RASOR

RAPID ANALYSIS AND SPATIALISATION OF RISK

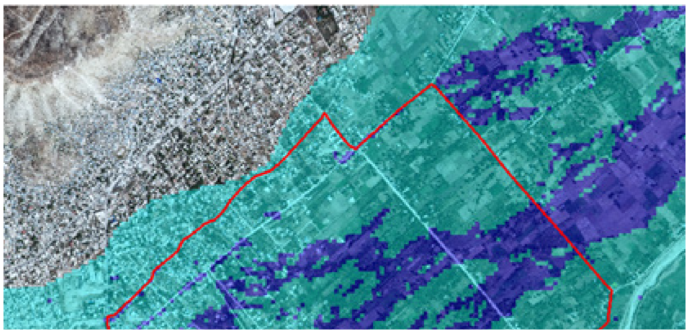
FLOOD

OF ALL NATURAL DISASTERS, FLOODS CAUSE THE GREATEST DAMAGE AND AFFECT THE LARGEST NUMBER OF PEOPLE WORLDWIDE. THE AVERAGE ANNUAL NUMBER OF PEOPLE AFFECTED AND ECONOMIC DAMAGES ARE ON THE RISE AT AN ALARMING RATE. SOCIETY MUST MOVE FROM THE CURRENT PARADIGM OF POST-DISASTER RESPONSE TO MITIGATION, PREVENTION AND IMPROVING PREPAREDNESS. PLANS AND EFFORTS MUST BE UNDERTAKEN TO REDUCE THE FLOOD RISK USING THE FULL CYCLE OF DISASTER MANAGEMENT, INCLUDING TARGETED SUPPORT TO CRITICAL INFRASTRUCTURE MONITORING, ECONOMIC DEVELOPMENT, LAND SUBSIDENCE AND CLIMATE CHANGE IMPACT ASSESSMENT.

RASOR OVERLAYS ARCHIVED AND NEAR-REAL TIME VERY-HIGH RESOLUTION OPTICAL AND RADAR SATELLITE DATA, COMBINED WITH IN SITU DATA FOR BOTH GLOBAL AND LOCAL APPLICATIONS. A SCENARIO-DRIVEN QUERY SYSTEM ALLOWS USERS TO PROJECT SITUATIONS INTO THE FUTURE AND MODEL THE FLOOD RISK BOTH BEFORE AND DURING AN EVENT. CRISIS MANAGERS CAN DETERMINE THE EXTENT OF FLOODING IN A GIVEN AREA AND DETERMINE, FOR EXAMPLE, THE RISK PENDING ON CRITICAL INFRASTRUCTURE SYSTEMS IN TERMS OF THEIR RESIDUAL FUNCTIONALITY AS A BASIS FOR A SYSTEMIC VULNERABILITY ANALYSIS. PUBLIC AUTHORITIES CAN DETERMINE THE IMPACT OF COASTAL SUBSIDENCE ON THE FUNCTIONING OF A FLOOD DEFENSE OVER SEVERAL YEARS GIVEN VARIOUS SEA SURGE SCENARIOS AND BASED ON ACTUAL, ACCURATE SUBSIDENCE INFORMATION. RASOR ALLOWS RISK MANAGERS TO USE REAL SCENARIOS WHEN DETERMINING NEW MITIGATION OR PREVENTION MEASURES, AND INTEGRATE NEW, REAL-TIME DATA INTO THEIR OPERATIONAL SYSTEM WHEN ORGANIZING RESPONSE ACTIVITIES.

EO FLOOD MONITORING

Earth Observation (EO) is an important source of information to flood risk management. Historical SAR-based maps of flood extents provide information about areas that have suffered from flooding in the past. RASOR offers access to historical and near real time EO data sources that provide information on flooded areas.

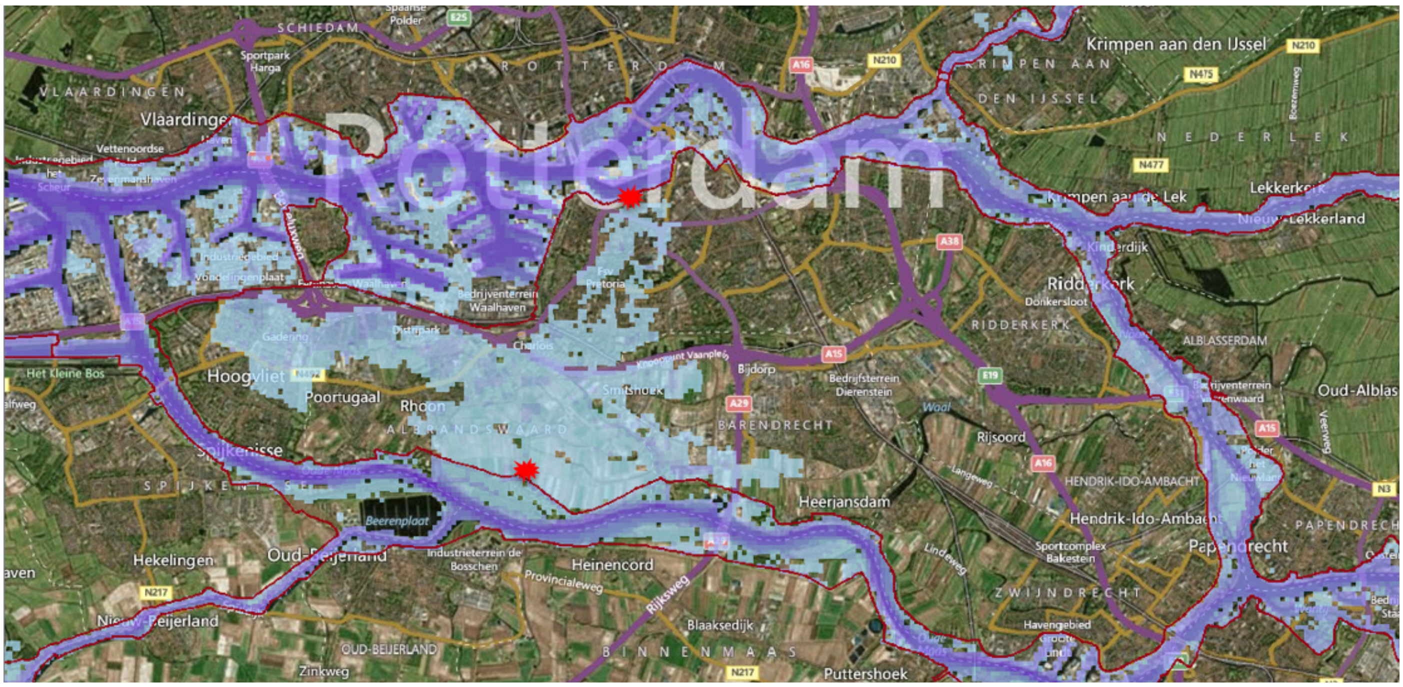


Les Gonaives (Haiti) flood extent during the 2008 hurricane.

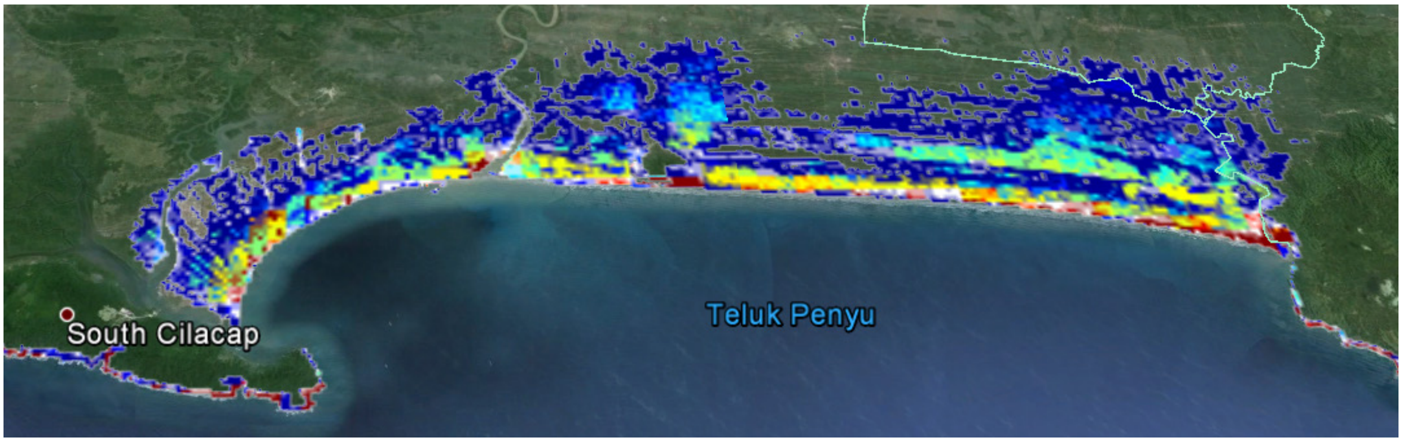
FLOOD MODELLING

Floods can be caused by several forces of nature, including heavy rainfall, storm surge, tsunami and failure of flood protection. Each flood prone area has its typical set of threats that should be included in a flood model for that area. Within the RASOR project, the user can run these models and simulate flooding scenarios with historical or self-defined input data.

Flood models have been developed for five RASOR case studies, with three more models currently under development. The operational flood models and their inputs are: tsunami flooding model with user-defined tsunami wave height (Cilacap, Indonesia); rainfall-induced riverine flooding with user-defined rainfall and soil moisture (Bandung, Indonesia); storm surge and levee breach flooding with user-defined storm surge level and levee weak spots (Rotterdam, the Netherlands); hurricane-induced storm surge and riverine flooding with user-defined hurricane track and intensity (Les Gonaives, Haiti); landslide-induced tsunami flooding with user-defined initial wave height and location generated by a landslide (Santorini, Greece).



Rotterdam inundation map. Levees are indicated by red lines, breaches by red stars.



Cilacap (Indonesia) tsunami wave runup.

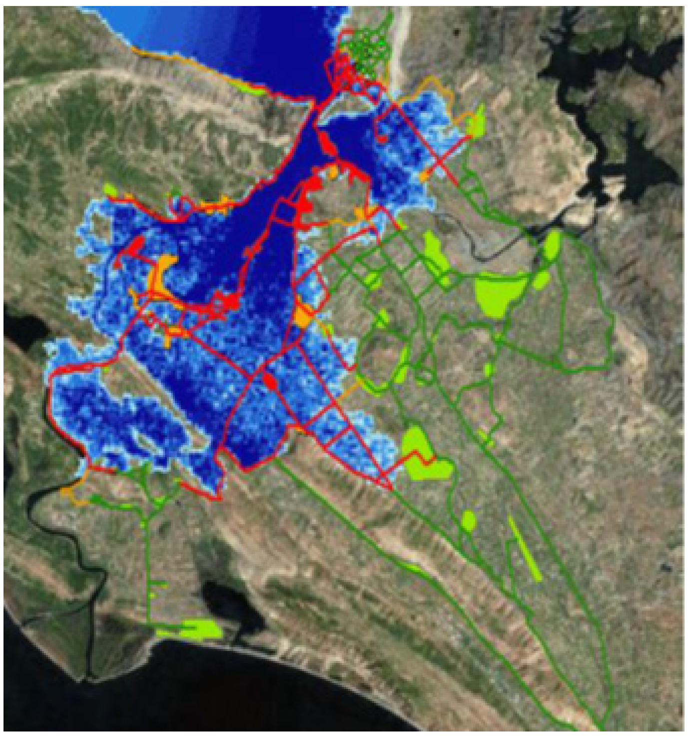
FLOOD MAPPING

Flood maps typically form the basis for damage reduction programmes and subsequent actions. The maps often have a legal connotation in terms of zoning and other structural and nonstructural measures undertaken, so they need to be accurate and credible. EO-based maps can show flood extents of historical floods. The flood models provide additional information such as water depth and flow velocity at every time step that is valuable for detailed risk assessment. The maximum depth and velocity per location are stored for use in RASOR in the flood damage and loss of life assessment.

In flood risk management, it is common practice to define a design event for each flood prone area and reflect this in policy or legislation. Often, this event is based on frequency analysis, for example the one-in-a-hundred-year most intense flood. Alternatively a historical flood is used. In that case, an attempt should be made to assign a return period to the historical event for communication and design purposes. The design event flood map can be stored as a reference scenario in RASOR.

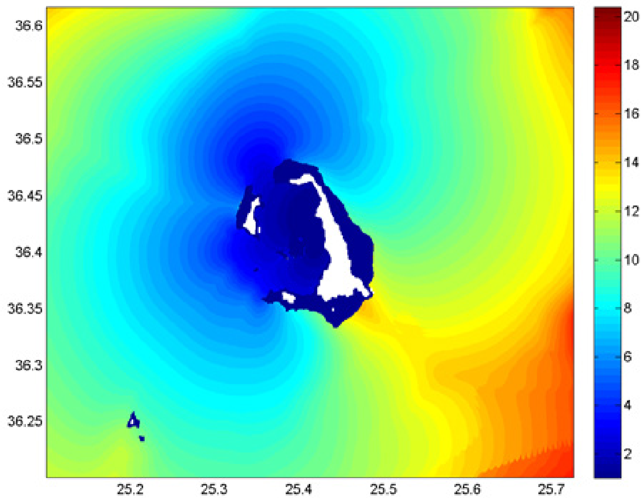
FLOOD RISK ASSESSMENT

Within the RASOR platform, flood maps can be combined with optical high resolution EO data and land use maps that quantify exposure and assets at stake in a flood risk assessment. The high-risk areas are targets for risk-reducing countermeasures. Information about the flood extent and the location of vital infrastructure and of logistical means to support operations, helps making better decisions during crisis management.



OTHER PRODUCTS

Flood models can provide additional information such as the time evolution of a flood. In case of the Santorini case study, a customized map is produced showing the time of arrival of the first tsunami wave relative to the time of the landslide (below). Such maps are valuable information for early warning and emergency action planning. An evacuation may be possible if sufficient time is available and escape routes are still open.



Wave arrival time (in minutes after the landslide) in Santorini (Greece).

Left: Residual functionality of the road network during a flood event in Albania. Green indicates high residual functionality; red is low residual functionality.

This project has received funding from the European Union's Seventh Framework Program for research, technological development and demonstration under grant agreement no. 606888