

Madagascar Weighted Index of Need Explorer Instructions

This publication was produced by Abt Global as part of the LASER PULSE program, led by Purdue University and funded by the United States Agency for International Development (USAID). The views expressed in this publication do not necessarily reflect the views of USAID or the United States Government.

The USAID Bureau for Humanitarian Assistance (BHA) seeks to reduce the need for ongoing and future food and nutrition security humanitarian assistance in Madagascar and build resilience among households and communities vulnerable to recurrent shocks. The **Madagascar Index of Need Explorer** allows users to calculate a custom index of need using indicators from nine domains relevant to ongoing vulnerability, and then use this information to identify and strategically target assistance toward the communes within the country with the highest degree of need. These instructions are to guide users of the application through the process of calculating an index of need and downloading the results. Details on the methodology and indicators can be found at the end of the document.

Purpose of this tool

This tool is designed to assist users with evidence-based design and decision-making for Resilience and Food Security Activities (RFSAs). The tool enables users to 1) visualize indicators related to resilience and food security across different communes in RFSA geographic areas and 2) select the relative importance of each indicator for the calculation of an Index of Need, which uses colors to visually represent each commune's level of need for a RFSA relative to the other communes. The ability of the user to manually select the weight for each indicator in the Index of Need allows users to decide for themselves the relative importance of each indicator in determining the level of need for a RFSA and incorporate this evidence into their RFSA design.

Application Interface

The application has three tabs: **Index Maker**, **Illustrative Example**, and **Indicator Explorer (ArcGIS)**

- **Index Maker** Calculates the Index of Need using custom weights. To calculate the index, the user adjusts the weights for the indicators in the left sidebar and after clicking the update button, the index is generated.
- **Illustrative Example** Calculates the Index of Need using equal weights across all variables.
- **Indicator Explorer (ArcGIS)** Displays a map of the indicators without Index of Need calculation.

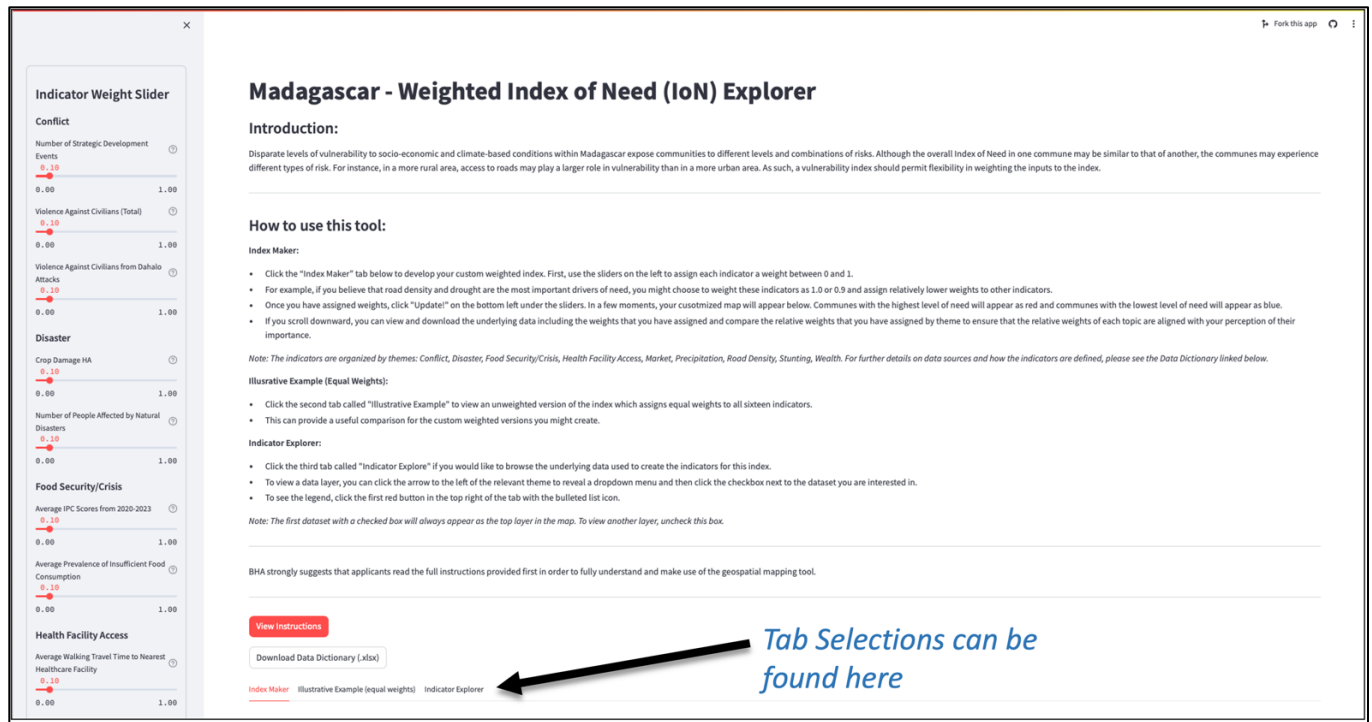


Figure 1 – Screenshot of application when opened

Index Maker Tab

Calculating a weighted Index of Need

Indicators that can be weighted are organized by themes: **Conflict, Disaster, Food Security/Crisis, Health Facility Access, Market, Precipitation, Road Density, Stunting, Wealth.**

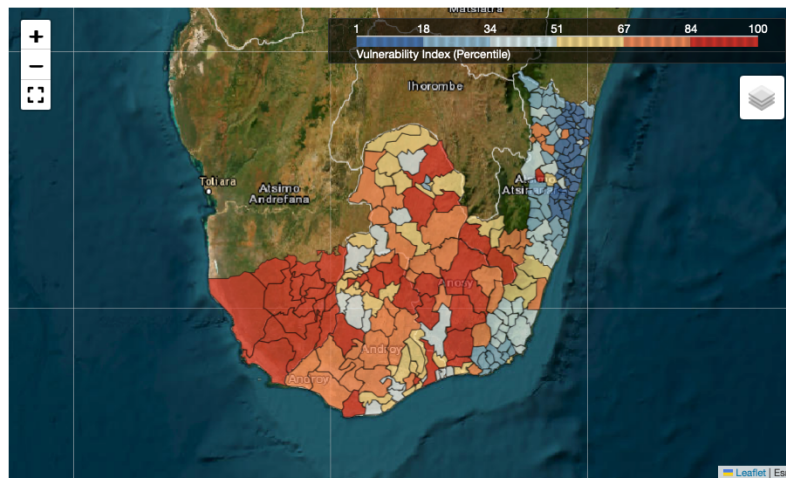
1) Click the “Index Maker” tab to develop your custom weighted index.

- First, use the sliders on the left to assign each indicator a weight between 0 and 1. For example, if you believe that road density and drought are the most important drivers of need, you might choose to weight these indicators as 1.0 or 0.9 and assign relatively lower weights to other indicators.

2) Once you have assigned weights, click “Update!” on the bottom left under the sliders.

- In a few moments (it may take up to 30 seconds), a customized map, table and pie chart will appear in the center of your screen.
- Communes with the highest level of need will appear as red and communes with the lowest level of need will appear as blue. If you scroll downward, you can view and download the underlying data including the weights that you have assigned and compare the relative weights that you have assigned by theme to ensure that the relative weights of each topic are align with your perception of their importance. (Note: for further details on data sources and how the indicators are defined, please see the Data Dictionary linked in the application).

Index Maker



Index Maker Dataframe:

OBJECTID	ADM3_EN	Vulnerability_Index	Vulnerability_Index_Percentile	ADM1_EN	ADM1_PCODE	ADM1_TY
1	Antondabe	0.1379	68	Atsimo Atsinanana	MG25	Region
2	Marovitsika Sud	1.3419	85	Atsimo Atsinanana	MG25	Region
3	Antaninarenina	0.1438	68	Atsimo Atsinanana	MG25	Region
4	Farafangana	0.2166	71	Atsimo Atsinanana	MG25	Region
5	Vohimasy	-1.5508	5	Atsimo Atsinanana	MG25	Region
6	Anosivelo	-1.7073	1	Atsimo Atsinanana	MG25	Region
7	Anosy Tsararafa	-1.5443	6	Atsimo Atsinanana	MG25	Region
8	Vohitromby	-1.8608	1	Atsimo Atsinanana	MG25	Region
9	Ivandrika	-0.4244	44	Atsimo Atsinanana	MG25	Region
10	Manambotra Atsir	-1.1492	21	Atsimo Atsinanana	MG25	Region

Thematic Influence on Weighted Index of Need Pie Chart

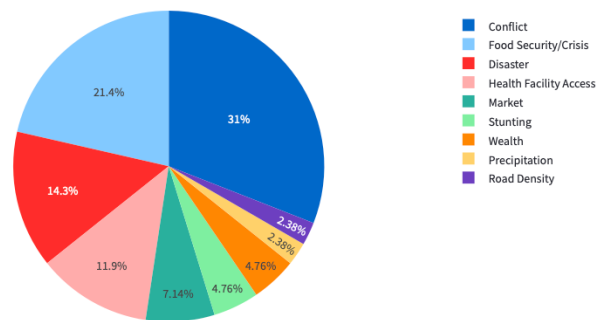


Figure 2 – Resulting map and table after assigning weights

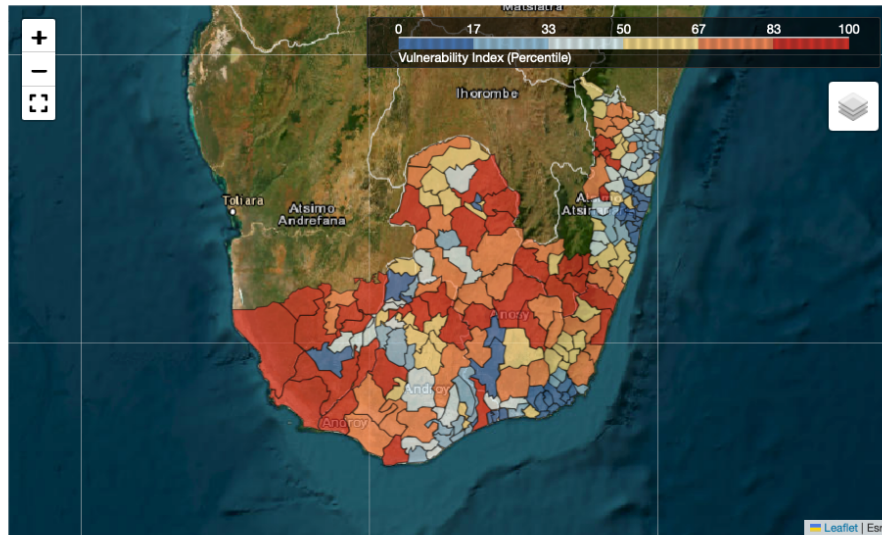
- 3) **The map and table can be downloaded using the links underneath each one.** (Note: the application will refresh the screen after a period of time which will erase the map and table)
- 4) **The pie chart shows the influence of each domain on the Index of Need.**

Illustrative Example (equal weights) Tab

The Illustrative Example (equal weights) tab calculates the Index of Need using equal weights for all indicators. This tab shows an unweighted version of the index which assigns equal weights to all sixteen indicators. This can provide a useful comparison for the custom weighted versions you might create.

- 1) Clicking on the Illustrative Example (equal weights) tab displays a map and a table of Index of Need calculated by assigning a weight of one to all indicators.
NOTE: The Indicator Weight Slider will still appear on the left of the screen but it will not affect the calculation of the unweighted index.

Illustrative Example (equal weights)



Unweighted Index of Need Dataframe:

OBJECTID	ADM3_EN	Vulnerability_Index	Vulnerability_Index_Percentile	ADM1_EN	ADM1_PCODE	ADM1
1	Antondabe	0.3113	84	Atsimo Atsinanana	MG25	Regio
2	Marovitsika Sud	0.5902	94	Atsimo Atsinanana	MG25	Regio
3	Antaninarenina	0.3818	89	Atsimo Atsinanana	MG25	Regio
4	Farafangana	-0.1056	42	Atsimo Atsinanana	MG25	Regio
5	Vohimasy	-0.2338	27	Atsimo Atsinanana	MG25	Regio
6	Anosivelo	-0.3427	17	Atsimo Atsinanana	MG25	Regio
7	Anosy Tsararafa	-0.2609	24	Atsimo Atsinanana	MG25	Regio
8	Vohitromby	-0.4286	9	Atsimo Atsinanana	MG25	Regio
9	Ivandrika	-0.1298	37	Atsimo Atsinanana	MG25	Regio
10	Manambotra Atsimo	-0.1727	32	Atsimo Atsinanana	MG25	Regio

Figure 3 – Screenshot of Un-Weighted Index of Need map and table

Indicator Explorer Tab

Use the Indicator Explorer tab if you would like to browse the underlying data used to create the indicators for this index.

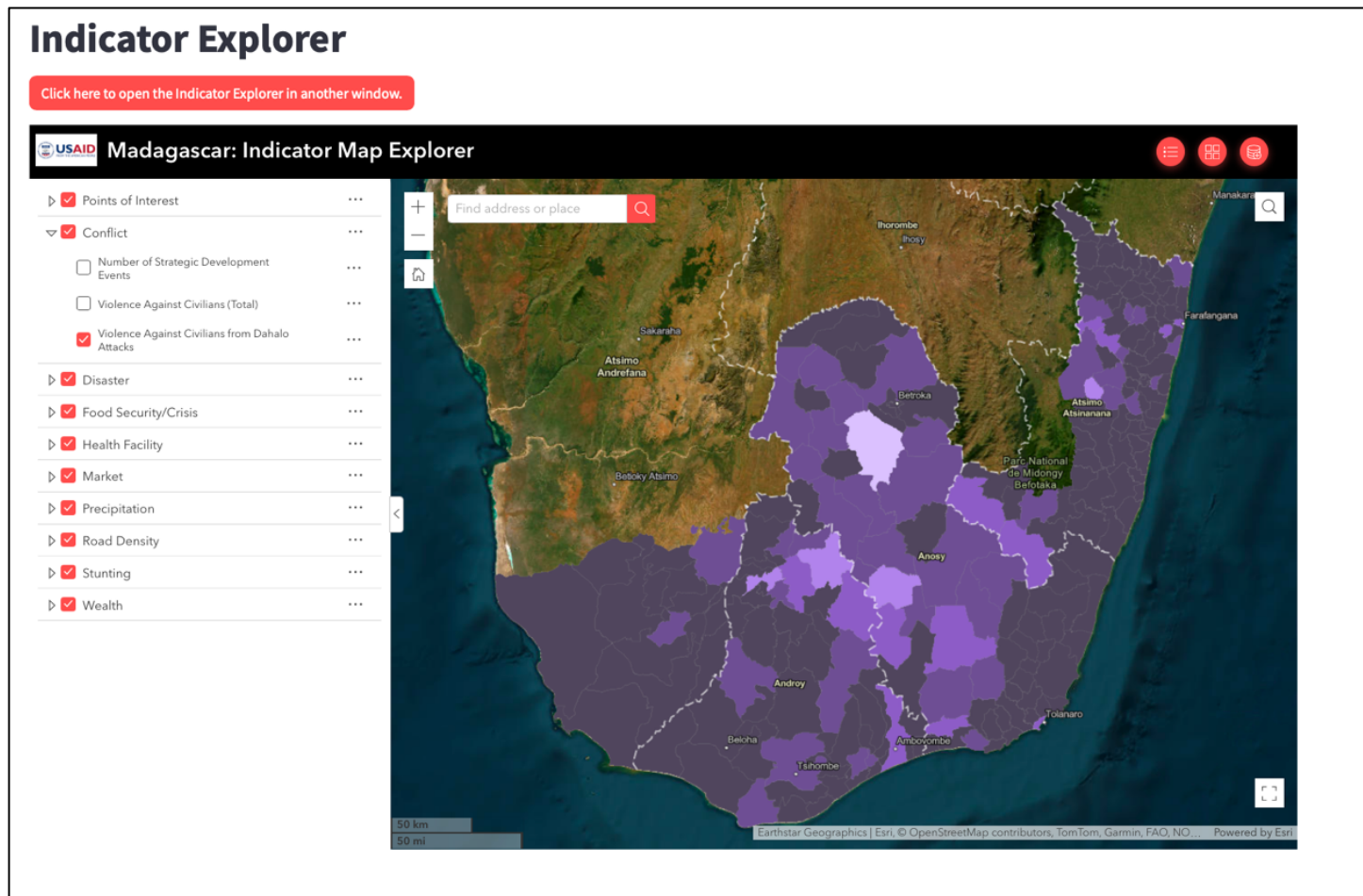
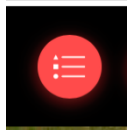


Figure 4 – Screenshot of Indicator Explorer

Displaying layers

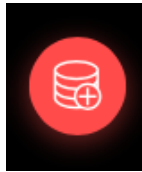
To display layers on the map, click the check box next to the layer name. To view a data layer, click the arrow to the left of the relevant theme to reveal a dropdown menu and then click the checkbox next to the dataset you are interested in. Note that the first dataset with a checked box will always appear as the top layer in the map. To see the legend, click the first red button in the top right of the tab with the bulleted list icon. Clicking on the check box next to the layer will display it on the map.



Legend Icon found in upper right of the Indicator Explorer window

Adding data

It is possible to add additional data to the indicator map using the Add Data button in the upper right of the window. Data can be added from ArcGIS Online, a website via a URL or a file on the user's computer.



Add Data Icon found in upper right of the Indicator Explorer window

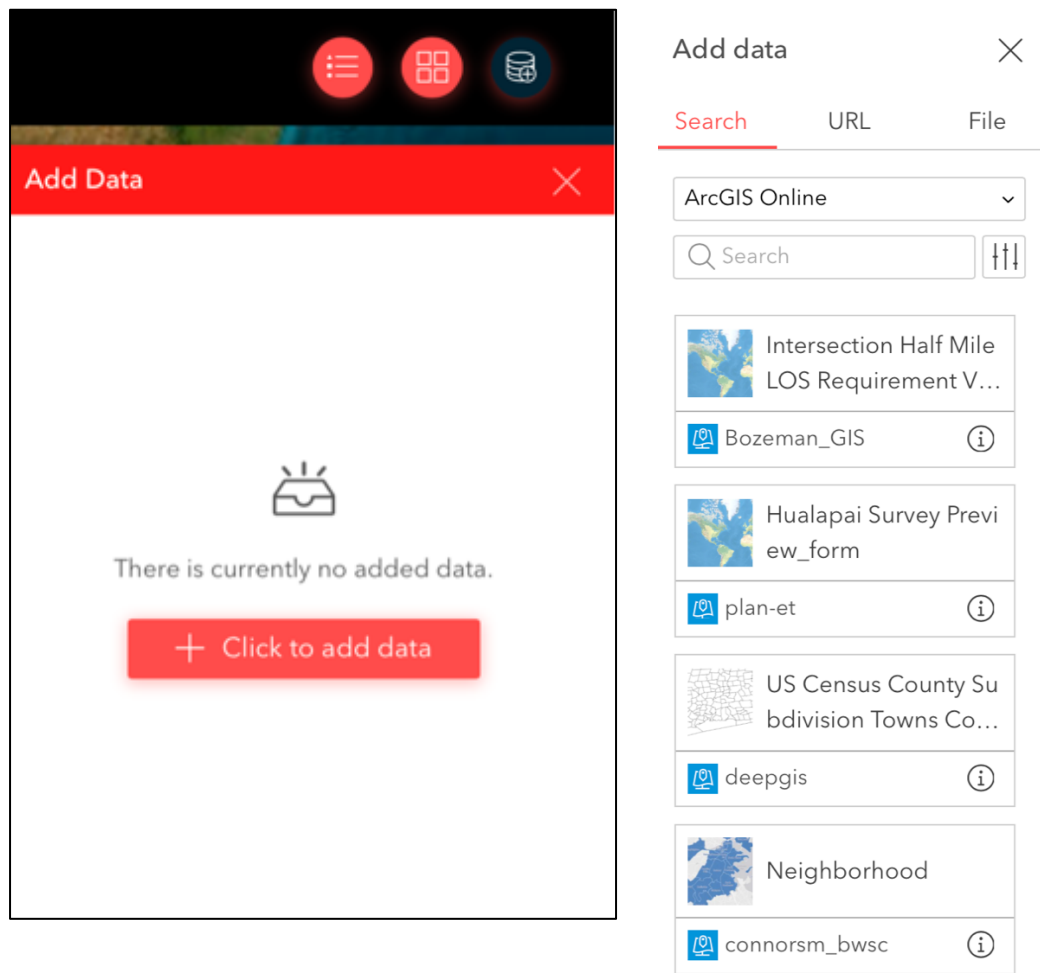


Figure 5 – Add Data pane on Indicator Explorer page (left), Data Location pane (right)

In the resulting window click on the button labeled “Click to add data” to display a pop-up window to search for available data on ArcGIS online, a url or a file on the local machine. Once a

layer has been selected, it appears in the list of layers on the left of the ArcGIS map screen. Any data added will be only available during the current session.

NOTE: Data must include geographic identifiers such as latitude/longitude coordinates, Administrative Codes or names in order to be mapped.

Background on Calculation Methodology

Index of Need

Vulnerability to shocks which can affect an area's health, food security and wealth can be assessed by relying on data about the potential sources of shocks. However, not all areas face the same risks. For instance, in a more rural area, access to roads may mean an increased risk vulnerability to shocks than it could in a more urban area. An Index of Need can be used to model the impact of different factors that can lead to increased need in some geographic areas relative to others.

Indicators used in Index of Need Calculation

Domain	Indicator
Conflict	Violence Against Civilians from Dahalo Attacks (2018-2023)
	Violence Against Civilians Total (2018 - 2023)
Food Security/Crisis	Average IPC Scores from (2020 – 2023)
	Average Prevalence of Insufficient Food Consumption (2022)
Market	Distance to Nearest Market (2023)
	Market Price Volatility Score (2018 - 2023)
	Market Pricing Anomaly Score (2018 – 2023)
Stunting	Percent Children Stunted (2021)
	Prevalence of Stunting (2021)
Disaster	Number of People Affected by Natural Disaster (2004 – 2023)
	Hectares of Crops Damaged by Natural Disasters (2004 – 2023)
Health Facility Access	Average Walking Travel Time to Nearest Healthcare Facility (2019)
Precipitation	Average Cumulative Precipitation per Sq. KM during 2016-2023 growing season
Road Density	KM of Road per Commune Sq Km area (Reversed) (2023)
Wealth	Relative Wealth Index (Reversed) (2022)

This application provides users the ability to calculate an Index of Need for communes in four regions of Madagascar (Androy, Anosy, Atsimo Andrefana, and Atsimo Atsinanana). The resulting index is a weighted index that is derived by summing together the weighted z-scores of each indicator.

$$\begin{aligned}
 \text{Index of Need} = & (w_{\text{conflict var 1}} * z(\text{Conflict Variable 1})) + \dots (w_{\text{conflict var n}} * z(\text{Conflict Variable n})) + \\
 & (w_{\text{food security var 1}} * z(\text{Food Security Variable 1})) + \dots (w_{\text{food security var n}} * z(\text{Food Security Variable n})) + \\
 & (w_{\text{market var 1}} * z(\text{Market Variable 1})) + \dots (w_{\text{market var n}} * z(\text{Market Variable n})) + \\
 & (w_{\text{stunting var 1}} * z(\text{Stunting Variable 1})) + \dots (w_{\text{stunting var n}} * z(\text{Stunting Variable n})) + \\
 & (w_{\text{disaster var 1}} * z(\text{Disaster Variable 1})) + \dots (w_{\text{disaster var n}} * z(\text{Disaster Variable n})) + \\
 & (w_{\text{wealth var}} * z(\text{Wealth Index})) + \\
 & (w_{\text{precipitation var}} * z(\text{Precipitation Variable})) + \\
 & (w_{\text{health facility access var}} * z(\text{Health Facility Access})) + \\
 & (w_{\text{road density var}} * z(\text{Road Density}))
 \end{aligned}$$