

**DRR IN
ACTION
CASE
STUDY**

Predictive analysis using highly accurate digital mapping

Theme of Case Study

Using ArcGIS and digital tools to further enhance the VCA and conduct predictive analysis

Country

Lebanon

Case Study Location

Country-wide programming

Background

In 2018, the Lebanese Red Cross (LRC) Disaster Risk Reduction (DRR) Unit underwent significant restructuring to address identified organizational gaps; namely the need to improve many aspects of its information management systems, including data collection, management, archiving, and reporting. As part of the restructuring efforts, the LRC DRR Unit evaluated the tools used in its community-based disaster risk management programming and concluded that the classic paper-based format of the Vulnerability Capacities Assessment (VCA) failed to deliver the results needed to properly analyze and build the resilience of the targeted communities.

Prior to the digitalization of the VCA tools, the LRC “enhanced” the VCA by revising & contextualizing the overall approach and tools to the Lebanese context to ensure the assessment is relevant, effective, comprehensive. The LRC sought to further improve the enhanced VCA (EVCA) by digitalizing some of the tools to make better use of the information/data collected during the EVCA process (ex: improving & simplifying data 1- visualization, 2- updating/archiving, 3- sharing across stakeholders and platforms, etc.).

Photo: Capacity mapping using ArcGIS

Enhancing the VCA

The LRC DRR Unit underwent a process of critical self-reflection to adapt and contextualize the VCA tools and approach to the Lebanese context (urban settings, FVC context, diverse communities, etc.). The LRC DRR Unit did this by carrying out a desk review of existing literature and research, identifying all best practices & lessons learned from previous implementation, conducting several workshops with different stakeholders, then establishing a roadmap for transitioning to an enhanced VCA and piloting this approach within targeted communities.

What did action seek to change?

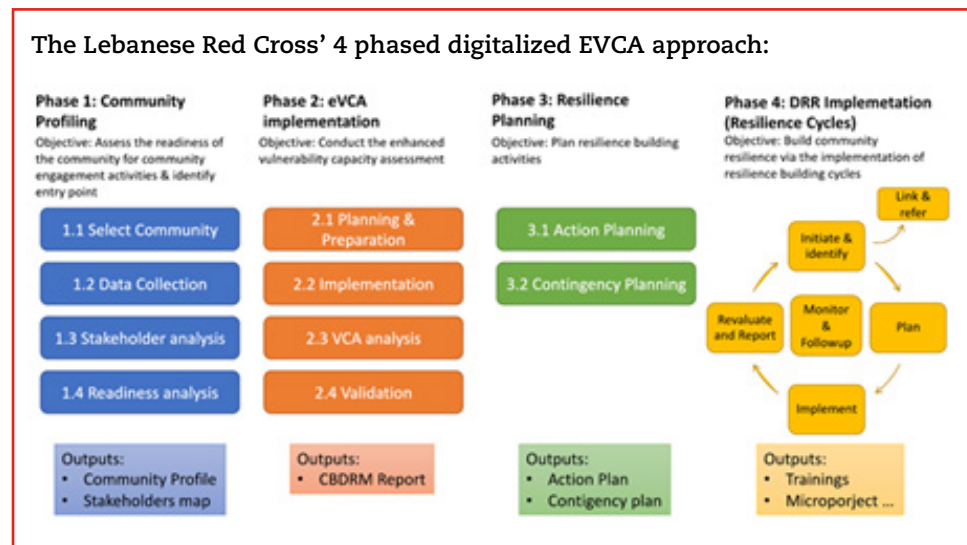
The digitalization of the EVCA aims to find innovative solutions to improve the accuracy, visualization, and analysis of data used for disaster risk management decision-making.

What key actions were taken to achieve change?

Essentially, the actions can be grouped into three broad categories:
1- reviewing, 2- streamlining, 3- developing.

The review basically entailed going over the EVCA process in detail to have a comprehensive understanding of all information/data that is collected at different stages during this assessment.

This preliminary review is essential for streamlining, which looks at improving the efficiency and complementarity of the process by identifying intersects of data collection with other initiatives to avoid duplication of efforts (for example the National Capacities Survey (NCS) conducted across Lebanon shares common points with the Community Profile Survey (CPS), thus the CPS was updated to ensure that the information needed for the NCS is collected during the CPS and the data is transferred to the NCS). Streamlining also consisted of restructuring the overall methodology in an abridged format to produce a concise 4 phase process with clear outputs.



Quotes:

“The idea is not reinventing the wheel, but rather making sure that the wheel is suitably adapted to the terrain”

The final category of actions pertains to developing digital solutions. More specifically, the LRC identified the digital needs in terms of data collection, storage, protection, sharing, visualization, etc. of the above streamlined process, then identified the most appropriate digital solutions. The identified solutions are then rolled out and adjusted according to feedback from users.

What essential steps?



Photo: Capacity mapping on base maps by hand, which will later be translated into fully digital maps.

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|---------|--|
| Step 1 | Depict all information/data collected and needed for VCA |
| Step 2 | Determine intersects with other DRM initiatives |
| Step 3 | Establish roadmap: identify gaps, problem tree, identify needs for various stakeholders, set-up milestones, etc. |
| Step 4 | Review and streamline EVCA process and methodology |
| Step 5 | Identify digital needs and identify appropriate technological solution |
| Step 6 | Develop digital tools (surveys, matrix, maps, dashboards, etc.) |
| Step 7 | Provide training for all persons involved (community, volunteers, staff, government officials, etc.) |
| Step 8 | Set-up data protection protocols |
| Step 9 | Draft relevant documents (guidance manual, toolbox, training, etc.) |
| Step 10 | Begin implementation and continuously monitor & adapt according to feedback |

What were the Achievements and Impacts?

The digitalization of the EVCA brought about countless improvements; this case study will briefly highlight three:

1. Prior to the digitalization, conducting a VCA was a very labor intensive and time-consuming endeavor to undertake. As result, the VCA was often regarded as a one-off product. By contrast, the digitalized version of the VCA is much less resource heavy and can easily be updated to generate new outputs to meet the needs of the evolving context. The ability to incorporate and reflect real-time data has shifted the perception of the VCA from a product to a process.
2. The level of reliability & accuracy of data collected and mapped using GIS has drastically improved the ability of communities, the Red Cross, and the governmental actors to make informed decisions regarding disaster risk management (DRM). The accurate information gathered while conducting the EVCA can be used to design future projects and create community DRM plans.
3. The digital maps create a platform for collaboration amongst several stakeholders. More specifically, they serve as shared spatial references with a common language and are interpreted by the different stakeholders (community members, CBOs, Red Cross, government authority, etc.) in the same way. Hazards are being mapped as polygons which helps identify areas that are at high risk and further define vulnerable communities. Capacities and points of interest (POIs) are plotted on the maps which allows the reader to identify and locate useful resources within (or in neighboring) communities. When the above-mentioned data is superimposed, it helps the reader identify the most vulnerable communities and determine gaps, which in turn informs what type of intervention is needed. Thus, communities are able to communicate their action plans and contingency plans to local & national authorities, as these plans are based on and reference the digital maps.



Photo: Using A1 printed maps to identify hazards (red), capacities (yellow), exposure (blue) by hand as polygons. This will later be translated into fully digital maps.

What digital tools are being used in EVCA?

The LRC is using the Environmental Systems Research Institute's (ESRI) ArcGIS software with its different applications to collect, manage, and visualize the data gathered while conducting an EVCA.

In a nutshell, the information gathered during the assessment is collected on paper and then data entry is carried out on Excel and consolidated on the digital platform ArcGIS Survey 123. This data is then mapped and analyzed on ArcGIS Pro Software for geospatial processing. The information is also monitored and presented in the form of an analytic report using ArcGIS dashboards (please see picture below).

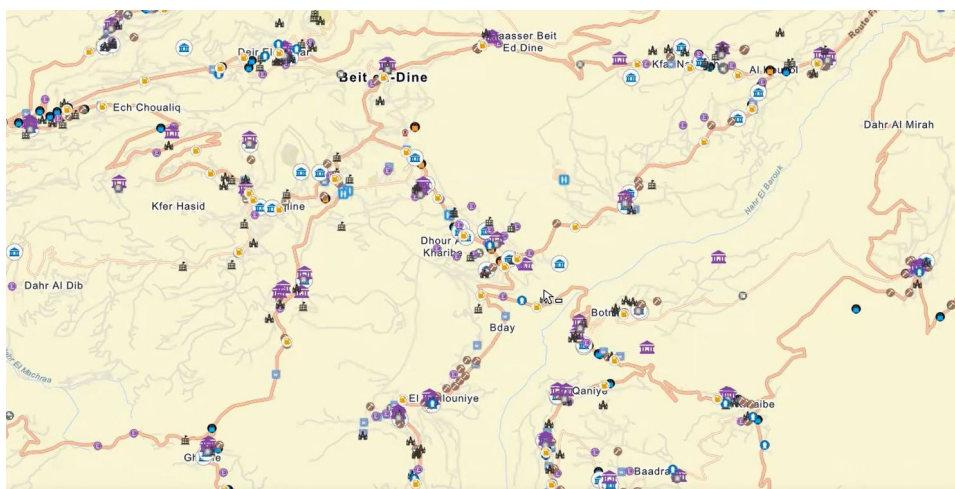


Photo: Capacity mapping on digitalized base maps

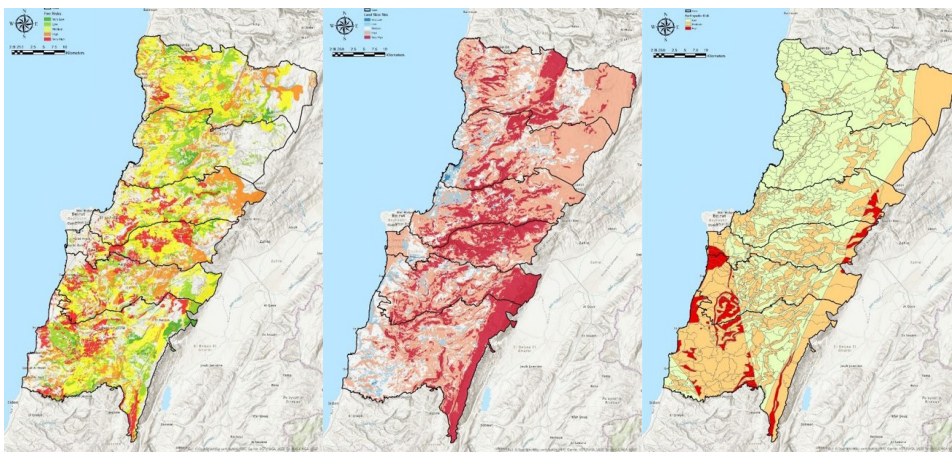


Photo: Risk exposure maps of different hazards (ex: fire, landslide, and earthquake).

Can the digital tools be used outside of the EVCA?

ArcGIS is a powerful tool that presents the LRC, communities and the governmental actors (such as municipalities and governorates) with several opportunities for its broader outside of the limits of the EVCA. Below are two examples of how this tool is being used with other initiatives.

Example 1: Coupled with other initiative

The LRC has partnered with the Scientific Council for National Research to create risks maps on ArcGIS (see picture below). Natural risks such as forest fires, floods, landslides, etc. are mapped, then using geospatial analysis, the LRC identifies which areas are exposed and at high risk. This risk analysis allows the LRC to initially select communities in which to conduct EVCAs and community-based DRM activities. Furthermore, early warning and early action (EWEA) tools were developed (ex: forest fire forecast dashboard) providing a publicly accessible three-day fire risk forecast in communities at risk, which is updated daily.

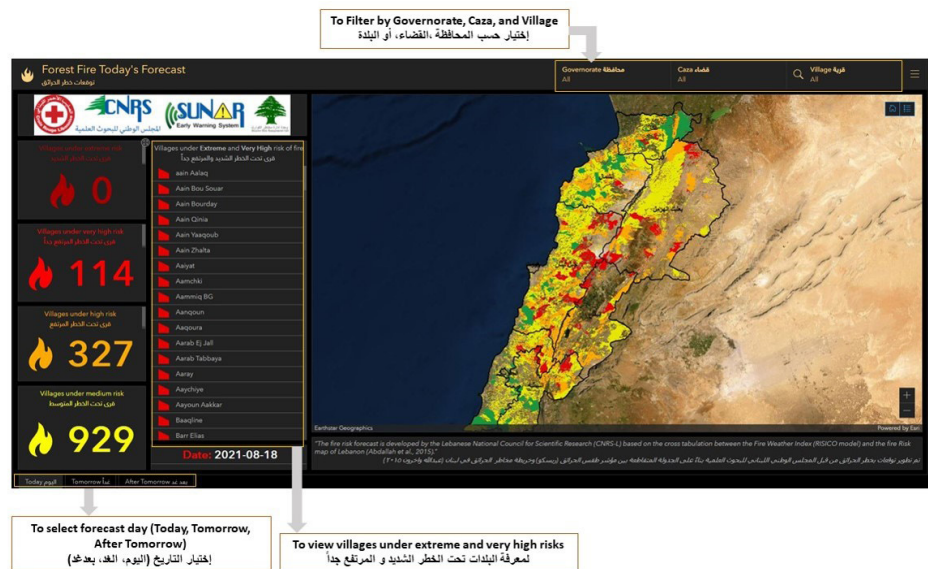


Photo: EWEA forest fire forecast dashboard with fire risk map; dashboard [link](#)

In addition to the risk maps, the LRC also maps/plots potential hazards and vulnerabilities (ex: petrol stations, factories with highly combustible materials, etc.) within communities; as well as capacities and resources within communities or neighboring communities (ex: fire stations, hydrants, place of worship for shelter, etc.). The LRC can then share this information with Governorates who can then analyze this layered data to determine the risks and plan mitigation measures and make data driven decisions and interventions.

Quotes:

“The digitalization process is like the community-based approach, it takes a long time and requires a lot of investment before you can see the benefits”

Example 2: As part of a set products/services for communities

Using ArcGIS, the LRC has initiated Community Engagement Hubs throughout Lebanon. Essentially, the hubs are resource centers for the community where they can access general and specific information regarding their community (ex: NGO / Government lead initiatives, natural risks, community capacity & resilience, specific data sets, and the community fact sheet which is a product of the EVCA).

Community Engagement Hubs also serve as a space allowing community members to connect with their Municipalities. Community members accessing the hubs are empowered as they become increasingly risk aware and are connected to their local authorities.

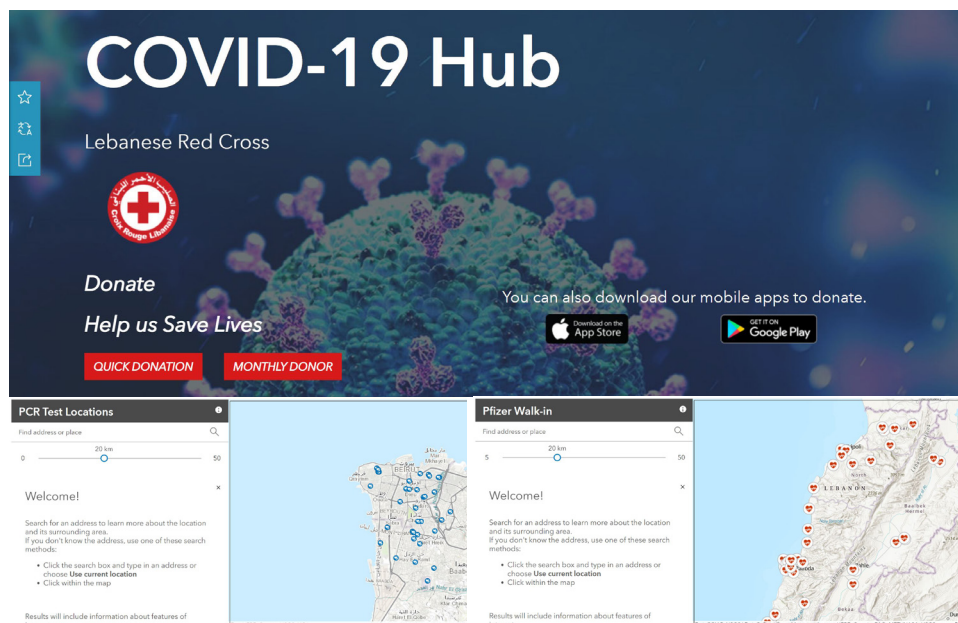


Photo: LRC COVID-19 Hub [link](#) (above); map of vaccination sites (left), and map of PCR testing sites (right).

An example of a national hub initiated by the LRC is the publicly accessible LRC COVID-19 Hub where all types of information can be accessed (vaccination sites, PCR testing sites, mapping of COVID cases, awareness, training, etc.).

Tech Tip

It is more useful to use polygons when illustrating risk exposure than using specific geographic coordinates as this information is better visualized when layered with other maps.

What are Key Lessons Learned?

Sustainable Funding Source

A complete digital overhaul of the VCA approach is a lengthy process that requires a lot of resources (big investment). For this reason, it is highly recommended to move way from project-based funding towards more secure longer-term funding source. Some costs related to digitalization are:

- Licensing for use of software (ex: ESRI's ArcGIS)
- Procurement of specialized equipment (computer, monitors, tablets, etc.)
- Training cost for different stakeholders
- Staffing technical positions (GIS officer, data officer, IM officer, field workers, etc.)

Showcase Results

It may be difficult to secure longer term funding, in this case a digital pilot project can be initiated. The pilot project can be used to showcase the achievements and usefulness of acquired digital capacities. Dashboards and maps are great ways to visualize project data and tend to impress viewers and provide credibility to the project. They can be utilized for fundraising efforts.

Tech Tip

Organize the data collection into sections based on the desired output, this will make the data analysis much easier.

The Big Picture

Digital tools (apps & software) are powerful and tend to be multi-purposed. When possible, research the tool's capacities and functions to understand how the digital tool can be used beyond its purpose for the EVCA as the likelihood of securing structural funding for this type of tool will be higher. For example, a digital tool that can be used to collect, store, analyze and visualize data for any assessment (not just VCA) and for different activities (not limited to disaster risk reduction), and that can benefit multiple departments within the national society and/or other stakeholders – ArcGIS.

What were the Good Practices arising from this action?

This Case Study will briefly summarize two Good Practices:

1. Taking the time to contextualize VCA to the Lebanese context (urban context, FCV settings, etc.) and identifying the organization's digital needs and capacities before initiating the digital transformation was time consuming but was vital as it provided a clear sense of direction of future resources needed to digitalize along with a clear indication of what digital solutions were needed.
2. Proper training of volunteer/staff, community members and government officials on the use of digital tools really helps build cohesion around the DRM activities and a sense of ownership of the products (maps, dashboards, reports, plans, etc.). Please note that the above-mentioned stakeholders undergo training on the utilization of the tools themselves prior to the learning about the digitalized versions.

References for this Case Study

1. Fire Forecast Dashboard Link: <https://www.arcgis.com/apps/dashboards/563d0603043640448882203a40d6d818>
2. COVID 19 Hub Link: <https://covid-19-lebaneseredcross.hub.arcgis.com/>
3. ESRI ArcGIS community engagement hubs: <https://www.esri.com/en-us/arcgis/products/arcgis-hub/overview>

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