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National Explosive Remnants of War Response Study, Cambodia

by

Norwegian Peoples Aid in collaboration with the Cambodian Mine Action Authority

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Phnom Penh, Cambodia

March, 2006

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EXECUTIVE SUMMARY

The purpose of this study was to initiate a strategic dialogue through an assessment of the explosive remnants of war issues facing the future of the mine action sector in Cambodia. The study was conducted in a phased program between 28 November to 31 March 2006 by a combined team of two Norwegian Peoples Aid contracted independent consultants and a senior official from the Cambodian Mine Action Authority.

Originally, called a “National EOD Study” the full spectrum of the explosive remnants of war impact on Cambodia necessitated a wider focus of inquiry to address the future of the sector in a holistic manner. The study was renamed “*National Explosive Remnants of War (ERW) Study – Cambodia*” to appropriately reflect the problems associated with ERW contamination and the necessary responses for this long term issue. The report takes stock of the mine action situation, analyses the broad issues of ERW contamination and determines the needs for an effective long-term National ERW Response thru the process of “End State Programming”. The underlying principle guiding this study is developing national self-sufficiency to undertake professional ERW Response programs that meet national development goals and objectives.

Early 1990’s mine action predictions determined that mine clearance organizations would be working in the Thai-Cambodia border area within a decade, this is occurring now. The main body of work removing high impact landmine contamination from the populated central Cambodia is near completion. Accelerating the end of the landmine impact is attainable through innovative area reduction techniques, now being introduced. The remaining high impact border contaminated areas can arguable be reduced within a 5-10 year period.

Once, area reduction makes large-scale mine clearance operations redundant, the more challenging long term issues associated with explosive remnants of war such as abandoned munitions, unexploded ordnance i.e. air-dropped munitions etc. can assume national priority. The scale of the ERW contamination in Cambodia is only now being understood, first evidenced by the shift from landmine victims to unexploded ordnance incidents. This study is the first step towards comprehending existing EOD operational data and a wealth of un-analyzed data on aerial bombardment that has not been fully exploited to define the scope of ERW impact on Cambodian society.

Twenty years of continuous warfare liberally polluted vast areas of Cambodia with land service munitions¹, and air-dropped munitions² in quantities much higher than originally imagined by mine action planners. Initial estimates indicate that up to 50,000 tons of general-purpose bombs³ and upwards of 3.75 million individual unexploded air dropped bomblets contaminate Cambodia. EOD operational records also indicate a general contamination level of up to eighteen (18) ERW items per hectare have been recovered, outside of mine clearance operations. Additionally, dioxin contaminated areas caused by herbicide spraying during the Vietnam War in eastern Cambodia adds to the cocktail of hazardous challenges facing Cambodia.

¹ Land service munitions include grenades, mortars, rockets, and artillery etc.

² Air-dropped munitions include rockets, bombs, cluster munitions (bomblets) etc.

³ Large air-dropped bombs ranging from 250lb-2000lbs.

Finding the optimum balance of technology and method to address ERW threats in the challenging SE Asia environment stretches the limits of humanitarian mine action empirical knowledge. These challenges are similar in UXO Laos where a series of systems trials are revolutionizing their approach to a long-term ERW strategy, lessons which can be introduced in Cambodia. Clearly a transition from “mine centric” thinking to ERW Response using explosive ordnance disposal (EOD) and battle area clearance (BAC) techniques and methodologies requires development. Mine action service providers will need to adapt their organizational structures, methods and technology for these changes. The main finding of this report indicate the technical aspects of evolving an ERW Response to be less challenging than creating governmental impetus for strategic planning, organizational change, human resource development and developing appropriate structures, and facilities.

The Royal Government of Cambodia (RGC) responsibility and commitment to mine action is generally positive allowing an unimpeded environment for mine action agencies to perform their humanitarian and developmental work. RGC contributes funds and facilities that support CMAA and CMAC management although only represents a fraction of the costs required to deliver the volume of mine action or ERW Response activity required in Cambodia. CMAA and CMAC are 95% funded through the generosity of the international community. In this regard, the mine action sector is neither sustainable in its present form nor prepared to develop a long-term National ERW Response capacity.

Whether by design or default the mine action sector will undergo transformation as the impact of mines lessens, and priorities shift to other development issues during the next 5-10 years. The national strategy is crafted from a limited analysis of the Level One Impact Survey (L1S), which presents an unbalanced picture of the overall ERW situation.

Fundamental analytical and management processes are required to plan a long-term ERW Response. Starting with a realistic threat analysis that re-evaluates residual landmine contamination with all other ERW contamination to determine actual impact and acceptable risk levels on Cambodian communities is needed. Thereafter a risk management program that addresses community and national development needs must be designed. Finally, a revision of the national strategy and policies with end state programming for national institutions (CMAA, CMAC, RCAF and National Police) as the guiding principle to meet these challenges is necessary to shape the National ERW Response future.

The mine action sector has developed into a hybrid collection of agencies, with additional government agencies entering the field. Over a decade of development has created a national capacity for coordination and direct implementation of operations. CMAA legislative agenda is progressing enabling direct governmental oversight of the sector, although ability to coordinate the development of RCAF and National Police operations is questionable at this time. RCAF and the National Police will increasingly become key stakeholders and national service providers in their own right. However, their roles are complementary and ancillary to CMAA and CMAC’s main national service roles, which cannot be duplicated under the current level of national funding.

Defining the roles of stakeholders is critical in the final development of the ERW sector. Intervention/assistance priorities must stay the course following a decade of

capacity building with existing national service providers such as CMAA and CMAC. Changing development strategies creating parallel structures would dilute existing capacity rather than strengthening or preparing the sector for the future. The opportunity to structure a holistic government strategy inclusive of RCAF and the National Police that shapes the future for ERW Response in Cambodia is now.

Cambodia requires forward thinking leadership and innovative end state programming focused on developing national civil service organizations to address the longer-term national strategic goals and objectives. Change must be targeted at three levels simultaneously; strategic, institutional, and operational, embracing change dynamics while adapting to new ERW roles (See Part III Study Recommendations). Interventions by a progressive donor community providing targeted support thru incremental capacity building services aimed to build national self-sufficiency should be the motivating catalyst for transition.

Cambodia's last explosive remnant of war should be removed by a professional Cambodian ERW technician, deployed by his/her government, and supported by its treasury. Preparing for that eventuality is the responsibility of the RGC dedicated towards national capacity building, alongside a supportive international community.

All the aforementioned interventions are achievable with strong national leadership and donor community encouraging change and introducing innovative measures that benefit the ERW community as a whole. This National ERW Response Study starts the strategic dialogue for those changes to occur.

PART I: TAKING STOCK

Study Purpose and Background

This study was initially conceived through a consultative process with Cambodian Mine Action Center (CMAC) and Norwegian Peoples Aid (NPA) to review the explosive ordnance disposal EOD sector and later at the request of a supportive donor community broadened to incorporate a more holistic study of this sector.

The need for a deeper understanding of the mine action sector is based upon the innovative work investigating munitions tampering, and the shift from mine victims to unexploded ordnance related victims. This study is a logical progression investigating trends leading towards addressing the wider issues of explosive remnants of war (ERW) and looking at this sectors future once the landmine problem is largely resolved. Maintaining a policy for strengthening national capacity, NPA committed to a joint study with the Cambodian Mine Action Authority (CMAA) to develop strategic recommendations (Bonnet, 2005).

Originally, named the “National Explosive Ordnance Disposal Study”, this study evolved through a dynamic discovery process that revealed aspects of ERW, which constituted further definition and inquiry. This evolution resulted in addressing an extensive set of ERW related issues and consequently renamed appropriately, the “*National Explosive Remnants of War Response Study – Cambodia*”.

The purpose of conducting a “National Explosive Remnants of War Response Study – Cambodia” is to support the development of strategic innovation that meets the challenges of ERW response beyond the reduction of the landmine problem. The study was a phased participatory process spaced over the following periods:

- a. Phase I - Mobilization & Literature Review (30 Nov-10 Dec 05),
- b. Phase II - Review of ERW Systems Study at UXO Lao Sekong Province (11 Dec-18 Dec 05)
- c. Phase III - Data Collection & Initial ERW Workshop (03 Jan-27 Jan 06),
- d. Phase IV - Needs Analysis (27 Jan-24 Feb 06), and
- e. Phase V - Final ERW Workshop (24 March 06)
- f. Phase VI – Draft - Final Report Edit & Review (10-31 March 06)

The study team consisted of multi-disciplined professionals selected for their familiarity with Cambodian Mine Action sector development. Norwegian Peoples Aid contracted one EOD consultant as Team Leader (Dave McCracken), a development consultant (Bruce Powell) and a senior Cambodian Mine Action Authority (CMAA) official (Leng Sochea). Over the period January-March 2006, the study team met with a wide variety of national and international stakeholders traveling throughout Cambodia conducting field visits with organizations implementing EOD operations.

Study Composition & Objectives

The study is divided into three components addressing the main issues concerning development of the ERW sector in strategic, institutional and operational terms;

- a. Part I – Taking Stock,
- b. Part II – ERW Analysis & Needs Assessment,
- c. Part III - Summary of Recommendations, and
- d. References.

Working directly with the stakeholders the study team addressed relative issues from strategic to operational level developing a holistic understanding of the entire ERW sector in Cambodia. Specifically, these summarized objectives were addressed:

- a. *Objective 1* - To conduct an independent review and analysis of achievements and present challenges faced by the overall EOD sector in the country. Building on lessons learned from various operators' experience, mapping present capacity and thoroughly documenting best practices for the creation of an EOD national strategy.
- b. *Objective 2* - To provide an in-depth insight into the present EOD dynamics and investigate practical ways through which the EOD sector can best benefit from an enhanced collaboration between the various stakeholders and be grounded in the genuine participation of local communities. As such, the study will closely look into the potential involvement and coordination between other key stakeholders like CMAA, national police, RCAF (Royal Cambodian Armed Forces), local and national authorities, scrap metal dealers, development NGOs etc.
- c. *Objective 3* - To present recommendations as to future technical assistance requirements and strategic orientations for the future of the EOD sector with a focus on both medium and long-term financial and technical sustainability (Bonnet, 2005).

The complex environment to which Cambodian mine action has evolved comprises, organizational development, donor requirements, emerging technologies and methodologies all contributing to hybrid situation unique in the region. Influencing factors include culture, political instability, demographic changes, and economic difficulties all challenge this mine action community. A holistic understanding of the mine action sector is necessary to begin a review of the sector achievements and way forward.

The study started with a systematic plan including a rapid collection of available publications and papers for a formal literature review of the Cambodian mine action sector. The literature review spanned the breadth of strategic, institutional, operational data/information, planning documentation, technical procedures for mine action and EOD operations. The availability of policy papers, standing operating procedures (SOP's) and

operational reports enabled the study team to drill down in detail the workings and development of the mine action sector. The literature review underpinned the design process for primary and secondary key informant interviews, field visits and other information gathering activity. A comprehensive list of fully referenced sources is provided with this study.

The main field visit activities involved CMAC, RCAF, MAG, HALO and JMAS. and with secondary visits to key experts in specialized fields. Notably, the study team leader was experienced reviewing RCAF capacity to undertake Mine Action and EOD operations after conducting an in-depth analysis in Sept-Oct 2005. Data collection and analysis consumed a considerable portion of study time with CMAC and CMAA databases developing queries, extracting unprocessed data, and creating information. Additional data and information was provided by HALO Trust and MAG databases on their EOD and BAC operations.

This study was limited by the time allocated (52 days) to cover a diverse spectrum of unprocessed data available to the mine action community and the creative process of determining the needs for a futuristic ERW Response capacity. All objectives of this study received full attention within the limited time available for detailed investigation.

The strength of this study is the team's experience and understanding of the development environment in Cambodia. An open balanced approach with key informants and organizations during interviews created a sense of trust and credibility. Consequently, dialogue between key informants field operator and team members provided candid points of view and open provision of information.

Fundamental principle of this study was taking stock of achievements and current capacities in relationship to developing a futuristic ERW Response sector. Criticizing the performance of various agencies developing national mine action capacity is not considered constructive or warranted for the purposes of this study. This study does not intend to criticize individuals or portray organizations in a negative sense. Conversely, our intent is to provide informed constructive observations and analysis for the Mine Action sector to allow a strategic dialogue for the way ahead to create a Cambodian professional ERW Response.

ERW Contamination in Cambodia

The complexity of the explosive remnants of war contamination warrants a comprehensive overview that explains the environment in which it exists and organizations must function. Various accounts of historical conflicts and the mine action sector development exist, although few are fully informed or unbiased. This report intends to portray as accurately as possible the situation as it stands today.

A well-documented history of conflict in Cambodia and the Southeast Asia region exists covering wars lasting several decades (Chanda, 1986). The advent of modern warfare with massive use of landmines, land service and air dropped munitions created a human security dilemma in post-conflict Cambodia. Cambodia is among the Southeast

Asia nations most heavily contaminated by explosive remnants of war (ERW) countries in the world⁴.

Through extensive information sources on the various conflicts and data collected by agencies in Cambodia, an informed picture of the extent of ERW contamination is possible. This study is merely an introduction to the possibilities of information and knowledge that can be derived from an extensive analysis of Cambodia's rich data environment.

Origins and nature of ERW contamination in Cambodia

National and regional armed forces engaged in a series of deadly conventional and guerrilla warfare styled conflicts starting mid-century and eventually ending in civil war spanning a twenty-year period chronologically as follows;

- a. 1939-1945 - World War II,
- b. 1946- 1954 - French Indochina War,
- c. 1956-1975 - Vietnam War,
- d. 1975-1979 - Khmer Rouge Regime,
- e. 1979-1992 - Civil War, Insurgency Warfare and Factional fighting between VN Forces, CPAF, KPNLAF, ANKI and NADK⁵, and
- f. 1994-1998 - Civil War between RGC and Khmer Rouge remnants.

Resulting extended conflicts fuelled by massive use of munitions from Communist Bloc, and Western sources, combined with locally produced or improvised weapons and munitions created an unparalleled potpourri of explosive contamination.

Unique to the region is Cambodia's high level of landmine contamination. Combatants used this persistent weapon to isolate conflict areas and populations with barriers of mines. Cambodia also suffered from massive aerial bombardment during the Vietnam War contaminating large areas with an enormous amount of unexploded air dropped ordnance (Shawcross, 2002).

During these protracted conflicts warring factions abandoned munitions on the battlefields or in caches extending all over Cambodia. Smaller munitions caches abandoned on former battlefields are routinely found by mine clearance agencies and scrap collectors. Additionally, unused munitions from these conflicts sit deteriorating in dilapidated military stockpiles throughout the country. All these munitions pose a danger to communities and remain accessible to whoever locates them first notably the growing scrap metal collection industry. Apart from munitions are the weapons themselves. The

⁴ ERW includes all forms and types of munitions left behind in a post-conflict environment whether, unexploded or abandoned are categorised ERW according to the UN CCW Protocol V November 2003.

⁵ Vietnam (VN) forces formed the Cambodia Peoples Armed Forces (CPAF), whom jointly fought a protracted war against the Khmer Peoples National Liberation Armed Forces (KPNLAF), Army National Kampuchea Independent (ANKI) and National Army Democratic Kampuchea (NADK) commonly known as the Khmer Rouge (KR).

entire country armed itself during each of the conflicts with uncontrolled weapon distribution.

Human security of the general population continues to be adversely affected by ERW, particularly as land pressure increases as people move seeking livelihoods on land in former battlefields and minefields. The close proximity of hazardous areas to the population negatively affects the socio-economic structure of society. ERW impact is persistent forcing the population to either wait for mine action agencies to create space for living or accept personal risk entering hazard areas without assistance bearing the consequences to survive.

The majority of ERW contamination in Cambodia results from several distinct periods in the country's recent history. From the mid 1960's until 1973, the south, central and northeast provinces were pounded by US, South Vietnamese and Cambodian air forces intent on cutting North Vietnamese supply routes into southern Vietnam. As these campaigns ended, the Khmer Rouge stepped up their offensive against the Lon Nol Government. During this period, an extensive aerial bombardment campaign supported the Lon Nol Government as the Khmer Rouge forces closed on the capital. In 1975, having successfully routed the Cambodian Army from the southern, central and eastern provinces, the Khmer Rouge finally overran the capital, Phnom Penh and assumed control of the country.

Cessation of fighting was relatively short-lived. In response to repeated Khmer Rouge incursions into Vietnam and the unfolding humanitarian crisis brought about by Pol Pot's return to year zero, Hanôï acted in 1979 and launched a major offensive into eastern Cambodia. Overwhelmed by the speed and size of the offensive, the Khmer Rouge fled to the northwest corner of the country. Support by the Thai military, western countries and other Khmer factions such as KPNLAF and ANKI, a Cambodian resistance conducted a protracted guerrilla war against the Vietnamese Army and CPAF. Over the next 15 years a cycle of dry season offensives against the Vietnamese and CPAF continued until the early 1990's, and later a sporadic civil war between the RCAF and Khmer Rouge continued until 1998.

Starting in the early 1980s onwards, both Vietnamese and Cambodian militaries laid extensive landmine defences along much of the northwest Thai-Cambodian border. Known as the K5 mine belt, these defences constitute more or less a continuous field of mines running for approximately 700 kilometres. Further mine defences were also laid, as combatants from both sides retreated to secure ground following each dry season offensive. These sporadic and often overlapping mined areas spread across much of the country including extensive mine laying on infrastructure such as bridges and culverts. The concentration of mines is primarily in Pursat, Pailin Battambang and Banteay Meanchey, Odder Meanchey and Siem Reap provinces.

Scope of ERW contamination in Cambodia

Along with mine contamination, years of successive dry season offensives in the northwest and earlier periods of intense fighting during the rise of the Khmer Rouge,

have left vast areas of the country littered with all types of explosive remnants of war. The extent of this contamination is witnessed thru CMAC mine clearance and EOD operations west of Phnom Penh. This area has an extreme level of contamination, where on average CMAC encounters 30.6 abandoned ordnance (AO) or unexploded ordnance (UXO) items per hectare in Kandal and Kompong Speu provinces, the majority of which dates from Lon Nol times.

Similar operations have found averages of 7-9 items per hectare (numbers exclude munitions caches). The average number of AO/UXO found during all CMAC clearance operations is just over 18 items per hectare. Since 1993, CMAC has destroyed more than 850,000 items of ordnance; 630,378 by EOD teams and 223,077 during clearance operations (CMAC, 2006).

The other remaining form of ERW contamination is air dropped ordnance resulting from US bombing of Cambodia during the early years of the Vietnam War, and later, in support of Lon Nol forces engaged against the Khmer Rouge. Between June 1965 and August 1973, the South Asia Command launched 115,274 combat sorties against targets in the lower east, central and northeast regions of Cambodia. Several thousands of these were B52 and B57 strikes involving more than a million tons of general-purpose bombs (ranging from 500lb to 1,000 lb). A further 9,500 sorties comprised tactical air strikes, carrying up to 87,000 cluster bomb units⁶. Average payloads for these bombs were as high as 2100 individual bomb units (bomblets) per canister.

A USAF study designed to assess amounts of explosive placed within reach of enemy forces due to malfunctioning air ordnance (Study and Evaluation of Counter Mine Activities, SECMA, 1968) estimated that 5 percent of general-purpose bombs and up to 20 percent of cluster munitions may have failed to detonate as designed. This translates to potentially 50,000 tons of unexploded general-purpose bombs and 3.75 million unexploded cluster bomblets. All of these areas are now openly accessible to the Cambodian population exposing people to the hazardous explosive material.

ERW Data Sources

Over time, mine action organizations collected survey data with very different missions and mandates, these data sources range in quality from anecdotal experiences to

⁶ South East Asia Air Sortie Database (SEADAB) provides a highly useful but incomplete record of air operations conducted inside Cambodia. Although SEADAB records various attributes of 115,274 bombing missions and tactical air strikes conducted by the UASF South Asia Command in Cambodia from 1965 to 1973, 9,282 of these entries however have no location data. Equally, it does not record any missions by the South Vietnamese Air Force in eastern Cambodia or air operations of the Royal Thai Air Force in western Cambodia. It is also widely believed that USAF records for other areas of operations were deliberately falsified to conceal bombing activities conducted in eastern Cambodia, west of the permissible "Freedom Zone".

Level One Impact Survey (L1S) data⁷. Consequently, Cambodia has a diverse array of reasonable quality data, available for both strategic and operational planning. A holistic description of the Cambodia's ERW contamination has simply not been collated by any one organization. The seemingly intractable problem of determining the size and scope of the ERW problem can be resolved with minimal resources and inter-agency cooperation. Therefore, an understanding of existing survey information accuracy and its influence on national strategy and operational planning is crucial to finding solutions.

CMAC under UNTAC developed the first mine information database recording mined areas locations in preparation for the deployment of UN peacekeepers and electoral staff. The UNTAC Mine Liaison Team collected minefield tactical information from the three combatant factions CPAF, KPNLAF, and ANKI during 1992-1993. Unfortunately, the NADK never cooperated in this process until the collapse of the Khmer Rouge in 1998. These initial steps were supplemented by various agencies creating data for specific program needs such as the UNHCR rapid mine survey, conducted by HALO Trust of four northwest provinces in preparation for the 1992-93 refugee repatriation.

Important to note is the collation, and analysis of these two data sets (HALO Trust survey & UNTAC Mine Liaison Team factional mine information) into one mine data set with registered serialised/coded mine contaminated areas. This data set became the CMAC Mine Database used for the deployment of UNTAC to support the elections and eventually the national mine action database until the L1S and formation of CMAA.

During 1996-1998 period, CMAC conducted a limited mined area verification program in a few provinces visiting reported mined areas to determine information accuracy. Little documentation exists of this survey's results and consequently its accuracy was questioned due to limited training and quality control measures exercised in this project⁸.

At the conclusion of hostilities in 1998 with the former Khmer Rouge faction, CMAC conducted a rapid survey of the previously inaccessible regions of Pailin, and Anlong Veng. This data was added to the existing spatial database completing what is now called the "CMAC Database and in some cases the CMAC survey"⁹.

Culminating this ad hoc survey history, was the recognition for a comprehensive study of Cambodia thru a "National Level One Impact Survey (L1S)" to determine the extent of the socio-economic impacts caused by landmines and unexploded ordnance. The L1S was completed in 2002 by Geospatial supported by funded by CIDA (Geospatial, 2002).

During the late 1990's Handicap International Belgium (HIB) supported a Cambodian Red Cross project to carry out a comprehensive victim survey at village level.

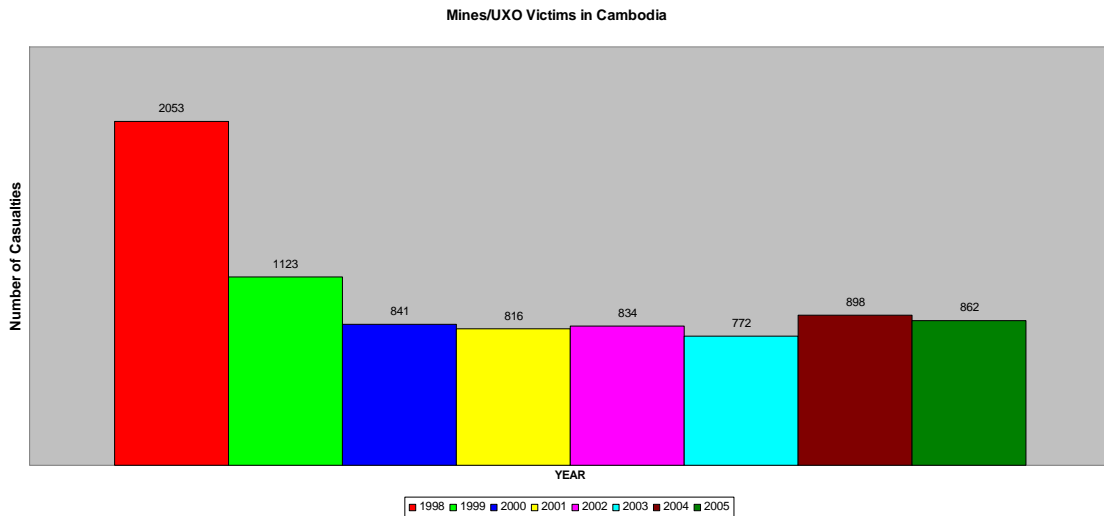
⁷ Strong controversy exists whether the Geospatial survey complies with UN survey protocols. For the purposes of this report, the Geospatial survey is a Level One Survey (L1S).

⁸ This survey became part of an information verification process confirming factional mine data handed over to the UNTAC Mine Liaison Team in 1992-93.

⁹ Notable that CMAC conducted a number of information gathering projects that serviced operational needs. None, of these surveys are conclusive in of themselves, hence the requirement to conduct a L1S.

The information collected is publicly available in the Cambodian Mine Victim Information System (CMVIS) database (CMVIS, 2004). Volunteers in a countrywide network continuously collect victim information. CMVIS is considered the most accurate depiction locating where mines and uxo directly impact communities as evidenced by casualties. Monthly and annual reports are accessible through the CMVIS website and distributed in hard copy; National victim results leading up to January 2006 are depicted graph below.

Figure 1 - Mines/UXO Victims in Cambodia



Mine action programs have contributed positively to the reduction of casualties in Cambodia starting in 1998 at 2,053 victims and reaching a consistent level of victims in the last six years of approx 800+ victims to 2005¹⁰.

In recent years, International NGO mine action operators MAG, and HALO Trust have added their survey and clearance information to the CMAA database. The deposits of LIS, CMVIS, CMAC and NGO data represents the best possible picture of the mine/uxo situation and impact on Cambodia's population. However, owing to a lack of trained Cambodian staff and resources, the existing data has not been fully exploited by thorough examination, collation and analysis. These various surveys can be described as data pools, which have not been integrated into a common data set and developed into information for analysis.

¹⁰ Statistics retrieved from the Cambodia Red Cross website, as of January 2006.

A summary of the available information is listed in Table 1 see below.

Table 1 - Summary of Survey & Data Sources Available in Cambodia

Survey/Data Collection	Timeframe	Collated w/ Existing Data	Analyses & Verification	Availability
UNTAC Mine Liaison Team Survey	1992-93	Yes	No	CMAC
HALO Trust Survey	1992-93	Yes	Yes	UNHCR – HALO - CMAC
CMAC Mine Database	1992-2006	Only UNTAC and HALO data	yes	CMAC
CMAC Verification Survey	1996-97	Only UNTAC and HALO data	Yes	CMAC
CMAC Survey Pailin & Anlong Veng	1998-1999	Yes	Yes	CMAC
MAG & HALO Databases	1998-2006	No	Local Operational Area	MAG & HALO
SEADAB	1965-73	No	No	USG – USAF- CMAC
FANK	1970-73	No	No	USG - CMAA
CMVIS	2000-2006	No	No	CRC-HI-CMAA
Level 1 Impact Survey	2002	No	No	CIDA- Geospatial- CMAA

Data available on ERW contamination does not end with this table other sources are now available in US Government archives. The CMAA GIS Database Technical Advisor has researched and located an extensive source of ground and air combat records that must be acquired for analysis (Thomas, 2003). To reach a comprehensive understanding of the ERW contamination facing Cambodia collation and analysis of these data pools is fundamental.

Organizational Capacity of ERW Response in Cambodia

In recent years, both national and international ERW service providers have added value to the sector. The mine action sector has matured allowing opportunity to reflect on achievements and explore groundbreaking innovations that will deliver ERW services better, faster and safer for national needs.

The sector development cycle has realised introduction and equipping of a full toolbox of resources. These recently introduced resources (mechanical assistance and explosive detection dogs) have not reached their full optimization to deliver high productivity, which eventually will dramatically change strategic outcomes in Cambodia.

The structure of complementary national and international organizations is fundamental to the success of the mine action sector and will be the basis for evolution into an ERW Response capacity. Therefore, a baseline understanding and stock taking of various organizations involved with ERW is necessary to determine where gaps exist and needs requirements for the future.

National ERW Service Providers

Council of Ministers (COM)

Prime Minister Hun Sen chairs the Council of Ministers (COM) as the authoritative body consisting of major ministerial representatives overseeing all mine action activities in Cambodia (RGC, 2000). The COM has two deputy prime ministers (vice-chairmen) with a varying number of ministers acting as an executive group. The COM directly administers the CMAA whose Director is the COM Secretary-General reporting to the Chairman.

The cross cutting nature of the ERW sector requires the capacity to interact with government at the inter-ministerial level. Through the COM the mine action sector has unique access and a regular venue for placing issues on the RGC agenda enabling the rapid promotion of mine action legislation developing the sector. The direct access arrangement is positive for implementing change and introduction of policies that will create an environment for ERW programs and plans to reach fruition.

Cambodia Mine Action Authority (CMAA)

CMAA was created to strike a balance between implementing agencies and a governmental body that could regulate the mine action sector without conflicting interests. Since inception, CMAA's main activity has been passing legislation establishing its primacy in the mine action sector (RGC, 2000).

In 2004, RGC passed a sub-decree on the Socio-Economic Management of Mine Clearance Operations (RGC, 2004). This decree effectively empowers CMAA and provincial authorities to direct the allocation of mine action resources, ostensibly thru the Mine Action Planning Units (MAPU) and Provincial Mine Action Committee (PMAC). The MAPU/PMAC are established in five north-west provinces/municipalities of (Banteay Meanchey, Battambang, Otdar Meanchey, Preah Vihear & Pailin). Additionally, CMAA has established the framework for national standards receiving RGC approval for the first component of the Cambodian Mine Action Standards (CMAS) in 2005 (RGC, 2005a).

After initially establishing its mandate and role, CMAA began setting out its national strategy in a Five Year Mine Action Plan (FYMAP) for 2003-2007, now superseded by a rolling strategic plan FYMAP 2005-2009 presented by CMAA in late 2004. The two key CMAA milestones reviewed in this study are, clearing high priority minefields by 2015, and Cambodia becoming "impact free" by the year 2020 (CMAA,

2005). CMAA refers to its strategic plan and a “rolling” document subject to change and review on an annual basis. This is a beneficial policy for creating a flexible environment for change to introduce the “End State Programming” required for a transitional shift towards an ERW Response community.

In 2005, CMAA’s mandate has been revised to reflect its expanding roles and responsibilities (RGC, 2005). These changes enhance CMAA governance capacity for the mine action sector and provide a good foundation for a shift towards National ERW Response. Additionally, the CMAA departments are reduced to five and more responsibilities are delegated to Deputy Secretary-Generals in their functional areas. CMAA is able to function through a government budget and donor contributions to the UNDP Trust Fund.

Cambodian Mine Action Center (CMAC)

CMAC was formed in 1992 as part of the United Nations Advanced Mission in Cambodia (UNAMIC) as the authoritative body to oversee all Cambodian mine action operations¹¹. Simultaneously, the Mine Clearance Training Unit (MCTU) was formed to train and field demining teams in support of UNTAC forces assisting UN sponsored national elections. In late 1993, MCTU merged into CMAC, which became the focal point for all mine action in Cambodia until 2001. The Royal Decree NS/RKT/0801/264 (dated 8 August 2001) revised the legal status of the CMAC and established it as “*a national institution to provide mine action services for humanitarian and development projects*”. These services included developing national policies on mine action.

CMAC is the national mine action service provider. Today, CMAC provides a full range of national mine action services including survey, clearance, explosive ordnance disposal, mine risk education, database, training and management. CMAC priorities as outlined in the Royal decree are as follows:

- a. Humanitarian purposes in high casualty areas;
- b. Economic purposes for the expansion of agriculture, rehabilitation, national reconstruction or development projects.

In 1999, CMAC suffered a crisis of confidence amongst the donor community over the use and allocation of land, demined by CMAC. This crisis resulted in reforms to the mine action sector, accelerating the formation of CMAA to assume all policy issues and changing CMAC into a purely operational mine action service provider. (RGC, 2000).

As a consequence of the donor confidence shake up the net mine clearance capacity of CMAC’s seventy-nine (79) platoons were reduced to forty-nine (49) platoons, laying off scores of deminers. The donor exodus shock traumatized CMAC affecting its ability to change or innovate without clear and direct guidance from the international community. CMAC has since implemented reforms in compliance with the donor

¹¹ Until the formation of CMAA regulating CMAC to a national mine action service provider in 2001.

community guidance and recovered from this organizational catastrophe with renewed donor support.

The donor community has invested in CMAC complimenting its manual demining teams with explosive detection dogs, and mechanical brush cutters. Today, CMAC has a tremendous toolbox capacity available for operations. The prime clearance resources are supported by skilled teams such as mine risk education teams (MRE), technical survey teams (TST), explosive ordnance disposal teams (EOD), and community based mine or uxo risk reduction (CBMRR & CBURR) networks.

Funding for CMAC operations by donors has formally been through the UNDP Trust Fund. Recently donors contribute directly to CMAC through bi-lateral mechanisms. CMAC staff is able to solicit the bulk of its operational requirements through bi-lateral mechanisms with the governments Japan, USA, Netherlands, Germany and Australia.

RCAF

Military factions from the CPAF, KPNLAF, ANKI and NADK have been merged together to form the Royal Cambodian Armed Forces (RCAF). Initially this transformation took place under the guidance of UNTAC at the end of the peacekeeping mission. Following the collapse of the Khmer Rouge political structure, NADK disintegration, and RCAF military pressure the Khmer Rouge joined the RGC in 1998.

During the UNTAC period, the various factions were tasked to clear up landmines in their respective areas of control. Most of the factions acted with reservation upon this request; however, some CPAF units actively removed mines experiencing heavy casualties. These operations were cut short to avoid undue loss of life without proper training and equipment.

The MCTU teams created during the UNTAC period were in fact soldiers from all factions except the Khmer Rouge. Eventually, these teams were demobilized after UNTAC's departure forming the core of CMAC's demining teams. This unofficial demobilization has been the only successful Disarming, Demobilization and Re-integration (DDR) process in Cambodia.

While, CMAC was absorbing demobilized soldiers, RCAF was assuming a national responsibility for security and defence of the nation, which included some responsibilities towards clearing mines and uxo. RCAF evolved during this period conducting tactical demining operations in support of war fighting operations against the Khmer Rouge. The US Department of Defense (USDOD) supported training and equipping of an RCAF Engineer Battalion with mine clearance capability. This technical and logistical support was removed following the political instability during 1997. Since, this time the RCAF Engineer Battalion capacity no longer exists, its soldiers and resources dispersed throughout RCAF structure.

Recent, RCAF operational reports to the Council of Ministers claimed enormous achievements clearing land and removing mines/uxo. RCAF claims supporting infrastructure and facility construction projects with mine clearance operations

throughout the country (RCAF, 2003). In these operations, RCAF claimed clearance of ninety-seven (97) square kilometres of land since 1992. CMAA and other mine action agencies requested RCAF to substantiate these statistics. RCAF has not been able to provide clearance reports or operational records as evidence of their operations.

In recent years, the World Bank and Asia Development Bank (ADB) provided repayable loans to the RGC to facilitate rebuilding major roads and some secondary routes. Loans are transferred to Ministries various ministries responsible for development. Mine clearance projects are then directly sub-contracted to RCAF.

In 2005, the Prime Minister ordered RCAF to clear rural roads as part of its mine action mandate¹². The most recent operations started in July 2005 with RCAF deploying demining teams to Siem Reap, Bantey Meanchey, Oddar Meanchey and Battambang provinces. RCAF's now defines its mine action role as clearance for infrastructure and development projects, such as rural road construction. During this study RCAF was tasked by COM to prepare clearance plans for the rail lines leading from Sisophon to the Thai border and Takeo to the Vietnamese border.

In a separate initiative, the RGC successfully lobbied the United Nations to include RCAF as part of peacekeeping forces. The UN responded by offering United Nations Military Observer (UNMO) positions to RGC on its missions. Supporting this initiative the Australian Defence Force trained a number of Cambodian UNMO's for deployment on UN missions, where recently RCAF officers have been posted to Sudan.

Most recently, the UN requested the RGC to provide a 135-man Military Demining Unit for the peacekeeping mission in the Sudan. RGC responded equipping and training a RCAF Demining Unit of company strength meeting stringent International Mine Action Standard (IMAS) requirements and deploying in February 2006 to the Sudan¹³.

National Police

The National Police has been working together with mine action service providers at the local level since 1992. These arrangements have mostly been security related although included direct liaison for clearance operations and information sharing.

The National Police are the main component of the European Union Small Arms and light Weapons (SALW) reduction program. This project offered local people the opportunity to obtain development funding for their village in exchange for handing over weapons to the authorities (Sinthay, 2003). The police network is an integral part of SALW project and likewise has recognised as a potential valuable asset to the CMBRR program.

The National Police appointed a representative for CMAA in September 2005 as part of their interests in joining the mine action sector. At the time of this assessment, the

¹² Statement by MGEN Sem Sovanny referring to his mandate for RCAF Engineering Branch responsibilities.

¹³ Study team witnessed final preparations of RCAF Demining Unit deployment for the Sudan Peacekeeping mission at Odong RCAF Engineer School.

national police role in mine action is increasing joining the CBMRR information network in collaborative operations with CMAC and enforcing the law as outlined in the Law on the Management of Weapons, Explosives and Ammunition (RGC, 2005b).

Institutionally the National Police are well suited for contributing to the mine action sector. The National Police are present in every commune with a communication network extending through district, provincial and national levels.

The capacity for the National Police to reach every mine or uxo affected commune is already in place. CMAC has capitalised on the police infrastructure through the CBMRR volunteer representatives to support its community-based mine risk reduction strategy (CMAC, 2002). The expansion of CMAC's successful CBMRR mine/uxo information gathering networks naturally include the National Police. In November 2005, CMAC provided mine risk education training to 182 police officers so that they can be included into the CMBRR program.

The CMAC and NGO experience of working with the national police is positive. Formalizing this relationship is in the best interest of the ERW sector as a whole. The National Police have proven to bring good value to the information and prioritization process. Developing a consistent reporting system that includes the national police would multiply the positive impact.

After several consultation sessions with the National Police, the study team observed a specific interest in developing EOD services, such as a "Bomb Squad" capacity for traditional police roles. Later, at the conclusion of the study the National Police presented a pilot project vetted through the Ministry of Interior to develop a National Police EOD response capability. This pilot project intends to train, equip and deploy National Police EOD teams into five provinces. This proposal will be presented to a Chinese government delegation visiting Cambodia in April 2006 as a request for bi-lateral support.

National Commercial Companies

The presence of national commercial companies is the subject of considerable discussion in the mine action community. This study was not able to pursue the shadowy nature of this unofficial sector. All inquiries meet silence at national coordination meeting on the nature, composition and authority in which commercial companies operate in Cambodia. Rumours abound that at least fifteen (15) commercial companies have received provisional licences from the CMAA for operating in Cambodia, renewable every six-months.

The recent UNDP "Clearing for Results" program, which has a quality assurance capacity-building component, may be the instrument that brings this underground component of the mine action sector out of the closet.

International ERW Service Providers

United Nations

The UNAMIC mission in Cambodia had the foresight to set up CMAC as a focal point to undertake mine action activities. UNTAC carried this concept forward to support the electoral process during its mandate. At that time, CMAC technical advisors attempted to find a United Nations body that could host the development of CMAC. UNHCR took up CMAC's request to support refugee repatriation from Thailand for a finite period 1992-93.

Post UNTAC withdrawal of peacekeeping forces, Handicap International Belgium sponsored CMAC to ensure it did not collapse. CMAC technical advisors managed to obtain 20 million USD in donor contributions to sustain CMAC mine action operations. It was at this time UNDP became interested in Mine Action and organized the UNDP Trust Fund under their management for CMAC in mid 1994. Since this period, UNDP has been responsible for the development of CMAC as the national institution to execute mine action in Cambodia. Owing to the aforementioned crisis in 1999-2000, CMAC reorganized to meet the demands of the donor community.

As CMAC developed into a nationally managed organization, UNDP adjusted its support to other priorities and such as CMAA development. Most recently, UNDP has created the "Clearance for Results" program initiated in early 2006.

World Bank & Asia Development Bank

The World Bank and Asia Development Bank (ADB) provide grants and loans to the RGC for a full range of development programs such as water management and road building. Loans are deposited into RGC ministry accounts after which development projects are competitively bid in public process. At this time, contracts for development demining have only been received by RCAF no other known bids have been awarded.

A recent ADB Partnership Fund deposited a thirty (30) million USD loan for rural road development in northwest Cambodia is having a direct impact on the mine action sector. Two million USD were allocated for mine clearance support to rural road construction projects and eventually awarded to RCAF through the Ministry of Rural Development.

It's noteworthy to understand that these contracts are awarded, without any known mine/uxo clearance standards or contractual obligations for safety. Based upon a slow legislative environment where the first five sections of the CMAS have only recently been issued this situation is not healthy for professional level management of the sector. Potentially this unstructured environment without standards and guidelines sets precedence for unsafe practices affecting the Cambodian population.

European Commission (EC)

The EC initiated the national regulatory concept developing and funded CMAA's implementation as part of the mine action sector reform. The EC has left the development of the CMAA to UNDP and diverted its assistance efforts on international mine action NGO's and support to the Small Arms and Light Weapons reduction programs in Cambodia.

Most recently as of 24 February 2006, the EC has announced a five-year assistance package for mine action in Cambodia. This initiative has not been fully investigated by the study team, however initial review of EC documentation indicates this contribution was developed in 2001-2002 and may in fact not reflect the dynamic changes and needs of the mine action sector in 2006 and beyond.

International NGO's

Handicap International Belgium (HIB)

HIB is a leading supporter in the mine action community and joined CMAC early in its development. HIB provided direct support services technical advisors at CMAC HQ and other Demining Units until 2000. Additionally, HIB contributed to the development of CMAC's by training and deploying Demining Unit #4. HIB development policy is to integrate and hand over all program resources to the host nation authorities within a reasonable development timeframe. All HIB/CMAC developed resources were handed over to national responsibility since 2000.

HIB has participated in several interesting studies on informal village demining and scrap metal collection (Bottomley, 2003). HIB is renowned for its development of the CMVIS program with the Cambodian Red Cross. Mine action stakeholders use the CMVIS as the main tool for prioritizing operations. HIB is currently reviewing the CMVIS program with a view to fully hand over to the Cambodian Red Cross.

Norwegian Peoples Aid

NPA began its mine action operations in northwest Cambodia developing several demining platoons in Bantay Meanchey Province. These teams were handed over to CMAC in early 1994, after which NPA continued to support national mine action development with technical advisory positions in CMAC HQ.

Today, NPA continues to directly support CMAC with Mine Detection Dog (MDD) and operational management technical advisors for the MDD program. This program is expanding the number of MDD teams supplied to CMAC. NPA is experimenting with long leash dogs and a uxo detection dog program.

NPA has developed an internal quality assurance process in Demining Unit #1, which has empowered local managers to define problems and create home-grown

solutions. Demining Unit staffs have taken ownership of the internal quality assurance accepting this method of working. NPA may extend this program with Japanese Government funding approval to support DU #2, DU#4 and DU#5.

Also, NPA is most noted for its continued technical advisory support to CMAC in the form of innovative studies that have resulted in successful programs such as the community based mine risk reduction program. NPA has received the blessing of the mine action community and CMAA to initiate this National ERW Response Study.

Hazardous Area Life Support Organization (HALO)

HALO Trust started its mine action activities in Cambodia conducting the first survey in 1993 of the four northwest provinces. HALO Trust continues to conduct mine clearance operations in northwest Cambodia. HALO uses CMVIS reports to focus its demining operations primarily working in high-risk casualty causing areas along the K5 mine barrier. HALO works with the PMAC/MAPU process when their priorities match CMVIS data and HALO needs assessment criteria.

HALO Trust has actively recorded the results of land reclamation in their areas of operation (Boulter, 2005). This has led to targeted deployments of their survey, clearance, and EOD teams into highly productive operations. The HALO Trust country representative is working with the CMAA, and CMAC actively promoting the recognition of area reduction by informal village demining and land reclamation.

HALO is very active supporting a working group to determine how land can be re-categorized from suspected mined areas to productive land after cultivation. This initiative will have a long-term impact on the direction of mine action operations in Cambodia.

Mines Advisory Group (MAG)

MAG continues to provide innovative mine action services using integrated multi-skilled teams. MAG primarily targets high impact areas providing the full range of mine action services in well thought out operations creating the greatest benefit to recipients. MAG uses CMVIS information collated with localized technical survey confirming the target areas on the ground ensuring maximum impact of every operation. MAG actively participates with the PMAC/MAPU process; however only deploy their mine clearance assets on meaningful tasks.

MAG uses mechanical assistance in their operations, and recently started using mine detection dog teams provided by CMAC. Initial reports from MAG are positive with claims of increased productivity amongst MDD supported teams.

MAG delivers mine action services for humanitarian and development priorities, servicing the wider assistance community in their areas of operations. The small multi-skilled team compositions allow rapid deployment to remote areas, servicing the

requirements of development agencies. MAG is a supportive and active participant in Cambodia's national mine action development.

Japan Mine Action Service (JMAS)

JMAS is active providing managerial, financial and technical support for six (6) CMAC EOD teams in central and eastern Cambodia. JMAS receives funding from the Japanese government for operational costs of CMAC EOD teams and provides three (3) EOD technical advisors to follow CMAC EOD teams. The JMAS project support started in 2002 with two EOD teams incrementally rising to six teams operating in Prey Vieng, Svay Rieng and Kandal provinces in 2004.

Retired Japanese Defense Force EOD experts, provide the technical advisory support CMAC EOD teams. JMAS program has added the community based unexploded ordnance risk reduction (CBURR) network to its operations. Initial results of the CBURR network are positive freeing up EOD teams to react to uxo reports rather than looking for uxo themselves. This network is based on the same principles as the CBMRR network used effectively in northwest Cambodia.

JMAS intends to continue operations in three provinces and expand the number of teams it supports depending on donor support.

Golden West Foundation

Golden West Foundation is developing a Explosive Harvesting & Recast System in collaboration with the Cambodian Mine Action Center (CMAC). This systems purpose is recovery of valuable explosive materials which can be re-used in mine clearance and EOD operations by national service providers and NGO's in Cambodia (CMAC, 2005).

The project is supported by US Department of Defense Humanitarian Demining Directorate research & development program. Starting in 2005 this experimental program has set up operations co-located with the CMAC Training Center in Kompong Chnang and begun developing special charges for demining and EOD operations.

The project has successfully recovered explosives from munitions provided by the RCAF, CMAC and NGO's. These explosives have been recast into special shaped charges and issued to operators in an ongoing field trial starting in January 2006. To date, thirty-six different special shaped charges have been designed and produced for trial and operations (Hess, 2005). The potential of this project to address the pressing shortage of high grade explosives is significant. Affordable high grade explosive is mandatory for successful mine action and future ERW Response operations in Cambodia.

Australia Volunteers International (AVI)

Australian Volunteers International (AVI) is currently implementing the Capacity Building in Mine Action Planning Project, with support from AusAID. AVI provides

technical advisory services developing national governance of mine action through the CMAA and Mine Action Planning Unit (MAPU) and Provincial Mine Action Committees (PMAC) in five northwest provinces. This NGO posts volunteers in each province to train, advise, and help formulate mine action priorities. This program enables better decision-making process from the commune to Provincial level. The capacity of decision makers is improving through the intervention of AVI support to MAPU/PMAC organizations and national staff¹⁴. AVI approach to directly working with government authorities developing national ownership of the ERW problem and creating capacity for good governance of the sector is unique amongst the international service providers.

PMAC/MAPU process developing provincial and municipal level governance of the mine action sector is progressing. Appropriate priorities for mine clearance are planned for community development and coordinated amongst local government offices for those areas in need. Mine action service providers generally support this process, as it develops. As the MAPU/PMAC process develops strength, mine action service providers will use this mechanism as a preferred method to long-standing methodologies working without good governance in place.

CMAC on the other hand undertakes MAPU/PMAC these tasks as priority in their role as national service provider. As a result, CMAC is routinely questioned by program monitors on the allocation of demining teams working in low priority areas according to CMVIS and LIS data. These questions relate to the use of demining teams in areas that do not synchronise with CMAC/CMAA mandates, national strategy and plans. In this respect, the connection between the Provincial level and National level (CMAA) is a rubber stamp process, which does not necessarily follow the goals or objectives of national plans or strategies.

Another key aspect of the AVI project is to improve information management and knowledge of databases thru the use of GIS. This capacity building is very valuable at the provincial/municipal level. The completion of the information/knowledge cycle also requires development at the national level where AVI is starting technical advisory support.

Linking governance development at the Provincial level with the national responsibilities of CMAA and improving the information/knowledge that integrates all mine action activities is the next level of capacity building challenge. The AVI Capacity Building in Mine Action Planning Project is providing valuable good governance development of the mine action sector and has high potential to continue it work developing sovereign ownership in National ERW response.

¹⁴ Correspondence with Scott Rankin and Andy Kervell April 2006, updating AVI programs and plans for future capacity building development in the mine action sector.

International Commercial

BACTEC

BACTEC is an accredited EOD/UXO company with the Australian Government Defence UXO Panel (DUXOP) and carries out work in SE Asia¹⁵. Starting in January 2006, UNDP contracted BACTEC to develop CMAA capacity for conducting national quality assurance monitoring as part of the “Clearing for Results” program.

Geospatial

Geospatial a Canadian commercial company contracted by the Government of Canada to support geographic information system (GIS) services for Cambodia. Geospatial and AVI have worked together to supporting the development of the MAPU/PMAC decision-making process.

Although the Canadian government continues to support mine action programs in Cambodia through Geospatial, recently funds supporting three (3) MAPU’s are directed thru the ADMAC Project. Geospatial continues supporting MAPU process indirectly while concentrating on other land titling related issues. Coordination and integration of Geospatial resources into a comprehensive development plan could have a positive effect on information management, operational prioritization and strategic outcomes in Cambodia.

QASIA

QAsia is a local company based in Cambodia conducting a quality assurance monitoring project for the US Department of State in its assistance program for mine action in Cambodia¹⁶. Primarily, QAsia has been contracted to conduct external quality control monitoring of US PM/WRA support to CMAC Demining Unit (DU) #3 in Pailin. QAsia also sells various types of mine clearance and EOD equipment to operators in Cambodia.

EOD & BAC Operations in Cambodia

Ostensibly, all programs in Cambodia have been “mine centric” in nature focusing for very good reason on the impact of landmines. This study investigative process focused on EOD and Battle Area Clearance (BAC) operations. However, investigation of EOD/BAC operations cannot be achieved without a holistic analysis of existing mine action operations.

¹⁵ Sourced through BACTEC website at <http://www.bactec.com/asia/index.htm>

¹⁶ Sourced through QAsia website at <http://www.qasia-solutions.com/pailinproject.html>

Initial UNAMIC plans for the UN mission in Cambodia included the requirement for mine clearance operations however, did not make provisions for developing an EOD capacity. This oversight was addressed through ad hoc measures stretching existing mine clearance budgets to develop the first EOD training and teams in mid 1993 by MCTU.

Dutch and Belgian EOD Technical Advisors trained a total of five (5) basic EOD courses until late 1998. In 1999, the first advanced EOD course was taught raising the level of Cambodian EOD expertise. As far as it is known, no more basic and/or advanced EOD courses have been offered since the departure of Dutch and Belgian EOD Technical Advisors in 2000 and 2004 respectively (Fiers, 2006).

Cambodian EOD teams and management received the highest ratio of technical advisory support of all components of CMAC on a continuous basis from 1993 til 2004. The result of this dedicated capacity development is Cambodian EOD teams operating almost entirely independently in successful operations all over the country.

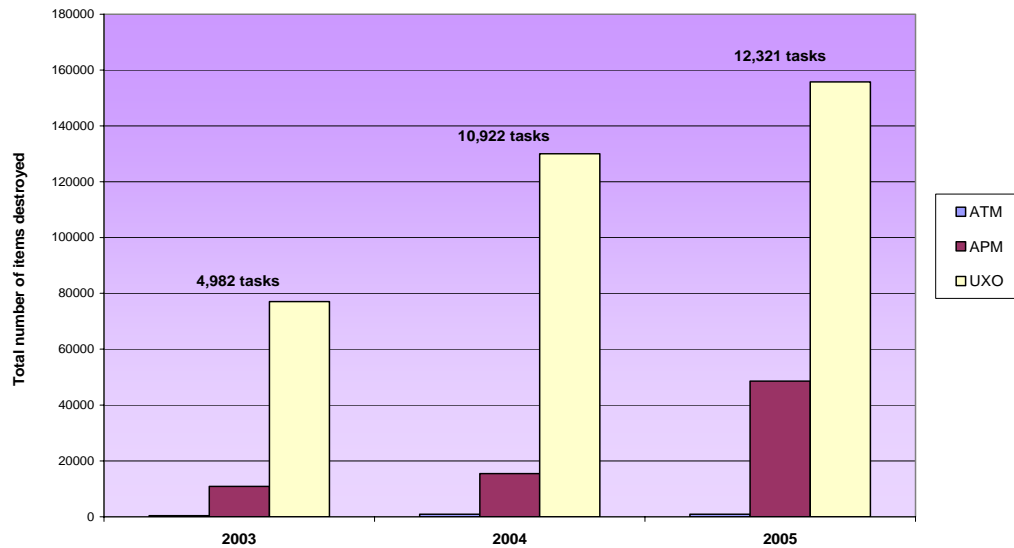
Battle Area Clearance (BAC) is nominally listed as a function for mine clearance teams to utilize under certain threat conditions. All operators in Cambodia have engaged in limited BAC operations where essentially a mine clearance team has been diverted to deal with an area of reasonably high ordnance contamination and lacking a mine threat. These operations are normally reported as mine clearance operations aggregated into standard reports at organizational level and national level reports to CMAA.

All organizations has provisional BAC SOP's that reflect minor changes from mine clearance SOP's and are equipped a limited number of large-loop and depth search detectors to enable these operations as required.

Operational & Technical Capacity

EOD operations have been highly successful since inception. The productivity of this small group of skilled operators has effectively removed at least two thirds of all ordnance located in Cambodia. CMAC and MAG have deployed varying numbers of EOD teams throughout the country for several years; with The Halo Trust following suite in 2003. Since then, the three operators have completed some 28,135 EOD tasks between them, destroying almost 440,000 items of ordnance in the past three year alone.

Figure 2 - EOD Outputs for 2003-2005



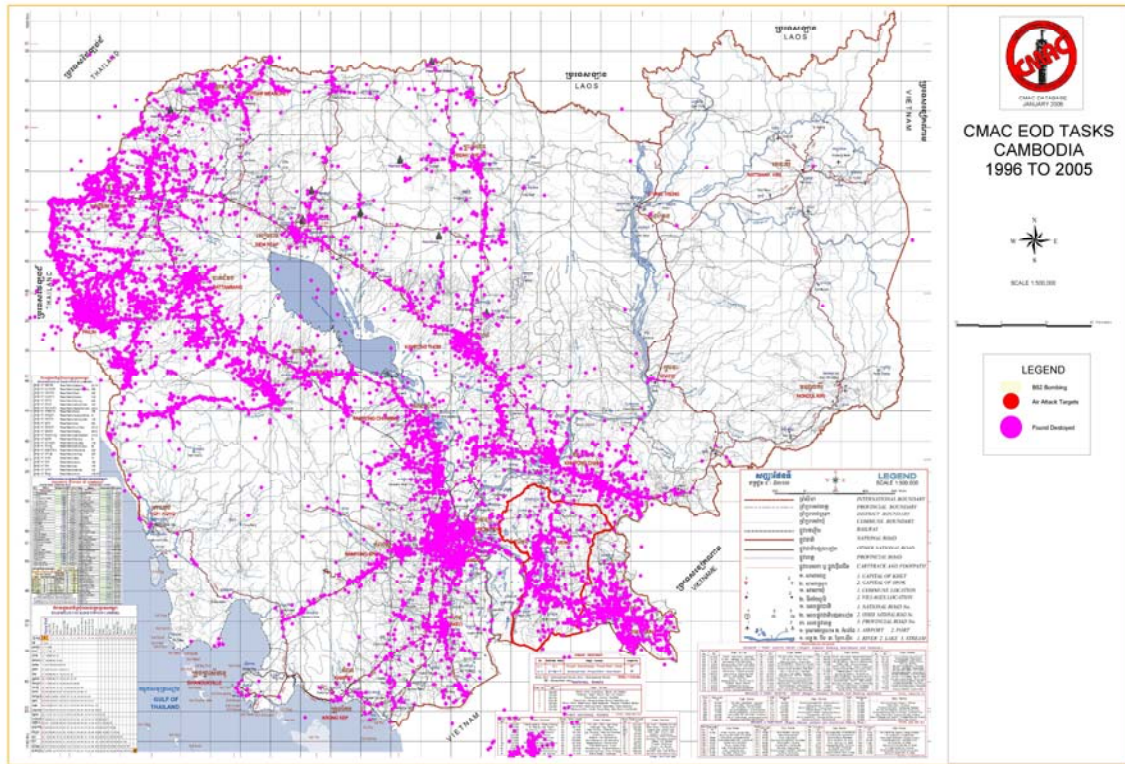
Note * Aggregated figures for CMAC, HALO TRUST & MAG, calculated over the past three years where all three operators statistics and record keeping were equal.

Due to the magnitude and level of threat posed by mine contamination in Cambodia, mine clearance operations have understandably taken priority over EOD. EOD operations has, and continues to be treated primarily as an ancillary service. Over the years however, operators recognized the need for a dedicated capability; one that was able to respond to random requests and deal with a wide range of the both land and air service munitions.

EOD teams are most commonly deployed on the basis of CMVIS casualty statistics; matched where possible, against each operators' own survey findings (technical or village surveying), LIS data and USAF bombing records. Within these targeted areas, teams often operate according to a set work plan, moving progressively from village to village or commune to commune, and responding to emergency tasks as they arise.

These tasks are generally requested through a range of channels, including direct approaches by villagers to the teams themselves or contact with their respective regional headquarters. EOD response requests are also made through local authorities, police, NGO staff, or village-based volunteers linked into a broader district-wide reporting network such as the Community-Based UXO Risk Reduction Program (CBURR).

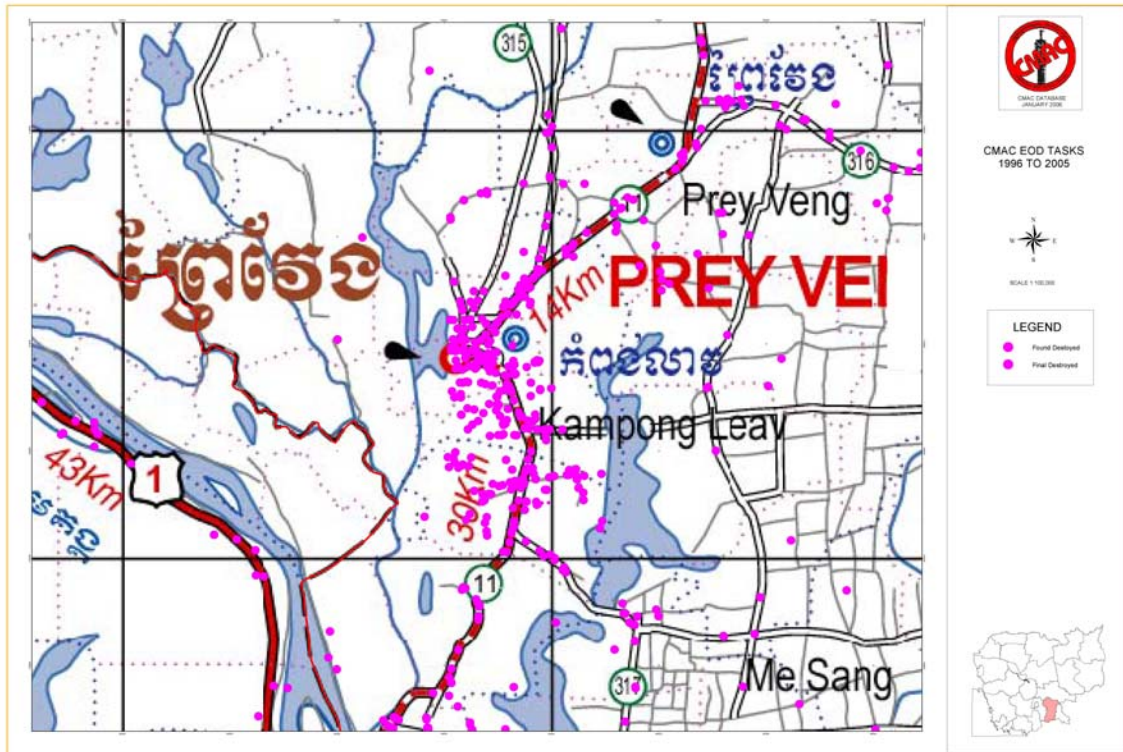
Figure 3 - CMAC Depiction of EOD Operations 1996-2005



This map emphasises the pattern of CMAC EOD operations since 1996 when operations were fully recorded in the CMAC database. Essentially, these operations are considered emergency response in nature, reacting to reports from communities and local authorities.

Although most EOD operations have up until the last few years, been primarily “emergency” tasked, CMAC/JMAS and MAG have begun to adopt a more methodical approach to dealing with ERW contamination. While still maintaining an “emergency response” capability, both operators have decided to focus resources on particular areas for a period of time and effectively “blitz” impacted villages. Evidence of these operations can be clearly seen from CMAC/JMAS records for EOD operations in Prey Veng province. Figure 4 below demonstrates recent operations in Prey Veng province targeting Kompong Leav for sustained EOD operations.

Figure 4 - Close up of CMAC EOD Operations in Prey Veng Province 2003-2005



During 2004-2005, the two CMAC/JMAS EOD teams operating in Prey Veang conducted a total of 245 tasks in just two districts¹⁷. Similar outputs are recorded for the MAG EOD teams operating in the northwest of the country.

The study team visited CMAC/JMAS, MAG and HALO Trust EOD teams in field operations. The differences between organizational technical procedures is minimal in nature, SOP's are similar and these teams on the whole operate relatively safely. However, the CMAC teams operate at a disadvantage with only three (3) EOD operators per team, which restricts their capacity to control access to demolitions when operating in populated areas.

Overall, the operational capacities of the EOD operators can be characterized as light responsive EOD operations capable of responding quickly to destroy or remove land service and small air ordnance (bomblets) from airdropped ordnance.

¹⁷ JMAS Annual Report, June 2004-May 2005, Phnom Penh, Cambodia. Undated

Table 2 - Summary of EOD Operational and Technical Capacity in Cambodia

Operational & Technical Capacity	CMAC	MAG	HALO	RCAF
EOD Teams	21 tms @ 3 men ea	up to 10 tms* @ 5 men ea	3 tms @ 5 men ea	0 0
EOD Training and Technical Advisory Support	✓	✓	✓	No
Detection Capacity				
Bomb Locators	✓	✓	No	✓
Large Loop Detectors	✓	✓	✓	✓
Metal Detectors	✓	✓	✓	✓
Disposal Capacity				
Electric Initiation	✓	✓	✓	No
Neutralization & Disarming Equip	✓	No	No	✓
Special Charges	✓	✓	✓	No
Bulk Demolitions capacity	No	✓**	✓**	No
Small Arms Incendiary Capacity	No	No	✓	No

*Note - MAG supports up to 10 EOD teams dependent on funding availability.

** Note - MAG & HALO have technical advisory staff to support bulk munitions demolitions other organizations lack training and experience in this specialty.

Nationally the maximum of 131 men are allocated to dedicated EOD teams. Each organization has a limited amount of enhanced detection capacity in bomb locators and large loop detectors suitable for EOD/BAC operations. Notably, is the lack of training or equipment for neutralizing or disarming techniques. Organizations that have .50 cal de-armers do not have access to specialized ammunition to support this equipment.

CMAC, MAG and HALO Trust have trained Cambodian EOD staff to use special charges effectively for demolition tasks. These organizations increasingly rely upon these techniques in light of a declining availability of high-grade plastic explosive. Goldenwest explosive recovery project is a potential source of high-grade explosive and special charges for the future. During the conduct of this report Golden West Foundation delivered its first experimental special charges to CMAC, MAG and HALO Trust for field trials, the results these tests are not finalised.

Bulk munitions demolitions requires specific training and careful execution of these delicate tasks. The RCAF recently requested support through the US Embassy to assist cleaning up some excess munitions at K86 ammunition depot in Kompong Speu province. HALO Trust assisted RCAF destroying large amounts of bulk munitions including anti-personnel landmines. HALO also purposely built a reinforced incinerator to efficiently burn large amounts of small calibre ammunition.

MAG and HALO have EOD qualified technical advisory staff to support training and other capacity building efforts. CMAC has a technical correspondence with their former Dutch and Belgium EOD technical advisors, however the training development link has been severed with the withdrawal of the Belgium contingent in 2004.

Community Risk Reduction Responses

By their very nature, large-scale technical surveys, mine and battle area clearance operations and area-wide EOD responses are logistically complex and relatively inflexible. They offer little scope for varying deployment plans mid-stream or diverting assets to other smaller tasks that may be identified. As such, there is an obvious need for mine action strategies to encompass a capacity to react to contain high-level threats or develop interim risk reduction measures until more comprehensive responses can be implemented.

Community risk reduction can therefore comprise a suite of responses, ranging from the deployment of small mobile mine action teams, to the development of community-based threat assessment, mine action planning and risk education. Community risk reduction in Cambodia has covered a similar spectrum of responses. Broadly speaking these can be broken down into four principal categories:

- a. Emergency mine action responses, comprising the deployment of small, highly mobile mine action teams capable of undertaking limited clearance and/or EOD tasks.
- b. Rapid mine action responses, comprising the deployment of slightly larger mine action teams capable of undertaking clearance tasks of up a hectare in size.
- c. Risk education, comprising integration of national mine/UXO risk education programs within primary and secondary schools; use of mass media and employment of mine/UXO risk education teams.
- d. Community engagement and mobilization strategies. Typically these are aimed at drawing affected communities into the assessment and planning of mine action responses. MAG utilizes mine action community liaison staff, while CMAC, as with the Cambodian Red Cross and other CNGOs have opted to use village-based volunteers or networks of volunteers.

Another dimension of community risk reduction that needs to be developed is that of institutional support from the national police. As recommended in the Tampering study, this should comprise:

- a. Establishing coordination mechanisms with mine action operators and scrap dealers; the latter with a view to monitoring and reporting ordnance in the scrap trade as well as enforce responsible purchasing practices amongst scrap collectors.
- b. Disseminating information and training key stakeholders in the legal framework governing weapons, explosives and munitions (mine action operators, police, local level authorities and scrap dealers).
- c. Standardizing police responses to ordnance reports.
- d. Formalizing the role of the police in national reporting structures.

Emergency and Rapid Mine Action Responses

The ability to deploy small, highly mobile mine action teams capable of responding to contained high level threats is an essential component of community risk reduction. Various modalities have been used in Cambodia over the past five to ten years, ranging from CMAC's five member Community Mine Marking Teams, capable of conducting small scale mine/UXO clearance, survey, long term marking, EOD and mine/UXO awareness education, to MAG's eight member Rapid Response Teams providing a similar range of mine action responses.

The success of these teams' lies in their ability to be deployed far more flexibly than larger demining platoons - this enables them to respond to a greater number of high impact tasks in a much timelier manner. Additionally, as the majority of these emergency tasks involve securing safe access to water points, farming lands and neighbouring communities, their impact goes well beyond immediate risk reduction and begins to address some of the major restrictions on daily livelihood activities posed by ERW contamination.

Combined multi-skilled teams with advanced EOD/BAC capacity is the way forward for dealing with the longer-term ERW challenges.

Mine/UXO Risk Education

Although the impact of mine/UXO risk education (MRE) on casualty reduction is often minimized among certain sectors of the mine action community, its importance in community risk reduction cannot be understated. Numerous KAP surveys and other qualitative research have clearly shown that MRE has contributed to improved awareness and adoption of safer practices among many populations, and as such should be treated as a valued adjunct to mine clearance and/or EOD activities.

Perhaps the greatest weakness in traditional MRE however is in the realm of affecting change in intentional behaviour, such as people who knowingly enter mined areas or consciously handle ERW. Most MRE in this respect is poorly lacking in understanding of behaviour change dynamics, and as such unable to develop effective alternative interventions outside of "abstention" messages (to draw a parallel with some of the more simplistic approaches to HIV/AIDS prevention education promoted by USAID among others).

Modifying intentional behaviour requires a markedly different approach to awareness raising and generic risk education. Reducing casualties resulting from intentional handling of UXO, particularly among children and adolescents, will require significantly more intensive and complex MRE interventions than are currently employed. As such, there is a palpable need to develop an appropriate knowledge base and practice of behaviour change theories and approaches among national MRE practitioners. Without this, most MRE in Cambodia will remain predominantly limited to various takes on information dissemination.

Another key issue in relation to MRE is the extent to which external agencies should be held responsible for conditioning behaviour within mine/UXO affected communities. As Moyes contends, "...Given the duration over which ordnance contamination is going to persist in Cambodia it is of fundamental importance to establish that the responsibility for transferring knowledge regarding dangerous items and for policing dangerous behaviours lies with affected communities themselves."

Moyes sees the role of external organizations as one of facilitating local discussion of risks and risk practices with a view to agreeing on "...a framework of what is and what is not considered acceptable and responsible behaviour." Behaviours that contravene this framework should be subject to social sanction. In this respect, "...communities need to be able to draw upon an effective and supportive response from the police in order to address problematic behaviour."

Community engagement and mobilization

All of the components so far mentioned are ultimately dependent on the effective engagement and mobilization of affected communities. Without this, vital local information will remain untapped, village resources under-utilized and community commitment essentially lacking. Various approaches have been explored, ranging from the use of mine action community liaison staff to village-based volunteers or networks of volunteers.

The most recent attempt to establish a system-wide approach to community engagement has been CMAC's Community-Based Mine Risk Reduction and UXO Risk Reduction Programs (CBMRR and CBURR). Established in late 2001, the CBMRR program comprises a network of 13 District Focal Points (DFPs)¹⁸ operating in 13 of the 30 most mine affected districts of Cambodia. In all, the program covers four provinces¹⁹ and a total of 99 villages, with two volunteers from each village forming a local mine/UXO committee. Similar committees have also been established at commune and district levels. Together, all three committees form the mine risk reduction network. The DFPS are managed by Provincial Coordinators and supported by two Training and Monitoring Officers; all operating out of their respective Demining Units. Overall management is through a Program Manager and Project Officer based at CMAC Headquarters in Phnom Penh.

Working in tandem, the CBMRR District Focal Points and Mine/UXO Committees (MUCs) facilitate participatory mine/UXO assessments at village level. This involves both spatial mapping of suspected areas as well as qualitative assessment of how this impacts the community. Information gathered not only serves to better inform a range of mine action interventions, from technical surveys and clearance tasks to risk

¹⁸ Many of these Focal Points have been recruited from Bureaus within the District Government, or from Provincial Departmental Offices. This is also the case with the CBURR program.

¹⁹ The program operates in Battambang, Banteay Meanchey, Krong Pailin and Pursat provinces.

education and victim assistance, but also assists communities in identifying and determining broader development needs and priorities.

One of the key products to come out of these assessments is a detailed map of the village and its surrounds. In addition to recording and locating village infrastructure, these maps also identify known and suspected contaminated areas and if possible, location of incidents and casualties. Together with the results of other Poverty Reduction Assessment (PRA) exercises, such as wealth ranking, population mobility mapping and village seasonal calendars, these maps offer a comprehensive assessment of mine/UXO vulnerability and have proved an invaluable resource to technical survey, clearance and EOD operations²⁰.

Given the success of the CBMRR program, CMAC agreed to auspice a local NGO, Kampuchea Mine Action Service (KMAS) to trial a similar approach in Angsnoul district in Kandal province, and Chba Mon district in Kompong Speu. The significant difference being that the new project would respond to UXO contamination. In July 2005, the project was expanded to a further 10 districts, including four in Svay Rieng and four in Prey Veng provinces. Funding for the project, now known as CBURR, has been secured through the Japan Mine Action Service (JMAS).

CBURR is similarly structured to the CBMRR program, utilizing a network of District Focal Points supported by commune and village based UXO volunteers. Unlike CBMRR however, the CBURR program is managed out of the CMAC EOD section and does not have specifically dedicated coordinators at provincial level, nor Training and Monitoring Officers. Another major difference between the two programs relates to their operational conceptualization and implementation.

While both programs share similar objectives, there is a marked difference in the nature and comprehensiveness of the responses. In essence, the CBMRR program engages community members in assessment and discussion of the problem, so as to better inform mine action interventions. On the other hand, Community engagement under CBURR is at this point primarily limited to villagers reporting the presence of UXO and fielding requests for EOD.

Although the program contemplates the development of risk education interventions and support to access victim assistance services, neither of these areas are particularly well-developed. Equally, there is little activity in terms of community assessment of problems arising from UXO contamination (there is no village mapping for example) and, as reported in a recent internal evaluation of the program²¹; the DFPs have tended to work in isolation of other potential reporting networks such as the national police. Many of these shortcomings may result from the relatively short training provided to CBURR focal points and that staff and volunteers have not been able to benefit from on-going formation and monitoring that their CBMRR counterparts have enjoyed.

²⁰ It should be mentioned that the MAG Community Liaison program uses similar methodology, as does World Vision Cambodia.

²¹ "Evaluation Report: Efficiency Task for 3 Months, July-September 2005. CBURR". CMAC, Phnom Penh, Cambodia. September, 2005.

As the recent CBURR evaluation demonstrates, CMAC are aware of some of the changes required and are working toward implementing these. What is unclear is whether CMAC recognizes the fundamental difference in the conceptualization of each program, and if so, what action is proposed to bring CBURR closer into line with its counterpart. What needs to be remembered is that the real strength of both programs lies in their ability to engage communities in responding to the comprehensive problems of mine and UXO contamination. The creation of district-wide UXO reporting systems is something that could, and ultimately should be developed through the National Police, with CMAC.

Training Capacity

Training capacity in Cambodia has been part of the mine action landscape since the UN intervention in 1992. Initially, the training centered on MCTU activities preparing demining units to support the elections. Later, the first CMAC Training Center (TC) was established in Battambang. This center was destroyed in the fighting during the Khmer Rouge assault along National Route #10 in 1994. The CMAC TC was re-located north of Phnom Penh at the former UNHCR Returnee Reception Center, finally, the present CMAC TC is located in Kompong Chnang.

The CMAC TC has a history of training all manner of mine action courses, however this study only focused on EOD training. As depicted in Table 3, the majority of training has been conducted by Dutch & Belgium EOD Technical Advisors assisted by Cambodian EOD operators and managers. The development of a dedicated EOD Training School was funded by the German Government and initiated in 2000, however this effort has not received funding to sustain its development. Under a series of funding restrictions, CMAC has not been able to support a dedicated EOD School.

Table 3- Dutch & Belgian Supported EOD Training for CMAC 1993-2000

Type of Training	Training Center (TC)	Instructors Netherland (NL and Belgium (BE)	No of Students	Date
First Basic EOD course (4 wks)	TC Battambang	NL Air Force EOD	± 6	Early 1993
Second Basic EOD course (6 wks)	TC Phnom Penh	NL Army EOD	± 12	May 1994
Third Basic EOD course (6 wks)	TC Phnom Penh	NL Army EOD	± 12	Dec. 1995
Fourth Basic EOD course (6 wks)	TC Kampong Chnang	NL Army EOD	± 12	Feb. 1998
Fifth Basic EOD course (6 wks)	TC Kampong Chnang	NL Army EOD and BE Army EOD	± 12	Nov. 1998
First Advanced EOD course (3 wks)	TC Kampong Chnang	NL Army EOD and BE Army EOD	± 12	1999
			66*	

* Note - Five basic courses and one advanced course totalling (66) trained Cambodians (Fiers, 2006).

The only Cambodian institutional EOD training capacity in resides within CMAC EOD management and operational teams. This limited pool of trained personnel is fully engaged in operations and does not maintain a training capacity. Training aids,

instructional tools, lesson plans and curriculum have been fully developed during CMAC EOD experience over a decade. However, these assets are degrading owing to the ad hoc nature of sustaining EOD training expertise.

A recent basic EOD course was put together to cross-train CMAC MRE teams into multi-skilled EOD Response teams. The instructional cadre were brought from CMAC HQ and field units to develop the course and provide training.

Unfortunately, these makeshift arrangements do not encourage the best practices of professional level training for the sector. Overall, the training capacity in Cambodia is deteriorating due to the lack of investment in training facilities and “train the trainer” programs.

Donor Interventions & Funding Environment

Owing to the high cost of mine clearance and the fact that such operations have been funded for over a decade in Cambodia, many observers believe that there is an element of “donor fatigue” emerging and that levels of funding will certainly begin to wane. Adding to this likely decline, is the realization that with better surveying and improved clearance methodology, most of the remaining high impact tasks, particularly those located in the K5 area, could feasibly be completed in five to ten years.

If there are sufficient indications over the next few years that this projection is realistic, then it is highly probable that mine action funding will begin to significantly scale down. It appears that the RG holds a similar view and is preparing to assume responsibility for mine action from 2015 onward.

There is a very real risk that as the number of high impact tasks decreases, along with an attendant drop in national mine casualties that donors may declare, “mission accomplished” and begin to redirect funding elsewhere. It is imperative therefore that the mine action sector in Cambodia be able to effectively scope a well-informed and cost effective national strategy for addressing remaining ERW contamination.

Despite these projections however, CMAC, MAG and HALO Trust have all been able to significantly expand their operations over the past four to five years. This would appear to confirm their ability to capture mine action funds within a relatively competitive world market. It may also suggest that donors are becoming more cognizant of the need to capitalize on past investments. Whichever the case, the recent \$16 million USD equipment grant awarded to CMAC by the Japanese, and a smaller, but similar grant provided to MAG, may in fact represent the last of the major funding for capital expansion in Cambodia.

Of all operators, CMAC has been the most successful in transforming its primary funding base, shifting from reliance on the UNDP Mine Action Trust Fund for the majority of its funding in 2001, to drawing most of its funding from bilateral sources in 2004. At the time of writing, 18.6 million USD had been committed to fund mine action

operations²² during 2005-2006 fiscal year. This is somewhat down on 2004-2005 funding which amounted to just over 36 million USD, though 16 million USD of this consisted of a one off grant to CMAC for expansion of capital equipment²³.

Historically, funding for mine action in Cambodia has typically included support for:

- a. Mine clearance, survey, MRE and EOD operations,
- b. Institutional support for the national regulatory authority, CMAA; and provincial mine action planning units, MAPUs,
- c. Operational support for socio-economic planning and management of cleared lands,
- d. Maintenance of the Cambodian Red Cross Cambodian Mine Victim Information Service (CMVIS), and
- e. Provision of victim assistance services and sectoral research.

Direct funding assistance is commonly augmented by in-kind technical support to CMAC provided from Belgium, Japan, New Zealand and US and on-going institutional support to RCAF, CMAA and CMAC from the Royal Government of Cambodia. Funding has been provided in two ways: direct grants to national and international mine action agencies and development organizations, and through the UNDP Mine Action Trust Fund. Contributions to the Trust Fund have been used to fund mine action operations as well as generalized institutional support, as in the cases of CMAC and CMAA.

CMAC, the Halo Trust and MAG have been the main recipients of mine action funding, with CMAC receiving close to USD 10 million per year in overseas development assistance since 2002. Government funds or proceeds from World Bank and ADB development loans have been utilized to fund clearance for road construction and other rural infrastructure development conducted by the RCAF.

CMAC

In addition to the cash contributions described above, CMAC's resources are augmented by in-kind contributions from several donors. In 2004-2005, for example, the Japanese Government provided brush cutting, transport and protective equipment worth \$16.0 million. Belgium, Japan, New Zealand and US have been providing technical advisors in such specialties as disposal of explosive ordnance, training, logistics and information technology.

²² This amount was derived from figures provided by operators and UNDP. It is not indicative of total mine action funding, which would include resourcing of the CMAA, PMACs, MAPUs as well as other mine action related entities such as CMVIS, etc.

²³ Source: "Joint Evaluation of Mine Action in Cambodia for the Donor Working Group on Mine Action", R. Griffin & R. Keeley, 2004 (this figure includes 16M USD grant from Japan to CMAC for the purchase of capital equipment).

The HALO Trust

For the current year, the Halo Trust is receiving grants for mine action from six bi-lateral donors and five international NGOs. The Trust's budget for 2006, which cannot be precisely calculated as some project budgets are not on a calendar year basis, is estimated at around \$4.13 million USD.

MAG

MAG also has diverse funding base, receiving grants from six bi-lateral and multi-lateral donors and four international NGOs. MAG's 2005-2006 budget, which like Halo's is difficult to calculate for the calendar year, is in the vicinity of \$2.46 million. In the case of MAG's NGO donors, funding is provided as a fee for services. The NGOs hire MAG to clear mines in designated areas where they are implementing development projects. These arrangements are established as partnerships based on memoranda of understanding rather than as commercial transactions.

RCAF

World Bank and Asian Development Bank reported that their rural road rehabilitation loans require the Government to undertake mine clearance for road right-of-way. Thus, it appears that RCAF is funded directly by the Government from loan proceeds or counterpart funds. The mechanism by which the Government provides funds to RCAF to undertake mine clearance is unclear.

PART II: ERW ANALYSIS & NEEDS ASSESSMENT

Potential surface area affected by ERW contamination

With the exception of CMVIS data all surveys in Cambodia are criticized for accuracy depicting ERW contamination in terms of density, size and location of areas. Inherent with unprocessed data are problems of accuracy and reliability to develop strategic projections or detailed operational planning. Regardless of accuracy or reliability, the compilation of available information affects all planning, budgeting and operations. Although these factors do not cripple the value of the data, as strategic planning tools it is necessary to consider the accuracy of current national strategic projections and planning using data without full analyses.

This study found that throughout all the surveys, with exception of the original UNTAC Mine Liaison survey, at no time were the former armed factions seriously involved in the survey data collection processes. RCAF military officers demonstrate clear knowledge of the mine laying plans and operations during the war period²⁴. Delivering, emplacing and managing the huge K5 mine barrier on the Thai-Cambodian border required military administration, logistics and record keeping. The RCAF is an information source not fully exploited, which could have potential cost saving benefits relieving unnecessary technical survey and mine clearance operations.

In 2000, Geospatial International began a nation wide survey tasked with assessing the scope and impact of ERW contamination in Cambodia. As with other National Level One Surveys (L1S), the Cambodian exercise attempted to cover the entire breadth of the country, visiting every registered population centre. In all, the survey teams visited 13,908 villages located across Cambodia's 24 provinces (Geospatial, 2002). The results of the Geospatial survey are widely criticized for its social-economic impact incompleteness, limited mine action community involvement and poor distribution (EC, 2003). Some members of the mine action community question the currency and utility of this information.

The Landmine Monitor records mine action data since 1992, and describes the contamination in Cambodia prior to the L1S;

“In 1998, 1,249 known new casualties occurred. More than 644 square kilometers of land is known to be mined, and another 1,400 square kilometers is suspected to be mined. In a country where 85 percent of the population is dependent upon agriculture or related activities, such a contamination represents a massive restriction of Cambodia's economic base.” (ICBL, 1999)

Differences between the 1998 data and the L1S completed in 2002 are dramatic. The 2002 survey shows 3,037 suspect mine/uxo areas throughout Cambodia a 100% increase from the 1998 figures. The surface area recorded equals 4,466 km² twice the original 1999 estimate. Its entirely possible that mine contamination information

²⁴ RCAF staff claim records exist in Cambodia and Vietnam for logistics and mine laying operations in the K5 border areas.

available prior to the L1S is a not collated and analysed with the UNTAC Mine Liaison Team and HALO Trust surveys.

This study observed that both the CMAC database and L1S data are used simultaneously, to develop information or record data. This two very different data sets with entirely diverse levels of accuracy are not compatible for strategic or operational planning. Adding to the potpourri of data sources and usage, CMAC conducted some limited impact survey of its own in 2002, this exercise was primarily restricted to gathering further information on selected areas. It appears that CMAC uses both data sets in tandem. Information management across the mine action sector in Cambodia is poor.

Despite contentions about the accuracy and utility of estimates reached by the Cambodia L1S, it nonetheless represents the only nation-wide appraisal of ERW contamination in the country, and as such, the only comprehensive baseline of its sort.

At the conclusion of the survey in 2002, the L1S had identified 3,037 ERW affected areas, covering some 4,544 kms² or approximately 2.5 percent of Cambodia's total land surface. The authors of the L1S admit that the survey "...questionnaire is not well designed with respect to contamination and its quantification". The database query application will sort and aggregate numbers of affected areas, but not the spatial estimates of contamination (GIS area). This is only possible through directly querying individual village records within the database files, in many cases field by field. Doing this however allows the total estimated affected area to be separated into three main categories:

- a. Suspected mine contaminated land (3,214 kms² or 71 percent of total L1S suspect area),
- b. Land suspected to be contaminated by air service cluster munitions²⁵ resulting in socio-economic impact²⁶ and/or spot UXO (270 kms² or 6 percent of total L1S suspect area), and
- c. Land suspected to be contaminated by a mix of mines and various types of land and air service battle debris (1,060 kms² or 23 percent of total L1S suspect area). This last area can be broken down into three further sub-categories:
 - Land affected by mines and battle debris, predominantly spot distributed land service munitions (697 kms² or 15 percent of total L1S suspect area),
 - Land affected exclusively by land service munitions (13 kms² or 0.3 percent total L1S suspect area), and
 - Land affected by mines and non-impact cluster munitions (350 kms² or 8 percent of total L1S suspect area).

²⁵ The L1S did not query respondents about other types of air ordnance contamination.

²⁶ The L1S uses socio-economic indicators to define impact from cluster munitions. These include restricted access to agricultural land; pasture land; water sources; forest (gathering activities); existing homes; potential housing land; health centers; markets; pagodas; canals and other irrigation infrastructure; bridges; business activities; neighbouring villages; school and other.

Over half of the area under the first and second sub-categories (i.e land affected by mines and battle debris or solely by land service UXO), is located in the northwestern provinces of Battambang, Otdar Meanchey, Banteay Meanchey, Pailin and Pursat. Other impacted provinces include Kampong Cham, Kompong Thom, Kampot and Kompong Speu (accounting for 21 percent). Only 11 percent of land area under this sub-category falls in the northeast of the country.

Almost 40 percent of land under the third sub-category (i.e. affected by mines and non-impact cluster munitions) lies in Koh Kong, suggesting that the border province may have been used as a drop zone for returning US and Thai aircraft that failed to reach their targets inside Cambodia or Laos. The remaining area in this category, totalling some 215 kms² is largely spread across Kompong Cham, Kompong Thom, Kompong Speu and Kratie provinces. Close to 90 percent (238 kms²) of LIS areas affected by cluster munitions resulting in socio-economic impact are located in the central and northeastern provinces of Steung Treng, Ratanak Kiri, Kompong Cham, Kompong Thom and Kratie.

Table 4 - Breakdown of LIS mixed contamination areas by type of ordnance (Land vs Air)

LIS areas estimated to be affected by mixed mine and land service AXO & UXO contamination (excluding impact air service cluster munitions)			LIS areas estimated to be affected exclusively by impact air service cluster munitions & spot UXO		
Province	N ^o areas	Area km ²	Province	N ^o areas	Area km ²
Battambang	307	314	Stueng Treng	26	106
Otdar Meanchey	119	84	Ratanak Kiri	20	44
Banteay Meanchey	94	82	Kompong Cham	78	34
Pursat	75	60	Kompong Thom	70	32
Pailin	62	37	Kratie	16	22
<i>Other areas of significant contamination</i>			<i>Other areas of significant contamination</i>		
Kompong Cham	136	71	Kandal	76	7.5
Kampong Thom	111	67	Kompong Speu	44	7.5
Kampot	103	40	Preah Vihear	22	7
Kompong Speu	175	42	Svay Rieng	4	4
Total n^o areas/km²	1531	1060	Total n^o areas/km²	396	270

Likely Surface Area Affected by ERW Contamination

CMAC, Halo Trust and MAG have all initiated technical surveys (TS) of their own as a means of providing more detailed and robust planning information. These technical surveys are a result of the rapid reclamation of land by local people in previously suspected mined areas. CMAC has the largest dedicated technical survey capacity of all operators. During 2005, it conducted 13 technical surveys of high casualty

villages located in nine provinces. These surveys comprise area verification, quantification and designation exercises.

The first step involves reviewing LIS and CMAC's own Impact Survey data for a particular area; drawing in additional information derived from CBMRR village mapping and PRA impact assessments, CMVIS casualty data, and primary information from key village informants. This exercise is conducted in-situ. On the basis of this review, areas designated by the LIS or CMAC's own Impact Survey as "suspect", are either validated or removed from the list. CMAC refers to this as their 'First Technical Survey'. Most of the area removed during this process of information reduction comprises land that has been used without incident for several years and is considered by the local population as posing negligible risk.

During this process concerns rise about spatial and geographic accuracy of LIS data with a growing ratio of clearance operations that are falling outside LIS survey areas (currently estimated to be anywhere from 30 percent to almost 60 percent²⁷). Although not fully investigated during this study these additional suspected areas are most likely a product of operators not having access to uniform set of collated data and an expected limited accuracy of the LIS²⁸.

The next stage of the technical survey involves physical verification of the remaining suspect areas through the use of breaching lanes. Mechanical assets and mine detection dogs (MDD) are available but not widely deployed in support of TS. During this phase, areas are classified into three categories:

- a. Confirmed contaminated by mines,
- b. Suspected mined, and
- c. Residual mined (i.e. land presently used for housing, cultivation or other uses, where there has been historical or physical evidence of mines, but no subsequent incidents or items found within the past two years).

It should be noted here that these technical surveys are primarily focused on identifying and delineating high threat areas primarily contaminated by mines, not necessarily ERW, which are generally treated as lower risk.

Technical Survey & Area Reduction Analysis

Illustrating the need for area reduction and enhanced technical survey of mined areas is an analysis of a series of CMAC technical surveys conducted in 2005.

²⁷ Estimates derived from CMAA and the report, "Joint Evaluation of Mine Action in Cambodia for the Donor Working Group on Mine Action": Robert Griffin. R, Keeley. R, December, 2004. Phnom Penh, Cambodia

²⁸ LIS survey teams spent little more than a few hours per village to complete a national survey of +3000 villages. Accuracy of information is expected to be $\pm 70\%$, reasonable for strategic planning and limited operational deployment planning.

Nine of these 13 technical surveys were conducted in villages surveyed by L1S; the other five were presumably conducted in areas covered by CMAC's own Impact Survey. Within these nine "L1S" areas, CMAC reports to have reduced the original suspected surface area by 35.2 kms², from original targeted 66 kms² designated for area reduction through technical survey. Within this 35km² area, the technical survey teams identified 228 individual suspected mined areas.

These outcomes would appear to substantiate claims that L1S spatial estimates are overly inflated, in this case, by more than 100 percent. The L1S however only covers seven of those nine villages, comprising a total suspect area of 41kms², not the 66 kms² the TS attributed to the Level One. It can only be assumed that the remaining 25 kms² has been derived from CMAC's own local Impact Survey and added to the L1S estimate²⁹.

The two sites, where this appears to be the case are O' Ta Mou and Ta Ey villages in Svay Teab district, Svay Rieng province, and Thmal Keng village in Sala Krau district, Pailin (Ta Ey village doesn't appear in the L1S, so it is assumed that it adjoins O' Ta Mou and has been settled since the L1S was completed). The L1S estimate for these sites is 16 kms²; the CMAC L1S attributed estimate is 43 kms². The remaining 7 km² differential is from the two other sites surveyed, Phum Ou and Phnom Touch villages in Kamreang district, Battambang province, which although attributed to the L1S, do not appear in the December 2002 version of the database. Excluding these and other similar anomalies evident in the 2004 report, it is still useful to look what the CMAC Technical Survey Teams were able to achieve with respect to reducing actual L1S estimated areas.

Through both technical survey exercises (information reduction and physical area reduction), the teams reduced the seven L1S areas from the original estimate of 41 kms² to 30 kms². A further reduction is possible by excluding areas classified as residual, bringing the total area reduced to 31 kms². This represents a 29 percent reduction of the overall original area. In addition, the teams were able to categorize areas far more definitively than the generic 'suspect' classification provided by the L1S, in all delineating 120 confirmed mined areas, 175 suspect areas and 62 residual areas.

While it is difficult to draw any firm conclusions about the scope of potential overall area reduction, TS outcomes to date do suggest that the L1S spatial estimates may be inflated by up to 30 percent in some cases. An interesting correlation that may support this hypothesis is the degree of difference between L1S area estimates of impact cluster munitions and those derived from SEADAB bombing records. Table 5 represents an estimate of area affected by multiple cluster munitions strikes within 500 metres of a national and/or rural road (proximity to national and rural roads being the closest possible measure of impact accordant to L1S criteria).

²⁹ Use of multiple data sets, not been codified into a common register of suspected contaminated area complicates analytical comparisons.

Table 5 - Comparison of SEADAB records vs LIS estimated surface area affected by single and multiple cluster munitions strikes.

Affected Areas & Population	Hectares	Square Kilometres	# of People
Total LIS estimated area reporting cluster bomb impact	27,000	270	
Total LIS estimated area reduced by 30%	19,000	190	
Total area affected by more than two cluster munitions strikes ³⁰	48,370	483.7	
Total area affected by more than two recorded cluster munitions strikes & located within 500m of a national rte or rural road ³¹	19,357	193.5	
LIS affected population			141,847
Estimated affected population from “Landscan” imaging			106,507

* Excludes cluster munitions types: BLU27 & 32b Firebombs, CBU222 INC Smoke and anti-riot. Source: USAF Bombing Missions 1970-1975, SEADAB

As can be seen in the table, reducing the LIS estimate by 30 percent brings it almost exactly into line with alternative estimates derived from the SEADAB. While there is a 50 percent probability that this correlation purely coincidental, there is an equal probability that it is not. For this reason, there is a strong argument for further triangulation of available data to provide informed estimates of area affected and better quantification analysis of the LIS overall. Similar estimations of area contaminated by battle debris (such as those affected “spot” and “field” contamination) may be possible through analysis of several other data sets held by the US National Archives (NARA)³² and unreleased military records of the Vietnamese and Cambodian governments.

Taking this alternative cluster munitions estimate into account and applying a potential area reduction of up to 30 percent, the total LIS area can be reduced to just over 3200 kms² (a reduction of 1,340 kms²). Given current mine action priorities, it is likely that most of this reduction will be achieved primarily in mine suspected areas. The remaining areas represent Battle Area Clearance (BAC) tasks; the potential scope of which is discussed below.

Possible scope of Battle Area Clearance and EOD

Using the LIS and SEADAB, it is possible to draw some estimate of the total area possibly affected by mixed contamination. As already mentioned, the LIS estimate of area affected by impact cluster munitions and spot UXO lies somewhere between 190 km² (assuming a 30% area reduction) and 270 km². Estimates derived from the SEADAB

³⁰ Includes secondary and tertiary rural roads and cart tracks.

³¹ Ibid.

³² These include Cambodian Friendly Units Files (FANK), Cambodian Incidents File (KHMER), Enemy Base Area File (BASFA) July 1966-June 1971, Situation Report Army Files, 7/31/1966-3/12/1973.

are around the 190 km² mark as well. The LIS estimate of area affected by mines and battle debris, predominantly spot distributed land service munitions, ranges from 488 km² (assuming a 30% area reduction) to 697 km². A further 245 km² (assuming a 30% area reduction) to 350 km² can be added to this for land affected by mines and non-impact cluster munitions. The remaining area comprises 9 km² to 13 km² of land affected solely by land service UXO.

The following table details the possible scope of technical survey; Battle Area Clearance and/or EOD tasks based on LIS estimates.

Table 6 - Possible Scope of BAC & EOD Tasks

Types of Contaminated Area (LIS & SEADAB)	LIS Area (km²)	After 30% Reduction (km²)
Area affected by cluster munitions & spot UXO	270	190
Area affected by mines & spot UXO	697	488
Area affected by mines & non-impact cluster munitions	350	245
Area affected by land service munitions	13	9
Total	1330	931

Of the above, the only areas that could be approached exclusively as Battle Area Clearance tasks are those estimated to be free of mines (i.e. some 199 kms² -283 kms²). The remaining areas would need extensive technical survey in order to locate suspected minefields, and then area reduced utilizing a combination of Battle Area Clearance and standard demining procedures.

Assuming all of these areas can be reduced by up to 30 percent through technical survey and area reduction, the potential area requiring exclusive BAC may be as little as 200 kms², and the area requiring combined BAC and mine clearance, 733 kms².

As very little large scale Battle Area Clearance has been conducted in Cambodia, it is difficult to estimate how long it would take to clear this total area. The experience of demining teams who have undertaken area verification tasks, ostensibly deep searches of areas for high-metal content ordnance (i.e. sub-surface anti-tank mines, UXO or air service munitions), may provide some indication of the expected pace of BAC. Other experiences such as UXO Laos can be used for initial estimates.

Recent field trials in Laos indicate that a four man teams using hand held brush cutters, wide area deep search detectors with analytical software, and large-loop detectors are able to clear one hectare (10,000m²) of cluster munitions contaminated ground in 3 days (Kaminski, 2006). This systemized approach to BAC operations has increased productively by a factor of 600% over traditional mine clearance techniques used in Laos and Cambodia. The high productivity of small BAC teams promises cost efficient operations for proactive ERW operations in the future.

CMAC mine clearance operations in the northwest, north and east of the country have found averages of 7-9 UXO per hectare (numbers exclude caches). The average number of AXO/UXO found during all CMAC clearance operations is just over 18 items

per hectare³³. These are not high numbers by any means. Another point worth considering is that despite the size of area contaminated by air service cluster munitions, CMAC EOD operations in known strike areas have not found extensive numbers of air service munitions (generally less than 20 percent of all items destroyed)³⁴.

This would suggest that a majority of surface items have either already been removed or deteriorated to such an extent that they no longer pose a threat. This raises the question of responding to sub-surface cluster munitions and other ERW.

EOD/BAC Operational Analysis

While EOD/BAC planning generally demonstrates some use and analysis of secondary data sources such as CMVIS, LIS and USAF bombing records, it is generally fairly light in the capture and use of primary information derived from affected communities themselves. Although most EOD teams generally conduct some reconnaissance of their own, this does not normally extend to village mapping of ERW contamination. Both MAG, through its Community Liaison Teams and CMAC, with its CBURR network has the capability to do this, but such efforts are generally contained to mapping mine contamination.

Although defining the spatial dispersion of ERW is likely to be more difficult compared to that of mines, simply because of the size of area affected, the use of village mapping to scope ERW contamination at least needs to be trialed to see what benefit, if any it may have in respect to EOD/BAC deployment. CMAC is probably in the best position to do this; given its CBURR program and recent integration of MRE and EOD staff into new five-person multi-skilled teams. While such mapping may ultimately prove to be of limited value to “emergency” EOD tasking, it would certainly assist in identifying and scoping Battle Area Clearance tasks.

It is important to note that outside of the LIS, there have been no other attempts to systematically survey the extent of uxo, cluster munitions and other battle debris contamination in the country. While it is not surprising that priority has been given to scoping national mine contamination, if the CMAA and operators are serious about dealing with the remaining ERW threat, then such surveying needs to be developed at the earliest possible time. Relying on random reports of ERW is no substitute for conducting a methodical appraisal of contamination levels, and from this deciding where and what resources should be deployed.

Assessment of the ERW situation could be approached in a manner similar to that currently employed by CMAC’s Technical Survey Teams (information reduction followed by physical reduction) In fact, there are more data sources available in respect to potential ERW contamination than there are for mined areas. Among these are the

³³ Since 1993, CMAC has destroyed more than 850,000 items of ordnance; 630,378 by EOD teams and 223,077 during clearance operations.

³⁴ It is worthwhile remembering however that the Cambodia National Level One Survey (LIS) records more than 2,000 villages reporting problems associated with cluster munitions contamination.

SEADAB bombing records and FANK and Khmer combat incident reports. Added to these is information derived from operators' own population surveying as well as clearance and EOD/BAC Tasking reports. Although many of these records need to be further analyzed, and in the case of the combat incident data geographically located. There is probably sufficient material available already to complete at least a first level information reduction for much of the country.

Known Impacts of ERW contamination in Cambodia

Estimated affected population

According to the L1S, some 6,422 or 46 percent of all Cambodian villages are contaminated by ERW. Based on suspected surface area, this represents an affected population of some 880,000 people³⁵. Using the three main categories of contamination derived from L1S fields, it can be estimated that 422,000 people are affected by suspected mine contamination, 130,000 by air service cluster munitions resulting in socio-economic impact, and 328,000 by a mix of mines and various types of land and air service battle debris.

Almost 40 percent of mine-affected populations are located in the northwest, 30 percent in the central provinces of Kandal, Kompong Speu and Kompong Thom and 12 percent in the north/north east. This pattern is practically inverted with respect to cluster munitions; with 42 percent of affected populations located in the north/north-east and 30 percent in the same central provinces of Kandal, Kompong Speu and Kompong Thom.

Impact on rural livelihoods

The L1S attempts to define the dimensions of ERW contamination and its impact on affected populations through the use of self-assessed ratings in six principal domains. These include high numbers of casualties (reported by 78 percent of all L1S villages), impeded gathering activities (73 percent), restricted access to housing and farming land (61 percent and 66 percent respectively), loss of livestock (57 percent), and difficult access to water resources (48 percent). Other indicators that emerged during the course of the survey included restricted access to neighbouring villages and public facilities (schools and health clinics); impediments to infrastructure development (roads, schools, hospitals), and restriction of livelihood activities (utilization of forest resources, access to markets, pasture lands, etc).

³⁵ The L1S estimates some 5,187,000 people or 45 percent of the country's population to be "at risk", although what this term refers to or how the figure was reached is unclear. The L1S puts the number of people in areas reporting no contamination at 10,139,095. This figure represents 88 percent of the country's total population. Other calculations also call the population at risk figure into question (e.g. 1,640 villages with L1S areas divided by Population at Risk returns an average village size of 3,162 inhabitants. The average village population derived from L1S recorded data however is 803)

Across all six principal domains, 53 percent of contaminated villages reported severe to very severe impact, with access to farming land being the most heavily impacted. Other severely impacted domains include access to housing land, high numbers of casualties and impeded gathering activities. Various studies have also highlighted the referred costs from impeded development, citing indicators such as reduced numbers of crops and lower yields due to inadequate irrigation or meagre returns on produce due to high transport costs and restricted access to markets.

The national strategy does not define impact or the priority of effort that should be allocated to various explosive hazards. In light of a diminishing landmine contamination problem the impact of other ERW hazards is crucial for national strategic planning. These definitions of impact are fundamental to the future planning, allocation and prioritisation of ERW response resources.

ERW Casualties

While casualty rates have dropped significantly from the levels of the early 1990's, they now appear to have plateaued at around 800 per annum³⁶. The most discernible trend within current casualty rates is the proportional shift between mine and UXO accidents. While there has been a sustained reduction in mine casualties since 1998, incidents involving UXO have actually increased by 13 percent. In fact, nationally, uxo are now responsible for more than half of all ERW deaths and injuries in Cambodia (485 of 825 during 2005). This trend is consistent across most of the country with the exception of the K5 affected provinces of Banteay Meanchey, Battambang and Pailin. In these areas, between 2001-2005, almost two of every three casualties resulted from mines, see Figure 5 below.

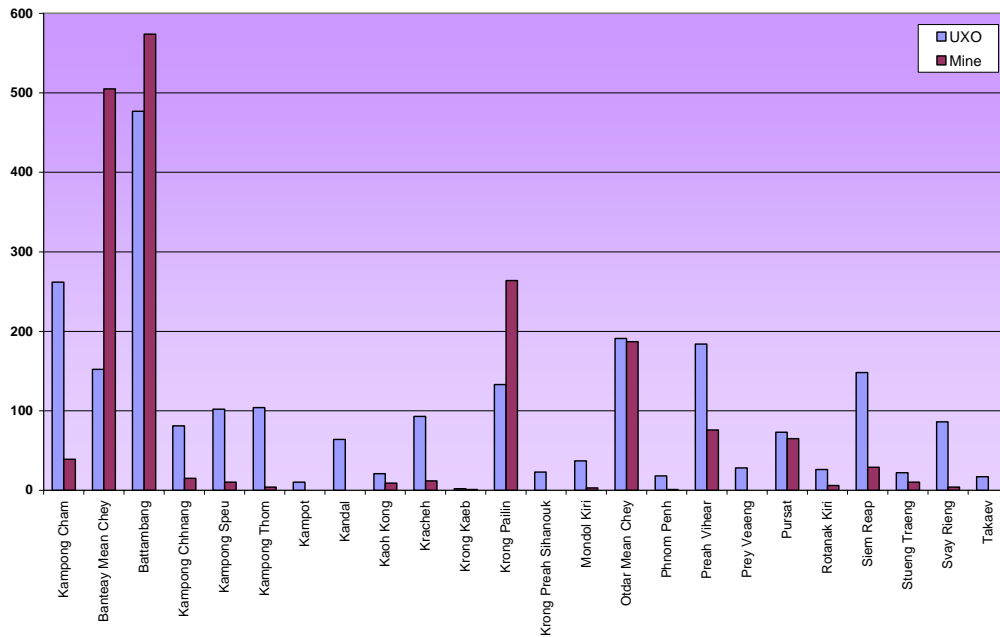
Excluding these casualties from the national figures however provides a valuable insight into the extent of the UXO problem. Outside of mine casualties in Banteay Meanchey, Battambang and Pailin provinces, 83 percent of all other recorded deaths and injuries since 2001 have been caused by uxo.

These casualties are predominantly distributed across six provinces and account for two thirds of all uxo casualties nationally³⁷. The ratio of UXO casualties per head of rural population in the north & northeast is approximately half the rate reported in the northwest.

³⁶ Unless otherwise stated, all casualty statistics have been drawn from Cambodian Red Cross Cambodian Mine Victim Information Service (CMVIS) datasets (January 2001- November 2005)

³⁷ Banteay Meanchey, Battambang, Krong Pailin, Otdar Meanchey, Preah Vihear and Siem Reap

Figure 5- Mine & UXO Casualties by Province.



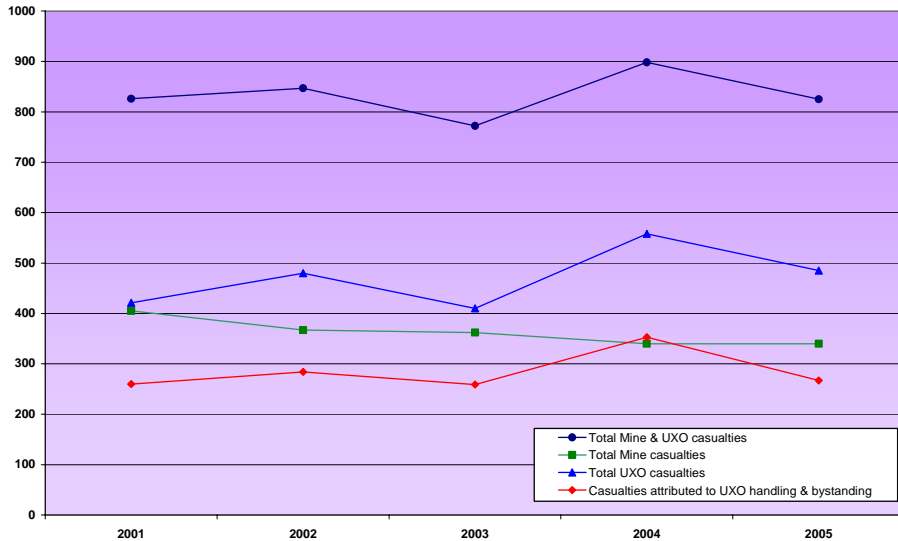
Unlike mine accidents that generally occur as a result of daily livelihood activities³⁸, 60 percent of uxo incidents arise from intentional interaction with the device (or standing by as someone else handles it). As Moyes identified in *Tampering: Deliberate Handling and Use of Live Ordnance in Cambodia*, “to play with” is the single most commonly reported activity at the time of accidents (CMVIS casualty data)³⁹.

Only 3 percent of accidents are attributed to either moving an item or attempting to destroy it. Given that intentional play is the most commonly reported activity, it is not surprising that almost half of all uxo casualties involve children. In fact in a number of provinces, child casualties arising from intentional handling of UXO are at least double, if not three times the number of incidents reported among adults.

³⁸ Ninety-one percent based on aggregated CMVIS data for 2001-2005

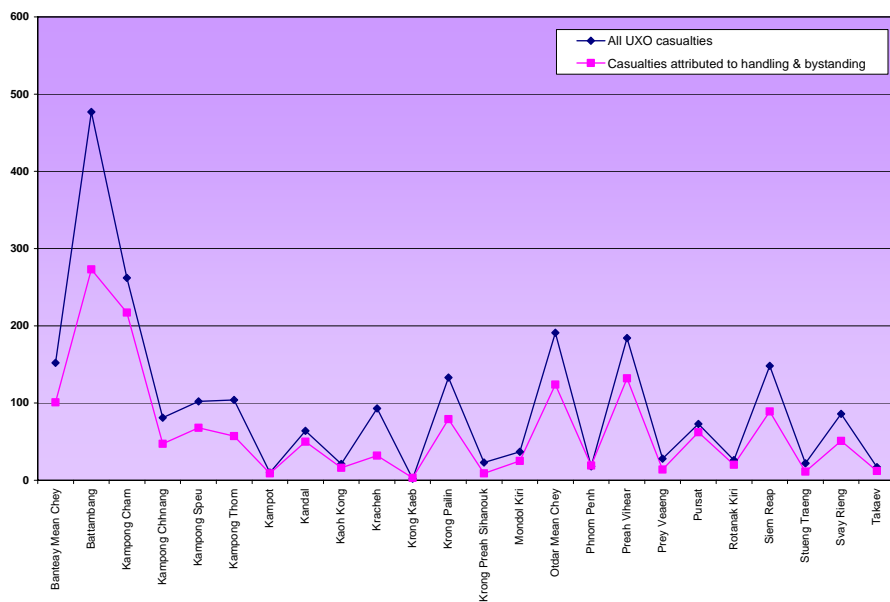
³⁹The report suggests that there may well be several concurrent motivations behind “play”, such as to sell the items for scrap afterwards, which are not fully investigated by CMVIS. Equally, that some activities such as burning or throwing the device, may be mistakenly categorized as “play”, whereas they are actually done to render the device safe for salvaging.

Figure 6 - Trends in Mine/UXO Casualties Compared to Casualties Attributed to Intentional Handling



This phenomenon is common across all ERW affected areas, with child incidence rates being almost identical in the north-west and north-east (46 percent in the N/NE to 48 percent in the NW). More disturbingly, Kandal, Kompong Thom, Krong Pailin and Pursat have all seen significant increases in child UXO casualty rates over the past three years (ranging from 58 percent -128 percent), indicating that trends are most likely still yet to peak.

Figure 7 - Geographic Distribution of All UXO Casualties Compared to UXO Handling Victims



One of the principal differences between mine and UXO contamination relates to the nature of people's interaction with the respective threat. By far the majority of mine casualties result from people unintentionally triggering a device, most often while traveling through unfamiliar areas clearing land, foraging and collecting firewood. To some extent, the risk associated with these activities can be offset through learning to better interpret the environment (by way of warning clues) and adopt safer practices.

Modifying intentional behaviour on the other hand is much more difficult and requires a markedly different approach to simple awareness raising and generic risk education. This is particularly pertinent to certain population groups such as soldiers or ex-combatants who make up the majority of tampering casualties resulting from fishing with explosives or refashioning devices. The study concludes there is strong evidence of a link between engagement in high-risk activities and a "...cultural background of familiarity with ordnance and acceptance of high-risk behaviours." Addressing these features will require more intensive and targeted behaviour change interventions than are currently offered.

One final note from the Tampering study is the observation that in villages where incidents had occurred as a result of intentional handling, 83 percent only recorded one such accident within the last five years. In fact, only 100 villages in the whole country have had more than one "tampering" accident over the same period years and only 33 villages have experienced more than two accidents. Although the study cautioned that it was not possible to assert, "...that the occurrence of an accident reduces deliberate handling practices", it observed that villagers interviewed during the study "...frequently reported that handling of live ordnance had declined subsequent to the occurrence of accidents." This feature also lends support to the need for more participatory and iterative approaches to awareness raising, and more importantly, integrating behaviour change strategies within generic community risk education.

Interface between Poverty and Tampering

Harvesting of ERW for sale onto the scrap metal trade has been occurring for a number of years. Its role in the economies of rural communities varies considerably from village to village and from household to household. As the Tampering study identified, its importance depends "...upon the economic base of village (availability of rice and *chamkar* land) and the relative value of scrap metal (as defined above in terms of difficulty to collect, price and market integration) by comparison with other locally available resources." Another feature that the study identified was the changing importance of scrap metal as a commodity, relative to the development of a community's economic base. That is, that the economic importance of scrap metal appears to diminish as economies of village communities mature and diversify.

Overall, the study concludes that salvaging from live ordnance is a marginal economic activity in most rural household economies. Where the study did find that it played a more significant role was in the economies of children. This observation is also made in Bottomley's work, "*Crossing the Divide: Landmines, Villagers and Organisations*". In this, she reports "villagers often described the selling of mines for

scrap metal as an activity carried out by children, who were then able to buy candy with the money.”

As the Tampering study notes “...many playing” accidents are likely to result from contact with items that children have picked up because of their potential scrap value. This is particularly true with respect to separated fuses which children seem to identify less easily as dangerous.” The study reported that some 65% of children interviewed drew upon scrap metal as a source of additional income and scrap metal alone was the single most prominent source of cash for children. The extent to which children utilize scrap metal is very important in understanding their contact with ordnance and designing subsequent behaviour change interventions.

Informal Village Demining

The villager deminer who clears his own land for a homestead and then helps his neighbor will remain a daily activity in the foreseeable future. Entrepreneurial village deminers clearing land for profit will also remain a commercial activity that has a market for people either living in mined or suspected areas. Recent, studies of village demining is complete, this issue has been professional documented by HIB (Bottomley, 2003). Other studies have raised the issue in a contentious manner accusing national service providers of neglecting the village deminer and his achievements (Fleisher, 2005). This has created controversy over legitimizing informal village demining.

The notion of accrediting work by unregistered, untrained, under equipped villagers is a stretch for any governmental organization to undertake. In Cambodia, considerable effort has been made to legislate and regulate ownership of weapons and access to munitions. Giving license for citizens to collect explosive remnants of war contradicts existing laws regulating weapons and munitions (RGC, 2005b). It cannot be legitimate to have a grenade in your possession because of your efforts to clear your neighbours land and meanwhile eligible to be arrested for possessing an illegal AK 47.

At the moment informal village deminers are not criminalized nor are the police actively looking for these individuals and stopping their activities. Likewise, CMAA is making no attempts to either criminalize or legitimize village demining, a state of impasse exists on this issue.

The best outcome for including the efforts of informal village demining is to incorporate the village deminer as a key informant in advanced technical survey operations supporting area reduction. Village deminers can provide valuable information on their operations, including location, density and types of munitions located. This information would directly support service provider technical survey, area reduction and mine clearance resources to target actual contaminated areas in a win-win situation. Extended effort to legalize or license village deminers detracts from the real needs of mine action service providers to enhance their area reduction operations.

Scrap Metal Collection

The increasing price of scrap metal on the world market creates an insatiable demand for ERW materials. Regionally, this demand is driven by China’s growth and

requirement for steel to support construction booms. Changing this economic dynamic is not possible; scrap metal collection is lucrative for desperately poor rural people. A clear example is the long-standing scrap metal business in Vietnam where the authoritarian government has not been able to control its proliferation.

Police sweep operation that arrest or criminalizes scrap metal collectors would not solve the situation. Rather, the best use of the scrap metal collection network is identification of ERW collection areas, controlling dangerous collection practices, and removing existing hazardous material on a routine basis. Developing an environment of trust that results in scrap metal collectors routinely calling the national police, CMAC and NGO's to perform a hazardous material removal service and handing back safe scrap is an achievable objective using existing resources.

Cambodia will not be able to control the spread or increase in this business as regional appetites for iron and steel increase. The best result of donor intervention would be training EOD teams to handle cleanup operations in scrap metal yards in collaboration with national police support. Incorporating the CMBRR & CBURR network to include reporting on scrap metal collection would allow Technical Survey Teams and EOD teams to deliver services at collection points.

Essential Components (Needs) of a Cambodian National ERW Response

National ERW Sector Good Governance & Legal Framework

An essential dimension of mine action is promoting the development of an appropriate legislative and legal framework. This should cover regulation of ERW Response, compliance with international treaties, conventions and other multi-lateral agreements prohibiting the use of landmines and cluster munitions, and ideally, domestic control and management of weapons, explosives and munitions. According to a study of mine action legislation conducted by the Geneva International Centre for Humanitarian Demining (GICHD) in 2004⁴⁰, Cambodia was among one of the few countries reviewed that has pursued such a comprehensive legislative response.

The Geneva study did however note that Cambodian law needed to be revised to reflect changes in CMAC's status following the creation of the Cambodian Mine Action and Victim Assistance Authority (CMAA), as well as remove contradicting and overlapping provisions concerning the control of arms and explosives. The passing of several sub-decrees delineating the role and responsibilities of the CMAA and amending those of CMAC, as well as introduction of a new law governing the control and management of weapons, explosives and munitions have largely resolved most of these issues. It does however appear that the new law may not come into effect until several articles pending definition by sub-decree are finalized. The only remaining issue identified is the need to include clauses on clarification procedure with reference to Article 8 of Ottawa Convention.

⁴⁰ "A Study of the Development of National Mine Action Legislation", GICHD, Geneva, November 2004

Legislation Governing Control of Weapons, Explosives and Munitions

One of the first comprehensive laws concerning the control of weapons, explosives and munitions in Cambodia was legislation passed in April 1999 prohibiting the use of all anti-personnel mines⁴¹. Before this the legal environment comprised a series of discreet laws and decrees pertaining to various aspects of weapons control and management introduced throughout the course of 1998.

The most recent, the Law on Management of Weapons, Explosives and Munitions establishes the legal framework for the management of all kinds of weapons, explosives and munitions in the Kingdom of Cambodia⁴². Based on a comprehensive draft developed by EU-ASAC program⁴³ in cooperation with the Working Group for Weapons Reduction, Ministry of Interior and the National Commission for the Management and Reform of Weapons and Explosives in Cambodia, the law replaces Sub-Decree 38, introduced in 1998. It is understood, however that as several provisions of the latest law are still pending definition by Sub-Decree, it is not yet in force, and that Sub-Decree 38 may well still apply.

This latest law vests legal competence for the management, security, storage, transport, decommissioning and destruction of all kinds of weapons, explosives and munitions in the Kingdom of Cambodia to the Ministry of National Defense- RCAF and the Ministry of Interior (in respect to the National Police, public institutions, officials and civil individuals) [*Chapter 2, Articles 9, 10, 11*]. Legal competence for the import, export, production and repair of all kinds of weapons, explosives and munitions is vested in the RCAF [*Article 8, Chapter 3*]. Each Ministry has the legal competence to issue Certificates of Authorization to use all kinds of weapons, explosives and munitions [*Chapter 2, Article 11*].

The law applies to all kinds of weapons that can be used to injure people or damage property, as well as all kinds of explosives and munitions, including those containing chemical or biological agents, capable of causing danger to people's lives, property and the environment (*Chapter 1, Article 3*)⁴⁴. It specifically prohibits the equipping, owning, carrying, use, buying, selling, trading, loan, renting, transfer, distribution, production, installation, repair, recycling, transport, import, export and

⁴¹ This same legislation authorized CMAC to "...coordinate all mine action activities, control all types of anti-personnel mines and coordinate with all state institutions in order to fulfill the obligation of the Kingdom under international treaties, conventions, agreements or other legal instruments". Source: "A Study of the Development of National Mine Action Legislation", GICHD, Geneva, November 2004.

⁴² Approved by the National Assembly on 26 April 2005 and the Senate on 12 May 2005

⁴³ EU-Assistance on Curbing Small Arms and Light Weapons in Cambodia

⁴⁴ Certain categories of pseudo firearms and munitions such as those used in sporting events or art performances, firearms and paint/dye munitions used to mark targets and firing devices for pyrotechnics are exempt from the law, as are explosives used for public service and civil engineering purposes. (*Chapter 2, Article 5*)

storage of all kinds of weapons, explosives and munitions by non-authorized civil individuals (*Chapter 2, Article 4*).

Penalties for breeches of the law range from 3 months to one year imprisonment, accompanied by fines from 200,000 to one million Riel to five to ten years imprisonment. Breaking the law includes, not reporting loss of weapon, falsification of Certificates of Authorization, unauthorized possession of all kinds of weapons, explosives and munitions by foreigners and unauthorized import, export, storage or transport of all kinds of weapons, explosives and munitions.

It appears from reading of the law that historic artefacts, whether weapons, explosives or munitions are not covered until in the physical possession of an unauthorized civil individual. Salvage of all kinds of weapons, explosives or munitions, whether contemporary or historic artefacts, is clearly prohibited.

Legislation Governing Management, Regulation and Representation of Mine Action

There are several pieces of legislation governing the management, regulation and representation of mine action in Cambodia. These comprise the 1999 legislation, which along with prohibiting the use of anti-personnel mines also defines the mandate and authority of CMAC. In September 2000, Royal Decree No. 177 was passed establishing the CMAA as the national mine action authority. Later, Royal Decree NS/RKT/0801/264 passed in August 2001, revised the legal status of CMAC and transferring policy and regulatory responsibility to the CMAA, accompanied by several other Sub-Decrees articulating the organization and functioning of the national authority (CMAA).

Other major pieces of legislation governing the management or regulation of mine action in Cambodia are two sub-decrees concerning “Social Land Concessions” and “Socio-economic Management of Mine Clearance Operations” introduced in March 2003 and September 2004 respectively. The first five Cambodian Mine Action Standards (CMAS) have been legally ratified and recently passed into law which include; Application of the Standards; Accreditation and Licensing; Monitoring of Mine Action Operations; Storage, Transport and Handling of Explosives; Occupational Health and Safety /Reporting and Investigation of Demining Incidents.

Establishment of a National Regulatory Body

Up until late 2000, implementation and enforcement of all mine action legislation in Cambodia was vested with the Supreme Governing Council of CMAC. In September 2000 however, the Royal Government passed legislation to enable the creation of an independent national regulator, the CMAA. This move ostensibly separated mine action service provision from mine action regulation. As with some other national regulatory authorities, the CMAA is not located under a line ministry but attached to the Council of Ministers.

The Royal Decree issued in September 2000, delineates the roles and responsibilities of the CMAA as:

- a. Development of policies on mine action and UXO clearance and assistance to victims;
- b. coordination of all mine action and UXO clearance and assistance to victims;
- c. mobilization of technical and financial resources within Cambodia and abroad;
- d. accreditation and licensing of national and international demining operators working in Cambodia;
- e. managing a database on mine action and UXO clearance;
- f. development of policy on the use of demined land; and
- g. implementation in Cambodia of the Ottawa Convention on land mines.

A further sub-decree detailing the organization and the functioning of the new mine action authority was introduced in August 2001⁴⁵. The CMAA is presided over by the Prime Minister, with the Senior Minister in charge of the Council of Ministers as its Vice-President and a high-ranking official as its Secretary-General. The Authority comprises representatives from five senior ministries and several other key government bodies. It has a Standing Committee comprising the President, Vice-President and Secretary-General. A Secretariat General, headed by the Secretary-General however, manages day-to-day business of the Authority.

The Secretariat General of the CMAA currently comprises six departments covering the following functions: legislation, regulation and monitoring; socio-economic planning and database management; victim assistance; coordination and public relations; administration, personnel and logistics; and finance. To all intents and purposes, CMAA responsibilities in respect to victim assistance have been passed to the Ministry of Social Affairs, Veterans and Youth Rehabilitation and the NGO sectoral body, the Disability Action Council.

Two recent evaluations of the Cambodian mine action sector, and one of CMAA itself highlight a number of constraints impacting the Authority's ability to effectively perform some of its key functions⁴⁶. One evaluation concluded that "...as designed the CMAA has too many responsibilities, some of which overlap with other agencies" and "...other more appropriate agencies should be directly tasked to carry out activities that have a mine action aspect, but are more appropriately theirs. These activities include mapping, land policy, land allocation and land titling (Ministry of Land Management);

⁴⁵ Source: "A Study of the Development of National Mine Action Legislation", GICHD, Geneva, November 2004.

⁴⁶ "Evaluation of the Technical Assistance Project for the Development of the Cambodian Mine Action and Victim Assistance Authority", and "Review of the Mine Action Sector in Cambodia for the European Commission": both by Wilson. M; Phnom Penh, Cambodia; December 2003; and "Joint Evaluation of Mine Action in Cambodia for the Donor Working Group on Mine Action": Griffin. R, Keeley. R; Phnom Penh, Cambodia. December, 2004.

mine risk education (Ministry of Public Health); and victim assistance (Disability Action Council)⁴⁷.

The evaluation went on to suggest that the CMAA's focus should be reduced to a several core activities such as policy-making, resource mobilization, preparation of annual reports, and establishing standards for example. Following the suggestions and recommendations by donors the RGC took action to reform and restructure the CMAA secretariat, as a result, two royal decrees have been revised and one sub decree amended. A Technical Working Group comprising of the donors and key ministries has also been set up chaired by HE Prak Sokhon as a 2nd vice chairman of CMAA.

Similar observations concerning the outsourcing of some of the Authority's current responsibilities were also made in an evaluation of EC support to the CMAA. In that report, the author claims that there was no formal external QA or accreditation input from the CMAA and that he did not believe the Authority had the competencies to issue clearance certification or properly accredit operators. The evaluation went on to recommend:

- a. The provision, by contract, of an organization to provide accreditation, licensing and quality assurance services to CMAA.
- b. The appointment of a Senior Management Advisor to carry out a needs assessment, set up administrative systems, develop personnel policies, revue and produce relevant position descriptions and develop appropriate management practices for CMAA⁴⁸.

In view of these appraisals, UNDP has included technical support for two of the CMAA's departments under its new-pooled funding arrangement, "Clearing for Results Project - 2006". Support to the Socio-Economic Planning and Database Department will focus on strengthening monitoring of Provincial Mine Action Committees and Mine Action Planning Units, further developing site selection and prioritization procedures and building capacity in post-clearance impact assessment and analysis. Support to the Legislation, Regulation and Monitoring Department will focus on strengthening accreditation procedures, monitoring operator performance and finalizing the remaining Cambodian Mine Action Standards (CMAS). Significant support will also be channelled to developing performance-based staff management systems within both departments.

Enforcement

Implementation of laws and decrees governing the control and management of weapons falls to the Ministry of National Defense and the Ministry of Interior. Responsibility for their enforcement however lies with the National Police. In order to ensure appropriate enforcement of the new law on the control and management of

⁴⁷ "Joint Evaluation of Mine Action in Cambodia for the Donor Working Group on Mine Action": Griffin. R, Keeley. R; Phnom Penh, Cambodia. December, 2004.

⁴⁸ Source: "Evaluation of the Technical Assistance Project for the Development of the Cambodian Mine Action and Victim Assistance Authority": Wilson. M; Phnom Penh, Cambodia; December 2003

weapons, senior RCAF and National Police personnel need to be inducted to the new legislation and their respective forces briefed on its implementation.

One of the most pressing issues affecting the enforcement of mine action legislation in Cambodia concerns the introduction of national mine action standards. Despite the CMAA being presented a comprehensive draft of the standards in 2002, only five of them have been subsequently ratified and only recently passed into law. Without national standards and guidelines being in place, most of the regulatory functions are conducted in an ad hoc or interim basis.

Operators for example, have been provided interim accreditation and licenses from the Director-General. Some technical monitoring of operations has been conducted only with CMAC, MAG and HALO Trust against each agency's own rather than any uniform national benchmarks such as standards and guidelines. While the use of such temporary arrangements is understandable, it is important that CMAA implement a full complement of Cambodian Mine Action Standards (CMAS) as soon as practicable rather than waiting for ratification of the entire framework.

Cambodian Mine Action Standards (CMAS)

The study team reviewed the CMAS documentation completed by UNDP with MAG technical advisory support in 2002. Initially written at a time when the international standards and guidelines first became available from the Geneva Center for Humanitarian Demining based on sector norms from the 2000-2001 period. The CMAS documentation no longer reflect contemporary conditions in Cambodia and requires revision. Since the first publication of International Mine Action Standards and Guidelines (IMAS) there has been a number of revisions and additions to these international protocols and norms. Additionally, CCW protocols defining Explosive Remnants of War (ERW) have changed influencing how mine action and ERW will be implemented in the future.

Viewed in a contemporary context of an evolutionary transformation from mine action to ERW response, it is prudent to review existing CMAS documentation changing its fundamental premise to reflect a long-term ERW response. This will require bringing together national and international expertise with Mine Action and ERW in a Cambodian context into a Technical Review Board. The purpose of the Technical Review Board would be the guidance, development and delivery of a set of standards and guidelines addressing the full requirements of mine action and explosive remnants of war response.

Owing to the advanced nature of development of the current CMAS documentation with its Khmer translation, this work should take no longer than six months to complete. To avoid further unnecessary delays implementing national standards and guidelines the completed work should be made available to the ERW sector as an interim protocol allowing service providers opportunity to adjust and comply.

ERW Role Definition

Although a series of decrees and sub-decrees provides a firm foundation for governance of the sector and clear delineation between the roles of CMAA and CMAC is established, other stakeholders such as the National Police and RCAF require definition. Cambodia's active mine action community operates in an open opportunistic environment. This is positive advantage enables humanitarian and development work to proceed practically unimpeded. However, as other government agencies start developing their place in the mine action and ERW sector overlapping roles and duplication of effort is occurring particularly between government agencies.

The wide spectrum of the ERW problem facing Cambodia offers scope to divide the problem/issues into manageable components. Coordination is fundamental for an integrated government response and structuring the future roles and responsibilities. The realisation of full RGC fiscal ownership of this sector by 2015 demands definition of government roles and responsibilities, as early as possible.

Additionally, the interaction between aid agencies such as World Bank, ADB, and bi-lateral donors supporting mine action through development programs is unclear. Direct funding to ministries that result in mine clearance contracts to support development projects occur without CMAA oversight. The lack of inter-agency coordination and technical guidance in these large-scale development projects undermines effective coordination of limited resources for mine action or ERW Response. Definitions of ERW roles are necessary for good governance and effective strategic and operational response to the ERW problem in Cambodia.

Role Duplication National Police & RCAF

Recent RCAF and National Police interests and contribution to the mine action sector have led to much discussion on how these government organizations might assume greater roles in the sector. Suggestions in other assessment reports have pointed towards using the military and police in similar EOD roles as seen in Europe or North America. These concepts are presented without "on the ground" knowledge of real RCAF and National Police status and capacities.

Firstly, the National Police are well suited to increasing their networking role at the commune level and strengthening their traditional law enforcement role to protect civil society. The National Police have appropriately indicated the need for a "Bomb Squad" capacity, which is arguably a traditional police role that should be pursued to a level thought necessary in the Cambodian context.

Increasing the National Police role, as suggested in the Ministry of Interior "Pilot Project" to develop EOD capacity and operations in five provinces is a duplication of resources already in place with CMAC and NGO's. This recent pilot project proposed by the National Police has is not part of an integrated planning process coordinated through the Council of Ministers.

Similarly, the RCAF capacity to transform from traditional defence roles to mine action, EOD/BAC humanitarian and development capacities is not possible from a standing start. RCAF does not have institutional depth; troops do not have the training, equipment, necessary skills, management ability or knowledge to undertake full national mine action and ERW responsibilities at this time.

Developing RCAF into a fully capable organization would require a decade of training and development support. Military units are never static, staff changes occur annually, and engineering units constantly change location and roles. Developing a military organization is a longer-term activity involves strong infrastructure and training support. Neither the infrastructure or training facilities with experienced mine action nor EOD instructional staff exists in RCAF, developing the necessary human resources and developing a training facility would have to be created from scratch⁴⁹.

Judging by current cleared land estimates by mine action service providers the priority-mined areas will be completely reduced within a decade. Developing another organization to meet these targets for the same priority mined areas would be a huge duplication, without changing the outcome. Therefore developing a large RCAF demining force as requested, to meet this need would be a redundant exercise.

Investment in training for RCAF to meet national standards and norms would strengthen its managerial and operational capacity. Training and equipping RCAF must be balanced against real needs, which according to this analysis should be a supportive role in mine action. Determining the end state requirements according to a National ERW Strategy and fitting a role for the military is crucial to aligning their contributions into a cohesive national plan.

Recent, deployment of an RCAF Demining Unit (135 men) stripped the military of its best people and forced a quick procurement of the equipment necessary to meet the UN requirements. When this unit returns it will undoubtedly bring experience back to Cambodia that will be useful for supporting RCAF mine action operations on rural road construction. However, a real risk exists that these soldiers will return to garrison duties without utilizing their skills because no equipment or operational funds are allocated to support this resource.

However, the reality is RCAF contributes to clearance of rural roads throughout Cambodia, and is increasing becoming a member of the mine action community, albeit below national standards. There are three value-added contributions that RCAF can provide to the sector that are within their current capacity to develop.

- a. RCAF intimate knowledge of the mine laying plans during past conflicts and their ability to provide qualitative information on the locations of the remaining mine contamination along the K5 barrier and other areas in Cambodia. Information from RCAF resources, currently serving staff, former combatants and former allies involved in the mine laying and defensive plans could be gathered, and collated into a usable product to support national mine action operations.

⁴⁹ RCAF Engineering School is located at Odong, lacks proper training facilities for mine action operations.

- b. Enhancing RCAF existing rural road clearance capacity to meet acceptable national standards for clearance, and reporting.
- c. Develop the capacity to destroy bulk munitions and small arms destruction would be useful contributions to de-militarizing the national and removing hazardous materials from populated areas.

Pursuing this vital mine contamination information is a national priority. Potentially this would be a major RCAF contribution to the nation and an epic contribution populating the national database with enhanced information. Additionally, the training, equipping of existing RCAF demining teams to undertake their current operations in safety and producing quality work clearing rural routes would be an achievable RGC contribution. These three roles can be achieved without creating large-scale organizations while complimenting rather than duplicating existing national mine action resources and services.

Likewise, enhanced traditional roles for the National Police would be an appropriate first phase to developing positive contributions to a National ERW Strategy. The Nation Police network for reporting at the commune level is an example of beneficial police work and their aspirations to develop a “Bomb Squad” would service other national security needs.

Profiling ERW Threat, Impact, and Risk

The definition of acceptable risk and impact is fundamental to developing a risk response plan that addressing the needs of communities and national development goals.

Threat and Impact Analysis

The full scope of the ERW threat facing Cambodia is still only partially understood. Threat and impact analysis has occurred at different junctures of mine action development in Cambodia; however, there has been little follow through or knowledge capitalization.

Landmines have received the greatest attention of the technical experts. Landmine threats are identified; technical solutions crafted through a marriage of technology and common sense procedures on the ground to deal with the most difficult landmine threats in Cambodia. Thorough technical analysis has characterised the landmine threat into various components such as, minimal metal mines in ferrous soil, beneath a jungle overburden i.e. Type 72A Chinese anti-personnel mine. A combined solution integrating armoured mechanical brush cutters enabling access through thick tropical forest, then the application of explosive detecting dogs, combined with manual deminers using sensitive ground compensating minimal metal detectors addresses the majority of Cambodia’s landmine threat.

The threat of stepping on a landmine is easily imaginable and its threat perceived or actual causes a fear reaction. Other explosive remnants of war do not create the same

threat perception and consequently are considered less dangerous. The remaining ERW comprises a vast array of explosive hazards such as; land service munitions, air-dropped munitions and dioxin contamination which the public is now learning actually threaten life and limb to a greater degree than the receding landmine threat in Cambodia.

Many factors influence whether an explosive device will cause loss of life or limb. These include the munitions type, fuze type, condition, length of time exposed to the elements and location. A detailed review of technical data available in national/operator databases combined with operator knowledge and experience is necessary to develop a "threat profile" of the different explosive hazards in Cambodia's diverse environment.

Recent shifts in funding from humanitarian to development priorities is increasingly directing landmine orientated resources to use the same technologies and methodologies in less threatening environments. Simply, development agencies are requesting the same level of assurance experienced in landmine clearance operations for other areas where only unexploded ordnance are expected or encountered.

This trend will increase exponentially as the landmine threat diminishes and other lands open to development. An understanding of threat and impact is required by national and international planning and policy makers to properly use the limited mine action and ERW resources available to the maximum benefit.

BAC operations to remove abandoned ordnance and unexploded ordnance are less threatening to operators than removing landmines which are victim activated. A different technical approach is possible that is less stringent and time consuming than traditional mine clearance methods. These methodologies for technical survey and clearance of abandoned ordnance and UXO are being trialed in Laos where lessons can be learned on these best practices.

Also, is the threat of dioxin poisoning caused by residual herbicides used during the Vietnam war to defoliate areas where guerrilla forces found sanctuary. Documented evidence of herbicide spraying over rubber plantations in eastern Cambodia exist, however these threats and geographic areas are not fully researched or mapped.

The State Department inspection team of Drs. C.E. Minarik, Fred Tschirley, and two others confirmed the extent of the damage to 173,000 acres (7% of Kompong Cham province), 24,700 of them seriously affected. The rubber plantations totaled approximately one-third of Cambodia's total and represented a loss of 12% on the country's export earnings... (Wells-Dang, 2002)

It is notable that these threats directly affect the lives of local Cambodian peoples and deminers of ERW Response personnel who work in dioxin-contaminated areas. Other documented evidence is available on the effects of dioxin poisoning and how demining practices can be adjusted to reduce risk to personnel engaged in clearance operations (Hatfields, 2000). These risks must be considered in combination to determine the level of threat exposed to the population and ERW operational staff.

Defining Impact

Once, actual or perceived threats have been determined these factors can then be compared against their socio-economic and environmental impact on Cambodians living in these hazardous areas. The definition of impact must be articulated in such a way to encompass the diverse levels of explosive and chemical threats and how these impact daily lives of Cambodians. Measuring these threats and impact together in the context of a poor rural society exploiting its natural resources and agricultural land is fundamental to designing and ERW response.

The LIS used impact criterion to determine the level of intensity landmines and uxo had on Cambodian communities. These impacts were mostly measured in terms of denial of access to land, water and other facilities such as roads, markets, etc. The LIS also captured the concerns of villagers living in proximity to airdropped munitions in eastern Cambodia. The documented interviews and village mapping of these areas is invaluable to determining an effective response relieving the impact of airdropped munitions on these villages. Clearly, these villagers articulated the affects of ERW on their lives; these qualitative and quantitative measures are a clear reference point for defining impact.

The national strategy discusses elimination of all high impact mined areas before 2015, however neglects to define both impact and high priority. This definition is left for operators on the ground to determine and consequently enormous debate ensues over how to apply limited response and development aid in the best way.

The impact imperative has shifted from humanitarian response to a development response. This paradigm shift is occurring at a rapid rate ahead of the national service providers ability to respond or change direction. The rapid reclamation of previously suspected mined area is making mine clearance redundant in some areas.

A definition of impact is necessary for national service providers to orientate their resources and efforts to limit threats and impact to the Cambodian population.

Acceptable Risk

Landmines have been determined by Cambodians and the international community as an “unacceptable risk” for people to be exposed. As the landmine problem is reduced to remote border areas, the question of “acceptable risk” for the remaining ERW contamination must be measured so a responsible National ERW program can be designed for this lasting threat.

It is “acceptable risk” for farmers in northwest Europe to cultivate potatoes and sugar beets in former World War I & II battlefields where each year their ploughs pull up “Mustard Gas Shells”. European farmers are allowed access to these highly contaminated former battlefields where tons of munitions are recovered annually by ERW Response teams.

After the major conflicts in Europe ended, governments made decisions that allowed local populations to use land highly contaminated with uxo. Provisions were made for a ERW response dealing with munitions found and education for people who lived in these areas. The result is a population living with ERW and prospering without undue threat to life or limb and impact on their daily lives.

The experience of peoples living in SE Asia in similar condition where their lands are heavily contaminated with air-dropped munitions and residual dioxin contamination is only now being investigated. Some research has occurred in SE Asia such as PDR Laos on the social-economic impact of living with uxo (Handicap-International, 1997).

More frightening is the field research in Vietnam on the effects of dioxin poisoning on local populations and the impact on deminers and their methods working in contaminated areas.

In many areas of southern Viet Nam, landmine and UXO clearance activities may be occurring in chemically contaminated soils; of particular concern are soils contaminated by dioxins as a result of historical applications of Agent Orange herbicide. Aside from chronic exposure problems for local inhabitants, the existence of chemical contaminants can result in acute exposure risks to UXO/landmine clearance crews and support workers. Unexploded ordnance, landmines, and chemical contamination are insidious threats that create an atmosphere of fear and uncertainty among local residents, which ultimately inhibits rehabilitation and agricultural/economic development of impacted lands (Hatfields, 2003).

These studies are invaluable start points to develop a ERW and dioxin poisoning threat profile to determine what is “acceptable risk” for Cambodians living in these hazardous areas. The combination of threat, impact and risk analysis paves the way to developing a comprehensive Risk Management strategy.

ERW Risk Management

Comprehensive understanding of threats, impacts and acceptable risk creates a knowledgeable environment for designing risk management structures to address the prime ERW issues affecting Cambodia. Risk management is a series of activities that identifies threats, impact and determines a response with an ability to monitor and control risk.

Cambodian mine action has evolved into a Risk Management structure over time rather than through a specific design owing to its transition through peacekeeping, emergency, humanitarian and development phases. As the risks for society change with the success of landmine removal operations, the opportunity to design a Risk Management approach to the ERW sector of the future is now.

An example of prime components of risk management are:

- a. Risk Identification,
- b. Qualitative Risk Analysis,
- c. Quantitative Risk Analysis,
- d. Risk Response Planning, and
- e. Risk Monitoring and Control (Duncan, 1996) .

This type of program design is entirely possible at the national level in Cambodia. Starting with the threat profile and impact analysis, acceptable risk definition are the main entry points for “Risk Identification”. “Qualitative and Quantities Risk Analysis” can be achieved by through examination of the various data sources already available to national service providers. The objective is to decide the probability and impact of risk presented by the various threat exposures to the Cambodian population.

“Risk Response Planning” is an analytical process to determine how threats/risk can be addressed through various risk mitigation techniques or procedures such as education, training, detection and disposal operations. Finally, “Risk Monitoring and Control” is essentially the tracking/monitoring of risk and effectiveness/quality of risk mitigation operations.

A comprehensive national strategy requires a well thought out “ERW Risk Management Plan” as a fundamental component to create a clear focus for agencies to execute professional ERW responses.

Information & Knowledge Management

Cambodia is data rich and information poor which results in knowledge depreciation. Constant reference is made to “databases” that apparently hold all manner of information within where knowledge is shared and delivered in unbounded quantities. The reality in Cambodia is very fragmented collection of databases spread between several organizations. A recent review of Technical Survey operations by CMAC concluded “...No valid central national database exists and reporting to CMAA is *ad-hoc*; i.e. no formal reporting process exists” (Morete & Lardner, 2006).

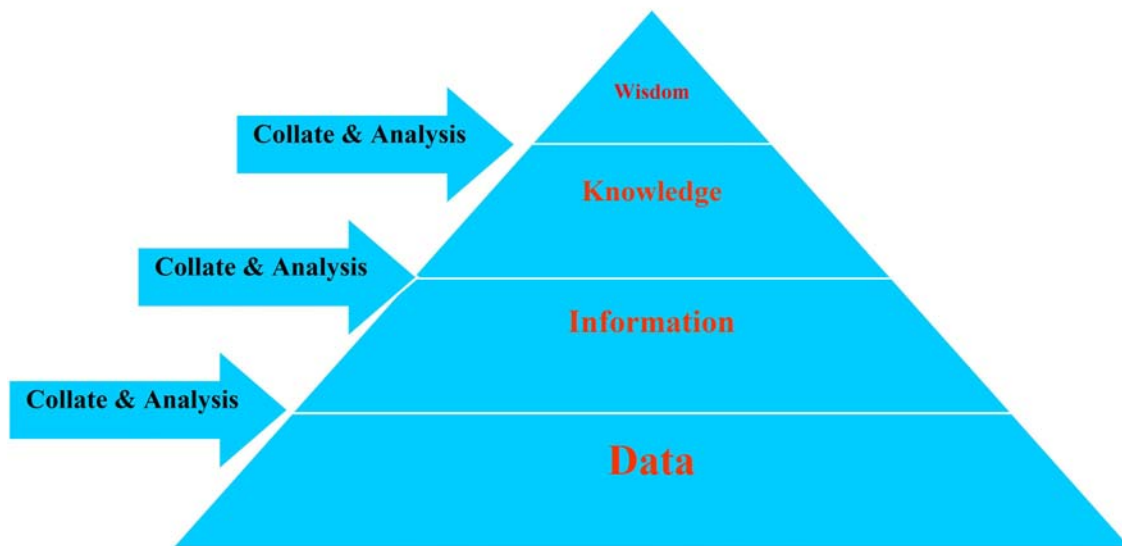
It has been the experience of this study team delving into various databases to discover a wealth of data yet unexplored or exploited. National databases in Cambodia can be characterized as repositories for loosely organized data pools. An example is the CMAC database which is in the process of combining several databases; mine clearance data, EOD data, US Bombing data, and CMAC assets deployment data.

Other studies have come to the same conclusion for example;

That CMAA establish a national database populated through a formalised and possibly legalised reporting processes from all operators. That a donor be sought to fund a mine action information management consultant (not a database specialist) to develop the systems and procedures required of a national mine action database (Morete & Lardner, 2006).

The ultimate aspiration of any field is the development of wisdom. This is attained through experiences and development of knowledge until all manner of a subject or field is thoroughly understood. The process is clear as visualized in the figure 8, data is organized, collated, analyzed and processed into information. These information products become the basis for understanding a subject or field of inquiry. The analysis of information products develops sector knowledge and expertise. The accumulation of knowledge and its application creates a level of wisdom. Then the process starts all over again, re-examining the premise of acquired knowledge and wisdom in a dynamic and changing human environment.

Figure 8 - Development Process of Data - Information - Knowledge into Wisdom



Cambodia mine action is firmly attached to the data phase with a limited entry into the information level of the field. This is primarily due to an unstructured development process and limited “capitalization of knowledge and experience” of the mine action sector. The “know-how” developed in Cambodia is not fully documented, distributed and accessible through a central information resource center.

Knowledge Capitalization

A conscious management program to capitalize on information and knowledge is the hallmark of effectiveness. This process requires development in Cambodia before the

lessons learned in the mine action sector development erode away leaving the longer term ERW Response sector the task of re-building.

Data pools are spread amongst CMAA, CMAC, RCAF, and the international NGO's. Bringing all these data assets together into a central CMAA data pool to form a national archive is necessary to begin a knowledge capitalization process. Specifically, planned information and knowledge management requires an audit of available data and information. Once available data/information is centrally collated then a complete analysis can be initiated to develop credible information products and synthesize knowledge for the development of the ERW sector.

Knowledge capitalization must evolve and is never static this requires a dedication to the development of a professional sector for ERW Response. Without a demonstration of national will to capitalize on the experience/knowledge of Cambodian mine action programs and international investments the likelihood of Cambodia achieving self-sufficiency is doubtful.

ERW Center(s) of Excellence

National ERW Information Resource Center

Experience and skill in a variety of ERW activities is prevalent in Cambodia, yet, the accompanying knowledge expected after over a decade of development has not fully materialized. Information and knowledge cannot exist in a vacuum. Today, there is no central location where mine action or ERW information can be found, each research project or study must painstakingly develop relationships with a number of stakeholders who will offer information in a piecemeal fashion.

Cambodia requires a central information/knowledge resource center where all, technical, operational, managerial, archival, topographic, etc. resources are held for development, distribution and archival purposes. This center must be staffed with Cambodian that are not merely librarians but rather the most experienced and knowledgeable people available to develop ERW information and knowledge for the future of the sector.

Naturally, the national database and archive/library should be co-located in a National ERW Information Resource Center. The Cambodian staff of this type of center must be trained database specialists, GIS specialists, and information analysts working as a dynamic team under a robust information management structure. A comprehensive collection/collation and analysis plan that capitalizes on the wealth of data/information existing in Cambodia must be developed to fill ERW knowledge gaps.

The purpose of the information resource center is to develop useable information/knowledge products for the ERW sector for immediate application to strategic plans, annual work plans and operational/technical planning. Also, this center must be the workhorse recording, monitoring and quality checking data/information and knowledge products provided through various service providers and other agencies.

It is understood that data/information analytical capacities of Cambodia staff is limited; this weakness merits the focus of development agencies to create that capacity to strengthen Cambodia's ability for moving towards a knowledge based ERW sector.

National ERW Training and R&D Center

The essence of a professional discipline is its ability to create a human resource core of experts in a specific field. Normally, this is achieved through academic institutions of technical schools. The ERW problem in Cambodia warrants a specialized training, research & development center to meet the technical demands and ongoing requirements of this discipline and professional field.

The existing mine action community and growing number of government stakeholders (RCAF & National Police) combined with an expanding national commercial sector justifies the requirement for a national center that caters to the ERW community needs.

Bringing together experienced human capital into one common training facility is the most efficient and effective method to service national requirements. Skills and knowledge developed over a decade must be capitalized and shared amongst national stakeholders to ensure self-sufficiency of the ERW sector. A National ERW Training Center could incorporate the needs of all stakeholders and equally contributions to the development of a national training capacity.

In the short term, the CMAC Training Center is the obvious choice to form the basis for a National ERW Training Center with its classrooms, student accommodations, instructional aids, training areas, warehouses, administrative offices and staff. Incorporating National Police and RCAF instructor cadre into the school to both learn and assist national training requirements would be a major step towards nationalizing the ERW capacity.

A National ERW Training Center deliver the full spectrum mine action and ERW curriculum building upon the current capacities of the CMAC training center. Specifically, meeting the requirements for Advanced training in Battle Area Clearance (BAC) and Explosive Ordnance Disposal (EOD) for integrated ERW operations.

The active nature of technology innovations brought to Cambodia for experimentation and field trials warrants a national response to facilitate these cost effective contributions. Technical trials in Cambodia are responsible for developing, enhanced minimal metal mine detection, mechanical assistance and explosive detection dog techniques. Cambodia has directly benefited from the results of these experiments and field trials using these innovations. However, the knowledge capital gained from these innovations remains offshore.

Creating a Research & Development Center that facilitates the introduction of new technologies and methodologies would directly benefit professionalizing Cambodia's ERW sector. Allowing foreign investment a fast track avenue to experiment and conduct field trials while sharing knowledge capitalization is a win-win strategy. Most importantly, is the technical and knowledge transfer to the national service

providers deepening their institutional depth and strength for long-term National ERW programs.

Integration of ERW Operations

The lessons learned by the mine action community are transferable to developing Integrated ERW Operations. Without question, the same principles of information collection, task selection/prioritizations, operational planning, technical survey, MRE, and mine clearance are applicable with modification to ERW operations.

However, some lessons are not readily apparent as witnessed in UXO Lao where mine clearance procedures from the early 1990's have not evolved to meet the real ERW needs in Laos. Simply, UXO Lao is using antiquated mine clearance techniques to clear uxo. After a decade of low productivity enhanced technical survey methods and a systems approach to clearance is now being used to modernise and make efficient UXO Lao operations.

Cambodia cannot afford to make this mistake and must develop specific Advanced EOD/BAC operations to tackle its ERW problem. Current SOP's for EOD/BAC were developed in the context of supporting mine clearance programs. Integrating the lessons learned through the development of information networks (CBMRR & CBURR & National Police), analysis of contamination information (bombing data), into advanced EOD/BAC procedures is a necessary transition from "mine centric" operations to ERW Response operations.

EOD/BAC operations in Cambodia can be termed "reactive" in their response to community needs and requests for support. This type of operation is efficient and responsive to real-time community threats and impact of ERW. This capability needs to continue and augmented by "pro-active" EOD/BAC operations.

Pro-active EOD/BAC operations are intended to relieve communities from ERW threats by applying concentration of effort through sustained "blitz-type" operations, i.e. surface and sub-surface clearance until all evidence of threats are removed. ERW analysis identifies known highly contaminated areas and specifically targets these communities for intensive operations. This type of operation will minimise the necessity for repeated visits by "reactive" EOD/BAC teams in the same communities. "Reactive EOD teams" could then focus on maintaining operational presence covering a wider area of medium ERW contaminated communities.

All EOD teams in Cambodia are trained and equipped for light operations identifying ordnance and disposal through demolition or removal. These operations are generally limited to small scale ordnance. A requirement exist to train and equip a portion of EOD teams to handle heavy tasks such as large air-dropped bombs and bulk munitions demolitions. This expertise involves learning techniques to render safe munitions using special equipment, explosives and techniques. Additionally, training is required to develop a Cambodian capacity to dispose of bulk munitions causing extreme hazards in government ammunition facilities and caches throughout the country.

Scrap metal collection of hazardous explosive material will remain a problem for communities. The solution to removing these hazards is joint National Police and EOD service providers working together on a regular collection plan. The LIS identified scrap metal dealers all over the country, this information combined with National Police capacity to network at the commune level is the starting point for designing a response plan. The key is national service provider integration working together on a risk mitigation plan that creates a safer environment for communities and the scrap metal trade.

End State Programming

Strategic Forecasting

The current estimates published by CMAA indicate that mine action agencies will complete high priority minefields by 2015. The plan does not list or indicate which minefields are targeted as “high priority” for clearance. The next milestone is 2020, the period when Cambodia will be impact free; again impact is not well defined. There is no plan outlining the expected activities or outcomes during the intervening period or indication how service providers can contribute to strategic goals beyond 2015.

International NGO’s are predicting that major priority areas may be complete as early as 5-10 years from now. Bearing in mind CMAC’s enhanced capability deploying mechanized brush cutters, mine detection dogs and advanced Technical Survey Teams focused on area reduction operations a productively level not yet fully realized, even a five to ten year projection may be a conservative estimation.

The rapid reclamation of land in formerly suspected areas has overtaken the capacity of mine clearance agencies to keep up to clearance demands. This massive shift in land reclamation is making redundant the current national strategy. Additionally, the massive ERW problem known to exist in eastern Cambodia is not quantified into the strategic planning. Troubling is a lack of end state vision in view of these develops in the sector.

International organizations are recognizing the changes in Cambodia and it is now time for the national mine action service agencies to embrace a realistic projection of requirements for mine clearance operations and make preparation for changes to organizational structure that addresses the longer-term ERW roles.

End State Development

End State programming is a product of developing a strategic and operational roadmap to reach a desired optimum outcome or vision. Definition of the Cambodia mine action and ERW mine action end state is a function of combining a strategic vision with a designed organizational structure, which matches the long-term requirements of the sector.

National mine action service providers must define their organizational end state that meets the reality of a diminishing landmine problem and the requirement to address the longer-term ERW issues. The End State is a national affair where the expectation is total RGC ownership for the national ERW Response structure and operations. Without a specific plan for an “End State” the current management of mine action or ERW Response would not be credible.

The End State for National ERW Response should include:

- a. Redefining the problem through information management, and area reduction policy/procedures,
- b. Re-orientate the existing organizational structure to finish the main task of removing landmine threats using area reduction techniques, and
- c. Build a national structure that can address the longer-term ERW threat.

The focus since 1992 has been landmine clearance, now mine action service providers are visualizing the limits of the remaining contaminated areas. Analysis and planning targeted operations can effectively diminish the landmine threat to manageable proportions. Thus, leaving the long-term ERW problem to organizations designed to meet the requirements of the impacted communities and the national development plan.

An example can be taken from the northwest Europe experience contaminated with unexploded ordnance leftover from two world wars. The casualties from uxo are minimal due to long-term education programs that have changed the behaviour of people living in contaminated areas. Government EOD/BAC resources are available on call to handle munitions discovered in communities as result of agriculture or construction works. It is conceivable Cambodia will have a similar organizational structure and capacity, albeit larger due to the extensive contamination from aerial bombardment.

End State programming is essential for the national mine action service providers to create a ‘national’ sustainable organization to meet future requirements. An example End State status; CMAA staffed by civil servants coordinating a network of government institutions, CMAC, military, police and civil society ERW response resources. A national budget process that providing the fuel to activate a National ERW Strategic Plan supporting national development goals and objectives would finance these programs and operations.

End State Transitions

Over a decade of international investment has created solid foundations for mine action in Cambodia. CMAC’s capacity as an organization and achievements are a direct result of government commitment and international support to the fundamental ideas of mine action in Cambodia. Replicating this resource in other government agencies would require the same amount of investment over a similar period. Therefore, it is in the best interest of the RGC to capitalize on these investments in CMAA & CMAC by preparing for the self-sufficiency of ERW Response for the future.

The most valuable contribution of the RGC would be fully institutionalizing the existing mine action structure, as a first step towards national responsibility and ownership of the ERW sector. CMAC is a government institution by decree, however not fully assimilated into the government administration. Amalgamating CMAC into government administration must be achieved through a phased transitional process, planned in such a way that both operational objectives for mine clearance and ERW Response transition occur in a smooth evolutionary process along with the retention of experienced staff.

The opportunity to meet the changing sector dynamics before mine action resources become redundant for lack of real mine areas to clear, and the donor community moves onto other pressing priorities is now. Planning a transition that develops human resources and organizational structures for the future must start immediately before events overtake the opportunity to craft the future.

Impact on National Development Plans

Attempting to estimate the impact of ERW contamination on Cambodia's national development is an immense task, requiring complex modeling of numerous inter-dependent variables across several key socio-economic domains. The impact on public health and social welfare spending for example is one; the affects on rural workforce participation, agricultural production and development of national and provincial irrigation, power and transport infrastructure are others.

Such analysis clearly lies beyond the scope and expertise of this study. However, there is one domain that can be relatively easily measured. That is the amount of overseas development assistance committed to mine action. This in effect represents supplementary monies added to national development targets as a direct result of ERW contamination.

Some of this funding comprises of World Bank or ADB loans awarded for national infrastructure development; other, bilateral Government and INGO assistance for specific demining and development projects or generic mine action operations. While it is possible to estimate the sum of the latter from NGO reports to the Cambodian Council for Development (CDC); details of budgets allocated from WB and ADB loans are not in the public domain.

It is well known, however that the RCAF Engineering Command has undertaken clearance operations for companies awarded WB and ADB funded road construction contracts. Historically, these have included work on Route 1 (Phnom Penh to Vietnam), Route 5 (Phnom Penh to Battambang, south of the Tonle Sap) and Route 6 (Phnom Penh to Siem Reap, north of the Tonle Sap). More recently, the RCAF was sub-contracted to provide clearance support for the rehabilitation of Route 7 (Stung Treung to the Laos border). A study of the role of the military in mine action, conducted by the Geneva International Centre for Humanitarian Demining (GICHD) in 2003, reports that the Royal Cambodian Armed Forces Engineering Command estimated it had "...earned about US\$200,000 from commercial road projects", but that no details were available.

As a conservative estimate, some \$3.75 million USD has been provided solely to national development NGOs to procure mine action services over the past two years. If all mine action funding is included, such as expenditure on national capacity development, emergency risk reduction clearance and EOD operations, this figure jumps to \$36 million USD since 2004, with a further \$18.6 million USD allocated for 2006.

Recent, National Police aspirations for a pilot project to support and EOD capacity in five provinces adds another dimension to the assistance requirements in Cambodia. Clearly, coordination of assistance requirements must be strengthened through the Council of Ministers to ensure fiscal responsibility is focused on well-planned and articulated National ERW Response requirements during the limited period of remaining international support to RGC.

Conceivable, international contributions have peaked and remaining funding over the next 10-year period will gradually reduce according to donor's capacity for contribution. RGC International loans are increasingly feeding the general development sector, which in turn is becoming the trend for the ERW sector.

Developing an ERW End State program and plan would be beneficial for integration into the RGC development plan. The current mine action level of resources will not be sustainable either by loans or RGC funds to maintain for a decreasing need for landmine clearance.

PART III: STUDY RECOMMENDATIONS

Strategic Level

Overview

Recommendations of this report address the primary issues of ERW response within national structures and interests. Taking into account contextual international/national political and social-economic realities this study recommends strategic, institutional and operational improvements that are achievable outcomes for the ERW sector in Cambodia.

Framed within a diminishing landmine problem and receding international support this study focused on recommendations that target solutions to achieve a nationally sustainable ERW sector. Fixing time scales linked with government development goals and existing CMAA objectives offers a framework to determine short, medium, and long-term perspectives.

The Council of Ministers set the goal for national assimilation of fiscal responsibility for the ERW sector at 2015. This key milestone marks the end of the medium-term period and beginning of the Royal Government of Cambodia treasury sustaining National ERW programs.

Strategic periods for national development of the ERW sector are as follows:

- a. Short-Term 2006-2010 (4-years),
- b. Medium-Term 2010-2015 (10-years), and
- c. Long-Term 2015, (20-years) and beyond⁵⁰.

A central theme to National strategic planning is end-state programming to achieve a sustainable National ERW sector. Fundamental to sustainability is a strategic vision, which includes the roles and goals for institutional and operational frameworks necessary to implement Cambodia's National ERW strategy.

During the short-term period CMAC, RCAF and National Police are moving towards full maturity of their institutional and operational capacities to address the landmine problems in northwest Cambodia. Conceivably, the short-term period until 2010 will witness the landmine problem largely resolved, creating a surplus of mine clearance resources. These surplus resources will be required to address the longer-term ERW issues.

This scenario creates a sense of urgency to re-orientate, re-train and re-equip mine action resources before redundancy overtakes the sector. The aim of planning a nationally sustainable ERW sector would be to ensure Cambodia has the capacity for the long-term

⁵⁰ Long-Term ERW Response will extend for an indefinite period until ERW is no longer a threat in Cambodia, similar to the experiences of North-west European countries after WWI & II.

resolution of the ERW problem. Adopting “End State Planning” national sustainability is achievable before the conclusion of the medium term period in 2015. The foundations for long-term national responsibility meeting humanitarian and development imperatives, can be prepared before 2015 by beginning the planning and transitional process in 2006.

The study recommendations are further categorized into Strategic, Institutional and Operational levels that illustrate a way forward with practical measures towards transitioning the MA sector into a fully-fledged National ERW sector.

Defined ERW Roles: Governance & Legislation

Through the legislative authority of the Council of Ministers, define the roles for each of the national government and private sector stakeholders. In an interactive strategic planning process coordinate ERW stakeholder roles and responsibilities, and set guidelines for their contributions to international and national ERW Response capacities. Establish defined roles for institutions to create an environment of positive cooperation and focused use of the limited ERW Response resources.

- Goal 1- Define National ERW Response Roles for each stakeholder (see recommended roles).
- Goal 2- Legislate guidelines for ERW Response Roles.
- Goal 3- Provide environment for institutional transition into new ERW Response Roles.
- Goal 4- Assume national fiscal responsibility and governance from national to municipal level for the ERW sector.

This process must be coordinated by the COM, framing the roles of each stakeholder in a development process that allows maximum creative interaction between agencies. The following roles are recommended to bring clarity for stakeholders engaged in mine action and future ERW sector.

Recommended Roles

Council of Ministers (COM)

The COM should provide national oversight of the ERW sector inclusive of national level strategic planning, legislation, budget allocation, and monitoring. Establish the roles and guidelines for ERW stakeholders in the sector and provide an environment for effective reduction of risk and impact associated with ERW contamination.

Cambodian Mine Action Authority (CMAA)

Executive coordination, monitoring and reporting body of the COM. The CMAA ensures effective coordination of ERW stakeholders and resources in synchronisation with National Strategic goals and objectives. CMAA monitors and reports the

implementation of Annual Integrated ERW Work Plans and maintains a National ERW Information Resource Center.

Cambodian Mine Action Center (CMAC)

National ERW service provider executing Annual Integrated ERW Work Plans synchronised with National Strategic goals and objectives. Establish and maintain both skill and knowledge level human resource capacity for long-term ERW Response.

Develop and maintain a National ERW Training and R&D Center to service the professional needs of the ERW sector.

RCAF

Maintain the traditional National Defence roles supporting defence policies. Represent National interests internationally with ERW Responses capacity for UN Peacekeeping and other external emergency, humanitarian or development responses.

Develop a National ERW Response capacity capable of conducting operations supporting national development plans specifically in rural road and infrastructure development.

Safe storage, control, security, and monitoring of national defence munitions stocks for RCAF. Bulk munitions destruction of unneeded, expired, non-serviceable or obsolete munitions including implementation of the AP Ban Treaty stockpile destruction agreements.

National Police

Assume traditional National Police law enforcement role relative to weapons and ERW issues in collaboration with National and International ERW stakeholders. Develop a “Bomb Squad” capacity for national security requirements.

Develop and maintain a national ERW reporting structure that identifies the type, and location of ERW reported by citizens down to commune level.

Provide Police support to ERW agencies in their EOD/BAC removal or destruction operations. In particular, Police support for reducing risk in the scrap metal trade, through interactive operations in collaboration with ERW service providers, scrap-metal dealers/collectors and communities.

International & National - NGO's

The primary non-governmental organizational role is addressing emergency, humanitarian and development ERW responses in sectors and geographic areas where the national government is unable to respond in a timely manner or with the necessary resources. Additionally, the NGO role is interactive national capacity development of the ERW sector based on intrinsic professional expertise and experience.

International & National - Commercial

Provide professional level ERW services based on national standards and guidelines. Commercial operators are suited for supporting development related ERW operations fully integrated into a National ERW framework responsive to national standards and guidelines.

National ERW Information & Knowledge Management

Cambodia requires National ERW Information Management that benefits the national interests and all stakeholders. A National ERW Information Resource Center complete with clearinghouse for operational and archival information is necessary to meet this requirement. Develop central information collection, collation, analysis, information product development and dissemination for ERW stakeholders and the public at large. Collated ERW contamination data results codified into one (1) serialized reference of all ERW contamination in for Cambodia. Maintain interactive, up-to-date ERW contamination information and products.

- Goal 1- National Audit of ERW Data/Information
 - Objective 1- Collect all available ERW data in compatible formats.
 - Objective 2- Collate and analyze all ERW data.
- Goal 2- Create a Common National ERW Contamination Register
- Goal 3- Systemized reporting of all ERW operations into common formats and reports.
- Goal 4- Develop a National ERW Information & Resource Center
 - Objective 1- Create ERW Information Services and Products
- Goal 5- Maintain a National Library & Archive for ERW Data, Information and Knowledge.

Threat Analysis, Define Impact & Risk Management

A full analysis of the National ERW threat facing Cambodia must be completed as a baseline for all future planning. Following a National Audit of ERW Information a threat analysis can be initiated utilizing the definition of threat munitions and environments that they are located. Define the actual munitions, types, condition and probable location of hazardous explosive material. Establish the impact of hazardous explosive material has on the Cambodian population and determine the levels of “acceptable risk”. Finally develop Risk Management Policies and Plans to mitigate the impact/risk of hazardous explosive material in Cambodia.

- Goal 1- Complete a threat analysis on munitions types, conditions and locations in Cambodia.

- Goal 2- Define impact of hazardous explosive threats on the Cambodian population
- Goal 3- Establish minimum Acceptable Risk level for hazardous explosive threat exposure to the Cambodian population
- Goal 4- Establish a Risk Management Policy and Plans

Standards and Guidelines

National ERW Standards and Guidelines for all aspects of ERW Response must be developed, published and distributed for public use. Five (5) Cambodia Mine Action Standards and Guidelines (CMAS) standards published is a start point to revising and completing the remaining standards for implementation. Fast track the development of this fundamental documentation so the structuring of threat analysis, risk management, operational and strategic planning can proceed efficiently.

Through an interactive process with stakeholders, review existing CMAS documentation and prepare an interim National ERW Standards and Guidelines for immediate use of operators in the field. Allow time for operators to transition their organizations to ERW Response structures.

- Goal 1- Establish a Technical Review Board and Update 2002 version of standards for ERW requirements.
- Goal 2- Complete a full complement of interim National ERW Standards and Guidelines for the sector.
- Goal 3 – Legislate and implement National ERW Standards and Guidelines, phased with sector transitional plans.

Establish a National ERW Strategy

Transition from mine clearance centric planning to ERW themed national strategic planning is required at this junction of Cambodia's development progression. The results of a comprehensive review of the National ERW Contamination audit, threat analysis, definition of impact, and risk management necessitates a revision of the existing strategy. A National ERW Strategy will more fully represent Cambodia's humanitarian and development needs for future generations.

- Goals 1- Establish a National ERW Strategy
 - Objective 1- Establish a National ERW Strategic Planning Group
 - Objective 2 – Develop a National ERW Strategy White Paper and Strategic Plan
 - Objective 3- Legislate the National ERW White Paper, Strategy Plan and Planning Process

- Objective 4- Develop Stakeholder Annual National ERW Integrated Work Plans

Transitional End State Planning

As a result of a defining the roles and responsibilities of each ERW stakeholder and introduction of an National ERW Strategy an environment is created to allow organizations to think forward and develop future plans. Introduce “Transitional End-State Planning” as a guiding principle to achieve full national capacity before 2015.

- Goal 1- Introduce “Transitional End State Planning” concept at all levels of planning.
- Goal 2- Create institutions that meet the long-term National ERW Response requirements of the National ERW Strategy.
- Goal 3 - Transition existing Mine Action resources into ERW Response resources.

Knowledge Based ERW Community

The Mine Action community in Cambodia must entrench its established mine action skill-based experience and transition to ERW knowledge based enterprising institutions. Capturing and retaining knowledge, experience, and skills acquired over a decade of development are necessary for achieving national self-sufficiency.

Develop the existing training facilities and human resources to create a community that values its contributions, establishes standards for excellence and professionalizes the ERW sector. Create centers of excellence to capture and maintain the skills & knowledge through a National ERW Information Resource Center with National ERW Training and Research & Development Center.

Develop a forward thinking National Human Resource Development plan which will provide the best qualities of people, skills and knowledge necessary to carry the ERW roles and responsibilities of the future.

- Goal 1- Develop a knowledge based ERW community environment.
 - Objective 1- Create ERW Center(s) of Excellence.
 - Objective 2- Create a National Human Resource Development Plan.

Institutional Level

Linked to strategic level planning is the development of institutional capacity to push forward ERW Response development. These recommendations embody the necessary measures for initial planning and development of organizational depth to meet the challenges of the future.

National ERW Training & R&D Center

Long-term requirement for professional ERW services will be necessary in Cambodia for several generations. Focus existing experienced trainers and create advanced skilled human resources into a national training facility. Concentration of effort into one (1) national center that services the entire ERW sector would benefit both national and private sector stakeholders.

Develop a Research & Development facility to further the knowledge and develop the necessary technologies and methodologies necessary to address the long-term needs of the sector.

- Goal 1- Strengthen existing CMAC training facilities into a national training center for all ERW related skill and management training.
- Goal 2- Develop a multi-agency training cadre (CMAC, RCAF, National Police) servicing a full sector curriculum, with value-added services.
- Goal 3- Co-locate and develop a National Research & Development capacity

ERW Human Resource Planning

Create plans and training curriculum for transitioning existing mine action personnel into professional level ERW human resources.

- Goal 1- Establish the skill and knowledge criteria for future ERW Response programs and strategy requirements.
- Goal 2- Implement a human resource training program to prepare individual, teams, managers and organizations for their future roles in ERW Response.
- Goal 3- Implement a human resource retirement process for redundant mine action staff.

Community Risk Reduction

Develop government, community and ERW service provider synergy to reduce community risks.

- Goal 1- Integrate CBMRR & CBURR & National Police best practices into a consolidated reporting network.

- Goal 2- Develop community mapping for local definition and ownership of ERW contamination.
- Goal 3- Integrate National Police reporting structure and develop EOD service provider organizational cooperation.

Technical Survey & Area Reduction

Adopt recent technical survey & area reduction innovations into the main stream of mine action as the main focal of activity to reclaim land and reduce risk for communities.

- Goal 1- Area Reduce suspected ERW contaminated areas as priority of operations.
- Goal 2- Integrate Explosive Detection Dogs and Mechanical Assistance into Area Reduction Operations.
- Goal 3- Develop National Area Reduction reporting criteria.

Advanced EOD-BAC Operations

Shift existing mine action resources towards advanced Explosive Ordnance Disposal and Battle Area Clearance operations. Develop pro-active EOD-BAC operations alongside existing reactive EOD operations.

- Goal 1- Enhanced EOD-BAC operations for ERW contaminated areas by development of EOD/BAC Heavy & Light operational units.
- Goal 2- Develop ERW EOD-BAC operational/technical procedures with standards, guidelines and SOP's.
- Goal 3- Integrated EOD-BAC operations with MRE, Technical Survey and CBMRR/CBURR/National Police networks.
- Goal 4- Develop knowledge and skill based EOD trainer/operators with bulk demolition expertise.

National Quality Assurance Monitoring

Development of a Quality Assurance culture within National ERW stakeholders.

- Goal 1- Establish Quality Assurance standards for National ERW Stakeholders.
- Goal 2- Define Internal & External Quality Assurance measures for CMAA, CMAC, RCAF, National Police, International/National NGO's and Commercial operators. Based on National ERW standards and guidelines.

ERW Technical Working Groups

Establish the environment for interactive technical cooperation between ERW institutions to discuss, debate, development and enhance through dialogue the ERW sector. Rotating TWG chairmanship amongst recognized ERW stakeholders to organize dialogue and development sessions to professionalize the ERW sector.

- Goal 1- Establish quarterly ERW Technical Working Groups.
- Goal 2- Scheduled review of all ERW technical/operational issues and introduction of innovative techniques, technologies and procedures.

Operational Level

Recommendations at the operational level specifically identify key areas for development.

Develop Technical Detection & Disposal Capacities

Develop methodologies and technology selection for EOD/BAC survey and clearance appropriate to the Cambodian context. Enhance existing SOP's to reflect transition of mine clearance centric operations to integrated operations addressing the challenges of active EOD and BAC operations.

- Goal 1- Conduct a systems trial for the integration of survey methods and clearance systems to address active EOD and BAC operations.
- Goal 2- Establish EOD/BAC SOP's that address the requirements and standards for ERW risk/impact reduction.

Pro-Active Community Risk Reduction Operations

Using existing US bomb data issue all EOD teams with target folders of contaminated areas in their areas of operations. Combine target folder information with local community mapping to determine areas to focus ERW Response operations.

Initiate, pro-active EOD/BAC operations to “blitz” highly impacted community to reduce risk. Increased level of reactive EOD teams positioned at district level throughout Cambodia responding to the growing demand of CBMRR & CBURR and National Police networks. Use existing scrap metal dealer location information in the LIS and the collection network of the dealers themselves to reduce risk to communities in collaboration with the National police.

- Goal 1 - Analysis existing bomb data and produce district level target folders for commune level EOD/BAC operations. Integrate community mapping of ERW contamination into EOD/BAC operations
- Goal 2 - Pro-active Community Risk Reduction Operations that target highly impacted communities with concentration of EOD/BAC resources.
- Goal 3 – Increased Re-active EOD response at throughout known contaminated district and specific targeting of scrap metal dealers across Cambodia.

Practical Measures in 2006

This study is about looking to the future with the “art of the possible” in mind. The existing resources available in Cambodia with some limited support is completely capable of designing the future of the ERW sector into comprehensive plans within a twelve (12) month period.

A critical path, point of view is developing foundational impact and risk documentation to serve as the stepping stones developing a National ERW Strategy. These fundamental steps should be preformed in open dialogue through working groups formed by the sector stakeholders. Each member of the working groups would commit to supporting the development of the ERW sectors future, and CMAA would be responsible for documenting the process.

A thorough analysis of existing ERW data and information to establish the scope of the problem to be solved must be achieved before a National ERW Strategy is written. Simultaneously, fundamental principles establishing definitions of impact and acceptable risk enables clear articulation of ERW standards and guidelines. All these activities are Impact, risk, and standards are reliant upon each other, however can be developed at the same time leading to a foundation in which a National ERW Strategy can be based upon.

An achievable proposed schedule is recommended as follows:

- a. Establish National ERW definition of “impact” and “acceptable risk” (NLT July 06)'
- b. Finalize National ERW Standards and Guidelines (NLT July 06)'
- c. Collate, analysis full spectrum of ERW data and develop National ERW Contamination baseline (NLT Sep 06),
- d. Develop a National ERW Strategy (NLT Dec 06), and
- e. Develop Transitional ERW “End State” Plans (NLT Feb 07)

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