estimation), or at a later stage (for studies and model calibration/validation) but then with high accuracy.
Required reliability
very high 90 - 100 %
Requirements on delivery formats
GIS-Format (shape)
Economic relevance of product
high; use for earthquake model validation, damage/vulnerability studies, and loss estimation

3 CONCLUSIONS OF THE WORKSHOP

In the following the results of the discussions during the workshop and joined conclusions are given. The first set describe general requirements towards EO based products and services. Then more detailed requirements for a market place of EO based information products are given. A possible approach for such a market place is outlined and future planned activities summarised.

General Requirements on products and services

- Information products are required and not basic or raw satellite data.
- The individual companies within the insurance industry don't want to built up internal infrastructure (hardware/software and brainware) for image processing.
- The information products should contain detailed metadata and an assessment on uncertainties.
- A GIS compatible standard data format shall be used for the information products (no new formats).
- The consistency of information product is a central issue of the insurance industry.

Requirements for a market place for EO based information products

- A simplification of access and licensing of the products is required.
- In order to achieve this, a market place or one-stop shop is desirable.
- License restrictions should be avoided for basic information products, so that they can be used open and for free.
- For specific information retrieval (e.g. on request) the licensing should be transparent and sufficiently flexible to distribute further derived products (no re-engineering possible).
- The access should be non-restrictive and available to the whole insurance industry in Europe.
- Data protection issues should be considered.
- Licensing can be different for different market segments.

Possible approach for such a market place

- Start or use a company platform that has the goal to provide such EO based services.
- This could work similar to PERILS AG (<http://www.perils.org/>) in Europe or ISO's Property Claim Services (PCS) (<http://www.iso.com/>) in the USA for loss data.
- The platform should organize the selection of hazard events.
- They would assure consistency and quality of products.
- The final goal is a definition of standardized products.
- The evolution of services should be obtained by regular assessments (feedback loop).
- The information service could start with well established and mature services like flood outline.
- In parallel not so mature information services could be developed (e.g. fire risk)

Outlook to future activities

- The member of the working group agreed that they intend to continue their collaboration for the implementation of their requirements from the insurance industry side.
- In the next meeting a clear action plan for the different topics should be worked out and the next activities of the working group should be planned e.g.
 - priorities in the implementation of products,
 - decisions whether there are standard and special products,
 - start of a password protected web site,
 - definition of roadmap of the working group.
- A password protected web site would allow a safe exchange of files, data and products. Here a "market place" could be tested and the results and application of the products should be discussed within the working group.
- The next meeting of the working group should be in the first quarter of 2010.