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PacSAFE

realistic natural hazard impact scenarios for better
planning, preparedness and response activities


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PacSAFE in a nutshell




PacSAFE



SPC
Secretariat
of the Pacific
Community

PacSAFE has initially been developed to enable hazard data and asset data, such as the Pacific Catastrophic Risk and Financing Initiative (PCRAFI) asset database, to be used to generate impact information to assist planning, preparedness and response activities for Pacific Island Countries. It is based on InaSAFE and QGIS.



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Who is it for?



Persons responsible for developing disaster management plans in PIC

Representatives from NGOs working in disaster risk reduction and climate change impact in the region

Geohazard and Oceanographic Scientists and Researchers

Academia

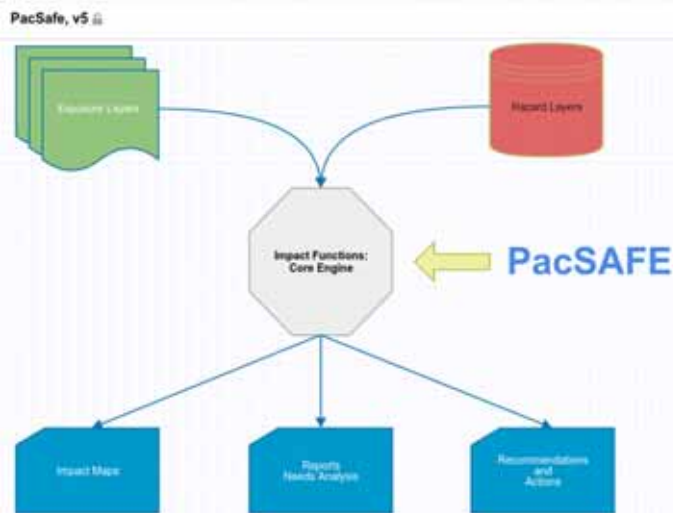
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Key Concepts



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Exposure Layers



Roads data

Road information is a useful data source when you wish to confirm the impact of a hazard on roads infrastructure. Road data includes the location, geometry and elevation of roads, and can also include other details such as road type, length, responsibility or status. Road data often does not include information on road condition, so this data can be used to identify potential road damage areas. The information provided is in a standard format of exposure data. This data is freely available, generally well maintained and is a good starting point for disaster management systems. There are various ways to download OpenStreetMap road data, but the recommended way is to download the data using the OSM API.

Key notes for roads data

Format: Vector tiles (PBF)
 Data: A shapefile or GeoJSON
 Notes: The geometry is in WGS 84 and the elevation is in meters.
 Source: Data is obtained from continuously updating a worldwide mapping system.

Buildings (structure) data

Like roads, building information can be a useful source to help the understanding the impact of a hazard. This category of data can be used to identify buildings at risk from flooding, and other types of buildings are also used. In OSM data, buildings are represented by the 'building' tag. This tag is used to describe the type of structure affected by a disaster, and the tag can be used to describe the building's status. This data is freely available, generally well maintained and is a good starting point for disaster management systems. There are various ways to download OpenStreetMap building data, but the recommended way is to download the data using the OSM API.

Key notes for buildings data

Format: Vector tiles (PBF)
 Data: A shapefile or GeoJSON
 Notes: The geometry is in WGS 84 and the elevation is in meters.
 Source: Data is obtained from continuously updating a worldwide mapping system.

Population data

Population data can be used to identify the impact of a hazard on the population. This data is freely available, generally well maintained and is a good starting point for disaster management systems. There are various ways to download population data, but the recommended way is to download the data using the OSM API.

Key notes for population data

Format: Vector tiles (PBF)
 Data: A shapefile or GeoJSON
 Notes: The geometry is in WGS 84 and the elevation is in meters.
 Source: Data is obtained from continuously updating a worldwide mapping system.

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GeoHazard Layers

In the context of PacSAFE a hazard is any natural or human caused event or series of events that may negatively impact the population, infrastructure or resources in an area.

Some examples of natural hazards:

- a flood
- an earthquake and the resulting ground shaking that is produced by it
- a volcano and the resulting lava flow from a volcano
- ash fall from a volcano
- a tsunami

PacSAFE is NOT a hazard modelling tool.

Both Single-event versus multiple-event hazards are supported.



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Impact Functions

An Impact Function is software code (in Python Language) that implements a particular algorithm to determine the impact of a hazard on the selected exposure.



Earthquake Impact Functions

Earthquake hazard: continuous raster
 Population exposure: continuous raster with counts
 Building exposure: classified polygon or point with a type attribute



Flood Impact Functions

Flood hazard: continuous raster or classified polygon
 Population exposure: continuous raster with counts
 Building exposure: classified polygon or point with a type attribute



Volcano Impact Functions

Volcano hazard: continuous polygon or point
 Population exposure: continuous raster with counts
 Building exposure: classified polygon with a type attribute



Generic Impact Functions

Volcano hazard: classified polygon, classified raster or continuous raster
 Population exposure: continuous raster with counts
 Building exposure: classified polygon with a type attribute



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Impact Layer

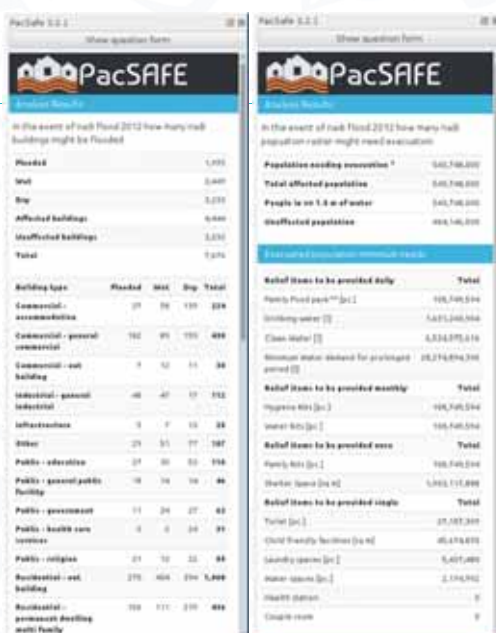
The result of running an Impact Function on a GeoHazard and Exposure Layer



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Impact Reports

Impact summary as tabular and textual data



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Walkthrough and Examples

The screenshot displays three main components of the PacSAFE software interface:

- Open Project Dialog:** A window titled 'PacSAFE' with a sub-header 'Open Project'. It lists several project types: Flood Building Flood, Road Road Flood, Road Population Flood, Area Building Flood, Area Road Flood, Area Population Flood, and Christmas Island Shoreline Change Detection. 'Load' and 'Close' buttons are at the bottom.
- Central Help Window:** A window titled 'PacSAFE' with a sub-header 'Getting started'. It contains a list of steps:
 1. Add or load the hazard form (e.g. earthquake hazard) to QGIS.
 2. Add or load the exposure layer (e.g. structured to QGIS).
 3. Make sure you have defined keywords for your hazard and exposure layers. You can do this using the keywords creation wizard in the toolbar.
 4. Click on the Run button below.
 Below the steps is a 'Limitations' section with four points:
 1. PacSAFE and builtPE are not a stand-alone desktop tool.
 2. PacSAFE has already been developed from ArcGIS for access and use that is restricted to part of PNGAP. Some functionality of PacSAFE has not yet been implemented.
 3. PacSAFE was not built as a tool used in real-time operations.
 4. Population count data (if used) must be...
- PacSAFE Flood Exposure Categorization Options:** A configuration window for 'PacSAFE Flood Exposure Categorization Options'. It features a 'Threshold value to categorize inundated areas' set to 1.00. Below, there are radio buttons for 'PacSAFE Flood Exposure Categorization Options' with a checked box. Underneath, there are five radio button options:
 - Low (Default) *
 - Medium (Default) *
 - High (Default) *
 - Extreme (Default) *
 - ...

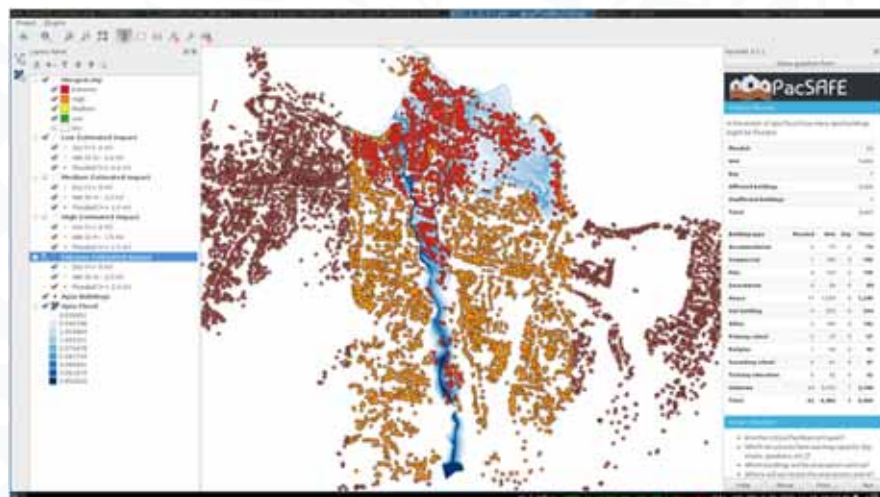
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Example: Flood/Building (Nadi)

The screenshot shows the main map interface of PacSAFE. The map displays a geographical area with a river and various buildings. Overlaid on the map are several layers representing flood and building exposure. A legend on the left side of the map lists these layers with corresponding color swatches. On the right side, there is a data table with the following columns: 'Number', 'Area', 'Per cent of total area', 'Percentage of total area', 'Percentage of total area', 'Percentage of total area', 'Percentage of total area', 'Percentage of total area', 'Percentage of total area', 'Percentage of total area'. The table contains numerical data for each layer.

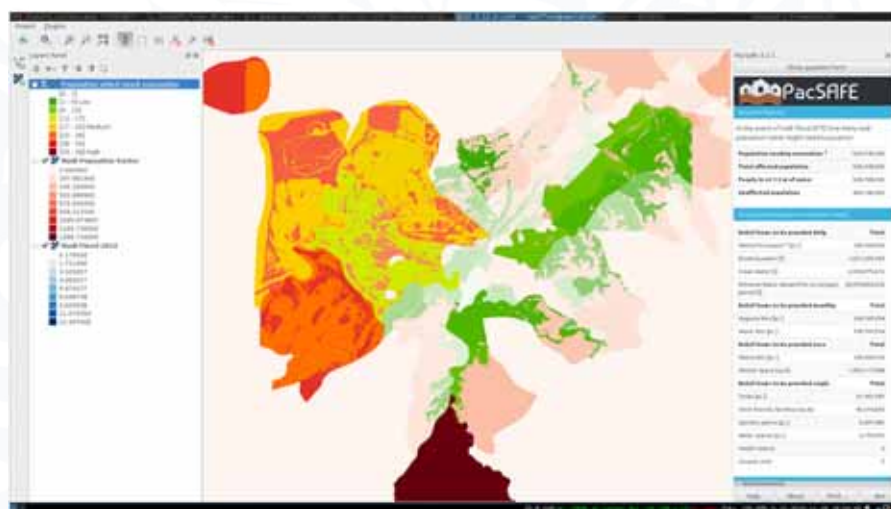
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Example: Flood/Building (Apia)



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Example: Flood/Population (Nadi)



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Example: Detailed Population Report

Detailed Gender and Age Reports



Total population affected: 118,310



Female population affected: 59,155



Youth affected: 31,116



Elderly people affected: 9,228

Notes

Total population 237,510,000 in the exposure layer

People need evacuation if they are within the volcanic hazard zones.

Detailed gender report

Area	Total	Female population (affected)	Weekly hygiene packs	Additional weekly kits for pregnant and lactating women
Entire area	118,310	59,155	46,851	5,512

Detailed age report

Area	Total	Youth count (affected)	Adult count (affected)	Elderly count (affected)
Entire area	118,310	31,116	77,968	9,228

Detailed minimum needs report

Area	Rice	Drinking Water	Water	Family Kits	Toilets
Entire area	501,268	2,070,425	12,422,550	23,662	5,916

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Example: Shoreline Change

Estimated buildings affected

- Green (1-1.5 m)
- Yellow (1.5-2.5 m)
- Red (2.5-3.5 m)



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Partners



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Summary

PacSafe software package is under active development, and therefore is not feature complete and has known bugs and limitations. Newer improved versions are frequently made available on the project website.

Source code freely available on GitHub repository.

Available for download and testing @ <http://ict.sopac.org/pacsafe>

Email feedback to sachindras@spc.int

In open source, we feel strongly that
to really do something well, you
have to get a lot of people involved.

— Louis Favre —

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