# Study of ERW Accidents in Quang Tri Province, Vietnam

The purpose of the study discussed in this article was to determine statistical findings, as well as the knowledge, attitude, practices and beliefs of the affected population, regarding the number of explosive-remnants-of-war victims in Quang Tri province, Vietnam, from the end of the American-Vietnam War in 1975 through 2010.

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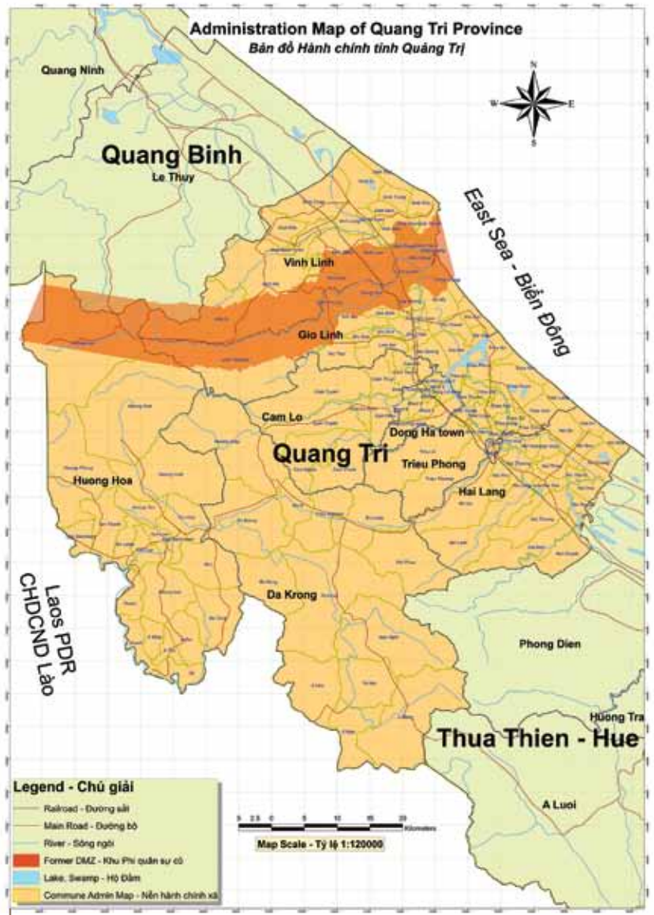
The American-Vietnam War caused lasting and tragic consequences to the land and the people in Vietnam. Explosive-remnants-of-war contamination remains one of the country's most severe problems, impeding socioeconomic development, threatening people's lives and safety and damaging the environment. According to figures from Vietnam's Ministry of Defense's Technology Centre for Bomb and Mine Disposal, U.S. military forces deployed 15 million tons of bombs and landmines, shells and other weapons during the war in Vietnam—three times the amount used in the American-Korean War.[1] The U.S. Department of Defense estimates that about 10 percent of this ordnance did not detonate as designed; there are hundreds of thousands of tons of ERW, landmines and other lethal weapons still scattered across Vietnam.[2]

More than 35 years after the war, Vietnamese citizens, especially those in Quang Tri province, are still threatened by these ERW, which not only endanger the living and working conditions of the people, but also hinders community development efforts. Approximately 1.18 percent of the Quang Tri province's population has been victimized by ERW incidents and approximately 83.8 percent




An administrative map of Quang Tri province. The orange band indicates the former Demilitarized Zone, which divided Vietnam into two parts during the American-Vietnam War (1954–75).

| District | Population | Total Casualties | Casualties as % of population | Fatalities | % fatalities of total casualties |
|---|---|---|---|---|---|
| **Trieu Phong** | 93,640 | 1,297 | 1.39% | 478 | **36.85%** |
| **Hai Larg** | 85,962 | 1,124 | 1.31% | 536 | **47.69%** |
| **Gio Linh** | 72,457 | 1,081 | 1.49% | 380 | **35.15%** |
| **Vinh Linh** | 84,810 | 812 | 0.96% | 289 | **35.59%** |
| **Cam Lo** | 44,253 | 783 | 1.77% | 271 | **34.61%** |
| **Huong Hoa** | 75,228 | 1,103 | 1.47% | 319 | **28.92%** |
| **Dakrong** | 36,308 | 411 | 1.13% | 155 | **37.71%** |
| **Dong Ha Town** | 82,944 | 297 | 0.36% | 136 | **45.79%** |
| **Quang Tri Town** | 23,219 | 167 | 0.72% | 71 | **42.51%** |
| **Con Co** | 400 | 0 | 0.00% | 0 | **0.00%** |
| **Province total** | **599,221** | **7,075** | **1.18%** | **2,635** | **37.24%** |

Table 1: Total mine and ERW casualties, including fatalities, for the period of 1975–2010 in the 10 districts of Quang Tri province.

of all land in the province is contaminated with ERW. Until recently, only a small amount of verifiable information and data analysis had been conducted regarding the ERW situation and humanitarian mine-action operations throughout Vietnam.

### Research Methodology of ERW-affected Victims

A cross-section of the targeted population using descriptive research was conducted among ERW victims in nine districts (including one town) of Quang Tri province. The goal of our "Knowledge, Attitudes, Practices and Beliefs" survey was to gain information about the knowledge, attitude, practices and beliefs of these victims and their family members to determine if they comprehend the means to avoid and prevent accidents caused by ERW. The reference population for the study was the human population of Vietnam. The study sample was selected from families in Quang Tri province that were exposed to ERW accidents from 1975 until the end of 2010.

The study was carried out as a household survey with a cross-section design. The identification of landmine/unexploded ordnance victims was done through a reduction process. First, the public head of all villages provided the study committee with lists of all deaths and injuries that occurred during the study period. This village data was then cross-checked with data from the local health center, and then was scrutinized through direct interviews in which investigators contacted each of the listed families as well as their neighbors. The study sample was then selected from this pool of known casualties.

### Methodology in KAPB Survey

In 2010, the Vietnamese nongovernmental organization Project RENEW, with the provincial Department of Health in Quang Tri, conducted a cross-sectional epidemiological KAPB study in order to describe the incidence and risk factors in ERW accidents in the province. The required sample size for the KAPB study was calculated by the following formula where n = sample size, α = significance level at 0.05, Z = 1.96, d = expected preciseness at 0.014 and P = 0.5. This gives a sample size estimate of 4,900 study units. With the provisional alternative of an additional 5 percent, at least a total of 5,100 subjects were required for the study.

The research subjects were then selected among the verified casualty population by purposive sampling in all 10 districts of Quang Tri province using the method of accumulating population, iterated addition and division into 30 random groups. All research subjects were family members who were at least seven years old and could answer the contents of a predefined questionnaire. In each district, the method of selecting the probability sample relevant to the population at random was used. Each random group had at least 170 research subjects (5,100 divided by 30 equaled 170 for each random group). This formula can be used for calculating sample size: $n=A2(1-a/2)\ P(1-P)/d2$.

The investigators were all university graduates who were experienced medical staff. The KAPB data was collected by structured interviews at families´ homes with facilitation of

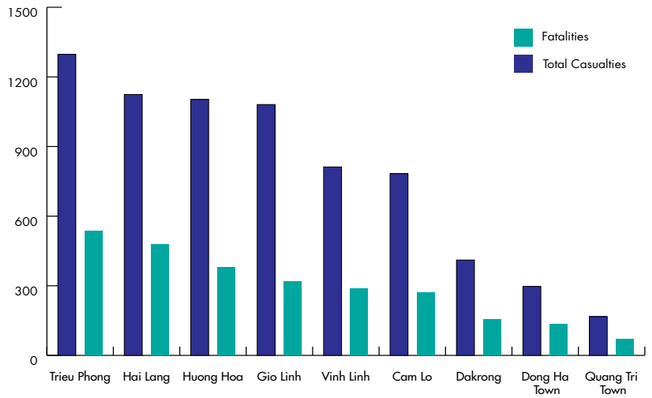



Figure 1: Total number of casualties, including fatalities, for the period of 1975–2010 in the 10 districts of Quang Tri province.

local guides and interpreters. To ensure preciseness and uniformity of the data, the research committee trained the team of investigators using the questionnaire before the interviews were conducted. In cases involving fatalities, data was collected from family members and/or survivors from the same accident.

The study was approved by the Quang Tri People's Committee. Any interviewee who refused to answer the questionnaire was excluded. As 5,100 questionnaires provided sufficient data, we included all for the study research in addition to 7,075 cumulative ERW victims. Data were processed by using Confident Interval Analysis software, version 1.2. Proportion was expressed with a 95-percent Confident Interval.

After collected forms were transferred to the Quang Tri Department of Health, the research team checked all information and concluded that there were 7,075 accident victims since the war ended (1975–2010), comprising 1.18 percent of the provincial population (95 percent CI 1.07–1.12) , including 2,635 deaths accounting for 37.2 percent (95 percent CI 36.2–38.4) and 4,435 injuries. As a cross-sectional study, we could not collect the actual number of casualties in each community; however, this study may be representative of the whole province. ERW constitute the main problem; more than 90 percent of the casualties were ERW-related, and only 9.8 percent of casualties were caused by landmines. Cluster munitions and M-79 rifle grenades were the most common types of weapons involved in ERW accidents, accounting for 44 percent and 13 percent of all ERW accidents, respectively.

The legacy of war has put a heavy burden on the population. The overall mortality rate in ERW accidents during the study period was 37.2 percent (95 percent CI 36.2–38.4). There were no significant variations in trauma mortality rates between the study districts (see Table 1 on the previous page and Figure 1 above). Reliable data on every ERW-related accident within the province was not available, some victims had moved away from the province or were only visitors when their accident happened. In 2005, the death rate from ERW in Quang Tri was 37 percent, which was much higher than the death rate from all other types of accidents.[3]

There was a significant decrease in annual incidence rates during the study period (see Figure 2 on the next page). During the last five-year period, an average of 25 people were involved in ERW accidents in the province per year. Still, this number is relatively high in comparison with other affected countries.

Quang Tri province witnessed some of the most severe fighting of the war. As a result, UXO clearance programs have been concentrated in this area. ERW casualties were found in all districts of the province. The three districts with the highest number of ERW casualties were Trieu Phong (1,297 casualties), Hai Lang (1,124) and Huong Hoa (1,103) respectively. It should be noted that Trieu Phong and Hai Lang are the two most populous districts in Quang Tri province.

In the first five years after the war (1975–79), ERW accidents caused 3,193 casualties, accounting for 46.1 percent of the total number of victims since 1975. The number of casualties was reduced significantly in the next five years (1980–84) to 983, accounting for 14.2 percent of the total figure. Since 1990, the number of annual ERW casualties has generally been on the decline.

In 2000–10, Quang Tri province began cooperating with international NGOs in neutralizing ERW, and as a result, the average number of annual victims has fallen to 38, a reduction of 81 percent in comparison with the average figure for the 1975–2010 period.

When we review the data, the geographical skew is confirmed when we look at ethnicity. For instance, most ethnic minorities (Van Kieu and Paco) live in mountainous areas, especially in Huong Hoa and Dakrong districts, which were sites of fierce battles, military bases and heavy U.S. bombing of the Ho Chi Minh Trail. While ethnic minority groups comprise only 7.9 percent of the province total, this subsample accounts for 16.6 percent of all ERW casualties that occurred during the study period.

The victims belonged to all age groups, but the vast majority were children, teenagers and middle-aged adults. Victims under 36 years of age constituted 80 percent of total casualty numbers, and those younger than 20 years of age made up 46 percent of the total. Gender was also skewed, as male victims comprised 83 percent of victims, despite the fact that the study population was quite balanced in terms of gender (50.4 percent female, 49.6 percent male). The suspected reason is that accidents are mainly related to outdoor income-generating activities such as farming (38 percent), collecting scrap metal (11.4 percent), herding cattle (8.3 percent) and tampering with ERW (6.3 percent).

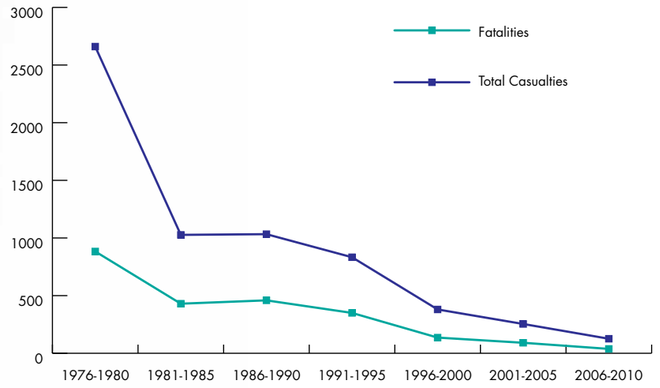



Figure 2: Total number of ERW casualties, including fatalities, for five-year periods from 1975–2010. There is a reduction in the number of injuries and deaths over time.

The problem mainly affects the poor groups of the population. Out of all affected households, 72 percent earned less than US$130 per year as compared to the average per capita income in Quang Tri province of approximately $330 per year (2005 estimate).[4] The authors found that people with less income take greater risks to earn more and often go into contaminated areas even if they know ERW are present.

More than half the informants said they encountered ERW at least once a year. One in every nine participants said they encountered ERW monthly, one in every 30 encountered ERW weekly and one in every 37 people (4 percent) said they saw ERW daily. They reported that 92.7 percent of incident sites were not marked with an ERW warning sign.

## Conclusion

The study illustrates that 1 percent of the population suffers from ERW accidents involving unexploded cluster munitions. As late as 2004, Quang Tri province alone reported higher casualty numbers than country counts from most other mine- and UXO-contaminated countries. Mine and UXO injuries are severe and have higher mortality rates than other types of trauma. The problem mainly affects low-income households in remote rural areas. Efforts to neutralize the effect of ERW in Quang Tri province include risk education, victim assistance and ERW clearance. The capacity of these projects depends on available funding; however, we are appealing funding resources, so that we may establish a mine-action coordination entity in the province to continue the aforementioned activities. We recommend that ERW-risk education programs take into account the epidemiological findings when designing future campaigns in order to target high-risk areas and activities.

*See endnotes page 82*

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