Using GIS to Locate and Map, Damaged Buildings in Lebanon

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Abstract

When you travel along the roads in Lebanon you frequently see buildings that were damaged as a results of Israeli aggression and sixteen years of internal fights and disturbances (1975-1991). In 1977 the Council of Development and Reconstruction (CDR) was established as a public authority by law DL no. 5 partially in replacement of the Ministry of planning, to be the governmental unit responsible of reconstruction and development.

In 1998, K&A signed a contract with the CDR to reassess the number, location, and status of the buildings that were damaged during the civil war. This project was completed using field surveys and presented the results in ArcView. This article provides a brief summary of project methodology.

A0 Map generated from Satellite imagery

Project Scope

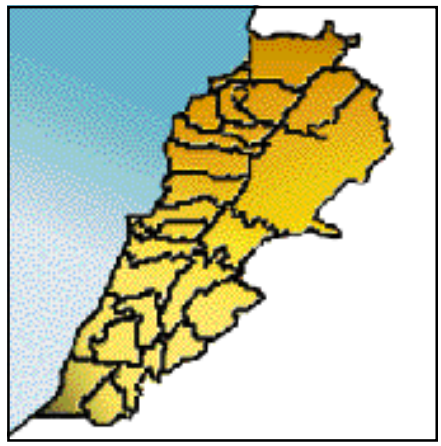
The scope of the project covered the entire country, where more than twenty thousand buildings (20,581) needed to be re-surveyed. The initial lists of these buildings were provided by CDR along with schematic plans showing the location of the buildings and status, reported from the initial field surveys completed in 1993.

Field Data Collection

The Minor Administrative boundaries for Lebanon or Kada were used as data collection block. Inside each of these Kada two elements were included: the first was the number of towns that were determined to be damaged and the number of damaged buildings both identified as a results of field surveys in 1993.

The location of the buildings to be surveyed were marked on A0 size maps generated from satellite imagery. Field survey results were marked and filled on printed Access forms. Next, the data was entered, updated, corrected and verified using Access.

The field data collected was divided into two parts. During the initial investigation, Phase I, surveyors determined if damage was structural or non-structural. If the damage was non-structural, no additional data collect was needed and the building was classified accordingly. If the damage was structural, additional data were collected, in Phase II, relating to the severity of the structural damage and the structural integrity of the building.



Administrative Boundaries of Lebanon

The data collected in Phase I included: lot number, number of floors, building type, type of finish and type of damage. The additional data collected in phase II included: building area, estimated age, type of structure , structural damage, and digital photographicreference.

Data entry in GIS included entering the point showing the location of the buildings, the cadastral limits, and the administrative areas. In order to transform the survey data from the Access database format to GIS format, summary tables were exported from Access in (dbf) format and imported into ArcView where these tables were linked to the GIS layers showing the point location of each surveyed building.

Satellite imagery at two meters resolution rectified and corrected according to the local Stereographic Projection, allowed for the display of point showing building damage type

Access Report

according to each geographical location.

The Cadastral limits which were based on the 1:20,000 scale in Stereographic Projection were also used in correlation with the Satellite images in order to determine the number of towns in each Cadastral area.

The other component of the field survey was the Digital photographs that were taken for each of the structurally damaged buildings. This digital photo which was correlated with each damaged building gave a visual assessment of the extent of the damaged.

Results

The results of this GIS project included:

1- Summary listing of the damaged cities and towns according to each administrative area and the total number of damaged building and their respectivetypes.

2- The generation of A0 size maps that showed the satellite images of the damaged cities and the respective buildings along with the legend indicating the type of damage.

3- The generation of A4 size report that include a zoom in window on individual buildings and also showing the digital photograph correlated with each location. The A4 page report also included summary information about the type of damaged and related detailedinformation.

4- The final form of GIS output included all the digital files needed to run two ArcView based application to automatically generate the A0 or A4 size maps.

Summary

As a result of this project, CDR personnel have direct Access to all the data they need to make investigations and generate maps related to each damaged building in Lebanon. This is used to decide if identified building needed to be demolished, rehabilitated, or repaired. The GIS system could also be used to define priority areas and also to allocate funds for needed rehabilitation based on the number and type of damaged buildings in each geographicalarea.

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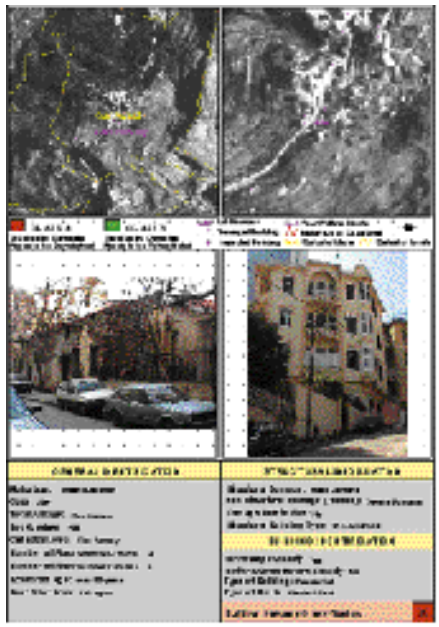

The detailed A4 Report

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