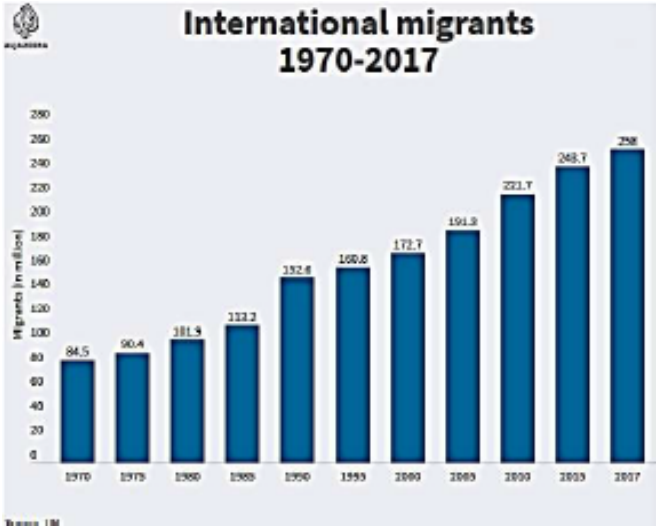
Emerging Technology for Mine Action in the Context of Displacement

Introduction:*De Reymaeker Brice – MFA Belgium Deputy Belgian National Mine Action Director*

The displacement caused by the current and past conflicts directly impacts humanitarian* mine action. This side event will explore various modern technologies, such as precise UAV detection, *efficient digital management tools and risk education that can help mitigate these risks.

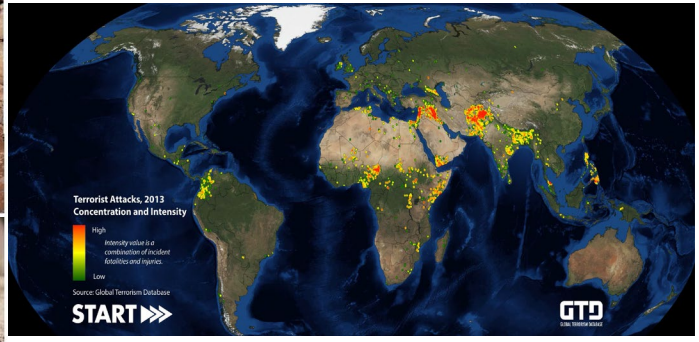


Around 80 percent of the world's migrants move between countries in a safe and orderly fashion. But more than 60,000 people have died on the move since the year 2000, according to the UN. In 2018 alone, more than 3,300 people have "died or gone missing in the process of migration towards an international destination", says the International Organization for Migration (IOM).

- Thanks to the efforts of the International Campaign to Ban Landmines (ICBL) the total stockpile of antipersonnel mines worldwide has been reduced from 160 million to about 50 million. It is hoped that the remaining stockpile can be eradicated before 2025.
- In 2017, casualties of landmines/ERW were recorded in 49 countries and resulted in 2,793 dead and 4,431 injured; 87percent of the casualties were civilians and of the civilians, 47 percent were children.
- In 2017, non-state armed groups (NSAGs) produce improvised landmines in Afghanistan, Iraq, Myanmar, Nigeria, Pakistan, Syria and Yemen.

Some Explosives' Facts By Berto Jongman Source: http://nct-magazine.com/december-2018/ibc-threat-assessment/

NEW CHALLENGES



IED, with possible **CBE** content

↓

SPECIFIC SENSORS

AREA SURVEY before any 'demining'

Terrorisme and conflicts

Migrations
Risky displacements

SUMMARY

- Migration flows caused by current and past conflicts, compounded with the erratic displacement of innocent people and children, have a direct impact on mine (and IED or CBRNE) hazards. As a consequence, there is an urgent need to correctly delineate the risk zones by using modern technology, such as **precise UAV detection, efficient digital management tools and affordable adult/children mine risk education.**
- Currently developed with the support of the International CBRNE Institute/EKC ex-FP7 European TIRAMISU Project(Belgium)
- Suggested applications for UAVs include border and perimeter security, natural disaster response, medical emergency first response, aerial analysis/mapping, and supplies transport. While the cost will vary greatly according to the configuration and options, it could be very limited – UAV Technology (DRONEVOLT Belgium, HOTZONESOLUTIONS/ICI Belgium, HCR-CTRO Croatia)
- Affordable Mine risk education tools for Adults/children (IMM Poland , SNAIL-AID Italy)
- Information Management System (SITE Sweden)

UAV and HYPERSPECTRAL SENSING (HOTZONESOLUTIONS / ICI Belgium/The Netherlands) SURVEY OF CBE contaminated areas

Terrorists potentially have a wide range of available weapons, ranging from very simple to exceedingly complex. Terrorist weapons can be categorized into five major groups: (i) conventional weapons and explosives; (ii) nuclear and radioactive weapons; (iii) chemical weapons; (iv) biological weapons (v) Improvised CBE (Chemical, Biological, Explosive) devices These weapons can be combined or used sequentially. After a CBRNE event has taken place, the earlier identification of the CBRNE agent can mean the difference between life and death.

For identifying the agent, our partners can provide the capability for real-time, wide-area reconnaissance by using modular portable CBRNE sensors integrated in UAV (as the RICOPTER). For radiation surveillance, the proposed sensor subsystem can based on the integration of new miniaturized sensors for gamma radiation and a high efficiency neutron detector based on novel silicon technologies. Such a sensor subsystem has already been designed, implemented and validated in the European FP7-REWARD Project (Radiation Surveillance System. For Chemical Warfare Agents (CWA) identification and Toxic Industrial Chemical (TIC) detection), Ion Mobility Spectrometry (IMS), infra-red spectroscopy, Raman spectroscopy, colorimetric and Surface Acoustic Wave (SAW) sensors are considered as well. Hyperspectral imaging systems as well as vapour sensors based on fluorescence polymers are currently evaluated for accurate explosives trace detection in a NATO project coordinated by our Croatian partner and combining UAV and bees…

DRONE VOLT : UAV industry enhancements for C-IED and landmine clearance

Contact : Mr Matteo Baronio
(matteo.baronio@dronevolt.com)

International CBRNE Institute

LAST YEARS INNOVATIONS

- Project Find Me – Urs Endress Foundation & partners

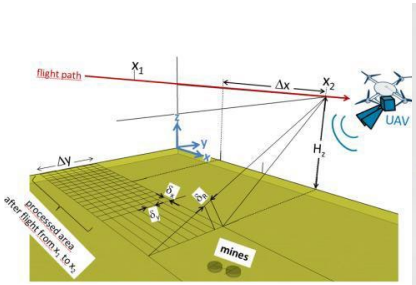
  > GPR, DRTK, …

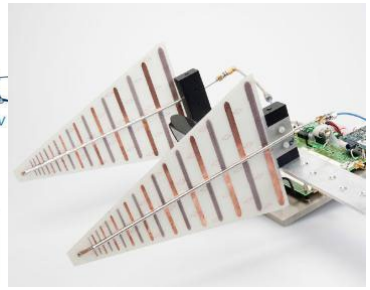
- Oct ‘18 paper by Alex Nikulin et al.

  > Thermal sensing

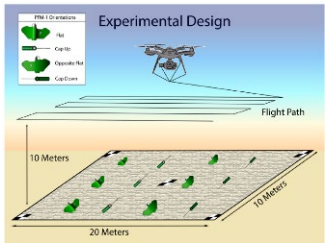
- Multiplication of sensors & tools

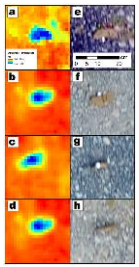
  > Hyperspectral cameras, payload drop, …



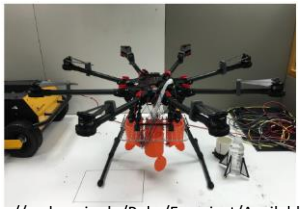


Source: https://www.ue-stiftung.org/findmine





Source: https://www.mdpi.com/2072-4292/10/11/1672



Source: https://web.wpi.edu/Pubs/E-project/Available/E-project-031216-115612/

DRONE VOLT

International CBRNE Institute

DRONE VOLT SOLUTIONS: HERCULES 20

- Heavy carrier (up to 20 kg) for increased autonomy / heavier payload capacity

FRONTLINE LOGISTICS

Placing a clearing charge

Transport UGV

DRONE VOLT

International CBRNE Institute

DRONE VOLT SOLUTIONS: AIRSHADOW

- Fully 3D Printed cost effective mini-UAV
- Ideal for indoor inspection
- Dual camera payload
- Avoid spare parts logistics
- Reduce training constraints

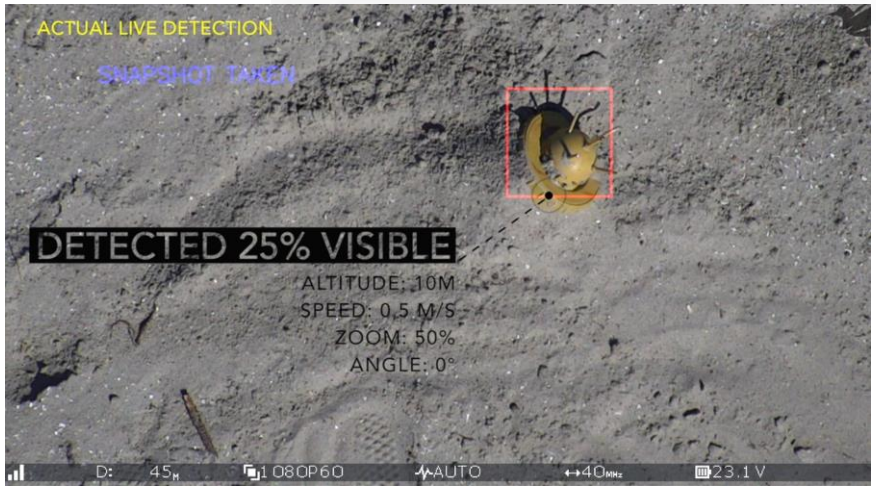
- Increase use of 3D printing for advanced ordnance teaching material and risk education

DRONE VOLT

International CBRNE Institute

DRONE VOLT SOLUTIONS: PENSAR CAMERA

- Dual sensors computer vision system
- Embedded artificial intelligence powered by Nvidia GPU
- Trained models based on landmines datasets for autonomous graphic detection and precision mapping (RTK)
- Real time on board processing
- Sensor Independent !
  > works with thermal sensor as well



DRONE VOLT

International CBRNE Institute

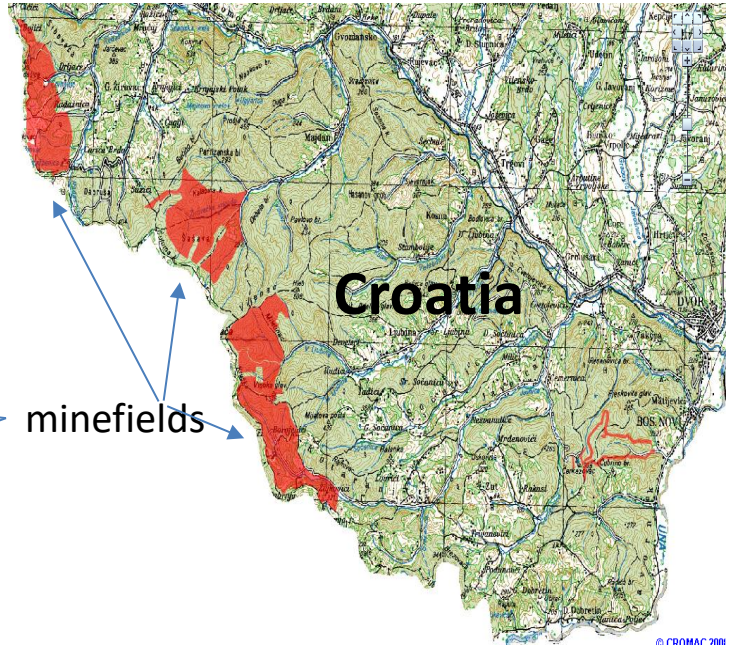
New challenges for mine action posed by illegal migrations

Milan Bajić PhD, Ret.LTC , milan.bajic1@gmail.com HCR-CTRO Scientific Council, **Nikola Pavković** M.S.,
Sanja Vakula (presenter) HCR Centre for Testing, Development and Training (HCR-CTRO), Zagreb, Croatia www.ctro.hr

- **Illegal migration of persons towards Europe produces new challenges in many domains in EU countries, but only in Croatia this phenomenon is linked with mine action. The Croatian borders are 2374 km long, and the one with Bosnia and Herzegovina, 1011. 4 km long, is the most vulnerable.**
- **The Balkan illegal migration route from Bosnia and Herzegovina ends at its land border with Croatia in the regions contaminated with minefields.**
- **Minefields in Croatia are marked with warning signs maintained by CROMAC, which publishes the maps of existing minefields on the Internet, [1].**
- **Illegal migrants cross the border outside the traffic routes, making the permanent space-time surveillance of the area impossible if done only by ground forces.**
- **High risk for illegal migrants and continuous very high risk for the border police.**
- **Although the border police has helicopters for the land border survey, only a surveillance system with UAVs is a sustainable solution for permanent control of this EU land border.**

[1] Croatian Mine Action Centre (CROMAC) MIS Portal, https://misportal.hcr.hr/HCRweb/faces/intro/introduction.jsp

Parts of Bosnia and Herzegovina and Croatia with intensive migration – high risk of mine accidents



Surveillance of the border regions and minefields with unmanned aerial vehicles (UAV) was initiated by HCR-CTRO in 2017, continued in 2018. Operational and R&D [2], [3], [4] references.

We encourage donors and invite to cooperation in the implementation and deployment of UAV based 24/7 surveillance of minefields near the border, on illegal migration routes.

[2] Impact of Flooding on Mine Action in Bosnia and Herzegovina, Croatia, and Serbia, https://commons.lib.jmu.edu/cgi/viewcontent.cgi?article=1030&context=cisr-journal

[3] Developing a Hyperspectral Non-Technical Survey for Minefields via UAV and Helicopter, https://commons.lib.jmu.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=2765&context=cisr-journal

[4] Development of the TIRAMISU Advanced Intelligence Decision Support System, https://doi.org/10.1080/22797254.2018.1550351

Billy Goat Radio

Risk educational tool

Snail Aid – Technology for Development

Introduction to Billy Goat Radio

Roots and developments

- Billy Goat Radio has been designed and developed within the context of TIRAMISU research project (2012-2015)

- It has been successfully tested in the field, with the support of National Mine Action Authorities in two different contexts:

    1. Saharawi refugee camps in Algeria
    2. Pailin region in Cambodia

- It has been recently transformed to be more user friendly: the core system, the *adaptability system*, is now an application running on web browsers.

Billy Goat Radio at a glance

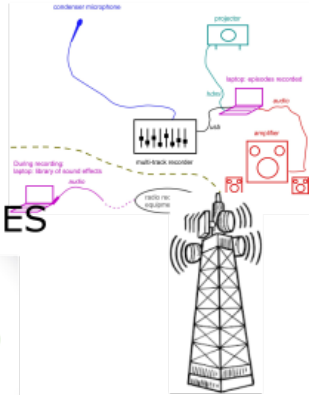
A COMPLETE SYSTEM FOR CREATING RISK EDUCATION CAMPAIGNS

3 ELEMENTS:

1. RADIO BROADCAST SERIAL DRAMA
2. ITINERANT LIVE SHOWS
3. GROUP DISCUSSIONS

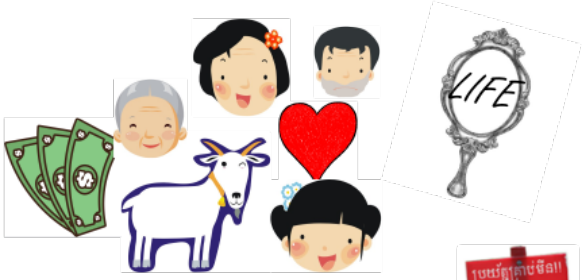
5 MODULES, guides and applications to create these elements:

1. ADAPTABILITY SYSTEM
2. ACTORS TRAINING GUIDELINES
3. AUDIO RECORDING AND POST-PROCESSING GUIDELINES
4. HOW TO SET UP A SMALL RADIO STATION
5. GROUP DISCUSSION GUIDELINES



Billy Goat Radio at a glance

RADIO BROADCAST SERIAL DRAMA



+ MESSAGES

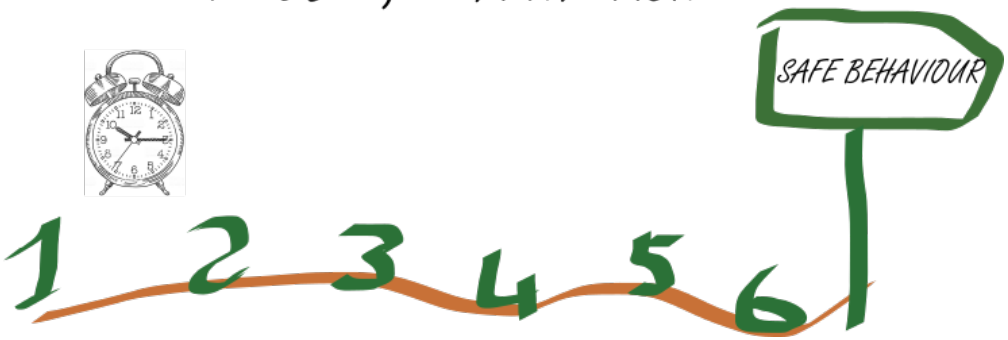
VICTIM SOCIAL INCLUSION,

INDICATORS,

ECONOMIC ALTERNATIVES,

CONTACT DETAILS OF ORGANIZATIONS

6 EPISODES, 20 MIN. EACH

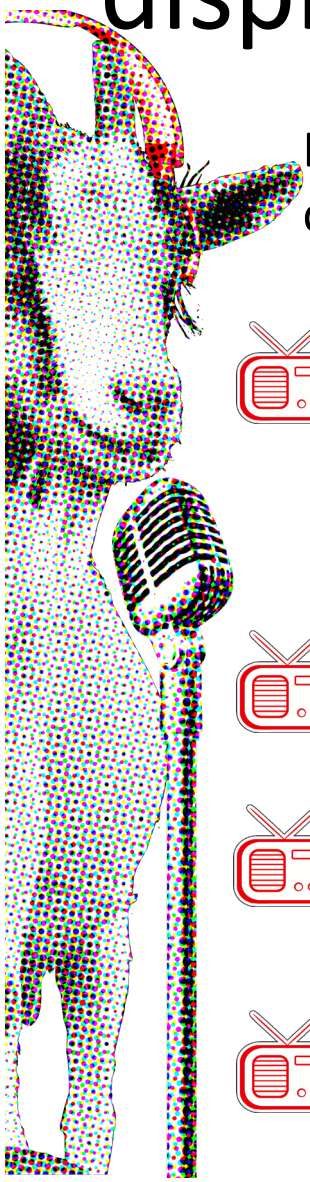


Key features

Billy Goat radio is a Risk Education (RE) tool allowing local operators to produce short educational serial dramas which will be broadcast by radio and performed live by a team of local actors travelling through the interested region.

- Cost-efficient system, based on educational entertainment theory
- Designed to promote sustained behavioural change
- Adaptable to different contexts and risks, including IEDs, landmines and UXOs. Easily adaptable to other risks
- Embedding messages about victim social inclusion, economic alternatives, indicators, contact details of helping organizations,...
- Embedding impact assessment (during group activities)

Key features – context of displacement



Billy Goat radio is particularly indicated to be used in the context of displacement, for several reasons:

- Based on RADIO;
  camps often already have community radios set up to convey important camp information and provide entertainment. If a radio station is not there, it can be relatively easy set up on purpose.
- Live episodes or podcasts can be listened while travelling, working,…
- Using an entertaining story: building up fidelity and suitable for collective listening of episodes
- Quick to set up /low cost

Future steps

- Snail Aid is interested in having Billy Goat Radio system in use in the field to improve it further, so we would like to offer the system for free to interested partners, please contact us!

- On our website www.snailaid.org, there are:

  - ✓ DEMO online, upon registration (password).
  - ✓ Episodes already recorded downloadable from web site (Hassanya and Khmer)
  - ✓ Examples in English

- Snail Aid is a no profit social enterprise; we do research and development of new ideas in the field of mine action (together with agriculture, sustainable buildings, participatory design, appropriate technologies,…). We don't have employees and we run the organization on the basis of volunteers work. We can hire people when projects come (members or friends sharing our vision) and we can work remotely or in the field.

Mine Risk Education computer game for children

Great Rally on the Back of Electronic Turtles

Marek Kacprzak
Institute of Mathematical Machines Scientific Foundation
Warsaw, Poland

- Concept of the game based on IMAS 12.10 *Mine/ERW Risk Education* and on guidelines defined by psychologists.
- Idea of the game is to mold safe children's behavior.
- **Gaming may be conducted in camps of refugees, under supervision of an instructor (teacher).**

- Defined didactic objectives of the game limit its "by plot" attractiveness, so sporting type competition, at international level in prospect, is to attract children.
- Knowledge of risks and safe behavior is relayed at a briefing, before gaming; the game teaches how to use this knowledge and serves its consolidation.
- Board game to be played simultaneously by a group of children.
- Dedicated for children of 8-10 years of age.

Board game.

Pawn – electronic turtle depicted as 3-wheeled vehicle equipped with camera and tiny intelligence, feed on "**grains of movement**" (one grain or one step).

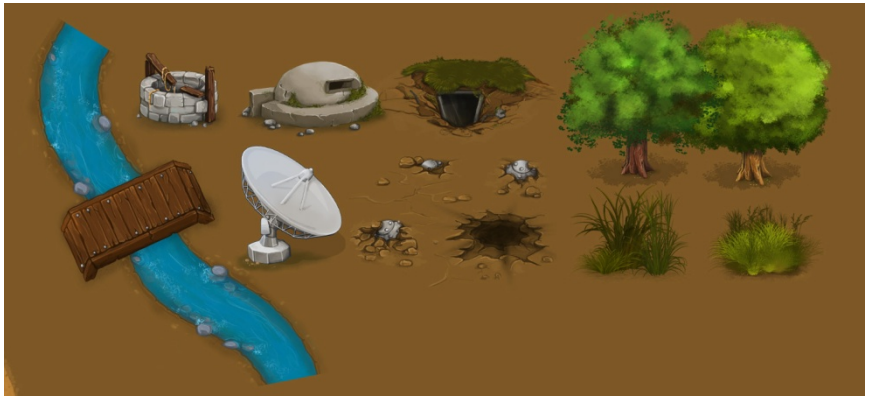
It's necessary to gain grains on the way, reporting what turtle's camera shows.

Other way of grains gaining is to take quizzes in waysides "**Information Outlets**".

Board – map with a net of paths

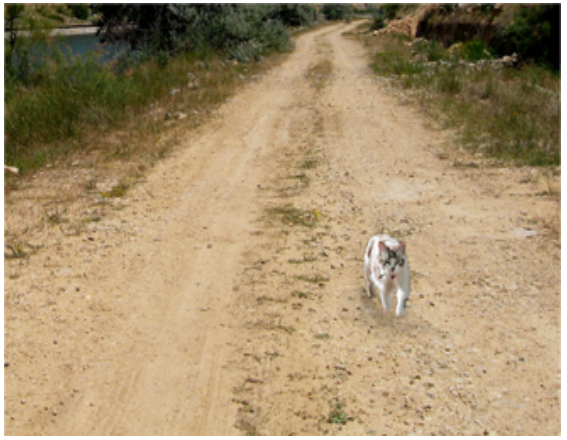
If there are grains at disposal then a gamer can translate his/her turtle from the occupied point to the next one touching this next point of the path. Thus it is possible to choose a **safe way** from start point to the finish line.

Dangerous objects on the board



Besides dangerous objects on the board, there are also objects located on the path, shoved by the turtle with its camera when spotted from the preceding point on the path. These objects can be dangerous or not.



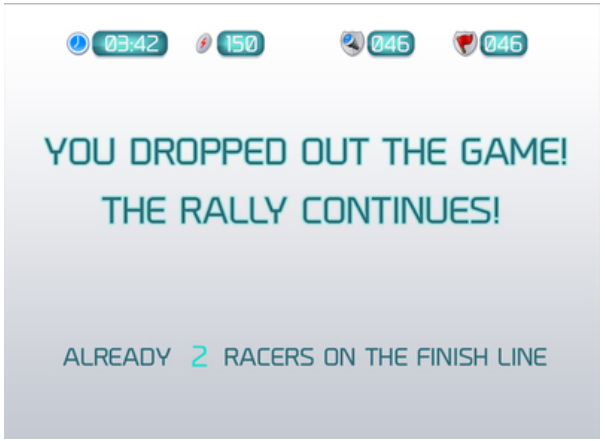


The gamer can go forward, turn back, as well as left or right (on intersections).

IF HE/SHE MAKE WRONG CHOICE OF PATH AND STEP ON A MINE, THEN:

WILL SEE THIS SCREEN FOR 15 SEC

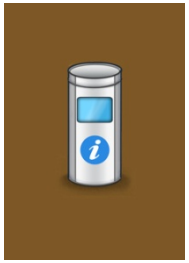
AND THEN THE SCREEN OF DIS- -QUALI- -FICATION



The turtle shows also objects situated past the path

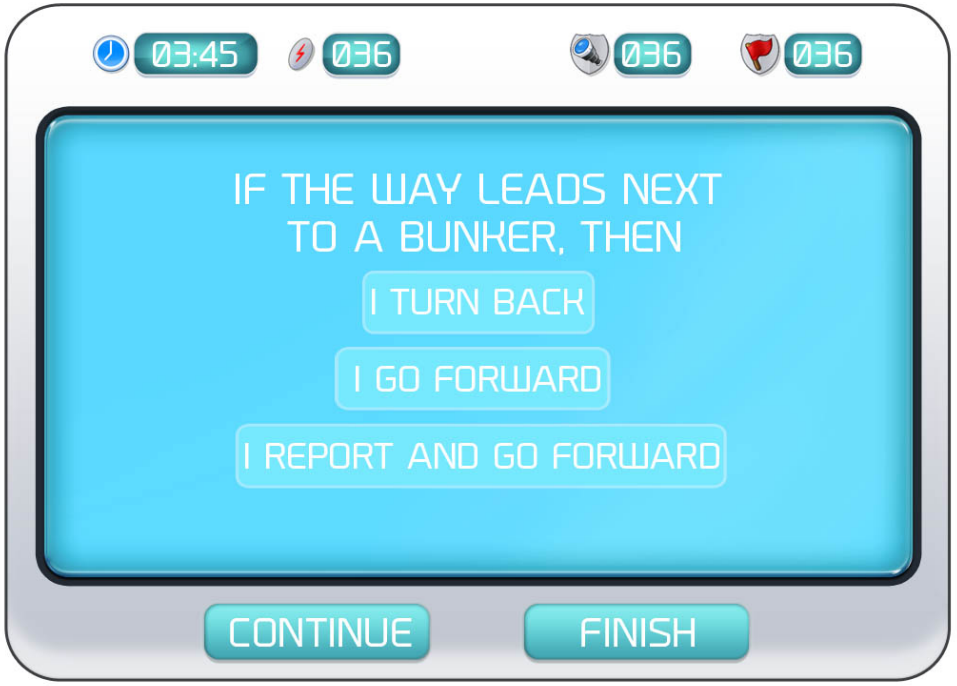
The gamer reports on them touching buttons on the screen

RED – DANGEROUS; GREEN - NEUTRAL →



Information Outlets are as filling stations where the gamers can obtain grains of movement paying for them with correct answers in a quiz.

Besides of grains of movement gamers earn score points for obtaining **proficiencies of OBSERVER and GUIDE**.



At the top of screen counters of time, grains, and score points for proficiencies are located

Final gamer's screen

Closing screen

Winners of the game are rewarded with **prizes and awards**

Implementation of the game

- Architecture client – server (local or remote)

- Smartphones as players' devices
- Game may be played simutaneously by up to ten players

Game as an educational tool

- Education kit consists of:
  - presentation on MRE
  - presentation on how to play the game
  - set of computer games
  - handbook for instructors on how to play the game and how to evaluate the results
- Currently Accessible in English, Polish and Croatian….open to other languages

- Game successfully tested in Poland and Croatia
- Video on the game: https://youtu.be/GRcpXNJB63Y
- Paper on the game: *Computer Games Journal*

More information: marek_b_kacprzak@wp.pl

OFFER

LOOKING FOR PARTNERS AND FINANCING

Cooperation based on contract agreement between

- International CBRNE Institute (ICI), Belgium and
- a country affected by mines and other remnants of war

Responsibilities:

ICI – MRE computer game development

A partner – guidelines for game localisation

– conducting of a set of educational training based on the game

Contact: yvan.baudoin@ici-belgium.be

From Field Data Collection to Analysis, The Lebanon project

T-IMS – The SITE Information Management System

22nd NDM-UN, 6 Februari 2019, Room XXIII 15.00 - 16.15

Torsten Vikström, SITE

Project background…

The SITE Information Management System (T-IMS) by SITE Scandinavian Information Technology AB (SITE) has been selected by the Danish Church Aid (DCA) for a six month's pilot project implementation and case study. The pilot project will be conducted in Lebanon together with the Lebanon Mine Action Centre (LMAC) where the system will be used in mine action and battle area clearance activities such as field data collection, reporting and quality assurance.

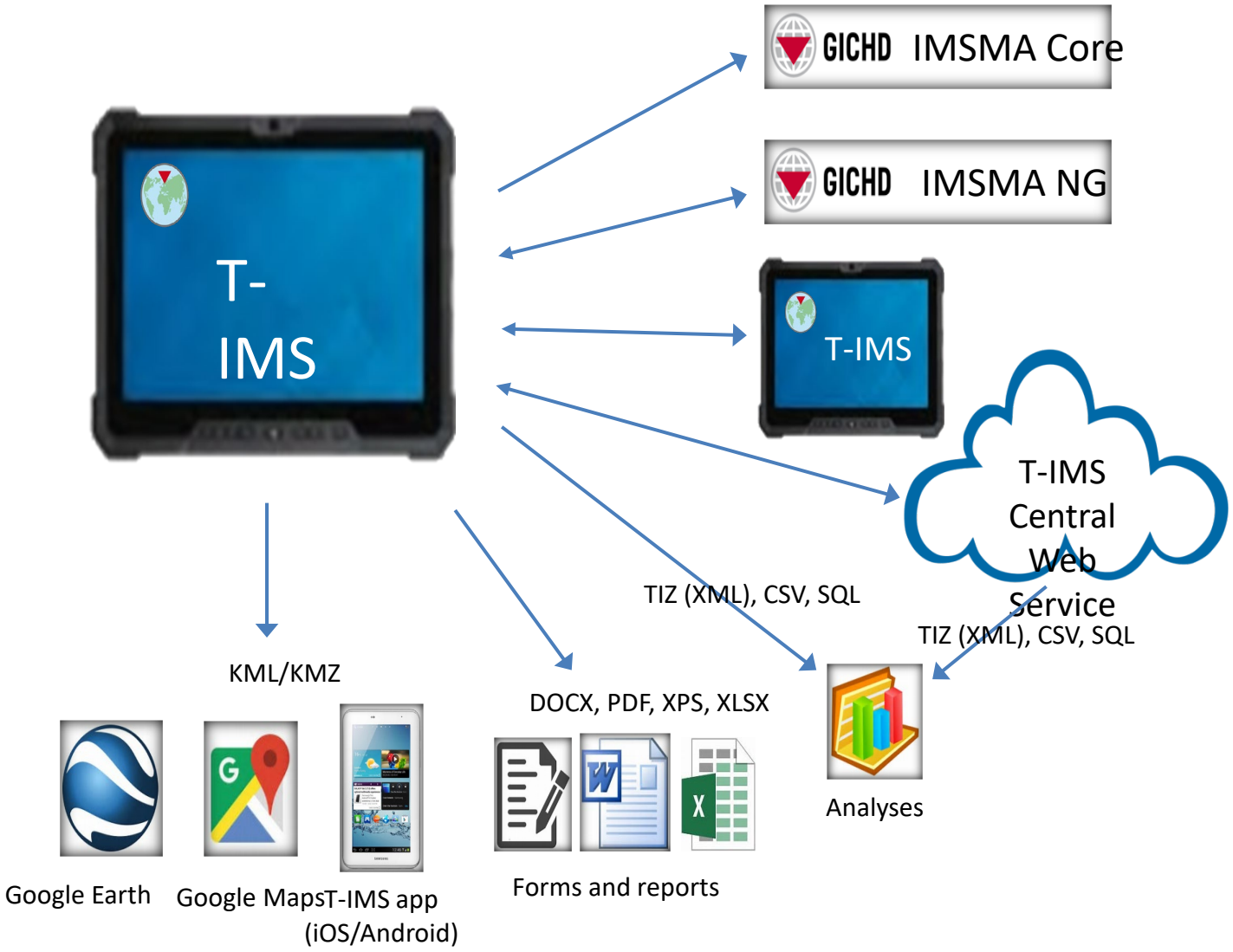
About SITE Scandinavian IT

- Swedish software development company, located in Stockholm
- Founded in 1999
- Dedicated to the support of military and humanitarian mine action using mobile technologies
- Long relationship with GICHD
- Member of the ICI/CBRNE

T-IMS – The SITE Information Management System

- Development received funding from EU's 7th framework package, 2012-2015.
- Operationally validated by HCR-CTRO (CROMAC-CTDT)
- User-friendly and intuitive field data collection tool built on touch technology, no need for a keyboard or a mouse
- Full compliance with international standards for land release (IMAS 7.11)
- Adaptable input forms for easy customization (NMAS, SOP)
- Runs with Esri map engine and supports all well established map formats and layering of data (geotiff, shape files etc)
- For use in the early stages of non-technical surveys through the phases of technical survey and mine clearance
  as well as quality assurance/quality control, reporting and analyses
- Any type of attachment – such as georeferenced photos, images, documents and voice recordings – can be attached to any activity
- Communicates with IMSMA NG and is a part of the new "IMSMA Core Eco-system"
- Optionally equipped with JMU's ordnance database – CORD, giving access to approximately 5 000 ordnance objects in T-IMS off-line
- Operates on Windows platform (tablet, laptop etc), with internal or external GPS connected (Eg. Trimble)
- Ability to use a rangefinder for positioning of objects in the map directly in the field situation
- Runs with 100% functionality off-line and does not require internet or WiFi connection

T-IMS – Share your data!

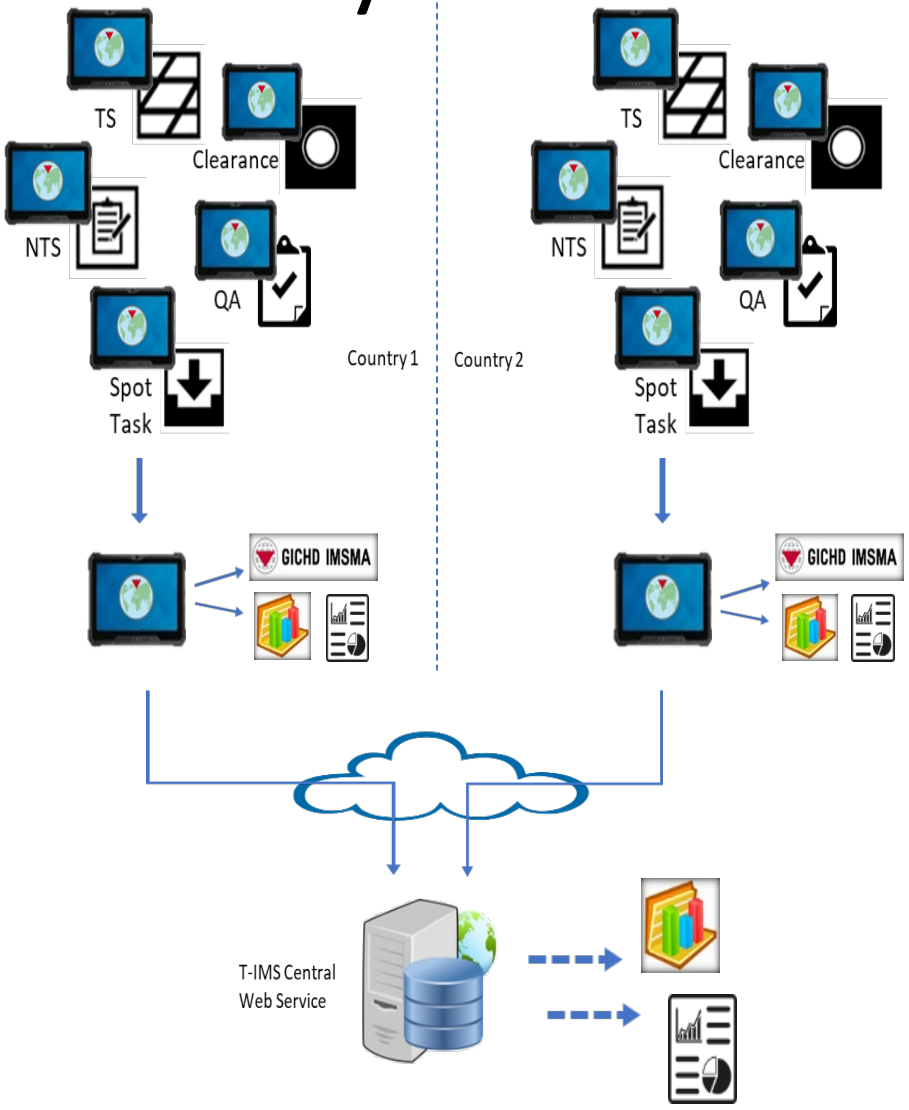


Overall project objectives

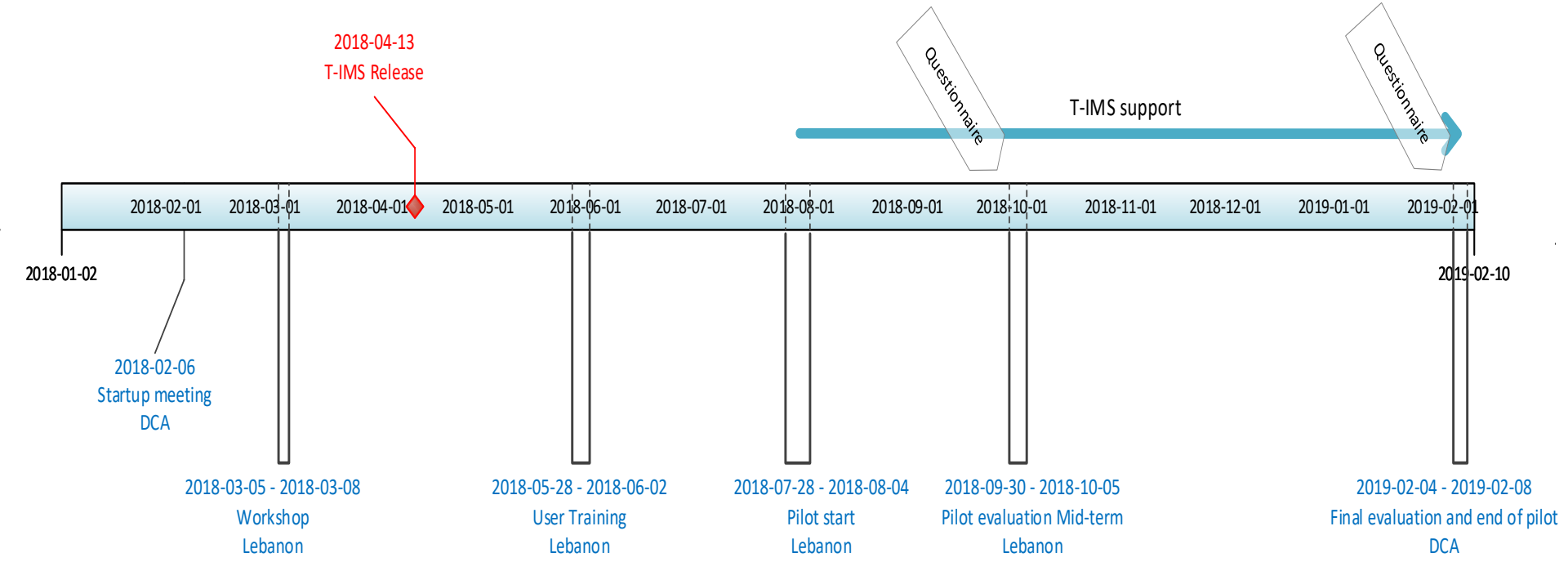
- Facilitate IM with the help of modern technologies, devices and tools throughout the whole work-flow in land release activities, *where suitable(!)*
- Move away from pen & paper and manual paperwise reporting, towards digital integrated reporting
- Safety and efficiency in field operations, improved situation awareness
- GIS

From field data collection to analysis, the challenge...

From field data collection to analysis...



Project roadmap



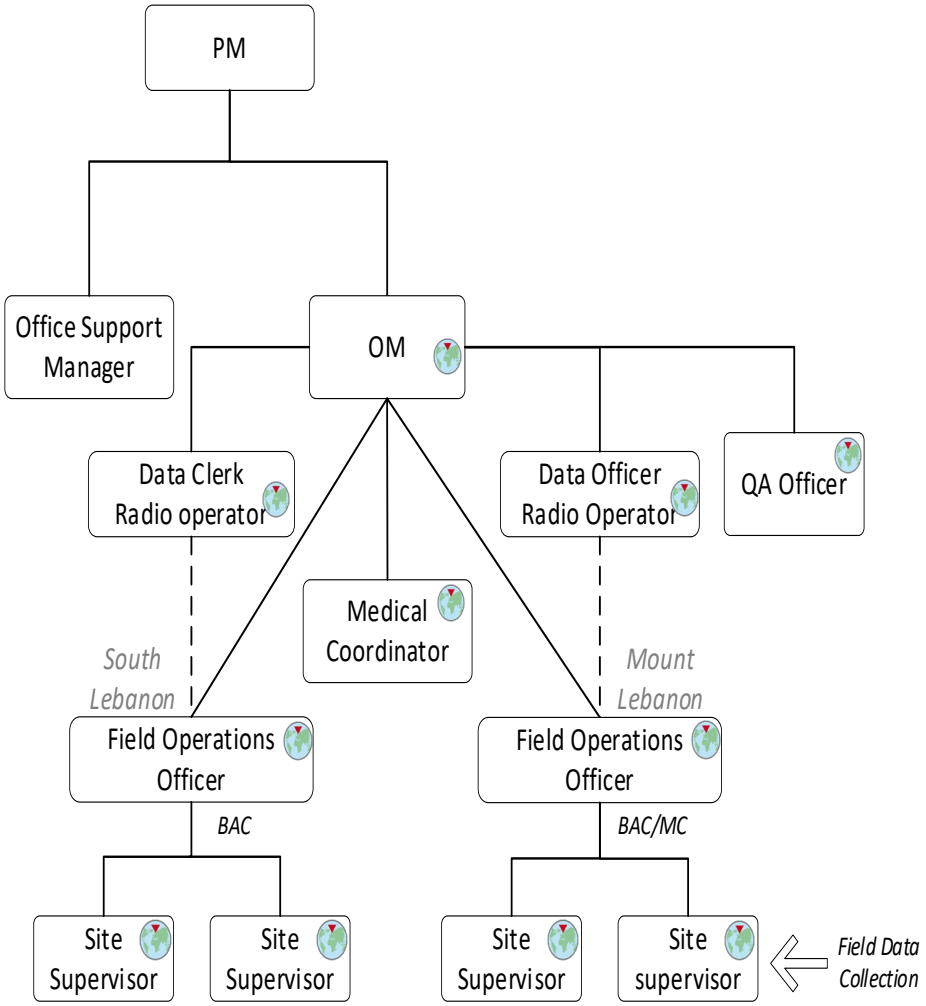
Training for 2x2 teams: Minefield clearance & BAC

Progress of work, system meets requirements and expectations?

Organisation, work processes, IMSMA integration, daily/weekly progress & reporting etc.

Recap and project startup: Recapture of training, workflows, technical environments & integrations**. Starting up Pilot.**

Organisation & reporting



- 4-5-3-1 Admin Area QA
- 4-5-3-3 Demolition Drill QA
- 4-5-3-5 Manual Demining QA
- 4-5-3-7 Command and Control QA
- 4-5-3-8 Explosive Storage QA
- 4-5-3-9 Initial Site Setup QA
- 4-5-3-12 Minefield Marking QA
- 4-5-3-12-1 Battle Area Marking QA
- 4-5-3-18 BAC Clearance QA
- Medical Observation Form QA

- DCA Lebanon – Pre Clearance Survey
- DCA Lebanon – Post Clearance Survey

- IMSMA Completion Report
- IMSMA Progress Report

- Daily Report AP Mines
- Daily Report AT Mines
- Daily Report Cluster Munitions
- Daily Report Surface BAC
- Daily Report Surface MC
- Daily Summary Report BAC
- Daily Summary Report MC

- Weekly & Monthly Summary Report MC
- Weekly & Monthly Summary Report BAC

Preparations… Hardware, T-IMS and IMSMA NG

- Windows tablets (HP Elite x2 1012 G2, with built in GPS)
- Map ordnances (devices) in T-IMS' ordnance database repository (TOR) to the corresponding IMSMA NG ordnances (ID's)
- Define a Lebanon (country) specific dataset in T-IMS ordnance database
- Set up T-IMS map module to use the proper coordinate system (WGS84, UTM 36N)
- Import of IMSMA NG Gazeteers and Locations into T-IMS
- Define IMSMA NG reports, including Lebanon Custom Defined Fields (CDFs) in T-IMS
  - Progress reports
  - Completion reports
- Map module in T-IMS with a vectorized country map of Lebanon
- Detailed orthophotos of suspected and confirmed contaminated areas as map layers
- …

T-IMS training, 1 June

- T-IMS walk-through and desk excercises – 1 day
- Outdoor excersices – 1 day
- Certificates hand-out

Part of the training…

The process of Land Release in T-IMS

How to continuously work with and follow the progress of work with land areas, an example

Step 1:

Create a Baseline Survey (NTS) and create a land polygon categorised as a SHA.

Step 2:

Create another NTS.
Navigate to the SHA in the map and select/mark it.
Make a copy of the SHA into your current activity by pressing

You can now continue the work with your NTS and update, modify and divide the land area.

The original SHA will not be affected!

Part of the training…

The process of Land Release in T-IMS

How to continuously work with and follow the progress of work with land areas, an example

Step 3:

Land outputs of the Non-technical

Classified land:

SHA, 18 830 m2

CHA, 1 225 m2

Land release product:

Cancelled land (released), 3 971 m2

Step 4: Create a TS and choose to continue with the SHA…

Part of the training…

The process of Land Release in T-IMS

How to continuously work with and follow the progress of work with land areas, an example

Step 5:

Land outputs of the Technical

Classified land:

CHA, 13 050 m2 (incl. Fade Out)

Land release product:

Reduced land, 6 363 m2

Step 6: Create a Clearance activity and choose to contin[illegible]th the CHAs…

Part of the training…

The process of Land Release in T-IMS

How to continuously work with and follow the progress of work with land areas, an example

Step 7:

Land output of the Clearance

Classified land:

-

Land release product:

Cleared land, 14 275 m2

Summary:

Cancelled area (NTS), 3 791 m2

Reduced area (TS), 6 363 m2

Area cleared (Clearance), 14 275 m2

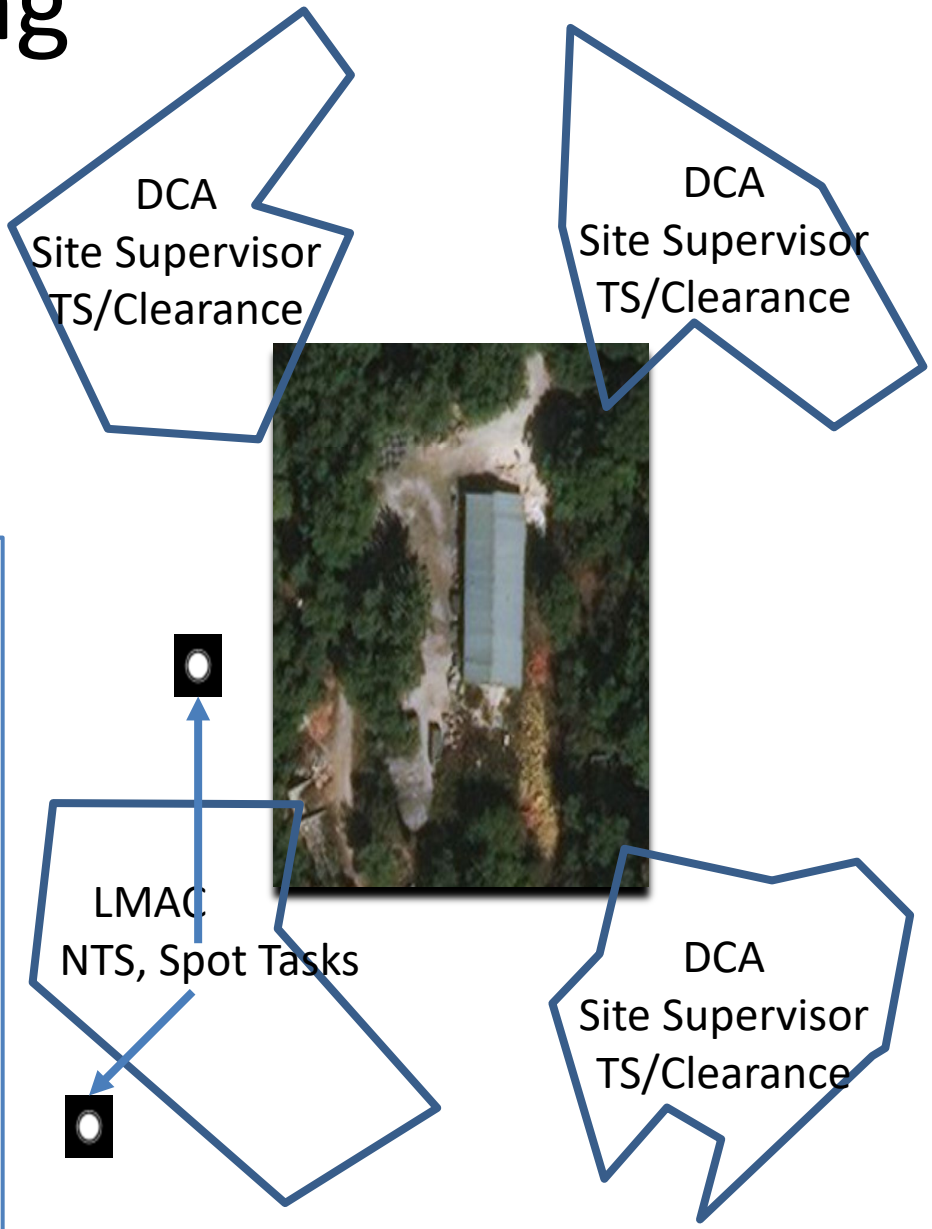
=> Total area released, 24 429 m2

Part of the training

The outdoor exercises

- Three DCA teams
  Task: TS -> Clearance
- One LMAC team
  Task: NTS, Spot Tasks
- QA-teams
  Task: QA

- ***Use the GPS to:***
  - ***Perform tracking***
  - ***create points, lines and polygons***
- ***All minefields must have an area ref.point, landmark and benchmark***
- ***Add attachments (photos, videos, voice recordings…)***
- ***Create applicable Forms***
- ***NB! Create Daily reports for clearance activities!***
- ***Close and save your activities on your USB-stick***



Part of the training

The outdoor exercises

Start of pilot, 1 August

- Short recapture of training, workflows, technical environments & integrations, reporting, responsibilities etc
- Official start of the pilot

-

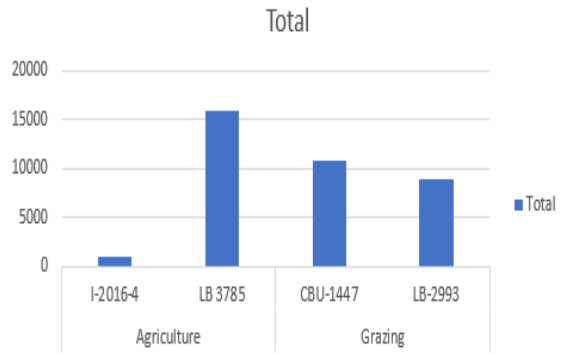
Mid-term evaluation, 1 October

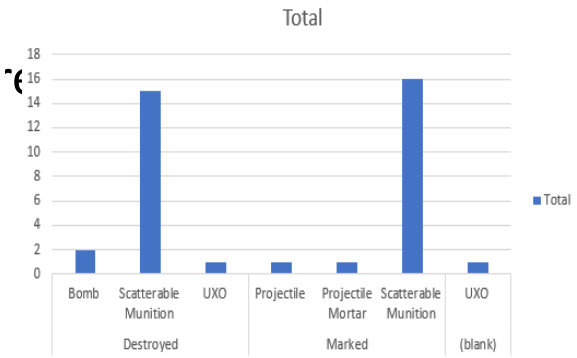
Purpose

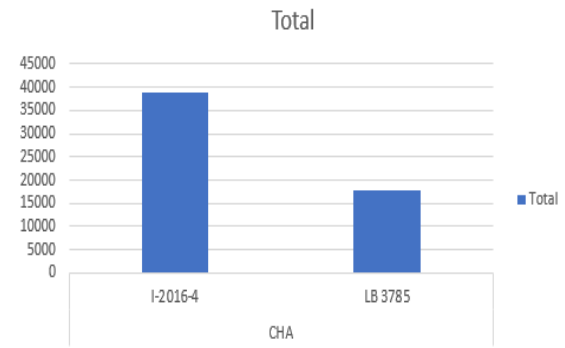
- Follow-up on the progress of the work with T-IMS
- Verify that the system did meet requirements and expectations
- Make a survey, a questionnaire for the T-IMS users to fill out
  (The result was approx. 6 points out of 7 over all...)
- Introduce T-IMS' built-in Analysis module

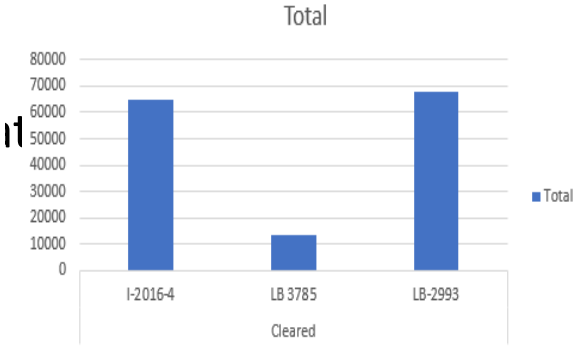
Mid-term, analysis

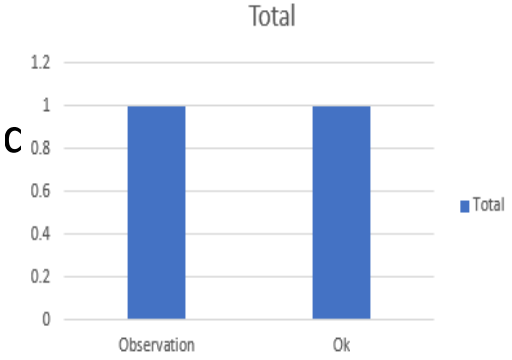
From T-IMS' built-in Analysis module, based on…







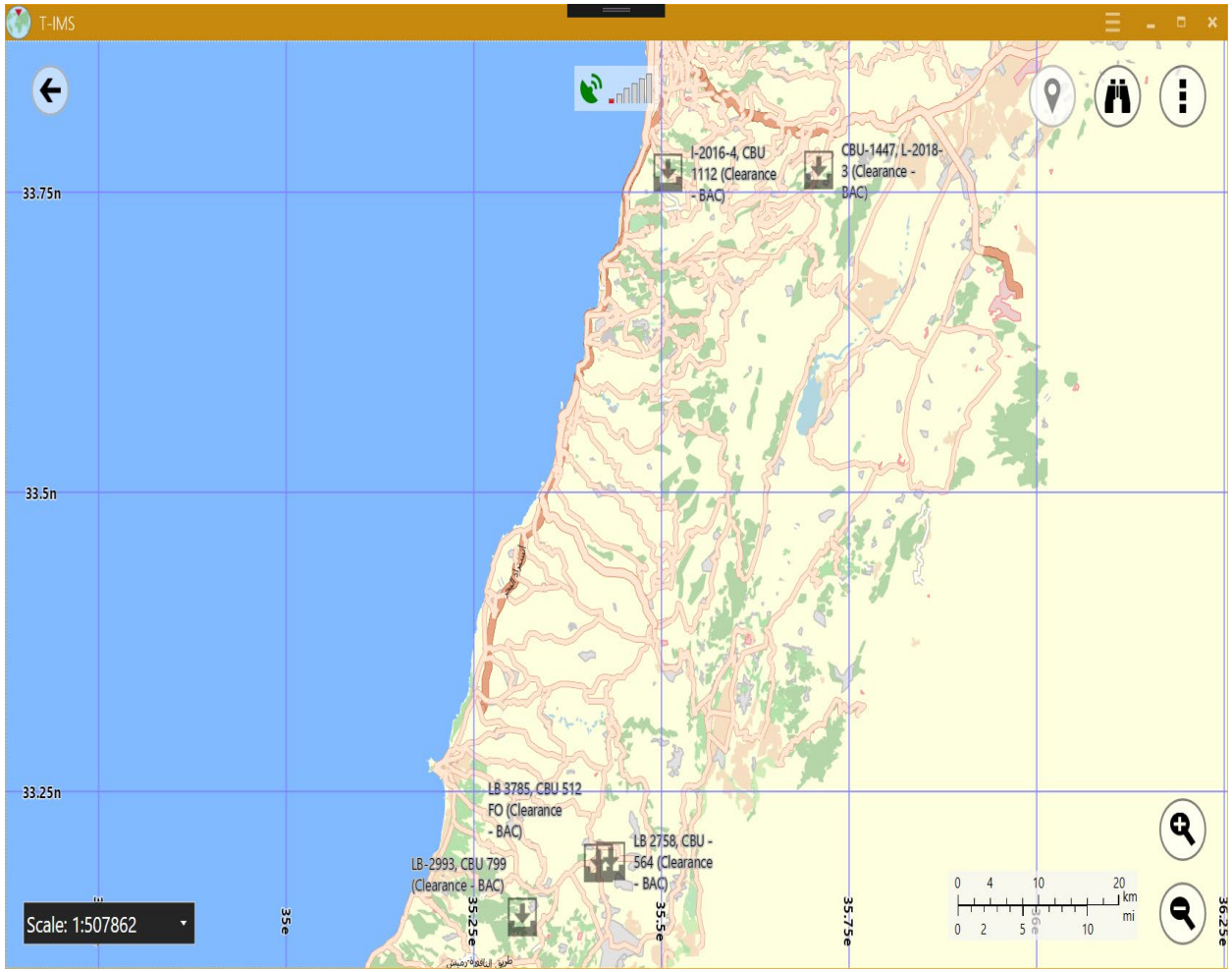




End of pilot project, observations of benefits

- The system allows everyone involved in survey, clearance and QA/QC to be able to contribute & report.
- No more human errors and errors from manual handling.
- No need for additional office work for completion of field reports.
- Situation awareness. Digital up-to-date maps with historical information, also showing the carriers' current position substantially improves safety in the field.
- Standardised terminology and map symbology minimises the risk of misunderstanding and misinterpretation.
- All captured information in the field – what, when and by whom – is accessible for communication, interaction, reporting and analyses in native form.

End of pilot project, achievements and results



Row Labels	Sum of Area
Agriculture	**80127**
Full excavation	43
Sub-surface	79884
Surface	200
Grazing	**111406**
Full excavation	8
Sub-surface	100591
Surface	10807
Housing	**4315**
Full excavation	33
Sub-surface	4032
Surface	250
Roads	**1731**
Surface	1731
Grand Total	197579

Row Labels	Sum of Quantity
Bomb	9
Projectile	1
Projectile Mortar	1
Scatterable Munition	57
UXO	2
Grand Total	70

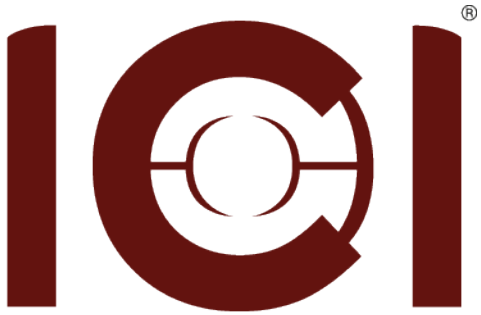
From field data collection to analysis, final words

- Organisation, workflow and responsibilities
- User training, train the trainers
- Digital field data collection and daily reporting
- IMSMA integration
- Analysis and reporting needs
- GIS
- ..

Thank you!

Questions..?

FOR MORE INFORMATION



International **CBRNE** Institute

www.ici-belgium.be

Yvan.baudoin@ici-belgium.be

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Time schedule

An abstract (approximately 200 words in English) should be received not later than 28 Feb ***2019*** Electronic submissions of the abstracts (PDF-files) should be mailed to:

Yvan.baudoin@ici-belgium.be
info@ici-belgium.be

- Abstract proposal deadline: Feb 28, 2019
- Final selection and invitation of participants: March 12, 2019
- Receipt of full papers: March 31, 2019

Local Organization Committee

Workshop inquiries to:

CBRNE MPPM'2019
International CBRNE Institute
Rue de sart-Dames-Avelines, 8A
B6210 Les Bons Villers
Tel: +32 71820840
info@ici-belgium.be
Fax: Homepage
www.ici-belgium.be/events

International **CBRNE** Institute

RISE'2019
CBRNE-MPPM

9 th International Workshop on Measurement, Prevention, Protection and Management of CBRNE Risks
01-03 April 2019 – International CBRNE Institute, Belgium

BEMEKO

IMEKO

www.imeko.org-TC17

The 9th International Workshop on Measurement , prevention, protection and management of CBRNE risks follows the successful 7th IARP-RISE'2015 held at the Portuguese Naval Base (BNL), the 8th IARP RISE' 2017 held at ICI, Belgium and it is aiming to gather high quality original contributions in the CBRNE field and associated CBRNE measurements, prevention, protection and management with the final goal of assessing the most recent developments in this utmost domain of science and technology. The Workshop scope covers a broad spectrum ranging from advanced conceptual and virtual design and methodology, sensors, actuators, instrumentation, and real-time control algorithms to innovative robotics , mobile (ground/aerial/undersea) robotics, personal and collective protection, multilevel rescue operations and management applications. It will contribute to provide a full picture of the state of the art in the area of increasing CBRNE risks. The key words you will use are essential to organize the different sessions for this conference..

Scope and Topics

Measurement of CBRNE –related environmental risks
Environmental CBRNE surveillance
Search and Rescue in CBRNE incidents/accidents)
Medical management of CBRNE agents in indoor targets (teaching facilities, entertainment facilities, hospitality facilities, etc.)
CBRNE ground/aeria/maritimel robotic systems
CBRNE detection sensing systems

Participation

	Before March 31	After March 31
Authors, co-authors	75€	100€
ICI and Associate ICI sponsoring members	100€	150€
Others	150 €	200 €
Accompanying	150€	200€
Students	50 €/day	50 €/day
Exhibitors	100 €/day	150 €/day

The fees include the lunches, get together dinner, social events and proceedings

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The workshop will be conducted in parallel with CBRNE Measurement and Robotics exhibition/demonstration