GIS in Mine Action
Five pillars of Mine Action

- Humanitarian
- Demining
- Mine Risk Education
- Stockpile Destruction
- Advocacy
- Victim Assistance
The Global Landmine and ERW Problem

Mine Contamination as of October 2013

Legend:
- Very heavy contamination (>100km²)
- Heavy contamination (10-100km²)
- Medium contamination (1-10km²)
- Low contamination (<1km²)
- Residual or suspected contamination
- No evidence of mined areas

Note: Other areas, where sovereignty is contested, are indicated in italics.
Effective decision-making in mine action is driven by geographic factors.
Applications in Mine Action

• generate intuitive maps at various scales, eg, for operators in the field and for strategic stakeholders at country level

• increase the accuracy of area size calculations

• improve prioritisation and planning of field operations

• help model the nominal operational difficulty of demining and determine which assets are suitable for a given task
Main info shown in 2D overview maps

- **Geographic location** of hazards, population, IDPs, infrastructures, working teams
- **Historical information** about hazardous areas
- **Local conditions**: terrain, weather, accessibility, traffic, security, logistical constraints
- **Task management**: number and type of assets deployed in an area

Representation of every hazardous area by a polygon delimiting its boundaries, and/or by a point symbol marker at its central XY coordinates.
Base map for planning purposes
Mine presence/absence Indicators

Road/path not longer in use (Bosnia & Herzegovina)

1996 2005
Land use change (Bosnia & Herzegovina)

2005

2011
Land use change maps
Activity maps
Contamination density maps

Contamination by ERW in Afghanistan

Contamination by ERW
- High
- Low
3D analysis

- Easy generation of 3D surfaces using RS data and GIS tools

- **Advantages** of the 3D analysis:
  - increase the accuracy of *area size calculations* of contaminated surfaces;
  - more realistically assess the operational difficulty of demining in a region by integrating *slope and elevation* into the analysis;
  - better prepare *field operations*;
  - determine the potential location of *mines* that may have *moved* over time through water run-off or surface movement; and
  - report on demining activities in a more visually intuitive manner.
Example of 3D map
Analysis of accessibility

- **Best route** between two points according to **terrain conditions** (slope, land cover, road quality), season, temporary/permanent blockages, hazardous areas

- Improvement of the **logistical efficiency**

- Applicable to **road clearance management** (analysis of impacts)
Prioritising Activities and Evaluating Costs

- Combining different data sources and spatial relationship between features (i.e. proximity) to:
  - prioritise hazard clearance
  - determine time and effort for clearance by integrating local terrain and infrastructure conditions
  - decide most suitable asset by comparing different scenarios under similar terrain conditions;
  - have better knowledge of the accessibility of a hazardous area
  - assess the degree of clearance difficulty on the basis of quantifiable terrain criteria (cost evaluation)
5D: Determining and Displaying the Degree of Operational Difficulty of Demining
Multi Criteria Analysis (MCA)

- Population Distribution
- Infrastructures Distribution
- Vegetation
- Spatial Proximity
- Terrain
Several options...

- **MASCOT**: mine action scoring tool (GICHD-UNIGE)
  
  [Link](http://www.unige.ch/sig/outils/MASCOT.html)

- **GIS-based Multi-Criteria Analysis**: priority selection in humanitarian demining
  
  [Link](http://tiramisu.maps.arcgis.com/home/)
Advantages of RS and GIS

- Low risk
- *Low cost* **
- Multitemporal
- Consistent
- Objective
- Systematic
Thank you!