



European
Commission



GMES Initial Operations
Emergency Management
Service - Mapping

product portfolio

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The European Commission wishes to thank the coordination team and the partners of the SAFER project for kindly allowing re-use of the material and illustrations developed by the project and in particular for the elements of the SAFER STARTER PACKAGE.

Credits: Most map products illustrated in this product portfolio have been developed in the course of SAFER, an FP7 project managed by the EC's Research Executive Agency. Front cover illustration: Vendée, France, after the Xynthia severe storm in 2010 [Sertit(SAFER)]. Back cover illustration: Refugee camp, Kobe, Ethiopia, in 2011 [DLR(SAFER)].

1. General Service Description

Services and products of GIO EMS - Mapping are supplied as of April 1st, 2012 within the framework of the Regulation on GMES and its Initial Operations for the period 2011-2013 (GIO).

GIO EMS - Mapping provides all actors involved in the management of natural disasters, man-made emergency situations and humanitarian crises, with timely and accurate geospatial information derived from satellite remote sensing and completed by available *in situ* or open data sources.

The information generated by the service can be used as supplied (e.g. as digital or printed map outputs). It may be further combined with other data sources (e.g. as digital feature sets in a geographic information system). In both cases it may support geospatial analysis and decision making processes of emergency managers.

GIO EMS - Mapping is provided during all phases of the emergency management cycle, in either rush or non-rush mode, free of charge for the users. It can be activated only by authorised users.

The service is funded by the EU budget and managed by the European Commission (EC). Responsibilities are shared between DG Enterprise and Industry (ENTR) (policy supervision and overall coordination), DG Humanitarian Aid and Civil Protection (ECHO) (operational coordination including interface with the users and authorisation of the activations based on predefined criteria) and DG Joint Research Centre (JRC) (technical support, contractual management and monitoring of activations). Data and products are provided by Industry and contracted Service Providers (SP).

The objective of this service is to offer a specific product for all the phases of a crisis. In order to achieve this, the products offered by the GIO EMS - Mapping can be selected as a function of:

- > The type of disaster to which they are best suited;
- > The phase of the crisis cycle to which they are related (prevention, preparedness, disaster risk reduction, recovery, emergency response);
- > The type of product needed (reference maps, delineation and grading maps, pre or post-disaster situation maps).



The Emergency Response Centre (ERC/MIC) of DG Humanitarian Aid and Civil Protection (ECHO) is the single entry point for the GIO EMS - Mapping.



1.1 Service Modes

Rush Mode

This service consists of the on-demand and fast provision (hours-days) of geospatial information. This information supports emergency management activities immediately following an emergency event. The service is based on the acquisition, processing and analysis, in rush-mode, of satellite imagery and other geospatial raster and vector data sources.

The products are standardised following a set of parameters the user can choose when requesting the service.

Reference maps provide a quick updated knowledge on the territory and assets using data prior to the disaster. The content consists of selected topographic features on the affected area, in particular exposed assets and other available information that can assist the users in their specific crisis management tasks. A reference map is normally based on a pre-event image captured as close as possible prior to the event.

Delineation maps provide an assessment of the event extent (and of its evolution if requested). Delineation maps are derived from satellite post-disaster images. They vary depending on the disaster type and the delineation of the areas impacted by the disaster.

Examples: burnt area map, flooded area map, earthquake impact area map.

Grading maps provide an assessment of the damage grade (and of its evolution if requested). Grading maps are derived from post-event satellite images. Grading maps include the extent, magnitude or damage grades specific to each disaster type. They may also provide relevant and up-to-date information that is specific to affected population and assets, e.g. settlements, transport networks, industry and utilities.

Examples: earthquake grading map with the count of the number of destroyed/damaged buildings in each cell of a regular grid. Population, roads, hospitals, shelters, gathering areas, etc. may be included.

Non-Rush Mode

This service consists of the on-demand provision of geospatial information. This information supports emergency management activities not related to the immediate response phase. This service addresses prevention, preparedness, disaster risk reduction or recovery phases (product delivery in weeks/months).

Given the wide variability of situations to be addressed, the user may request non-rush mode products in two ways:

- > Choosing from a pre-defined set of detailed topographic features (in particular regarding infrastructures) and disaster risk information (hazard, exposure, risk). This allows to have a standard base structure;
- > Describing in free text the information needs specific to the given situation and type of product wanted. This allows to include a wide range of optional information layers, depending on the user's needs.

Three broad product categories are available:

Reference maps provide a comprehensive and updated knowledge of the territory and relevant assets in a disaster risk reduction context.

Pre-disaster situation maps provide relevant and up-to-date thematic information that can help planning for contingencies on areas vulnerable to hazards, aiming to minimise loss of life and damage. **Examples:** hazard exposure, vulnerability, resilience, risk status, evacuation plans, modelling scenarios.

Post-disaster situation maps provide relevant and up-to-date thematic information for the needs of reconstruction planning and progress monitoring, mapping long-term impact, etc. These maps may need to be updated frequently. **Examples:** post disaster needs assessment, recovery plans, reconstruction/rehabilitation monitoring, Internally Displaced Persons (IDP) monitoring, Refugee Camp monitoring.

2. Rush Mode



Rush Mode activation can only be requested by Authorised Users (AU). Associated Users have to contact their focal point in order to request a service activation.

Each rush mode activation normally leads to the generation of one product. A “product” is defined, by default, as one overview map (the overall scene) and one detail map (the most relevant area). Additional detail maps can be requested by the AU in the Service Request Form; they are included in the same “product”. The AU specifies the Area Of Interest (AOI) in the Service Request Form, expressed as overview and detail map(s) extents. Exceptionally large events and evolving crises (e.g. a flood that propagates downstream) may require additional products; in these cases the AU can require additional products.

The three standardised product categories offered in rush mode are:

- > Reference Maps
- > Delineation Maps and
- > Grading Maps

All three different types of products may be delivered as an overview and/or as a detail map.

By default, the product (overview map and one or more detail maps), is provided with the output types and formats described in the following table.

Output Types
<p>Printable map Full colour ISO A1, or equivalent Resolution: high = 300dpi; medium = 200dpi; low = 100dpi GeoPDF file format Metadata file</p>
<p>Georeferenced map Full colour ISO A1, or equivalent Resolution: high = 300dpi; medium = 200dpi; low = 100dpi GeoTIFF, Georeferenced JPEG file format (with worldfile) Metadata file – can be the same as for the printable map</p>
<p>Vector files of all the features derived from the analysis and interpretation stage ESRI shapefiles with projection file (.prj) Google Earth KML (or KMZ) format Metadata file</p>



Activation # 1

Product #1 (default for activation #1)	Overview map (default for prod#1)	Detail map 1 (default for prod#1)	Detail map 2 (optional for prod#1)
Product #2 (optional for activation #1)	Overview map (default for prod#2)	Detail map 1 (default for prod#2)	Detail map 2 (optional for prod#2)

Default and optional deliverables for an activation

RUSH MODE

2.1 Reference Maps



General Description

The aim with reference maps is to quickly provide knowledge on the territory and assets using data prior to the disaster. The content consists of selected topographic features of the area affected by the disaster, in particular exposed assets.

The reference map is based on a pre-event image, captured as close as possible prior to the event. If a pre-event image is not available, the reference map will be based on the post-event image and ancillary information from other sources.

Technical Specifications

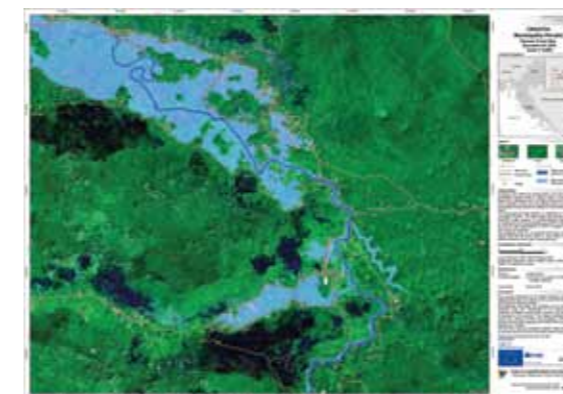
Depending on user requirements and the size of the Area Of Interest, reference maps are provided as:

- Overview maps:**
Scale 1:25,000 – 1:500,000
Area approx. 200 – 100,000 km²
- Detail maps:**
Scale 1:5,000 – 1:25,000
Area approx. 10 – 200 km²

The **target delivery time** after activation is 6 hours.

Typical key features of reference maps (not exclusive)

Hydrology	Transport	Population-related (incl. Industry & Utilities)	Land cover & Physiography
Rivers Canals Lakes Reservoirs Open Water Shorelines Dams Wells Ponds	Railways Roads Cart tracks Bridges River crossing points Airfields Runways Ports	Toponyms Administrative boundaries Built-up areas Settlements Processing / industrial plants Pipelines Power lines Power stations	Woodland Natural vegetation Cropland Grassland Scrub Bare soil Snow/Ice Land subject to Inundation Void Areas Contours Spot heights Cliffs



Reference Map: Flood in Perusic, Croatia, in 2010 (1:15,000) [Source: DLR (SAFER)]



Reference Map: Civil unrest in Benghazi, Libya, in 2010 (1:20,000) [Source: SERTIT (SAFER)]



Reference Map: Flood in Vicenza, Italy, in 2010 (1:20,000) [Source: e-GEOS (SAFER)]

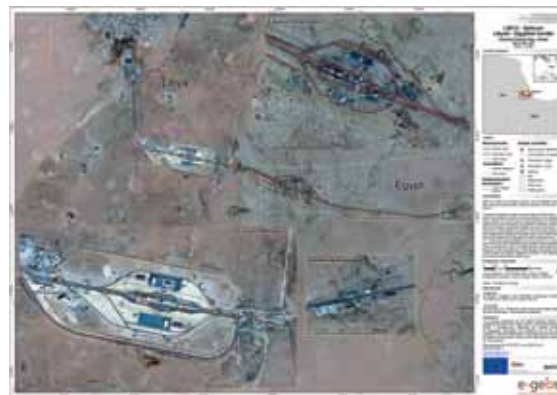


RUSH MODE

2.2 Delineation and Grading Maps

Delineation and **Grading Maps** are standardised disaster extent products, showing the extent of the affected area as observable from Earth Observation (EO) data. The cartographic delineation of the extent is extracted from available EO data. The disaster extent will be shown on the products according to the following definitions (indicated with different classes or symbols in the map):

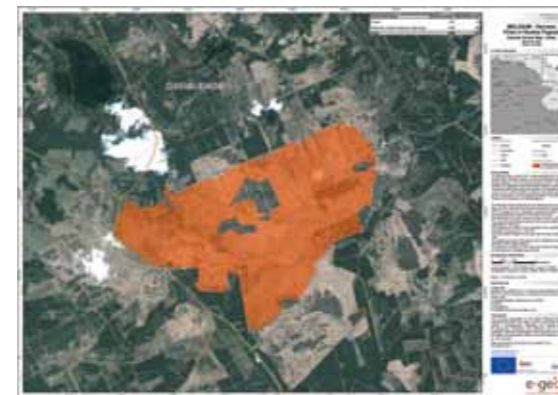
- > **evidence of affected area** (physically affected area with high level of confidence of analysis)
- > **possibly affected area** (possibly physically affected area with a certain level of uncertainty due to the quality or characteristics of the satellite imagery)



Delineation Map: Civil unrest, Libyan-Egyptian border, in 2011 (1:15,000) [Source: e-GEOS (SAFER)]

2.2.1 Delineation Maps

In order to assess the extent and evolution of an emergency event, delineation maps are directly derived from satellite images acquired immediately after the event's occurrence. When relevant, they may be combined with digital modelling and compared with archive information of similar event occurrence. Delineation maps include the event type and the delineation of the areas impacted by the disaster. Examples include burnt area maps, flooded area maps, earthquake impact area maps.



Delineation Map: Fires in Hautes Fagnes, Belgium, in 2011 (1:15,000) [Source: e-GEOS (SAFER)]

2.2.2 Grading Maps

Grading maps provide an assessment of the damage grade (and of its evolution if requested).

Grading maps are directly derived from satellite images acquired immediately after the emergency event. They may be combined with digital modelling and compared with archive information of similar event occurrence. Grading maps include the extent, magnitude or damage grades specific to each disaster type. They may also provide relevant and up-to-date information that is specific to affected population and assets, e.g. settlements, transport networks, industry and utilities.



Grading Map: Ammunition depot explosion, Brazzaville, Congo, in 2012 (1:15,000) [Copyright: European Commission]

The damage grade will be assessed with respect to predefined classes and whenever possible to standards, e.g. the EMS-98.



3. Non-Rush Mode

Non-Rush Mode activation can only be requested by Authorised Users (AU). Associated Users have to contact their focal point in order to trigger the service.

GIO EMS - Mapping in non-rush mode is designed to allow the users to request a range of products, based on their needs.

By selecting among a predefined set of information layers and by filling in a free text box, the users are enabled to formulate a request containing all the elements relevant to their needs. The ERC/MIC is available to assist the users in formulating and submitting their request.

Each service request should correspond to a "product", i.e. to the consistent thematic information set related to the emergency phase of interest, e.g. an evacuation plan, a monitoring of reconstruction, etc. If different information sets are needed, different Service Request Forms should be submitted. Nevertheless, the "product" can be composed of several maps, with different sizes and extensions as required in the Service Request Form.

The three broad product types (reference maps, pre- or post-disaster situation maps) and their main characteristics are described in the following pages. It should be noted that a specific request may deviate from these characteristics by combining elements of more than one category.

Thus the information contained in the products can be grouped in three categories:

- > (i) topographic features;
- > (ii) disaster risk information;
- > (iii) tailored information related to the specific event and to the relevant crisis management cycle phase.

Examples of information contained in prevention or recovery products include:

Land use zoning plans (where risk maps are used for rulings on appropriate land use, with the corresponding effects on different segments of the population or interests of a community, e.g. discouraging high-density settlements and key infrastructures in hazard-prone areas, siting of service routes for transport, power, water, sewage and other critical facilities)

Mitigation measures (undertaken to limit the adverse consequences of hazards, e.g. physical constructions, protective structures, policies, awareness, etc.)

Further combinations of the above mentioned information.



By default, the products are provided with the output types and formats described in the following table.

Output Types

Printable map
Full colour ISO A1
Resolution: high = 300dpi; medium = 200dpi; low = 100dpi
GeoPDF file format
Metadata file

Georeferenced map
Full colour ISO A1
Resolution: high = 300dpi; medium = 200dpi; low = 100dpi
GeoTIFF, Georeferenced JPEG file format (with worldfile)
Metadata file - can be the same as for the printable map

Vector files
ESRI shapefiles with projection file (.prj)
Google Earth KML (or KMZ) format
Metadata file



NON-RUSH MODE

3.1 Reference Maps

General Description

The aim is to provide comprehensive knowledge of the territory and assets in the context of prevention, preparedness, disaster risk reduction and recovery phases. The contents of the products are (i) topographic features on areas vulnerable to hazards, in particular regarding infrastructures, (ii) disaster risk information and (iii) other available information that can help the users in their specific crisis management planning tasks such as providing protection from potential disasters, including engineering and other protective measures, taking legislative measures, awareness raising campaigns etc.

Technical Specifications

Depending on user requirements and the size of the Area Of Interest, reference maps are provided as:

Overview maps:

Scale 1:25,000 – 1:500,000.

Area approx. 200 – 100,000 km²

Detail maps:

Scale 1:5,000 – 1:25,000.

Area approx. 10 – 200 km²

The **target delivery time** is a maximum of 8 weeks after activation.

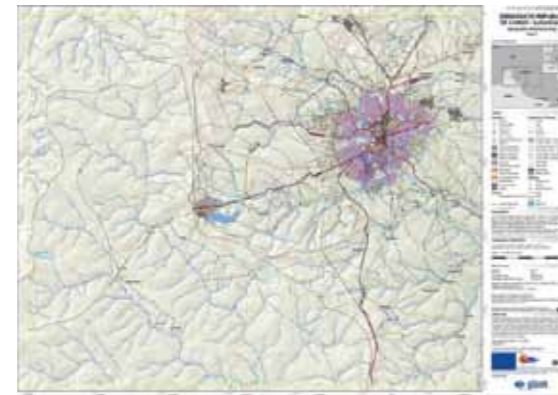


Typical key features of reference maps (not exclusive)

Hydrology	Transport	Population-related (incl. Industry & Utilities)	Land cover & Physiography
Rivers Canals Lakes Reservoirs Open Water Shorelines Dams Wells Ponds	Railways Roads Cart tracks Bridges River crossing points Airfields Runways Ports	Toponyms Administrative boundaries Built-up areas Settlements Processing / industrial plants Pipelines Power lines Power stations	Woodland Natural vegetation Cropland Grassland Scrub Bare soil Snow/Ice Land subject to Inundation Void Areas Contours Spot heights Cliffs



Reference Map: Mbor, Senegal, in 2010 (1:100,000)
[Source: INDRA (SAFER)]



Reference Map: Lubumbashi, DRC, in 2011 (1:100,000)
[Source: GISAT (SAFER)]



Reference Map: Abidjan, Ivory Coast, in 2011 (1:32,500)
[Source: Astrium (SAFER)]



NON-RUSH MODE

3.2 Pre-disaster Maps

General Description

Pre-disaster situation mapping products provide relevant and up-to-date thematic information that can help civil protection and humanitarian aid agencies plan for contingencies on areas vulnerable to hazards. The aim is to minimise loss of life and damage, by preparing in advance timely response operations, organising temporary reallocation of people and property from threatened locations, and facilitating timely and effective rescue.

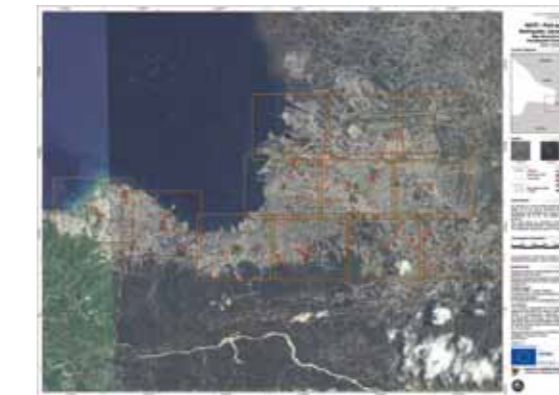
Up-to-date imagery use and modelling play key roles in this phase. Pre-disaster situation products may need to be updated frequently.

Application Examples

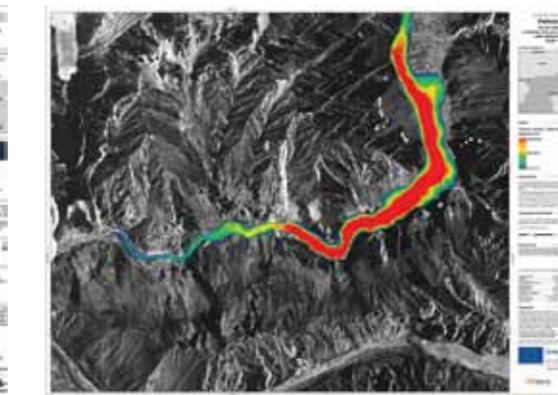
- > Hazard exposure of a given location to a certain hazardous event e.g. the exposure to flooding, landslides, volcanic eruptions, etc.
- > Vulnerability or resilience of urban settlements and buildings
- > Risk status for population and assets
- > Evacuation plans (evacuation points, assembly points, escape routes, vulnerable road infrastructure, public reception facilities, safe locations, priority evacuation areas)



Preparedness Situation Map – Hazard – Detail:
Macuse, Mozambique, in 2011 (1:100,000),
[Source: e-GEOS (SAFER)]



Pre-disaster Overview Map: Earthquake, Haiti, in 2010
(1:30,000) [Source: DLR (SAFER)]



Preparedness Situation Map – Hazard – Detail:
Dike failure scenario, Hunza River, Pakistan, in 2010 (1:20,000)
[Source: Astrium / geomer (SAFER)].



NON-RUSH MODE

3.3 Post-disaster Maps



General Description

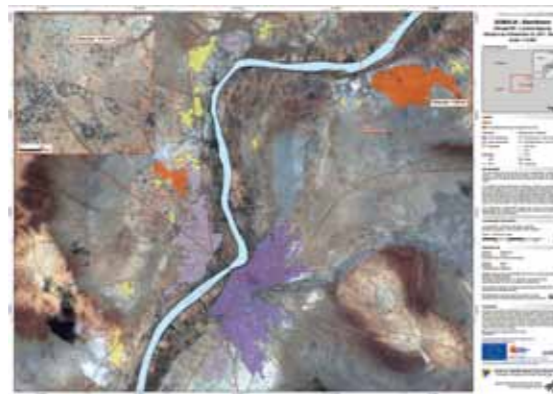
Post-disaster situation mapping products provide relevant and up-to-date thematic information, beyond the immediate response phase. Post-disaster situation products are composed on the basis of updated imagery of: (i) topographic features, (ii) disaster risk information. In addition, (iii) specific information e.g. recovery needs, reconstruction planning and progress monitoring, mapping long-term impact, etc. is used. Recovery measures aim to re-establish as much as possible the social, economical and environmental conditions of a community or geographical area to the pre-disaster state. Post-disaster situation products may need to be updated frequently.

Application Examples

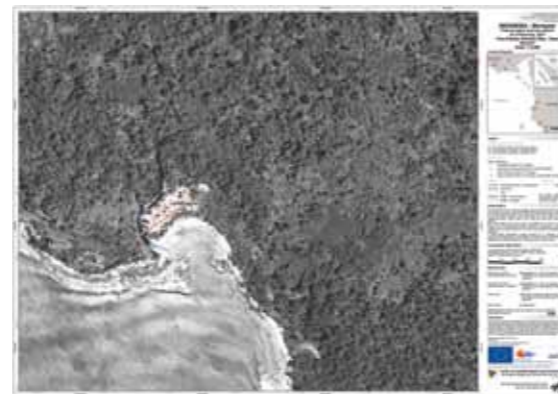
- > Hazard exposure of a given location to a certain hazardous event (in particular for new assets)
- > Vulnerability or resilience of urban settlements and buildings (in particular for new assets)
- > Risk status for new assets
- > Post-disaster needs assessment (detailed damage and loss assessment and estimation of recovery needs, collected in dedicated atlases)
- > Recovery plans (mapping the measures and a schedule to re-establish the physical infrastructure of a community after a period of rehabilitation subsequent to a disaster)
- > Reconstruction/rehabilitation monitoring (rubble clearance, progress monitoring of new construction, rehabilitation of agricultural land)
- > IDP monitoring (IDP camps, IDP movements)
- > Further combinations of the above mentioned information



Detailed Damage Assessment Map - Detail Downstream of collapsed tailings reservoir near Kolontár, Hungary, in 2010 (1: 15,000) [Source: Astrium (SAFER)]



Refugee / IDP - Location Mapping: Baardheere camp, Somalia in 2011 (1:12,500) [Source: DLR (SAFER)]



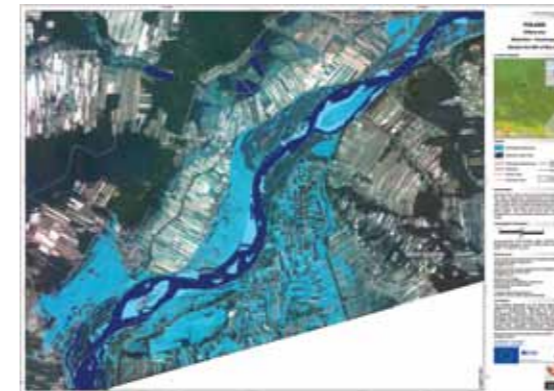
Recovery Status Map - Detail: Post-tsunami recovery efforts, Mentawai, Indonesia, in 2011 (1:2,500) [Source: DLR (SAFER)]



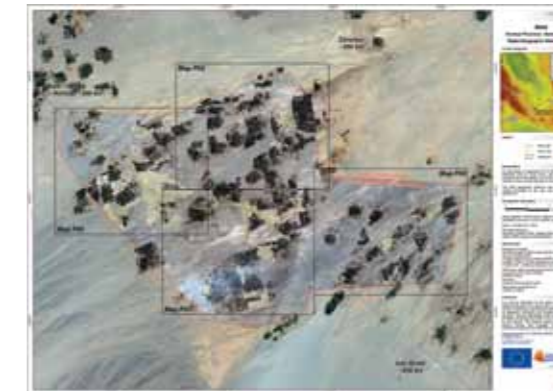
4. Disaster Types

Here are examples of products corresponding to the different types of disaster covered by GIO EMS - Mapping.

More detailed, disaster-specific information on available products is provided on nine separate fact sheets.



Floods Poland 2010 [Source: SERTIT (SAFER)]



Earthquakes Iran 2010 [Source: SERTIT (SAFER)]



Landslides Tajikistan 2009 [Source: DLR (SAFER)]



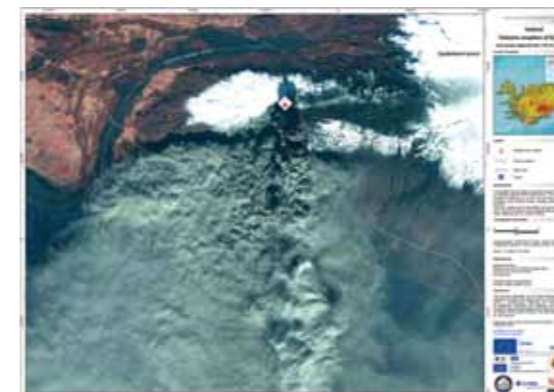
Severe Storms Haiti 2010 [Source: DLR (SAFER)]



Fires Greece 2009 [Source: DLR (SAFER)]



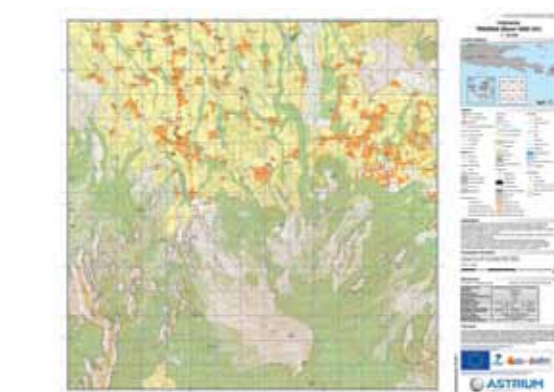
Technological Disasters Norway 2011 [Source: DLR (SAFER)]



Volcanoes Iceland 2010 [Source: SERTIT (SAFER)]



Humanitarian crises Somalia 2011 [Source: Metria (SAFER)]



Tsunamis Indonesia 2010 [Source: Astrium (SAFER)]

5. Comparison of GIO EMS – Mapping and SAFER product portfolios

Since users may be accustomed to the SAFER product portfolio and in order to support the transition into operational service delivery, the following table gives some suggestions on how to find in GIO EMS – Mapping the equivalent to SAFER product types.

The table below is based on examples. GIO EMS - Mapping non-rush mode products can be completely tailored to user needs.

Rush Mode

SAFER	GIO EMS – Mapping
Geographic reference *	Reference map
Disaster extent map	Delineation map
Damage assessment map	Grading map
Monitoring	The user can request additional products at different points in time
Affected population	Affected population is an option available for all reference/delineation / grading maps
Briefing note	- Not available -
Refugee / IDP	Informal settlements (e.g. IDP camps, slums) is an option available for all reference/delineation /grading maps
Evacuation plan	- Not available in rush mode -
*	In any product the following options are always available to the user: <ul style="list-style-type: none"> - specific topographic features the user needs - specific map scale, which implies to obtain the assets detail up to the building footprint - exposure information, (assets and population)
	In any product vector files are included by default

* Applicable to both modes

Non-Rush Mode

SAFER	GIO EMS – Mapping
Hazard	Pre-disaster situation maps requiring <ul style="list-style-type: none"> - Risk info: hazard
Vulnerability	Pre-disaster situation maps requiring <ul style="list-style-type: none"> - Topographic features: assets of interest - Risk info: exposure (population, assets)
Key assets	Reference maps <ul style="list-style-type: none"> - Topographic features: assets of interest
Detailed damage assessment	Post-disaster situation maps <ul style="list-style-type: none"> - Topographic features: assets of interest, land cover, any other - Risk info: consequences, [exposure]
Medium term-impact	Post-disaster situation maps <ul style="list-style-type: none"> - Topographic features: assets of interest, land cover, any other - Risk info: consequences - Specify in the SRF free text box the required impact range
Recovery status	Post-disaster situation maps <ul style="list-style-type: none"> - Topographic features: assets of interest, land cover, any other - Risk info: consequences, exposure, etc. - Specify in the SRF free text box the requested time range to be analysed and any other need
Information dossier	Not a standard GIO EMS - Mapping product.
Refugee / IDP	Post-disaster situation maps <ul style="list-style-type: none"> - Topographic features: assets of interest, land use) - Specify in the SRF free text box your requirements (e.g. count and type of structures, road access, time range for change detection)
Evacuation plan	Pre-disaster situation maps <ul style="list-style-type: none"> - Topographic features: hydrology, physiography, settlements, transport, industry and utilities - Risk info: hazard, exposure - Specify in the SRF free text box that you want an evacuation plan any requested planning element, e.g.: optimal routes, areas for population relocation and operation centers, etc.
	Risk maps <ul style="list-style-type: none"> - Pre-disaster situation maps - Topographic features: land cover, assets (settlements, transport, industry and utilities), any other - Risk info: risk (Risk is assessed by combining, for the area of interest, hazard and exposed assets)

