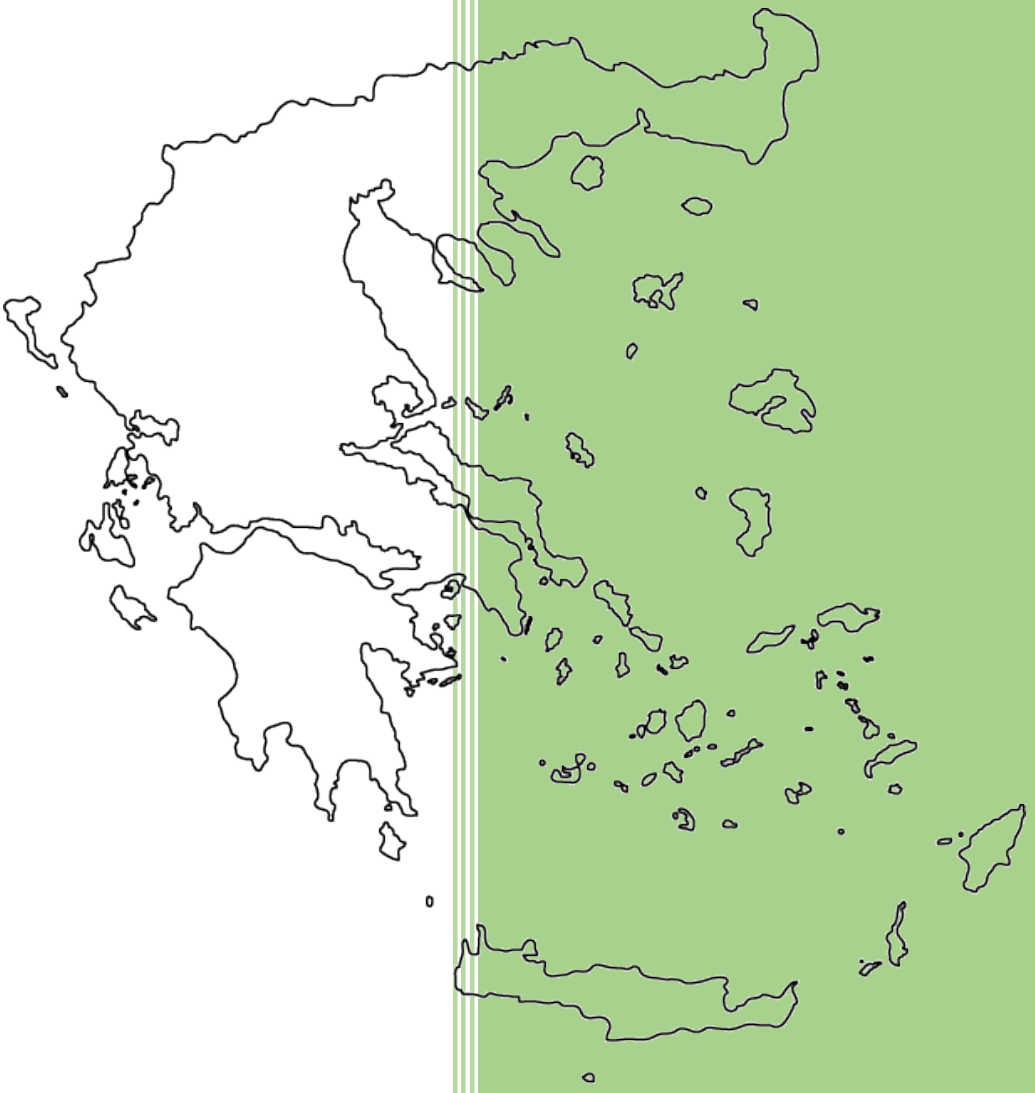
ΕΝΩΣΗ
ΑΣΦΑΛΙΣΤΙΚΩΝ
ΕΤΑΙΡΙΩΝ
ΕΛΛΑΔΟΣ

ΕΠΙΤΡΟΠΗ ΠΕΡΙΟΥΣΙΑΣ, ΑΝΤΑΣΦΑΛΙΣΕΩΝ, ΜΕΤΑΦΟΡΩΝ & ΣΚΑΦΩΝ

NATURAL HAZARD MAPS OF GREECE



Μάρτιος 2018

Table of Contents

A. Introduction 2
B. Cresta zones 2
I. CatNet tool – Swiss Re – Cresta LowRes 2
II. CatNet tool – Swiss Re – Cresta HighRes 3
III. Nathan tool - MunichRE - Cresta LowRes 3
C. Earthquake 4
I. Technical Chamber of Greece – seismic hazard map 4
II. European seismic hazard map 5
III. Nathan tool - MunichRE 6
IV. CatNet tool – Swiss Re 7
D. Flood 9
I. Ministry of Environment & Energy – flood maps 9
II. Nathan tool - MunichRE 11
III. CatNet tool – Swiss Re 12
IV. FM Global 14
V. EIONET Central Data Repository 14
E. Hail 16
I. CatNet tool – Swiss Re 16
F. Wind / Storm 17
I. Nathan tool – MunichRE 17
II. CatNet tool – Swiss Re 18
G. Tornado 19
I. CatNet tool – Swiss Re 19
H. Landslide 20
I. Wildfire 22
I. CatNet tool – Swiss Re 22
II. Nathan tool – MunichRE 22
J. Lighting 25
I. CatNet tool – Swiss Re 25
K. Tsunami 26

ΕΝΩΣΗ
ΑΣΦΑΛΙΣΤΙΚΩΝ
ΕΤΑΙΡΙΩΝ
ΕΛΛΑΔΟΣ

A. Introduction

In this document the natural hazard maps of Greece are presented for perils of earthquake, flood, hail, wind/storm, landslide, wildfire, lighting and tsunami.

B. Cresta zones

The CRESTA zones now comprise a total of 137 countries and feature two resolutions: HighRes (HR) and LowRes (LR). They are based on postal and administrative boundary data rather than being peril-dependent. Choice of two levels of detail: “HighRes” for risk modelling and data exchange, and “LowRes” for cumulative risk analyses and reporting.

Country: Greece

Current Zoning

CRESTA zones: 1188, 5-digit zips

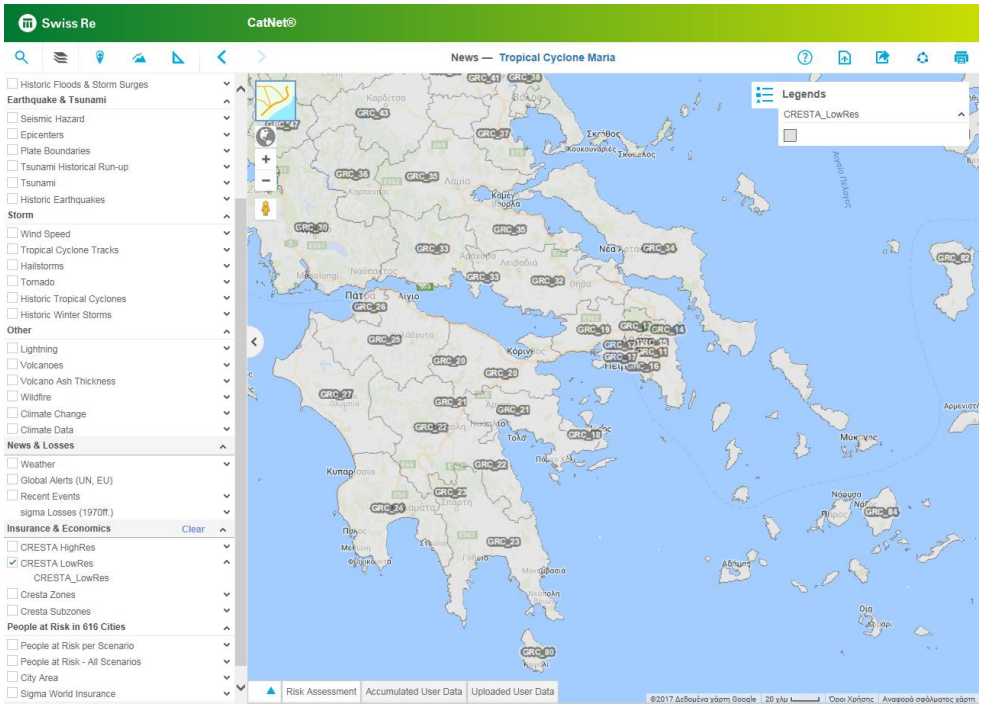
Future Zoning

CRESTA High Res: 1188, 5-digit zips (no change)
CRESTA Low Res: 70, 2-digit zips

The CRESTA_ID definition slightly changed from its initial definition (200): 3-digit country code/underscore/zip or ISO subdivision code (or an assigned ID if not available) (Ref. Swiss Re).

I. CatNet tool – Swiss Re – Cresta LowRes

Ref.: http://www.swissre.com/clients/client_tools/about_catnet.html

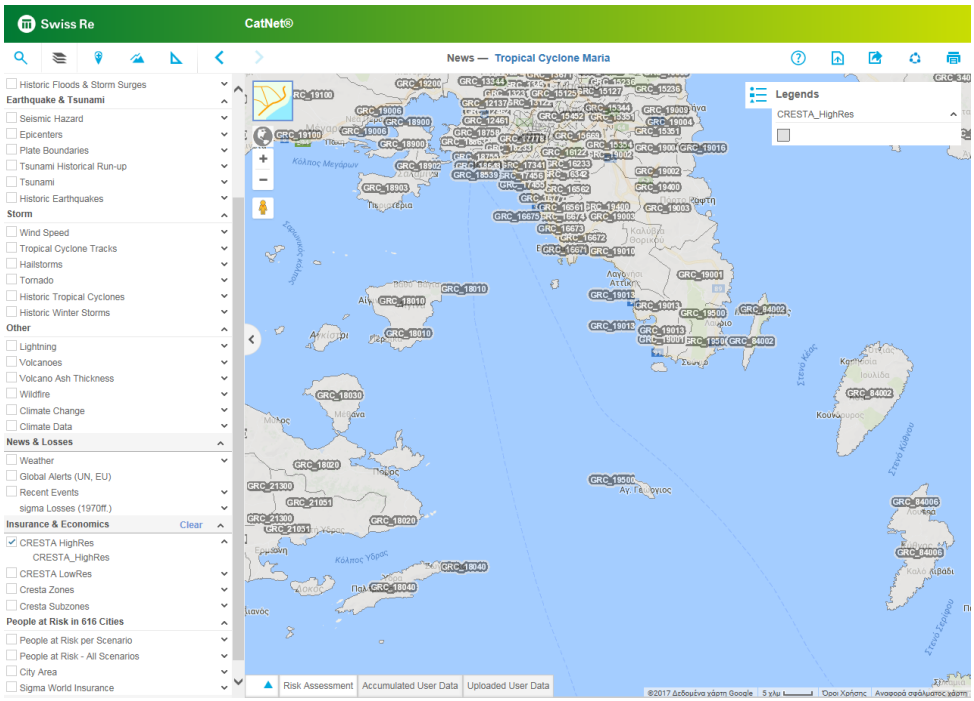


Ref.: Swiss Re’s Copyright

ΕΝΩΣΗ ΑΣΦΑΛΙΣΤΙΚΩΝ ΕΤΑΙΡΙΩΝ ΕΛΛΑΔΟΣ

II. CatNet tool – Swiss Re – Cresta HighRes

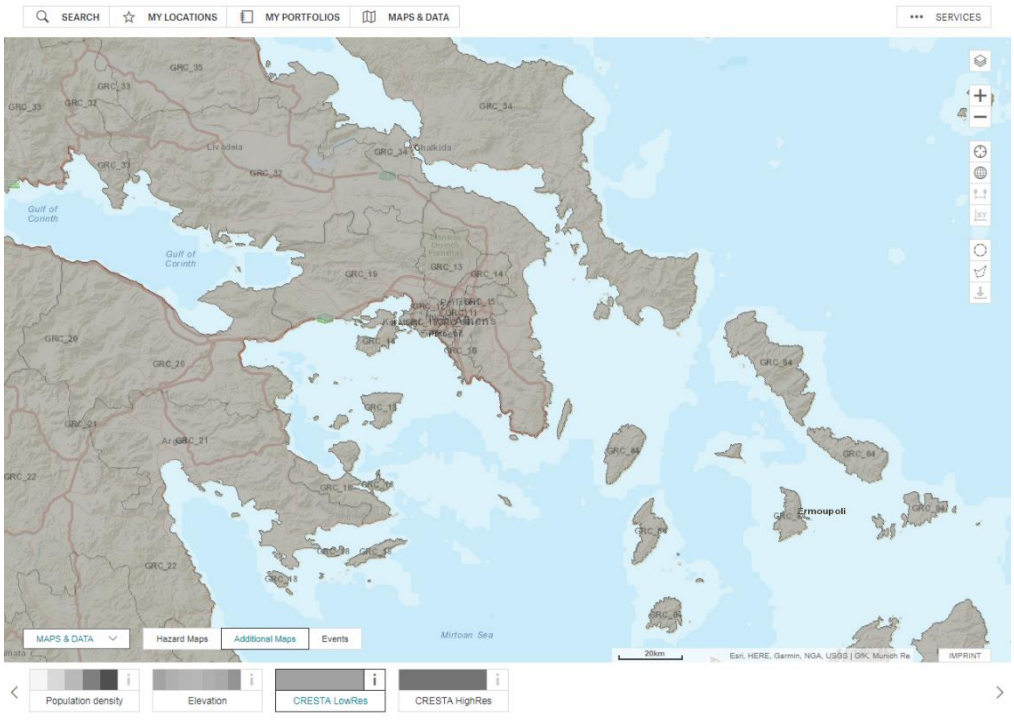
Ref.: http://www.swissre.com/clients/client_tools/about_catnet.html



Ref.: Swiss Re's Copyright

III. Nathan tool - MunichRE - Cresta LowRes

Ref.: http://nathanlight.munichre.com/



Ref.: Munich Re's Copyright

ΕΝΩΣΗ ΑΣΦΑΛΙΣΤΙΚΩΝ ΕΤΑΙΡΙΩΝ ΕΛΛΑΔΟΣ

C. Earthquake

I. Technical Chamber of Greece – seismic hazard map

The new seismological data and the scientific developments that have emerged in recent years have led to a revision of the seismic map of Greece. The new revised map will start to be implemented from the beginning of 2004.

The new Seismic Risk Map is incorporated into the Hellenic Antiseismic Regulation of 2000, which was amended in 2003 (Law: Δ 17α/115/9/ΦΝ 275/7.8.2003). The Earthquake Risk Map of Greece, currently in force, was designed in the period 1986-1989 and began to be implemented in 1995.

With the new map, the Greek area is divided into three zones of seismic risk, unlike the four zones until today where the smallest is abolished. Ground acceleration values are 0.16g (percentage acceleration g) for the first zone, 0.24g for the second zone and 0.36g for the third zone (Ref. Technical Chamber of Greece).

The most important differences between the old map and the new map are the following:

- The abolishment of the low zone (0.12g) and the transition of the areas that belong to it into the zone of 0.16g.
- The boundaries of the zones with soil accelerations of 0.16g and 0.24g changed and some areas moved from the 0.16g zone to the 0.24g zone. These changes mainly concern Central Macedonia, Western Greece, Attica and Peloponnese.
- In Attica, the municipalities of Ano Liosia, Acharnon, Zefyri, Metamorphosis, Lykovrysis, Kamatero, Petroupoli, Nea Philadelphia, Ilion, Agioi Anargyroi, Fylis, Aspropyrgos, Elefsina, Salamina and Aigina as well as the communities of Thrakomakedon, Kalamos, Afidnon, Polydendri and Kapandriti that belonged to the 0.16g zone, passed into the 0.24g zone. Also in Attica, the municipalities of Marathon, Grammatiko, Rafina, Spata, Artemida, Markopoulos, Kalyvia, Kouvara, Keratea, Anavyssos, Saronida, Palea Fokea and Lavreotiki passed into the 0.16g zone.
- In the county of Thessaloniki, the municipalities of Kallithea and Migdonia that belonged to the 0.16g zone, passed into the 0.24g zone. Also, the municipalities of Axios, Michanionas and Epanomis passed from the abolished 0.12g zone into the 0.16g zone.

Ref.:
http://portal.tee.gr/portal/page/portal/SCIENTIFIC_WORK/ARTICLES/033/%D7%C1%D1%D4%C7%D3%20%D3%C5%C9%D3%CC%C9%CA%C7%D3%20%C5%D0%C9%CA%C9%CD%C4%D5%CD%CF%D4%C7%D4%C1%D3.htm

Ref.: Technical Chamber of Greece (Revised Greek Seismic Risk Map)

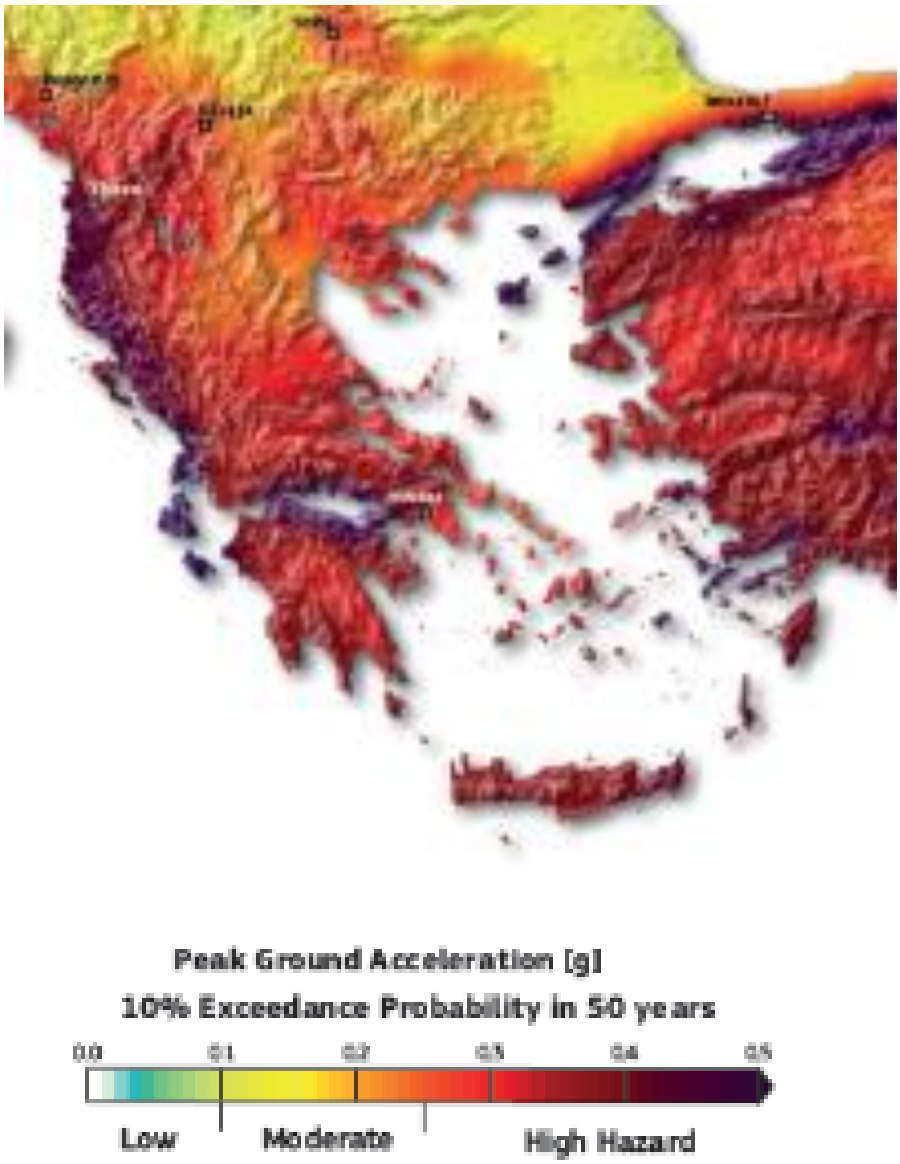
II. European seismic hazard map

SHARE was a Collaborative Project in the Cooperation programme of the Seventh Framework Program of the European Commission. SHARE's main objective was to provide a community-based seismic hazard model for the Euro-Mediterranean region with update mechanisms. The project aims to establish new standards in Probabilistic Seismic Hazard Assessment (PSHA) practice by a close cooperation of leading European geologists, seismologists and engineers.

There are 18 partners involved in the SHARE project and two of them are from Greece:

- Aristotle University of Thessaloniki (AUTH)
- Seismological Laboratory, University of Athens (NKUA)

Ref.: http://www.share-eu.org/

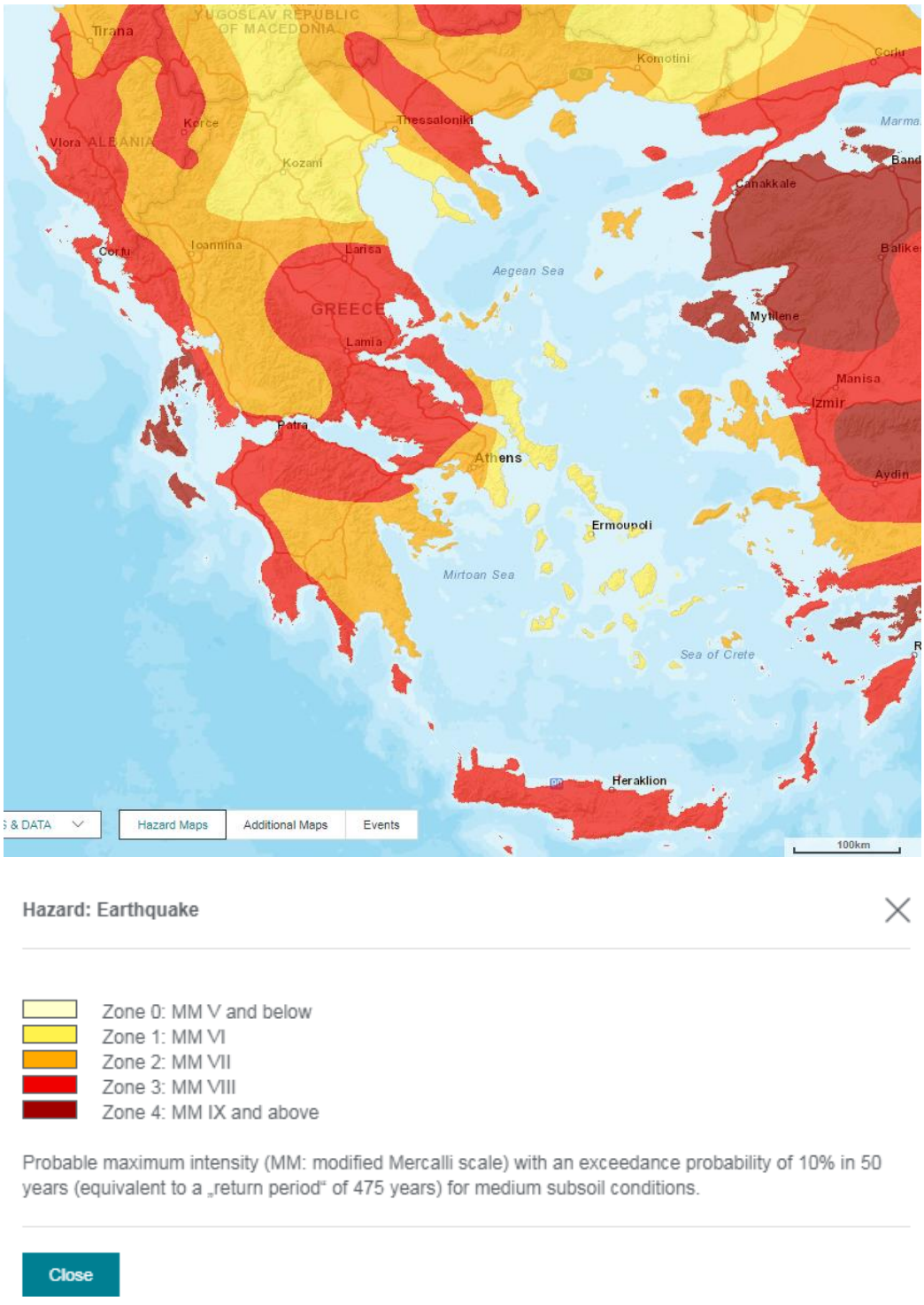


Ref.: http://www.share-eu.org/

III. Nathan tool - MunichRE

Probable maximum intensity (MM: modified Mercalli scale) with an exceedance probability of 10% in 50 years (equivalent to a „return period“ of 475 years) for medium subsoil conditions.

Ref.: http://nathanlight.munichre.com/



Ref.: Munich Re's Copyright

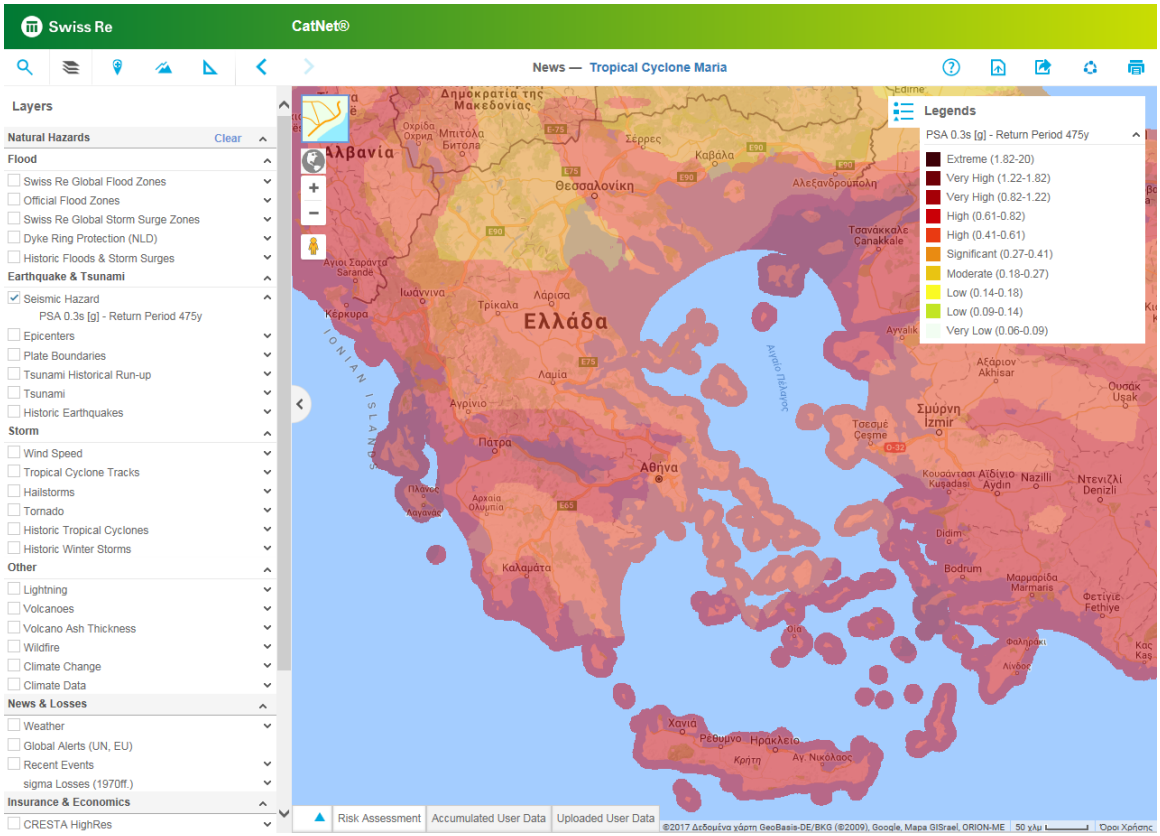
IV. CatNet tool – Swiss Re

Global earthquake hazard map of pseudo spectral accelerations in units of g at a shaking period of 0.3s and for a return period of 475 years based on various sources.

ΕΝΩΣΗ ΑΣΦΑΛΙΣΤΙΚΩΝ ΕΤΑΙΡΙΩΝ ΕΛΛΑΔΟΣ

Source: Swiss Re approach based on combining Swiss Re models with scientific data by calibrating to a common intensity measure.

Ref.: http://www.swissre.com/clients/client_tools/about_catnet.html



Ref.: Swiss Re's Copyright

ΕΝΩΣΗ ΑΣΦΑΛΙΣΤΙΚΩΝ ΕΤΑΙΡΙΩΝ ΕΛΛΑΔΟΣ

D. Flood

I. Ministry of Environment & Energy – flood maps

Flood hazard maps for all areas of Greece can be found on the following site of the Ministry of Environment and Energy: Ref.: http://floods.ypeka.gr/index.php/xartes-epikindynotitas

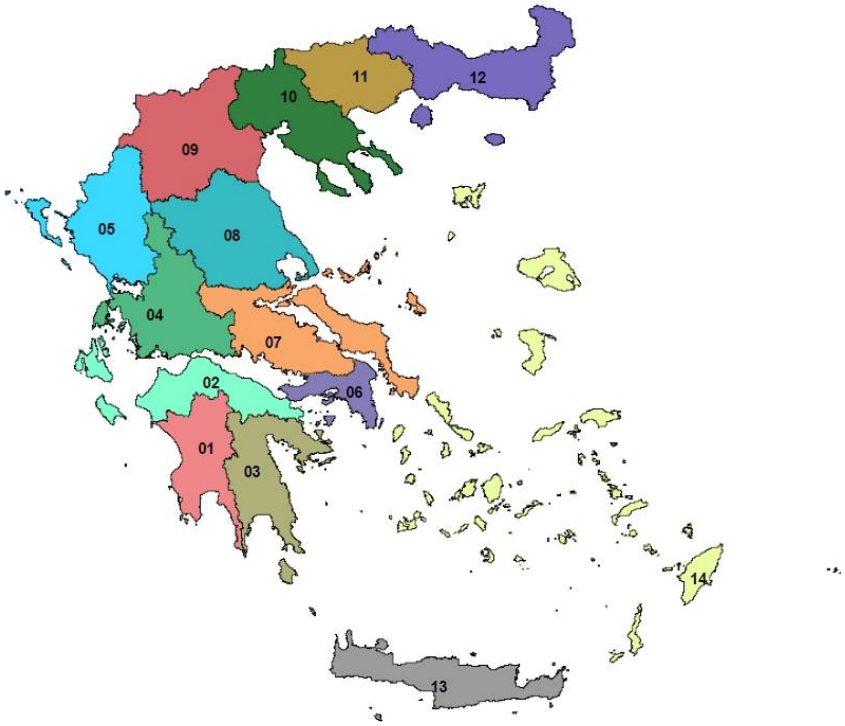
The flood hazard maps are prepared for the areas of potentially high flood risk that were identified during the Preliminary Flood Risk Assessment (PFRA). The flood risk maps show the zones that could be flooded according to the following scenarios:

- floods of low probability of exceedance or extreme phenomena scenarios (indicative return period of 1000 years)
- floods of average probability of exceedance (probable return period of at least 100 years)
- floods with high probability of exceedance, depending on each case (ie. frequent phenomena: indicative return period of 50 years)

For coastal zones where there is an adequate level of protection and for flood-affected areas due to groundwater, the preparation of flood hazard maps is limited to the flood scenario of low probability of exceedance.

The flood hazard maps are presented on a scale of 1:25000 and show the flooded surface, the maximum water depth, the maximum flow velocity and table with arrival and stay times of the flood wave at points of interest within the flooded areas.

The picture below presents the several water areas of Greece.



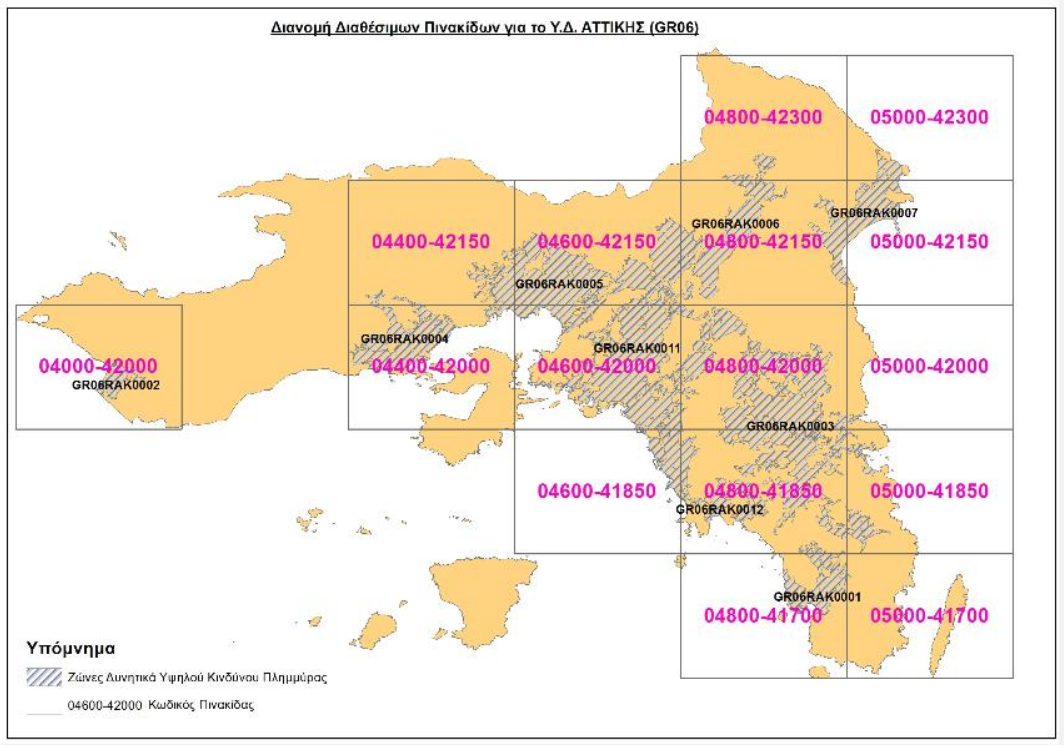
Ref.: http://floods.ypeka.gr/index.php/ydatika-diamerismata

ΕΝΩΣΗ ΑΣΦΑΛΙΣΤΙΚΩΝ ΕΤΑΙΡΙΩΝ ΕΛΛΑΔΟΣ

Attica Region (GR06)

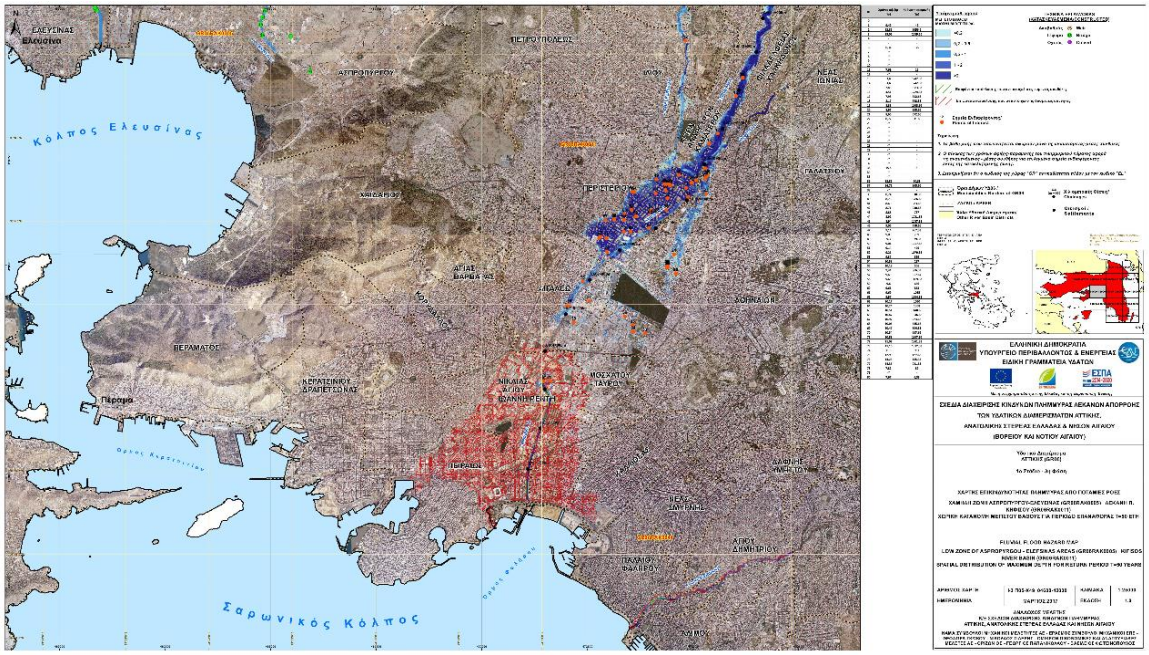
The flood hazard maps have been developed in the following High Flood Potential Areas that were identified during the Preliminary Flood Risk Assessment (YPEKA-EGY, 2012):

- Coastal areas of Saronida-Anavyssos-Palea Fokea (GR06RAK0001)
- Lower zone of Loutraki (GR06RAK0002)
- Area of Mesogeia (GR06RAK0003)
- Lower zone of Megara-N.Peramos (GR06RAK0004)
- Lower zone of Aspropyrgos-Elefsina (GR06RAK0005)
- Lower zone of Marathon artificial basin (GR06RAK0006)
- Coastal flat area of Marathon-Nea Makri (GR06RAK0007)
- Basin of Kifissos (GR06RAK0011)
- Coastal areas of Glyfada-Voula (GR06RAK0012) and of Vari-Agia Marina Koropi.



Ref.:
http://thyamis.itia.ntua.gr/egyFloods/gr06/gr06_maps_jpg_p05/maxdepth/GR06_P05_S1_MD_T50_04600-42000.jpg

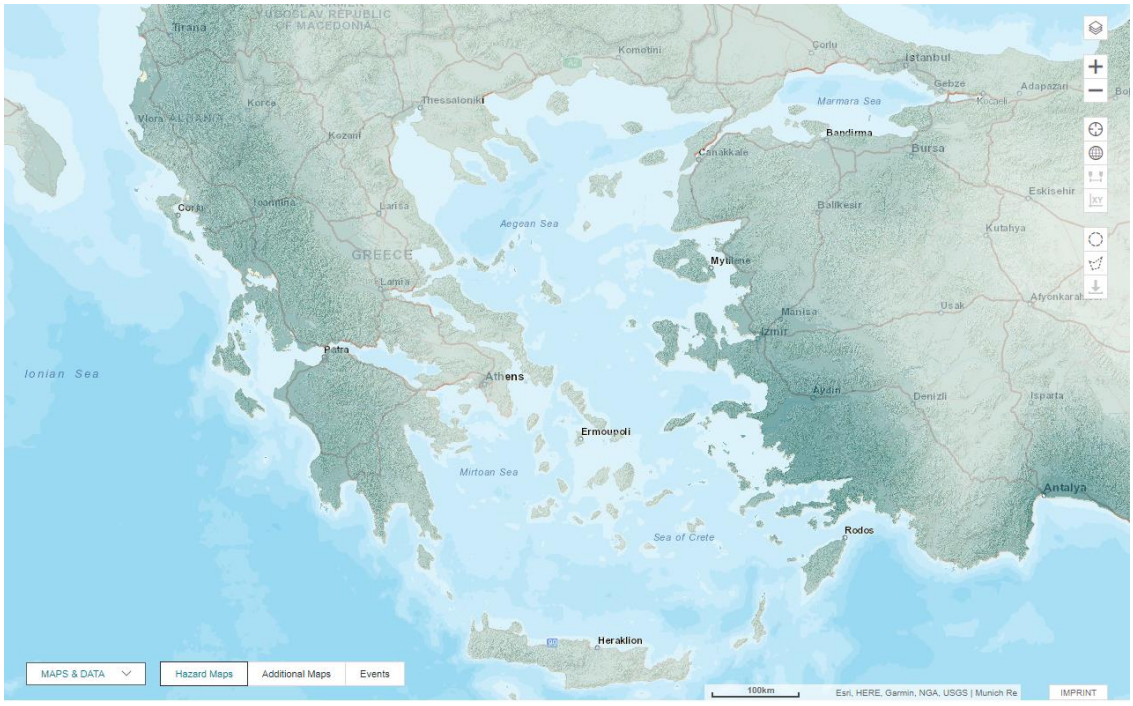
ΕΝΩΣΗ ΑΣΦΑΛΙΣΤΙΚΩΝ ΕΤΑΙΡΙΩΝ ΕΛΛΑΔΟΣ



II. Nathan tool - MunichRE

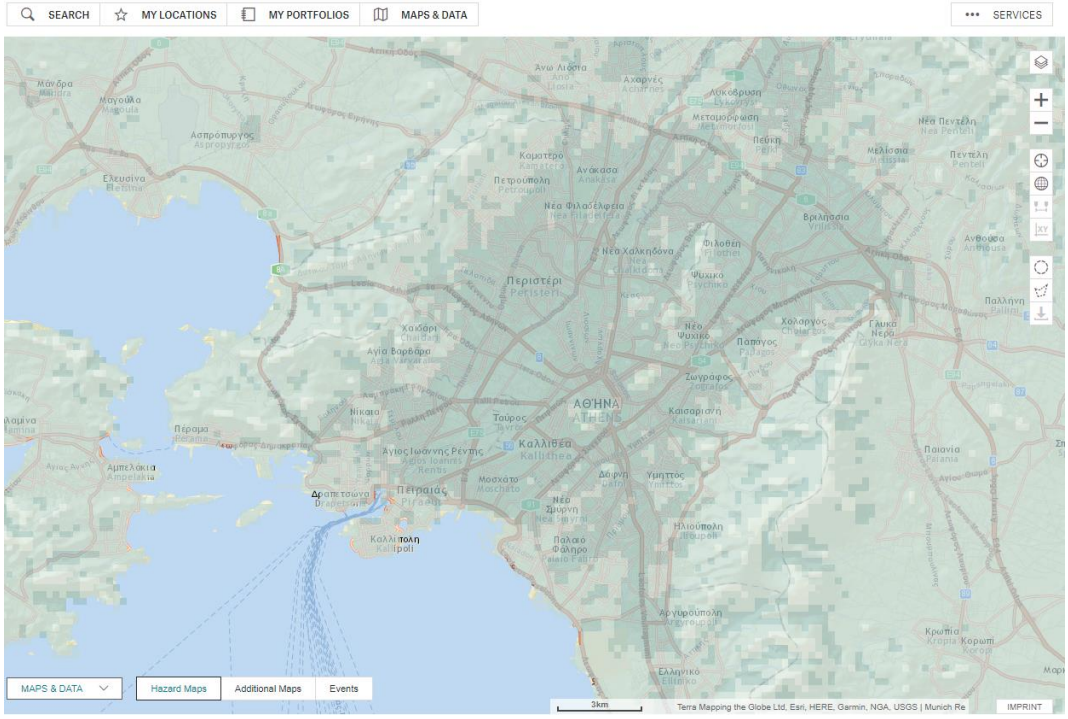
Frequency and intensity of flash floods.

Ref.: http://nathanlight.munichre.com/

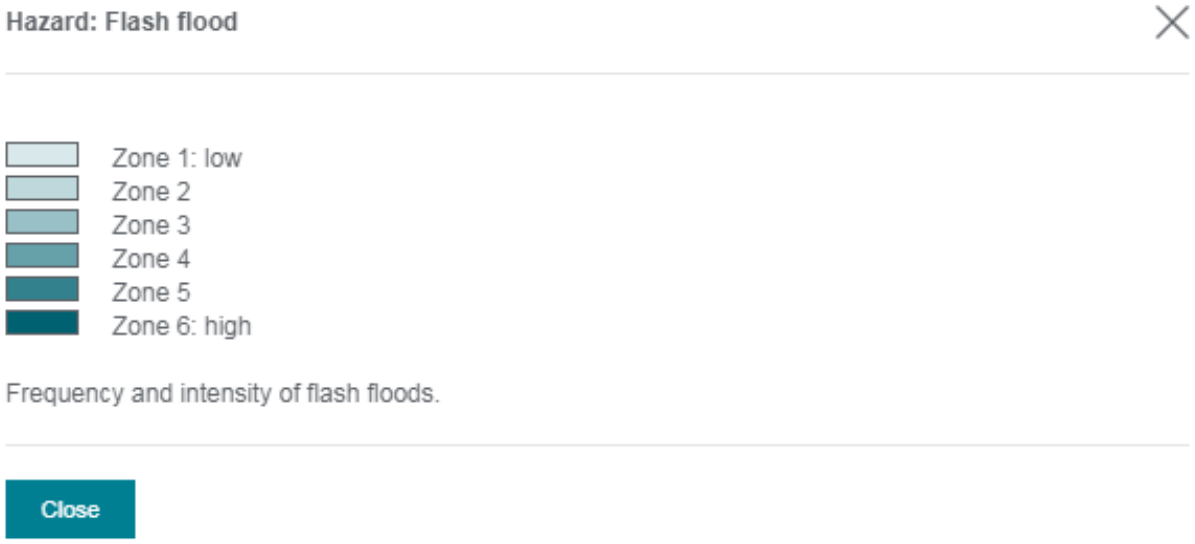


ΕΝΩΣΗ ΑΣΦΑΛΙΣΤΙΚΩΝ ΕΤΑΙΡΙΩΝ ΕΛΛΑΔΟΣ

Attica Region



Ref.: Munich Re's Copyright



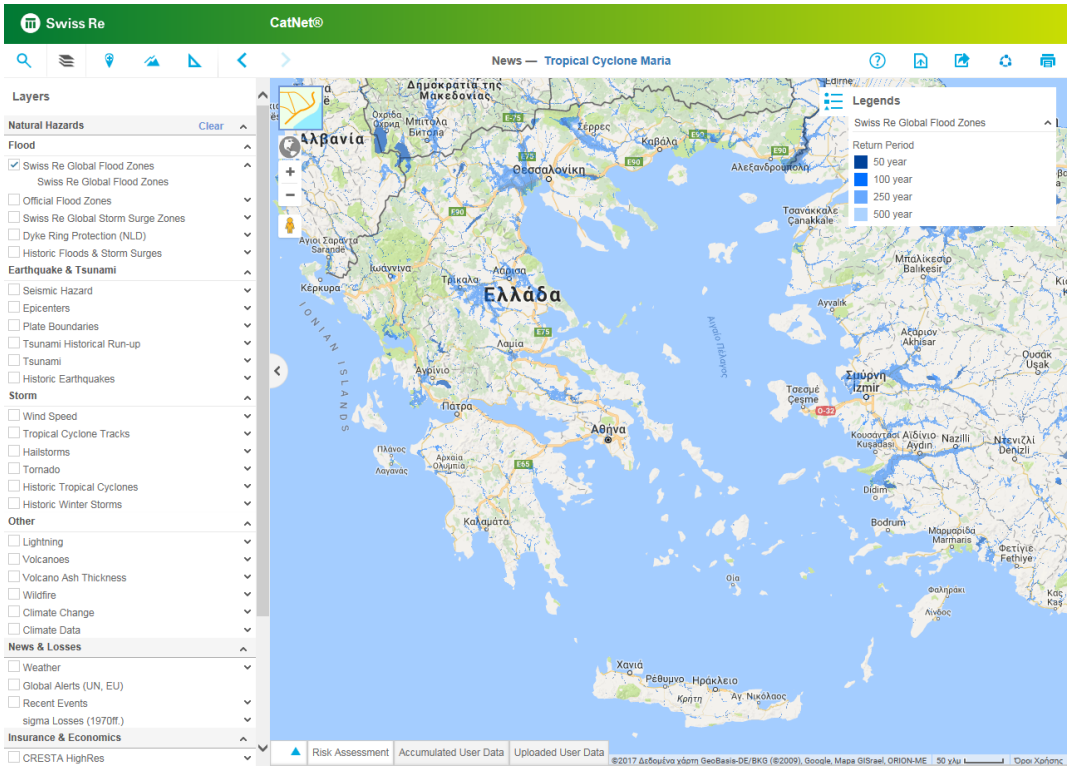
Ref.: Munich Re's Copyright

III. CatNet tool – Swiss Re

Swiss Re's Global Storm Surge Zones are based on a high resolution digital terrain model (acquired on 5 meter resolution for Europe). The effect of tides is considered during the modelling while the effect of flood protection measures is not taken into account, i.e. the Storm Surge Zones provide an "unprotected" view, corresponding to a view when flood/surge protection measures fail. The new zones are available on a 30 meter resolution and replace the previous Coastal Flood Risk Layer which was purely based on topography (i.e. elevation and distance to coast).

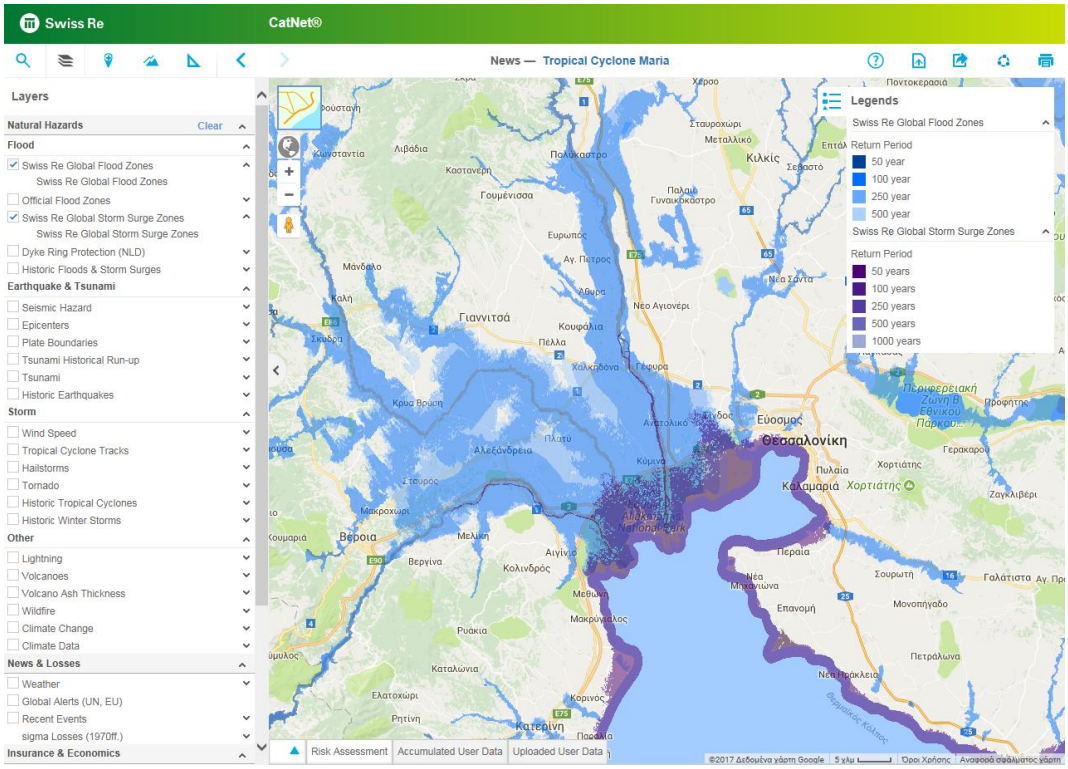
CatNet river flood zones are based either on Swiss Re Global Flood Zones or on flood zones that are officially used or developed by the insurance industry.

Ref.: http://www.swissre.com/clients/client_tools/about_catnet.html



Ref.: Swiss Re's Copyright

THESSALONIKI REGION (FLOOD & STORM SURGE)



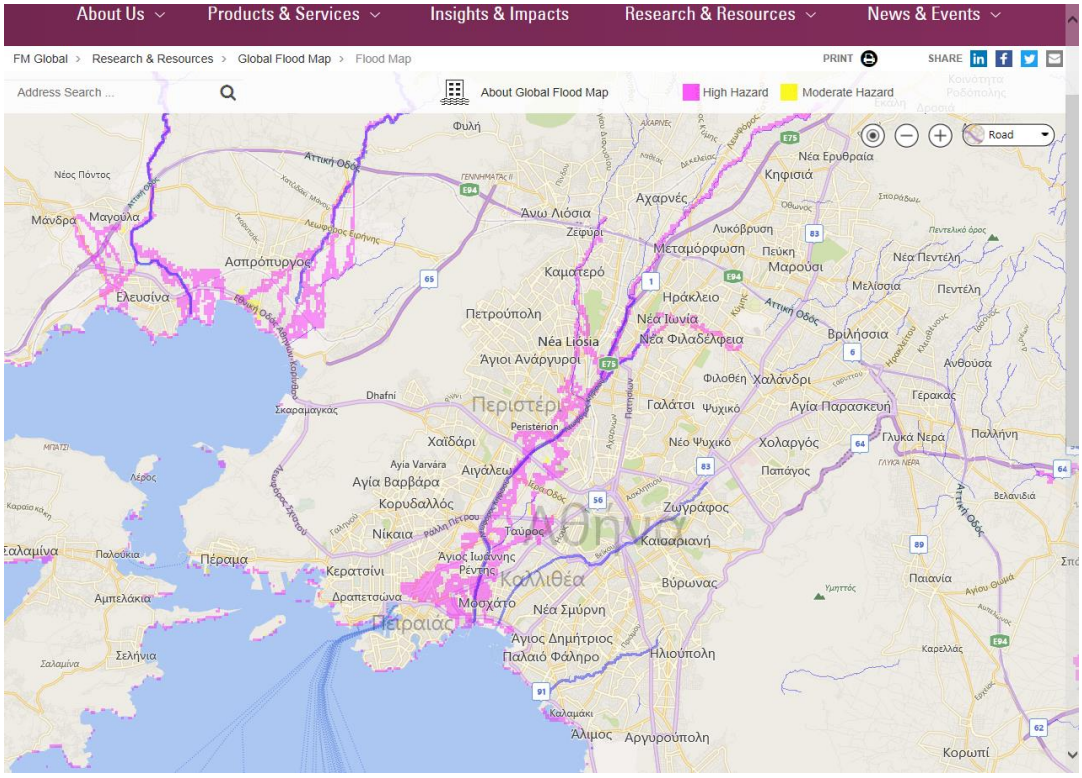
Ref.: Swiss Re's Copyright

ΕΝΩΣΗ ΑΣΦΑΛΙΣΤΙΚΩΝ ΕΤΑΙΡΙΩΝ ΕΛΛΑΔΟΣ

IV. FM Global

FM Global has conducted research building on the data and experience of governmental and research organizations to develop a Global Flood Map that identifies areas exposed to moderate or high-hazard flooding. In addition to historical flood data, the Global Flood Map is derived from physically based hydrology and hydraulic scientific data, which accounts for variable external factors such as rainfall, evaporation, snowmelt and terrain. The Global Flood Map is particularly valuable in parts of the world where local or regional flood maps are inconsistent or unavailable. The Global Flood Map currently displays high (100-year) and moderate (500-year) hazard flood zones via a 90 x 90 meter grid.

Ref.: http://www.fmglobal.com/research-and-resources/global-flood-map/flood-map



Ref.: FM Global's Copyright

V. EIONET Central Data Repository

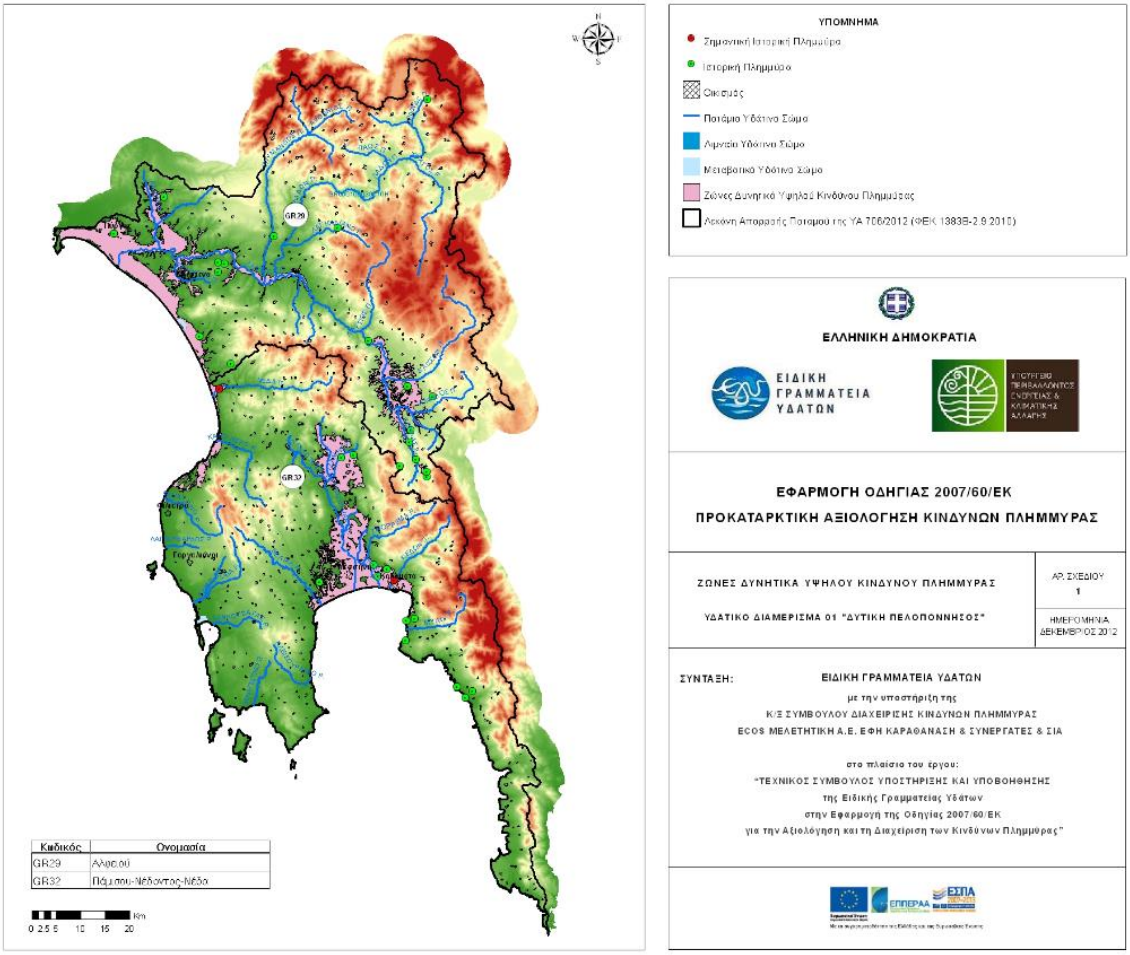
The Central Data Repository is like a bookshelf with data reports on the environment as submitted to international clients. Each country either has a collection for its deliveries or a referral to a different preferred repository. The data reports within each country collection are arranged under the relevant reporting obligations or agreements. The Directive covers all types of floods, including fluvial, pluvial, coastal and groundwater floods as well as floods from artificial water-bearing infrastructure and may exclude floods from sewerage systems.

ΕΝΩΣΗ ΑΣΦΑΛΙΣΤΙΚΩΝ ΕΤΑΙΡΙΩΝ ΕΛΛΑΔΟΣ

Article 6 of the Floods Directive requires Member States to prepare flood hazard and flood risk maps (at the river basin level and at the most appropriate scale) for the areas of potential significant flood risk identified under Article 5 or 13.1(a), or for the areas for which Member States decided to prepare flood maps according to Article 13.1(b).

Flood hazard maps show the geographical area which could be flooded under different scenarios (Article 6.3), whereas flood risk maps show the potential adverse consequences of these flood scenarios (Article 6.5).

Ref.: http://rod.eionet.europa.eu/obligations/602/overview



Ref.: http://cdr.eionet.europa.eu/gr/eu/floods/coluuhqng/envuuhqag/overview

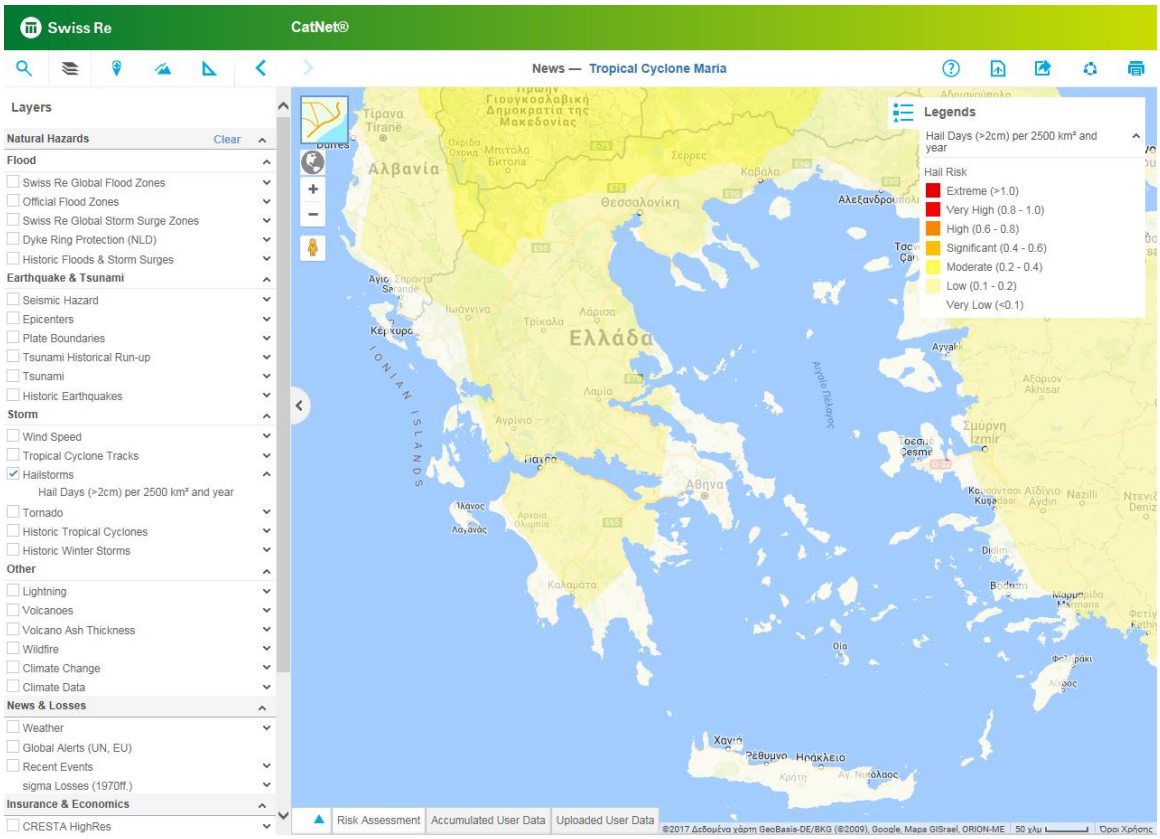
E. Hail

I. CatNet tool – Swiss Re

The global hail map shows the expected number of hail days per year with a hail diameter larger than 2 centimeters related to an area of 50km x 50km. As a rule of thumb divide the value by 20 to get the risk per individual location to be affected by a major hailstorm. Hailstones >2cm can create substantial damage to buildings, cars, crop etc. Example: 0.4 hail days per year and 2500km² relate to 0.02 hail days per location or one severe hailstorm once every 50 years.

The map combines numerous data sources such as scientific literature about the global and regional climatological distribution of hail frequency and severity, Swiss Re's internal claims and hail model data, reports of severe hail events and expert judgment of Swiss Re's Atmospheric Perils Specialists.

Ref.: http://www.swissre.com/clients/client_tools/about_catnet.html)



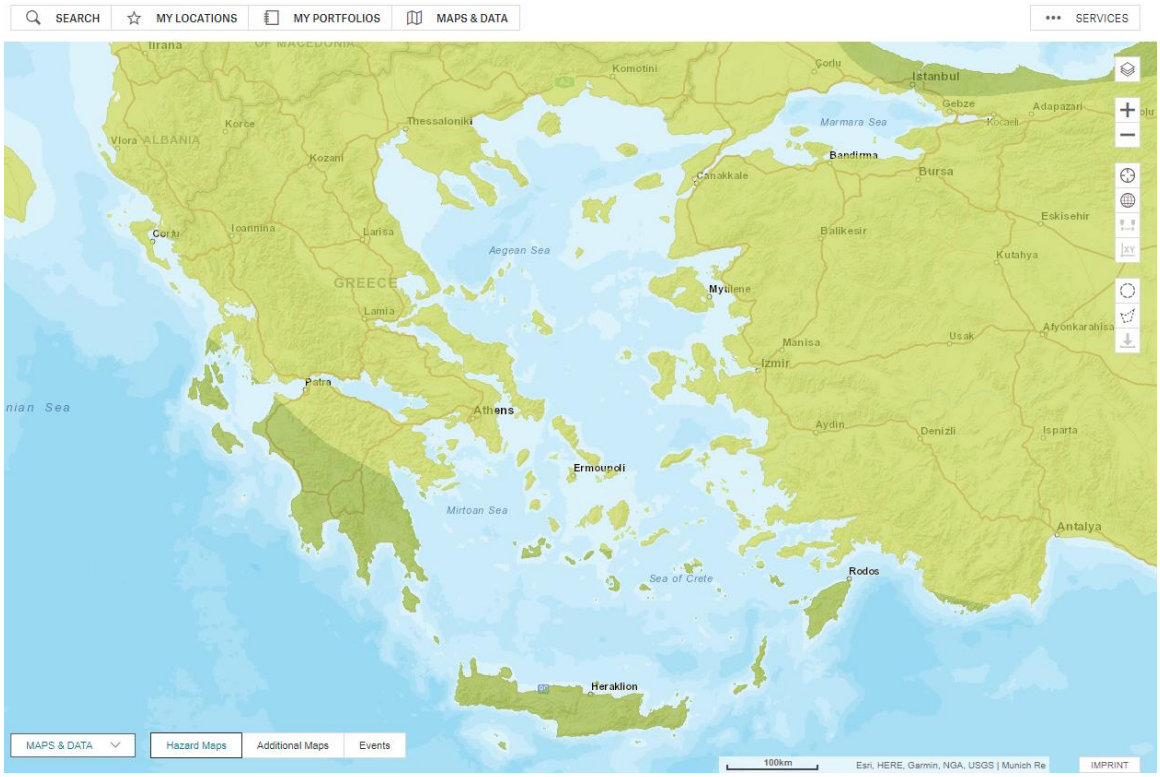
Ref.: Swiss Re's Copyright

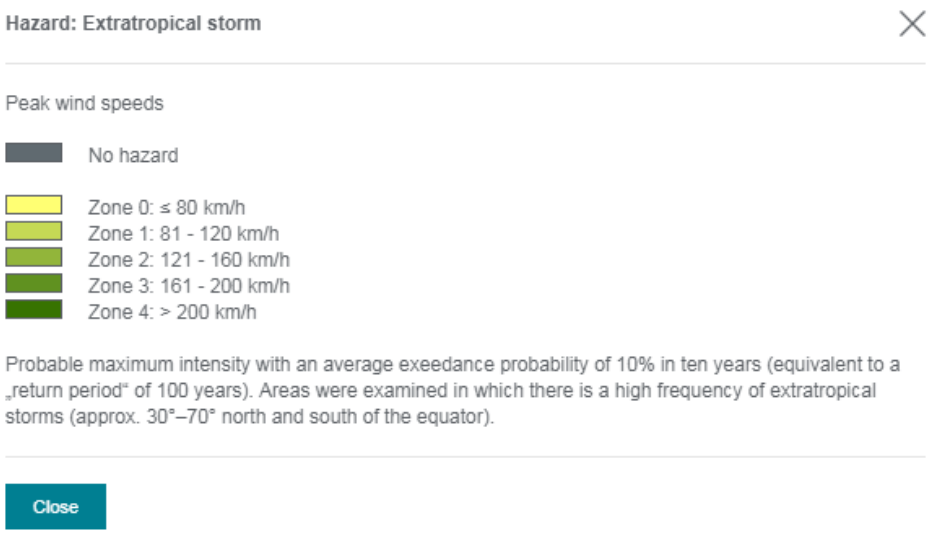
F. Wind / Storm

I. Nathan tool – MunichRE

Probable maximum intensity with an average exceedance probability of 10% in ten years (equivalent to a return period of 100 years).

Ref.: http://nathanlight.munichre.com/





Ref.: Munich Re's Copyright

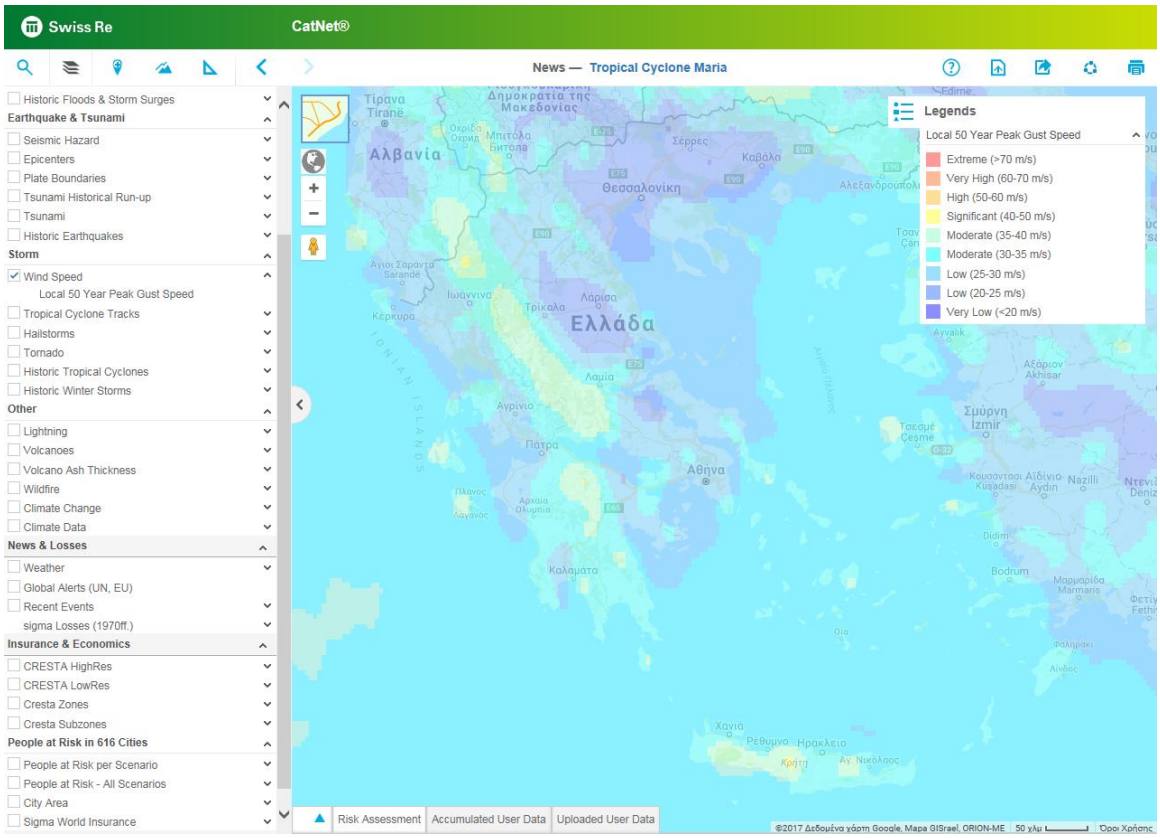
ΕΝΩΣΗ ΑΣΦΑΛΙΣΤΙΚΩΝ ΕΤΑΙΡΙΩΝ ΕΛΛΑΔΟΣ

II. CatNet tool – Swiss Re

The wind speed data shows the 3 seconds peak gust with a return period of 50 years. The units displayed are meters per second (1 m/s = 3.6 km/h = 2.24 kn).

The wind speed information given here covers mid to large scale weather events such as tropical cyclones (typhoons, hurricanes) and extra-tropical cyclones (winter storms). Not considered are smaller scale weather events such as severe convective storms (e.g. thunderstorms), regional orographic winds (e.g. Föhn, Bora, Mistral or Chinook) and tornadoes (see the tornado hazard map).

Ref.: http://www.swissre.com/clients/client_tools/about_catnet.html



Ref.: Swiss Re's Copyright

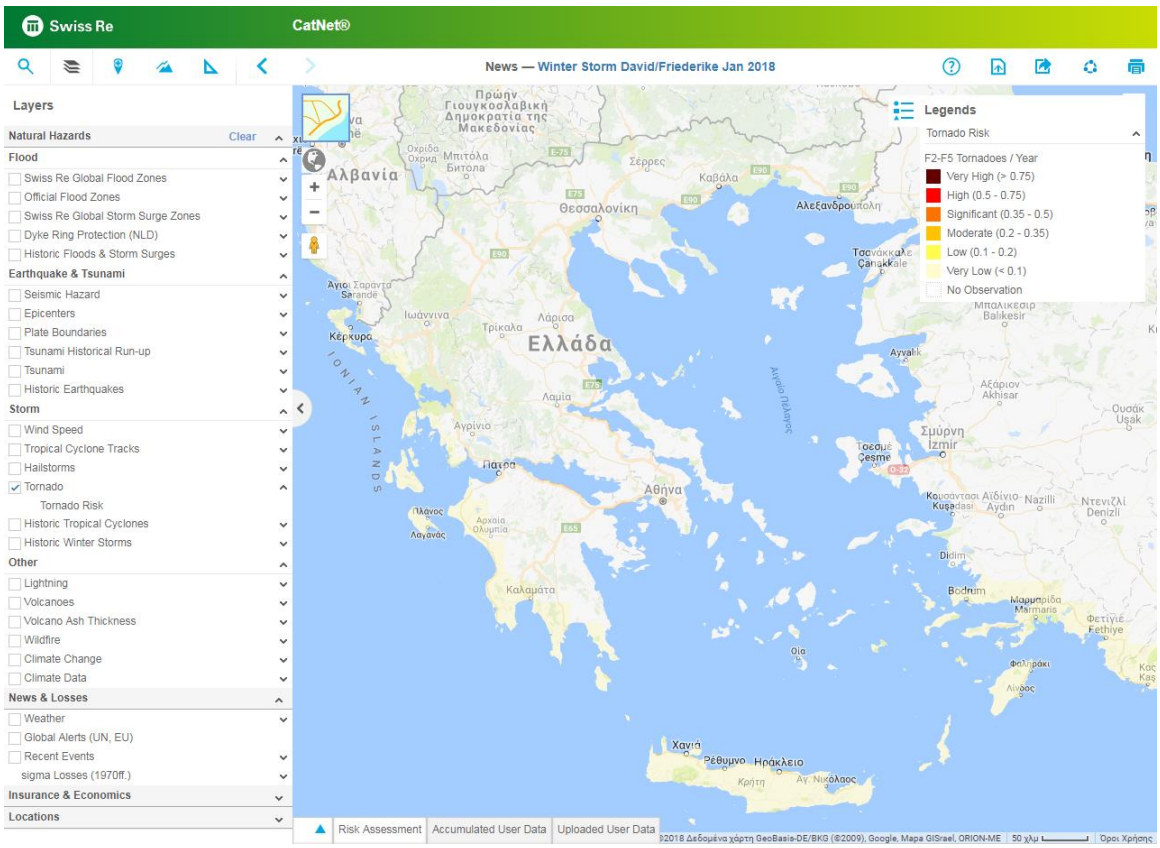
ΕΝΩΣΗ ΑΣΦΑΛΙΣΤΙΚΩΝ ΕΤΑΙΡΙΩΝ ΕΛΛΑΔΟΣ

G. Tornado

I. CatNet tool – Swiss Re

A combination of the knowledge of Swiss Re's Atmospheric Perils Specialists, own interpretations of tornado models and recent event observations built the basis to define the hazard zones in a general way. Note that due to the lack of detailed information, mean values per class range were defined to represent the average yearly tornado occurrence.

Ref.: http://www.swissre.com/clients/client_tools/about_catnet.html

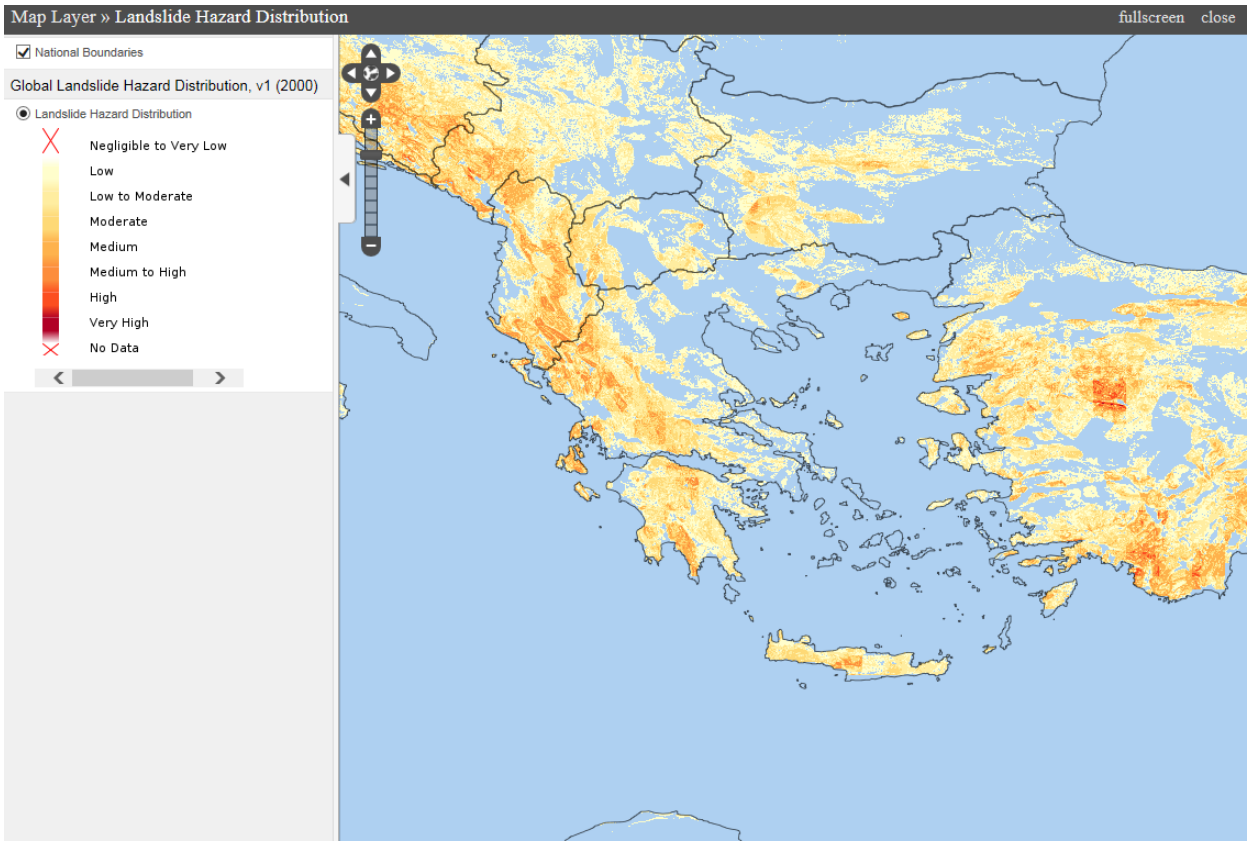


Ref.: Swiss Re's Copyright

H. Landslide

1) Global Landslide Hazard Distribution is a 2.5 minute grid of global landslide and snow avalanche hazards based upon work of the Norwegian Geotechnical Institute (NGI). The hazards mapping of NGI incorporates a range of data including slope, soil, soil moisture conditions, precipitation, seismicity, and temperature. This data set is the result of collaboration among the Columbia University Center for Hazards and Risk Research (CHRR), Norwegian Geotechnical Institute (NGI), and Columbia University Center for International Earth Science and Information Network (CIESIN).

Ref.: http://www.ldeo.columbia.edu/chrr/research/hotspots/coredata.html
Ref.: http://sedac.ciesin.columbia.edu/data/set/ndh-landslide-hazard-distribution



2) European Landslide Susceptibility Map (ELSUS1000) v1

The map shows landslide susceptibility levels at continental scale, derived from heuristic-statistical modelling of main landslide conditioning factors using also landslide location data.

The map has been produced jointly by the Federal Institute for Geosciences and Natural Resources (BGR, Hannover, Germany), the Joint Research Centre (JRC, Ispra, Italy), the Institute of Physics of the Globe (CNRS-EOST, Strasbourg, France), and the Research Institute for Hydrogeological Protection (CNR-IRPI, Perugia, Italy), as part of the work of the European Landslide Expert Group, with contributions from other members of the Group.

ΕΝΩΣΗ ΑΣΦΑΛΙΣΤΙΚΩΝ ΕΤΑΙΡΙΩΝ ΕΛΛΑΔΟΣ

The map is available to download together with ancillary spatial datasets used for landslide susceptibility modelling, or produced for referencing to administrative regions and for evaluation of the confidence level of the classified landslide susceptibility.

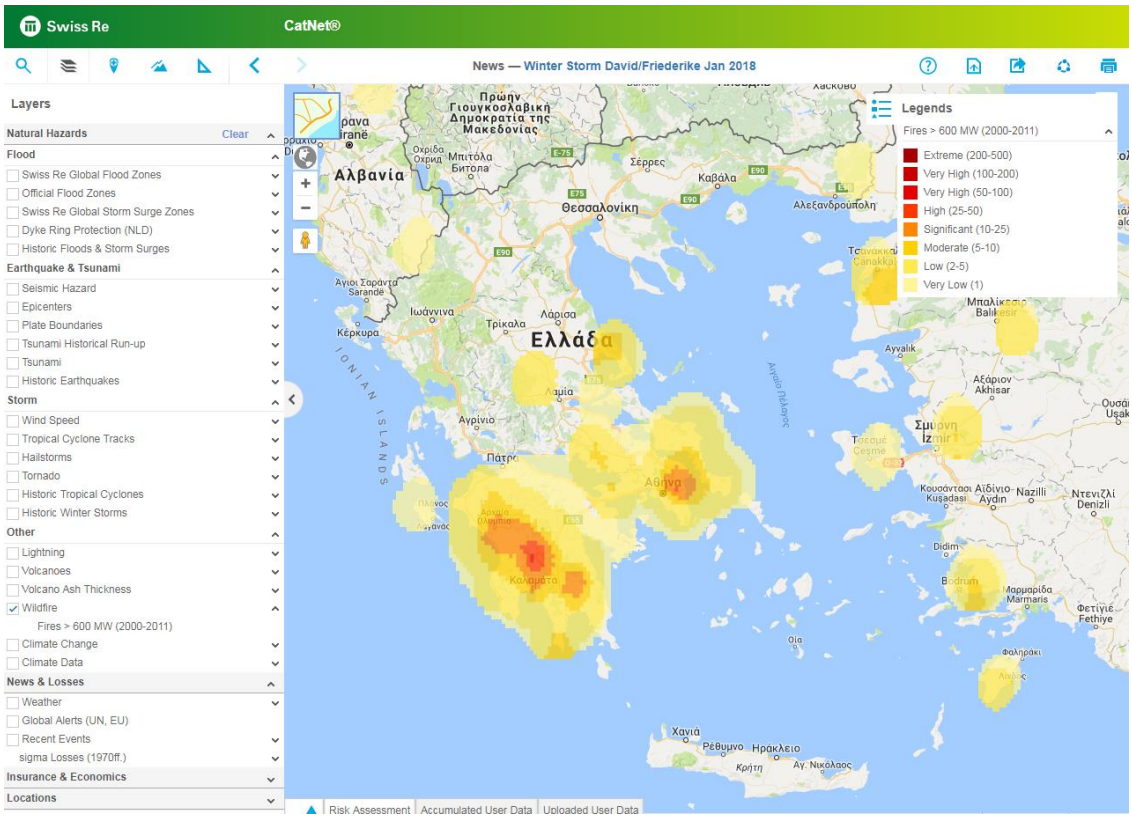
Ref.:
https://esdac.jrc.ec.europa.eu/content/european-landslide-susceptibility-map-elsus1000-v1#tabs-0-description=0

I. Wildfire

I. CatNet tool – Swiss Re

The Wildfire Map shows the number of fire with intensity above 600 MW in period November 2000 - December 2011. The dataset is based on MODIS Satellite measurements with an original resolution of 1km*1km. The data is provided by the University of Maryland. Basis for the map is the assumption that a very small percentage of all wildfires is responsible for a large part of losses. These fires have a very high intensity (>600 MW) and are difficult to combat.

Ref.: http://www.swissre.com/clients/client_tools/about_catnet.html

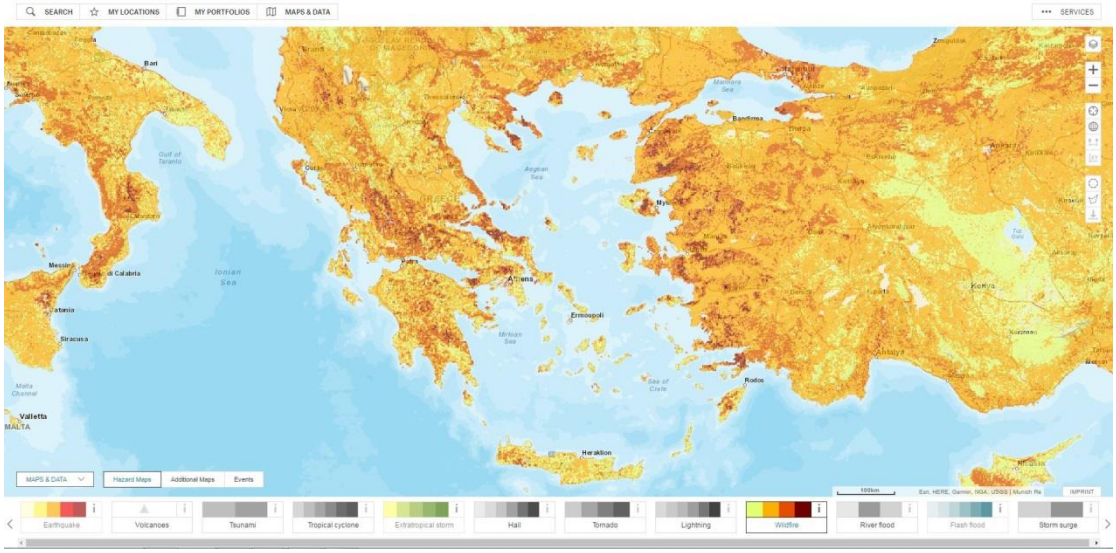


Ref.: Swiss Re's Copyright

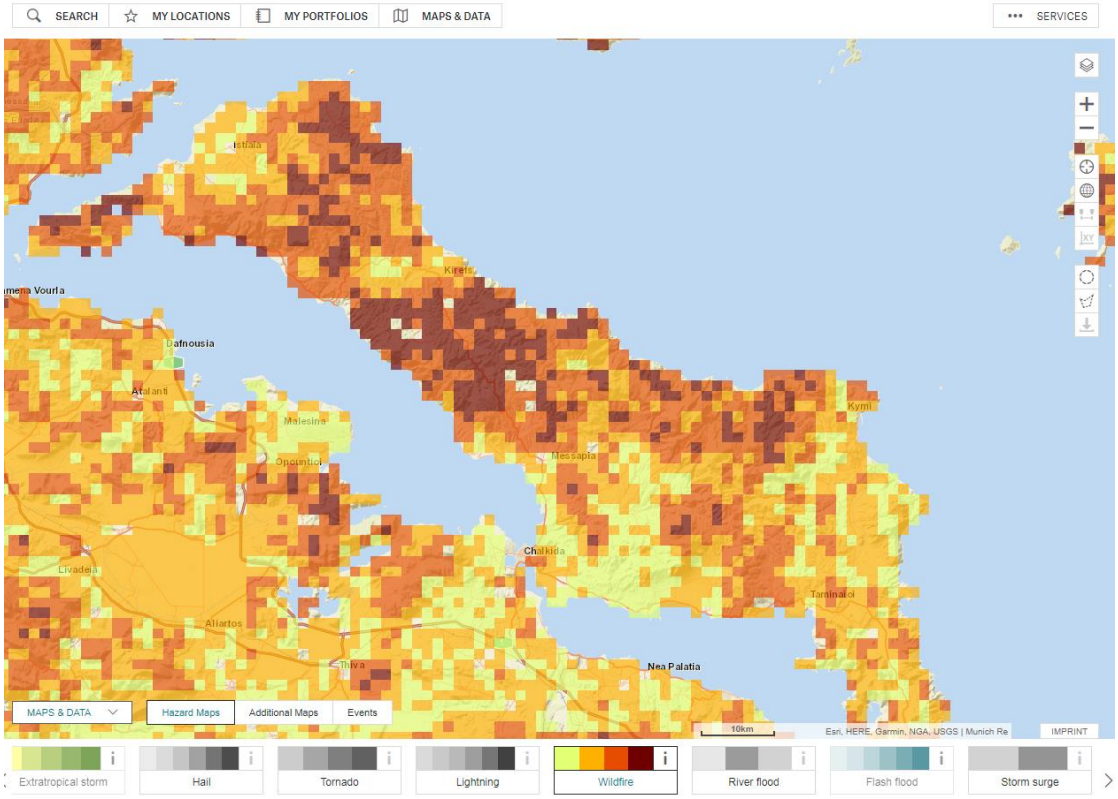
II. Nathan tool – MunichRE

The effects of wind, arson and fire-prevention measures are not considered.

Ref. http://nathanlight.munichre.com/

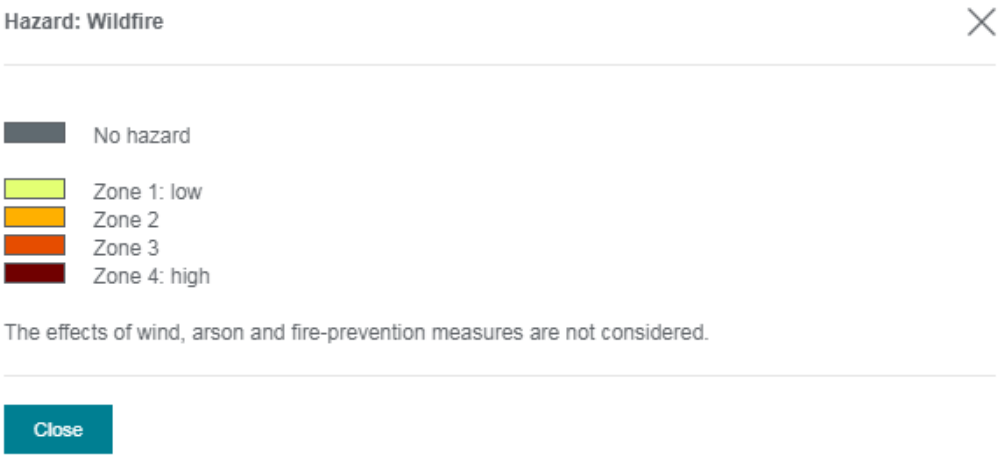


EVIA ISLAND



Ref.: Munich Re's Copyright

ΕΝΩΣΗ ΑΣΦΑΛΙΣΤΙΚΩΝ ΕΤΑΙΡΙΩΝ ΕΛΛΑΔΟΣ



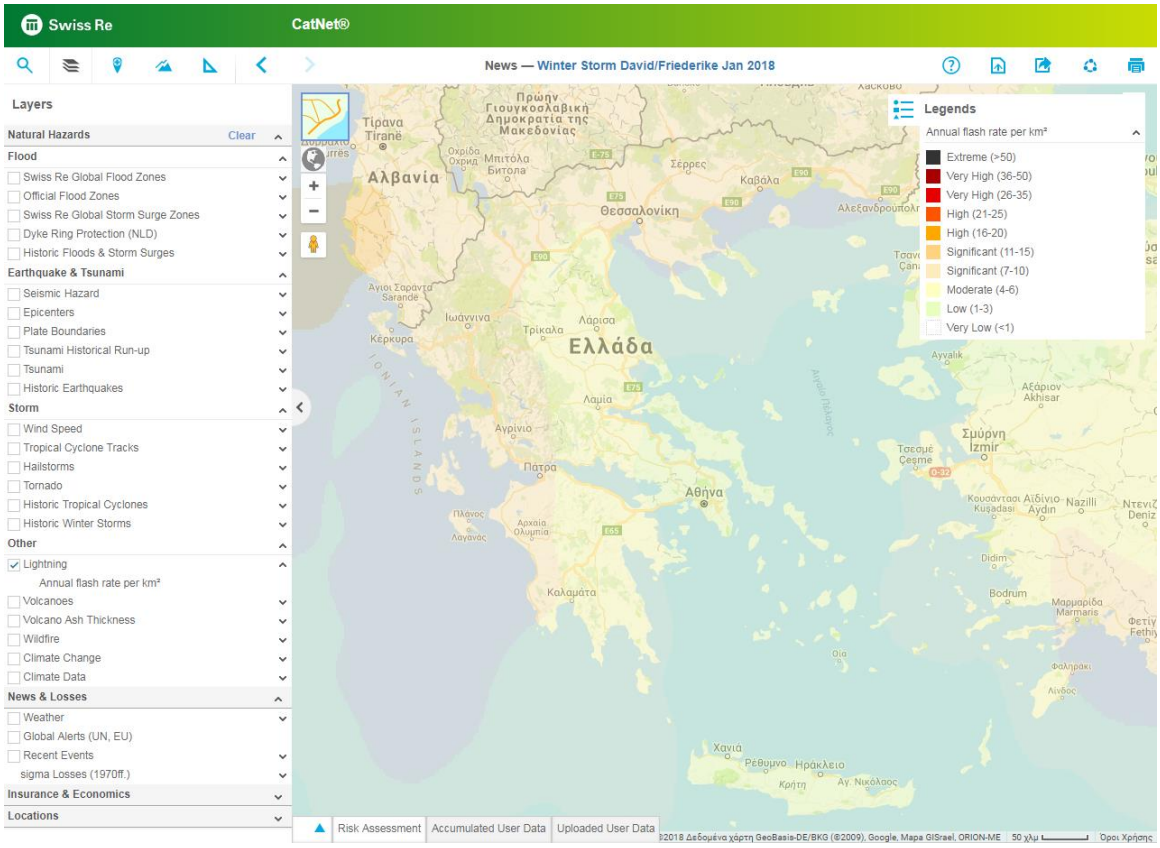
Ref.: Munich Re's Copyright

ΕΝΩΣΗ
ΑΣΦΑΛΙΣΤΙΚΩΝ
ΕΤΑΙΡΙΩΝ
ΕΛΛΑΔΟΣ

J. Lighting

I. CatNet tool – Swiss Re

The global lightning hazard layer shows the mean annual flash rate per square kilometer. Data Source: NASA Earth Science Data and Information System (ESDIS) Project and the Global Hydrology Resource Centre (GHRC) Distributed Active Archive Centre (DAAC).



Ref.: Swiss Re's Copyright

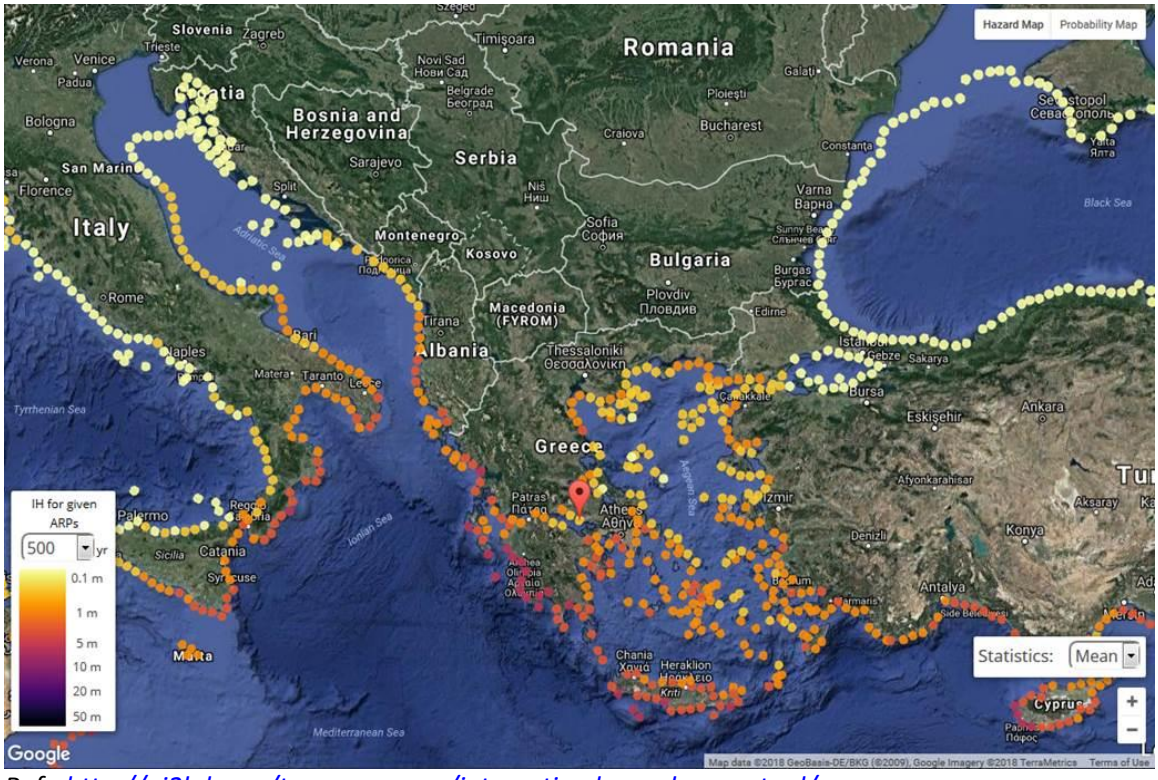
K. Tsunami

The largest tsunami generating EQ fault in the Mediterranean sea is the Hellenic Subduction Trench, which runs East/West south of Crete. Therefore, because of the position and the amount of coastal area, Greece is actually one of the most exposed countries to Tsunami in the Mediterranean (together with some North Africa countries). Tsunami modelling is not as developed as other perils, but recently there has been quite some fast development in the area, particularly for the Mediterranean.

The long term development project is the Global Tsunami Model (GTM) which is still in the makings. However, for the NEAM region (North-East Atlantic and Mediterranean area) there is the TSUMAP-NEAM project available, a EU funded project which has been completed and has released very interesting data.

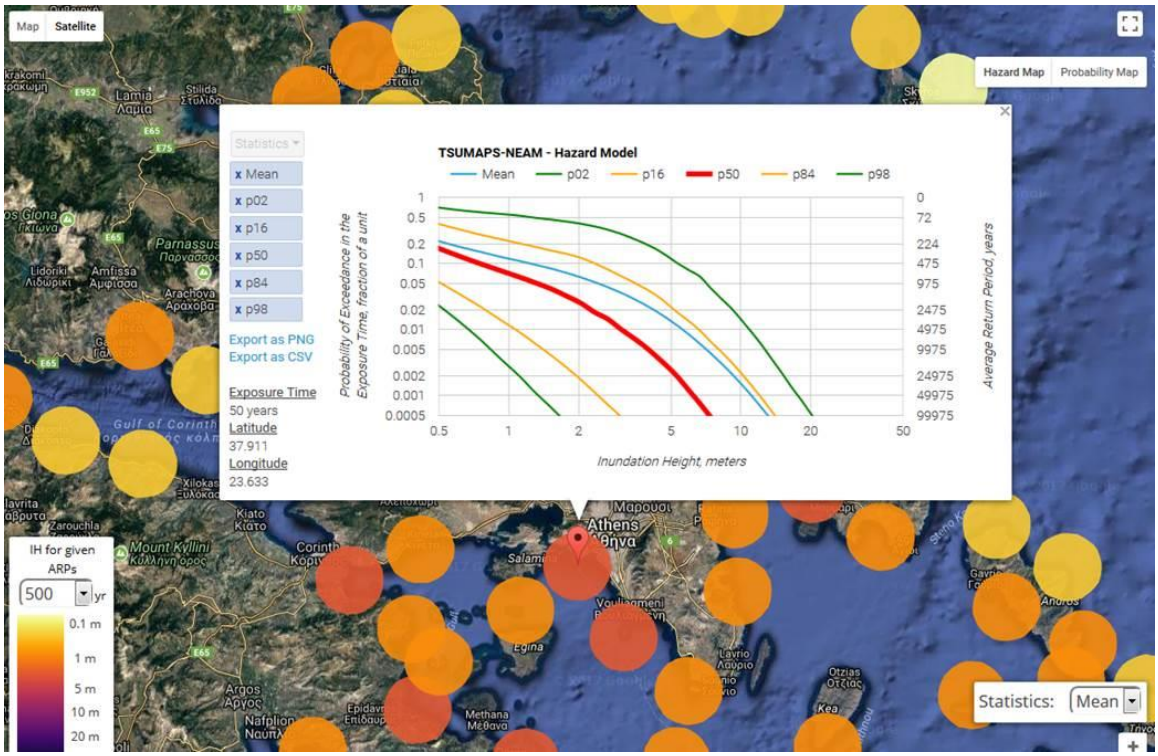
The map below gives the Tsunami wave height for controlling points in NEAM region for a 500yr return period.

Ref.: http://www.tsumaps-neam.eu



Ref.: http://ai2lab.org/tsumapsneam/interactive-hazard-curve-tool/

In addition, the following chart, which is the tsunami hazard curve (expressed in wave height) for the closest controlling point to Athens (similar curves available for all controlling points in the NEAM region).



Ref.: http://ai2lab.org/tsumapsneam/interactive-hazard-curve-tool/

ΕΝΩΣΗ
ΑΣΦΑΛΙΣΤΙΚΩΝ
ΕΤΑΙΡΙΩΝ
ΕΛΛΑΔΟΣ