

# **UXO Sector Evaluation Lao PDR June-July 2008**

## **Final Report**



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## 1. Recommendations

The Evaluation Team makes the following recommendations based on the findings and conclusions in the chapters above.

### Scoping

- A strong correlation exists between high levels of UXO contamination and the 47 poorest districts. The overall scope of the UXO clearance program should be based on the clearing of all potential paddy land likely to be contaminated and that a proportion of the potential upland cultivation should be cleared in the 47 poorest districts. With more resources, the 25 poor districts could be included as well.
- Where possible, other upland areas should be released by technical survey, if a credible survey process can be developed. Land released by survey would be faster and more cost-effective manner than achieved solely by full clearance.
- The scoping results initially indicated that the clearance of the land included above would require 16 years at current rates of clearance. This period could be shortened by a number of years 1) with the provision of additional resources, 2) further improvement of survey and clearance techniques, and 3) further refinements in the definition of contaminated land, such as, removal of land in concession areas and land already cleared from the current estimate.
- The original JICA analysis appeared to have a more exacting method of identifying the highest-potential agricultural land. The NRA office should continue to research this and other relevant land use and land cover data, perhaps through an extension of its intern program.
- Given the dynamic nature of the situation (i.e. the potential for further changes in the values of the most sensitive inputs over time), the cost-benefit analysis model should be periodically re-run to identify the effect of changes in circumstances. The NRA office could undertake this work.
- There is some discussion in the sector that it's coverage should be expanded beyond the current nine provinces currently covered. The scoping and resource allocation models developed as part of this evaluation could help establish a means of quantifying the requirement.

### The UXO Sector

- Suggested Sector Themes. The structure of the UXO sector should be refined to focus on two thematic areas: 1) accident prevention and 2) area clearance of UXO.
- Accident prevention would emphasize targeted activities for groups at high risk of accidents, namely, people involved in scrap metal collection and processing and 2) people who discover UXO in the course of agricultural or other activities. The following strategies and activities are suggested:

- Expanded numbers of roving teams should first deal with the backlog of reported UXO.
- As part of the overall accident prevention theme, a public information campaign should be undertaken to encourage the reporting of UXO. Bottom up communications linkages need to be established from the village level to UXO roving teams. Village chiefs should be encouraged to use whatever communications channels are available to report dangerous items and the concerned roving team should respond within five days. The contact information for roving teams should be widely advertised.
- Roving teams should also develop partnerships with scrap metal dealers and collectors. These teams would provide 1) training and education on safe scrap handling and 2) rapid response when UXO are encountered in the course of scrap collection.
- Roving teams should provide rapid response when villagers encounter UXO in farming or other activities. The teams should respond immediately to destroy or remove these items to prevent children from playing with them or amateur attempts to defuse them.
- In accordance with the recommendations under scoping above, area clearance would continue to focus on UXO clearance of land for development and poverty reduction purposes.
- In regard to UXO clearance for family agricultural plots, there are a number of methods available for use at a provincial and district level to prioritize the requirements of individual households. These include rationing and lotteries. Research should be carried out to examine the alternatives and select the best practice for use in the Lao context.
- Quality Assurance. Within the sector, external quality assurance monitoring for UXO area clearance cover at least 5% of clearance work on a random basis. At least some of these observations should be unannounced.
- QA monitoring could be provided in a number of ways:
  - The NRA office could contract in sufficient people to meet the 5% target. This is probably the most expensive option, but some compensating reductions could be sought in other elements of the NRA staff.
  - The NRA office could let an independent contract for QA monitoring; if this were done it should involve an organization that is not in competition for clearance funding in Laos.
  - Individual donors could contract in their own independent QA monitors.
  - The NRA office could require, by regulation, that each operator is responsible for hiring in a QA monitor.
- All Quality Control sampling should be conducted on the assumption that the UXO clearance being sampled has not been fully effective and some UXO remain. The QC sampling team should therefore be trained and equipped in a manner appropriate for UXO search and accompanied by the same safety requirements.
- ETS and PCIA. The ETS desk analysis process should be used to help order priorities in the short term pending the development of an improved quantitative analysis process.

- PCIA should be a simple process included in the standard project cycle management and quality management processes within the sector, and could be as simple as a quality assurance (QA) team answering the question “is this land being used for the purpose for which it was intended?”
- Transitional Operations. Within the next two years, donor support in the sector in the areas below should transition as follows:
  - Education-based community awareness should shift to increased support for roving and targeted prevention activities;
  - Responsibility for in-school risk education should shift to MOE;
  - Responsibility for the victim assistance database should shift to MOH.

If deemed necessary, capacity assessments should be carried out to confirm the ability of the recipient organizations to manage transferred functions along with appropriate measures to ensure the sustainability of the respective functions.

## **The Next National Strategic Plan**

The goal for preparation of the next National Strategic Plan should be the integration of UXO activities into the plans and strategies of next socio-economic development plan (2011-2015). In other words, the next plan should supersede the current plan and begin a new five-year planning period in 2011. The essence of the next plan would be incorporated into the socio-economic plan.

The main themes for the UXO sector should be 1) accident prevention and 2) UXO area clearance for development and poverty reduction.

The plan should take into account and cover these key aspects:

- The use of scoping results as the basis for planning
- The need for greater emphasis on roving tasks and responsiveness
- The need for development of a simple system of priority setting that addresses development and poverty reduction priorities
- The development of new types of targets, given the shift in emphasis to roving tasks
- An explanation of funding policies and mechanisms for the sector
- The definition of an exit or handover strategy for the NRA and UXO Lao residual functions.

## **The NRA and the NRA Office**

- Leadership. The NRA office should expand its public relations function to include active outreach to Government offices, other development agencies and the private sector for the provision of up to date information and presentations about the UXO situation, clearance obligations, NRA policies and the activities of UXO operators.

- The NRA office should advocate for removal of provincial laws that restrict the scrap metal trade, advocate for the implementation of safe scrap handling strategies by UXO operators under the accident prevention theme, and advocate for a national regulation preventing children under 14 from participating in scrap metal collection.
- In cooperation with MPI, the NRA should advise on the establishment of a Government regulation that clearance must be undertaken in all contaminated concession or investment areas for purposes of public health and safety.
- The NRA office should negotiate within the Government the locus for residual capacity to deal with UXO disposal in the long term; mobilize resources and help formulate a plan to develop this capacity. Whilst donors might help with the development of such a capacity, its ongoing recurrent costs would be borne by the Government after the end of donor support.
- The NRA office should include the following principles in both National Standards and in policy documents for UXO clearance in support of development projects:
  - Any agency wishing to conduct a development project in Lao PDR should seek advice from the NRA office about the likely contamination.
  - Clearance should only be contracted from agencies accredited by the NRA office.
  - The technical annexes and scope of work for UXO clearance should be drafted by a competent specialist that is not involved with the clearance agency and should be compliant with National Standards.
  - Clearance contracts should be awarded pursuant to competitive bidding.
  - UXO clearance should be subjected to external quality assurance monitoring.
  - The National Regulatory Authority office can provide customers of UXO clearance with advice on how to contact technical specialists to assist in the drafting of technical annexes and assist with external quality assurance monitoring. Such technical specialists can also be contracted by competitive bidding, depending on the customer's own organizational requirements.
- Governance. The NRA should approve the National Standards for UXO clearance and arrange for publication as soon as possible.
- The NRA office should take steps to accelerate the accreditation process for clearance operators.
- The NRA office should develop and implement quality assurance monitoring up to 5% of clearance activities.
- Coordination. The NRA office should develop and apply an economically sound model for analysis of costs and prices of various clearance operators. No such model exists today in Laos.
- The NRA office should assist in the creation of a benchmarking test facility, ideally at the UXO Lao training centre. This benchmarking facility would allow organizations to measure their own likely productivity given their own equipment and procedures in a controlled environment. The test facility should consist of a number of one-metre wide lanes, each thirty metres long. The lanes should be first made "metal free" and processed to make sure that their soil contents are consistent. They should then be seeded with a

known level of contamination both in terms of depth, object size and density of contamination per square metre. It is recommended that four sets of four 30m lanes be prepared, with each set consisting of:

- 1 x lane with no metal contamination (control lane)
- 1 x lane with average density of 1 indication per m<sup>2</sup>
- 1 x lane with average density of 5 indications per m<sup>2</sup>
- 1 x lane with average density of 10 indications per m<sup>2</sup>.

The lanes should be at least one metre apart to allow for the use of larger detection systems (such as the Ebinger 'Large Loop') and to prevent confusion from signals from other lanes.

- Organizational Issues. The NRA office should develop a plan for determining capacity development requirements and the planned reduction of the number of technical assistance advisors.
- In general, the NRA office should anticipate irregular funding and therefore constantly seek to reduce optional costs. Suggestions for cost reductions, some of which have already been made, include:
  - Regular review of staffing and personnel needs;
  - Transferring the victim database and related data collection network to the Ministry of Health or the National Rehabilitation Center;
  - Simplify the post clearance assessment process so that it can be carried out as an aspect of project cycle management;
  - In lieu of creating provincial offices, consider providing necessary services on a visiting basis.
- Given the time bound nature of the UXO problem, the NRA office should remain as a programme of UNDP and the Government.
- The functions of the NRA office should be defined as follows:
  - a. Act as Secretariat of the NRA.
  - b. Prepare requests for Lao Government budgetary support.
  - c. Draft policy and resource allocation strategy on UXO area clearance and accident prevention; this function does not extend to day to day tasking of operators.
  - d. Prepare and review of sectoral plans that are to be integrated into national socio-economic plans.
  - e. Accredite UXO clearance operators.
  - f. Manage a database on contaminated land and land clearance.
  - g. Monitoring of UXO operators and their compliance with sectoral plans
  - h. Carry out quality assurance monitoring on behalf of stakeholders.
  - i. Report to the NRA and stakeholders on UXO plans, activities and results in the sector.
  - j. Prepare and revise standards.
  - k. Conduct research into relevant UXO-related issues (such as, the development of a sound costing model as recommended above).
  - l. Coordinate and share information among UXO operators.
  - m. Act as an administrative interface between UXO operators and relevant government ministries, on issues such as MOU.
  - n. Represent the Government at international meeting and events dealing with UXO and related matters.

## UXO Lao

- Roving. Roving tasks should be the first priority of UXO Lao and work should be undertaken to clear the backlog of EOD tasks. Roving teams should also respond to UXO found by scrap collectors and processors.
- The importance of roving tasks should be recognized as part of an overall accident reduction concept and a response time analysis process should be adopted to ensure that such tasks are dealt with in a timely manner. A recommended maximum response time is five days between reporting and clearance of any single item of UXO. If this response time cannot be achieved, more roving teams should be established. Roving EOD teams should be reallocated across provinces to ensure that response times are equitable over all of Lao PDR.
- Field staff need to be encouraged to deal with general purpose bombs in a timely manner; if there are indeed no technical problems, in terms of training or equipment faced by the EOD teams then appropriate managerial safeguards need to be put into place to give the field staff confidence that they can discharge their jobs without fear of inappropriate disciplinary action providing they follow approved procedures. Senior management of UXO Lao should investigate the reasons for the hesitancy to deal with these munitions and take action accordingly.
- Reporting and surveying processes should be streamlined to minimize the number of times a task is visited. In the case of single items of UXO, survey and/or EOD teams should be trained and equipped to deal with UXO 'on the spot' wherever possible. Thought should also be given to reorganizing roving teams into smaller units to allow more teams to be on the ground for the initial response and survey process. It could then be possible to combine these smaller teams where larger groups are needed to cordon off demolition sites.
- Community Awareness. Some Community Awareness personnel should be redeployed with roving teams and their jobs reconfigured to communicate messages for 1) safe scrap collection among scrap collectors and processors and 2) UXO accident prevention in land clearing and agriculture. They should communicate the message of how to report UXO as part of an overall accident prevention concept. Other CA personnel could be re-trained as roving EOD team members.
- Area Clearance. Area clearance by UXO Lao should focus first on the clearance of unfunded public works projects identified by local government and then on the clearance of agricultural land where suitable land tenure arrangements exist and the beneficiary is likely to be able to make use of the land. Family agricultural plots should be cleared only when no higher priority public good projects are pending. This work should be free at the point of delivery. UXO Lao should work with NRA and MPI to develop appropriate policies linking poverty reduction and clearance, such as, concentration of clearance efforts on the 47 poorest districts.
- UXO Lao should set overall criteria for prioritization in line with national priorities, and then allocate resources between provinces on an equitable basis. The detailed task of prioritization should be delegated to provincial coordinators. UXO Lao would then only

be required to monitor compliance with national requirements. This should free up the prioritization process. Provinces should be encouraged to generate six-monthly or even quarterly works plan, thus making them more responsive to requests for clearance.

- The work plan of UXO Lao should be freed up to allow more detailed prioritisation to take place at a provincial level. National involvement should be limited to setting overall criteria for intervention, allocating resources between provinces and then following up to make sure that work is carried out in accordance with the agreed criteria.
- UXO Lao should stop the automatic increase of production targets in terms of hectareage; instead they should introduce a reasoned, objective and transparent mechanism to forecast an average annual production rate as *part* of a more sophisticated system of indicators that focuses on outcomes and outputs rather than on activities.
- UXO Lao should continue to look for opportunities to make further gains in efficiency through the adoption of new techniques and/or appropriate new technologies.
- Survey. The current ETS field sampling process of 25% of a potential clearance task has yet to be statistically validated and should be suspended pending its formal quantification.
- The ETS desk analysis process should be used to help order priorities in the short term pending the development of an improved quantitative analysis process; ideally this should be based on the Oxiana model or an ‘open source’ equivalent. If a quantitative analysis process is desired as a field sampling complement to the desk analysis, then the concept of fragment sampling should be investigated. The results of this investigation should be made available to all UXO clearance operators in Lao PDR.
- Quality Assurance and Quality Control. More quality assurance (QA) monitoring of UXO Lao operations should be conducted, with at least 5% of UXO clearance activities being observed on a random and unannounced basis. QA should be conducted internally by UXO Lao management and externally by NRA, though donors should not be discouraged from the use of their own monitors.
- The internal quality control sampling (QC) processes inside UXO Lao should be reviewed to ensure that the finding by a QC inspector of any indication (by a detector calibrated to find a half-BLU 26 and fuse), and where the indication has clearly not been investigated by clearance personnel, should be considered a quality failure, even if that indication is not actually an item of UXO.
- Organizational Issues. UXO Lao should proceed with accreditation by the NRA office as soon as possible.
- If UXO Lao is asked to tender for area clearance services on an infrastructure or development project, it should not do so until UXO Lao has a cost-capture process in place that will allow the organization to identify its true costs. Conversely, once they have such a process they should be encouraged to tender for such projects. Given that donations of funds and equipment have been provided for humanitarian purposes, UXO Lao should not bid on commercial projects.

- Given the time bound nature of the UXO contamination problem and as in the case of the NRA office, UXO Lao should continue as a project of the Government and UNDP. Other donors contributing funds to UXO Lao should channel them through UNDP or set up their own project implementation units to administer their resources.
- The fiduciary role of UNDP advisors in financial management and their management role in quality assurance should be clarified and strengthened. The contract of the STA should be amended to reflect this and his contractual independence from the Director of UXO Lao should be strengthened.
- UNDP should consider expanding the scope of work for audit of UXO Lao to include not only compliance but also management performance and value for money as well.
- UXO Lao should assist in the development of a residual national capacity through its training centre. UXO Lao staff should be encouraged to join this capacity at the end of the UXO Lao program.

## **Government and Donor Support**

- The Ministry of Foreign Affairs should undertake a major reform of the MOU process. Streamlining that process could immediately and dramatically increase funding available for the sector. Assuming an average processing time at present of six months per MOU – an underestimate according to concerned parties – and using the total UXO programme expenditures of \$6.0 million for the three largest non-governmental organizations in 2007, the opportunity costs of six months' delay is estimated at \$3.0 million – half of a year's total delivery of area clearance and other UXO services.
- There is a clear indication amongst donors that a significant cash contribution (i.e. above and beyond the current 'in kind' contributions) to the UXO sector by the GOL would be an important signal that could help unlock additional donor funding. Discussions with stakeholders suggest that a figure comparable to the recurrent costs of the NRA Office (i.e. approximately \$500k per year) would be a welcome start.
- In order to harmonize technical assistance and capacity development, the technical working group for the UXO sector should address the issue of the actual needs for technical advisors at the NRA office and UXO Lao and advise donor organizations accordingly. The roles of the UNDP STAs at the NRA office and UXO Lao should be recognized by other donors as playing the coordinating role for technical assistance.
- Following the lead of AusAID in its Lao-Australia NGO Cooperation Agreement (LANGOCA) Program, other development agencies working in Laos should fully fund the costs of any necessary UXO clearance for development projects in their planning and budgeting processes.
- Funds should be allocated to the Poverty Reduction Fund and the District Development Fund to allow them to fund their own clearance requirements. These Funds should avoid tendering for small jobs, however, and should design contracts for a total number of hectares per year in order to take into account clearance operators' needs for economies of scale.

- The Government, in cooperation with the NRA office, should decide where the locus of residual capacity for UXO disposal should be and begin the process of capacity development to establish that capacity within the Government.
- If accession to the Oslo Convention on Cluster Munitions results in the mobilization of large amounts of additional resources, there may be a case for the establishment of new funding arrangements for the sector to facilitate donor coordination.

## Annex 1: OECD Development Evaluation Criteria

No.	Criterion	Definition	Rule of Thumb
1	Relevance	The extent to which the aid activity is suited to the priorities and policies of the target group, recipient and donor	Does it fit development and/or poverty reduction plans?
2	Impact	The positive and negative changes produced by a development intervention, directly or indirectly, intended or unintended. This involves the main impacts and effects resulting from the activity on the local social, economic, environmental and other development indicators.	Does it have a positive effect on the intended beneficiaries?
3	Effectiveness	A measure of the extent to which an aid activity attains its objectives.	Does it meet its targets?
4	Efficiency	Efficiency measures the outputs -- qualitative and quantitative -- in relation to the inputs. It is an economic term which signifies that the aid uses the least costly resources possible to achieve the desired results. This generally requires comparing alternative approaches to achieving the same outputs, to see if the most efficient process has been adopted.	Does it meet its targets in a cost-effective manner?
5	Sustainability	Sustainability is concerned with measuring whether the benefits of an activity are likely to continue after donor funding has been withdrawn.	Will the government take on funding?

## Annex 2: EOD Resource Allocation<sup>1</sup>

This method is based on an approach used by a number of countries, including, for example, Australia and the UK. Under such an approach, an average response time is set as a standard by the appropriate authority. This would be the expected time between a UXO being reported to the implementing agency and its team arriving to deal with the suspected item.

Given the time necessary to deal with an ‘average’ find after the team arrives on site, and typical travel times between two separate locations, one could expect each team to deal with two separate UXO tasks each working day. This then allows analysis using the principles set out in Box 1 below.

- *If EOD teams are each carrying out an average of two tasks per day and there is no backlog of tasks, then the number of teams available can be considered sufficient and their management efficient*
- *If EOD teams are carrying out an average of two tasks per day and there is a backlog of tasks, then the number of teams available may be insufficient, even if they are being managed efficiently*
- *If EOD teams are carrying out less than two tasks per day and there is no backlog of tasks, then there may be too many teams available (or a problem in the task reporting process)*
- *If EOD teams are carrying out less than two tasks per day and there is a backlog of tasks, then it is likely that the teams are being managed inefficiently.*

*Box 1. Principles for EOD response time analysis.*

This analysis can be carried out at a national level to determine whether there are sufficient EOD teams in the country, and repeated at a provincial level to establish whether the capacity is allocated efficiently between provinces.

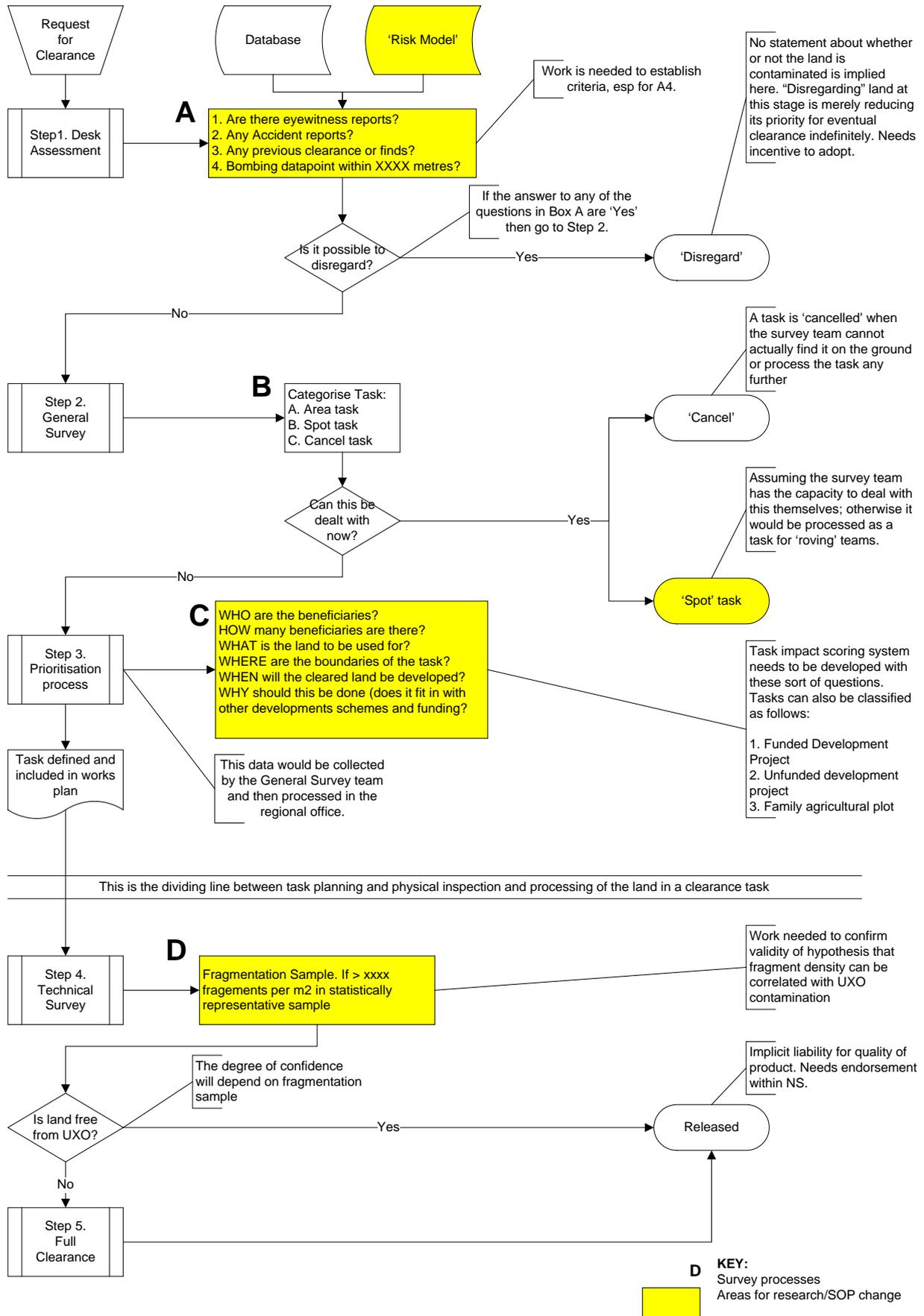
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<sup>1</sup> These principles were originally set out in an evaluation of the mine action sector in Cambodia carried out on behalf of UNDP in 2004 by two of the members of this Evaluation Team. See: Robert Griffin and Robert Keeley “Joint Evaluation of Mine Action in Cambodia” 2004

### Annex 3: UXO Lao Planning Score Sheet

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	Selection and Prioritisation of Clearance Tasks																				
2	Section - 1																				
3	Village	KENGKOUA				Village Code	1305445				Province	SAVANNAKHET									
4	Area (sq. m)	30000				No. of Beneficiaries	15				District	PHINE									
5	Task Code				Task type																
6	Section - 2																			Points	
7																					
8	A The impact of UXO in this village is rated as follows in the 1997 Impact Survey Report																				
9																					
10	Severe	<input type="checkbox"/>				Significant	<input checked="" type="checkbox"/>				None	<input type="checkbox"/>				7					
11	OK GO TO B1																				
12																					
13	B Casualty recorded in the village																				
14	B1 In the last two years																				
15	1-3	<input type="checkbox"/>				4-6	<input checked="" type="checkbox"/>				7 or more	<input type="checkbox"/>				15					
16	None <input type="checkbox"/>																				
17	OK GO TO B2																				
18	B2 Since 1973																				
19	1-3	<input type="checkbox"/>				4-6	<input checked="" type="checkbox"/>				7 or more	<input type="checkbox"/>				7					
20	None <input type="checkbox"/>																				
21	OK GO TO C1																				
22	C1 Are there any bombing records for this village in US-provided database information?																				
23	Yes	<input checked="" type="checkbox"/>				No	<input type="checkbox"/>				10										
24	OK GO TO C2																				
25	C2 Has there been any ground battle in this area																				
26	Yes	<input type="checkbox"/>				No	<input type="checkbox"/>				ERROR										
27	CHECK YOU MIGHT HAVE TICKED MORE THAN ONE BOX OR NO BOX																				
28	D National Growth and Poverty Eradication Strategy (NGPES)																				
29																					
30	The village is listed as a priority village <input type="checkbox"/>																				
31	The village is not listed as a priority village but the district is <input type="checkbox"/>																				
32	Neither the village nor the district is listed <input type="checkbox"/>																				
33	CHECK YOU MIGHT HAVE TICKED MORE THAN ONE BOX OR NO BOX																				
34																					
35	E1 Contamination level based on previous clearance carried out in this village																				
36	Less than 3 UXO/hectare	<input type="checkbox"/>				3-9 UXO/hectare	<input type="checkbox"/>				ERROR										
37	More than 10 UXO/hectare	<input type="checkbox"/>				No UXO contamination	<input type="checkbox"/>														
38	CHECK YOU MIGHT HAVE TICKED MORE THAN ONE BOX OR NO BOX																				
39																					
40	E2 Number of roving visits made in this particular village <input type="checkbox"/>																				
41	CHECK YOU MIGHT HAVE TICKED MORE THAN ONE BOX OR NO BOX																				
42																					
43																					
44																					
45																					
46	F Number of beneficiaries benefitting from the clearance task per hectare <input type="text" value="5"/>																				
47	OK GO TO G																				
48																					
49																					
50																					
51	G Nature of task (refer National Strategic Plan - The Safe Path Forward)																				
52																					
53	Priority 1: Agricultural tasks, public service utilities, educational facilities <input type="checkbox"/>																				
54	Priority 2: Grazing land and forested areas, communal facilities, government facilities and offices <input type="checkbox"/>																				
55	Priority 3: Public infrastructure work, communal 'profit-making' areas, tourism sites, commercial private business sites <input type="checkbox"/>																				
56	CHECK YOU MIGHT HAVE TICKED MORE THAN ONE BOX OR NO BOX																				
57																					
58	ERROR																				
59	H Development projects relevant to the task site																				
60	None	<input type="checkbox"/>				On-going	<input type="checkbox"/>				Planned	<input type="checkbox"/>				ERROR					
61	CHECK YOU MIGHT HAVE TICKED MORE THAN ONE BOX OR NO BOX																				
62																					
63																					
64	I Information from the beneficiary																				
65																					
66	I1 Land is not used but will be used soon after it is cleared and it is not known if UXO is in this land or not <input type="checkbox"/>																				
67	Land is being used and it is known that some UXO are still in the land <input type="checkbox"/>																				
68	Land is being used and it is not known if any UXO is still there <input type="checkbox"/>																				
69	Land is not being used but will be used soon after it is cleared. Also there are many UXO known to be in this land <input type="checkbox"/>																				
70	Land is not being used but will be used soon after it is cleared and some UXO are known to be in the land <input type="checkbox"/>																				
71	Land is being used and it is known that many UXO are still in the land <input type="checkbox"/>																				
72	CHECK YOU MIGHT HAVE TICKED MORE THAN ONE BOX OR NO BOX																				
73																					
74																					
75	I2 Resources are available to use the <input type="text" value="-"/> land once it is cleared																				
76	Yes	<input type="checkbox"/>				No	<input type="checkbox"/>				ERROR										
77	CHECK YOU MIGHT HAVE TICKED MORE THAN ONE BOX OR NO BOX																				
78																					
79																					
80	I3 When will work start once the land is cleared																				
81	Immediately	<input type="checkbox"/>				Within 3 months	<input type="checkbox"/>				3-6 months	<input type="checkbox"/>				ERROR					
82	6-12 months	<input type="checkbox"/>				More than 12 months	<input type="checkbox"/>				Don't know	<input type="checkbox"/>									
83	CHECK YOU MIGHT HAVE TICKED MORE THAN ONE BOX OR NO BOX																				
84																					
85																					
86	Total																			43	
87																					

### Annex 4: Recommended revised Technical Survey structure



## Annex 5. Alternative UXO Risk Assessment Methods

### Risk and Hazard

- A *hazard* is defined as something with the potential to cause harm.
- *Risk* is considered in its formal sense as the product of the severity of an adverse outcome created by a particular hazard and the probability of its incidence.
- Where the probability of incidence is directly affected by the activity of people or institutions using a particular piece of land, risk can also be considered as a function of hazard and activity.

#### Box 2. Definitions of hazard and risk

#### *GICHD Risk Model*<sup>2</sup>

One of the Evaluation Team members recently had the opportunity to examine the latest version of the software associated with the GICHD risk model and discuss it with the GICHD staff member currently assigned to develop it. The software, when and if it can be completed, offers the potential for assisting Lao PDR allocate its scarce UXO resources through a principle of risk management rather than attempt to clear all of the potentially contaminated areas. Unfortunately, as the GICHD staff member agreed, there are several significant problems with it at present. It is therefore not available for use in the short term. There has been no independent validation of the formulae used in the model, and the model is therefore a ‘black box’. Furthermore, the formulae include a number of coefficients which effectively weight the mathematical operations of the model. These coefficients appear to be set arbitrarily (at least, the rule set for their application is not apparent) and were done so without consultation in the UXO sector in Lao PDR. Even when (or if) the model is finalised it will not deal with the apparent problem addressed in the ETS process of demonstrating physical evidence of the land.

#### *Oxiana Risk Model*

There is an alternative ‘risk’ model which is being discussed for use in the Sepon gold mine by Lane Xang Minerals Limited (LXML). The model is sometimes referred to as the ‘Oxiana’ model due to its links with the Australian element of the LXML consortium. It is understood that this model measures the probability of UXO being found in a given distance from one of the data points from the US bombing data. Given the high number of data points available, it seems reasonable that statistical modelling should be able to allow a potential user to say something like “there is 95% confidence that all UXO are found within X hundred metres of the nearest data point”. This, once established, would allow a comparatively simple risk-benefit analysis to be undertaken and could lead to an effective mechanism for releasing land that has a low probability of contamination<sup>3</sup>. Unfortunately the Oxiana model is not available for general use in Lao PDR at present. The Evaluation Team understands that it is still under development and that LXML are not yet actually employing it. If LXML are subsequently unwilling to release a completed version of the model for commercial reasons<sup>4</sup>,

<sup>2</sup> Lao PDR Risk Management and Mitigation Model, GICHD, February 2007.

<sup>3</sup> Note that the product of this (or indeed the other risk assessment processes) is not ‘low risk’ land, as even land that has a high probability of contamination only becomes ‘risky’ as a result of human activity on that land.

<sup>4</sup> If the Oxiana model is ever finalized and used by LXML, there is a case to be made that the NRA office should have full visibility of its function in order to establish whether or not it is producing a product acceptable within Lao PDR; this is entirely feasible within the roles of the NRA.

then it should be possible for a third party to develop a similar process, given that LXML hold no patent on either the rules of statistics or the US bombing data. The main disadvantage of the Oxiana model is that whilst it would help the desk analysis described above it does not provide a physical check of the potential clearance task as a confidence-building measure. It also shares a common problem with the GICHD in that by concentrating on the bombing data it is really a measure of *hazard* rather than *risk* (see the definitions in Box 2 above).

### *Fragmentation sampling*

One of the members of the Evaluation Team has previously investigated a possible alternative process by which survey teams would test an area for a higher-than-normal density of metal fragmentation contamination. The central premise of this hypothesis is that land that has been bombed or fought over will have a higher proportion of metal fragmentation than land that was not bombed or fought over, and given that UXO only exist in such land (as a percentage of the total amount that was dropped or fired) a high fragment level will be a strong indicator of the presence of UXO. It is further hypothesized that, given that this alternative survey process would be looking for indications amongst a large fragment 'population' (there are more items of fragmentation than there are UXO) the sample size in terms of square metres to be searched could be much smaller. It should also be possible to measure the indications without excavating them. This could lead to an inherently faster sampling process (even perhaps a single surveyor on a motorcycle) which would be much more efficient and effective than the ETS process (and would be much closer to the axiom of "getting 80% of the result from 20% of the effort). Admittedly, the hypothesis is as yet unproven (as indeed are all the other models described above), but it would also have the benefit of including a physical inspection of the candidate task sites. Furthermore, it would not suffer the problems of adverse selection, in that it could be used on sites that are unlikely to have been bombed or fought over (where the hypothesis would be that the site included a small metal fragment population) as well as on a site which was thought likely to have been bombed (where the hypothesis would be that it contained a larger number of metal fragments). It should be comparatively simple to establish quantitative thresholds for both of these cases.

### *Combination of techniques*

A combination of quantitative techniques at both stages of the process would probably be the most attractive. A variant of the 'Oxiana' approach at the desk analysis stage would give a quantitative assessment of the likelihood of hazard, and when combined with an overlay of the nature of the ground (and therefore its possible future use, particularly in terms of agriculture) would give a true estimate of risk as it would combine hazard and potential activity. A simple version of this approach has been used in the scoping exercise in this Report. A fragment sample could then be used in 'low' areas in order to confirm their status and provide physical evidence of some type of ground processing to end users, in order to prevent a 'False Negative' or 'Type II' error. Combination of both techniques in a quantitative manner would also allow the users to combine both sets of probabilities in a 'Bayesian analysis' which uses a mathematical principle known as 'conditional probability'<sup>5</sup>. This would allow a formal statement of probability of an area being contaminated where *both* a desk analysis using a variant of the Oxiana model and fragment survey suggest that no UXO will be found.

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<sup>5</sup> Bayes' Theorem is a theorem of probability theory originally stated by the Reverend Thomas Bayes. It can be seen as a way of understanding how the probability that a theory is true is affected by a new piece of evidence. It has been used to try to clarify the relationship between theory and evidence. See for example <http://www.trinity.edu/cbrown/bayesWeb/index.html>

The statistical modelling techniques integral to both the Oxiana model and the fragment sampling process may sound complicated; indeed there is some work to be done in ensuring that they are statistically valid. However, this can be turned into something which can be considered as an 'open black box' where a normal user can simply use the resulting tools developed in the research process (i.e. just as in a 'closed' black box), but which can be 'opened' for external validation processes before the model is adopted. In other words, a user will not need to know the principles of Bayesian conditional probability: all he will need to know is that if he finds more than an average of  $x$  pieces of fragmentation in  $y$  metre-square boxes in an area of  $z$  hectares then he should consider it contaminated. This could easily be operationalised into a working SOP (in both English and Laotian) that would be both practical and statistically valid.

**Annex 6: Traffic Accident Data in Lao PDR 2005-2007**

<b>Year</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>Total</b>
Total Number of Accidents	4,619	4,620	5,198	14,437
Total Number of Deaths	414	480	608	1,502
Total Number of Injuries	7,312	7,825	8,714	23,851

Source: Handicap International  
Road Safety Project