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Vietnam
Mine Risk Education
Survey and Clearance
Disability Rights, and more...

FEATURE
Environmental & Cultural Considerations in Demining

IN EVERY ISSUE
NOTES FROM THE FIELD
RESEARCH & DEVELOPMENT
The Journal of ERW and Mine Action
Center for International Stabilization and Recovery
at James Madison University
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Upcoming Issue
Issue 19.2 | July 2015 (Print and Online)
Focus: Colombia
Feature: Mine/ERW Risk Education
Notes from the Field
Research & Development

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Cover Photo
The provincial MAG (Mines Advisory Group) technical operations coordinator carefully unscrews a cap to see if there is a rear fuze in the bomb. Fortunately there was no fuze and the bomb was safe to move.

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The Journal of ERW and Mine Action is a professional trade journal for the humanitarian mine action and explosive remnants of war (ERW) community. It is a forum for landmine and ERW clearance best practices and methodologies, strategic planning, mine risk education and survivor assistance.

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Director’s Message

I am thrilled to announce a new sponsor for The Journal’s Research and Development (R&D) section, one of our publication’s most-read sections. We would like to thank the U.S. Department of Defense’s Unexploded Ordnance Center of Excellence (UXOCOE) for supporting our peer-reviewed R&D section. In this issue we have “Measurement of the Forces Generated in the Ground by the Free Fall of DEMICHAIN” by Christian Baras et al. of the Association de Recherches de Techniques Innovantes en Déminage Humanitaire. Finally, we would like to extend our deepest thanks to the U.S. Department of Defense’s Humanitarian Demining Program for their support for the past seven years and we will miss working with them on this section of The Journal.

In this issue’s Focus section, we highlight Vietnam with articles by Jonathan Guthrie and Portia Stratton on the NPA/MAG joint project, “The Quang Tri Integrated Survey and Clearance Project,” as well as a disability-rights training in Vietnam by CISR’s Cameron Macauley and Heather Holsinger. In addition, MAG’s Sean Sutton presents an eye-opening photo essay depicting clearance work in Quang Binh and Quang Tri provinces, Vietnam.

In our Feature section, we look at the environmental effects of mine action. Management of natural disasters will only become increasingly difficult for the global community, as climate changes increase the frequency and severity at which they occur. Building preparedness and risk reduction will allow communities to “build back better” and help vulnerable communities succeed in long-term rehabilitation. Included in this issue, Milan Bajic et al. discuss a multi-country project resulting from the flooding in Bosnia and Herzegovina, Croatia, and Serbia. In addition, Martin Jebens looks at incorporating environmental legislation into mine clearance in Skallingen, Denmark.

As we strive to capture the latest trends and technologies in the field, we turn our focus to Colombia and Risk Education in issue 19.2 and the Middle East and Survivor Assistance in issue 19.3. In the future, we will cover new Journal topics including the use of mobile technologies in the field, best practices in conventional weapons destruction, including stockpile management and security, and MRE in conflict and ceasefire environments. As a journal of practice, we encourage readers to contact us with timely topics they would like to see covered in future issues of The Journal. As always, we invite industry experts, government bodies, nongovernmental organizations, military personnel, researchers, and academics to submit their articles and case studies. We depend on your voice and look forward to hearing from you.

Ken Rutherford
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**FOCUS: The Middle East**

The Focus section of The Journal looks at issues affecting a particular country or region. The Journal seeks articles analyzing the effect of recent unrest in the Middle East on mine/ERW-clearance progress, use of surveys and area reduction, destruction of excess munitions or small arms/light weapons, mine-risk-education projects, victim-assistance efforts, socioeconomic impact of mines or other conventional weapons, and technology being produced or tested in the region. Article submissions from national programs are strongly encouraged. Stories on regional projects covering multiple countries are also highly desired.

**FEATURE: Survivor Assistance**

The Feature section of The Journal analyzes issues or studies challenges within the scope of post-conflict recovery and mine/ERW-action. The Journal invites articles on best practices and lessons learned in survivor assistance, with a special focus on legislation. What trends and global developments are occurring in the field of survivor assistance for mine/ERW survivors as well as other armed-conflict survivors? What lessons learned in mine/ERW survivor assistance can apply to other armed conflict/war survivors and their families/communities (e.g., those subjected to sexual violence, forced conscription, displacement, disappearances, etc.)? How do national legislation and international agreements support survivor assistance in the field? Are there barriers to implementation? What strategies are effective? What differences are encountered in providing survivor assistance to men, women, girls and boys? How do cultural norms and regional differences affect survivor assistance issues? How do microloans and/or training affect survivors and their communities?

**Notes from the Field:** This section of The Journal features articles, case studies, and experiences by practitioners and subject-matter experts. Notes from the Field accepts articles on a variety of subjects on a rolling basis.

**Research and Development:** This is a peer-reviewed technical section of The Journal. Scientific and technical articles on current trends and developments in the field of mine action and conventional weapons destruction will be considered on a rolling basis.

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**Issue 19.3**

**Deadline: 1 July 2015**

**Publication: Fall 2015**

*Submissions for issue 19.3 are due by 1 July 2015. However, because of limited space, we strongly encourage authors to submit articles to The Journal before the deadline.*
Vietnam 40 Years After the War

Sean Sutton, photographer and international communications manager for MAG, provides a photographic essay of Mines Advisory Group’s (MAG) clearance work in Quang Binh and Quang Tri provinces, Vietnam.

by Sean Sutton [ MAG ]

Nearly 40 years after its war with the United States ended, Vietnam continues to be plagued by explosive remnants of war (ERW), particularly cluster munitions (known as bombs in Vietnam). According to the Landmine and Cluster Munition Monitor 2013, the Vietnam government reports that “ERW affects 63 provinces and cities” impacting approximately one-fifth of its land, with the central provinces suffering from the worst contamination. With a population of nearly 90 million people, Vietnam has the highest population density in the region; every square meter of land is precious.

Since 1999, MAG (Mines Advisory Group) has implemented clearance projects in Vietnam’s heavily contaminated central provinces. MAG’s current projects are based in Quang Binh and Quang Tri provinces, located on opposing sides of the former demilitarized zone that once divided northern and southern Vietnam. These provinces demonstrate poverty rates far higher than the national average among populations that are predominantly reliant upon agricultural and farming activities for income.

In 2013, MAG cleared 164,498 sq m (40.65 ac), removing and destroying 15,340 items of unexploded ordnance (UXO) and 2,615 cluster munitions. MAG also performed 15,189 explosive ordnance disposal spot tasks, directly helping 606,062 men, women and children in Vietnam.

MAG’s completed clearance projects include grounds for Trung Hoa Kindergarten (a new school in Quang Binh province) and gardens around homes in Tan An village in Quang Nam province, Kim Nai village, Moc Dinh village, and Le Thuy district in Quang Binh province. During the
A BLU 26 cluster bomb submunition (bombie) sparkles in the sand. Bombies, which are very unstable, are particularly attractive to children.

Community liaison team members collect information from Mr. Nam about contamination in his garden.
Mr. Nam watches as MAG technicians clear his garden.

Mine Action Team 4 is clearing a garden in Kim Nai village in Quang Binh province using a large loop detector. Wooden pickets are placed to mark the location of potential UXO picked up by the detector. These threats are then investigated.
Technical field manager Daniel Dobbs carefully places an abandoned 40 mm grenade into a bucket of sand in order to transport it to the demolition site. These grenades are notoriously dangerous due to their sensitivity and claim lives every year in Vietnam.

Technical field manager Daniel Dobbs carefully places an abandoned 40 mm grenade into a bucket of sand in order to transport it to the demolition site. These grenades are notoriously dangerous due to their sensitivity and claim lives every year in Vietnam.
Nearly 1,000 cluster bomb submunitions were found by the community and stored by the local military before transport to the demolition site on the beach nearby, Moc Dinh village, Le Thuy district.

clearance process, MAG’s community liaison (CL) teams went house-to-house to ask families whether they were affected by ERW. The CL teams showed the villagers a picture book of ERW for identification to determine areas that needed clearance.

“This is our ancestral land and we want to build a house here, but we can’t,” said Mr. Nam. “I was digging for making cement and found bom-bies and mortar bombs. There is an old bunker under the ground here, and I am worried. Old people [in the village] told me this is the place people would put unexploded bombs when they found them in the village.” Sixty-three percent of beneficiaries from MAG’s clearance activities reported between 2011 and 2013 that being able to use land productively was the most significant outcome of clearance.1

After MAG cleared three 40 mm grenades from her garden, Mrs. Rua, who lives in Quang Nam province, said “When we dug behind our house, we found a grenade. And then just a few months ago after heavy rain, we saw another one. We were very scared for the safety of the children. Both my husband and I work so we can’t watch the children all the time. It caused us a lot of fear and worry. We told the children to keep out of the garden, but sometimes we would catch them playing there. Now I am very thankful my children will be safe.” More than 70 percent of those benefitting from MAG’s clearance activities reported that improved psychological safety is one of its most important impacts.1

MAG Mine Action Team 4 cleared 7,645 sq m (1.89 ac) in October 2012. They found 20 projectiles (rockets and shells), mortar bombs and grenades. Ha Thanh Village Primary School was then built on the cleared land and opened in February 2013. Mrs. Chung, one of the teachers, said “Thanks to MAG we now have a new school in the village. Before, students had to travel a long way to another village and that school was over-crowded. We are so very grateful and it means a lot to the community. Forty-seven children now go to school here and they are very happy indeed.”

MAG remains committed to its goal of making Quang Tri and Quang Binh provinces free from the impact of cluster munitions. With sustained levels of funding and a supportive constructive operating environment, MAG believes that this goal is obtainable within a 10-year period.6

See endnotes page 65

Note: Funding was provided by the Office of Weapons Removal and Abatement in the U.S. Department of State’s Bureau of Political-Military Affairs (PM/WRA), Irish Aid and the U.K’s Department of International Development (DFID).
PeaceTrees’ EOD Program in Vietnam

PeaceTrees Vietnam has explosive ordnance disposal programs in Dakrong and Huong Hoa, the two westernmost districts of Quang Tri province bordering Laos. Huong Hoa was the scene of the Battle of Keh Sanh in 1968. These mountainous districts lack sufficient infrastructure and are afflicted by extreme poverty. The districts include a large number of ethnic minorities who have no written language, do not speak Vietnamese and suffer injuries from unexploded ordnance at a higher rate than the ethnic Vietnamese in the region. The war severely impacted the two districts, and about 80 percent of the territory is considered contaminated.

by Claire Yunker [PeaceTrees Vietnam]

PeaceTrees demining teams perform a mixture of explosive ordnance disposal (EOD) and area clearance. During the fiscal year, which ended September 2014, the teams received calls for 990 EOD tasks and received 2,718 reports of unexploded ordnance (UXO) from locals. Demining teams cleared 105,298 sq m (26 ac), of which 58,446 sq m (14 ac) were area-clearance projects.

In 2014, 29 PeaceTrees demining team members found and destroyed 6,834 items of UXO (329 cluster-bomb submunitions, 1,176 grenades, and 4,076 mortar shells and other projectile weapons). In addition, 15 large aircraft bombs were located and destroyed. Although the majority of these weapons were destroyed at a local site near Khe Sanh in Huong Hoa, the 15 bombs were too large for local destruction and were taken to coastal dunes for disposal.

Rough terrain and unforgiving weather complicates the work of PeaceTrees’ EOD teams. For example, 500-pound bombs have to be carried by hand out to roads over a brutal, often steep landscape. Several team members put long trusses underneath the bomb, attach it to sticks and work together to carry it up to a waiting truck. UXO are often found in such large quantities that they cannot all be destroyed on a weekly basis out of concern for environmental damage. Area clearance for economic development purposes is often delayed because of the large volume of EOD calls PeaceTrees receives. In the past, teams also faced difficulty in communicating with local ethnic minorities because of cultural and language barriers. Over the years, experience in the districts helped PeaceTrees’ teams learn better ways to work with and
employ the local citizens into the demining teams, which now include some minority representation.

The Ba Long Village Project

Natural disasters (most recently Typhoon Ketsana in September 2009) have recurrently devastated the Commune of Ba Long in Dakrong, Quang Tri. Overall, 495 houses in 10 villages flooded—including homes along the river—and 1,200 farm animals were killed or swept away.

In 2013, thanks to an innovative funding plan based on a US$75,000 grant from the Office of Weapons Removal and Abatement in the U.S. Department of State’s Bureau of Political-Military Affairs (PM/WRA) and matched by private donations, PeaceTrees Vietnam began work on a fixed clearance project to clear a safer new village site and nearby farmland in Dakrong.

The goal was to provide Ba Long residents with housing and agricultural land in a new village uphill from the flooded area. Residents could keep their old land, and were promised a new house and garden site. None of the villagers were required to move. Villagers who wished to relocate put their names on a list, and in fact the project was oversubscribed. A lottery chose the first 50 housing sites. The Ba Long Commune managed the entire process, while PeaceTrees ensured the families were not compelled to move and did so voluntarily. The new village is about one kilometer from the old site. The clearance project itself only took eight months and was completed in July 2014. During this fixed-site clearance project, 621 pieces of mixed Soviet-, Chinese- and U.S.-manufactured UXO were discovered and 90 ha (222 ac) of land were cleared.

A U.S. veteran of the war raised the majority of funds required to build a community center in the new village, while the local government contributed the remaining funds. The community center was completed in early October 2014 on newly cleared land. On 30 October, 50 households drew lots for garden and home sites in the new village. The local government is providing partial funding for the new houses, and homeowners already began construction. This project represents a joint effort from the U.S. Department of State, many private donors, and the People’s Committees of Dakrong District and Ba Long Communes. The Department of Foreign Affairs of Quang Tri and its Vice Chairman Nguyen Duc Quang facilitated the project.

Challenges and the Future

Quang Tri is a difficult place to work. Weather alternates between torrential rains and extreme heat. Typhoons, flooding, landslides, road construction, extreme terrain and diverse populations complicate the effort. However, much has been accomplished. The local governments are committed and innovative in their efforts to create a safe place for people to live and work. In cooperation with PM/WRA and Quang Tri province, Norwegian People’s Aid recently developed a sophisticated data and mapping project that will prioritize clearance to the most dangerous areas and munitions. The project’s objective is to allow the Quang Tri Provincial Authorities to maintain knowledge of contaminated and released areas, allowing for successful planning of socioeconomic development and making effective use of limited resources available to neutralize the war’s legacy in the province. PeaceTrees Vietnam employs a data analyst who provides current and historical data to the Information Management System for Mine Action.

Claire Yunker is deputy director at PeaceTrees Vietnam, a humanitarian organization working in central Vietnam to address the consequences of the Vietnam War. Yunker manages PeaceTrees Vietnam’s mine-action and economic development programs, advancement, and operations out of the U.S. office in Seattle, Washington. She holds a master’s in public administration from University of Washington’s Evans School of Public Affairs.

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Building Capacity to Promote the Rights of People with Disabilities in Vietnam

In Vietnam, legislation to guarantee the rights of persons with disabilities has advanced significantly during the past decade; however, implementation of laws and reduction of social barriers has been slow. An ongoing campaign focuses on changing the attitudes of Vietnamese government officials and of the public to promote education, employment and inclusion for Vietnam’s large population of persons with disabilities.

by Cameron Macauley and Heather Holsinger [Center for International Stabilization and Recovery]

The Vietnam War (1954–1975) lasted over 20 years and left hundreds of thousands of Vietnamese with physical and psychological injuries. Although disabled veterans receive many privileges and benefits in Vietnam, most persons with disabilities (PWD) continue to face employment discrimination and lack of access to health care, transportation, education and vocational training. The exact number of PWDs living in Vietnam is unknown. A 2009 U.N. Population Fund survey found 6.1 million Vietnamese with one or more disabilities including an unknown number with neurological and genetic effects from Agent Orange, a defoliant used to uncover Viet Cong bases and supply lines during the war. Those affected by Agent Orange often rely on mobility devices such as crutches or wheelchairs, but streets, sidewalks, buildings and bathrooms in Vietnam are rarely accessible. Many PWDs also live with visual, auditory or intellectual disabilities, yet Vietnamese schools have few teachers trained to work with children with disabilities, and courses in Braille or sign language are almost nonexistent.

Training included small group activities to develop ideas for marketing materials. Photos courtesy of CISR and AEPD.
Disability Legislation in Vietnam

Legislation has progressed through a series of laws that guarantee the rights of children and adults with disabilities. In addition to these laws, various ministries of the Vietnamese government have enacted at least 20 different directives, decrees and decisions relating to disability in such areas as labor and employment, vocational training, accessible transportation, building construction standards for residential and commercial buildings, welfare policies, teacher training, and sports. In 2006 the Ministry of Labor, Invalids and Social Affairs drafted the “National Plan to Support People with Disabilities,” to be implemented between 2006 and 2010. On 22 October 2007, Vietnam signed the Convention on the Rights of Persons with Disabilities (CRPD), and the government immediately began preparing national legislation to complete ratification.

On 17 June 2010, the National Assembly of Vietnam enacted the National Law on Persons with Disabilities, the first comprehensive national law in Vietnam to guarantee the rights of PWDs. The law mandates equal participation in society for disabled people through accommodation and access to health care, rehabilitation, education, employment, vocational training, cultural services, sports and entertainment, transportation, public places and information technology.

Although these legislative reforms clearly reflect a desire on the government’s part to protect the rights of PWDs and to facilitate their inclusion into society, implementation of the laws has proceeded slowly and irregularly. Since constitutional reform in 1992, Vietnam decentralized much of its government, transferring significant power to provincial and municipal authorities. One effect of this has been inconsistent implementation of the national disability law, due mainly to lack of resources in the poorer provinces.

Another reason behind the law’s slow implementation is lack of pressure from PWDs and their families. People in
Vietnam rarely petition legislators to take action on issues such as disability rights since government officials are appointed, not elected. However, signing and ratification of the CRPD gave disabled people worldwide a stronger voice in promoting disability rights and in urging its fulfillment, inspiring some Vietnamese with disabilities to engage in political activism.8

Public Relations Campaign

In 2013–2014, the Center for International Stabilization and Recovery (CISR) at James Madison University received funding to work with Vietnamese nongovernmental organizations to facilitate the creation of a public relations campaign, conduct a nationwide training program to empower PWDs in public policymaking and advocacy, and to sensitize local government officials as to the importance of enforcing the National Law on Persons with Disabilities.9

The project also sought to raise the awareness of local government officials about the need for social and political change regarding disability rights in Vietnam. This has been achieved through a series of 10 workshops held in 2014 in Quang Binh, Quang Tri, Thua Thien–Hue, Da Nang, Ho Chi Minh City and Ha Noi. The 326 workshop participants included 119 provincial government officials and 126 disabled Vietnamese representing 78 different disabled people’s organizations (DPO).

Each workshop included sessions on the national disability law, and discussions allowed disabled participants to argue for
allow messages to reach a large sector of the populace and create an expectation that the government will improve compliance with the National Law on Persons with Disabilities.

CISR’s training also focused on accessibility and discrimination. Among other concerns, employment discrimination against PWDs—even those with advanced training and technical skills—prevents many Vietnamese with disabilities from finding full-time employment. Discrimination in schools also discourages many Vietnamese families from allowing their children to attend school with nondisabled children. Due to lack of accessible schools, reasonable accommodations and/or special education programs, many disabled children in Vietnam never attend school.

Finally, the project conducted a series of surveys to measure change in public attitudes toward PWDs and disability rights in Vietnam between the initiation of the project and its completion. Although the project is not the only factor influencing these attitudes, those engaged in the project anticipate demonstrating that the Vietnamese public is increasingly supportive of greater fulfillment of the rights of PWDs as specified under Vietnamese law.

As a result of this campaign, those engaged in the project are optimistic to see a series of new actions designed to immediately benefit disabled people in Vietnam. These include financial discounts and fee exemptions for health care, transportation and education; construction of accessible streets, sidewalks, entrances and bathrooms in public buildings; training of teachers for children with disabilities; new sports facilities and athletic programs accessible to PWDs; and appointment of disabled people to committees and other local government bodies advocating for the fulfillment of disability rights. See endnotes page 65
The Quang Tri Integrated Survey and Clearance Project

Surveys estimate that as much as 83 percent of land in Quang Tri province in Central Vietnam is contaminated by explosive remnants of war. Recent advances in information management and operational methodology have significantly reduced this figure. This article looks at a coordinated response currently being implemented in Quang Tri province in collaboration between MAG and Norwegian People’s Aid, and the key factors involved in successfully facilitating this process.

by Jonathon Guthrie [Norwegian People's Aid] and Portia Stratton [MAG (Mines Advisory Group)]

Almost 40 years after the end of the war, Vietnam is still considered to have one of the highest levels of unexploded ordnance (UXO) contamination in the world. Of the estimated 15.4 million tons of ordnance used during the war, as much as 10 percent failed to detonate. This legacy continues to place communities at risk and restricts access to land required for housing, agriculture, infrastructure and community development. Cluster munitions represent a significant proportion of the remaining contamination and, along with 40 mm grenades, are responsible for the majority of civilian deaths and injuries.

Significant post-war clearance efforts have been carried out by both the military and nongovernmental organizations (NGO) using funding sourced from the national budget as well as from institutional donors, including the Office of Weapons Removal and Abatement in the U.S. Department of State’s Bureau of Political-Military Affairs (PM/WRA) and the governments of Germany, Ireland, Japan, Norway and the United Kingdom. Particularly around the former Demilitarized Zone, NGO efforts have focused on provinces in central Vietnam, which is considered to be the most contaminated part of the country. Despite this work, there is no reliable way to measure the extent and scope of the remaining contamination, in part due to outdated survey methodology and an underdeveloped information management system.

In the last two years, however, significant progress has been made in the development of a national mine action program and in the coordination of mine action activities at the provincial level. These advances created an opportunity to undertake a more strategic analysis of how remaining contamination in Vietnam could be tackled.

The Quang Tri Integrated Survey and Clearance Project

Mine action organizations in Quang Tri have historically operated in administrative locations known as districts, with each operator working according to their own operational methodology. Districts have been allocated by the Department of Foreign Affairs (DoFA), the body within the provincial authority responsible for coordinating international mine action NGOs. Both Norwegian People’s Aid (NPA) and MAG (Mines Advisory Group) have worked in Central Vietnam. NPA, which works in Cam Lo, Dakrong, and Trieu Phong districts, has piloted and adapted the Cluster Munition Remnants Survey (CMRS), initially developed by NPA in Laos. MAG’s area of operation includes Vinh Linh and Gio Linh districts, where the emphasis has been on clearance in support of development activities and on conducting explosive ordnance disposal (EOD) tasks as a response to local needs.

Following advances in provincial level information management systems in late 2013, NPA and MAG began to discuss potential collaborative opportunities for increasing the efficiency and effectiveness of the land release process. NPA’s data generated from the CMRS provided more detailed information about contaminated areas than had previously been available. However, the lack of follow-on clearance risked decreasing the effectiveness of the survey information; there would be no lessons learned to provide feedback and further refine the survey tool.

Operational in Quang Tri for a number of years, both organizations had significant staffing and equipment assets as well as strong relationships with the authorities at the provincial and district levels. Together with the provincial authorities, MAG and NPA discussed the idea of operators deploying
their assets province-wide and working on the basis of activity rather than being limited to specific districts. In early 2014, DoFA granted MAG permission to work in Trieu Phong district to conduct clearance of confirmed hazardous areas (CHA) that contain cluster munitions and have been generated through the CMRS process.

NPA and MAG have continued to work together to develop this approach. Implementation of the CMRS in Trieu Phong and Cam Lo districts enabled NPA to estimate the extent of the remaining cluster munition contamination affecting the province. The data suggests that slightly more than 55 km (34 mi), or nearly 1.2 percent of the total land surface area is contaminated with cluster munitions and other UXO, a significant reduction in the estimates of previously conducted surveys. Using this estimate and the data from MAG’s clearance trials, MAG and NPA developed a plan to conduct CMRS and follow-on clearance of all CHAs within a five-year period.

The development of this project in Quang Tri is possible for two main reasons. The strength of the partnership among NPA, MAG and the provincial authorities has ensured trust and transparency between the organizations involved. Moreover, the establishment of the provincial database unit (DBU) in Quang Tri in 2013 provided a focal point for provincially-held information on contamination.

Partnership and Information Sharing. Effective partnership and the adoption of a coordinated approach to deal with the remaining contamination problem in Quang Tri province is the foundation upon which this project is built. To date, MAG has provided NPA with feedback from its experience clearing CHAs to develop and refine the CMRS methodology. In turn, NPA has been able to improve its CMRS methodology to more accurately define CHAs. In building an effective partnership, MAG and NPA have created an opportunity for other organizations and operational stakeholders to become involved, establishing a model of cooperation as the standard for Quang Tri province. Organizations are also discussing how to share expensive mechanical assets that will increase the value of donors’ money.

Information Management and Improved Communication. The DBU was set up in Quang Tri in 2013, becoming fully operational in October 2013. Previously, operators maintained organizational databases with individual reporting formats. Hence, obtaining a province-wide picture of the survey and clearance activities undertaken to date was impossible. All operators now provide information in a standardized format to the DBU on a monthly basis. In turn, operators receive an updated version of all mine action operational data in Quang Tri. This has allowed NPA and MAG to map, analyze and estimate the extent of the overall contamination within the province.
The DBU also provides MAG with all the relevant information regarding the CHAs that it will clear. This initiative has been key to MAG’s and NPA’s collaboration, ensuring operations and survey data across the province are accessible and transparent. The creation of the DBU has been instrumental in demonstrating to the provincial authorities how organizations can coordinate and cooperate, and has ultimately led to the approval of province-wide operational memorandum of understanding for both MAG and NPA.

Looking Ahead
This project demonstrates a new approach to survey and clearance in Vietnam. It is built on strong relationships with local authorities and places an emphasis on the critical role of information management. Combined with strong collaboration between operators, these elements have facilitated efficient and targeted clearance in Quang Tri, maximizing outputs, reducing the impact of UXO contamination and improving the program’s success. MAG and NPA intend to continue documenting and analyzing the progress of the project, and will continue to share lessons learned to create a successful model for clearance of the remaining UXO contamination in central Vietnam. See endnotes page 65
Vietnam is believed to be one of the most explosive remnants of war (ERW)-contaminated countries in the world.¹ In 2000, the Vietnamese Ministry of National Defense (MND) estimated that ERW contaminated 20 percent of Vietnam’s territory (equal to 66,000 sq km), encompassing 63 provinces and cities. Although mines contaminated the border areas, the major problem was ERW. However, for much of the international community, the nature and scope of ERW contamination in Vietnam is unknown, and no precise figure exists for the extent of remaining contamination.²

Founded in 1980, the Vietnam Veterans of America Foundation (VVAF) was one of the founding members of the International Campaign to Ban Landmines. In 2009, VVAF’s active projects were transferred to The International Center (IC), a Washington, D.C.-based nonprofit organization founded in 1977 to focus on issues in the developing world. VVAF has an extensive history of providing support for the removal of ERW and programs for persons with disabilities as well as those affected by dioxin and Agent Orange. However, VVAF currently focuses on providing project support to various Vietnamese government agencies working in mine action.

VVAF has worked with the Vietnam Engineering Command’s Technology Center for Bomb and Mine Disposal (BOMICEN) since 2001. This work includes designing and implementing the Vietnam Unexploded Ordnance/Landmine Impact Assessment and Rapid Technical Response project in six central Vietnamese provinces. The project’s goal was to document the nature and scope of ERW and landmine contamination, as well as the social and economic consequences of contamination in six heavily-affected central provinces: Nghe An, Ha Tinh, Quang Binh, Quang Tri, Thua Thien Hue and Quang Ngai.
This partnership between MND and IC-VVAF was the first collaboration between MND and a nongovernmental organization (NGO) in the field of mine action. From inception, the project took almost two years to be implemented. Relevant parties from Vietnam and the United States made tremendous efforts during the two-year negotiation process to implement the concept of the Landmine Impact Survey (LIS), an initiative of the Survey Action Center and an internationally adopted methodology.

Three years after the study’s implementation, the project cleared 1,357 ha (3,353 ac) of land, disposed of 24,018 ERW items and mapped 4,296 ERW-affected areas. Provincial stakeholders and government agencies now use data from the impacted areas in prioritizing clearance as well as planning socioeconomic development in the six provinces. In recognition of the project’s success, the government of Vietnam expanded the survey to the 57 remaining provinces, using lessons learned. BOMICEN conducted the national survey, completing it at the end of 2013. By the time of this article’s publication, the data entry will be complete and ready for analysis, which will improve the ability of Vietnamese officials to determine contaminated areas and prioritize demining activities.

Following completion of the LIS project, IC-VVAF continued supporting BOMICEN to implement small clearance projects for priority needs in contaminated communities in Nghe An, Ha Tinh and Quang Tri provinces.

Since 2010, in partnership with the Geneva International Centre for Humanitarian Demining (GICHID), IC-VVAF has provided technical assistance to Vietnam’s national mine-action authorities, focusing on capacity development. VVAF and GICHID signed a tripartite memorandum of understanding (MoU) with the Vietnam National Mine Action Standing Board of the National Mine Action Program (Program 504) to combine support in Vietnam. In its role as the chair of the Landmine Working Group (LWG), VVAF has the opportunity to discuss group members’ concerns with the Vietnamese government, seeking more effective cooperation and a better working environment.

Prior to receiving international support, the Vietnam People’s Army conducted the majority of demining work in Vietnam after the war ended in 1975. In the late 1990s, international support was channeled through approximately 10 NGOs to Vietnamese mine action.\(^4\) NGO activities focused on the highly contaminated areas with priority needs such as clearance, mine-risk education (MRE), victim assistance and community development. Research conducted by GICHID in 2011 shows that, through 2009, the Vietnam government spent about US$100 million on ERW clearance.\(^4\) The Landmine and Cluster Munition Monitor reported in 2013 that total international financial support for mine action in Vietnam from 2008 to 2012 was approximately $36 million.\(^5\)

According to Vietnamese regulations (reflected most recently through Prime Minister Nguyen Tan Dung’s Decision in 2006), the MND is responsible for implementing nationwide ERW and landmine clearance.\(^6\) However, incorporating other aspects of mine action—such as MRE, victim assistance and community development—requires participation from other ministries. Thus, an interministerial body focusing on mine action is needed to set up a national system to coordinate mine-action activities nationwide. This system should be able to verify the extent of contamination, plan for mine-action programs, quantify finished work and estimate the work that remains.

To this end, under the MoU with Program 504, VVAF and GICHID supported Vietnam’s authorities in the development of the National Strategic Plan on Mine Action in 2010, the establishment of the National Mine Action Steering Committee (Committee 504) in 2011, development of National Mine Action Standards in 2013 and the Vietnam Mine Action Center in March 2014.\(^6\)
To run such a large mine action program, the Vietnamese government needs to enhance its management capacity to ensure mine-action funding is used effectively. In 2014, IC-VVAF worked with GICHD and an International Standards Organization consultancy firm to support BOMICEN/MND in developing and implementing a pilot quality-management (QM) model for demining projects in Ha Tinh province. BOMICEN is applying the QM tools developed for this project in a pilot land-release project in the same province, with its technical method adapted from the Cluster Munition Remnants Survey applied by Norwegian People’s Aid in Southeast Asia. IC-VVAF also supports GICHD in implementing the center’s Management of Residual ERW (MORE) Program in Vietnam.

Like other international organizations, VVAF experiences challenges during its programs: slowness of multi-layered administrative procedures, foreign military-relations protocols, differences in approaches to problems, and lack of full-time, international, ERW technical assistance. To overcome these challenges, VVAF maintains frequent communication with all related stakeholders; expands its access to pools of experts; continuously builds capacity for its staff; and develops flexibility in its strategic planning to adapt to the working context in Vietnam.

VVAF receives support from the Office of Weapons Removal and Abatement in the U.S. Department of State’s Bureau of Political-Military Affairs (PM/WRA) and implements the project in partnership with the Geneva International Centre for Humanitarian Demining (GICHD) with support from the governments of Australia, Ireland, Germany, the United Kingdom and the United States, as well as IrishAid and the Cluster Munition Coalition.

See endnotes page 65
Quality Management in Vietnam: Building a National ISO 9001 System

Vietnam’s pilot quality management (QM) project in Ha Tinh province has proven successful in its implementation of the international QM standard ISO 9001. The next step for GICHD and partners will be to support Vietnam in establishing ISO 9001 QM on a national scale.

by Russell Gasser [GICHD]

Vietnam has taken on the challenge of systematic quality management (QM) for mine and explosive remnants of war (ERW) action, and established a successful pilot project in Vietnam’s Ha Tinh province. In 2014, the project worked toward compliance with the international QM standard ISO 9001. This standard establishes criteria for a QM system and can be utilized by any organization, regardless of size or field of activity. Currently, ISO 9001 is used by over one million companies and organizations in more than 170 countries.

BOMICEN (Vietnamese Technology Centre for Bomb and Mine Disposal Technology), which works closely with the Vietnamese Ministry of National Defense, is very pleased with the results. The experience gained will be shared with wider stakeholders and policy makers in order to advocate for rolling out the systematic QM to further provinces, and then nationwide. The QM systems developed for the pilot will be the basis of the national system. There is a clear intention to make Vietnam one of the leading countries for systematic and coordinated QM of nationally funded and implemented mine and ERW clearance work.

Quality Management and ISO 9001

Quality is often defined as fit for purpose and in mine action this includes making sure that all operations are carried out in accordance with International Mine Action Standards (IMAS). There is another important aspect of quality in mine action: making sure that the prioritization, planning and resource allocation are also fit for purpose. These two parts of QM are often called doing the job right (performing a task in accordance with IMAS) and doing the right job (prioritizing the tasks that will make a real difference to local people).

Systematic QM takes an overall approach to ensure that all aspects of mine action reach a minimum standard and is recognized as a better approach than isolated quality assurance (accreditation and in-progress inspections) and quality control (post-clearance inspection). IMAS are based overall on an ISO 9001 approach to QM.

The ISO 9001 QM standard can be applied to the production of goods and supply of services, including mine action.
Mine action organizations are increasingly using ISO 9001 to demonstrate their quality—a web search in October 2014 shows several dozen ISO 9001 accredited organizations including MAG, HALO, BACTEC, Pax Mondial and MineTech International. ISO 9001 is one of several international QM standards but has the advantage of being used by a wide range of organizations, from one-person consultancies to giant corporations. Independent auditors who certify compliance are available worldwide, including Vietnam, and these local experts can help with compliance and certification without language and cultural problems or long-distance travel.

Case study: Ha Tinh

The Ha Tinh project started in 2011 when a QM Systems (QMS) project was launched by BOMICEN and the Geneva International Centre for Humanitarian Demining (GICHD), together with a key local partner in Vietnam, the Vietnam Veterans of America Foundation (VVAF). The 2011 and 2012 funding was received from the U.K. Department for International Development and in 2013 and 2014 the funding was provided by the German Federal Foreign Office, with additional support from the Australian government.

The approach taken by the GICHD was to provide initial technical training for a small number of Vietnamese staff in systems level QM, and to support technical visits to study the QM processes in other mine-affected countries. This created a baseline of QM knowledge on which the design of a Vietnamese system could be started by BOMICEN, with further technical support from GICHD. Later in the project, the local Hanoi office of the French international consultancy Apave was contracted to provide ISO 9001 compliance support. Ha Tinh province was chosen as the location for an initial pilot project and GICHD committed to identifying donors interested in supporting the project.

An important reason for the success of the project was the ability to accommodate Vietnamese public project management procedures and the extended time lapses involved in working through complex layers of administrative approvals. Completion of the project was possible due to the flexibility shown by the donors, and the ability of GICHD to continue
with other projects while waiting for Vietnamese administrative approvals and returning to the project at a later date. A rigid project timescale would have led to failure. The project required approval by the Vietnamese Prime Minister’s Office, and obtaining this took about nine months. The local partner, VVAF, was able to advise that this was not unusually slow (indeed it was the norm) and that the delays do not indicate any lack of interest or commitment. Having a local partner capable of translating not just the language but the entire cultural context was another important element leading to success.

Once the approval process was underway, the pilot project could be prepared and implemented in the province of Ha Tinh, 350 km (217 miles) south of Hanoi. In Ha Tinh province, like most of Vietnam, clearance is done by military personnel or local contractors who are linked to the military. Inspections of clearance tasks were conducted in accordance with ISO 9001 guidelines by QA officers from Engineering Command. Once the pilot project started, the commitment, skills and enthusiasm of the Vietnamese staff made a significant contribution to a successful outcome. GICHD staff and consultants continued follow up and advisory work in support of the locally-driven process. QM often relies on a chain of compliance with requirements that can be traced from activities and reporting at field level through to accreditation and certification. In June 2014, the entire human chain met in the field: GICHD staff and consultant were present as an Apave ISO 9001 auditor reviewed the work of QM staff inspecting local staff who were checking compliance at the start of a clearance task.

**Next Steps**

Understanding the reasons for success and learning lessons that can be applied in other mine- and ERW-affected countries is the next step in the project. By the time this article is published, GICHD will have the report of a lessons learned evaluation which will focus on identifying the factors that were unique to Vietnam and not easy to transfer, and the elements that can be applied to promote national level QMS in other countries. Promoting systems-level QMS, and using the worldwide resources linked to the ISO 9001 standard, will lead to mine action that can show it is indeed fit for purpose.

*The author would like to thank David Hewitson (consultant), Nguyen Thu Ha (VVAF), and Ursign Hofmann (GICHD) for their assistance in reviewing and correcting this article.*

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Russell Gasser joined the GICHD in 2013 as advisor on quality management systems and results-based management. An engineer by training with a Ph.D. in mine action technology, he became interested in landmine issues while working in Nicaragua in the 1980s where he met mine survivors at an International Red Cross prosthetics workshop.

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See endnotes page 65
Mine Risk Education in Vietnam

Catholic Relief Services (CRS) has focused their recent efforts on successfully implementing mine risk education (MRE) programs in Vietnam that have proven to increase knowledge and awareness about landmines and explosive remnants of war (ERW). This teacher and student MRE training prevents mine/ERW incidents in high-risk areas of Vietnam.

by Ta Thi Hai Yen [Catholic Relief Services]

Catholic Relief Services (CRS) has worked in Vietnam since 1994. The humanitarian agency’s programming in Vietnam focuses on two areas—education and health/HIV—and aims to help disadvantaged people, including individuals with disabilities and those living with HIV. CRS has also launched new programs in the areas of climate change and disaster risk reduction. Projects managed by CRS are underway in 11 provinces spread across Vietnam in the northern, central and southern regions. Currently there are 20 implementing partners working with CRS, including two ministries at the national governmental level, nongovernmental (NGO) and civil society organizations.

For over a decade, CRS has worked to reduce the risk of injury and death from landmines and unexploded ordnance (UXO) in the high-risk communities of Quang Tri, Quang Binh and Quang Nam provinces. CRS developed a mine risk education (MRE) curriculum for grades one through five, now approved and widely used by the three provincial Departments of Education and Training (DOET). To date, CRS has trained more than 55,000 children and 79,000 teachers, parents and community members on MRE, contributing to declining UXO/mine casualties in targeted areas.

Through the project, Responding to Social and Economic Effects of Landmine/UXO in Vietnam: Reducing Landmine/UXO Risks for Children and Communities and High Risk Areas, CRS integrated MRE within schools’ compulsory curriculum in high-risk provinces. Funded by the Office of Weapons Removal and Abatement in the U.S. Department of State’s Bureau of Political-Military Affairs (PM/WRA), CRS worked to better equip communities to support mine/ERW survivors and other persons with disabilities. The project employed the following strategies to achieve these aims:

- CRS piloted, together with DOET, the MRE Integration Guidelines (MREIG) in 44 schools. These provincial DOETs subsequently institutionalized MRE in their schools.
- CRS developed nine volunteer networks in the three targeted provinces, equipping them to identify needs of survivors and link them to services; trained survivors on improved livestock practices; engaged the local authorities and communities to identify survivors for livelihood training; and provided a forum for survivors to share their challenges and life stories with others in their communities.
- CRS involved landmine survivors in community awareness initiatives to improve their participation in project activities and involvement in their communities.

Methodology

In the first 10 years of the program (2000–2010), CRS and its partners developed a set of five MRE textbooks for students in grades one through five and a set of five MRE guidebooks for primary school teachers. During the project implementation
between 2010–2014, CRS and its partners developed MRE integration guidelines for primary school teachers, enabling MRE contents to be integrated with compulsory coursework in primary schools. This approach allows CRS and its partners to increase distribution of MRE across the provinces.

Recognizing the important role primary teachers play in transferring MRE messages, trainings were designed and implemented in two different ways:

- Delivering five stand-alone MRE lessons for five weeks
- Integrating MRE into compulsory subjects throughout the school year

In March 2013, 366 primary school teachers attended nine three-day MRE training courses to present five teacher guidebooks and five student textbooks. The materials included both theory and practice through active teaching methodologies such as group discussion, role play and storytelling. As a result of the training, 90 percent of teachers felt confident to teach students using the CRS MRE materials.

For the integrated MRE lessons, three three-day trainings were conducted for 182 key teachers in Quang Binh and Quang Tri from May to June 2012 and in Quang Nam in September 2013. Following the training, 182 teachers conducted replication trainings for an additional 965 teachers in their schools. The trainings focused on the following key principles:

- MRE integration into curriculum
- MRE integration methods
- Practical teaching tips for MRE integration lessons
- Feedback and comments after practicing MRE integrated lessons

Nearly half of the training was allocated to practicing the activity-based teaching methodology. As a result, around 90 percent of key teachers (those who are selected by DOET based on certain criteria) expressed their confidence in implementing replication training at 44 schools in the three provinces. After replication training, key teachers developed follow-up plans to further support peer teachers in implementing MRE the following school year. Key teachers provided support to their peer teachers on a monthly basis through class observation and teachers’ meetings in order to monitor the integration of MRE and document behavioral changes in students.

Outcomes

The project trained 60 Parents’ Association members and 366 primary school teachers. In addition, 4,867 primary school children in 15 schools were taught MRE in separate lessons, while 14,614 other primary students in 44 schools were taught MRE through integration in their compulsory, base curriculum. Teaching activities included children’s performances of dramas and story-telling, as well as interactive games and surveys with participants relating to MRE. Pre- and post-tests among the targeted primary school children indicated that unexploded ordnance (UXO) and accident prevention comprehension levels increased among students in Quang Binh province from 34 to 74 percent; 28 to 64 percent in Quang Tri; and 42 to 71 percent in Quang Nam. In addition, familiarity with the appearance of UXO and landmines, their negative effects, and how to avoid accidents increased from 31 to 70 percent.2

Additionally, over 10,000 parents and community members participated in school events organized by the project, leading to changes in community attitudes and behavior. Scrap metal (including UXO) collectors and traders demonstrated safe behaviors such as storing their scrap metal far from their house, not taking their children into the forests to collect scrap metal, and sharing what they learn from project events with other scrap metal collectors. No deaths or injuries were reported in the targeted districts.

The Volunteers’ Network (VN) support, a group that connects landmine survivors to NGOs and social organizations for support, worked to ensure that 160 UXO survivors were successfully directed to appropriate medical services. Additionally, VN successfully linked survivors’ families with the Department of Agriculture in Quang Binh and Quang Tri, which provided livelihood trainings to the survivors.

Challenges

Securing partner ownership and buy-in for the new project areas was initially a challenge since partners were not fully convinced that the project could help children and communities protect themselves from UXO/mine accidents; this slowed the project’s startup. To address the challenge, CRS adjusted...
the activity schedule and brought these partners to previous project sites. This gave them a chance to interview primary school principals, students, parents and community members on their perspectives about the project’s impact on the community. CRS staff also accompanied them during implementation to be able to provide immediate answers to partners’ questions.

In addition, teacher turnover created a challenge as those who had the MRE training phased out and new teachers were not equipped with the skills to conduct the lessons in their classes. Partners agreed that MRE-trained teachers are responsible for training new teachers as well as providing frequent follow-up support. In addition, school principals now ensure that new teachers are fully equipped with MRE knowledge and teaching methods through routine collaboration with trained teachers.

**Impact**

According to provincial DOET partners’ reports and the five-year report from Clear Path International Vietnam, there have not been any reported UXO/mine accidents in project areas, including the districts of Quang Ninh, Quang Trach, and Dong Hoi in Quang Binh province; the Hai Lang and Quang Tri districts in Quang Tri province; and Que Son district in Quang Nam province. The project evaluation report conducted in February 2014 also provided evidence that children practice safe behaviors. These results reinforce the theory that MRE reduces the number of UXO/mine accidents.

**Scale and sustainability**

DOET has endorsed the MREIG to be used by all primary schools in affected provinces. The Quang Binh DOET has expanded the program to non-targeted areas in the province, and has committed to ensuring that all elementary students in the province will study MRE after the project’s completion. MREIG has also been introduced to Binh Dinh, Kon Tom, Nghe An, Quang Ngai and Thua Thien Hue provinces in central Vietnam. CRS’ MRE textbooks have been adopted by other stakeholders in their projects, such as UNICEF. Additionally, CRS is replicating its Vietnam MRE model in Burma and Laos with local government and NGO partners. See endnotes page 66

Ta Thi Hai Yen is the program manager for CRS Vietnam and has worked there since since 2007. She is also a graduate of CISR’s 2012 Senior Managers’ Course in ERW and Mine Action at James Madison University.
Train-the-Trainer Trauma Care Program in Vietnam

By conducting a train-the-trainer trauma care program in collaboration with the Norwegian Tromsø Mine Victim Resource Centre and the Quang Tri Department of Health, Project RENEW hopes to develop the first-aid capacity of first responders in order to minimize the number of deaths and injuries caused by incidents involving landmines and unexploded ordnance.

by Dang Quang Toan [ Project RENEW ]

Nearly 40 years after the Vietnam War ended, Vietnamese citizens, particularly those in Quang Tri province, remain at risk of injury or death from landmines and unexploded ordnance (UXO) that continue to contaminate much of the country.1 From 1975 to October 2014, more than 100,000 mine/UXO casualties were reported in Vietnam. In Quang Tri, 7,515 casualties (2,986 killed and 4,529 injured) resulted from mine/UXO explosions.2

Today, mines/UXO contaminate 83.8 percent of all land in Quang Tri.3 Despite the efforts of the local government, provincial military and international nongovernmental organizations to solve the problem, mine/UXO contamination in this province remains a serious issue requiring strategic and long-term solutions in the form of clearance, risk education and victim assistance.

In order to save the lives of mine/UXO victims, the Quang Tri authorities in 2003 sent a delegation of Vietnamese doctors to Cambodia to examine Trauma Care Foundation (TCF) Cambodia’s Chain-of-Survival Intervention Model implemented in northwest Cambodia’s minefields. The group found...
the model suitable to replicate in Quang Tri, with a goal of saving the lives of Vietnam’s mine/UXO and other trauma survivors.

Although Vietnam has a very good health network from the national to local level, first aid for trauma victims is insufficient. Public Health University’s interuniversity survey shows that Vietnam has 11,000 trauma victims daily needing medical treatment. However, 55 percent of victims do not receive immediate first aid following an accident. Although Vietnam has a very good health network from the national to local level, first aid for trauma victims is insufficient. Public Health University’s interuniversity survey shows that Vietnam has 11,000 trauma victims daily needing medical treatment. However, 55 percent of victims do not receive immediate first aid following an accident. Similarly, a 2007 Quang Tri province-wide survey by the Quang Tri Department of Health showed that 89.4 percent of Quang Tri’s trauma victims do not receive first aid in situ, which has led to increased fatality rates among mine/UXO victims and can cause complications in later treatments.

Since 2006, the Quang Tri Department of Health has collaborated with Project RENEW—an organization founded in Quang Tri in 2001 to provide survivor assistance and prevent mine/UXO accidents through land clearance—and with the Norwegian Tromso Mine Victim Resource Centre (TMC), a medical action research center that coordinates networks of thousands of trauma-care providers, to create an effective trauma-care program. From 2011 to 2012, Project RENEW also extended operations to Quang Binh province, where mines/UXO contaminate 28.2 percent of the total land area.

Dr. Hans Husum, former head of TMC’s board, and Dr. Yang Van Heng and Dr. Chan Davoung of TCF Cambodia organized and headed the first trauma care train-the-trainers class in Vietnam. From 2007 to 2013, annual trainings were held in basic and advanced life-support practices. These training programs—among others—certified more than 2,300 health workers in Quang Tri and 180 health workers in the Quang Ninh district of Quang Binh, qualifying participants to respond to medical emergencies. Additionally, TMC funded Project RENEW and Quang Tri Department of Health’s First Aid Film, which aired four times a week on local television from 2010 to 2012. The program provided valuable knowledge on basic life support including instructions for how to respond to different injuries, control bleeding and ensure proper transportation, preparing people throughout the province to support trauma victims in the event of an accident.

Collaboration between Project RENEW and TMC for the trauma-care programs in Quang Tri and Quang Binh concluded in 2013. Project RENEW plans to analyze the projects’ results and develop a path forward to continue supporting Quang Tri and expand the project into other provinces.

Project RENEW’s impact on the communities of Quang Tri is evident. In 2014, a UXO explosion injured six. A community health volunteer, Hoang Van Mai, utilized his TMC/Project RENEW basic life-support training to stabilize the condition of the injured. Thanks to his prompt first-aid procedures, all six injured persons survived. Mai is one of 1,200 village health volunteers in Quang Tri who contributes daily to saving the lives of trauma victims.

See endnotes page 66
Clearance at Cultural Heritage Sites

The most mine- and unexploded ordnance (UXO)-contaminated countries in the world have long histories of conflict, as well as histories rich with extensive archeological and cultural records. It is not uncommon for known historical sites to be littered with mines and UXO, especially in regions with hundreds and even thousands of years of rich cultural heritage, such as Central and Southeast Asia and the Caucuses. This presents an added challenge to project teams tasked with clearing and safeguarding the land while also preserving the integrity of cultural heritage sites.

by Lindsay Aldrich, Suzanne Fiederlein and Jessica Rosati [Center for International Stabilization and Recovery]

This article highlights three cases of explosive remnants of war (ERW) clearance at historical and cultural heritage sites in different regions of the world, implemented by multiple humanitarian mine action agencies. One cultural heritage site, Bamiyan in Afghanistan, was a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage site at the time the clearance project was launched, although it was considered endangered due to the presence of mines. The David Gareja monastery complex in Georgia and the Plain of Jars in Laos are on the tentative list for consideration as World Heritage sites. Success in receiving official World Heritage designation requires submission of detailed plans for site preservation and management, which includes clearance of ERW contamination. Regardless of a country’s aspirations for World Heritage site designation, clearing historical, religious and natural sites that have significant patrimonial importance and the potential to attract tourists, contributes to a country’s national economic potential and strengthens its national identity.

Case Study 1: Bamiyan, Afghanistan

The Bamiyan valley of central Afghanistan, located 240 km northwest of Kabul, contains a wealth of sites with historical, cultural and environmental treasures. Bamiyan is best known for two enormous Buddha statues carved from sandstone cliffs in the sixth century and destroyed by the Taliban in 2001. Nearby are ruins of a medieval fortress and town that withstood a Mongol invasion in the 13th century but at the start of the 21st century were imperiled by the presence of landmines and unexploded ordnance (UXO). The local residents of Bamiyan, primarily Hazara, a religious minority in the country, lived amidst the constraints forced on communities heavily contaminated by ERW. In 2003, UNESCO declared the Bamiyan World Heritage site threatened. In cooperation with the Afghan government, mine clearance experts and archeologists, plans commenced to address the problem so the World Heritage cultural site could become safe again.

The Mine Action Coordination Centre of Afghanistan (MACCA) coordinated the clearance efforts with UNESCO, and partnered with the United Nations Mine Action Service (UNMAS) and the government of Japan to launch the clearance project in March 2008. The project, with a budget of just over US$2 million, began with a humanitarian focus, clearing construction work at the fortress of Shahr-i Ghulghulah at the Bamiyan World Heritage Site, Afghanistan.

Photo courtesy of MACCA.
taminated areas in central Bamiyan and conducting village-level explosive ordnance disposal (EOD) tasks to make the local residents safer and open up new economic prospects, including crop diversification projects, the development of new seed varieties and improved crop storage facilities.7,8

Phase II of the project turned its attention to the contamination threatening the historical sites. In a report issued in January 2010, MACCA explains the special approach taken by the team to conduct clearance in this delicate landscape.7 While they generally use a number of different techniques and tools to conduct clearance (manual, mine detection dogs, mechanical), the historical sites required use of manual clearance methods as “the sensitivity of the work required a slow and careful approach using extreme caution to avoid causing any damage to the site.”9 Deminers from the Afghan Technical Consultants (ATC) received special training from archeologists in how to work around the sites and be watchful of artifacts they may encounter while conducting clearance. UNESCO archeologists working on the project also were trained in landmine safety that allowed them to conduct their field work in a mine and ERW-contaminated environment.

The clearance process relied upon close cooperation among ATC deminers, MACCA quality-assurance staff and UNESCO archeologists, with Afghan Ministry of Culture officials involved in monitoring the operations. All three entities—ATC, MACCA and UNESCO—made adjustments to their usual methods in order to operate with the care needed to clear the explosive contamination while minimizing damage to the archeological sites and protecting the artifacts. The depths to which clearance was conducted were adjusted to account for variability in the terrain and the archeological structures.7 Mines were found mixed in with debris resulting from the gradual damage to the structures over the years. Instead of destroying the mines in situ, as is commonly done in less sensitive areas, the found mines had to be disarmed and transported to another location for destruction.9,10 Because of the buried artifacts and the presence of metal articles in the soil, the manual process progressed slowly but yielded success in clearing the delicate areas while preserving the current condition of the sites.

In September 2009, Phase II wrapped up ahead of schedule. As with completion of Phase I in 2008, a high-profile ceremony commemorated the project’s achievements and the formal handover of the cleared land involved officials from the local and national Afghan governments, UNESCO, MACCA, government of Japan (the donor), and national and internation-
As part of the handover documentation, MACCA certified the comprehensiveness of the clearance, the adherence to quality assurance procedures and the possibility of any contamination remaining below the clearance depths. In addition to removing and destroying 14 anti-personnel landmines and over 7,300 items of ERW in 2009 (plus more in Phase I), the deminers uncovered a number of artifacts that became part of the Bamiyan museum.

Bamiyan province offers the possibility of becoming a major destination site for tourists, not just for the historical and cultural significance of the Bamiyan World Heritage site but also because of the natural beauty of the area. In 2009, the Government of Afghanistan established its first national park encompassing the Band-e-Amir lakes region in the province. With completion of the landmines and ERW clearance at the Bamiyan World Heritage site, and the prospects for increased visitors to the region, new tourist development projects are underway, including training of tour guides and hotel and restaurant service personnel, although hospital infrastructure remains limited. Other infrastructure investment, such as road and airport improvements, is required before large numbers of tourists can make the trip to Bamiyan. Also, uncertain security in Kabul and other parts of the country continues to stymie development, even when local conditions are promising.

The Bamiyan clearance project is a great example of the intersection between mine action and economic development, as the successful clearance completion opened the doors to new development possibilities, both in tourism and agriculture. Development of the Bamiyan World Heritage Site continues, with UNESCO announcing in November 2014 a global design competition for the new Bamiyan Cultural Centre.

MACCA reports that the experience gained at Bamiyan was applied to clearance at a copper mine with nearby cultural sites in Logar province, although the presence of the cultural sites at that location were not known in advance. Similarly, MACCA took the initiative to consult with the Afghan Ministry of Culture about the location of other cultural sites that may be impacted by the presence of mines. The Ministry of Culture provided MACCA with information on 88 other cultural heritage sites, of which MACCA identified 14 located within the 1-kilometer (.621 miles) buffer zone of some “already recorded mine-contaminated areas.” MACCA has also communicated to its implementing partners that, if they work in cultural heritage sites or uncover cultural heritage items, they are to inform the relevant governmental departments and MACCA.
Case Study 2: Udabno, Georgia

The HALO Trust (HALO) conducted clearance on three historical sites in Georgia, namely the David Gareja monastery complex located on the Udabno firing range, Tusheti Protected Areas in Khakheti region and the Kaman Holy Spring site in the breakaway region of Abkhazia. Kaman was the first historical site that HALO cleared in Georgia with clearance activities funded by the U.K.’s Department for International Development beginning in 2003. The procedures used in Kaman on the handling of historical artifacts and community-liaison efforts were adopted for clearing Udabno and Tusheti years later.

Best practices developed through clearance at the other historical sites were further refined at Tusheti where air-dropped mines littered a gorga and contaminated a 17th-century fortress increasingly popular with tourists. Once again, careful handling of debris found during clearance uncovered important artifacts, and emphasis on shared goals among all stakeholders allowed for successful clearance while preserving the historical site and its buried record. In all of these cases, close cooperation among stakeholders, good communication, detailed planning and careful execution of plans opened important historical and religious sites to increased access by tourists and new business opportunities.

HALO’s most recent clearance project in Georgia is Udabno, which is preparing for inscription as a World Heritage site.

Udabno Former Soviet Training Area, KvemoKartli/ Kakheti Regions

During the Soviet Union’s occupation of Afghanistan, the land around the village of Udabno became part of a large military training and live firing range that straddled the border between the Soviet Republics of Georgia and Azerbaijan. The area is part of the David Gareja monastery complex, founded in the 6th century A.D., which had been abandoned since the Bolshevik Revolution. The Soviets used monastery buildings as targets during military training. Typically during live firing exercises, 10 to 20 percent of ordnance fails to function as intended and it remains unexploded, presenting a threat to anyone subsequently disturbing it. HALO reports suggest that a wide range of live ammunition, including air-dropped bombs, were used at Udabno.

Since Georgia’s independence, use of the area for military training has ceased. The Georgian Army still uses a nearby area away from the monastery complex. Land ownership was transferred to the Patriarchy of Georgia, and the government of Georgia submitted the site to UNESCO for its tentative World Heritage site list. The buildings of the monastery complex are gradually being restored, and the area has become one of Georgia’s key sites of religious pilgrimage and tourism. According to HALO, at least two UXO accidents occurred in this area, one of which resulted in the death of a shepherd. The people of the village of Udabno are aware of the danger and consequently they do not frequent the area, despite its religious and cultural significance. The part of the training area within Azerbaijan is being cleared by the Azerbaijan National Agency for Mine Action in partnership with NATO and funding from the U.S. Government.

Funded by the U.S. State Department and the government of Japan, HALO operates 10 clearance teams in the area. According to HALO, the contaminated area is surveyed to be 65 million square meters (25.1 sq miles). HALO began clearance in December 2013, and as of 31 January 2015, 21 million square meters (8.1 sq miles) of surface area was cleared through battle area clearance (BAC) methods. More than 500 items of UXO were found and destroyed—30 of which were within 500 meters (226 sq ft) of historical structures.

HALO knew prior to clearance that there would be specific cultural and historical considerations for operations at the site, but this did not cause any delays. Clearance assets were not deployed any differently and BAC proceeded per regular standard operating procedures (SOP), although HALO deminers and team leaders received sensitivity briefings and were informed to be particularly careful not to disturb certain obstacles. For example, HALO’s SOPs typically warrant the cutting of vegetation in order to provide deminers a better view of the ground surface to visually identify potential ERW. In Udabno, cutting of vegetation in certain areas is prohibited due to conservation status; thus, deminers spent more time checking inside thick vegetation rather than cutting it down. Furthermore, deminers were instructed not to move or damage any parts of the ruins or buildings in the area.

HALO took additional precautions when destroying various UXO found near the historical structures. Because the safest method to clear the unexploded items would be to destroy them in situ, EOD officers were given orders to provide additional tamping with sandbags for any items being destroyed within 500 meters of historical sites. Full overhead and side tamping was used in order to prevent any fragmentation or blast from damaging historical structures.

HALO learned two lessons from clearance in Udabno. First, HALO discovered that scrap-metal collectors were removing large-caliber UXO from the area and taking them to a nearby junkyard. To ensure the safety of the local population, HALO inspected the junkyard and removed and destroyed all dangerous items, giving safety briefings to the community and lo-
The experience emphasized the importance of community-liaison work, particularly near culturally sensitive sites likely to be frequented by civilians. Secondly, HALO’s project emphasized the importance of maintaining good relationships with all stakeholders, including landowners, which in this case were the Georgian Patriarchy. The church was appreciative of HALO’s efforts: in particular the care and attention HALO gave to preserving the historical sites.

Case Study 3: Plain of Jars, Laos

Dating back to the Iron Age, between 500 B.C. and 500 A.D., the Plain of Jars is an internationally known cultural site in the Xieng Khouang province of Laos. Beyond inviting curiosity and speculation as to its origins, this ancient site maintains significance by virtue of its historic merit and potential to reveal more about the prehistory of mainland Southeast Asia. Approximately 2,500 megalithic jars, fragments and lids of unknown origin are scattered across 15,000 square kilometers (5,791 sq miles) or jar sites. Local populations believe the jars were purposed for brewing rice wine, while many others have concluded they were used as funeral urns or for collecting rainwater. From 1964–1973, U.S. bombers heavily targeted areas of Laos—including the Plain of Jars—during the Secret War, leaving behind millions of landmines and other UXO that still contaminate the majority of the 90 recorded jar sites today.

In 1998, the government of Laos and UNESCO jointly began a multiphase program to develop the Plain of Jars. This program’s goal was to implement the national plan of securing and protecting the site for future development of its historical and archaeological resources in order to nominate the Plain of Jars for World Heritage inscription. The Laotian government and UNESCO organized the program into multiple phases, which included detailed mapping, survey and inventories of...
cultural sites within the Plain of Jars, and finally, mitigating threats to culture and biodiversity such as UXO. UNESCO and the Laotian government worked with local communities and commissioned humanitarian mine-action agencies, such as UXO Lao and MAG (Mines Advisory Group), to begin the work of clearing UXO from the jar sites, while still maintaining the integrity of the land and artifacts.17

In 2004, with funding from the New Zealand government through the New Zealand Aid Programme (NZAID), MAG began the first of two phases of UXO clearance at the Plain of Jars.18 Phase I, from 2004–2005, involved clearance of the three most visited jar sites. In 2007, MAG conducted Phase II by clearing four more jar sites.19 In addition to UNESCO and NZAID, MAG coordinated with the Lao National Tourism Administration and the Culture and Information Office, as well as the governor of Xieng Khouang province and the Xieng Khouang Tourism Office. MAG participated in regular coordination meetings and facilitated on-site visits from implementing and cooperating agencies and Laotian government ministries—all of which proved essential for joint planning and successful implementation.

The national plan called for a community-based approach to safeguarding and preserving the cultural sites, thus MAG and UNESCO developed a Village Assisted Archaeo-UXO Clearance methodology where the MAG Laos project team worked closely with the local communities to train villagers in UXO awareness, while MAG prioritized clearing pathways around the jar sites for villagers to safely conduct erosion-control activities along the perimeter. MAG teams also contributed directly to the archaeological research at the jar sites. Clearance methods are similar to those required for delicate archaeological digs: Teams survey and mark the area to be cleared and have to carefully avoid disturbing any finds.20 Methods differ in that the location of each find is an important part of the archaeological record, whereas in UXO removal the location is mainly of interest for removal. With archaeology, the circumstance in which an artifact is buried also provides an important record as opposed to UXO clearance, where the soil record may only be of importance for identifying the item’s position.

Therefore, MAG’s clearance methodology had to be refined slightly at the jar sites to allow the necessary mapping of each archaeological find. Employing these extra steps added to typical clearance times compared to projects without cultural de-mining considerations, but it resulted in positive cooperation between MAG and UNESCO and directly aided the ability of UNESCO to conduct future excavations and investigations vital to applying for World Heritage designation. As a result, MAG clearance teams located important artifacts such as pottery, stone tools and bones, giving clues for interpreting and dating the history of the jars.

With known UXO contamination removed from the Plain of Jars site and Phase IV of the preservation and management plan completed, the Lao government’s process for World Heritage site inscription is better positioned to move forward, although progress is slow. However, UXO contamination is not delaying the application process.1 Based on the experience of the two existing World Heritage Sites in Laos, Luang Prabang and Vat Phou, World Heritage designation should increase the flow of tourists to the site if other infrastructure development advances apace to accommodate the increased demand for access while also adequately preserving and managing the site. Already the region is seeing an increase in visitors, with the provincial authorities receiving assistance from UNESCO and government agencies to develop “sustainable and responsible tourism” in line with the community-based site preservation and management plan. However, the region depends on funds generated by tourism to sustain it in the long term.1

Conclusion

Although they represent different implementing partners in different geographic regions, all three of these cases of clearance at cultural heritage sites show the importance of strong cooperation among governmental authorities responsible for mine action, culture and preservation, and tourism development; local communities; and international organizations such as UNESCO and project donors. They also indicate the ability of demining agencies to adapt clearance methods to the special circumstances of these delicate sites, and the skill of the deminers in rendering the sites safe for future touristic development and in uncovering historical artifacts while protecting the sites from additional damage.

In all three cases, only minimal adaptation to SOPs was needed, as manual clearance methods already resembled archaeological practices, such as the careful survey, marking and removal of items with only minimal disturbance to surroundings. The demining agencies and their donors not only aided in restoring and safeguarding these sites—thereby protecting civilians and facilitating development—but they also acted as key partners in the wider archaeological recovery and preservation efforts. Therefore, with careful planning and coordination among
stakeholders, demining agencies may be uniquely positioned to help post-conflict countries maintain their cultural legacies without significant deviation from or added costs to clearance operations.

See endnotes page 66

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Protecting the Environment: Mine Clearance in Skallingen, Denmark

Denmark has long been affected by landmines. Environmental factors such as landscape, wildlife and endangered species make mine clearance difficult. However, through environmental legislation and mine clearance, Denmark has reestablished areas in Skallingen for use.

by Martin Jebens [Danish Coastal Authority]

Until 2012, Denmark was one of many countries affected by landmines. During World War II, German forces placed mines in Denmark as a part of the Atlantic Wall to prevent Allied Forces from invading Europe. After the war, most of the 1.2 million mines buried on the west coast of Denmark were removed. In Skallingen, the dynamic nature of the coastal zone made it impossible to clear all the mines using the methods available at the time and the area was fenced off. Over the next 60 years, mine awareness in Denmark decreased at the local and national levels, mainly because the remaining mines did not cause any casualties or impact the economy. By the early seventies, the fence preventing the general public from accessing the area had fallen into disrepair, and the marsh areas were used for grazing livestock. Parts of the area became accessible to the public, who used the area for recreational purposes. Scientists also used the area to study the unique fauna and wildlife.

During this time, Skallingen experienced both physical and legal challenges. Extensive erosion from the North Sea led to a 1.5 kilometer (0.93 mi) retreat of the coastline, thereby removing large areas of the minefield. The erosion led to the migration of sand dunes, which buried the mines deeper. When Denmark signed the Anti-personnel Mine Ban Convention (APMBC) in 1999, the boundary of the minefield, as well as the number of mines in Skallingen, were unknown. The repeated flooding of the area altered the functionality of the mines. Analysis of the explosives and mechanical parts showed that mines in the areas that experienced flooding lost their functionality. This had a major impact on how the mines were cleared.

Due to the unique nature and wildlife of Skallingen, the legal status of the area changed significantly. Prior to clearance, Skallingen was protected by a number of international directives and conventions due to its environmental value. Any activities that could disturb or deteriorate fauna or wildlife had to proceed in accordance with regulations. Therefore, an environmental impact assessment (EIA) was essential. Together with the EIA, surveys were conducted by the Danish Coastal Authority on the depth and functionality of the remaining mines. The analysis of the functionality of the mines and explosives was done by the Danish Coastal Authority in conjunction with Netherlands Organization for Applied Scientific Research, which was responsible for the functionality test, impact sensitivity tests, and analysis of the chemical composition of explosives. These three assessments resulted in clearance where different methods were used in different areas, all with a low environmental impact.
Denmark finished and released the minefield in the summer of 2012. During clearance, Denmark had to apply for an extension to meet APMBC requirements. One of the main reasons for the extension was the complex and time-consuming environmental legislation implemented by Denmark.

**Environmental Constraints**

Skallingen is a unique environment. The marshland on the eastern side of the peninsula is part of the largest undiked salt marsh in northern Europe. The dune and beach areas on the western and southern part of the peninsula, which face the North Sea, are untouched and are not protected from erosion. The migrating dunes and tidal flooding of the marsh areas create a highly dynamic situation, which is impacted by storm surges that often reach 4 m (4.37 yd) above normal sea level.

The landscape offers a rich fauna consisting of a number of endangered species. A large number of birds use Skallingen to feed, mate and rest during migration. Like the local fauna, many of the birds are endangered and therefore are protected by Danish law. Additionally, the area is home to a large population of seals and reptiles species protected by Danish law.

To conserve the flora and fauna, the area of Skallingen is protected by international and national legislation. It belongs to the Wadden Sea National Park, and most of Skallingen is a Natura 2000 area, a European ecological network of conservation areas. Any project that is likely to have a significant environmental impact on a Natura 2000 site must undergo an assessment of its implications for the site before being approved. If is deemed harmful, the project is rejected or redesigned. Exceptions can be made if there are reasons relating to human health and safety but only if alternative solutions cannot be identified.

Mine clearance on Skallingen would inevitably have caused impacts on some of the endangered species within the Natura 2000 area. Therefore, it was crucial to conduct an EIA specifying what kind of impact clearance activities would have on the environment and suggesting how these impacts could be mitigated. Based on the EIA made on Skallingen and the suggested methods for mine clearance, the environmental authorities in Denmark approved the mine clearance project, provided that a number of restrictions were followed.

**Mitigation Measures**

The environmental mitigation measures made on Skallingen mainly focused on protecting wildlife, minimizing erosion and reestablishing the area including removal of waste generated from the clearance work. Therefore, clearance was carried out...
under the supervision of a geologist who could address concerns relating to the aforementioned mitigation measures.

Wildlife. The wildlife protection influenced working hours and accessibility to the minefield. A large challenge to the operational planning stemmed from a ban on vehicles and the use of explosives in the southern part of the minefield from April to August to avoid disturbing the breeding season of endangered birds and seals. These months were the most productive due to the weather conditions and because a large part of the area was under water for the remainder of the year. Furthermore, clearance had to be carried out between sunrise and sunset from the period of 15 March to 1 October so as to avoid disturbing the wildlife. In order to ensure that porpoises, seals and fish species were not injured or killed, the contractor was obligated to carry out scare-off actions before detonating mines on the seabed, just as demolitions close to the coastline (300 m/328.08 yd) were prohibited between April and August.

Erosion. The area is subject to a large degree of erosion and will (in the span of 100,000+ years) completely erode away, as a consequence of the dynamic environment. Ensuring that the mine clearance would not increase erosion was therefore important. To avoid erosion, a number of mitigation measures were introduced. Marsh areas are very sensitive to mechanical and human activity, so detection and equipment transportation had to be done on foot. Moreover, to avoid damaging the area’s topsoil, driving was only allowed on pre-existing roads.

Since the remaining areas entirely consist of sand, the rework of the sediment could easily lead to a loss of sand due to wind erosion and flooding. As a result, sand was stored in areas where it would not be subject to erosion and was used to rebuild the area after the clearance.

Reestablishment of the area. Dune and beach areas had to be reestablished after clearance using sand from the existing areas. Since the dune area was excavated to an average depth of approximately 4 m (4.37 yd), contours of this area had to be reshaped with a tolerance of 0.5 m (0.55 yd) after clearance was completed. Some dunes could be reestablished with a higher tolerance but only in agreement with the Danish Coastal Authority.

After the dunes were reshaped, the area was replanted. Since a survey had shown that the mines had become

Reestablishing of the dune area in Skallingen.
submerged at a considerable depth after 60 years, the vegetation on the dunes prior to the clearance was removed and stored during clearance activities. After reestablishing the dune, it was possible to spread the old vegetation over the top of the dune. The effect was highly positive, and the dunes today appear green (see images above).

Incorporating Environmental Protection into Clearance

Together with the EIA, the Danish environmental laws had a large impact on the methods chosen during planning and clearance operations. To fulfill the requirements of the EIA and finish the mine clearance in compliance with the APMBC, the importance of surveys and contract management cannot be underestimated.

Survey

In addition to the EIA submitted to the Danish environmental authorities, the two surveys that were conducted—defining the depth and functionality of the remaining mines—had a major impact on the way the area was cleared.

These two surveys made it possible to use different clearance techniques in different areas, resulting in a low environmental impact (Figure 1, page 43). The depth of the mines influenced the clearance and detection method whereas the functionality of the mines determined the security level. It was therefore possible to choose methods in compliance with the EIA. Further, the survey results made it possible to datalog large areas of the marsh, which made clearance more efficient and cost-effective.

The surveys conducted in Skallingen will not necessarily be easy to replicate in other areas. However, the surveys emphasize that mine clearance operations should support a flexible approach to different minefields that necessitate the targeting of specific threats, which is preferable to implementing a standard response.

Contract Management

The environmental restrictions and mitigation measures were implemented as part of the legally binding documents made between the Danish Coastal Authority and the contractors. Moreover, references were given to Danish environmental legislation and International Mine Action Standards. A number of requirements concerning protection of the environment were also given to the contractors.

A previously approved environmental plan ensured that the contractors’ operations were in line with the mitigation measures and reestablishment of all areas. Equally important, the timeframe had to account for environmental protection,
especially pertaining to how the work would not influence restricted areas during the summer months yet still be able to complete the clearance in accordance with the APMBC.

A standard operating procedure (SOP) concerning the environment was made and incorporated into other SOPs where possible. This standardization allowed all employees involved in clearance activities to be aware of the environmental and legal stipulations involved in the clearance of Skallingen.

Finally, the contractor conducted separate environmental quality assurance/quality control (QA/QC) measures, the documentation of which was submitted and accepted. Notably, the Danish Coastal Authority made QA/QC related to the environmental impact.

**Use in Other Clearance Projects**

The environmental legislation in Denmark proved to be an excellent tool in assuring the implementation of environmental mitigation measures. However, the extensive environmental legal system maintained by Denmark can potentially have a negative impact on the success and implementation of a project. The processing time involved in approving construction work can be extensive and last up to two years in Denmark due to the number of public hearings and standstill periods. However, there is a possibility to adjust the normal procedures if the population is at risk. In an international mine clearance context where funding often has to be implemented immediately, problems can emerge if strict environmental legal acts are in place. Therefore, if environmental legislation is implemented, there should be exceptions in the timeframe for getting the legal permission to clear the mines. Funding can then be used faster, and land can be returned to the population more quickly. However, this action will demand a higher focus on monitoring and QA/QC of the clearance work.

A number of countries affected by landmines do not have extensive environmental legislations; however, accounting for environmental concerns while planning clearance projects can be done with a high degree of quality by conducting an EIA as well as other relevant surveys. Ensuring that stakeholders provide input is an important part of the EIA. Hence the mitigation measures are likely to include problems faced by the local population.

The EIA will give rise to a number of environmental criteria and mitigation measures that should be included in the terms of reference as well as other legally binding documents. Additionally, environmental protection could be included in the criteria (e.g., by 10 percent) for the tender evaluation process. Environmental protection is a cross-cutting issue linked...
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Figure 1. Using knowledge gained during surveys and analysis on functionality and depth of mines, together with the EIA, it was possible to divide the area into five subareas (beach, dune, marsh covered with dune, low marsh, and high marsh). Each of these areas was cleared using different methods thereby fulfilling the mitigation measures. Some areas had to be subdivided as they were part of the restricted wildlife area. The surveys not only led to clearance having a low environmental impact but also reduced overall expenses as marsh and beach areas were safe to walk across.

to a large number of processes during clearance activities. Awareness should therefore be raised among contractors and employees, which can be done by underlining the importance of environmental protection at contract, QA/QC and HFS meetings and among personnel during inspections.

The importance of promoting awareness for environmental conservation among donors cannot be underestimated since implementation could affect the budget and should be reflected in the funding. It is important to emphasize that whenever new demands and criteria are introduced to a clearance operation, the budget will increase or resources will need to be transferred from one part of the project to another. Furthermore, it will increase the need for QA/QC inspections, which could potentially draw on valuable resources.

The alternative would be to neglect the environment and release the land in a state it was not originally purposed before the mines had been placed. An environmental plan should therefore aim to release land to a level in which wildlife and the population are not harmed and are no longer in danger while ensuring that the increased expenses will not negatively impact the security of those involved in clearance activities. Mines are cleared so that the population can get access to and use the land again. Not returning the land back as it was before the mines were buried will not benefit the local population who use the land, and the clearance will not lead to an improved life. Therefore environmental mitigation measures should be included in clearance projects.

See endnotes page 66
Impact of Flooding on Mine Action in Bosnia and Herzegovina, Croatia, and Serbia

Devastating floods swept through Bosnia and Herzegovina, Croatia, and Serbia in May 2014. The destructiveness of the floods, landslides and sediment torrents on minefields resulted in significant environmental and security issues. These three countries’ mine action centers launched a joint project cofunded by the Republic of Croatia’s Ministry of Foreign and European Affairs to develop effective and efficient methods and technologies that might improve the situation. Their research seeks to provide reliable assessments of the flood damage to minefields and generate accurate implications for potential hazardous areas.

by Milan Bajic, Tamara Ivelja [HCR Centre for Testing, Development, Training Ltd.], Emina Hadzic [University of Sarajevo], Haris Balta [Royal Military Academy], Goran Skelac [Geoarheo Ltd.] and Zoran Grujic [Bosnia and Herzegovina Mine Action Centre]

In May 2014, Cyclone Tamara caused the worst floods in Bosnia and Herzegovina, Croatia, and Serbia in 120 years.1 Heavy rainfall, landslides, sediment torrents and floods destructively impacted the minefields in these three countries, abruptly changing the mine action situation and resulting in negative environmental and security consequences.2

A scattering of mines in the numerous minefields threaten the large, disaster-affected area.3 The Bosnia and Herzegovina Mine Action Centre (BHMAC), the Serbian Mine Action Centre (SMAC) and the Croatian Mine Action Centre (CROMAC) joined efforts to combat the issue. Several institutions, including Copernicus Emergency Mapping Service, Copernicus Emergency Management Service, MapAction, Esri, Humanitarian Open Street Map and NASA Earth Observation, provided satellite maps of the flooding for initial flood analysis.4

Figure 1. Geographic distribution of landslides (violet symbols) and floods (blue polygons) in Bosnia and Herzegovina, based on initial estimation by BHMAC. The light green strip shows the border lines.

All figures and photos courtesy of the authors.
Determining the Damage

The preliminary estimation showed that the worst destruction occurred in Bosnia and Herzegovina (Figure 1, page 43). The collaborating MACs decided to focus on Bosnia and Herzegovina and to apply lessons learned to address the problems in Croatia and Serbia.5

Taken in 2013 at a scale of 1:1000, digital orthophoto maps (DOFs) of the contamination in Bosnia and Herzegovina before the flooding are available only for BHMAC’s previously defined minefields and suspected hazardous areas (SHAs), which are included in BHMAC’s Mine Action Information System. The cyclone affected known minefields, moving soil, sediments and landmines to new locations not covered by BHMAC’s DOFs, which further complicated the problem.

Initial projections for Bosnia and Herzegovina show that:

- The total flooded area was 831.4 sq km (321 sq mi).
- More than 35 landslides occurred inside and in the immediate vicinity of the minefields in Bosnia and Herzegovina.
- Landslides, sediment torrents and floods directly impacted minefields covering 37.48 sq km (14.47 sq mi).
- A new area of 80 sq km (30.8 sq mi) became potentially hazardous due to the cyclone’s impact (Figure 2).

Previously known minefields spanning a length of 140 km (86.9 mi) on the banks of the Sava river bordering Croatia in Bosnia and Herzegovina may have moved as a result of the flooding. After processing and interpreting the collected images, the joint team developed a plan to assess the contaminated area. In this riverbank area, the team detected and documented landmines and unexploded ordnance (UXO) that shifted as a result of the cyclone.

In Croatia, floods covered 2.4 sq km (0.92 sq mi) of SHAs, but shifting landmines were not detected. Floods in Serbia covered SHAs and minefields, including 17.3 sq km (6.67 sq mi) of high-risk areas, 40 sq km (15.4 sq mi) of medium-risk areas and 106 sq km (40.9 sq mi) of low-risk areas, but new landmine locations, again, were not detected.
Creating a Plan

The collaborating MACs invited the HCR Centre for Testing, Development and Training Ltd. (HCR CTRO) to determine what methods and technologies could be used to assess current contamination and predict new SHAs. This initiative’s outcome is a joint project supported by the three MACs that is cofunded by Croatia’s Ministry of Foreign and European Affairs.5

BHMAC began with a statement of need defining the project’s parameters, which BHMAC and its regional offices developed from May through July 2014. Next, the mapping phase began. Remotely piloted aerial systems (RPAS) (Images 1 and 2) and a multisensory system mounted on a lightweight helicopter (Image 3) created an aerial mapping of the affected minefields and new SHAs—this phase of the project was completed in November 2014.

Problems to Overcome

Several factors, including endurance, maximum altitude, distance from a ground-based control station and required visual contact, limit the use of RPAS. RPAS can be used on smaller targets over open ground or area characterized by rough terrain. This part of the project requires close cooperation between collaborating MACs and the survey team comprised of RPAS aerial survey operators, researchers and deminers. In addition to collecting necessary images, this activity is used for on-the-job training of future BHMAC RPAS operators.

The sensors on light helicopters are suitable for large areas and hilly terrain with changeable relief, which the Croatian aerial survey team previously approved.6 The operational experience gained from using both kinds of aerial remote sensing platforms will be one of the outcomes of the project.

The Process

Initial plans for aerial image acquisition with RPAS were optimistic. However, as the project progresses, the team is finding that limitations caused by varying elevations, limited access and reduced visibility decreases the area that can be mapped to a smaller-than-predicted size and number of targets for imagery acquisition from the Gazela helicopter: 140 km (87 mi) line of minefields along the Sava river, more than 30 landslides, 37.48 sq km (14.47 sq mi) of minefields, which were under direct impact of landslides, sediment torrents and floods, 80 sq km (30.88 sq mi) of new potentially hazardous areas.
Image 4. Example of the landslide, which crosses the minefield in the upper part. A digital orthomosaic derived from aerial image collected by RPAS.
affected areas. The image-acquisition process with the Royal Military Academy’s (RMA) RPAS was applied to 12 landslides (estimated area 3.217 sq km [1.242 sq mi]), and the image-acquisition process with Geoarheo Ltd. RPAS was applied to nine landslides (estimated area 2.899 sq km [1.1194 sq mi]). Due to RPAS’ capacity limitations, a helicopter acquired additional aerial images (Figure 3).

After images are collected, digital orthomosaics (Images 4 and 5) and surface-terrain models of affected areas are developed (Figure 3). The workload in this phase is large due to the need for additional location data using geocoding from ground control points (GCP). When the orthomosaics and surface-terrain models for the target location are produced, they are delivered to researchers who are responsible for examining the consequences of landslides, sediment torrents and floods, and to BHMAC and its regional offices for their operational tasks. This phase is in its initial stage and aerial image acquisition will continue until all target locations are mapped. The researchers, comprised of experts in hydrology, geology, and geomechanics, use the new input data to conduct the field survey at each target location. In the case of landslides, the experts report on the following:

- Possibility of future landslides (low/medium/high)
- Estimated depth of new soil layer where landmines can appear
- Projected minefield or SHA border changes
- Urgency of landslide remediation (low/medium/high)
- Suggested prioritization of area clearance

This landslide field-survey mission awaits outcomes of aerial imagery processing. A similar process will be used to map and survey sediment torrents and flooding impact. Assessment is under way, and preliminary results were presented at the 12th International Symposium and Equipment Exhibition in Biograd, Croatia (27-28 April 2015).

The three processes (aerial survey, processing of imagery and field survey) are consecutive. Aerial survey and field survey depend on weather conditions, with completion expected in spring 2015. Data and images collected with RPAS 1 and RPAS 2 are processed and delivered to BHMAC and its regional offices, and to researchers at the faculty of civil engineering...
at Sarajevo University. Images and data collected by the Gazela helicopter are in the processing phase. Interpretation of delivered data is underway, and field survey is planned for spring 2015. The field survey is the most intensive part of the project and is unique in mine action, providing a treasure trove of empirical data. The acquired knowledge and experience will be directly applied to mine action processes in Bosnia and Herzegovina, Croatia, and Serbia, and it is expected to prompt additional research in several scientific fields, including methods and technologies for assessing mine areas after a disaster, impact of landslides and torrents, and landmine detection.

Future Steps

The next part of the project focuses on research methods and developing models for estimating the impact of the natural disaster on mine action. It is mainly based on information acquired from the project’s second phase. A variety of methods were considered, such as analysis of watershed boundaries, flow lines, flow path parameters, flood/torrents and erosion hazards. The locations of detected landmines will be used as the seed points for estimating the downstream flow paths along which the landmines could be dispersed. The opposite case will be analyzed also; the seed points serve for upstream watershed analysis and to determine regions where the landmines may have been displaced. Special efforts focus on research and development of hazard-distribution maps based on the spatial, multi-criteria, multi-objective decision-support methods. The goals of this phase are:

- Acquiring new data and information
- Sharing collected experiences
- Documenting lessons learned
- Deriving new approaches for the prevention, preparation and response of landslides, sediment torrents and floods

Aside from scientific results, this part of the project will assist with the development of the recommendations and standard operating procedures (SOP) for mine action behavior in similar kinds of natural disasters.

Additional aspects of the project will be advancing regional and cross-border cooperation, developing suitable technology, building capacity in the three MACs, and creating amendments to existing demining SOPs in the respective countries.

In addition to landslides, sediment torrents and floods within Bosnia and Herzegovina happened near rivers bordering the three countries. The right bank of the Sava river in Bosnia and Herzegovina has many minefields, which were exposed to the destructive flooding. There is a 140-km (87-mi) long line of minefields along the Sava river that may be affected by future natural disasters. Therefore these areas are of elevated importance in the project.

The three MACs agreed to establish resources for the aerial survey, prepare for quick and immediate reaction in case of emergency or disaster, and create a regional information network. As part of the project funding, the RPAS system will be provided to BHMAC, and operators will be trained.

Training is composed of three parts: (1) on-the-job survey training of RPAS teams (currently underway); (2) product training by the RPAS manufacturer; and (3) a 10-day seminar on aerial survey for mine action use in cases of natural emergency and disaster. The Aerial Survey Regional System for Mine Action Needs in Emergency and Disaster will be established in HCR CTRO. The nine-day workshop and on-the-job training was completed from 18 to 27 February 2015 in Vogosca, Bosnia and Herzegovina. The regional information network of the three MACs will be accomplished using cloud technology. The network will establish links to the European Emergency Response Centre service, the Copernicus Emergency Management Service, and the Global Monitoring for Environment and Security Initial Operations, if possible, as an authorized user or associated user.

Acknowledgments

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Mine Risk Education in Uganda

Although Uganda declared itself mine-free in 2012, explosive remnants of war (ERW) still contaminate the country. To prevent resulting deaths and injuries, ERW risk education must be accessible to civilians.

by Harriet Akello [Ugandan Ministry of Gender, Labour and Social Development]

Due to rebellions against the Ugandan government and the actions of the National Resistance Army in the 1980s, Uganda was contaminated with landmines and explosive remnants of war (ERW). The Lord’s Resistance Army (LRA) and the Allied Democratic Forces (ADF), two key rebel groups, contributed to the mine/ERW contamination and the displacement of tens of thousands of individuals.

These conflicts resulted in contamination of Uganda’s borders with South Sudan and Democratic Republic of the Congo, as well as the Luwero Triangle, West Nile region and the Rwenzori Mountains. To address related humanitarian issues, Uganda established the National Mine Action Center at the Office of the Prime Minister (OPM) in 2005. In July 2005, the National Mine Action Programme was inaugurated under the responsibility of the OPM to formulate an integrated response for the 13 mine/ERW-affected districts. In November 2012, Uganda completed landmine-clearance operations and declared itself mine-free. However, some mines may remain in Agoro along the border between Uganda and South Sudan. Although all known cluster munition remnants were cleared, ERW such as grenades and small arms remain. At least 2,770 mine/ERW casualties (531 killed/2,239 injured) were identified by the end of 2013. Seven of these casualties (2 killed/5 injured) were from ERW incidents that occurred in 2013.

The pending conclusion of the peace agreement and the imminent threats of attack by the ADF make it critical for Uganda to protect its citizens by establishing a sustainable MRE program.

Mine Risk Education in Uganda

In the Agoro and Ngomoromo minefields and the internally displaced person (IDP) camps of the Lamwo district, mine risk education (MRE) was offered as a part of OPM demining efforts funded by the U.N. Development Programme (UNDP). The MRE project was intended to reduce the risk-taking behavior of communities, increase their capacity to identify and manage threats, and raise awareness of the dangers of mines/ERW. With the aid of community-liaison operators, MRE aimed to prevent communities in IDP camps from returning to their home villages, which were highly contaminated with mines. At the conclusion of the demining operations in these areas, the OPM-sponsored MRE programs also closed.

Due to inadequate documentation, information on organizations conducting MRE in Uganda, including the time period covered, was not adequately captured. Different reports reference different dates; this has made determining the correct time frame difficult.

With the exception of OPM’s operations in the Lamwo district, the Ugandan government lacked a clear strategy, policy or program to implement MRE. As a result, civil society organizations implemented MRE separately. The following organizations provided MRE in Uganda:

Association of Volunteers in International Service (AVSI). AVSI coordinated with government and community leaders to provide MRE. As a result of national collaboration, AVSI developed sensitization material for training and networking with other agencies and partners in the mine action sector. At the regional level, AVSI established partnerships that led to developing consistent, yet flexible, MRE training programs. AVSI also built the capacity of district personnel to help design effective MRE programs. At the community level, AVSI trained IDP camp leaders as community-based MRE educators, enhancing the level of MRE information gathered and shared within the community. Camp leaders and district facilitators used drama and group discussions to target communities. In an effort to spread risk awareness, AVSI distributed a
variety of materials with MRE slogans and messages, including booklets, posters, T-shirts, stickers, exercise books, music CDs and cassette tapes. It distributed these materials in the Amuru, Gulu, Kitgum, Kotido and Lira districts.

AVSI trained community leaders to be MRE educators in the region, enabling the communities to provide MRE directly to citizens. MRE also led to behavioral changes. For instance, the number of people capable of recognizing landmines increased. Deminers used location data provided by civilians to determine where landmines were emplaced. Community members traveled in groups of two or more, so that if they encountered a suspected object, one person could remain behind while another left to notify the army to remove the objects. Risky behaviors, such as returning to villages after LRA attacks decreased, minimizing the number of accidents.

As a result of community engagement, the Uganda People’s Defence Force recovered 20 anti-tank mines and 84 bombs in the Amuru, Bundibugyo, Gulu, Lira, Kasese, Kitgum, and Kotido districts by September 2003.4

Anti-Mines Network-Rwenzori (AMNET-R). AMNET-R is an action group of teachers from Rwenzori High School. AMNET-R worked with school clubs as well as community and survivor groups in Kasese to provide MRE and victim assistance, promote peace and advocate for the universal observance and protection of human rights. Handicap International supported AMNET-R by providing MRE, financial resources and training and material support.

Danish Demining Group (DDG). DDG focused on MRE for children and IDPs who graze animals, collect firewood, fetch water and play outdoors. Because the land was contaminated with mines/ERW, these everyday activities put children and IDPs at higher risk.

**Handicap International (HI).** In western Uganda, HI developed an MRE training manual to guide AMNET-R. HI also produced radio programs that targeted a wider audience than was possible with other types of MRE messages, as well as MRE posters, comic books and T-shirts for children and youth, and a 15-minute script for an MRE film.

**Challenges of MRE in Uganda**

Only a small amount of MRE was provided during demining and the coverage remained limited to the most heavily affected communities. MRE also ended in conjunction with the completion of mine clearance. Organizations that implemented MRE documented their activities and progress poorly. To date, there is no known mechanism to deal with residual risks.

In addition, it was anticipated in 2001 that many new partners and actors in mine action would emerge by 2005 or 2006, but this did not happen. AVSI, HI and AMNET-R possessed limited resources for MRE. With the exception of Gulu, Lira, Kasese, and Kitgum, affected districts only benefited from the UNDP-funded OPM MRE component of the demining program.

There is no adequate sustainable MRE program in Uganda to educate at-risk communities, especially children, about the residual mines/ERW. Although Uganda declared itself mine-free, such threats could still wash up or become exposed after heavy rain. In addition, it is likely that ERW may still be hidden in houses within the affected communities.

The lack of a comprehensive government strategy for MRE hinders the establishment of an institutional network to coordinate national MRE efforts. Coordination is required to bring local governments, nongovernmental organizations, hospitals, schools and communities together for effective and sustainable MRE.

**Mainstreaming MRE**

One avenue of providing MRE is to include it in the Functional Adult Literacy (FAL) Programme, a nationwide program executed by the Ministry of Gender, Labour and Social Development that began in 1992. Aimed at increasing accessibility to information and eradicating poverty, this program teaches literacy and mathematic skills as well as skills in agriculture, health, child care, HIV/AIDS, gender issues, etc., an organized structure that provides at least one FAL class for every village. By including MRE, the FAL Programme educates parents on the dangers of mines/ERW, enabling parents to educate their children thereafter.
However, the implementation of the FAL Programme was destabilized during the LRA insurgency. Since the return of IDP’s to Uganda, there has been no government initiatives to support and strengthen the FAL Programme in post-war communities.

MRE integration into the FAL Programme would provide two significant benefits: It would strengthen MRE and increase adult literacy education in the region.

In order to integrate MRE into the FAL Programme, the following steps should be taken:

- Generate MRE course units
- Incorporate MRE into curriculum
- Mobilize additional resources
- Print and distribute copies of MRE educational materials
- Routinely monitor and support supervisors
- Train instructors as MRE educators

Pending funding, a national MRE program should be designed and delivered as part of the Victims Assistance Programme, run by the Ministry of Gender, Labour and Social Development to strengthen and expand MRE in Uganda’s communities.

**Conclusion**

Although Uganda was declared mine-free in 2012, other ERW and residual risks remain, threatening the population. MRE can be strengthened and sustained to protect these individuals. The Ugandan government could implement a national MRE strategy by integrating MRE into the FAL Programme and targeting local communities with Uganda’s Victims Assistance Programme. However, any steps to incorporate a MRE component into these programs are currently pending until additional government funds are provided for these programs.

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**News Brief**

**Distinctive Pattern Found in IED Survivors’ Brains**

New research offers insight into brain trauma incurred by improvised explosive devices (IED), a problem affecting survivors of blast-related injuries since World War I. These findings mark the first time modern pathology was used to examine long-lasting effects of explosions on the brain.\(^1\)\(^2\)

Individuals suffering brain damage from IED explosions experience cognitive and psychological difficulties. Previously known as shell shock, this concept is called blast neurotrauma or blast injury to brain. Recently, the problem resurfaced as a health concern in the United States, as soldiers return from deployments in Iraq and Afghanistan.\(^1\)\(^2\)

Eight researchers from the Johns Hopkins University School of Medicine in Baltimore, Maryland, (United States), studied the brains of five male U.S. military veterans who survived IED attacks and later died. The research data showed a distinctive brain pattern, which differs from that of brain damage caused by car crashes, drug overdoses and collision sports. The broken and swollen nerve fibers of IED-blast victims resemble a honeycomb pattern, and are found throughout critical brain regions including the frontal lobes, which control decision-making, memory, reasoning and other functions. This may explain some of the difficulties IED survivors face, such as depression, anxiety and post-traumatic stress.\(^1\)\(^3\)

According to researchers, these new findings “may be the never-before-reported signature of blast injuries,” which soldiers suffer. Researchers did not observe the honeycomb pattern in any other type of brain injury.\(^1\)\(^2\)

This discovery will help doctors more effectively treat IED survivors. Although a fundamental step toward understanding how IED blasts affect the brain, more research is needed to determine the impact over time.\(^2\)\(^3\)

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Female Demining Teams in Tajikistan

In addition to contributing to the safe release of landmine-contaminated land in Tajikistan, Norwegian People’s Aid (NPA) has pushed norms and traditions by incorporating an all-female demining team into its operations. Less than a year ago, imagining an all-female demining team operating in a country with strictly-defined gender roles was difficult.

by Julieta Nikolova [ Norwegian People’s Aid ]

Tajikistan’s landmine contamination is primarily a border problem stemming from three different conflict periods in predominantly three regions: the Tajik-Afghan border, the Central Region and the Tajik-Uzbek border. Invited by the Tajikistan National Mine Action Centre (TNMAC), on behalf of the government of Tajikistan, Norwegian People’s Aid (NPA) started operations in the country in 2009 in order to provide assistance to the fulfillment of Article 5 of the 1997 Anti-personnel Mine Ban Convention (APMBC).

In 2010, NPA replicated a common practice instituted by other country programs into its Tajik operations—establishing a female demining team. To date, NPA has female deminers in all of its country programs except for Iraq, Mauritania and Somalia. According to Resad Junuzagic, the country director of the Humanitarian Disarmament Programme in Tajikistan, “Including both men and women into operations and at all levels of programme activities has proven to be fairly uncomplicated in most cases, even in a traditionally male-dominated field and, in many cases,
traditionally male-dominated societies. Moreover, female de-
mining teams have contributed considerably not only to NPA’s
clearance projects, but to society development at large.2

Despite their proven benefit, recruiting female deminers
is challenging for NPA in Tajikistan. In general, demining is
accepted as a dangerous occupation. In a patriarchal society
such as Tajikistan, where men and women have separate du-
ties, men, as the “stronger” sex, are expected to deal with the
more dangerous situations.

Advertisements in local newspapers, as well as on
TV and the Internet, produced little support from local
nongovernmental organizations and governmental agencies.
However, in 2014, NPA approached the local community
in its area of operations along the Tajik-Afghan border, and
offered demining training and employment opportunities
to local female residents. Nevertheless, numerous meetings
with families, local authorities and community leaders were
necessary to help the citizens overcome their skepticism.

Since March 2014, the first all-female demining team has
operated in the region of Qumsangir in southern Tajikistan.
Minefields in Qumsangir are usually fenced, but most people
from nearby communities are not acquainted with the dan-
gers of mines, and to a lesser extent, ammunition. Prior to
joining the training, none of the women in the course knew
what humanitarian disarmament involved or what it would
take to work in a minefield.

The first basic demining training course consisted of 24
women from villages near the Tajik-Afghan border. NPA
provided and organized the women’s training, transportation
to and from their local community, food allowances and other
logistic support. Prior to training, participants’ only required
prerequisite was a routine health check. Training lasted about
four weeks, during which participants were acquainted with the
theoretical and practical aspects of demining projects. Following
the completion of the training, NPA evaluated the students and
TNMAC performed evaluations externally.

A number of female participants did not complete the train-
ing due to psychological barriers and fears regarding the dem-
ing work. Only nine of the initial 24 women advanced to the
selection process; those who completed the course were mostly
mothers, but some were grandmothers, with or without addi-
tional jobs and occupations. Almost no “real” job opportunities
exist for women in Tajikistan. Typical duration of a deminer’s
contract is one year with the possibility to extend depending on
available funding. Although a deminer’s salary is not high, it re-
mains a better option for women than no job outside of the home.

Nazokat Begmatova, Female Deminer in Tajikistan

Nazokat Begmatova is one of the women who passed the initial training to become a humanitarian deminer. As is the case for the majority of Tajik females, she never had the opportunity to attend university. However, contrary to most traditions, she did not immediately marry but searched for fulfilling career opportunities, often pushed by the need to earn a living.

Initially, Begmatova’s family, friends, neighbors and local community opposed her training as a deminer. However, she successfully passed the training and the final examination, much to the shock of her male colleagues. “At the end of the day, it all depended on me and my desire to learn, and to study more about mines. Once I started, I just could not look back and accept any obstacles,” says Begmatova.3

A humanitarian deminer requires working in difficult weather conditions with temperatures reaching 40–45
degrees Celsius (104–113 degrees Fahrenheit). In order to meet all of NPA’s safety requirements, Begmatova’s
protection includes a helmet, safety vest and detectors, totaling 25 kg (55 lbs). In addition, the standard proce-
dures she follows demand intense concentration. However, Begmatova confirms, “Although my work goes slow-
ly, as I have to be very accurate, it is very engaging, and I do it with pleasure, because I know that I am doing
something right for society. That is why I always work with a smile and a positive attitude.”3

Begmatova says she is proud of herself and her achievements as a humanitarian deminer. Although the path
was challenging, she now receives respect from local community members and disproved their beliefs about
women by working in a traditionally male-dominated field. For her, the next step in the deminer profession is
to become a team leader. After a year of experience in the minefield, Begmatova can apply for the three-week
(minimum) training for this entry-level position. Inspired by her work and convinced her future was headed in the
right direction, she left the community where she spent her entire life—something she used to fear.
Changing Attitudes

In a country where more than a million men emigrated to Kazakhstan and Russia in the search of job opportunities in recent years, women took on a great deal of societal responsibility. Shifting their traditional role from housekeepers and mothers, women became heads of the households, obliged to earn incomes as well as care for their home, land and animals. Due to scarce employment opportunities in other fields, most women eagerly take part in the training to improve their social conditions.

However, after the project’s successful start—as experience from other regions show—the female demining team brought substantive change to the local communities. Community members recognize the women at the bazaar, on the street and in the hospitals. The community looks upon them with appreciation, respect and admiration for their work. Moreover, even the relationship of women and men within their families has changed. The idea that women belong in the home, taking care of their children while the men go to work, has changed significantly. The society is adjusting to the idea that women can work, and perform a mentally and physically challenging job as a humanitarian deminer.

Looking Forward

The local communities’ interest in all-female demining teams has increased in Tajikistan. Many women with children and even grandchildren are now interested in joining future demining teams. Working as a humanitarian deminer is looked upon as an equal opportunity for women and men, which provides a positive base for NPA to implement in Tajikistan another common practice—to build a coed humanitarian demining team. According to Junuzagic, “Depending on operational requirements, availability of deminers, funding, etc., mixed gender teams can provide better information during survey and conduct better clearance during operations. Therefore, NPA’s strategy is to have mixed gender teams in all operational programmes.”

Adhering to one of NPA’s guiding principles—to mainstream a gender-diverse perspective into the design, implementation, monitoring and evaluation of its programs—NPA’s engagement in Central Asia was also a strategic decision to showcase an effective and cost-efficient, land-release methodology. Thus far, the female demining team contributed to the release of around 127,625 sq m (152,638 sq yd) of landmine-contaminated land, found and destroyed 809 anti-personnel mines, and contributed significantly to land-release operations along the Tajik-Afghan border. Although minefields are within a fenced and patrolled security zone to which civilians have no access, after mine clearance is complete, the area has huge agricultural potential due to fertile soil and access to water.

NPA plans to continue working with female demining teams, as long as they are interested in the work and funds are available to support mine-action activities in Tajikistan. At the moment, two female deminers are receiving team-leader training. The goal is to promote at least one participant to the role of team leader and include the other deminer in a non-technical survey team.

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Developers Win Mobile Apps Challenges

As more industries develop mobile technologies, demand for mobile applications (apps) increases. Within various humanitarian fields, mobile apps can serve a variety of special purposes, from providing users with the ability to communicate and share information wirelessly to facilitating disaster relief or humanitarian aid. The National Defense University saw a need for a landmine and explosive remnants of war reporting app, designing a contest to create one.

by Blake Williamson [ Center for International Stabilization and Recovery ]

In March 2014, the National Defense University’s (NDU) Center for Technology and National Security Policy (CTNSP) launched the Explosive Remnants of War [ERW] and Land Mine Reporting Apps Challenge. Funded by the U.S. Department of Defense, NDU is a national security institution with the purpose of “educating, developing and inspiring national security leaders.” The competition was facilitated by ChallengePost, a website used by government agencies and software companies for crowdsourcing solutions to issues that can benefit from public awareness, participation and innovation.

From 18 March to 20 July 2014, the ERW and Land Mine Reporting Apps Challenge accepted submissions for open-source applications that allowed users to report ERW and mines. According to ChallengePost, 54 people registered for the competition, which was open to anyone who could “demonstrate appropriate knowledge of SMS [short messaging systems] and smartphone applications.” Submitting entries directly to ChallengePost, participants were required to articulate how their respective solutions were sustainable and would produce new (or improve upon existing) methods for reporting ERW and mines. Submissions also needed to specify which interface was used to support their solution, as well as how their method acquired and updated data that could identify the appropriate and obtainable impact measures.

The contest sought to develop a mobile app that could be used by those likely to find ERW and landmines on a daily basis yet account for the rural communities’ limited access to education and low literacy rates; hence, simplicity and intuitiveness were primary app requirements. Moreover, the app could not impose further risk to the user and could not “encourage untrained, ordinary citizens to seek out, remove, disassemble or otherwise affect” dangerous objects. The data submitted by the app also needed to be transferrable to the appropriate national authority via the Information Management System for Mine Action (IMSMA).

In addition to the aforementioned sociocultural parameters, participants were obligated to follow a series of technical parameters. For the sake of potential future collaboration, Challenge submissions were to be open source; further, apps needed to demonstrate stability, sustainability, bandwidth conservation, interoperability with multiple platforms and data nongeneralization to ensure functionality with management systems such as IMSMA. The contest also asked participants to be familiar with developer networks to facilitate future collaboration with contributing developers.

"The contest sought to develop a mobile app that could be used by those likely to find ERW and landmines on a daily basis..."
The competition encouraged submissions from “public and private entities, labs, startups, students, developers, programmers and others.” Similarly, the rules urged would-be candidates to collaborate with software developers and experienced advisers who could provide real-world insight into the applicability of their respective solution. Candidates were also encouraged to provide insight into available data and agency operations as well as provide necessary information regarding network specifications and capabilities.

A panel of judges from CTNSP, the U.S. Department of Defense’s Joint Improvised Explosive Device Defeat Organization and the University of Maryland reviewed submissions for their contribution toward improving ERW and landmine-reporting methods (60 percent); implementability (15 percent), upgradability (15 percent) and sustainability (10 percent). In September 2014, CTNSP announced the winners of the Explosive Remnants of War and Land Mine Reporting Apps Challenge: First place was awarded to Channel16.me Land Mine Reporting (LMR), which received US$3,000. Taking second, Flare won $1,500 for offering low-cost, 2G, SMS-based landmine reporting; and ERW Detector took home $500 as third place. In addition to the prize money, CTNSP publicized the winning apps within the U.S. government.

Created by a joint team of developers and “wearable software enthusiasts” from Austria, Japan and the United States, Channel16.me LMR functions as “a Walkie-Talkie specially customized for Land Mine Reporting” using the Android and iOS platforms. By allowing users to report findings with “text, audio or photo messages,” the application broadcasts to other app users in the vicinity. When app users find a suspicious object, they can launch the Channel16.me LMR app and create an image, a sound recording or a text message that is sent to nearby users with the original reports’ GPS coordinates.

In addition to the Explosive Remnants of War and Land Mine Reporting Apps Challenge, CTNSP launched the Disaster Apps Challenge in March 2014, encouraging developers to “find innovative ways to improve and refine existing disaster relief solutions.” Similar to the Reporting Apps Challenge, the Disaster Apps Challenge permitted a four-month window for developers to submit their solutions via ChallengePost. First place went to GovSAFE, the Survivor Assistance Form Editor, which locates users and identifies local disaster-assistance centers; second place went to Siaga Banjir (Jakarta Flood Alert), a monitoring and flood-alert application for the greater Jakarta area; and third place went to National Storm Shelter GPS Precise Map Points, which allows users to report shelter locations using exact GPS coordinates. Black Mamba Rescue Beacon received an honorable mention for its application which allows users to send coordinates to friends and family during a disaster.

See endnotes page 67
In Remembrance

Nazim Ismayilov

Nazim Ismayilov of the Azerbaijan National Agency for Mine Action (ANAMA) died 11 December 2014 at the age of 70. Ismayilov long served as ANAMA director, a position he began three years after the organization was founded in 1998.

Ismayilov was born in Baku, Azerbaijan, in 1944 and graduated from the Polytechnic Institute. As a civil engineer, he began his career working in various government agencies including the Ministry of Industry and served as the first deputy chairman of the Industrial and Construction Company. Ismayilov was also an adviser to the International Academy of Engineering.¹

According to the International Eurasia Press Fund, "Under his leadership, ANAMA developed into one of the top humanitarian demining agencies in the world … Mr. Ismayilov never ceased in his devotion to this work, and it is clear that he has left [a]n eternal mark of progress and humanity on governments and civil society everywhere."²

CISR Associate Director Dr. Suzanne Fiederlein remembers him as a gracious and helpful host when she visited Azerbaijan for a casualty-data research project in 2007. He had a strong vision for ANAMA as a professional, effective and creative organization ever willing to collaborate with other organizations to advance the eradication of landmines and unexploded ordnance as a threat to civilians' lives and well-being. Ç

~ Chloe Cunningham, CISR staff
See endnotes page 67

Tim Carstairs

Former International Campaign to Ban Landmines (ICBL) and Cluster Munition Coalition colleague Tim Carstairs passed away 6 January 2015, following a long illness. The CISR family mourns Tim, a legend in the early days of ICBL who took part in its creation in October 1992. His professional contributions extend to the banning and clearance of anti-personnel landmines and victim assistance through his work with Handicap International, MAG (Mines Advisory Group), the UK Working Group on Landmines, and Geneva Call.

I had the privilege of working with Tim around the world, including in Syria in 2005 when we spoke at the opening of a new hospital in the unoccupied Golan Heights to service survivors, and when he expended his gracious time to interview for my book, Disarming States. Tim was a humanitarian advocate and aid worker who devoted his life to making our world a safer place.

Our thoughts and prayers are with Tim's family. He will be greatly missed by all who knew him. Ç

~ Ken Rutherford with Luiza Pire, CISR staff
Research and Development in ERW and Mine Action Technology

Sponsored by the U.S. Department of Defense
Unexploded Ordnance Center of Excellence (UXOCOE)
Forces Generated by the Free Fall of DEMICHAIN

The free fall of an array of heavy chains (360 kg/sq m) generates extensive pressure in the depth of the ground. These pressures have been measured and compared to the threshold pressures that trigger anti-personnel landmines. When dropped from moderate heights (1 m), chains can generate enough pressure to set off active landmines buried 20 cm, provided that the area of their pressure plates is larger than a few square centimeters.

by Christian Baras, Bernard Gautier, Robert Goepfert, Jean-Pierre Hancy, and René Joecklé
[ Association de Recherches de Techniques Innovantes en Déminage Humanitaire ]

First designed by Jacques Demichelis, the DEMICHAIN concept involves dropping an array of heavy chains on mine-contaminated ground. The force of the chains delivered into the ground sets off active landmines buried beneath the surface. This article reports the recent progress made toward improving the technology and shows the advantages as well as the limitations of the DEMICHAIN technique. After examining the amount of stress necessary to trigger the pressure plate of a buried anti-personnel (AP) mine, the study examined the relationship between stress waves and the drop height of the array of chains. Buried load cells measure the forces delivered by the falling chains. Discussion on the efficiency of the DEMICHAIN concept begins by comparing the results of the forces measured by the load cells with the characteristics of buried AP mines.

Overview of AP-Mine Characteristics

AP mines are detonated when a force exerted through the soil on the pressure plate is larger than the predetermined triggering force, which equates to the trigger pressure multiplied by the area of the triggering plate. The study examined the most frequently used AP mines and summarized their triggering force as listed in Jane’s Mines and Mine Clearance (Jane’s).

The surface of the pressure plate is not listed in the handbook and was estimated using the outer diameter of the landmine. An interpolation was made based on a picture. By measuring the ratio between the diameter of the pressure plate and the mine’s outer diameter, the latter of which was provided in Jane’s, the diameter of the pressure plate and its surface was determined. This provided an approximate value and allowed us to deduce the triggering pressure, as illustrated in Figure 1.

A pressure of less than 2 bars sets off most mines, as seen in Figure 1. Three of the mines examined required greater amounts of pressure to trigger a detonation. However, these mines must be installed on the surface along with the small pressure plate, which is placed above ground.

Overview of DEMICHAIN Concept

DEMICHAIN involves arranging heavy chains in a horizontal array to form an area that exhibits a uniformly distributed mass. This array of heavy chains hangs horizontally over contaminated ground. When released, the array falls to the ground and delivers a wave of vertical stresses. The basis of this theoretical principle can be found in Scott and Pierce’s Soil Compaction by Impact, which describes the process of soil being hit by the free fall of a uniformly distributed mass.

When a uniformly distributed mass is dropped from a moderate height, one can assume that the behavior of the ground is elastic. After a very short time, the surface of the ground moves at the velocity of the falling mass and is compressed. The vertical stress generated at the impacted surface is proportional to the velocity of the falling mass and the...
High mass density chain arrays used during testing.
elastic constant of the ground. Under the impacted surface, the stress is uniformly distributed and spreads in-depth into the ground at the velocity of sound. This vertical stress wave can then produce a force on the pressure plate of an active mine sufficient enough to detonate it.

Scott and Pierce show that the maximum pressure is obtained at the surface and is directly proportional to the height from which a uniformly distributed mass free falls, regardless of the specific mass. Similarly, duration of the pressure wave is directly proportional to the specific mass per unit area of the array of chains.

Experimental Studies

Three studies were conducted successively.

Tests on Standard Landmines. Using electronic mockups (Figure 2) that exhibit the same geometrical characteristics of standard AP mines, the Association de Recherches de Techniques Innovantes en Déminage Humanitaire (ARTID) tested DEMICHAIN.4 Buried at depths up to 20 cm, these devices contained pressure plates retained by compression springs. As soon as the load on the pressure plates reached 150 newtons, an electric switch depressed, showing that a mine would have detonated. During testing, an array of chains was released into a free fall over the ground. These initial tests, conducted by ARTID, showed that the DEMICHAIN concept is capable of triggering buried mines, even if mines are buried at depths up to 20 cm.

Tests on Practice Landmines. The Anti-personnel Mine Ban Convention allows countries to possess a small number of active landmines for research. The French Ministry of Defense owns a limited number of AP mines, which could not be used for this study (see the STOCK5000 in Rapport CNEMA 2011–2012).5 However, the French Ministry of Defense provided the opportunity to use practice mines, which differ from real mines in that the explosive material is replaced by a smoke-emitting material. The available practice mines in France are MI AP DV X 59. The test program was performed in Etablissement Technique de Bourges at Bourges and showed that the DEMICHAIN system is only efficient if the top of the landmine is located toward the ground’s surface. Due to the small area of the pressure plate for MI AP DV x 59, a rather high pressure level must be developed in order to exert a sufficiently high force on the pressure plate. Notably, this type of landmine is not normally buried.

Measuring Chain-generated Stress. An FC22 load cell by Measurement Technologies using the strain-gage technology was adapted in a housing in which a piston of 3.1 cm in diameter slides freely and transmits the force exerted on the free surface of the piston to the load cell. Four of these pressure sensors were buried in the ground. A digital oscilloscope simultaneously recorded the four generated signals (0 to 5 V for a nominal pressure of 7.3 bars).

A series of 59 successful tests were performed using different DEMICHAIN systems and detector depths. Most of the tests were conducted in a mix of sand and gravel, while several tests involved vegetated ground.

For the first series of tests, an array of chains with a mass per length unit of 6 kg/m and spaced 6.2 cm apart provided a mass density of less than 100 kg/sq m. The temporal aspect was relatively irregular. The study team built a reinforced array of chains with a higher mass density (360 kg/sq m); this exhibited a greater force than did the previous array of chains. The fall height was limited to 1.5 m, which would yield forces within the operational limit of the load cells.

From the tests, the pressure seems directly proportional to the height from which the array of chains is dropped. The pressure does not exhibit a large decrease in function of the depth. The duration of the pressure impulse at half of the maximum height is about 6 to 7 ms. Comparing this value to the delayed detonation time (which is not available in literature) built into several AP mines to avoid nearby explosions could yield interesting results. These results are summarized in Table 1.

This research could benefit from having these values compared to the triggering pressures of other AP mines with the exception of those that exhibit a very small pressure plate, as a modest fall height of 1 m will trigger mines buried at depths of 20 cm.

DEMICHAIN’s Advantages

DEMICHAIN maintains many advantages in contrast to other landmine-remediation tools and activities. Primarily, the forces developed

<table>
<thead>
<tr>
<th>Fall height (m)</th>
<th>Measured pressure range (Bar)</th>
<th>Minimum observed pressure (Bar)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1m</td>
<td>2.6–4.8 Bar</td>
<td>2.6 Bar</td>
</tr>
<tr>
<td>1.5m</td>
<td>4.7–7 Bar</td>
<td>4.7 Bar</td>
</tr>
</tbody>
</table>

Table 1. Summary of test results.
are vertical and are, therefore, analogs to the forces developed by the targets of the mines. Moreover, the demining process does not change the soil’s structure, ensuring the integrity of roads and paths. The developed forces decrease slowly in the depth; therefore, large soil depths (up to 45 cm with a larger surface array) can be demined with positive results. The issue for large depths of soil is the edge effects, which reduce dimensions of the maximum pressure zone.

The tool is not as sensitive to abrasion as flails are to sand. Furthermore, the tool consists of ordinary, inexpensive chains, which can be built in workshops and easily adapted to specific needs and lands. Thus, the DEMICHAIN tool can be mounted on an ordinary machine including cranes and hydraulic arms commonly used in demining. When a free-fall winch is used, DEMICHAIN can be remotely operated. Finally, forces in the soil that set off landmines will take place only at the end of the free fall; therefore the operation will be dangerous only at this moment. No permanent emission of dust will take place.

The DEMICHAIN concept does not require users to invest in a specialized piece of machinery, as devices need only be able to drop an array of chains onto the ground. Therefore, DEMICHAIN could be an affordable technique for small organizations or for reduced amplitude jobs, such as demining of paths and berms.

Conclusion

A free fall of an array of chains with a mass density of several hundred kg/sq m generates several bars of pressure in the ground, which is enough to trigger most buried AP mines up to 20 cm. This demining tool can also be used to reduce mined areas before using manual clearance; to detonate deeply buried mines, i.e., in sand or along river banks; or for control purposes of areas cleared with other techniques.

See endnotes page 67

Many thanks to Gilbert and François Schurrer, who warmly welcomed researchers into their farm and provided a tractor equipped with a hydraulic arm to lift the chains as well as an appropriate area containing sand and gravel.
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Vietnam 40 Years After the War by Sutton [from page 5]
1. Data from MAG Impact Assessment in Quang Tri, analyzing data between 2011 and 2013.

Disability-rights Campaign in Vietnam by Macauley and Holsinger [from page 12]
2. Controversy and legal battles have impeded research to estimate an accurate number of Vietnamese affected by Agent Orange. Approximately 4.8 million people lived in areas sprayed with dioxin defoliants during the war, and many of their children and grandchildren exhibit signs of toxicity. See Martin, Michael F. *Vietnamese Victims of Agent Orange and U.S.-Vietnam Relations*. Diane Publishing, 2010.

The Quang Tri Integrated Survey and Clearance Project by Guthrie and Stratton [from page 16]
4. Activities under the land release process include non-technical survey, technical survey and clearance.

Vietnam Veterans of America Foundation by Nguyen [from page 19]
6. According to Vietnamese law, the Ministry of Defense solely mandates demining through military units and military commercial demining companies.
7. The purpose of the land-release project is to pilot new survey and clearance approaches, and a better use of technology, to confront ERW contamination more efficiently.

Train-the-Trainer Trauma Care Program in Vietnam by Dang Quang [from page 28]

1. In Vietnam, this war is called the American War.
2. UXO Victim Data Section, Project of Provincial Coordination Database Unit in Quang Tri.
5. The study on injuries and prehospital first aid in Quang Tri province by Dr. Tran Kim Phung, former vice-director of Quang Tri Provincial Department of Health, and his colleagues, 2007.

Mine Clearance in Skallengen, Denmark: Protecting the Environment by Jebens [from page 37]


Impact of Flooding on Mine Action in Bosnia and Herzegovina, Croatia and Serbia by Bajic, Ivelja, Hadzic, Balta, Skelac and Grujic [from page 43]

5. CTDT. “Mine action after the floods - regional synergy in emergency response, technology development and capacity building.” Regional project of mine action centers of Bosnia-Herzegovina, Croatia, Serbia, supported by Croatian Ministry for Foreign and European Affairs. HCR Centre for Testing, Development and Training Ltd. July 2014.


Mine Risk Education in Uganda by Akello [ from page 50 ]


Distinctive Pattern Found in IED Survivors’ Brains by Stern [ from page 52 ]


Female Demining Teams in Tajikistan by Nikolova [ from page 53 ]

1. NPA’s female demining teams are in Albania, Angola, Bosnia-Herzegovina, Cambodia, Colombia, Democratic Republic of the Congo, Iraq, Jordan, Lao PDR, Lebanon, Mauritania, Montenegro, Mozambique, Myanmar, Somalia, South Sudan, Syria, Tajikistan, Thailand, Vietnam, Western Sahara and Zimbabwe.


4. Where mixed gender teams are impossible, NPA builds all-female teams, such as in Cambodia, Lebanon, Somalia, South Sudan and Tajikistan.


Developers Win Mobile Apps Challenges by Williamson [ from page 56 ]


References


In Remembrance: Nazim Ismayilov [ from page 58 ]


Forces Generated by the Free Fall of DEMICHAIN

by Baras, Gautier, Goepfert, Hancy, Joeklé [ from page 60 ]


References

1. The purpose of ARTID (Association de Recherches de Techniques Innovantes en Déminage Humanitaire), an association located in Saint-Louis, France, is to search and develop new de-mining techniques.

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where people can build peaceful and prosperous futures,
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