# Thesis goal:

Lebanon is faced with a complex Explosive Ordnances threat, causing a nation-wide contamination with Cluster Munitions Remnants, Landmines, Improvised Explosive Devices and other Explosive Remnant of War. This contamination implies a national threat which has a social-economic impact, and put lives in danger.

Lebanon mine action center (LMAC) is the national authority responsible for managing and conducting demining operations to relieve the threat.

So, my goal is to work in collaboration with the LMAC, in order to enhance the management system, implement a new technique for mines detection (drones) and integrate social media semantic data derived from sentiment analysis and from survey to reveal citizen’s interaction with mine action activities and the real impact on human behavior (social, economic, health). by the end, provide a model to represent demining operations in three dimensions: spatial, temporal and semantic.

GIS techniques are certainly used for spatial and temporal analysis, evaluating risks and incidents over time, in such a way to enhance accuracy and provide better understanding for the events, facts and related processes.

# Methodology:

* Related work: in Lebanon and worldwide
* spatial and temporal data gathering:
  + Contaminated areas (MF, Sub Munitions, UXO): distribution, area and number of items, classification as cleared or uncleared.
  + Social and economic impact: population and area affected.
  + Risks.
  + Demining progress rate: area cleared and number of removed items.
  + Demining method: manual or mechanical.
  + Difficulties facing demining operations: geography and physical or mental state of personnel.
  + Incidents occurred: civilians and deminers.
  + Land releasing strategy.
* Semantic data mining:
  + Conduct survey in contaminated and released zones.
  + Social media: Twitter, Facebook
    - Predefined words: category of related words.
    - Data collection (api, web scrapping).
    - Data preparation: cleaning and filtering.
    - Feature extraction using deep learning techniques.
    - Named Entity recognition and Sentiment analysis to reveal polarity.
* Integrating data in a GIS platform:
  + Enhance management system.
  + Prioritizing operations depending on:
    - Socio-economic impact.
    - Available resources.
  + Facilitating contaminating areas’ surveys: implementing new techniques (drones).
  + Predicting the occurrence of incidents especially from combining semantic data to spatial and temporal data (awareness, civil actions in suspected areas …).
* Output is enhancing homeland security by:
  + Minimizing incidents among deminers.
  + Minimizing incidents among civilians.
  + Speeding up land release system.
  + Involving the community as a main actor in the demining process.

**Enhance Homeland Security:**

Minimizing incidents

Speeding up land release

Involving the community

Enhance management system

Prioritize operations Facilitate surveys

Predict incidents

**Spatial-temporal:**

Contaminated areas

Socio-economic impact

Demining progress rate

Demining method

Difficulties

Incidents

Land release

**Semantic data mining:**

Survey

Social media:

Predefined words

Data collection

Data preparation

Feature extraction

NER & Sentiment