**TIRAMISU Report Summary**

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**Periodic Report Summary 4 - TIRAMISU (Toolbox Implementation for Removal of Anti-personnel Mines, Submunitions and UXO)**

Project Context and Objectives:

Anti-personnel landmines and unexploded ordnance (UXOs) represent an important obstacle in the transition from crisis to peace for war-affected countries. They threaten post-conflict development and welfare.

The objective of the TIRAMISU project is to provide the Mine Action community with a toolbox to assist in addressing the many issues related to Humanitarian Demining and thus promoting peace, national and regional security, conflict prevention, social and economic rehabilitation and post-conflict reconstruction.

TIRAMISU stands for Toolbox Implementation for Removal of Anti-personnel Mines, Submunitions and UXO.

The TIRAMISU toolbox is divided into several modules that cover all the different aspects of Mine Action.

A module is dedicated to Mine Action mission management. Tools in this module will help improve the planning and execution of Mine Action missions.

A module includes tools that will help the setting of priorities to suspected hazardous areas and the efficient use of the other modules in a given situation. These tools will make use of remote sensing and decision support systems.

Another module includes tools for Non-Technical Survey and Advanced General Survey, for instance by detecting indicators of probable presence of landmines/UXOs. These tools will facilitate land release.

Great efforts have been given to the design of agricultural-based platform for technical survey that are cheap to build and easy to return to agricultural use after being use for ground preparation or demining.

A module is dedicated to Ground-based Close-in Detection. It includes tools such as advanced metal detector array, Ground Penetrating Radar array and novel chemical sensors as well as their implementation on remote controlled unmanned ground vehicles (UGV).

For Stand-off Detection the module includes tools to detect mines, sub-munitions or explosives at close range with remotely controlled Micro/Mini (Unmanned) Aerial Vehicles (MAV/UAV) or flying biosensors (honeybees), possibly coupled with UGV.

A module regroups tools for Disposal of Explosive Remnants of War (ERW). These tools will help protect personnel or vehicles against explosions.

The Mine Risk Education module consists of tools to assist in Mine Risk Education activities through various techniques,
including theatre plays and computer games.

The Training module includes tools aiming at developing capacity building and enabling the user’s uptake of the developed tools.

A last module includes standardisation documentation.

In order to test the tools and increase the confidence of the Mine Action community in these tools, test and validation campaigns have been organised in several mine contaminated countries.

The project was supported by two boards involved in every step of the development of TIRAMISU to ensure that the tools being developed will really be useful to the Mine Action community: the End-User Board assisting in the definition of the needs and the assessment of the usefulness of the tools and the Project Advisory Board providing a scientific and independent view on the tools design and development and on any ethical issues that arised in the course of the project.

Project Results:
An important activity at the beginning of the project was to ensure that the tools were really what the Mine Action community needed. For this a Project’s Advisory Board (PAB) and an End-User Board (EUB) were set up.

Since that initial step the development of the tools has been continuously evaluated by the boards. In addition collaboration was secured with the Mine Action centres or authorities of Cambodia, Croatia and Jordan to test some of the tools.

Flight campaigns were organised in Croatia and satellite data were purchased over Croatia and Cambodia. Tools have been developed to analyse the data, detect key indicators on the contamination (or absence of contamination) and more generally to use these images to better identify suspected hazardous areas and set priorities among them.

Detectors mounted on remotely controlled vehicles have been developed and evaluated. One platform was designed to be used both for Mine Action activity and agriculture. Its versatility makes it a very promising vehicle.

The potential of drones in Mine Action is enormous and has been evaluated. Flight campaigns over mines areas in Bosnia and Herzegovina after floods moved mines were carried out in 2014 to help Bosnian Mine Action Centre and humanitarian organisations.

The use of honey bees to detect explosive has been studied with promising results. The method was demonstrated in Croatia and generated a world-wide media attention.

Two tools have been developed to help mine risk education: video games and a radio broadcast theatre play. The play was evaluated in Cambodia and with people living in a refugee camp in Algeria. The video game was evaluated in Croatia.

An important work has been done in the field of disposal of explosives, for instance with the design of a blast- resistant vessel, the decomposition of RDX and the prototyping of neutralisation sets. Requests for three patents have been submitted.

Blast-resistant wheels have been designed, tested and continuously improved. These wheels are equipping the agriculture/Mine Action vehicle.

Testing personal protective equipment is a key issue in selecting the best suited equipment for a given task. Threat against an explosive hazard, however, is usually tested against classic ballistic threats where the impact of one bullet at a time is
considered, not of multiple fragments. Therefore a triple-impact launcher has been designed to improve the relevance of the tests for mine action.

Several topics where standardisation is still needed have been identified after long discussion with key actors in Mine Action. CEN Workshop Agreements are being developed on the use of mechanical machines for technical survey and the evaluation of personal protective equipment.

Combining all these different tools into a toolbox is quite a challenge, particularly the communication between the tools that generate information and tools that require information. A repository system that would allow this communication has been designed.

In order to convince the Mine Action community to use these tools it is important that they are demonstrated, tested and evaluated rigorously. The validation protocols have been therefore detailed and, whenever possible, criteria to assess the success of these tools have been defined.

The preparation of the future exploitation of the tools has started and involves many contacts with potential users to better understand their needs and the reasons why they may be reluctant to adopt new solutions. An important demonstration took place on 24 September 2015.

The setting up of a Centre of Excellence to promote and exploit the result of the project has started.

Potential Impact:

Tools have been developed to help mine action: tools to help surveys and the use of data from satellites, airborne surveys, drones, etc., sensors to detect mines and other explosive remnants of war (ERW), ground platforms to carry these sensors, methods to dispose of mines and ERW, protection for human beings and vehicles, tools to help risk education campaigns and tools to help the training of personnel. All these tools have been evaluated and whenever possible validated. Standards are being developed to help the testing and evaluation of mechanical equipment and personal protective equipment.

A Centre of Excellence on Counter-Explosive Hazard is being established. The concept is being discussed with the Project Advisory Board (PAB), the End-user Board (EUB) and all main actors of the mine action community.

The Centre of Excellence would allow the Mine Action community to effectively use the developed tools (most of them being developed with their involvement), be involved in new developments and training, be involved in standardisation activities and be invited to significant events.

The legal status of the Centre of Excellence will be defined after consulting the PAB and EUB, but in a first step it may be managed by, and hosted at, the Royal Military Academy, in Belgium, as the secretariat of the International Test and Evaluation Program for Humanitarian Demining (ITEP) was. Again, End-Users interested in a TIRAMISU tool or in an integrated series of tools from several modules will be invited to subscribe to the Centre when they want to introduce their particular needs or requests.

Subsequently, the End-Users may hire or purchase the toolbox components which best fit their budget, local infrastructure and peculiarities. The End-User just pays for the components of the toolbox they really need and will use, which gives a high degree of flexibility.

The involvement of end-users in the design and evaluation of the tools has strengthened the relevance of these tools. Their acceptance among the mine action community has therefore been improved.
The future Centre of Excellence will serve as a Point of Contact for each module together with the description, guidelines, provider(s), availability, etc. Labels have been designed to help potential clients understand the specifications of the tools.

Each tool has been evaluated and whenever relevant validated operationally according to existing standards, and when possible certified; new CEN Workshop Agreements (CWA) are being developed.

List of Websites:
http://www.fp7-tiramisu.eu/

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