



IPP CommonSensing – DRR Spatial Decision Support Platform

User Manual

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Abbreviations

CS – CommonSensing

DQA – Data Quality Assessment

DRR – Disaster Risk Reduction

DSS – Decision Support System

ESA – European Space Agency

ESRI - Environmental System Research Institute

GIS - Geographic Information System

MCDA – Multiple Criteria Decision Analysis

OSM – OpenStreetMap

SPC – Pacific Community

HTML - Hypertext Markup Language

CSS - Cascading Style Sheet

JS - JavaScript

SSAS - Syntactically Awesome Style Sheets

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1 Users guide

The developer manual offers a step by step guide for the user to work with the Decision Support System platform. This manual is intended for decision making professional with little to no geospatial technology experience but some basic web browsing skills.

When a user clicks the link <https://unosat-geodrr.cern.ch/portal/apps/sites/#/common-sensing> they are welcomed to the landing page. The landing page is divided into following four main parts:

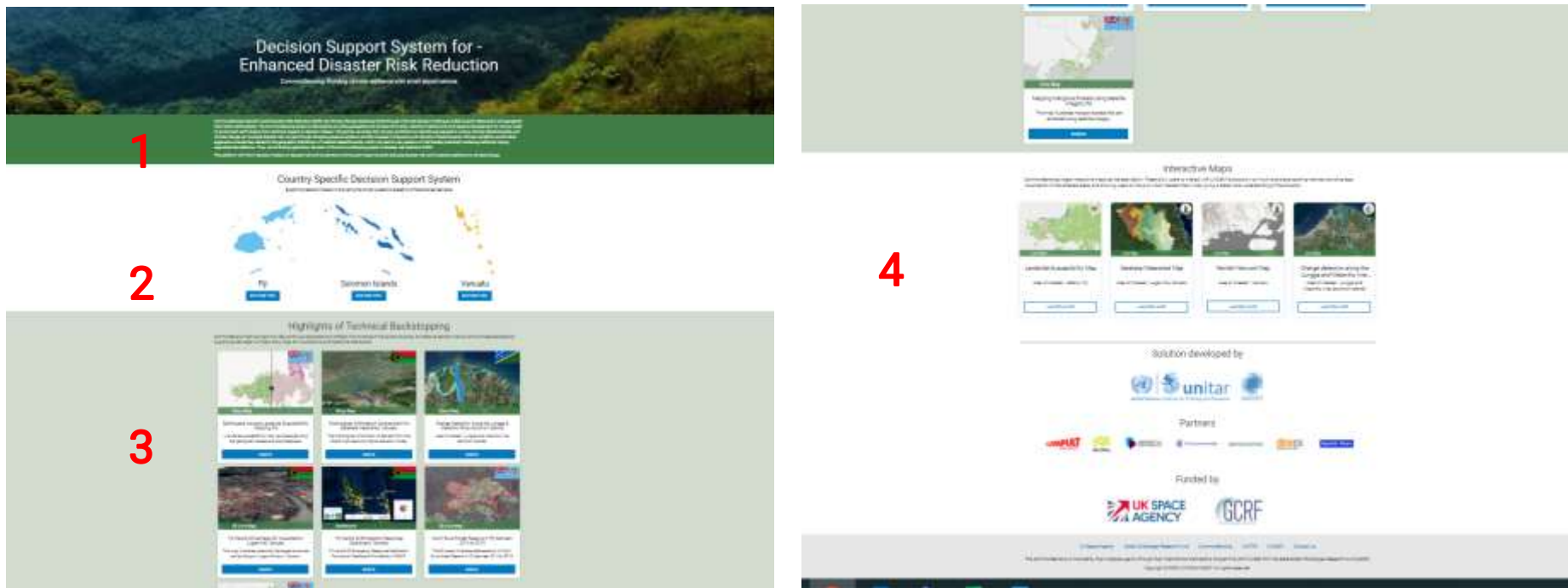


Figure 1 four main parts of the landing page

1.1 Introduction section

The introduction section provides a brief about Decision Support System platform. It also includes two social media buttons in the upper right which allows the user to view Twitter and Facebook pages of CommonSensing.



CommonSensing

Decision Support System for -
Enhanced Disaster Risk Reduction

CommonSensing: Building climate resilience with small island nations

CommonSensing intends to build Disaster Risk Reduction (DRR) and Climate Change Resilience (CCR) through informed decision-making provided by Earth Observation and geospatial information technologies. The CommonSensing project is delivered by providing geospatial and climate information, decision-making tools and capacity development for various levels of government staff ranging from technical experts to decision-makers. The partner countries (Fiji, Vanuatu and Solomon Islands) are exposed to various climate-related hazards, and climate change can increase disaster risk, namely through changing exposure patterns and the increase in frequency and intensity of hazard events. Climate variability could further aggravate uncertainties related to the geographic distribution of weather-related hazards, which may lead to new patterns of risk thereby potentially rendering traditional coping capacities less effective. Thus, one of the key application domains of the CommonSensing project is disaster risk reduction (DRR).

This platform will inform decision-makers on disaster risk and its elements to bring real impact towards reducing disaster risk and increasing resilience to climate change.

Figure 2 The introduction section

1.2 Country Specific Decision Support System section

In this section, you can explore Decision Support System tools for each country by clicking the explore tool buttons under countries name.



Figure 3 Decision Support System tool for each country

Below is site structure that demonstrates different tools available for each country specific sites,

- Fiji - Decision Support System - <https://unosat-geodrr.cern.ch/dss/FJI/>
 - Descriptive Analytics tool
 - Diagnostic Analytics tool
 - Multiple Criteria Decision Analysis tool
 - Solomon Islands - Decision Support System - <https://unosat-geodrr.cern.ch/dss/SLB/>
 - Descriptive Analytics tool
 - Diagnostic Analytics tool
 - Multiple Criteria Decision Analysis tool
 - Vanuatu - Decision Support System - <https://unosat-geodrr.cern.ch/dss/VUT/>
 - Descriptive Analytics tool
 - Diagnostic Analytics tool
 - Multiple Criteria Decision Analysis tool
-

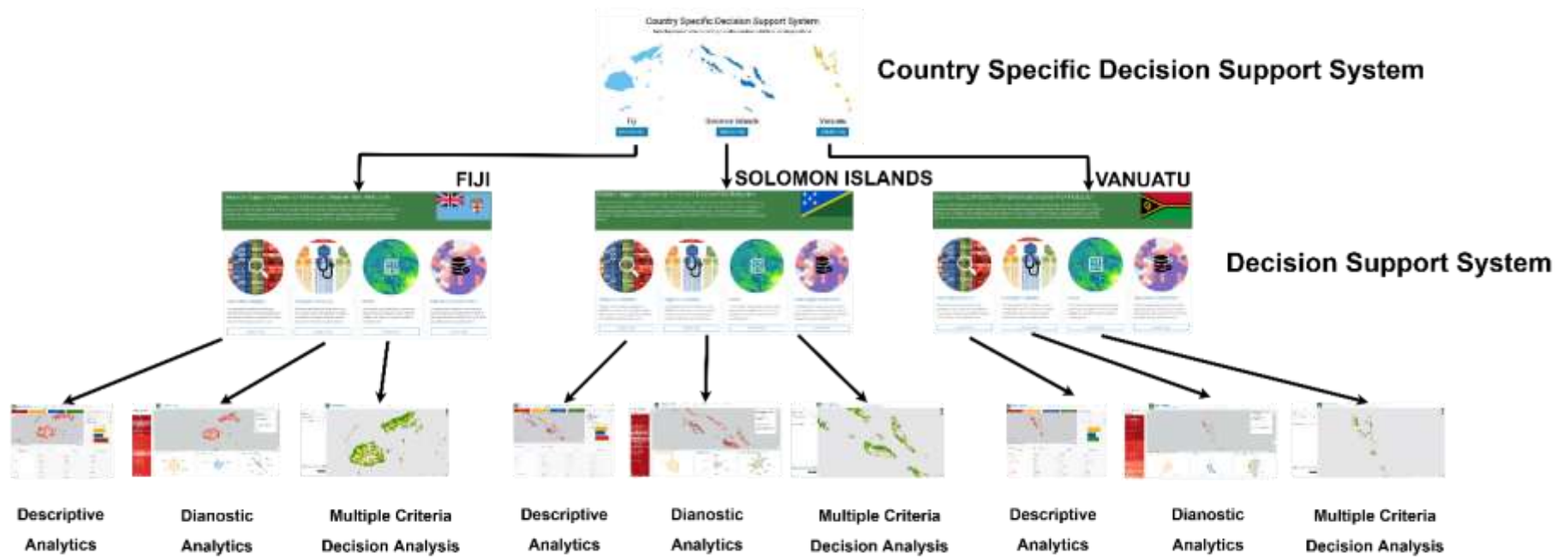


Figure 4 site structure of DSS tool

1.2.1 How to use The Descriptive Analytics

The descriptive analytics presents INFORM risk index at sub-national level, where the user will easily recognise the relative risks of different administrative unit. Easy-to-understand annotation on the INFORM scores will be presented in this display.

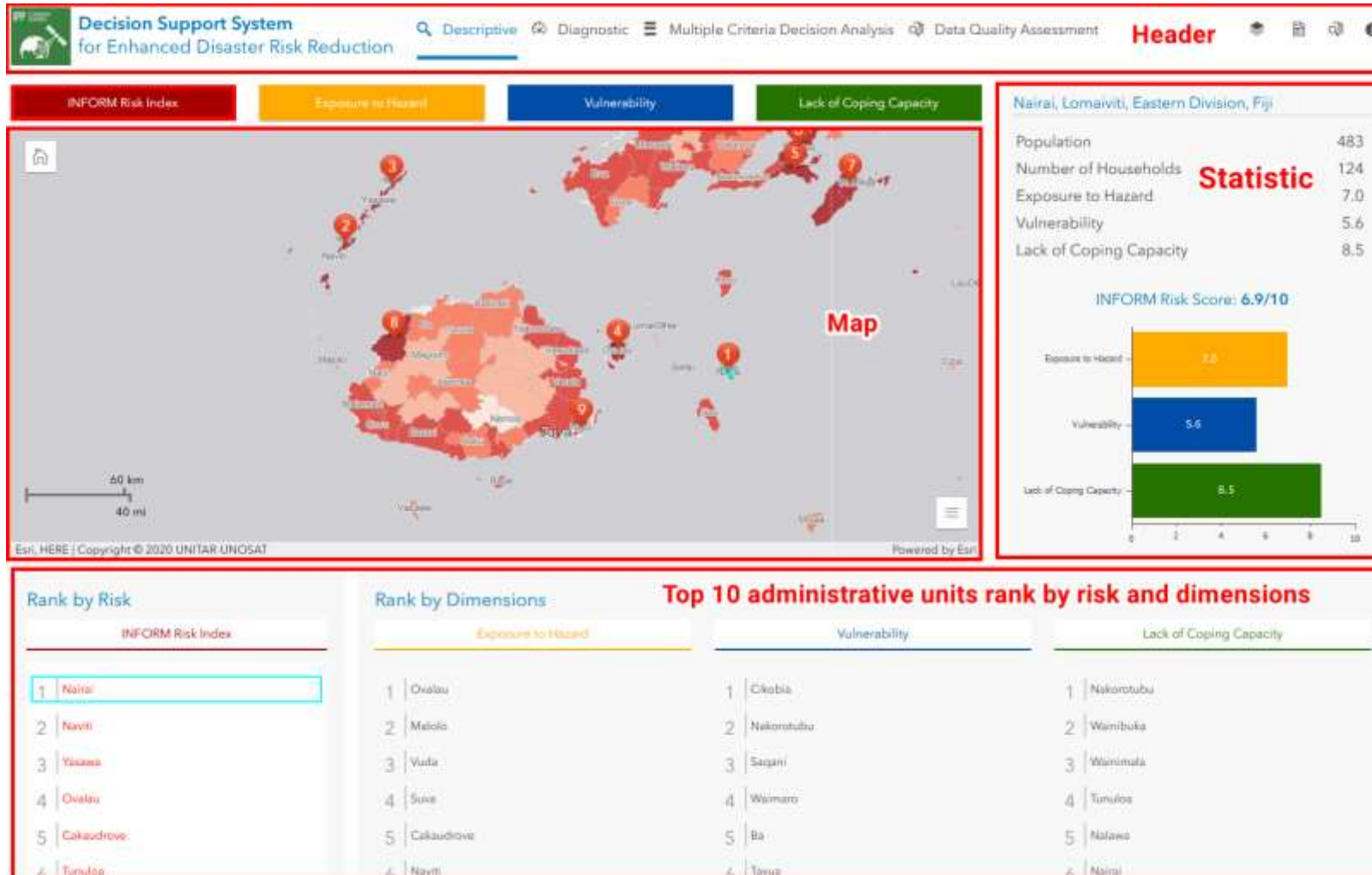


Figure 7 Descriptive Analytics application

When you open the application, you will see various elements include the following:

1.2.1.1 Header panel



Figure 8 Header panel of the descriptive analytics page

A header panel is a reserved area along the top of the application. On the left we have a specific site title, with that site's primary navigation. The right section of the header panel is used for user-interaction.

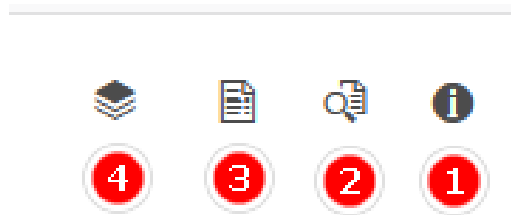


Figure 9 user-interaction sites

1. **App Details** provides all information about the app for users.
2. **INFORM Subnational Model** gives information on how INFORM Subnational created.
3. **INFORM Subnational Risk external link** allows user to open the INFORM Subnational Risk website which is managed by Joint Research Centre.
4. **View ArcGIS Online items** provides all details about ArcGIS Online items that are used in the application.

1.2.1.2 Map and Statistic panels

Map is designed to display multiple visualisations that work together with statistics side by side.

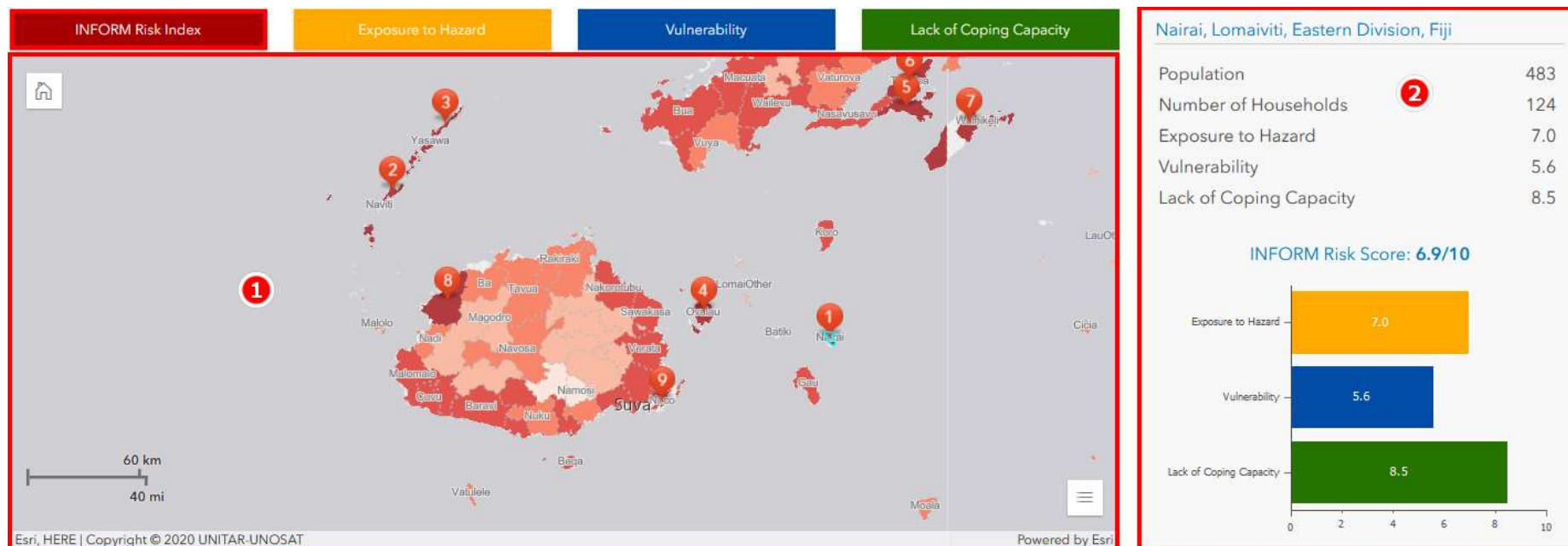


Figure 10 The layout of map and static panel

1. Map panel allows you to view INFORM risk index at sub-national level.
2. Statistic panel provides all information on selected administrative unit.

1.2.1.3 Top 10 administrative units rank by risk and dimensions panel

The descriptive analytics ranks the administrative units on many indicators. Thus, each administrative unit receives a ranking for each of the three dimensions, as well as an overall risk ranking.

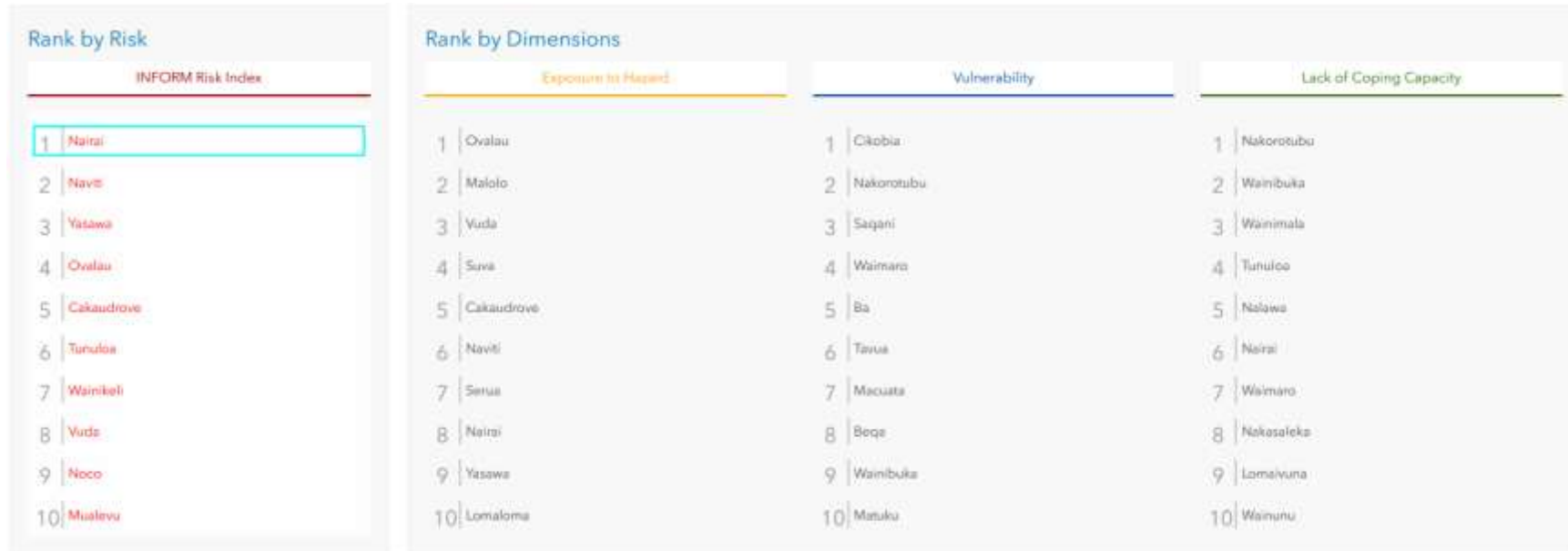


Figure 11 Top 10 ranking for each indicator

1.2.1.4 Navigating through the map

You can pan and zoom the map using the mouse. To begin exploring with your mouse, move the mouse pointer so it is in the middle of the map display. Use the following list as a guide for completing navigation actions with the mouse.

- To move or pan the map, click, and drag the map in the direction in which you want it to move.
- To zoom in to a specific area on the map, press the **Shift** key and drag a rectangle to designate the area of interest.
- To zoom out to a specific area on the map, press **Shift + Ctrl** and drag a rectangle to designate the area of interest.
- To zoom in on the map at the location of the mouse pointer, double-click on the point of interest.

You can also use the mouse scroll wheel to zoom in and out. Rotate the wheel up to zoom in and rotate down to zoom out.

There are several options to interact with the map.

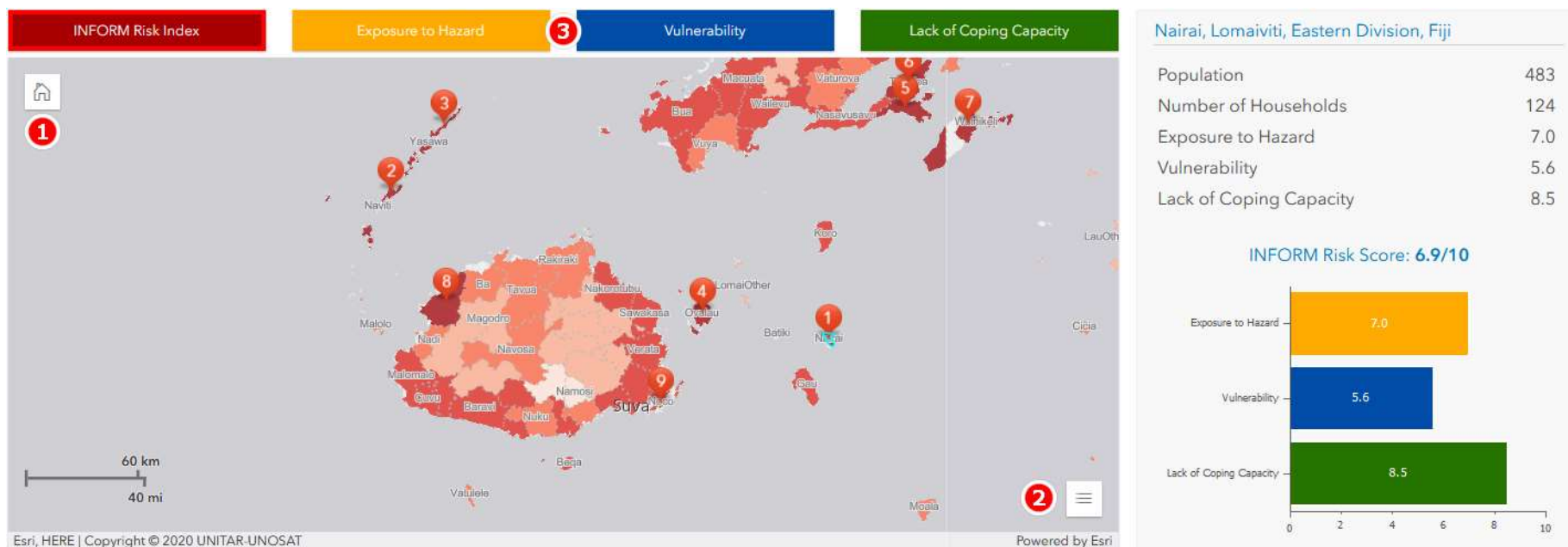


Figure 12 Options to interact with the map

1. The **Home Button** widget in the upper left of the map allows you to zoom the map to the initial map extent.
2. The **Legend** widget displays labels and symbols for a summary ranking of INFORM risk index at sub-national level in the map.
3. The **Interactive dimension buttons** allow you to switch the map display on different dimension.

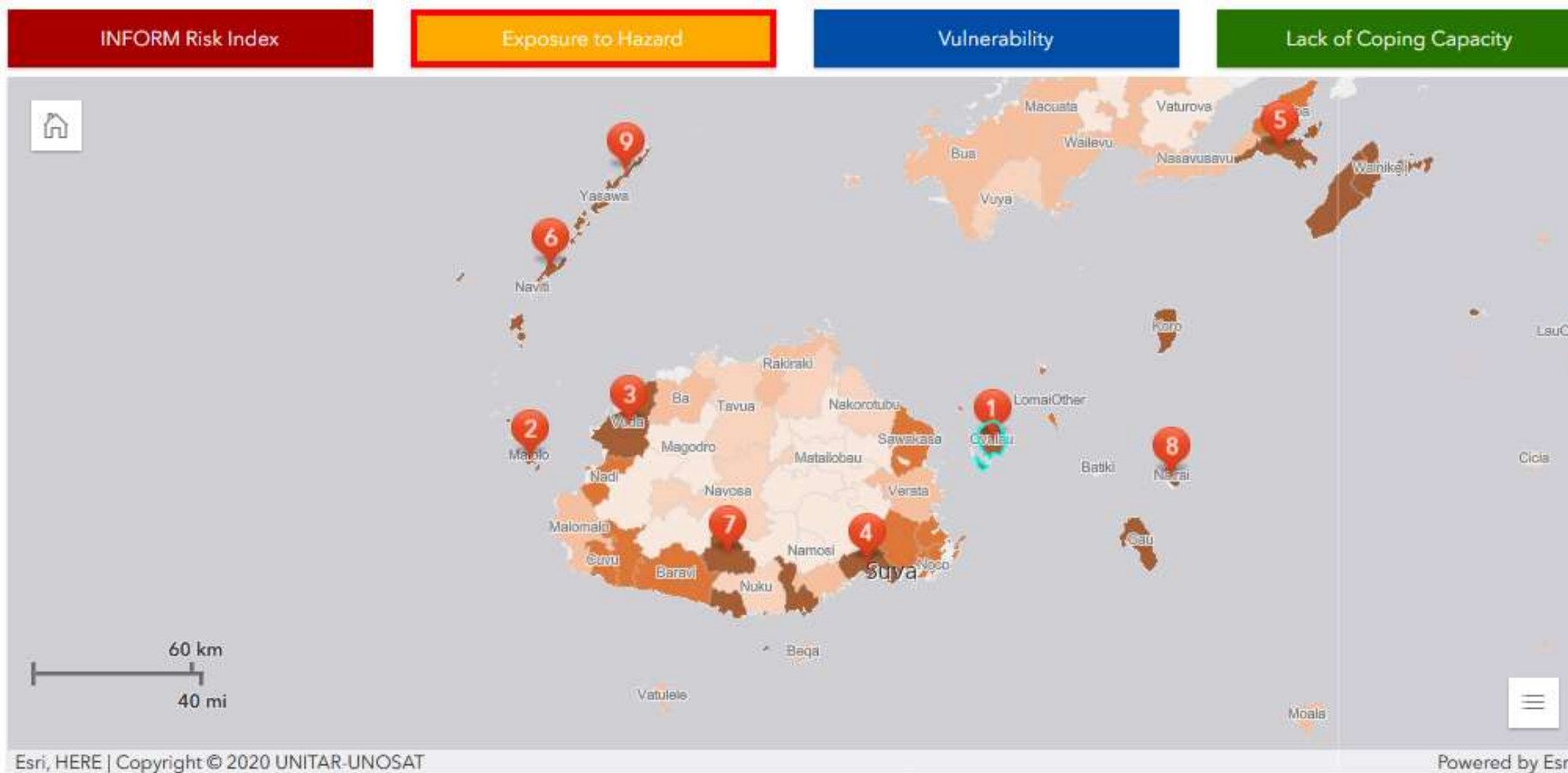


Figure 13 switch the map display on different dimension

4. You can click on the Top 10 administrative units rank by risk and dimensions panel to see where administrative unit located on the map.

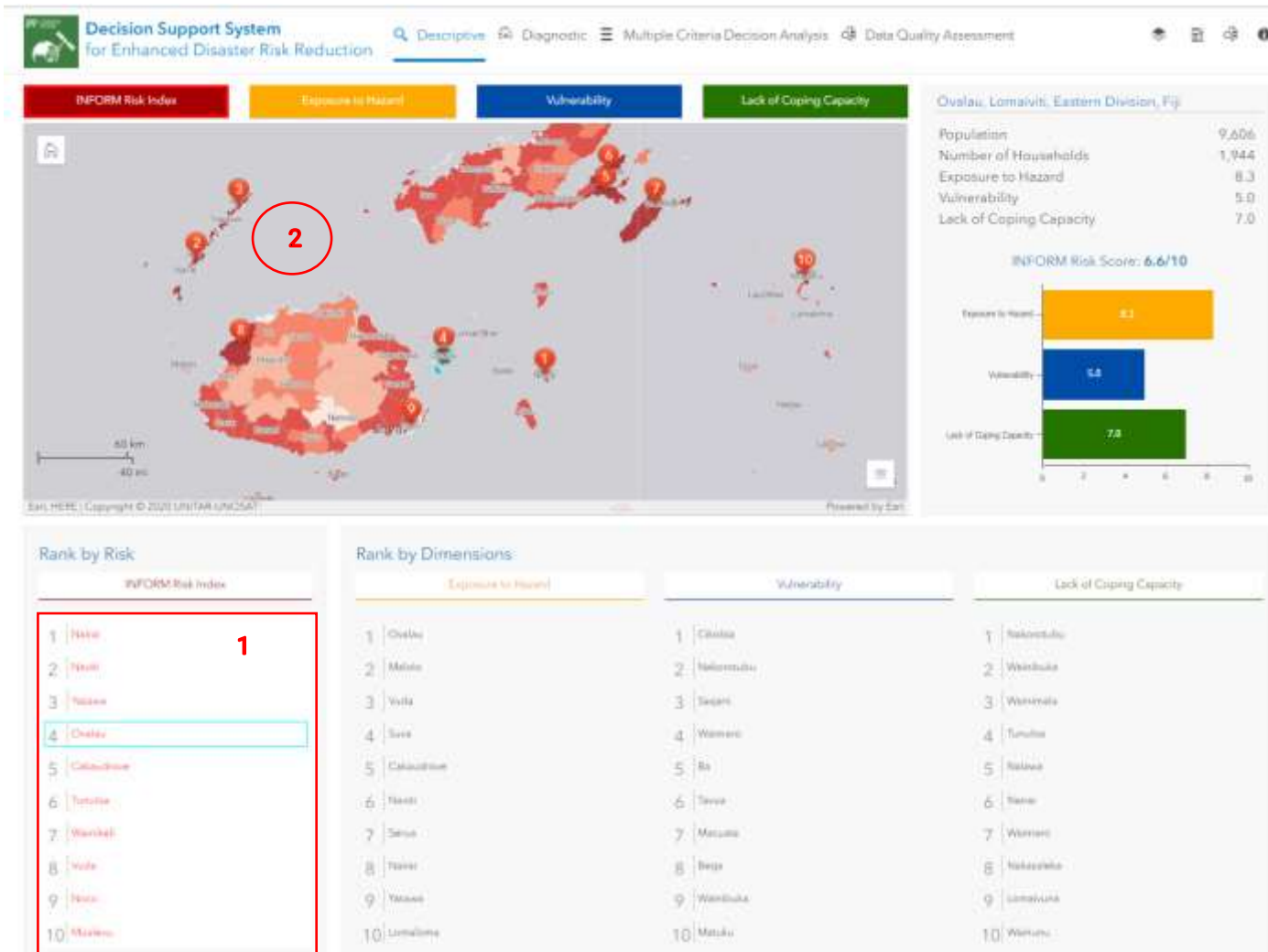


Figure 14 Click on rank panel to located administrative on the map.

1.2.2 How to use The Diagnostic Analytics

The diagnostic analytics further breaks down the INFORM risk into exposure to hazard, vulnerability, and lack of coping capacity indexes for selected sub-national levels. The diagnostic analytics shows graphs of the three dimensions, each followed by components in numeric value (on the scale of 0 to 10, 0 being no risk factor to 10 being high risk factor).

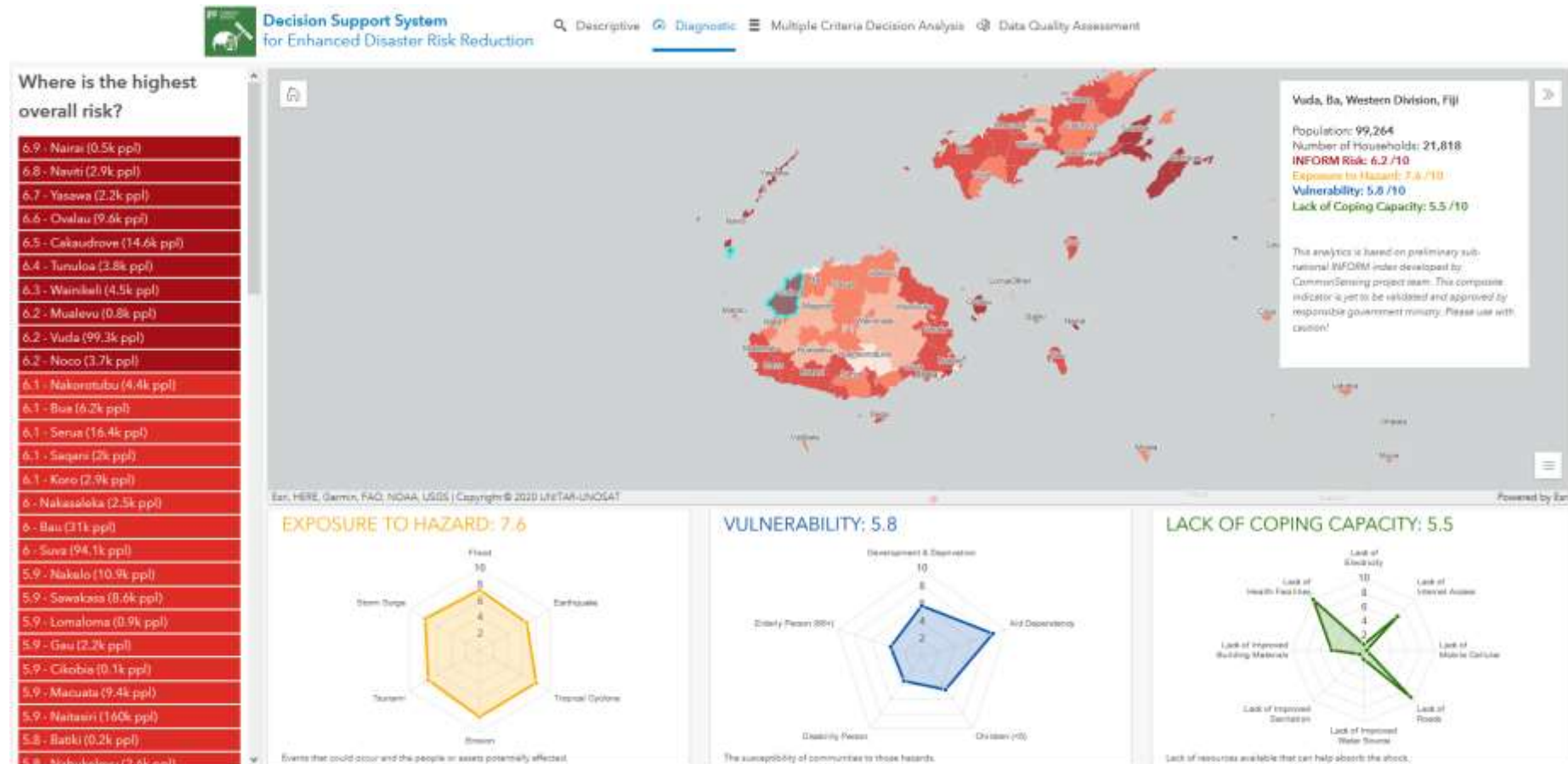


Figure 15 [Diagnostic Analytics application](#)

1.2.2.1 Navigating through the map

You can pan and zoom the map using the mouse. To begin exploring with your mouse, move the mouse pointer so it is in the middle of the map display. Use the following list as a guide for completing navigation actions with the mouse.

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- To zoom out to a specific area on the map, press **Shift + Ctrl** and drag a rectangle to designate the area of interest.
- To zoom in on the map at the location of the mouse pointer, double-click on the point of interest.

You can also use the mouse scroll wheel to zoom in and out. Rotate the wheel up to zoom in and rotate down to zoom out. There are several options to interact with the map.

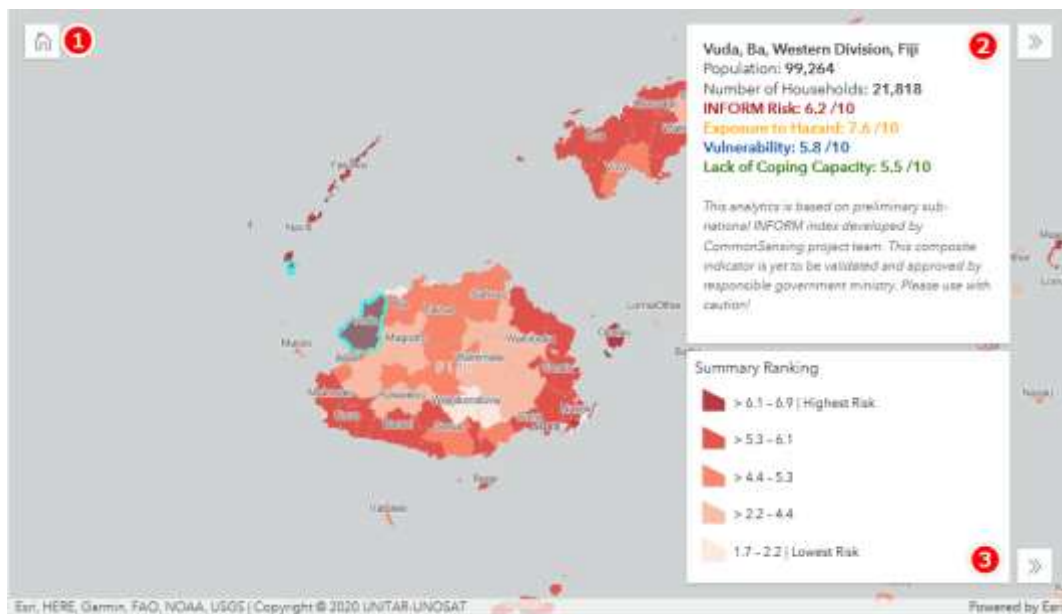


Figure 16 diagnostic analytic options to interact with the map

1. The **Home Button** widget in the upper left of the map allows you to zoom the map to the initial map extent.
2. The **Details** widget provides information for a user-selected location on the map.
3. The **Legend** widget displays labels and symbols for a summary ranking of INFORM risk index at sub-national level in the map.

1.2.2.2 Accessing Information

There are two options to access information of the application.

1. **Click** on the list of administrative units. When you clicked on the list, the map will zoom to your selected area and provide information in details widget. The charts will also change dynamically.
2. **Click** on the map. This allows you to click directly on the map to access information.

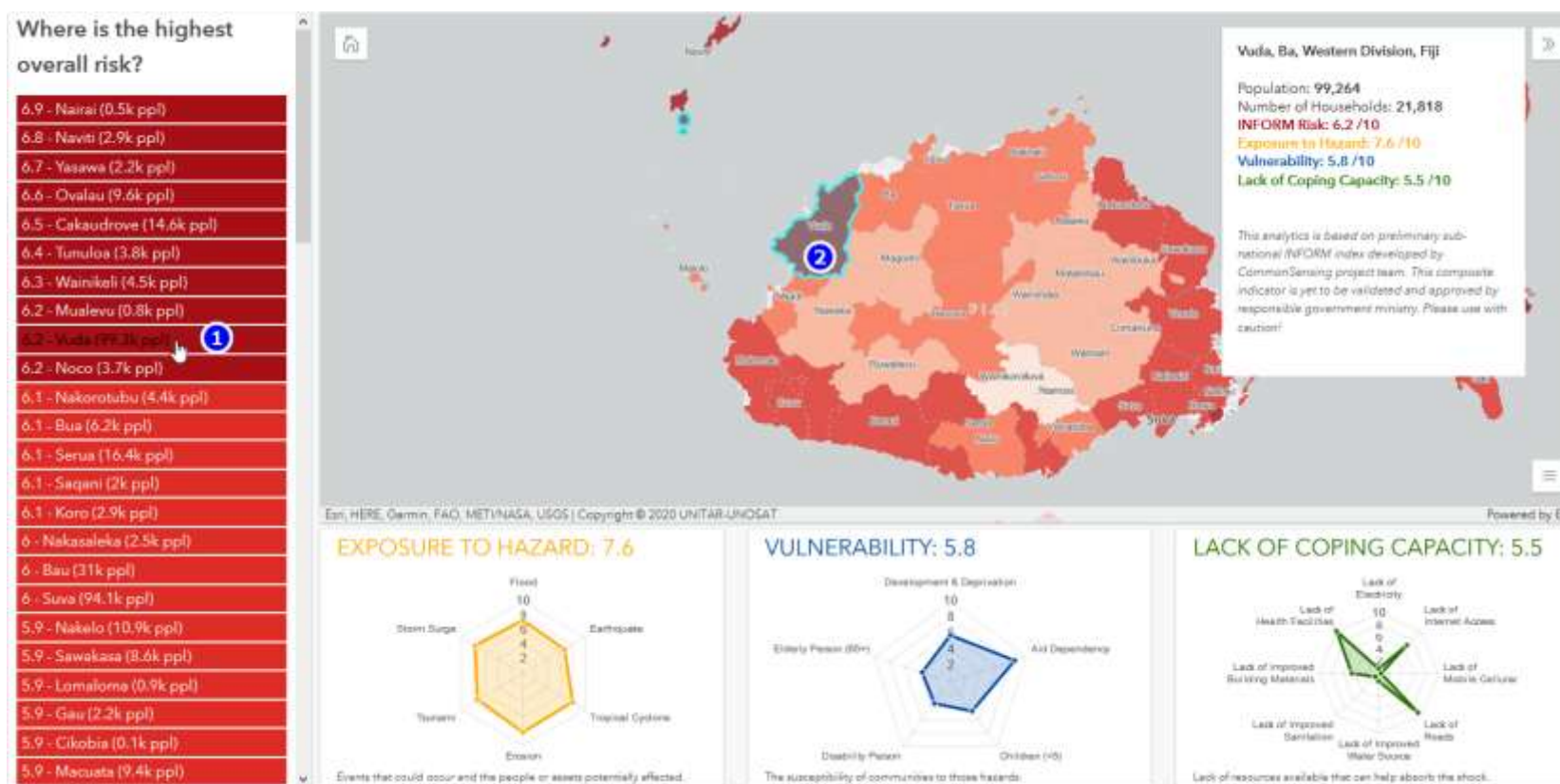


Figure 17 Option to access information of diagnostic analytics application

1.2.3 How to use The Multiple Criteria Decision Analysis

The multiple-criteria decision analysis tool (MCDA) is a new inclusion to the portfolio of the decision support system. It intends to empower the decision-maker with objective evaluation of different DRR options. The MCDA will enable the user to set up their own evaluation criteria's, visualise various options for interventions based on those, and assess the best possible action.

For example, you may be researching a site for relocate people and need to figure out which sites would be suitable based on elevation, slope, and proximity to roads. This can be a time-consuming process with conventional desktop GIS tools. MCDA is a web-based application that makes the entire process more efficient. It allows you to use raster services to visualize information via web browser.

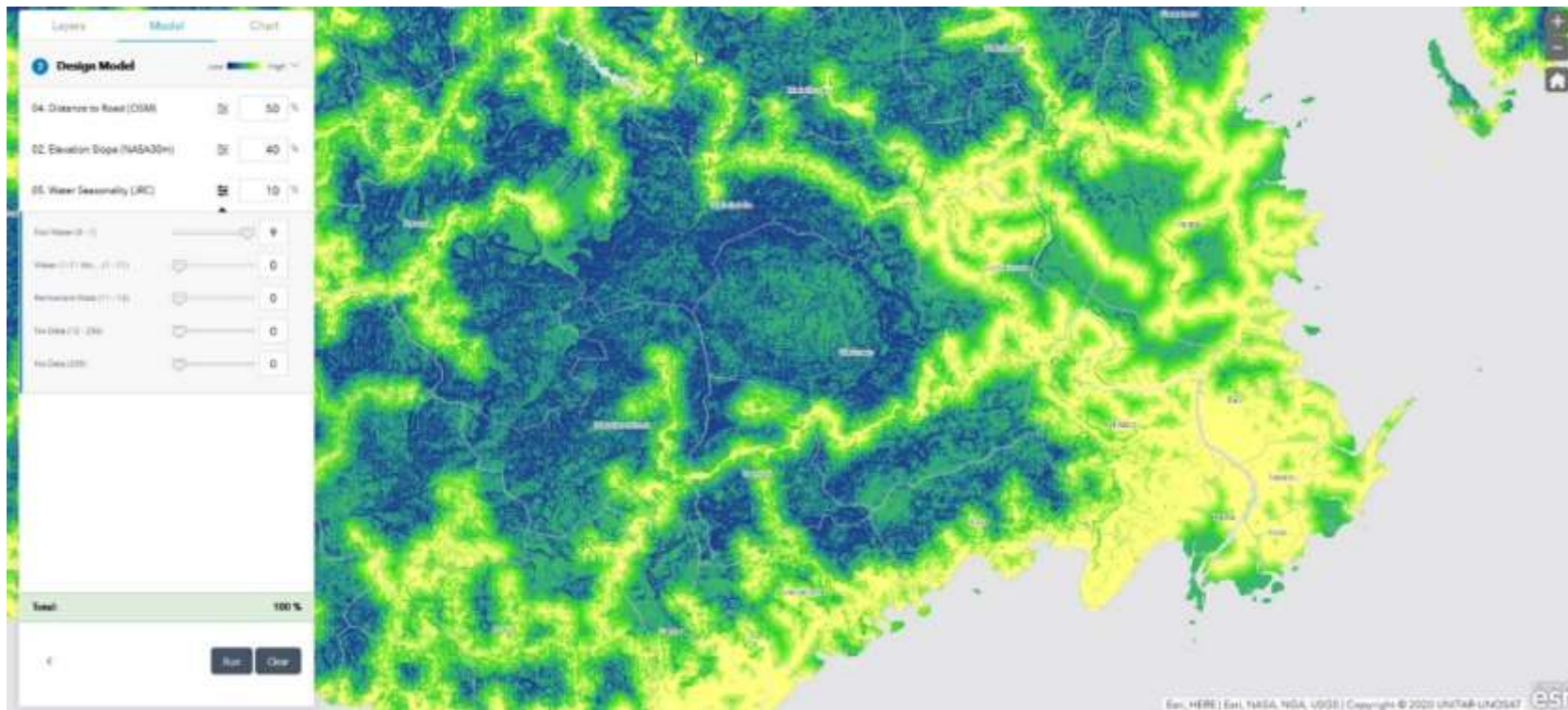


Figure 18 [Multiple Criteria Decision Analysis application](#)

The MCDA tool uses fast, web-based weighted raster overlay to generate models from a service. Choose layers, assign weights, and adjust layer classification values to define your analysis. Then, run the modeler, and visualize results.

1.2.3.1 Understanding weighted overlay

Weighted overlay has three conceptual steps. First, each raster layer is assigned a weight, as a percentage, in the analysis. This allows you to emphasize the relative importance of each layer in the analysis. Second, values within each raster layer are mapped to a common suitability scale. This allows you to compare the different types of information in each raster layer. Third, all raster layers in the analysis are overlaid. Each raster cell's suitability value is multiplied by its layer weight and totalled with the values of other raster cells it overlays. The result is a suitability value that is used for symbology in the output raster layer¹.

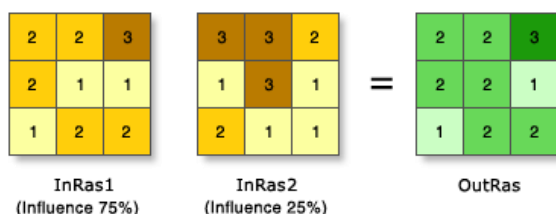


Figure 19 Understand weighted overlay

In the illustration, the two-input raster have been reclassified to a suitability scale of 1 to 3. Each raster is weighted with a percent influence. The cell values are multiplied by their weight, and the results are added together to create the output raster. For example, in the upper-left cell, the values for the two inputs become $(2 * 0.75) = 1.5$ and $(3 * 0.25) = 0.75$. The sum of 1.5 and 0.75 is 2.25. The final value is rounded to 2 as the output is an integer raster layer.

The user interface for the multiple-criteria decision analysis tool (MCDA) guides you through the process of building a model and running it, as well as drawing a reporting area and viewing reports based on the current extent.



Figure 20 interface for MCDA tool

¹Suitability Modeler widget. Available online at: <https://doc.arcgis.com/en/web-appbuilder/create-apps/widget-suitability-modeler.htm>

1.2.3.2 Preparing to build a model

Before models are created, you can zoom for a specific location, so it is better suited to the area you are planning.

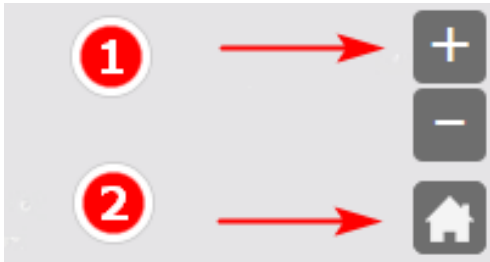


Figure 21 Tools for preparing to build a model

1. The Zoom widget in the upper right allows you to zoom in/out within a map. For example, you can zoom to Suva. You can also use the mouse wheel to zoom in and out. Roll the wheel away from you to zoom out and roll the wheel toward you to zoom in. Keyboard shortcuts such as shift + drag mouse allows you to zoom in by drawing a rectangle on the map.
 2. The Home Button widget allows you to zoom the map to the initial map extent.
-

1.2.3.3 Building a model

The multiple-criteria decision analysis pane contains everything you need to create a model: a panel for selecting layers to include in the model as well as a panel for assigning weights to the layers and the classes within them.

To begin, layers must be selected on the **Select Layers** panel. The Select Layers panel allows you to indicate which layers are going to be included in the model, as well as view more information.

- Under the Layers section, **check** the layers you want to include in your analysis. You can view more formation of the layer by clicking on information button next to layer name.

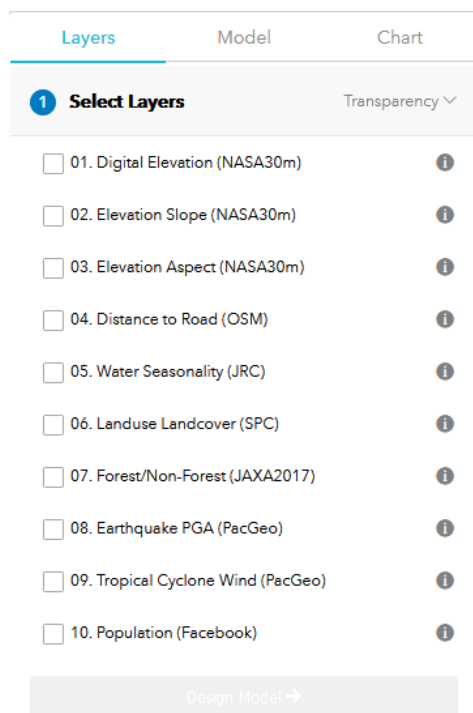


Figure 22 Layers selection window in MCDA tool

- Click **Design Model**.
-

1.2.3.4 Adjusting percentages weight of each layer

The **Design Model panel** is where you can assign percentages and weights to layers and the classes within them. All the percentages must have a sum of 100 before a model can be run. Percentages refer to each layer's relative importance.

- In the Model section, you can assign each layer a relative importance in the analysis by **typing** a percentage into the percentage (%) text box. The total percentage must equal 100 before you can execute the analysis.

Layer	Weight (%)
01. Digital Elevation (NASA30m)	10
Very Low (-62 - 200)	9
Low (200 - 400)	7
Medium (400 - 800)	5
High (800 - 1000)	3
Very High (1000 - 1312)	1
02. Elevation Slope (NASA30m)	30
04. Distance to Road (OSM)	60
Total:	100

Figure 23 Design Model of MCDA tool

1.2.3.5 Adjust each layer sub-class weights

Class weights are how layer values are mapped to a suitability scale. In the graphic above, the Elevation layer is weighted at 10% and has 5 classes. Each class is mapped to a suitability value of 1-9. Class Very Low (-62 to 200) is mapped to a suitability value of 9 (very high). During the analysis, any Elevation value between -62 to 200 is remapped to a value of 9. How you interpret this depends on your criteria. For example, if you are trying to build new settlements low elevation slopes like 0-5 can be assigned 9, which means those areas are highly suitable.

- **Change** the colour ramp used to symbolise the results
- Click **Run**.

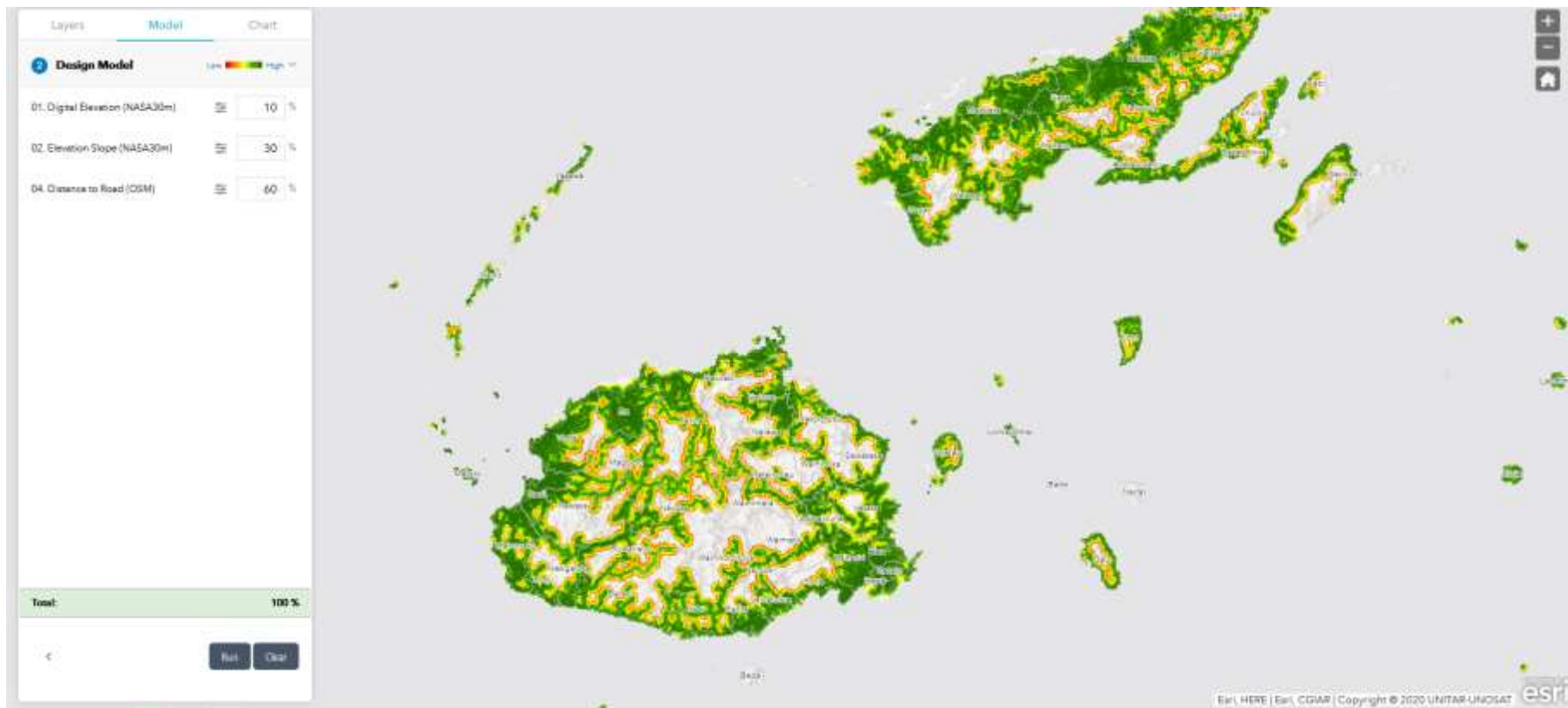


Figure 24 display the map using the designated colour ramp

After you execute the model, the results are displayed on the map using the designated colour ramp. As you pan around the map, you can view the way the suitability levels are higher or lower for a particular area. Once you have run your model, you will be able to create charting percentages.

- Select **Chart** in the panel window.

Choose between the features to create a chart of your model. You can use tools like:

- Draw a polygon
- Draw a freehand polygon
- Select from a layer
- Pan

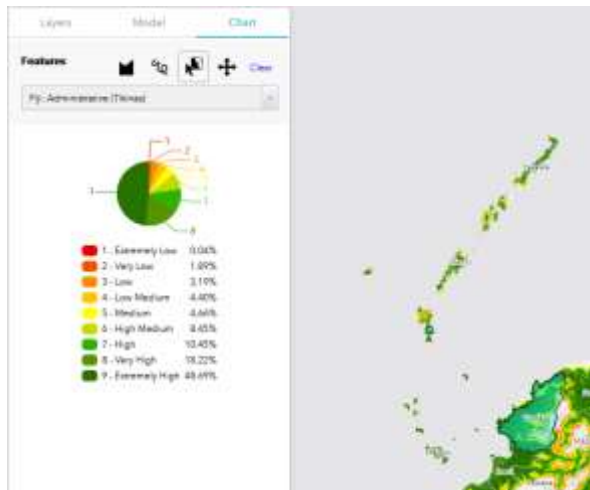


Figure 25 Feature to create a chart of your model

The multiple-criteria decision analysis tool (MCDA) provides a powerful way to visualize and analyse site suitability factors. Based on the shading in your model, you can identify areas of opportunity and risk.

1.2.3.6 Exporting the results for your report

Important thing to note here all the analysis performed are temporary in nature and as soon as close the browser all the results will be lost. You can take screenshots of different analysis outcomes using window snipping tool or any other similar tools.

1.3 Highlights of Technical Backstopping section

CommonSensing Technical team provides continuous backstopping to different line ministries of the partner countries. For effective decision making, some of these backstopping supports are delivered via modern story maps, 3D Visualizations, and Operations Dashboards.



Highlights of Technical Backstopping

CommonSensing Technical team provides continuous backstopping to different line ministries of the partner countries. For effective decision making, some of these backstopping supports are delivered via modern story maps, 3D Visualizations, and Operations Dashboards.

 Story Map	 Story Map	 Story Map
<p>Earthquake Induced Landslide Susceptibility Mapping, Fiji</p> <p>A landslide susceptibility map was prepared using the geological classes and slop steepness.</p> <p>Explore</p>	<p>Hydrological Information Development for Sarakata Watershed, Vanuatu</p> <p>The hydrological information is derived from Alos Palsar high resolution digital elevation model.</p> <p>Explore</p>	<p>Change Detection Along the Lungga & Mataniko River, Solomon Islands</p> <p>Area of Interest - Lungga and Mataniko river, Solomon Islands.</p> <p>Explore</p>
 3D Live Map	 Dashboard	 3D Live Map
<p>TC Harold 20 Damage 3D Visualization, Luganville, Vanuatu</p> <p>This map illustrates potentially damaged structures and buildings in Luganville town, Vanuatu.</p> <p>Explore</p>	<p>TC Harold 20 Emergency Response Dashboard, Vanuatu</p> <p>TC Harold 20 Emergency Response Dashboard - Provisional Dashboard Provided by UNOSAT.</p> <p>Explore</p>	<p>Colo-i-Suva Forest Reserve in Fiji between 2014 to 2019</p> <p>The 3D scene illustrates deforestation in Colo-i-Suva forest Reserve in Fiji between 2014 to 2019.</p> <p>Explore</p>

Figure 5 Highlights of Technical Backstopping section

1.3.1 Interactive Maps section

CommonSensing's latest interactive maps can be seen in this section. These allow users to interact with UNOSAT's analysis in an intuitive and eye-catching manner, providing easy visualization of the affected areas, and allowing users to focus on what interests them most, giving a better local understanding of the situation.



CommonSensing



Interactive Maps

CommonSensing's latest interactive maps can be seen below. These allow users to interact with UNOSAT's analysis in an intuitive and eye-catching manner, providing easy visualisation of the affected areas, and allowing users to focus on what interests them most, giving a better local understanding of the situation.


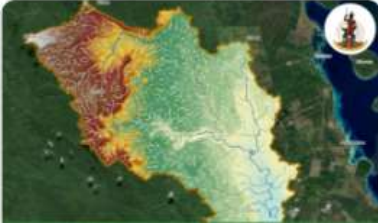


 Live Map	 Live Map	 Live Map	 Live Map
Landslide Susceptibility Map Area of Interest - Kadavu, Fiji	Sarakata Watershed Map Area of Interest - Luganville, Vanuatu	Rainfall Network Map Area of Interest - Vanuatu	Change detection along the Lungga and Mataniko river... Area of Interest - Lungga and Mataniko river, Solomon Islands
LAUNCH MAP	LAUNCH MAP	LAUNCH MAP	LAUNCH MAP

Figure 6 Interactive Maps section

1.3.2 How to use web maps

Web map is an interactive display of geographic information that you can use to tell stories and answer questions. Web map can be seen in CommonSensing's landing page under Interactive Map section. These allow users to interact with UNOSAT's analysis in an intuitive and eye-catching manner, providing easy visualisation of the affected areas, and allowing users to focus on what interests them most, giving a better local understanding of the situation.

Interactive Maps

CommonSensing's latest interactive maps can be seen below. These allow users to interact with UNOSAT's analysis in an intuitive and eye-catching manner, providing easy visualisation of the affected areas, and allowing users to focus on what interests them most, giving a better local understanding of the situation.

The figure displays four interactive map cards arranged horizontally. Each card features a thumbnail image of a map, a 'Live Map' label, a title, a description of the area of interest, and a 'LAUNCH MAP' button.

- Landslide Susceptibility Map:** Area of Interest - Kadavu, Fiji
- Sarakata Watershed Map:** Area of Interest - Luganville, Vanuatu
- Rainfall Network Map:** Area of Interest - Vanuatu
- Change detection along the Lungga and Mataniko river...:** Area of Interest - Lungga and Mataniko river, Solomon Islands

Figure 26 Interactive Maps main page

All maps are provided by the United Nations Institute for Training and Research (UNITAR) Operational Satellite Applications Program (UNOSAT) hosted at the European Organization for Nuclear Research (CERN) in Geneva, Switzerland.



Figure 27 Show various tool to interact the map

When you work with web map, you can interact the map with various tools include the following:

1. The **Legend** widget displays labels and symbols for layers in the map. The order in which layers appear in the Legend widget corresponds to the layer order in the map.
 2. The **Layer List** widget provides a list of operational layers and their symbols and allows you to turn individual layers on and off. Each layer in the list has a check box that allows you to control its visibility. Some layers contain sublayers or subtypes. The order in which layers appear in this widget corresponds to the layer order in the map. This widget provides functionality allowing you to change the order of layers in the map.
 3. The **Basemap Gallery** widget presents a gallery of basemaps and allows you to select one from the gallery as the basemap for the app.
 4. The **Draw** widget allows you to draw simple graphics and text on the map. You can also use it to add line distance or polygon area to the feature as text. This widget provides basic sketching and redlining functionality to a web app. It also displays some measurements for drawn features, such as length for lines and area and perimeter for polygons.
 5. The **Share** widget allows you to share an app by posting it to your social media account, sending an email with a link, or embedding it in a website or blog. It also provides an easy way to define URL parameters for the app.
 6. The **My Location** widget allows the network to detect your physical location and zoom the map to it. The location can be highlighted if necessary. The widget takes advantage of HTML geolocation. When the app runs on desktops, it uses the browser on the network to detect the location. When the app runs on mobile devices, by default, it uses GPS on the device to determine your location.
 7. The **Home Button** widget zooms the map to the initial map extent.
 8. The **Zoom Slider** widget provides interactive zoom controls in the map display.
 9. The **Search** widget enables end users to find locations on the map.
 10. The **External Hyperlink** widget allows you to connect to UNOSAT and CommonSensing websites.
 11. The **Print** widget allows user to print the current map with various formats.
 12. The **Bookmark** widget stores a collection of map view extents (that is, spatial bookmarks) displayed in the app. It also allows you to create and add your spatial bookmarks through configuration or at run time after the app starts.
 13. The **Measurement** widget allows you to measure the area of a polygon or length of a line or find the coordinates of a point.
 14. The **Scalebar** widget displays a scale bar on the map. The widget displays units in metric values.
 15. The **Coordinate** widget displays x- and y-coordinate values on the map. The coordinate values change dynamically when the mouse pointer moves to locations on the map.
-

1.3.3 How to use Dashboards

A dashboard is a view of geographic information and data that allows you to monitor events, make decisions, inform others, and see trends. Dashboards are designed to display multiple visualisations that work together on a single screen. They offer a comprehensive view of your data and provide key insights for at-a-glance decision-making.

Dashboard can be seen in CommonSensing's landing page under Highlights of Technical Backstopping section.

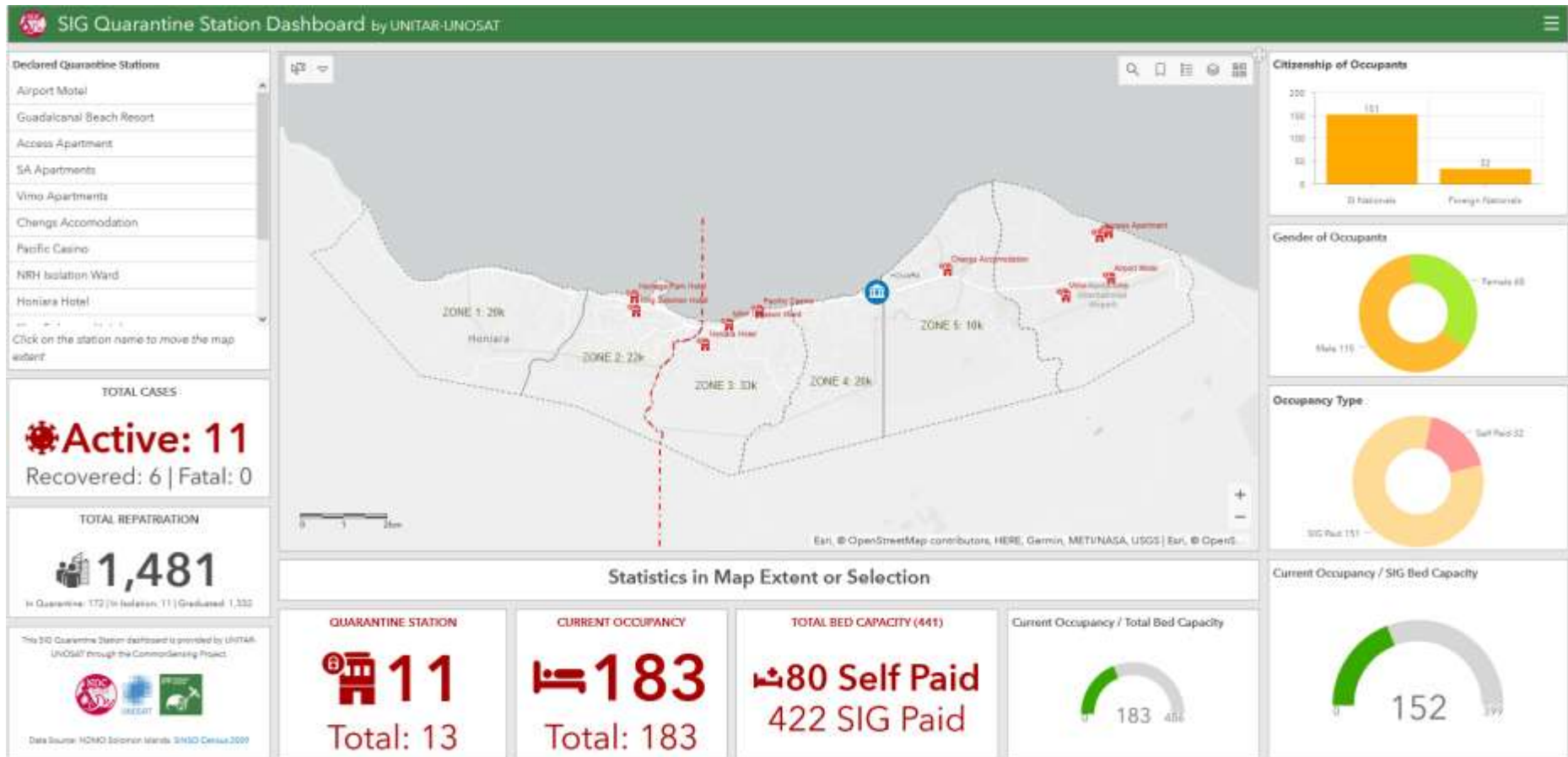


Figure 28 Dashboard windows

All dashboards are provided by the United Nations Institute for Training and Research (UNITAR) Operational Satellite Applications Program (UNOSAT) hosted at the European Organization for Nuclear Research (CERN) in Geneva, Switzerland.

When you work with Dashboard, you can interact the app with various elements include the following:

Header



Figure 29 The header of dashboard

A header is a reserved area along the top of the dashboard that can be used for giving the dashboard a unique identity, applying corporate branding standards, and providing links to additional content. External links can be found under section.

List

A list is used to show features or rows from a layer. When available, field formatting information in a list is based on information found in the layer's pop-up. You can click on a list to zoom or map a map.

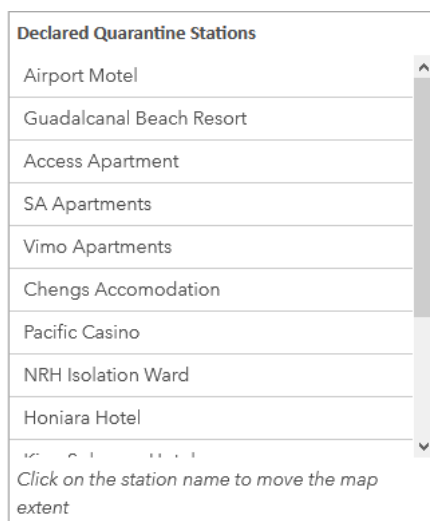


Figure 30 the features lists window

Indicators

An indicator is essentially a card. It uses to show the numeric attributes of individual features, or displays a count, a sum, an average, a minimum, or a maximum summary statistic.



Figure 31 the Indicator panel to show the numeric attributes of individual feature

Infographic

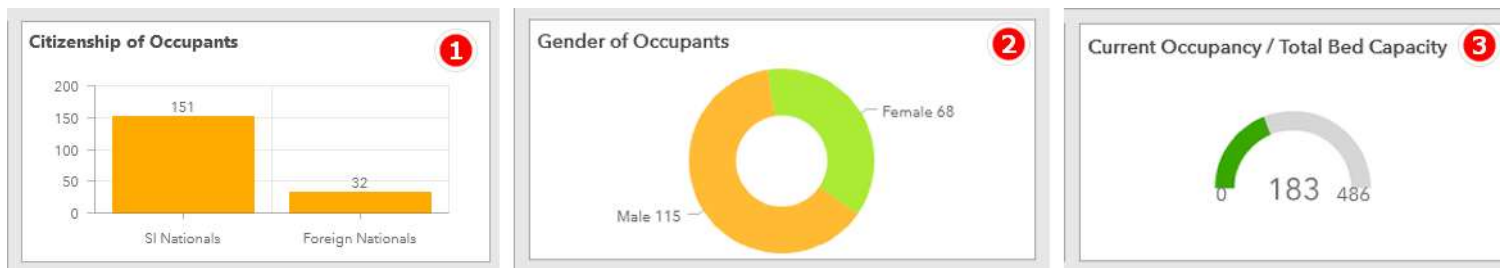


Figure 32 Infographic serial chart visualizes of data points

1. A serial chart visualizes one or more series of data points along a horizontal (x) axis and a vertical (y) axis. Serial charts get their name from an ability to show more than one series of data.
2. A pie chart is a circular chart divided into sections. Each section is proportional to the quantity it represents. A pie chart contains a single series of data points.
3. Progress gauges convey whether a value is moving forward within a quantitative context defined by minimum and maximum values.

Map and tools

Map plays a central role in many dashboards. The map element includes:

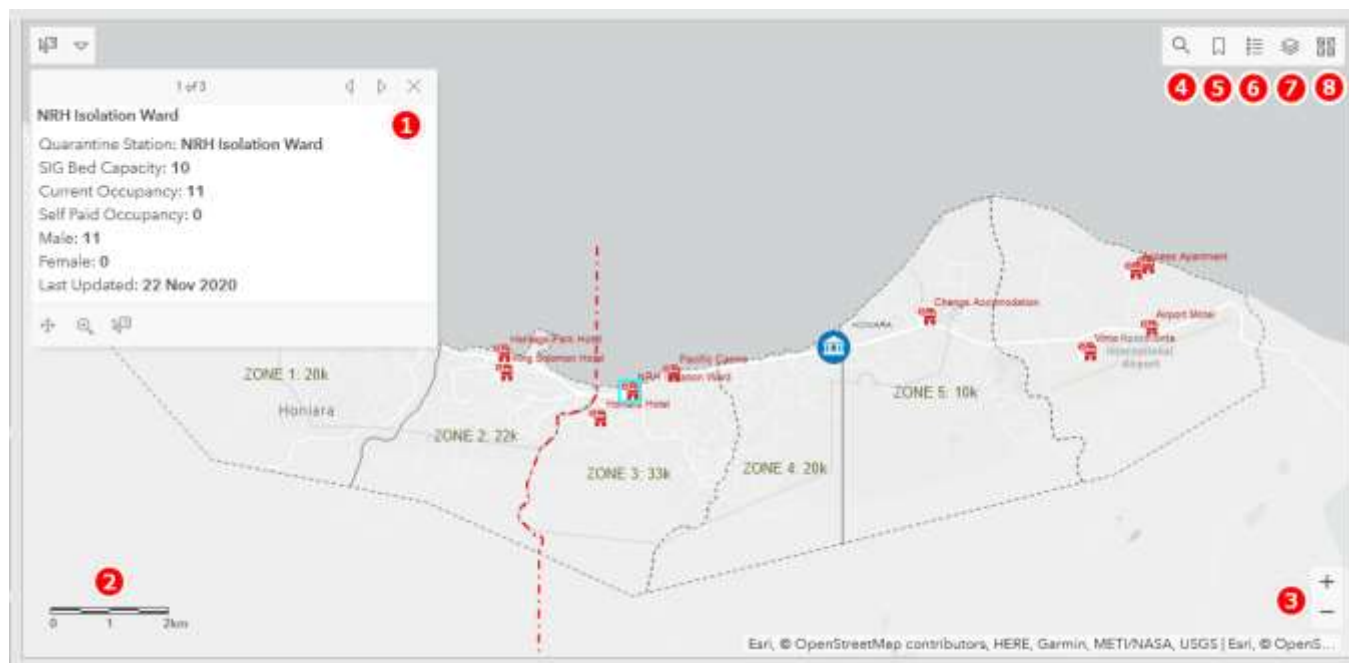


Figure 33 The map elements and tools in dashboard

1. **Pop-ups**—Displays descriptive information about a feature when clicked.
2. **Scalebar**—Displays a scale bar in the lower corner of the map.
3. **Zoom In/Out**—Allows you to zoom in or out on a map.
4. **Search**—Allows users to find locations on the map.
5. **Default Extent and Bookmarks**—Provides pre-existing bookmarks on your map and a way to return to the map's initial extent.
6. **Legend**—Displays the map's legend.
7. **Layer Visibility**—Allows you to switch operational layers on or off.
8. **Basemap Switcher**—Allows dashboard users to change the basemap at run time.

