PREPARING A BOOK ON RADIATION FOR THE PEOPLE OF THE MARSHALL ISLANDS

Bruce W. Wachholz,[1] William J. Bair,[2] John W. Healy[3]
[1]U.S. Department of Energy (present position: National Cancer Institute)
[2]Pacific Northwest Laboratory
[3]Los Alamos National Laboratory

INTRODUCTION

Between 1946 and 1958 the United States conducted 23 atmospheric nuclear weapons tests at Bikini Atoll and 43 tests at Enewetak Atoll in the Northern Marshall Islands. The inhabitants of these atolls were relocated prior to the tests. In the 1960's, the people of Bikini and Enewetak began to explore the possibility of returning to their respective atolls. In 1968, following radiological surveys, the Bikini people were allowed to return to part of their atoll; however, in 1978 these people were again relocated because additional radiological surveys and monitoring of the people living at Bikini indicated higher than expected levels of radioactive cesium.

In the mid-1970's, the United States undertook a major effort to clean up debris and transuranic contaminated soil from Enewetak Atoll in preparation for possible resettlement. Additional radiological surveys were completed by scientists from Lawrence Livermore National Laboratory on these atolls and other islands and atolls in the Northern Marshalls. Information obtained by these surveys of air, water, and land included measurements of gamma radiation emanating from radionuclides in the soil of the atolls, and measurements of ^{90}Sr, ^{137}Cs, ^{60}Co, ^{239}Pu, and ^{241}Am in soil, water, and in plants and animals used for food. Based upon several possible defined living patterns for relevant islands in each atoll, the Livermore scientists calculated radiation doses that people might receive. The Department of Energy subsequently used these dose values to estimate risks of fatal cancer and genetic effects for populations living on these islands during the next 35 years.

Interest by the Marshallese in the results of these surveys was heightened by many events: the second relocation of the Bikini people; renewed interest by the Bikini and Enewetak people to resettle their atolls; the evolution of self-government in the Marshall Islands; claims initiated on behalf of certain populations in the Marshall Islands against the United States to compensate for loss of their land; and concern by other northern Marshall Island residents about current and future possible radiation-caused health effects.

In response to this interest, the United States offered to describe and explain to the Marshallese the results of the radiological surveys and the estimates of health risks. This was to be done at public meetings in the Marshall Islands. To aid in communicating this information, the Department of Energy prepared several bilingual books in Marshallese and English: one for Enewetak Atoll in 1979, one for Bikini Atoll in 1980, and one for other atolls in the Northern Marshall Islands in 1982.

The following describes the preparation of these three books and offers examples of the subject matter developed.

THE APPROACH

Recognizing that we knew little about the Marshallese language and culture, we sought guidance from a cultural anthropologist at the University of Hawaii, Pacific Studies Center, who had lived with and written about the Bikini people. He identified various problems we would face in trying to communicate technical information to the Marshallese. He also directed us to one of the few people qualified to assist in translating the information we wanted to communicate. This person, Mrs. Alice Buck, was an American who had spent many years living with and working among the people of the Pacific Islands, first as a daughter of a missionary and later as the wife of a minister working in the Marshall Islands. She was in the final phases of translating the Bible into Marshallese, was familiar with the language and culture of the Marshall Islands, and was known and respected by many Marshallese.

Mrs. Buck's first recommendation to us was that it would be not only helpful but necessary to include in this effort Marshallese informants who were fluent in both English and Marshallese. Since Mrs. Buck wanted both sexes and a spectrum of ages represented, she selected a young woman and a more mature gentleman to assist us. The woman was a teacher who had received university training in the Phillippines and who, among other things, taught English; the gentleman held a responsible position with a large American contractor at the Kwajalein Missile Range base.

Our initial discussions soon dramatized the breadth and depth of difficulties we found. It became readily apparent that it was first necessary for us to familiarize Mrs. Buck and the two Marshallese with the basic concepts of radiation physics and biology and with information on radiological assessments. We also learned in our preliminary discussions that we would need to provide basic information on the metabolism, deposition, and excretion of radionuclides following inhalation and ingestion.

ORGANIZATION, TRANSLATION, AND PUBLICATION PROBLEMS

The usual difficulties with ambiguity and loss of tone or style that one encounters in translating from one language to another were considerably heightened by the vast differences between English and Marshallese. Moreover, since Marshallese has few technical or scientific terms, it was not possible to translate directly from a scientific English text. Conceptual comprehension was particularly difficult--the fact that gamma radiation can go "through" a person or material and not leave a hole was astounding. Probability and numbers smaller than one or greater than a few hundred are not only foreign to Marshallese culture but are difficult to accommodate linguistically. Therefore, risk and probability could only be approximated, and we attempted to avoid the use of numbers whenever possible, except in explaining dose and risk where there was no alternative. Only through extensive and repeated discussions and the use of examples, such as playing cards and dice, was a base of mutual understanding and an acceptable, if somewhat nontechnical, text established.

Certain peculiarities of Marshallese grammar and syntax only added to the difficulties. Marshallese lacks, for example, a conditional mood or tense and has no passive voice. Its spelling is also considerably fluid. Because of these and other language limitations and the general levels of educational achievement among the Marshallese, descriptions of technical topics had to be limited to an elementary level.

Word meanings also required extensive discussion. Many technical terms (e.g., atom, radioactive atom, the several types of radiation, cells, various elements) had no Marshallese counterparts; in these instances we were compelled to retain English words. Following publication and distribution of the first book in 1979 (i.e., The Enewetak Atoll Today), we were asked to provide a glossary of such English words. This worthwhile suggestion was incorporated in the second and third books published in 1980 and 1982. The discussions of metabolism, deposition, and excretion of radionuclides were also expanded in the later books at the request of a Marshallese teacher who had read the first book.

Each word, phrase, sentence, paragraph, and concept had to be discussed and reviewed numerous times among the authors and translators to ensure that the intended meaning was clearly understood and translatable without connotations that might be offensive or humorous or that might be negatively associated with beliefs or cultural characteristics.

We recognized immediately that illustrations, photographs, and color would need to be used to convey the information we hoped to include. Radioactive elements were color-coded throughout, and color gradations and intensities were employed to denote relative amounts of radioactive materials. (Other graphic techniques for conveying this information included dot density and direct numerical displays on maps.) These techniques helped to depict (1) the concept of radioactive decay; (2) absorption of types of radiation; (3) the way in which nuclear detonations contaminated the atolls; (4) the presence of radioactive materials in soil and how they enter food and reach man; (5) the movement of radionuclides in the body. Other illustrations showed division of normal and cancerous cells, health effects of radiation, and examples of how radiation is measured in the body and on the atolls.

This information preceded a discussion of the levels of contamination remaining on the several atolls. In particular, because of the intense desire of the Bikini and Enewetak people to return to their islands, dose and risk estimates were calculated for various combinations of time spent on residence islands, time spent on other islands, and sources of food supply (food grown on contaminated islands and food grown elsewhere). These various combinations in part were illustrated graphically and were accompanied by calculated estimates of the numbers of radiation-induced cancers and genetic defects among each population of each atoll.

Finally, the actual publication of the book required considerably more than the usual effort. The book's design had to ensure that the connection between text and related illustrations was apparent and that the text of each of the two languages was in juxtaposition. Waterproof paper and stainless steel

staples had to be located. In order to distinguish color shades and differences adequately, four-color printing was required. To ensure that illustrations and colors were properly registered and that last-minute corrections were executed, each word of text and each color was reviewed on proofs prior to printing. A press inspection of the final product was also conducted.

COMMENTS AND SUMMARY

These explanatory books, including the estimates of risk, have, we hope, enabled the people of the Marshall Islands, together with their government, to understand more about the radioactive contamination that exists on some of the atolls and what this means in terms of potential hazards. Unfortunately there has not been an opportunity to evaluate the effectiveness of these books in that regard. The books have also been of considerable interest to other parties including the U.S. Congress, other U.S. agencies, as well as organizations and institutions in the private sector. While they might not be directly applicable to the needs of other countries and while it might be necessary to improve certain portions of the books (each successive book was extensively revised), they might serve as models upon which other books could be written to serve comparable needs of people elsewhere.

The lessons learned in attempting to communicate this type of information to people whose language is technically limited or lacking linguistically or semantically might be summarized as follows:

1. People indigenous to the culture must be directly involved in the translation.

2. The authors and translators must work together and interact extensively; communication cannot be left to the written word.

3. Illustrations carefully designed to amplify concepts and information presented in the text require the skills of a competent graphics illustrator.

4. It is important that a graphics illustrator and technical editor be present in many if not all of the discussions.

5. Because literally hundreds of sentences and paragraphs will be written, rewritten, translated, and retranslated, it is imperative that a system for control of paper flow be established before translation is begun.

6. The authors, illustrator, translators, and editor must work closely with the printer to ensure accuracy of text and use of color.

7. The process of translating and rewriting is extremely time-consuming and should be carried out in several phases of one to three weeks each over a period of months.