# House Foreign Affairs' Sub Committee on Asia, the Pacific and the Global Environment
# Legacies of War: Unexploded Ordnance in Laos

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References:

A. UXO Sector Evaluation Lao PDR, June-July 2008, Final Report, Robert Griffin, Robert Keeley, Phetdavanh Sayyasouk, July 2008

B. The Economics of Landmine Clearance, Robert Keeley, www.dissertation.de, 2006.

### Q. What is the current scope of the Unexploded Ordnance problem in Laos?

Laos has the distinction of being, per capita, the most heavily bombed nation in the world. During the second Indochina conflict, Laos was the scene of extensive ground battles and intense aerial bombardment. More than half a million bombing missions were carried out between the years 1964 to 1973, during which more than two million tons of explosive ordnance was dropped. This includes approximately 270 million anti-personnel cluster munition bomblets or "bombies" released from cluster bombs, becoming in effect, de facto anti-personnel land mines. Apart from direct military activities, Laos also suffered from being used as a free drop zone where military planes were free to unload over Lao territory any unused ordnance that remained from air strikes over Vietnam or northern Laos. Over many years there has been an average of around 300 casualties per year from UXO in Laos[1].

Based on historical 'bomb damage assessment' conducted by the Luftwaffe in Spain after the Spanish Civil War, bomb disposal personnel commonly use a 10% 'rule of thumb' to estimate the number of bombs (or other explosive ordnance) that will remain unexploded after being dropped or fired. This is an empirical estimate of the *average* failure rate in operations, which is different to that achieved in testing in perfect conditions. Some sources place the failure rate of submunitions even higher.

Whilst unexploded large aircraft bombs present a localised, spot hazard, cluster munitions contaminate an area within their 'footprint'. Based on bombing data made available by the US government and using an average radius of 500m for each bombing point, the total extent of the contaminated area is approximately 500,000 Hectares or 1,930 square miles (see Reference A for details of this calculation). However, as will be discussed below, not all of this contamination poses a significant impact.

[1] This is compiled from a number of documentary sources available in the UXO sector in Laos. In particular the Lao National Regulatory Authority for UXO, and the UXO Lao websites are recommended. See http://www.nra.gov.la/ and http://www.uxolao.org/

## Q. The extent to which UXO prevents Laos developing its economy more fully?

The UXO present a significant physical impediment on the development of the Laotian economy. This can be measured in two ways. Firstly, given that most of the current economy is based on agricultural production, and rice in particular, it is possible to measure the amount of land not in production that could be put into production, and use the foregone value of the agricultural production in that land as a measure of the damage to the economy. I will address this in more detail below.

Secondly, where there are infrastructure projects the cost of the UXO clearance acts as a 'tax' on the cost of the project, at a rate of approximately 30-40 cents per square metre of surface area. In some infrastructure projects, such as a number of hydro-electric power plant construction projects, this is borne as a line item charge to the total project budget.

In some other economic endeavours, especially those borne by the private sector, these costs can act as a barrier to entry and can in many cases result in the project not being carried out at all. For example, in agri-business projects such as managed forestry or the growing of medicinal plants, the cost of the UXO clearance might dissuade a potential investor from engaging in the project in the first place. It is almost impossible to measure the impact of such decisions as we simply don't know how many people have decided not to invest.

Of course, at a village level many of the poorest cannot afford a choice and farm land they know to be contaminated; sometimes they or their children even deliberately seek out UXO for their scrap metal value. Many of the 300 annual casualties are caused in this way.

## Q. Any impediments which UXO places on enhanced US-Lao relations?

As a non-American citizen working in Laos I observe that relations between the US Embassy and the Lao government appear to be cordial. I know that the US Embassy takes the UXO issue very seriously.

## Q. Funding and other resources that the United States has committed to addressing the problem

I am not in a position to answer this question fully. I would refer you to the State Department's office for Weapons Removal and Abatement for a fuller assessment of full US contributions so far. However, I can tell you about my current project:

> In addition to State Department Funding, the United States Department of Agriculture has made a substantial contribution toward easing this problem through its well known McGovern-Dole Food for Education Program. Over the course of three years (2006, 2008 and 2010) the organization I work for, the Humpty Dumpty Institute (HDI), has received a total of $9 million for a school feeding program now servicing up to 20,000 children every day in 150 villages in three of the most remote provinces in central Laos. Of the $9 million total, slightly over $3 million has and will be used to remove unexploded ordnance (UXO) in and around school sites and from agricultural land in these 150 villages.

## Q. Plans for future US contributions

Again, I am not in a position to answer this.

**Q. How much in terms of total funding, manpower and other resources it would take to largely rid the country of its UXO problem.**

One could simply answer this question by multiplying the total surface area of the potentially contaminated area by the average aggregated cost of clearance per square metre. This would come to approximately $1.9 billion. Indeed, I believe a figure of this magnitude has been floated recently in this regard. However I do not believe it is necessary to clear all this area to substantially reduce the impact. I believe a realistic answer to be far lower than this. I will explain my findings below.

In the answer to the first question I explained how we have previously calculated the total *extent* of the UXO contamination. In Chapter Three of the 2008 evaluation report we also attempted to measure the *impact* of this contamination. In principle it is possible to use standard environmental economic principles to determine the point where the cost of clearing the UXO equals the benefit of that clearance. In this case, as mentioned above, this can be done using the value of the agricultural output of the decontaminated land as the benchmark. In any such calculations one must make a number of assumptions and work within the time and resources available for the study, and in this case we looked at four possible scenarios, with alternative economic assumptions modelled in each case. The academic background for these calculations was researched in my PhD thesis at Reference B and has been tested in Afghanistan, Angola and Cambodia. As far as I know there have only been two attempts to quantify the problem in Laos, both during evaluations arranged by the United Nations Development Program (UNDP) in 2002, and 2008. I was responsible for both sets of calculations.

In Laos in 2008 we concentrated on the 47 poorest districts (which have already been identified as in need of special development by the Laotian government) and on the potential agricultural area within the proportion of the 500,000 Ha of contaminated land in those districts. This reduced the area to be cleared to just under 78,000 Ha (301 square miles). In discussion with stakeholders what was referred to as "Option B" became the most favoured option, as a compromise between the other alternatives measured in the process (although all of these alternatives are very conservative when compared to the cost of full clearance). In Option B, which assumes that some land can be released by survey and analytical processes, the area to be cleared in order to substantially reduce the impact of the contamination would be only approximately 22,000 Ha (84 square miles). Based on an average budget of approximately 12,500,000 per year over 16 years, the total budget would be just over $138,000,000. A summary of the calculations of all of the four options is included at Figure 1 below. Spending more money per year would allow the problem to be dealt with earlier.

This still sounds like a lot of money, however, this needs to be put in context. Firstly, it is only, at today's prices and techniques, approximately 7.25% of the total cost of clearing all of the areas believed to be potentially contaminated with UXO; this is achievable by concentrating on the highest priority areas and using survey techniques to release some of the land. Secondly, some money is already being donated, by the US and a number of other donors[2]. The problem is that the funding is insufficient and tends to be short-term, preventing optimum planning. Thirdly, it is a small cost compared to other environmental disasters. The cost of cleaning up after the Exxon Valdez was estimated at some $2 billion, not including the cost of the litigation or the punitive damages awarded[3].

I am not suggesting that the money is simply handed over in a cheque. It might be possible to establish some sort of investment mechanism to generate interest that could help pay for the clearance. There is also a need to establish a robust management mechanism to ensure that the funds are targeted effectively and efficiently.

[2] According to the National Regulatory Authority UXO/Mine Action Sector in Lao PDR UXO Sector Annual Report for 2007, approximately $12 million was provided for *humanitarian* clearance and related activities from all donors. However, it is understood that funding levels have since decreased.
[3] http://en.wikipedia.org/wiki/Exxon_Valdez_oil_spill

It should also be noted that there are three main outputs in mine action; area clearance, as discussed here in detail, is the most expensive, but there is also a quantifiable case for spending money on mobile Explosive Ordnance Disposal (EOD) teams (sometimes referred to as "bomb squads") to respond to reports of isolated UXO, including unexploded large aircraft bombs, and to focussed public health awareness programs which provide advice on what to do when people find bombs, including contact details for the mobile teams mentioned above (commonly called "mine risk education"). There is also a need for a sustained capacity to be left behind once the main tasks are finished. However, if the requirement was fully funded, it should be possible to cover the cost of these activities from this budget.

There is also a related need to provide medical and economic support to the casualties of UXO. This activity, commonly referred to as 'mine victim assistance' is sometimes a poor relation to the more technical mine action activities and there has been little quantitative work done to measure the impact of landmine and UXO contamination on the medical and social service sectors of contaminated countries. More quantitative research is needed to determine the extent of this need.

There is a sound, quantitative, economic argument for increasing the budget for the UXO sector in Laos, making longer term commitments so that investments can be made in new technology and equipment, and improving resource allocation decisions to ensure that any resources provided are spent effectively and efficiently. As stated above, the benefit of such improved funding can be measured and predicted. However, it must be said in defence of the office for Weapons Removal and Abatement that they already support a number of programs in many different countries; simply reallocating their existing budget from other countries to increase funding in Laos is simply "robbing Peter to pay Paul". If I could, I would ask for additional funding to be found so that this problem can be ameliorated without prejudice to the other projects already supported through the good work of the US Department of State.

Evaluation of UXO Sector in Laos June-July 2008

Table 4: Summary of findings from CBA

| Ser | Option | Definition | Area (Ha) | Cost | | Time Required | Remarks |
|---|---|---|---|---|---|---|---|
| | | | | Annual | Total | | |
| (a) | (b) | (c) | (d) | (e) | (f) | (g) | (i) |
| 1 | Option A | Clearance of all potential Paddy and all potential Upland Rice | 77,587 | 8,584,847 | 299,769,662 | 35 | |
| 2 | Option B | Clearance of all potential Paddy and 20% of all potential Upland Rice, with the remaining 80% of potential upland rice being released by technical survey | 21,860 | 12,571,443 | 138,265,870 | 18 | 55,728 Ha of Upland rice area also released by cancellation. |
| 3 | Option C | Clearance of all potential Paddy and highest quality potential Upland Rice | 33,406 | 8,086,729 | 129,067,658 | 18 | |
| 4 | Option D | Clearance of all potential Paddy and 20% of highest quality potential Upland Rice, with the remaining 80% of potential high quality upland rice being released by technical survey | 13,023 | 10,000,724 | 70,005,068 | 7 | 20,382 Ha of Upland rice area also released by cancellation |

Note: assumptions in the modeling include:

- The availability of 26 area clearance teams
- Each clearance team is able to clear 8 Ha/month, working over an 11 month year
- The total cost of each square metre is $0.38/m2, based on full accounting using the MMAC Model version 1.3 (a copy of this model is available from the Evaluation Team).

Griffin, Keeley and Sayyasouk Page 21

**Figure 1. Extract from Reference A.**