

GENERATING ACCEPTABILITY OF PNRI ENVIRONMENTAL RADIOACTIVITY MONITORING STUDIES AT THE FORMER AMMUNITION DUMP AREA IN CLARK SPECIAL ECONOMIC ZONE

**An Action Plan and Project
Presented to
The Faculty of the Master in Public Management Program
School of Public Management
Development Academy of the Philippines**

**In Partial Fulfillment of the Requirements
for the Degree
Master in Public Management**

**TEOFILO Y. GARCIA
November 2002**

ABSTRACT

The rejection of the 1991 Treaty of Friendship and Cooperation, which sought to extend the Military Bases Agreement (MBA), paved the way for the Americans to abandon Clark Air Base in Angeles, Pampanga, which had served as an American military base since 1947. The total and immediate pullout of the Americans left the base in an “as is” condition and without the benefits of restoration efforts.

The 4,400-hectare Clark Special Economic Zone (CSEZ) was once the biggest American Air Base facility outside the United States, at its time serving as a major destination and refuel/transit point for US military aircraft within the Asia – Pacific Region. Today, CSEZ is being transformed as the site of commercial, industrial, residential, tourism and recreation center and the Philippines’ future premier international airport.

Various studies and reports have been conducted to determine the presence of hazardous wastes in the former Clark Air Base. The issue of hazardous wastes purportedly left there by the Americans is a continuing and a growing concern particularly of citizens living within its area. Health related complaints have been filed by non-government organizations (NGOs) with various agencies, attributing certain illnesses and diseases experienced by residents to the hazardous wastes avowedly left in the military base.

The Philippine Nuclear Research Institute (PNRI) is the sole agency of the government mandated to advance and regulate the safe and peaceful applications of

nuclear science and technology in the Philippines. It is one of the institutes of the Department of Science and Technology.

The vision of PNRI is to be an institution of excellence in nuclear science and technology propelled by a dynamic and committed workforce in the mainstream of national development. Its mission is to contribute to the improvement of the quality of Filipino life through the highest standards of nuclear research and development, specialized nuclear services, nuclear technology transfer and effective and efficient implementation of nuclear safety practices and regulations.

In November of 1997 and in April of 1998, the PNRI, upon the request of Clark Development Corporation, conducted a thorough radiological monitoring in CSEZ in order to determine the presence of radioactive contamination. Radioactive materials such as cesium-137 and tritium are considered hazardous wastes. Results of monitoring showed that radiation levels in CSEZ were within allowable standards. This means that the workers and residents at the Clark Air Base ("the Base") are free from dangers of exposure to radiation. Despite the findings, however, reports by the media and environmental NGOs on the presence of hazardous wastes, including radioactive wastes, in Clark have proliferated.

This Action Plan and Project (APP) intends to address the issue of environmental radioactivity contamination (if any) within the CSEZ. The APP results are geared towards dispelling the persistent fear of the public in general, and the Base stakeholders especially its residents, in particular, regarding the presence of radioactive contamination which results in untoward health effects to those exposed to such contaminants. Thus, the sectoral concern of this APP is to heighten the level

of social acceptability by the Base stakeholders that CSEZ is free of radioactive contamination.

The APP principally utilized scientific testing in order to verify the physical presence and extent of radioactive contamination as well as the social marketing approach to generate social acceptability of the scientific findings among the various stakeholders of the Base. In order to validate the results of earlier findings of non-radioactive contamination at the former US base, experiments were done to determine the radioactivity levels in soil and plants grown at the old ammunition dump site that was used by the Americans during their occupancy of Clark. The 10-hectare area is now being used for agricultural purposes and is planted with vegetables and rice.

The social marketing approach was used to deal in changing the mindset of the target adopters about the radioactive contamination of soil in CSEZ. The marketing mix called 5 Ps of social marketing was used – product, price, place, promotion and people.

In this APP, the “product” or the subject of social cause campaign is the acceptability of results of PNRI monitoring in Clark; the “price” is the “price of knowing” the benefits and/or costs derived from knowledge on PNRI studies; the “place” is the former ammunition dump site at CSEZ which is among the Base areas avowedly contaminated; the “promotion” is the use of the IEC materials, face-to-face interactions, technical reports published in scientific journals, newspaper reports, and radio broadcasts; and the “people” are the various Base stakeholders who are also the target adopters: the residents of Barangay Macapagal Village, Mabalacat,

Pampanga, the CDC employees, and the journalists at the media center based in CSEZ.

The methodology of social marketing involved the 5-step decision-making approach, which includes assessing, planning, preparing the materials, implementing and evaluating. Planning involved the preparation of a communication plan to deliver the intended message to stakeholders. Material preparation covered powerpoint presentations, pamphlets, flyers, PNRI annual reports and survey questionnaires. Implementation involved the conduct of surveys and the delivery of message through seminar, newspaper reports and radio broadcasts. Evaluation involved the determination of whether the communication objectives have been met. Assessment of needed behavior changes among the target adopters was made using questionnaires as instrument of inquiry. Surveys were done before and after an actually implemented social marketing campaign. Also used as an instrument was the raising of hands by the stakeholders during the campaign to determine the response of the target adopters to the “product” being sold to them.

The results of the post survey on the opinion of respondents about contamination in CSEZ are shown on the following table. Most notable among the listed survey opinions, in PNRIs’ point of view, is Item number 7, which indicated that after the social marketing campaign, the distribution of respondents who believed that hazardous wastes in CSEZ DO NOT include radioactive contamination went up from 32% to 92%, with a significant increase of 60%.

Results of Post Survey: Opinion of Respondents About Contamination in Clark Special Economic Zone.

Opinion	Before Social Marketing Campaign (%)	After Social Marketing Campaign (%)
1. Belief that wastes left in CSEZ is harmful	65	45
2. Belief that wastes left in CSEZ is not radioactive	49	85
3. Belief that there is no widespread radioactive contamination in CSEZ	50	82
4. Belief that there is no widespread contamination in CSEZ that is harmful to health	59	86
5. Belief that plant/vegetables in CSEZ are not radioactive and safe for consumption	77	93
6. Agreed to consume plants/vegetables planted in CSEZ	82	96
7. Belief that hazardous wastes DO NOT include radioactive wastes	32	92

Stakeholders' acceptability of the scientific findings on the extent of radioactive contamination, as expressed by raising of hands also showed that after the social marketing campaign, the respondents who believed that there is no radioactive contamination in Clark went up from 18% to 100%.* The 82% who initially believed negatively or were not sure about the presence of contamination changed their minds to the positive belief that there is no radioactive contamination in Clark.

*The entire proceedings of this campaign were recorded on a video tape recorder provided by the Information Section of PNRI.

Media mix is the combination of communication channels that can be used to deliver messages to target adopters. In this APP, the social marketing campaign given by the proponent at CSEZ was supported by journalists in two newspapers distributed nationwide - the Philippine Star and Today; as well as in two newspapers distributed regionwide – the Sun Star and the Angeles Observer. The newspapers featured the results of the PNRI study that there is no radioactive danger at Clark Special Economic Zone. The positive results on the radiological monitoring studies made by the proponent were also broadcasted through the Angeles City radio station DWRW-FM.

In summary, the APP showed that social marketing as a strategic management philosophy and approach, offers a different perspective in the conduct of a social advocacy campaign. Using the elements of commercial marketing to “sell” an idea, the social marketers’ focus is a behavior change in the target adopter. As a developmental tool, social marketing does not confine itself to just giving out or “supplying” information based on a perceived need but on developing a systematic strategy for generating acceptability of an idea including scientific data. It also showed that a government project or advocacy can be “marketed” using the “5 P’s” of marketing in the “social or developmental context”, just as these are used commercially to promote sales of soap or medicine in the consumer market place.

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November 2002**


DEVELOPMENT ACADEMY OF THE PHILIPPINES
SCHOOL OF PUBLIC MANAGEMENT
Master in Public Management

ENDORSEMENT FORM

To the members of the defense panel:

This Action Plan and Project (APP) entitled "Generating Acceptability of PNRI Environmental Radioactivity Monitoring Studies at the Former Ammunition Dump Area in Clark Special Economic Zone" of TEOFILO Y. GARCIA has been reviewed and is recommended for defense.


ALUMANDA M. DELA ROSA, Ph.D.
Institutional Partner


JOSEFA RIZALINA M. BAUTISTA
Faculty Adviser

DEVELOPMENT ACADEMY OF THE PHILIPPINES
SCHOOL OF PUBLIC MANAGEMENT
Master in Public Management

APPROVAL FORM

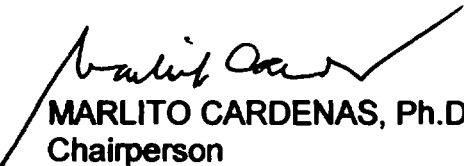
This Action Plan and Project (APP) entitled "Generating Acceptability of PNRI Environmental Radioactivity Monitoring Studies at the Former Ammunition Dump Area in Clark Special Economic Zone" of TEOFILO Y. GARCIA has been successfully defended on November 28, 2002 with a rating of 3.43 (Very Satisfactory).


ALUMANDA M. DELA ROSA, Ph.D.
Institutional Partner


JOSEFA RIZALINA M. BAUTISTA
Faculty Adviser


JOSE RAFAEL HERNANDEZ
Defense Panel Member


JUAN MIGUEL B. FUENTES
Defense Panel Member


MARLITO CARDENAS, Ph.D.
Chairperson

ACCEPTED BY:


SEGUNDO E. ROMERO, JR., Ph.D.
Dean, MPM


DONNA MITZI D. LAGDAMEO
Program Director, MPM


EDUARDO T. GONZALEZ, Ph.D.
President, Development Academy of the Philippines



development academy of the philippines
Graduate School of Public & Development Management
Institute of Public Management
Master in Public Management Program

This
Special Citation

is awarded to

TEOFILO Y. GARCIA

DOST-Philippine Nuclear Research Institute
MPM Batch 8

whose **Action Plan and Project** entitled,

**"Generating Acceptability of PNRI Environmental
Radioactivity Monitoring Studies at the Former
Ammunition Dump Area in Clark Special Economic Zone"**

exemplifies innovativeness in evolving and demonstrating a social-marketing approach to presenting the Government's position on contentious public issues.

The Project is pro-poor in that through critical information it has enabled poor farmers to allay their fears of threats to their health.

The project demonstrates that a systematic, targeted, and face-to-face effort by officials from technical government agencies can help Filipinos from different walks of life appreciate technical processes and data in forming opinions on controversial issues.

*Given by the APP Awards Committee this 13th day of January 2003 during the
Commencement Exercises of the 8th Batch of Graduates,
Master in Public Management.*

SEGUNDO E. ROMERO JR., Ph.D.
Dean and Chair of APP Awards Committee

ELIZABETH Y. MANOGUE, Ph.D.
Member

ALAN Y. CAJÉS
Member

JOSEFA RIZALINA M. BAUTISTA
Member

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MPM - Batch 8, different personalities but with one goal, to graduate with the MPM degree, 100 %. Thank you for the privilege of knowing you all!

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Jesus, the BLACK NAZARENE, the Supreme Being that gives me inspiration, strength, and enlightenment no matter how difficult the situation is.

*“If a tree fell in a
forest but nobody saw it
or heard it, did it fall?”*

*a philosophical question from
mr. jose rafael “ernie” hernandez,
social marketer, on the need to market
ideas including scientific data.*

CHAPTER ONE. THE PROJECT AND ITS CONTEXT

I. Background

A. Sectoral Diagnosis

Clark Special Economic Zone Facility

The rejection of the 1991 Treaty of Friendship and Cooperation, which sought to extend the Military Bases Agreement (MBA) between the United States of America and the Republic of the Philippines, paved the way for the Americans to abandon the Clark Air Base* in Angeles, Pampanga. The total and immediate pullout of the Americans left the bases in an "as is" condition and without the benefit of restoration efforts.

The Clark Special Economic Zone (CSEZ) was once the biggest American Air Base facility outside the United States, at its time serving as a major destination and refuel/transit point for US military aircraft within the Asia-Pacific Region. A map of CSEZ is shown in Figure 1.

Comprising a total of 4,400 hectares, the U.S. facilities at Clark Air Base constituted one of the largest overseas installations in the world. It housed the headquarters of the Thirteenth Air Force, the tactical air arm of the United States Air Force (USAF) in the Western Pacific and Indian Ocean. The Third Tactical Fighter Wing had been based here before it was recalled in 1991. Along with the Philippine Air Force's Fifth Fighter Wing, it was responsible for the air defense of the Philippines (1).

*Also referred in this APP as "Clark"

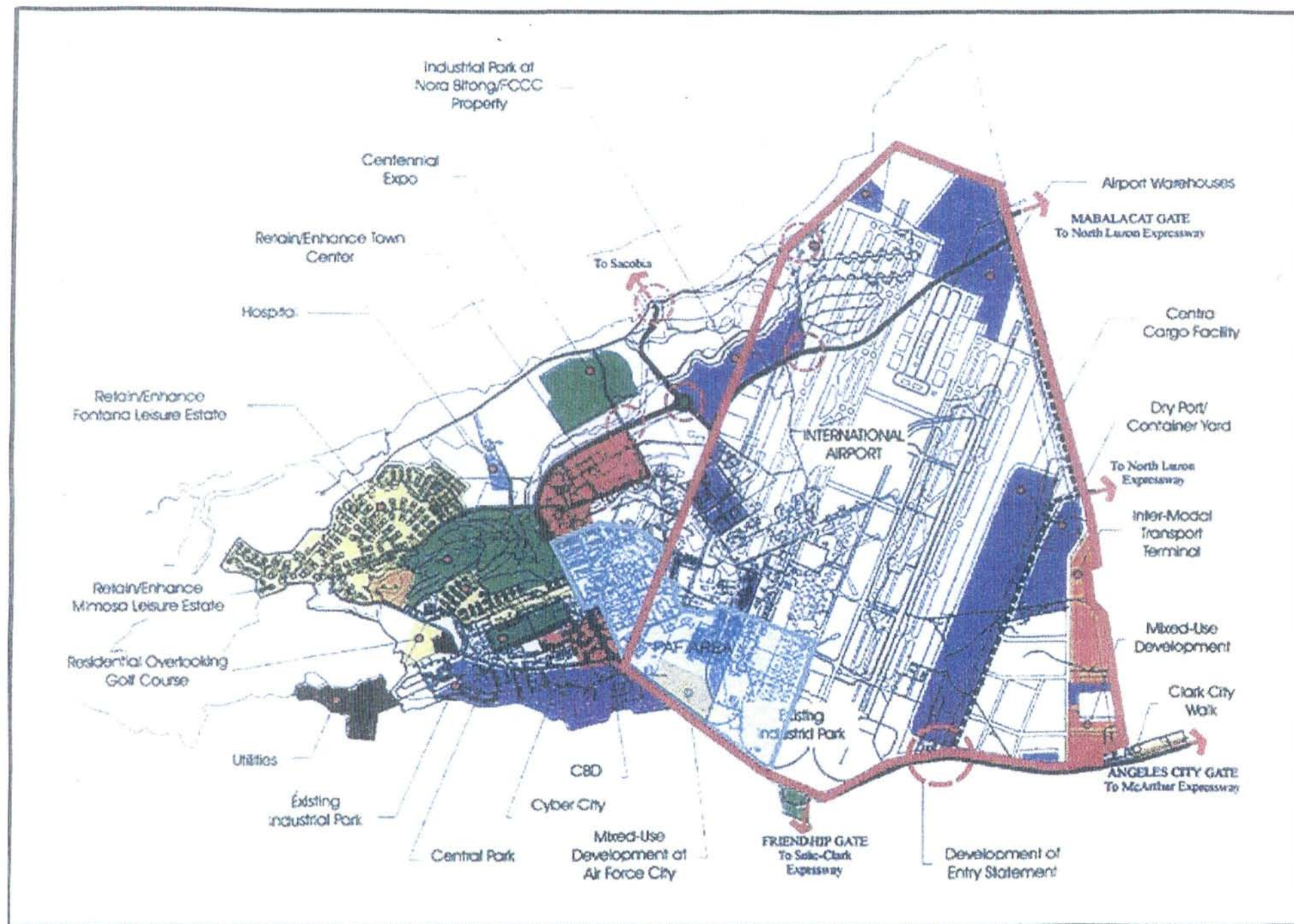


FIGURE 1. Map of Clark Special Economic Zone

A runway, 10,500 feet long, made Clark Air Base capable of handling any U.S. Air Force and Navy aircraft. It had 590,000 square yards of apron parking, as well as 79,000 square feet of hangar space. The petroleum, oil, and lubricants (POL) facility in the base was roughly equal in capacity to that of Kennedy International Airport (which has been reported to be capable of holding up to 25 million gallons of fuel) (2). It had 34 underground storage areas totaling 200,000 square feet for ammunition and ordnance, making Clark Air Base the major supply depot for Diego Garcia, a joint US-UK Air and Naval Support Facility located in the British Indian Ocean Territory, as well as an alternative route to supply U.S. allied forces operating in the Middle East.

Next to the airfield itself, the Crow Valley Weapons Range was the most important facility in Clark Air Base. Essentially a bombing range 13 miles northwest of the base, the Crow Valley complex provided as much as 70% of the training capabilities of the U.S. forces in the Western Pacific (3). Select U.S. Air Force, Navy, Marine, and Philippine Air Force personnel used it for a two-week course called "Cape Thunder". The 6200th Tactical Fighter Training Group furnished some of the best combat simulation training outside the United States. Aircrew from friendly nations also participated in these exercises (4).

Clark Air Base was also tasked with the responsibility of providing non-combat emergency and evacuation support for U.S. civilians and diplomatic personnel in countries along the Indian Ocean up to the eastern coast of Africa. For this purpose, it made use of the C-130 Hercules of the 374th Tactical Airlift Wing and the Regional Medical Center, the principal health care facility for U.S. forces in the Indian Ocean and the Western Pacific (5).

The eruption of the Mt. Pinatubo in June 1991 caused the United States to abandon Clark Air Base completely. The accumulation of volcanic ash and lahar made operations involving the facilities there more dangerous. Furthermore, the active state of the volcano itself had made the conditions in the area unpredictable. On 26 November 1991, the United States ended nearly a half-century of continued presence in one of the oldest and largest overseas base in the world.

Today, Clark as a special economic zone, is being transformed as the site of commercial, industrial, residential, tourism and recreation center and the Philippines' future premier international airport. CABCOM, a former motor pool area of Clark was put up in 1992 by the Mount Pinatubo Commission as a relocation site for Mount Pinatubo evacuees.

Alleged Toxic and Hazardous Wastes left by Americans

Issues Raised

The issue of hazardous wastes purportedly left by the Americans in the base is a continuing and a growing concern of the Filipino citizens particularly those living within the vicinity of the former US military bases. The People's Task Force for Bases Cleanup, an organization of residents living within the periphery of the former Clark Air Base, cited in their Initial Health Monitoring Report, that "there were cases of illnesses and disorders in Clark ranging from skin diseases, miscarriages, cancer to genetic and neurological disorders that were similar to the health problems experienced by residents near the Kelly

Air Force in San Antonio, Texas where chemicals used in the aircraft maintenance and industrial operation, such as trichloroethylene, dichloroethylene, benzene, vinyl chloride, heavy metals and traces of hazardous wastes were supposedly stored and dumped". (see Appendix A)

Distinguishing Toxic and Hazardous Wastes

Hazardous wastes refer generally to wastes that are risky or dangerous while toxic wastes are specifically related to, or caused by poison. Hazardous wastes affect not only environmental resources such as land, water and air, but biological life itself. The life of humans and even other biological forms are at stake should these wastes are ignored. Toxic wastes do not only affect the land, air and water, but also, eventually, the people residing in and around the areas where these hazardous elements are located.

Remnants of various types of toxic or hazardous wastes were found within the premises of Clark. Wastes in these on-site areas such as the landfills, fire training areas, jet engine test cell, storage tanks, drum disposal area, munition-related areas, motor pool, industrial shop areas, and wastewater treatment plant have been documented in numerous studies (see Appendix A). These toxic wastes may potentially affect the health of people who are currently utilizing the facilities in these areas for commercial and leisure activities. However, these on-site areas are not the only ones exposed to potential health risks. The surrounding off-site areas, i.e. residential communities around Clark, including farmlands, creeks, rivers and

bay waters, may also be threatened by the hazardous effluents seeping through soils and waterways. Drinking water wells, farmlands and even fishing areas are also potentially exposed to hazardous wastes.

Determination of Presence of Toxic and Hazardous Wastes in Clark Special Economic Zone

Various studies and reports have been made to determine the presence of hazardous wastes in the former Clark Air Base. In 1996, Clark Development Corporation (CDC) commissioned Weston International to conduct an Environmental Baseline Study (EBS) for soil and water contamination in 14 priority site and all its operational wells in Clark. Of the 14 priority sites tested, EBS identified seven (7) sites with contamination ranging from oil and petroleum by-products, pesticides, and lead exceeding allowable standard values. One site was positive for polychlorinated biphenyl (PCB). Water analysis taken from operational deep wells yielded values for arsenic and dieldrin exceeding the standards. Test for two decommissioned wells yielded exceedances for volatile organic compounds (VOCs), arsenic and lead while tests from the shallow wells at CABCOM area yielded values for nitrate, mercury and coliform bacteria beyond the allowable limits. (see Appendix A)

A radiological study was made by the Philippine Nuclear Research to test the levels of radiation in the entire Clark Field Main Zone in November 1997. The radiation levels gathered from the sites were within acceptable standards and do not pose any risk to public health. (see Appendix A)

Health related complaints have been filed with various agencies, attributing certain illnesses/diseases to the hazardous wastes left in the military base. Reports by the media and NGOs on the hazardous wastes issue have proliferated. (Please see Appendix B)

B. Organizational Diagnosis

The Philippine Nuclear Research Institute (PNRI), formerly the Philippine Atomic Energy Commission (PAEC) is the sole agency of the government mandated to advance and regulate the safe and peaceful applications of nuclear science and technology in the Philippines. It is one of the research institutes under the Department of Science and Technology (DOST) (6).

The PAEC was formally established in 1958 under the National Science Development Board (NSDB) by virtue of R.A. 2067, also known as the Science Act of 1958. The Act, amended by R.A. 3589, vested PAEC its regulatory authority over the use of radioactive materials. In 1982, the NSDB was reorganized into the National Science and Technology Authority (NSTA) by virtue of the Executive Order 784. Under this reorganization, PAEC was placed under the supervision of NSTA.

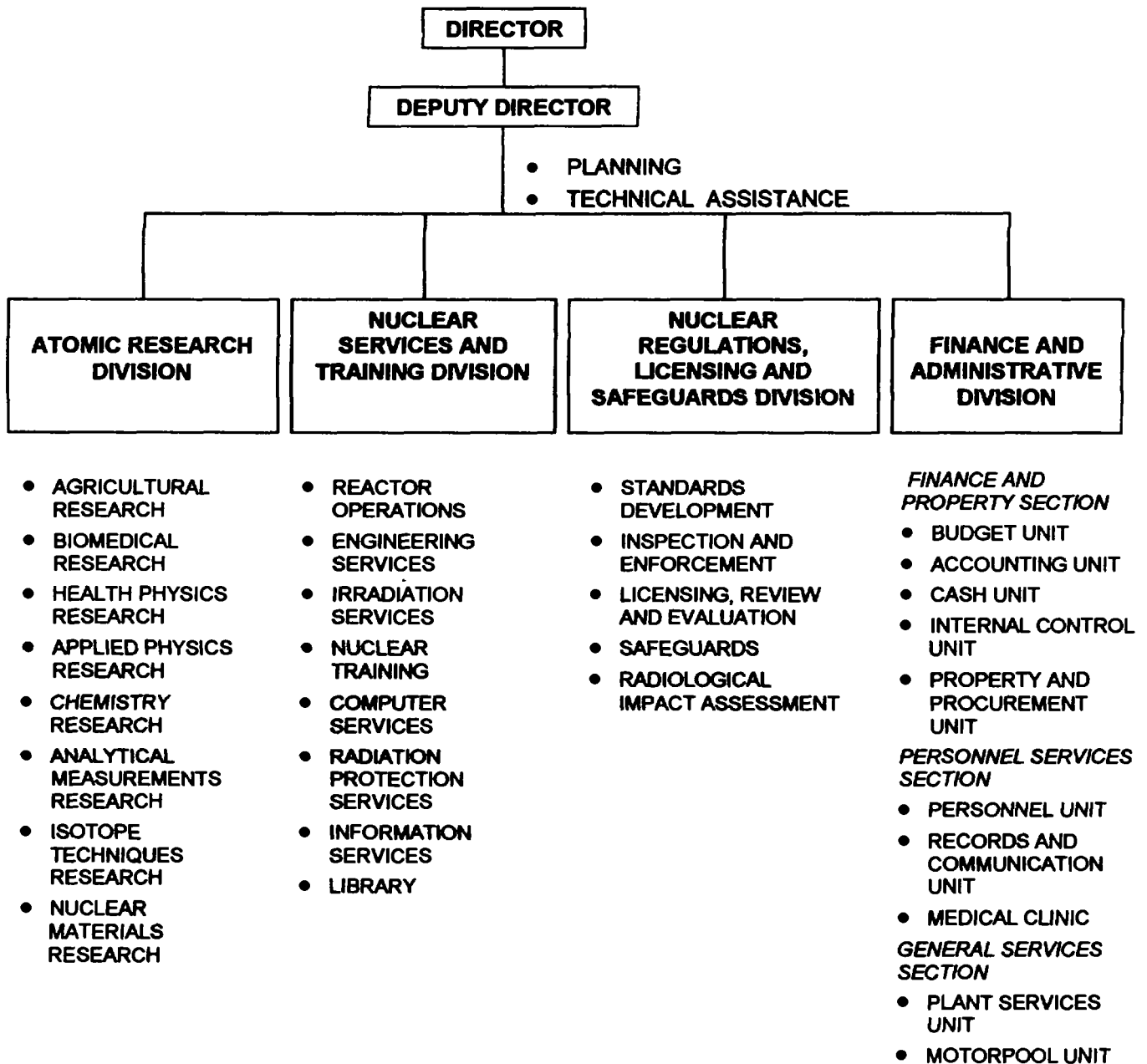
In 1987, under Executive Order 128, the NSTA and its agencies were again reorganized. The NSTA was renamed the Department of Science and Technology (DOST). PAEC became the Philippine Nuclear Research Institute headed by a Director and a Deputy Director (Figure 2).

Under EO 128, the Philippine Nuclear Research Institutes is mandated to perform the following functions:

- Conduct research and development on the applications of radiation and nuclear materials, processes and techniques in agriculture, food, health, the environment, nutrition and medicine and industrial or commercial enterprises;
- Undertake the transfer of research results to end-users, including technical extension and training services;
- Operate and maintain nuclear research reactors and other radiation facilities;
- License and regulate activities relative to production, transfer and utilization of nuclear and radioactive substances

FIGURE 2. ORGANIZATIONAL CHART

**Department of Science and Technology
PHILIPPINE NUCLEAR RESEARCH INSTITUTE**



The vision of the PNRI is *"to be an institution of excellence in nuclear science and technology propelled by a dynamic and committed workforce in the mainstream of national development"*. Its mission is *"to contribute to the improvement of the quality of Filipino life through the highest standards of nuclear research and development, specialized nuclear services, nuclear technology transfer and effective and efficient implementation of nuclear safety practices and regulations"*.

The PNRI is presently composed of four divisions, namely; 1) Atomic Research; 2) Nuclear Services and Training; 3) Nuclear Regulations, Licensing and Safeguards; and 4) Finance and Administrative. The Atomic Research Division, which is particularly pertinent to this APP, initiates and promotes research and development in nuclear science and technology in the following areas: (a) agriculture and natural resources, (b) biomedicine and biotechnology, (c) nuclear physics, chemistry, nuclear materials, and nuclear-based analytical measurements development, (d) applications of radioisotopes and nuclear techniques in industry, and (e) health physics and radioecology.

The PNRI extends specialized nuclear and allied services to clients from various sectors such as in industry, business, health, government and the academe. As a research and development institute, it has continued to undertake research and development activities where nuclear energy and nuclear techniques have unique advantages. But even as PNRI takes stock of the important contributions made by nuclear science and technology in the Philippines, the Institute is still faced with the reality that the direct benefits of

nuclear science and technology still have to reach a greater percentage of our population, that is, those who belong to the poverty level groups.

The many ills of our country are rooted in the fact that 40% of our population is deprived of a humane quality of life. PNRI actively aligns itself in poverty alleviation of many of the country's poor through its various programs so Filipinos would fully appreciate the edge of nuclear science and technology in the country over other technologies. PNRI needs to take a deeper look into the environment and apply the results of its successful R & D programs in this field. To do this, it must consciously and conscientiously take further action to pursue research and development through to completion, establish partnerships, look into the total requirements of the program so that its results can be utilized in a sustained manner. All these entail creativity and commitment in forging cooperative action at all levels.

C. Specific Concerns Addressed by the APP

Upon the request of the Clark Development Corporation, the PNRI conducted a thorough radiological monitoring of priority sites at the Clark Special Economic Zone (CSEZ) in November 1997 to determine whether there is radioactive contamination. The Health Physics Research Section of the Atomic Research Division, which is tasked to determine the levels and distribution of radioactive contaminants in the environment and their impact to public health, responded to this request. Results of the study showed that radiation levels at the sites were within background levels and do not pose any risk to public health. In April 1998, the PNRI again conducted a comprehensive radiological test in Clark using a "car-borne gamma ray

spectrometer**". Results indicate that the radiation values are within allowable standards. This means that workers and residents in Clark are free from dangers of exposure to increased levels of radiation. (Please see appendix A). Despite these findings, however, reports by the media and environmental NGOs on the presence of hazardous wastes with radiation contamination and their effects on humans have proliferated. One of these reports comes from the People's Task Force for Bases Clean-up, an NGO, which alleged that there are hazardous materials including nuclear materials in Clark Special Economic Zone**.

In other studies conducted in Clark by other institutions, (as shown in Appendix A) some contaminants like heavy metals, organic compounds and asbestos have been identified as present in the area. These contaminants, however, are non-radioactive. Allegations of radioactive contamination persist because the ordinary layman can not very well differentiate radioactive contamination from non-radioactive contamination. Trixie Concepcion, the Secretary General of a mass organization called AGHAM or Samahan ng Nagtataguyod ng Agham at Teknolohiya para sa Sambayanan, mentioned in an interview with the project proponent of this APP, that in general, people confuse toxic and hazardous contamination with radioactive contamination. Similarly, the experience of the Information Services Group of PNRI, based on the nuclear awareness and face-to-face discussions that they conduct in different schools in Metro Manila and provinces, indicate that generally,

*Car-borne gamma ray spectrometer is an instrument used for environmental radiation surveys and contamination assessment operations, including surveys of specific sites, and for locating lost radioactive sources.

**People's Task Force on Bases Clean-up (PTFBCU) Information Pamphlet

students associate radioactive contamination with any kind of hazardous contamination. This negative perception has to be remedied. The studies made by PNRI will be validated if only social perception is to be fair game. A comprehensive set of strategies will have to be undertaken to provide enlightenment and engender the key stakeholders in particular, and the public in general, to support the validated findings.

This Action Plan and Project (APP) intends to address the need to convince critical stakeholders in Clark Air Base that the facility is not contaminated by radioactive elements. The location of the radioactive contamination study is at the old ammunition dumpsite that was used by the American forces during their occupancy of Clark until 1991. The 10-hectare area is now being used for agricultural purposes and is planted with vegetables and rice. (Please see Figure 3 for aerial view of the agricultural farm at the former ammunition dumpsite.) The results of the APP study seek to dispel the persistent public fear on the presence of radioactive contamination and untoward health effects to those exposed to such alleged contaminants. Thus, the sectoral concern foremost in this APP is to heighten the level of social acceptability by the stakeholders to the radiation-free environment at CSEZ through the social marketing approach used by the APP. It is expected that the Project results would validate the results of the earlier environmental radioactivity studies done by PNRI, which had shown no radioactive contamination at the former US base. Specifically, the social marketing intervention would like to solve the problem of negative perception on radioactive contamination at Clark Special Economic Zone.



FIGURE 3. Aerial View of Agricultural Farm at Former Ammunition Dump Site in CSEZ

II. Theoretical Foundations of the Project

A. Review of Management Theories

1. THE SYSTEMS THEORY

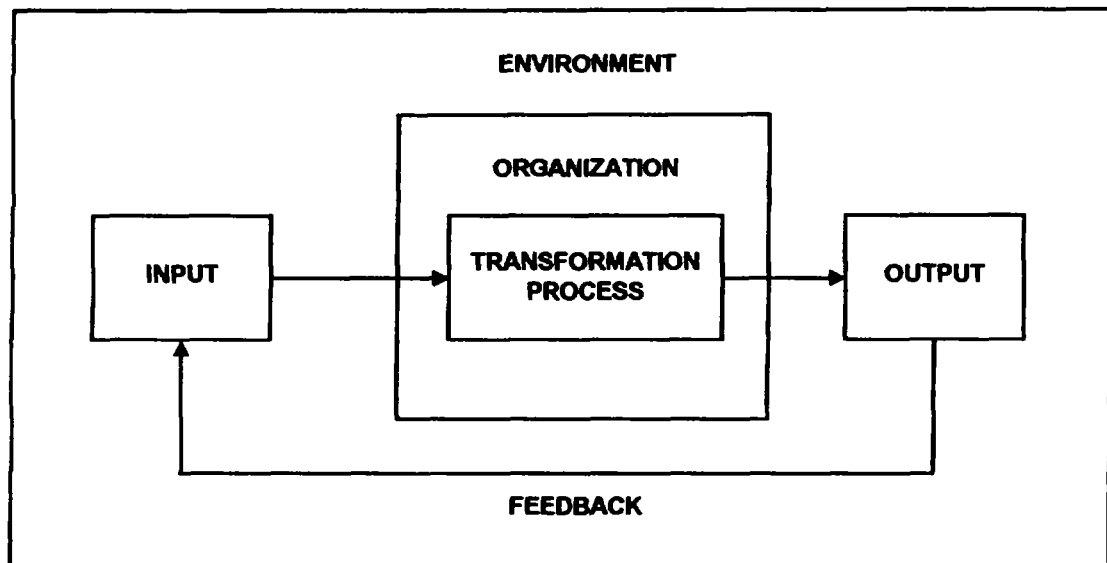
The Philippine Nuclear Research Institute, as an organization, is technology manager as far as advanced S & T sector is concerned. It is thus imperative that the PNRI recognizes that it operates within a system of internal and external forces impinging on its organization and in carrying out its vision, mission and goals. In particular, it must deal with issues relative to how radioactivity is perceived by the general public as well as key stakeholders, in view of PNRIs' developmental role on this matter.

According to Stoner and Wenkel, (7), the systems approach to management attempts to view the organization as a unified, purposeful system composed of interrelated parts. Rather than dealing squarely with the various parts of the organization, the systems approach gives managers a way of looking at an organization as a whole and as a part of the larger, external environment. In so doing, systems theory tells us that the activity of any part of an organization affects the activity of every other part. The extent to which the external environment influences managers varies with the type and purpose of the organization. It differs among the positions and functions within an organization and even between the hierarchical levels inside the organization.

A system can either be a close or open system. According to John R.

Schermerchorn (8), an open system is one that interacts with its environment; a close system does not. The openness of the system depends upon the amount of interchange between it and the environment. The simplest open system consists of input, transformation process and output (Figure 4).

FIGURE 4. The Open System Theory of Management



Reitz and Jewell (8) noted that in the open system, each part work together to make up an organized being. Each part gives something to and gets something from the others. A change in any part of the system causes changes in other parts or subsystems and in the system itself. It is interdependence that makes it an open system.

A critical element in the open system's perspective on organization is the environment. It has a significant impact because it is a source of resources and feedback. As the environment changes over time, it is the manager's job to stay informed and help the organization to respond in a

productive way. Through feedback, managers get information about the system performance that can be used for purposes of control and constructive changes.

People as a vulnerable resource in the system must be treated with respect, both those within the organization as well as those external to the organization, its external stakeholders. In some situations, people act rationally while in other situations, they are guided by emotions. The manager has a responsibility to create an environment in which people are induced to contribute to the aims of the organization. Different situations require a variety of managerial approaches for utilizing people most effectively and efficiently.

Stoner and Wenkel (7) said that the contingency approach was developed by managers, consultants and researchers who tried to apply the concepts of the major schools of real-life situations. They often found that methods that were highly effective in one situation would not work in other situations. Advocates of the contingency approach say that results differ because situations differ. A technique that works in one case will not necessary work in all cases. The task of the manager is to identify which technique will, in a particular situation, under particular circumstances, and at a particular time, best contribute to the attainment of management goals.

2. SOCIAL MARKETING

Inasmuch as this APP intends to heighten the level of social acceptability by the stakeholders of PNRI studies made at CSEZ, a review of

literature related to social marketing is deemed necessary. This is because it has been an effective tool in dealing with the need to generate support and acceptance from sectors who would otherwise initially render such, especially in contentious developmental situations. The traditional approach of one way information dissemination usually conducted by PNRI did not appear to convince certain sectors about the veracity of PNRI's initial findings on the non-radioactive contamination of Clark. The usual norm for scientists who write technical reports on the results of their environmental monitoring studies on a particular area is to submit these reports for publication in scientific journals. The reports, however, are read by only a few people because these reports usually end up in libraries. The scientist may also give seminars, but these, oftentimes are done only for select groups of people. The larger concerned audience does not hear about the reports. This essentially was the approach taken by PNRI in dealing with the data dissemination of the results of radiation monitoring studies at Clark.

Definition and Coverage

According to Kotler and Roberto (11), social marketing is a strategy of changing behavior. It combines the best elements of traditional approaches to social change in an integrated planning and action framework and utilizes advances in communication technology and marketing skills.

The term social marketing was first introduced in 1971 to describe the use of marketing principles and techniques to advance a social cause, idea, or behavior. Since then, the term has come to mean a social-change

management technology involving the design, implementation and control of a program aimed at increasing the acceptability of a social idea or practice in one or more groups of target adopters. It utilizes concepts of social segmentation, consumer research, product concept development and testing, directed communication, facilitation, incentives and exchange theory to maximize the target adopter's response. The sponsoring agency pursues the change goals in the belief that they will contribute to the individual's or society's best interests.

In his article entitled "A Social Marketing Model For Changing Health and Nutrition Behavior", Eduardo L. Roberto (12) mentioned that despite headways made in the field of research, technology development, and policy formulation, Third World countries still have to grapple with basic problems relating to health and nutrition. The success of social programs lies not so much on the rhetorics of the policy, but more importantly, on the actual implementation of the program. Knowing what to do does not mean knowing how to do it. Various steps are outlined under the social marketing scheme. First and foremost, the scheme requires a precise identification of the target segment of a population, the needs of such segment which vary according to the different stages of the process, and the specific product for each particular need. Social marketing focuses on determining how target behavior and responses of the target segment can be effectively shaped. Akin to commercial marketing, social marketing relies on advertising and promotion efforts in order to achieve predefined target behaviors of the program.

Use of Social Marketing

Social marketing represents a practice and a discipline of implementation. (12) Focusing on implementation does not mean that research, appropriate technology, planning and policy are less important. They are and they form related parts of a program management chain. Unfortunately, implementation has been a taken-for-granted part of this chain. Development and social program planners are not to blame for this. The management discipline itself has taken implementation for granted. One only has to compare the planning and the control literature with the implementation literature to quickly realize this. It was not until Peters and Watermen (13) showed that it was the superior implementing skills, the "hands-on management style" which differentiated the best-run from the mediocre companies, that implementation became as serious a concern for both management research and training as management planning and control.

Implementing is just as difficult a process and a skill as are research, technology development, planning and policy formulation. Its role in social program management is to supplement and augment the value from these other tasks.

To implement a health and nutrition intervention, social marketing takes these steps: (12) (a) identifying the intervention's target adopter segment, assessing their needs, and then choosing a priority of adopter segments; (b) specifying the target health and nutrition responses to influence for each target segment, and determining the social marketing tool needed to affect

each target response; and (c) integrating the identified social marketing tool into a comprehensive synergistic mix, and then fielding this mix through the appropriate implementing setup of people, task, procedures, controls and evaluation system.

Social Marketing Tools/Mix

The “social marketing tools” consist of “**the four Ps**” (11). These are:

- (1) **Product** - the set of tools covering the physical as well as the perceived aspects of the social program’s offer, including branding and packaging;
- (2) **Place** - the set of tools for making the product available and accessible, and also referred to as the distribution channels and service outlets;
- (3) **Promotion** - the set of tools used for informing, persuading and moving the target adopter segments to adopt now and not to postpone, and includes both mass and direct response advertising, field extension work, and adoption promotion, and
- (4) **Price** - the set of tools used to make the cost of adopting the product affordable to the target adopter segments both monetarily and non-monetarily.

The social marketers have suggested an **additional P** to the four P’s classification especially concerning the delivery of services. This additional P is “**People**”, the individuals, groups or populations who are target of appeals for change by social marketers.

Key Elements

- ***Market Segmentation***

When nutrition programs address specific adopter groups like pregnant women, mothers of children with diarrhea, mothers of infants four months old or less, and so on, they are clearly into a segmentation strategy of program implementation. But even nutrition programs for the general public such as mass media-based nutrition education campaigns, find that in their program implementation, it is cost-effective to stratify the adopter population according to certain criteria. This way, speedier adoptions can be attained by tailoring the intervention to fit each segment. This makes segmenting a cost-effective implementation tool.

- ***Assessing Target Segment's Needs***

After the choice of priority target segments comes the task of assessing segment needs. (12) Social marketing has contributed to a better understanding of this task. It has extended the needs assessment techniques by placing the task along the adoption process. Adopter segment needs differ at various stages of the process. To assure that the nutrition program implementation is truly responsive, all of the adopters' adoption stages needs should be determined and served.

- ***Stratifying the Identified Needs of Target Adopter Segments***

After learning the needs of the program's target adopter segments, (12) program implementers must now think of satisfying those needs. To

accomplish this, the target segments must be influenced to behave in certain ways. Social marketing assumes that marketing variables under the control of the nutrition manager cause and can change target adopter behavior. Adopter behavior can be classified into two: ultimate and intermediate. The ultimate behavior is characterized by a continued and committed adoption of what the nutrition program wants its target adopter to do. The intermediate class is composed of several related responses, all of which are instrumental in preparing the way for the ultimate committed adopter behavior.

In the social marketing model, the entire social marketing mix determines the adopter's committed adoption. The cause of the adopter's response does not come from just one or two or three elements but from all of the elements of the social marketing mix. Each of the intermediate adopter responses is a function of a specific social marketing mix element. For example, in the nutrition program illustrating the response of the adopters becoming aware and persuaded quickly about the nutrition "product" is a function of the social marketing mix element of advertising. The adopter response of availing of the nutrition product is a function of the social marketing mix element of distribution process and service outlets. The adopter response of trying the nutrition product right away and not later is a function of the mix element of adoption promotion. Table I presents all such intermediate responses including the ultimate, and designates what social marketing mix element is the determinant of each response.

Table I. Target Adopter Behavior and Responses and their Determinant Social Marketing Tools

<i>Sequence of Target Adopter Behavior and Responses</i>	<i>Responsible Social Marketing Tools</i>
Get adopters quickly informed & persuaded in great number	Advertising
Get them to implement their persuasion now and not later	Adoption promotion
Get them to avail of the social product and have a satisfactory service delivery experience at the service outlets	Distribution, placement and delivery
Get them to be able to afford the social product both monetarily and non-monetarily	Adoption cost management pricing
Get them into a trial adoption of the social product	Social marketing mix
Get them to be satisfied with their product adoption experience	Social product quality
Get them into retrial and committed adoption	Social marketing mix

Social Marketing as Behavior Change Model

The social marketing mix thus constitutes a model of adopter behavior and responses. It is a theory of behavior, if theory and model are regarded as synonymous.

What are the distinguishing characteristics of this adopter behavior model? It has at least three distinguishing characteristics. First, it is a "hounding" theory of adopter behavior. Webster defines hounding as "pursuing relentlessly until the victim succumbs". The social marketing mix model prescribes that for the nutrition program to successfully bring target adopters to committed adoption, the intervention must pursue them relentlessly while they are watching, reading, listening, thinking, feeling, desiring, intending, trying and deciding to continue or to drop out. When the nutrition intervention makes its presence felt in each and every one of these

adopter responses, the target adopters will eventually and finally succumb. They will adopt and continue to do so for as long as the nutrition program effectively satisfies their nutrition and health needs (14).

The Social Marketing Idea or Product

The goal of social marketing is to have a change in attitude towards a certain idea or behavior from advertising to acceptance on the adoption of new ideas or behavior. Ideas and behaviors are the "products" to be marketed. In this particular APP, the social product is the PNRI findings of non-radioactive contamination of soil and plants grown at the former ammunition dump in CSEZ. The social product becomes the subject of a social cause campaign. A social cause campaign is an organized effort conducted by the group (the change agent) which intends to persuade others (the target adopters) to accept, modify or abandon certain ideas, attitudes, practices and behavior. (15)

Target Adopters

Target adopters are individuals, groups, or entire population who are the target for change by the social marketer. The key to effective marketing is talking and listening to the people who a social marketer is trying to reach. Social marketing is a customer-driven process. All aspects of the social marketing program must be developed with the wants and needs of the target audience as the central focus. The starting point of social marketing, therefore, is getting to know the target adopters through market research;

their social and demographic make-up (economic status, education, age structures), their psychological features (attitudes, motivations, values, behavioral patterns) and their needs. (16)

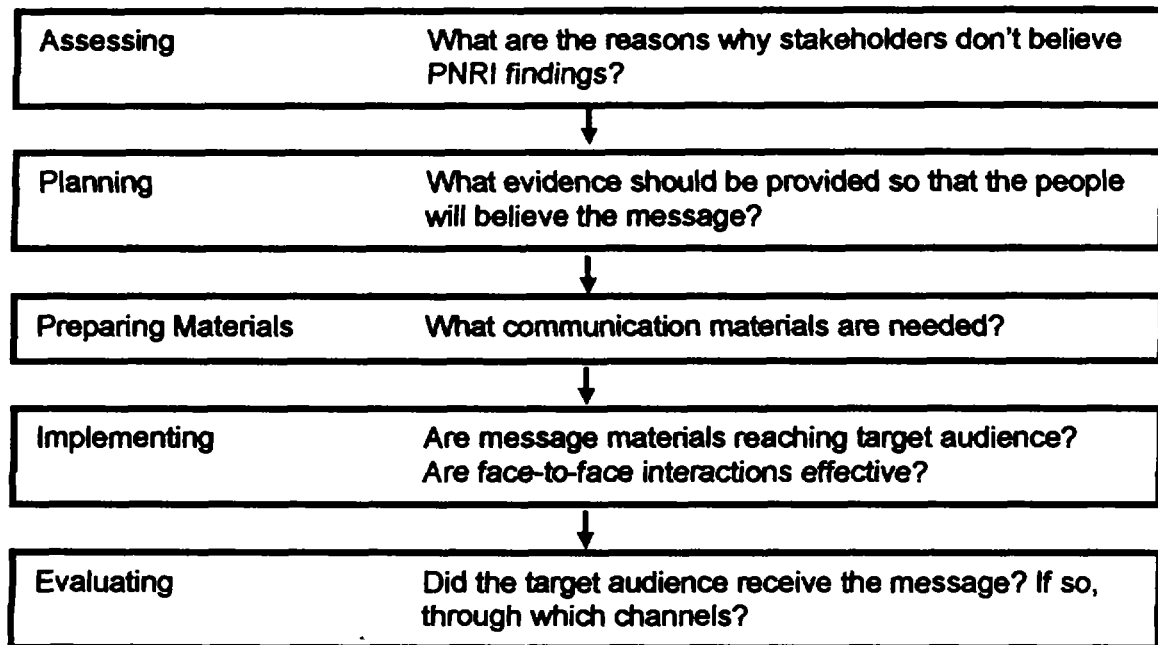
Many social cause campaigns (or IEC programs) fall short of goals because the target adopters and their needs were not researched. The major lesson in social marketing is "creativity is nice, but an accurate advertising of your target adopter is even better. Your Million Dollar asset is your target adopter". (17)

Methodology of Social Marketing

Social marketers develop an integrated social marketing plan in which the mix of elements is coherent and appealing to the target adopters. It is not sufficient to develop each element of the marketing mix separately. Putting together separate elements will not result in an optimal plan for a social change campaign. One marketing element or phase may be incompatible with others when combined in a mix. Ultimately, adoption of a social product will depend on an optimal mix of elements, rather than on the discrete separate elements themselves. (18)

The communication component of the project involves a five-step methodology illustrated in Figure 5. The project proponent found it useful to adopt this decision-making approach followed by the Department of Health-NCR Immunization Program. (19)

Figure 5. Five-Step Methodology for Social Marketing



B. Review of Related Literature

1. Social Marketing Campaigns

Social Marketing for Responsible Parenthood Family Planning

Campaign (20)

The Population Center Foundation (PCF) conducted a bid among Philippine advertising agencies where the winner was to prepare a massive and comprehensive social marketing communication program aimed at reducing the annual birth rate to, at best, 2 to 3 years. *"Well Advertising"* recommended a multi-media social marketing communications campaign anchored on the Catholic Church-endorsed family life principle of

“Responsible Parenthood” and won the bid.

The Campaign had these highlights:

- 1. The first phase educated the target couples on the meaning & application of “Responsible Parenthood” in the overall parenting roles of couples. This went on for 2 months. No contraception was cited.**
- 2. The second phase portrayed real young couples (highly reproductive) having one child and living up to the principle of responsible parenting by spacing childbirth and doing their best effort to provide for the material (food, clothing, housing, medicine, etc) and spiritual needs (education, love, prayers, mutual respect, etc) of every family member.**
- 3. The methods of spacing childbirth were presented “cafeteria style” in print and broadcast materials, with the natural methods first, followed by artificial contraceptives.**
- 4. To lessen the chances of arousing controversy, the campaign strategy called for the use of a highly respected NGO in the field of family planning as the “advertiser” or “client” of *Well Advertising*. POPCOM and PCF stayed in the background.**
- 5. TV and cinema were used as primary media in Manila and other key cities nationally, with print and radio as secondary media. In other areas, because of low TV ownership at that time, TV as well as print were used as support media to radio and cinema. Media strategy called for radio spots (with jingle “Ano ang Responsible Parenthood”) to dominate the soap opera hours of target couples. Print ads were**

placed in national and local newspapers, plus leading national and regional magazines. TV spots were placed in top-rating programs with broad appeal to the masses avoiding programs like news and sports that catered to opinion makers & sophisticated people. Comics were also used for secondary support medium. Leaflets were mass-produced and distributed at all health centers and also drugstores. Post survey was conducted by PCF to determined results. In general terms, the target was achieved and *WELL* was given a go signal to launch a sustaining campaign. The EDSA Revolution and a change of administration cut the program short.

Social Marketing for Generic Drugs Project of DOH (21)

With the enactment of the Generics Law, the Department of Health was mandated to implement it nationwide amidst a thick air of controversy mainly between groups with interests to maintain the status quo on one hand and by those who wanted a shift to generics based medical practice on the other hand. *WELL* advertising was tasked to promote the Generics Law particularly among the CDE economic groups nationwide. The objective was to urge the target groups to buy generics, instead of branded medicine and thereby substantially save on medicine bills.

The Detailed Description of Actual Service Provided by Well Advertising was:

Crafting the Message. Simplicity was the rule of thumb in the wording, phasing and in delivering of the message to the target groups.

The Message. The message delivered was "Buy generic medicine and save substantial amount of money". Prices of often-bought branded medicine were placed or cited side by side with generic equivalents in all communications materials.

Message Delivery. To deliver the message, highly credible doctors, government servants and couples representing a cross section of the community at large that had direct involvement in the enactment, implementation and public acceptance of the Generics Law, gave testimonials.

Apart from his appearance on the TV/Cinema commercials, and his testimony on the radio commercials, then Senator Orly Mercado, main author of the law in the Senate, and his counterpart in Congress, made personal appearances and gave interviews in order to persuade large TV and radio audiences to avail of the benefits of the Generics Law. Medical doctors in public service and private practice alike endorsed the law and pointed out all-important benefits to the public. On-the-street interviews of housewives and husbands strengthened the message of big savings of buying generic medicine, while comparing their prices with branded counterparts. In addition to the television and radio commercials, posters and leaflets carrying similar simple messages were distributed to all drugstores and health centers nationwide.

Social Marketing for Vitamin A Project (22)

Under the HealthCom Project (USAID) thru the Nutrition Center of the Philippines (NCP), *WELL Advertising* was also appointed to handle an

interesting and very challenging project, the objective of which is to promote intake of Vitamin A by way of Vitamin A – rich vegetables.

The identified problem was the alarming increase of night blindness caused by Vitamin A deficiency among children between 5 and 12 years of age. This surprisingly persisted even in places where there was abundant presence of natural food rich with Vitamin A. Malunggay, for instance, is a common backyard planted vegetables in many households across the country. But research data available at the Nutrition Center and the Nutrition Council of the Philippines indicated that family heads rarely appreciated nor knew the Vitamin A potency of malunggay beyond using it as a "soap-taste booster" or just as plain vegetable. Its notable decrease in usage compounded night blindness among children of said age bracket. There were many vegetables which the NCP identified to be rich in Vitamin A; in addition to malunggay, the other vegetables which are commonly grown or bought in the wet market are alugbati, camote tops, kangkong and pechay.

WELL Advertising prepared various broadcast and print communication materials in line with the media strategy of using combined local TV and radio as primary vehicles and with local newspapers as support medium. Posters and leaflets were prepared for citywide distribution in Cagayan de Oro City through health centers, drugstores, supermarkets, malls, city government agencies, TV and radio networks and barangay centers with full cooperation of barangay heads.

On the launching day, a barnstorming motorcade around the City of Cagayan de Oro (complete with the children's participation, health workers &

barangay leaders, city workers) was held to successfully create a high level of awareness, timed on the day the mass media activities began and after posters and leaflets had been distributed citywide.

The team, composed of *WELL* staff, together with the HealthCom Resident Advisor and the Vice-Mayor, persuaded the Department of Education's City Schools to take leadership in planting Mack-P at all school gardens and in every available open grounds. A contest was launched, i.e. trophies were to be given to the school that can produce the most harvest per square meter of garden plots over 4 months. The participating schools were also encouraged to sell their produce, the proceeds of which can be used for the schools or rolled-over to produce more harvest for community consumption. One school had a Grand Christmas party while another school rolled-over their proceeds. Awarding ceremonies were held in which one of the highlights was the serving of Mack-P pizzas.

Post-tracking research revealed a marked increase in consumers' awareness, knowledge, attitude and consumption of Mack-P and other vegetables. Importantly, the experiment demonstrated that various government departments, like LGUs, Agriculture, Education and Health, can work together for a common good and that they can take the initiative to lead the private sector and NGOs towards a health goal. As a common tool, a social marketing-based initiative can tie-up all elements.

2. Public Participation and Social Acceptability

Public participation and engendering social acceptability are critical

ingredients in ensuring the success of development interventions, especially those that need substantial public support. The Philippine Environmental Impact Assessment (EIA) system has provided one of the more developed tools and practices in measuring and assessing social acceptability in relation to proposed environmental projects.

In an article written by Agerico M. De Villa (23) entitled "Assessing Social Impact Assessment in the Philippines", a brief account of the workings of the Philippine Environmental Impact Assessment system is made. De Villa noted that the methods used in social impact analyses within the Philippine EIA system include demographic and perception surveys, focused group discussions, key person interviews, public consultations and public hearings. These are primarily meant to give "critical information necessary to predict likely beneficiary response to the proposed project. The dominant practice, however, has been to "involve affected populations in the design of their own futures" rather than to predict the likely beneficiary response.

The focus on public participation is assumed to bring about the following:

- Enhanced understanding of sustainable development issues, both within and between interest groups;
- Improved communications within and between interest groups;
- Consensus on the main issues, and what to do about the issues;
- Networks of committed individuals and institutions; and
- Renegotiations of responsibility between interests and joint actions for sustainable development.

3. Radiation in the Environment

Since the Action Plan and Project is concerned about the acceptance of PNRI environmental radioactivity monitoring studies done in CSEZ, a brief background of radioactivity in the environment is discussed below.

Radiation – A Fact of Life (24)

We have always been subjected to natural radiation. We are exposed to natural radiation from the sun, earth, the houses we live in, the building we work in, and the food and drink we consume. There are radioactive aerosols and gases in the air we breathe, and even our own bodies contain naturally occurring radioactive elements. The level of this inseparable natural “background” radiation exposure varies greatly from place to place.

We are also exposed to sources of radiation that we ourselves create. X-rays and other kinds of radiation used for medical purposes, fall-out from nuclear explosives testing and the small quantities of radioactive materials which are allowed to escape to the environment in the course of normal operation of nuclear installations are some examples.

Types of Radiation

The term “radiation” is very broad and includes such things as light and radio waves. It is most often used, however, to mean “ionizing” radiation; that is, radiation which changes the physical state of atoms which it strikes, causing them to become electrically charged or “ionized”. In some circumstances, the presence of such ions can disrupt normal biological processes. Ionizing radiation may therefore present a health hazard to man.

There are various types of ionizing radiation. These are: alpha radiation, beta radiation, gamma rays, x-rays and neutrons. Unstable naturally-occurring and man-made atoms that emit these kinds of radiation are said to be radioactive.

Biological Effects of Ionizing Radiation

Humans, animals, plants and microorganisms have lived under the influence of radiation since they first appeared on the earth. Depending on the energy, type and quantity of radiation and the sensitivity of the organism exposed, the effects due to radiation may be harmful or beneficial.

Radiation may affect living things by destroying, damaging or disturbing the function of cells that make up the living organism. Radiation damage occurs when the ionizing radiation interferes with the normal operation of a cell causing direct and indirect damage to cell. If the cells do not repair themselves, permanent effects of cell damage can be seen as biological changes in tissues and organs.

Beneficial Uses or Benefits of Radioactivity (25)

Progressive countries in the world extensively use radioactivity in industry. The use of radioactive materials in virtually all industries is of immense importance for process development and improvement, quality control and testing, operation research and measurement.

Nuclear technology helps ensure health security. Many lives have been saved and health care has been improved through the use of nuclear

techniques in medicine such as treating tumors and certain types of cancer. Nuclear techniques enable doctors to quickly and accurately diagnose condition and diseases of the heart, lungs, thyroid and kidney.

Nuclear technology includes food security and animal productivity. Radiation technique can increase yield, increase disease resistance and early maturity in agricultural crops. This technology also extends the shelf life of many food and other agricultural products, reduces post harvest losses by suppressing sprouting and contamination, and reduces food borne diseases caused by microorganisms. It can also improve soil quality and animal productivity.

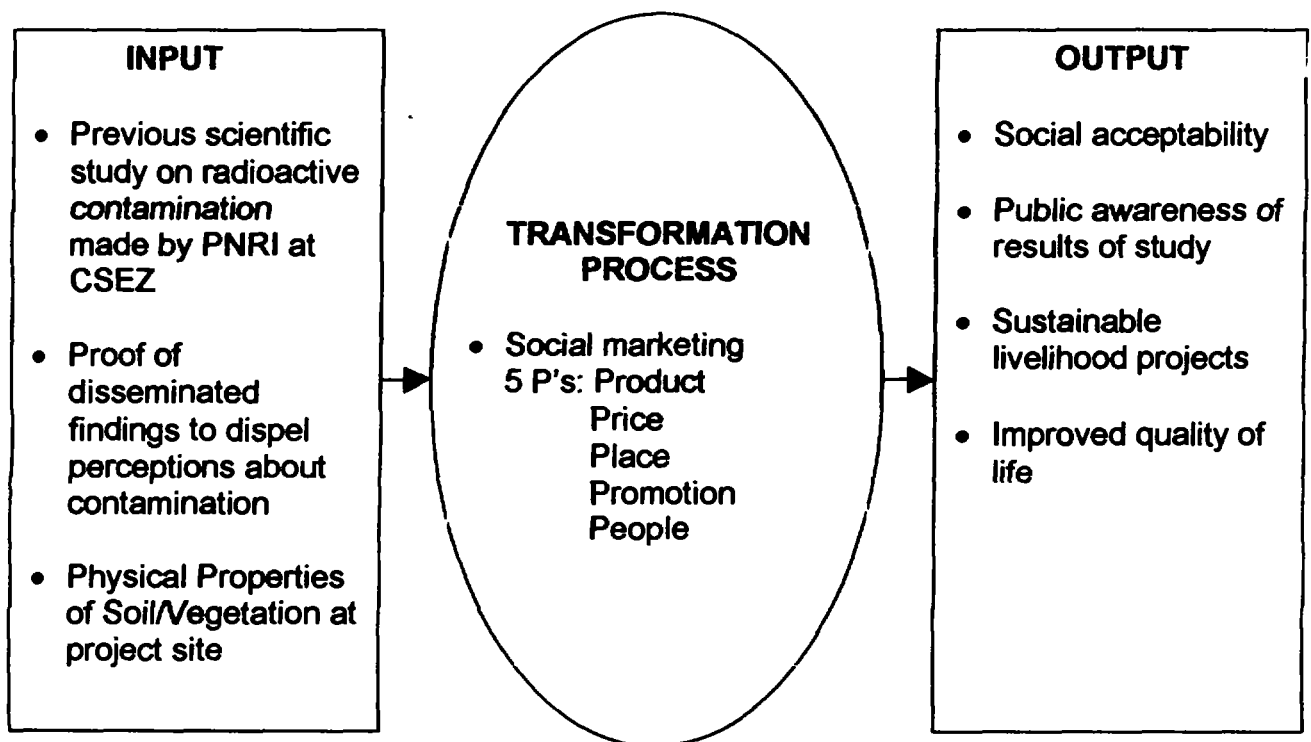
Nuclear technology helps protect the environment. Nuclear techniques are used in the study and detection of environmental pollutants such as pesticides and toxic metals. The level of pollutants and their effects on living organisms can be monitored very effectively in the air, soil and water by using radioactive material. Also, nuclear technology contributes to energy security and helps reduce global warming. Nuclear power provides seventeen percent of the world's electricity requirements. There are 437 nuclear reactors presently operating worldwide (26). Nuclear power plants do not emit carbon dioxide which contributes to greenhouse effect and global warming.

C. Conceptual Framework of the Project

The system theory indicates the interrelatedness and interdependence among elements affecting an organization both internal as well as external. It

stresses that the interrelated-interdependent parts are the organizational structure, technology and people which operate under the influence of the external environment (27). The simple open system – consisting of inputs, transformation process, and outputs (Figure 3) shall be the guiding theoretical model of the APP. The conceptual framework of the APP combines system theory and social marketing. The system theory is the overarching model for organizing the project and the data to be generated and social marketing is the approach used for the actual intervention.

FIGURE 6. Conceptual Framework of the Study.



By application, the above illustrated conceptual framework (Figure 6) indicates the following: the INPUTS of the study will be the previous studies on radioactive contamination made by PNRI at CSEZ, proof of the disseminated findings that will dispel the perception about radioactive contamination among people living around CSEZ, and the result of the conducted experiment on soil and vegetation samples at the project site. The TRANSFORMATION PROCESS will be the social marketing effort consisting of "five P's": the "Product" as the acceptance of the PNRI studies in Clark, the "Price" as the benefits derived from knowledge in PNRI studies, the "Place" as the location of the IEC campaign, the "Promotion" as the easy to understand seminar, face-to-face discussions and on-site demonstration on the safe consumption of the vegetable produce, and the "people" as the target adopters. The OUTPUTS of the project will be the social acceptability and public awareness on the results of the study, the sustainable livelihood projects, and the improved quality of life of the residents around CSEZ.

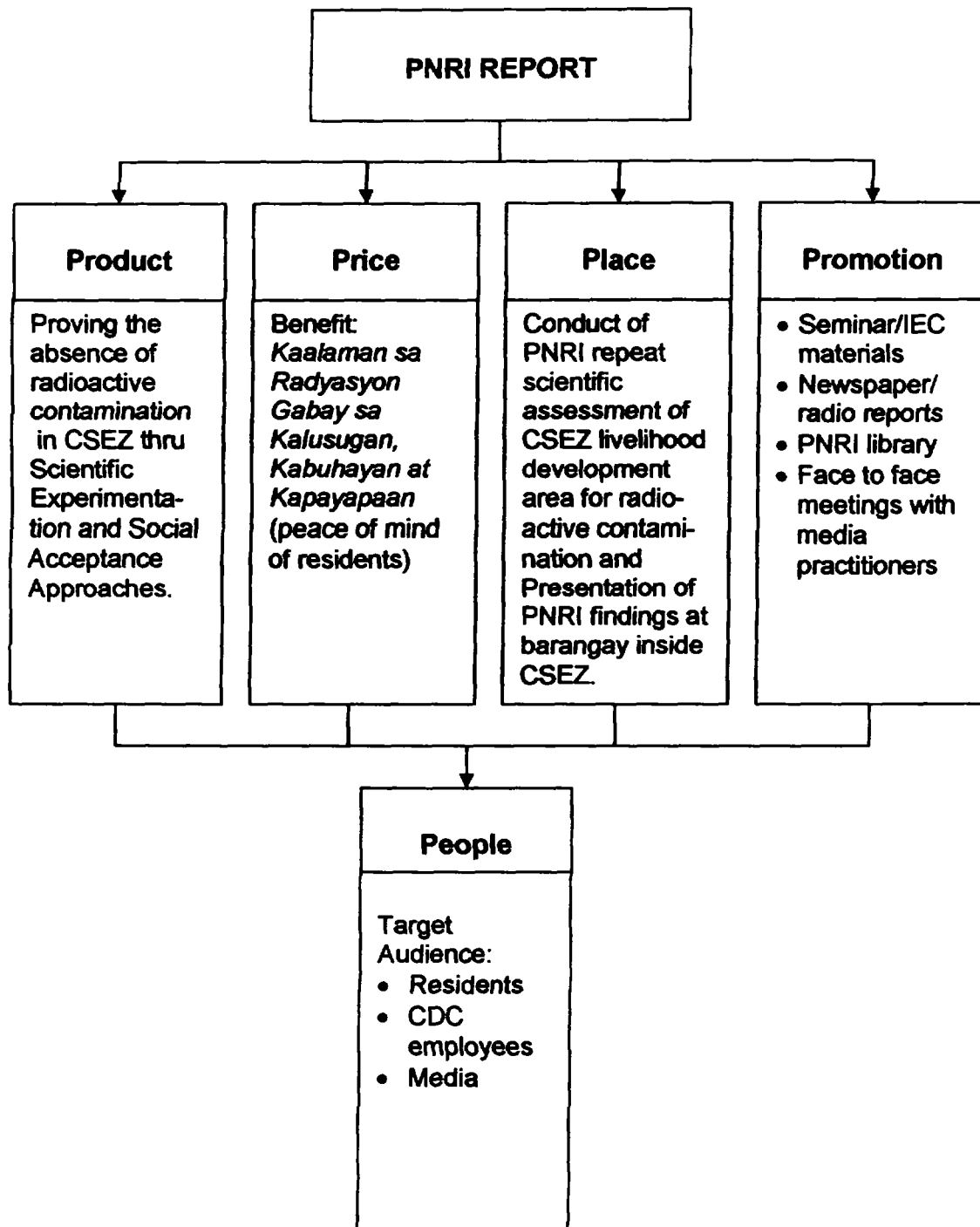
The "Transformation Process" that occurs in the Project, in accordance with the Systems Framework utilized, is brought about through social marketing. According to Kotler and Roberto (28), social marketing is a strategy for changing behavior. It combines the best elements of traditional approaches to social change in an integrated planning and action framework and utilizes advances in communication technology and marketing skills.

Change from an adverse idea or behavior or adoption of new ideas or behaviors is the goal of social marketing. Ideas and behavior are the 'products' to be marketed. Thus, the positive change that this APP wants to

bring about is the change in the mindset of the residents around CSEZ and the public in general about the radioactive contamination of soil in CSEZ. The use of the CSEZ site for livelihood programs as the testing ground for assessing presence or absence of radioactive contamination seeks to eliminate doubts of soil contamination in the area. The absence of radiation contamination to be demonstrated in the radiological tests conducted by PNRI will also cast out allegations of radiation-induced diseases.

The APP focuses on the concern to establish social acceptability of the PNRI reports on the absence of contamination on CSEZ and the use of the social marketing approach as a means to address this concern. The APP paradigm is that social marketing as a behavior change approach, can be adopted for affecting behavior change among the CSEZ residents and by stakeholders relative to the acceptance of PNRI scientific findings. This paradigm treats PNRI findings on non-contamination in CSEZ as the product to be marketed through social cause campaign. The APP uses the five P's in the social marketing of the PNRI findings - the Product, Price, Place, Promotion and People. The five P's are called the marketing mix. They are discussed below with the APP paradigm illustrated in Fig. 7.

Figure 7. The Five “P’s” of Social Marketing



1. The Product: PNRI Reports on Clark

In November 1997, the Health Physics Research Section of the Philippine Nuclear Research Institute conducted a thorough survey of

radiological monitoring at Clark Special Economic Zone to determine the presence or absence of radioactive contamination in the area. Results of the study showed that the radiation levels at the sites surveyed were within background levels and do not pose any risk to public health (29).

In April 1998, the PNRI again conducted a comprehensive radiological test in Clark using car borne gamma-ray spectrometer. The results indicated that the radiation values were within allowable standards. This means that the workers and residents in Clark are free from dangers of exposure to radiation (30).

In October 2002, the project proponent conducted a study to measure the levels of radioactivity contamination in soil and plants grown in the farm at the former ammunition dump area in CSEZ. The results of this study endeavor to validate the findings of the previous measurements made by PNRI at Clark. The results of the study were shared initially with the officials and employees of the Environment Planning and Management Department (EPMD) of Clark Development Corporation (CDC).

2. The Price: Benefits Derived from Knowledge on PNRI Studies

The project proponent has for its theme in its social marketing promotion campaign, the message: *Kaalaman sa Radyasyon: Gabay sa Kalusugan, Kabuhayan at Kapayapaan*. Workers and residents in Clark Special Economic Zone will have peace of mind when they know that they are free from the dangers of exposure to radiation. Understanding of the state of the physical environment is one of the factors that will guide the country's

policy and decision makers to develop projects for improved public health and sustained economic stability.

The data generated from the radiological studies in Clark will build confidence among the communities living around CSEZ about the integrity of soil in their farm. The results of the study will enlighten the media and field practitioners about the real conditions of the area in terms of radiation contamination. The results of the study also hope to influence policy makers of this country on their decision-making process on the development of CSEZ.

3. The Place: Where the IEC Campaign Can Be Conducted

The “Place” describes the way the product reaches the target adopters. For tangible products, it refers to the distribution system – warehouse, sales forces or retail outlets. For an intangible product, the place could be training programs or demonstrations.

The former ammunition dump site in Clark Special Economic Zone, now used as livelihood development area by local residents is the place where the scientific experimentation was conducted to test for the validity of PNRI scientific findings. For the social marketing campaign being waged relative to the absence of radioactivity in Clark Special Economic Zone, the presentation of the seminar was in Barangay Macapagal Village located inside the boundaries of Clark. However, since the PNRI report was also given to the members of the media, nationwide and regionwide dissemination of the information was expected.

4. The Promotion

The "Promotion" consists of the integrated use of mass media, public relations, and interpersonal communications, among others. For this APP, it was multi-pronged and targeted along different audience levels: 1) for the scientific community, this consisted of technical reports published in technical journals such as the Philippines Nuclear Journal and the Nucleus, and made available at the PNRI library, 2) for the residential community and local government units (LGU), presentation of IEC materials and face-to-face interactions are made, 3) for the general public, reports are published in newspapers and aired through radio broadcasts. These are done through partnerships with media groups.

5. The People

The "People" or target adopters are individuals, groups or populations who are target of appeals for change by social marketers. The target adopters in this APP were the residents of Barangay Macapagal Village, the employees of Environmental Planning and Management Department of Clark Development Corporation, and the journalists at the media center based in CSEZ.

III. Definition of Terms

Radioactivity - the emission of alpha, beta and gamma rays from the nuclei of atoms during the process of decay or disintegration in which atoms of one element are transformed into atoms of another element.

Hazardous wastes – refer to wastes that are generally risky or dangerous.

Toxic wastes - wastes related to, or caused by poison.

Gamma Spectrometry - a nuclear measuring technique used to determine the levels of concentrations of gamma-emitting radionuclides in air, soil, food, water, milk or in any other samples. Gamma-emitters may have an energy range of 50 kev to 2000 kev. The spectrometer used are NaI (TI) scintillation detector and/or High Purity Germanium (HPGe) semiconductor detector.

X-ray Fluorescence Spectroscopy - a nuclear measuring technique used to determine the elemental composition of a material based on energy of fluorescence upon excitation using a silicon semiconductor detector.

Social acceptability - result of a process that is mutually agreed upon by agencies, proponents of projects and the stakeholders to ensure that the concerns of the stakeholders, including affected communities are fully considered and/or resolved (31).

Social marketing - a strategy for changing behaviors. It combines the best elements of traditional approaches to social change in an integrated planning and action framework and utilizes advances in communication technology and marketing skills.

IV. APP OBJECTIVES

This APP seeks to attain the following objectives:

1. To validate the previous findings of low levels of radiation in the area by conducting measurements of radioactivity in soil and in plants grown within the perimeters of CSEZ
2. To ensure the social acceptability of the results of the environmental radioactivity studies made by PNRI at CSEZ.

V. SCOPE OF THE PROJECT

A. Subject

This APP addresses the management for the concerns of stakeholders of the presence of environmental radioactivity at the Clark Special Economic Zone. Specifically, the sectoral concern that this APP wants to respond to is the social acceptability of the results of the Philippine Nuclear Research Institute's environmental radioactivity studies on the residents of Barangay Macapagal Village, the key stakeholders in the CSEZ site purported to be contaminated with radioactivity. The specific site monitored is the farm formerly used by the Americans as ammunition dump area.

B. Locale

The APP was implemented at Clark Special Economic Zone in Angeles, Pampanga, specifically, at the 10-hectare farm being used by a local Cooperative group and approved by the CDC management. To demonstrate the integrity of the soil at CSEZ for livelihood program and to show that the soil and plants grown at a farm site are free from radioactive contamination,

samples of soil and plants were collected and brought to the Philippine Nuclear Research Institute in Diliman, Quezon City for analyses of radioactive concentrations and elemental composition. The farm site at CSEZ is presently operated by a Cooperative consisting of residents living around the vicinity of CSEZ.

C. People Involved

The people involved in the APP will be the following:

1. The MPM student as project leader of this APP. He is a Senior Science Research Specialist of the Philippine Nuclear Research Institute and conducts research studies along the field of Health Physics.
2. A Science Research Assistant of the Health Physics Research Section, Atomic Research Division, PNRI who assisted the project leader in the collection of samples at CSEZ, preparing the samples for analysis at PNRI and in conducting the surveys at CSEZ.
3. A Science Research Specialist II of the Health Physics Research Section, Atomic Research Division, PNRI. She performed the radioactivity concentration analysis of soil and plant samples by gamma spectrometry at PNRI.
4. A Senior Science Research Specialist of the Analytical Measurements Research Section of PNRI. She analyzed the soil and plant samples for elemental composition using the x-ray fluorescence spectroscopy.
5. Supervisor of Health Physics Research Section of PNRI who is the student's Institutional Partner and acted as co-adviser in the

implementation of the APP.

6. Information Services staff of PNRI who assisted the student in the conduct of nuclear awareness seminar at CSEZ.
7. Manager of the Estate and Environment Management Department of Clark Development Corporation who facilitated arrangements with the Cooperative using the vegetable farm at CSEZ and who will also help in the conduct of information dissemination campaign among residents around CSEZ.
8. CDC staff who assisted the student in the collection of soil and plant samples at CSEZ and in the conduct of survey questionnaire.
9. Members of the Cooperative tilling the farm within the perimeters of CSEZ.
10. Residents living around Clark Special Economic Zone.

D. Time Frame/Duration

The time duration of this Action Plan and Project shall be within a period of three months.

VI. Significance of the APP

A. To the Agency

This APP is significant to the Agency for the following reasons:

1. The Action Plan and Project complements the Philippine Nuclear Research Institute's commitment under the Philippine Task Force on Toxic Wastes in Former U.S. Military Bases (the main objective of which is to formalize the institutional mechanism that will address the bases clean-up issue).

2. The results of the study will benefit the PNRI in terms of the usefulness of the data in building public awareness on PNRI's activities and radiological protection.
3. The use of the Social Marketing approach used will benefit the agency in terms of utilizing innovative ways to disseminate and establish acceptability of scientific data especially to those who are living in areas vulnerable to radioactive contamination.

B. To the Community/ Country

1. The data generated from the radiological tests will enable the residents of the communities living within and around CSEZ to live in peace and confidence with the knowledge that the area where they live is safe from the dangers of radioactive contamination.
2. The data generated from the radiological tests on soil and plants will convince the farmers about the safe use of their farm in livelihood projects.
3. The results of the study will cast out allegations of radiation-induced diseases among residents and workers in the area.
4. The results of the study will enlighten the media and field practitioners about the real condition of the area in terms of radiation contamination.
5. The results of the study hope to influence policy makers of this country on their decision-making process in the development of CSEZ.

6. The results of the APP will encourage foreign investors to establish business at CSEZ, thus, generate economic growth for the area in particular and the country in general.

B. To the Field of Public Management

This APP will be useful especially for technically-oriented public managers. Lessons generated from the APP will help them “grow out” or “move out” of their shell especially with respect to communicating ideas, especially results of scientific research. The innovative approach used in the APP can be used by the bureaucracy in establishing acceptability of ideas, including scientific data.

CHAPTER TWO. DESIGN OF THE APP

I. The Project Plan

The Project Plan is discussed comprehensively in the following text. Please see Table 2 for the matrix presentation of the APP project plan with the column headings: Objectives, Major Activity, Success Indicator, Persons Responsible, Date (Start-End), Potential Problem, Preventive Action, Contingent Action, and Budget.

A. Organization of the Project Team

In order to carry out the objectives of the APP, a Project Management Team (PMT) will be organized to perform specific tasks in the implementation of the APP. The PMT will be activated immediately after the issuance of the PNRI Special Order signed by the Director of the Philippine Nuclear Research Institute.

B. Determination of the Perception of Stakeholders

1. Identify Stakeholders and Survey Respondents

Three (3) groups are the targets of the APP to have a change in perception towards waste left by the Americans at CSEZ. The three groups have been identified as the significant groups of people whose perceptions and misconceptions about wastes in Clark should be changed. These are:

- a.) Residents of the barangay located inside CSEZ.
- b.) Clark Development Corporation's Environmental Planning and Management Department employees and officials
- c.) Journalists at the Media Center based at CSEZ.

2. Conduct of Stakeholder Analysis

Demographic Analysis about the stakeholders will be undertaken. Their profiles will be established, to include their distribution according to sex, age, civil status and educational attainment. Their interests, problems and practices will also be identified.

3. Determination of Negative Perception about Contamination in Clark

All available data on negative perception about radioactive contamination in Clark Special Economic Zone (CSEZ) will be gathered. People will be interviewed on the reasons for their negative perception. This will determine the "price" that needs to be addressed in developing the social marketing program. Research will be undertaken using primary and secondary surveys.

4. Development of Survey Design and Questionnaire

An individual guide question will be prepared as survey instrument for individual interview. The guide question will prompt the respondents regarding their opinions about the perceived presence of radioactive contamination in soil and plants at Clark Special Economic Zone.

In sampling the residents, ten percent of the total number of the households in the barangay will be taken. The systematic random sampling with a random start will be used in identifying the sample respondents. On the other hand, reporters, columnists and

newscasters at the Media Center based at CDC and all the employees and officials of the Environment Planning and Management Department of CDC will be taken as respondents.

5. *Conduct of Survey and Interviews*

All the identified respondents will be surveyed and interviewed. Coordination with the CDC officials will be done to solicit clearance for the conduct of survey. The cooperation and support of the local government unit of Barangay Macapagal Village will also be solicited in the conduct of the survey.

6. *Evaluation of All Data Generated*

The profiles of the survey respondents including their distribution according to sex, age, educational attainment, civil status and occupation will be evaluated. The respondents' perception and misconception about radioactive contamination will be assessed. In processing the survey results, dummy tables will be prepared to facilitate processing of data gathered. Using the dummy table, the data will be hand-tabulated to determine the frequency count of responses, which will be completed into percentages. Only after results of data have been put in tabular form can the analysis be made.

C. *Validation of Absence of Contamination by Experimentation*

A validation of the absence of radiation contamination in CSEZ by experimentation is deemed necessary by the proponent to strengthen the previous findings of the PNRI that there is no radioactive contamination in CSEZ. The research study will be conducted to determine the presence, if

any, of the radionuclide cesium-137 in soil and plants grown at the former ammunition dump area at CSEZ. Since nuclear techniques can be used to detect the elemental composition of samples, the heavy metal lead will also be analyzed in soil and plants. The results of the study will be also used in the social marketing of the idea that radioactive contamination does not exist within CSEZ.

1. Collection and Preparation of Soil and Plant Samples

Samples of soil and plants will be collected from the ten-hectare farm located at the former ammunition dumpsite. The 10-hectare farm area will be divided into 10 sampling locations. This will be determined by setting up a grid measuring one hectare each over the farm. Soil sample will be taken from five cores distributed uniformly in the one-hectare grid. The soil from the five cores will constitute one sample. Vegetable samples will also be collected from the area. The samples will be placed in plastic bags, sealed, and labeled with codes. The samples will then be transported to PNRI for laboratory analysis.

2. Analysis of Radioactivity

The samples will be prepared for analysis in the PNRI laboratory by weighing, drying, and pulverizing. The pulverized samples will then be analyzed for radioactive cesium-137. Cesium-137 is a radioactive element that exists in the environment as a result of nuclear weapons tests and

nuclear accidents. Analysis of radioactivity in the samples will be done by gamma spectrometry.

3. *Analysis of Lead*

About five grams of homogenized samples of soil and plants will be palletized and analyzed for the heavy metal lead. The technique to be used in qualifying and quantifying lead in the samples will be the X-ray fluorescence spectroscopy.

4. *Evaluation of Results of the Study*

The radioactivity contamination of cesium – 137 in soil and plant samples will be determined and expressed in terms of Becquerel per kilogram (Bq/g). Becquerel is an indication of any of the electromagnetic rays given off by radioactive substances. The data gathered will then be compared to the acceptable standards. Lead concentrations in soil and plant samples will also be evaluated, and expressed in terms of milligram per kilogram or parts per million (ppm). These will then be compared according to allowable standards. A technical report on this research study will be written and will be submitted for publication in the Philippines Nuclear Journal.

D. Conduct of Social Marketing Campaign

1. *Design of Promotion Program*

The main purpose of the social marketing plan promotion program is to deliver a message that will stimulate the change of behavior in the target

adopter. For this APP, the social marketing promotion plan consisted of delivering the information, education and communication (IEC) campaign in the barangay within CSEZ. Other forms of communication materials to be given to the target adopters will be pamphlets, flyers, brochures and annual reports. Through partnership with the journalists at the Media Center at Clark, the use of print and radio broadcast media will also be explored to disseminate information to the audience at large. The use of simple terms, in the Filipino language will be employed. Important guests will be invited as "endorsers".

2 Conduct of Seminar (IEC campaign)

An Information campaign on the PNRI scientific findings in the form of a seminar will be conducted at the barangay inside CSEZ. The use of the Filipino language will be employed for better understanding of all participants in the seminar. The topic of the seminar will be discussed by the proponent using powerpoint presentations that would include the results of the study on soil and plants at the farm formerly used as ammunition dump by the Americans. An open-forum will follow the seminar where questions, comments and suggestions of the participants will be discussed.

3. On-the-spot Demonstration of Consummability of Farm Produce

In order to prove to stakeholders that the plants grown at the farm are indeed free from radioactive contamination, vegetables from the farm will be gathered and prepared for the participants to eat during the seminar.

4. Documentations of the Proceedings from Seminar

The acceptability of the PNRI findings by the stakeholders will be assessed through the questionnaires that will be distributed after the seminar. This post presentation questionnaire will be compared to the questionnaire given before the presentation. A statistical analysis (Z test) to test the difference of the two parameters will be then performed.

Table 2. THE APP PROJECT PLAN

Objective	Major Activity	Success Indicator	Persons Responsible	Date	Potential Problem	Preventive Action	Contingent Action	Budget
To ensure social acceptability by the local media, residents and CDC employees of the results of environmental radioactivity studies made by PNRI at Clark Special Eco-nomic Zone (CSEZ)	1. Organize Project team	Signed office order	Institutional Partner (IP), student	Sept 17-20, 2002	Delay in signing	Request for follow-up	Do personal follow-up	None
	2. Determine the perception of stakeholders on contamination at CSEZ:							
	2.1 Identify stakeholders & survey respondents	Stakeholders & survey respondents are identified	Student, IP, Project team]	Sept. 23-25, 2002]	Stakeholders not properly identified	List is made to ensure inclusion of all stakeholders	Validate the list to reidentify stakeholders	1,500
	2.2 Conduct of stakeholders analysis	Basic information about stakeholders are determined	Student, IP, Project team	Sept. 28-30, 2002	Information on stakeholders are not properly identified	Use the Venn diagram to properly analyze stakeholders	Reanalyze stakeholders	1,500
	2.3 Determine all existing data on negative perceptions re level of contamination	All available data on negative perceptions are determined	Student, IP, Project team	Oct. 1-4, 2002	Accurate information on stakeholders' views not determined.	Persuade stakeholders to cooperate in giving correct information	Enlist the help of experts in getting correct information	3,000

Objective	Major Activity	Success Indicator	Persons Responsible	Date	Potential Problem	Preventive Action	Contingent Action	Budget
	2.4 Develop Survey design & questionnaire	Easy to understand survey design & questionnaire are developed	Student, IP, Project team	Oct. 5-7, 2002	Questionnaire not clear & easy to understand.	Write the questionnaire in local dialect	Redesign survey questionnaire	1,500
	2.5 Conduct of survey questionnaire for primary data gathering	All identified respondents are surveyed & interviewed	Student, IP, Project team	Oct. 7-9, 2002	Respondents are hesitant to answer questionnaire	Persuade respondents by explaining the benefits of survey.	Give incentives to respondents to cooperate.	4,000
	2.6 Evaluation of all generated data from primary and secondary sources by experts/PNRI	Identified (+) & (-) perceptions, assessed nature of (-) perceptions, and identified behavior change.	Student, IP, Project team	Oct. 10-12, 2002	Insufficient data are not generated for evaluation	Gather additional data	Reassess data generated	2,000
	3 Validate absence of contamination by experimentation:							

Objective	Major Activity	Success Indicator	Persons Responsible	Date	Potential Problem	Preventive Action	Contingent Action	Budget
	3.1. Collect & prepare soil and plant samples from vegetable farm	Samples are collected and prepared according to lab specifications.	Student, CDC officials, Research Assistant	Sept 12-17, 2002	Insufficient samples are collected	Collect extra samples for analysis	Conduct better sampling design.	2,500
	3.2 Analyze soil and plant samples for radioactivity by gamma spectrometry	All samples analyzed with 95% degree of confidence	Student, CDC officials, Stakeholders	Sept 18-Oct 5, 2002	Electronic/mechanical problems on instrument	Maintain controlled environmental conditions for instruments	Use of alternative measuring device	2,000
	3.3 Analyze soil and plant samples for elemental composition by X-ray fluorescence spectroscopy	All samples analyzed with 95% degree of confidence	Student, IP, CDC official	Sept 23-28, 2002	Electronic/mechanical problems on instrument	Maintain controlled environmental conditions for instruments	Use of alternative measuring device	2,000
	3.4 Evaluation of results/ Report preparation	Results are evaluated and reported with 100% accuracy	Student, IP	Oct 7-10, 2002	Unavailability of computer	Make early time allotment for computer	Use personal computer	1,000

Objective	Major Activity	Success Indicator	Persons Responsible	Date	Potential Problem	Preventive Action	Contingent Action	Budget
	4 Communica-tion of results of study:							
	4.1 Design of promotion program to disseminate information on results gathered	Effectual promotion program to disseminate information is designed	Student, Project Team	Oct 11-13, 2002	Promotion program not convincing & persuasive to stakeholders	Enlist the assistance of a credible personality to promote program	Redesign promotion program	1,500
	4.2. Conduct seminar to disseminate information on results of experimentation	Results are thoroughly understood by the stakeholders	Student, CDC officials	Nov. 9, 2002	Information not thoroughly understood by stakeholder	Use laymans' terms supported by video presentations	Follow-up information dissemination	6,000
	4.3 On-the-spot demonstration of consumability of farm produce	Stakeholders' participation in the demonstration	Student, CDC officials, Stakeholders	Nov. 9, 2002	Poor participation of stake-holders	Convince stakeholders strongly to participate	Make better food preparation and presentation	None

Objective	Major Activity	Success Indicator	Persons Responsible	Date	Potential Problem	Preventive Action	Contingent Action	Budget
	4.4 Documentation of proceedings from seminar indicating acceptability of PNRI findings on non-radioactive contamination	Acceptability of stakeholders on PNRI findings are documented	Student, IP, CDC official	Nov. 9-14, 2002	The level of acceptability on PNRI findings are not properly evaluated	Enlist the assistance of experts in documentation of proceedings	Reevaluate the proceedings	4,000
							TOTAL	32,500

CHAPTER THREE. PRESENTATION OF PROJECT RESULTS

I. Presentation and Discussion of Results

The APP implementation was in accordance with the project plan evaluated and approved earlier by a panel duly constituted by the Graduate School of Public Management, Master in Public Management Program of the Development Academy of the Philippines. As designed, the major activities undertaken in the implementation of the APP were as follows:

A. Organizing the Project Team

The project proponent, through the PNRI Special Order No. 411 (Appendix C) issued by the Director of the Philippine Nuclear Research Institute (PNRI) organized a Project Management Team to perform specific tasks in the implementation of the APP. The activities in the implementation of the APP started immediately after the approval of the proposal.

The project proponent, as senior science research specialist under the Atomic Research Division of PNRI, maintained strong relationship with the organization for institutional support and guidance. The systems theory, which provides the overall guidelines of the APP, emphasizes that all the interrelated parts or the subsystems work together to achieve a common purpose. Realizing the importance of these guidelines, the project proponent coordinated, consulted and entered into partnership with concerned researchers, individuals, groups and agencies.

Since Clark Special Economic Zone (CSEZ) was the site of the project proponent's research study, the proponent made close coordination with the Environment Planning and Management Department (EPMD) of Clark Development Corporation (CDC). Initially, a Memorandum of Agreement (MOA) between the PNRI and the CDC was drafted by the proponent for the specific purpose of obtaining soil and plant samples from the project site within CSEZ. The manager of the EPMD, however, suggested to do away with the MOA, since an existing MOA already captures the concerns of soil and vegetable sampling and the related APP activities. (Appendix D). A letter allowing the extension of the said MOA for the purpose of collecting soil and vegetable samples from the project site was just made. The project site is located within the old ammunition dumpsite that was used by the American forces during their occupancy of Clark until 1991. The 10-hectare area is now being used for agricultural purposes and is planted with vegetables and rice.

The EPMD manager of CDC was very supportive of the APP project plan because it is linked directly to the concerns of the Environment Planning and Management Department which he heads. The student was most encouraged by the enthusiasm and immediate approval of the project proposal. The manager worked closely with the student in the implementation of the APP at CSEZ and assigned four of his most qualified personnel in assisting the student in the conduct of the project plan.

In the experimental analysis of soil and plant samples at PNRI laboratory, research analysts from the Health Physics Research Section where the project proponent belongs, analyzed the radionuclide cesium-137. Another research analyst from the Analytical Measurements Research Section analyzed the heavy metal lead. There was a need to orient the researchers on the objectives and activities of the project and win their support in order to facilitate the immediate implementation of the project.

In the social marketing aspect of the study, the team of Information Services Section of Nuclear Services and Training Division of PNRI was tapped. The team assisted in the design of the survey questionnaire used in the assessment of the social acceptability by the target respondents. The survey questionnaire included interview guide questions focused on getting the opinion of the respondents about the presence or absence of radioactive contamination in soil and plants at CSEZ. There were two surveys made. One survey was done initially to get the opinion of respondents about radioactive contamination at Clark. Another survey was done after presenting the results of the new study on soil and plants from the project site done by the proponent.

The project proponent also enlisted the assistance of the PNRI Information Section team in the conduct of the final nuclear awareness seminar held at the barangay located inside CSEZ. The support of the Information team in documenting the proceedings of the seminar was vital in the implementation of the APP.

B. Determining the Perception of Stakeholders on Contamination at CSEZ

1. Identifying Stakeholders and Survey Respondents

Because the target audience is the foundation upon which to build the communication programs, it is critical to pose the following questions: Whose behavior is to be changed? What is known about the target audience? How will the audience be persuaded to accept the messages and to adopt the idea being promoted?

Three target groups were the focus of the APP to have a change in perception towards wastes left by the Americans at Clark Air base. These three groups were pre-identified as significant groups of people whose perception and misconceptions about wastes in Clark should be changed. These were:

- a. Residents living at the barangay located inside Clark Special Economic Zone which is within the 2-kilometer radius of the project site, the farm area formerly used by the US Air Force as ammunition dumpsite.
- b. Officials and employees of Clark Development Corporation's Environmental Planning and Management Department (EPMD).
- c. Media people composed of the four reporters at the CDC Media Center who work with national daily newspapers (Philippine Star, Philippine Daily Inquirer, Today, and Manila Standard).

2. Stakeholders Analysis

The residents living at Barangay Macapagal Village inside Clark Special Economic Zone are directly affected by the study because they plant and consume the vegetable products from the project site. Their dwellings are also very proximate to the project site, suspected to be contaminated (if at all) with hazardous wastes. Based on information they received from media, most of the residents believed that their surroundings were contaminated with hazardous wastes, which included radioactive contamination. The residents of Barangay Macapagal Village composed mostly of farmers and blue-collared employees working at the Clark industrial zone.

The Clark Development Corporation manages the Clark Special Economic Zone, the country's premier industrial zone. It provides the necessary infrastructure and utilities that spark economic growth including roads, bridges, telecommunications, power, water and wastes management. The Environmental Planning and Management Department of CDC is specifically responsible for managing the CSEZ's environmental quality, ecosystems management, and environmental services and special projects. The EPMD is directly involved in addressing environmental concerns at CSEZ. The officials and employees of the EPMD are key stakeholders in the project.

A critical element of successful education campaign is the partnership between the science researcher and the media people. Thus, the project

proponent considered the newspaper reporters and columnists as important stakeholders in the project. Newspaper reports are important avenues in disseminating information to the general public. Newspaper reporters and columnists have resources and capabilities in influencing people through the reports that they make. They are vital in forming the beliefs of the people who read their reports. Promoting behavioral change is a difficult task if done by the science researcher alone.

3. Determining the Existing Data on Negative Perception on the Level of Contamination at Clark Special Economic Zone

The public, particularly the residents in the barangay within CSEZ, based their negative perception regarding levels of contamination on the reports by the media. Despite findings by the Philippine Nuclear Research Institute that radiation values at Clark Special Economic Zone were within allowable standards as evidenced in the scientific investigations that it conducted, reports by the media and environmental Non-Governmental Organizations (NGO) on the presence of hazardous contamination, including radioactive contamination, have proliferated. The project proponent realized that this stemmed from the fact that people confuse toxic contamination with radioactive contamination. No less than the Secretary General of a mass organization called AGHAM or Samahan ng Nagtataguyod ng Agham at Teknolohiya para sa Sambayanan mentioned in an interview with the project proponent of this APP that allegations of radioactive

contamination persist because people cannot differentiate radioactive contamination from non-radioactive contamination.

The project proponent also found out that fears by the barangay residents about hazardous contamination, including allegations that radioactive contamination were derived from hazardous contamination, were without scientific evidence and based mostly on allegations and assumptions. In an interview with the Executive Director of an NGO called People's Task Force for Bases Clean-Up (PTFBCU), the executive director admitted that no radioactive contamination at Clark Special Economic Zone has been specifically established and reported so far. She based her belief on alleged radioactive contamination at Clark on the report written by Paul Bloom et al. in 1994 about environmental and health impact of the contaminants left at the former military bases in the Philippines. The report indicated that "virtually every military facility around the world has required the extensive use of hazardous materials including nuclear materials and as a consequence, contaminated sites in the US have been identified." She said health related complaints have been filed with various agencies attributing illnesses/diseases on the hazardous wastes left in the former base (32).

The Executive Director of People Task Force for Bases Cleanup has established many alliances with local and international organizations. The organization's objectives were to campaign for bases clean up in order to obtain compensation for personal injuries suffered by the residents, including the

demands for compensating environmental damage (33). According to the Executive Director, the PTFBCU commits itself to lead and be part of an overall people's initiative on global campaign, policy advocacy and lobbying for the local communities and peoples of the world affected by the toxic legacy of the US military bases.

In one personal letter written to the Executive Director of PTFBCU by the Coordinator of the Positive Tour in 1994 of USNGO experts who came to the Philippines to share skills on the bases clean-up issue, the coordinator mentioned that "nuclear (or chemical weapon) residue **might** be found in the weapons storage units of Clark or some old chemical weapons buried prior to WWII (that would require a record search). The only place for the chemical weapon stuff **might** be the dumps since in the 1950s, the US military services (mostly the army though) issued small chemical kits so soldiers could see/practice what a chemical attack might be. Those kits are in the dumps of every military facility in the US. But without a record search, it is hard to know" (34).

The People's Task Force for Bases Clean-up believes that the operation of the former Clark and Subic bases has resulted in environmental toxic waste contamination including nuclear waste contamination. In one of its fliers, it states, "after nearly a century of presence in the Philippines, the US military left behind sites contaminated with toxic, hazardous and nuclear wastes." It further states that "health surveys and monitoring conducted by the People's Task Force and

the academe showed startlingly high cases of urinary, reproductive problem and central nervous system's disorders in Clark. For Clark Air Base Command Center (CABCOM) alone, an evacuation center, which was a former US Air force motor pool, 20,000 families were evacuated and lived there from an average of 2-5 years. Many of the children were reported sick with cerebral palsy, leukemia, kidney disorders, congenital heart diseases, epilepsy, delayed development, various tumor and deformities" (34).

The PTFBCU says further in its flier that it is a service institution of 3,000 victims, survivors and residents living within the periphery of the former US bases in Clark and Subic. Since 1994, the PTFBCU has been advocating for the environmental cleanup of the former US military facilities in the Philippines from toxic, hazardous and nuclear wastes. It pioneered in taking up the military toxic wastes issue in the Philippines.

4. Developing the Survey Design and Questionnaire

An interview guide question was prepared as survey instrument for individual interview. The guide questions focused on getting the opinion of the respondents about the presence or absence of radioactive contamination in soil and plants at Clark Special Economic Zone. (See Appendix E for the copy of the questionnaire/survey instrument)

A total of 71 samples from the three groups was selected. For the residents, the use of random sampling with a random start was used in

identifying sample respondents. On the other hand, all four reporters and columnists of the CDC media center and the twenty employees and officials of CDC's Environment Planning and Management Department were taken as respondents.

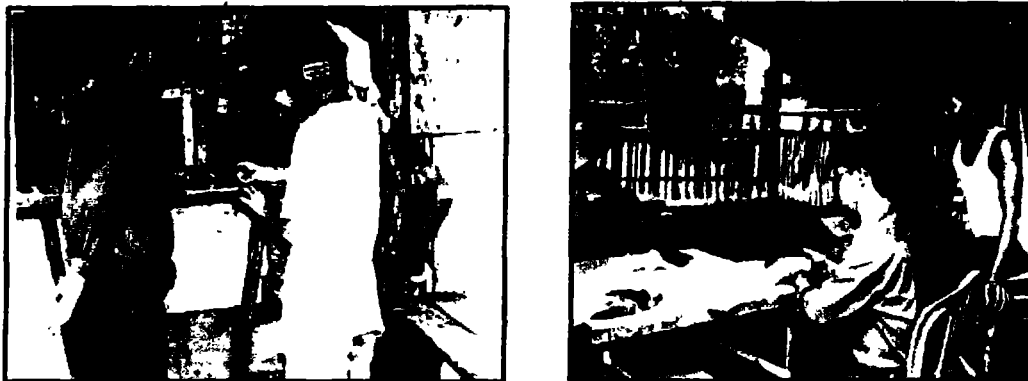
- a. Residents – households within the two-kilometer radius of the project site including the four households living inside the project site were taken as samples. The name of the barangay under study was Barangay Macapagal Village. Total number of households as of the 2000 Census of Population and Housing (Source: National Statistics Office) for the Brangay Macapagal Village is 479. Using ten percent samples, there were 47 sample households in Barangay Macapagal Village. Selection of households was done on the spot, that is, every ten households within the barangay.
- b. CDC – all twenty officials and employees of the Environment Planning and Management Department of Clark Development Corporation were surveyed.
- c. Media – a list of the reporters and columnists was gathered from CDC media center. The list contained four (4) personnel. All were made respondents of the survey.

5. Conducting the Benchmark Survey

Coordination with Clark Development Corporation officials was done to solicit clearance and enlist support for the conduct of the individual interview at the barangay. The residents of the barangay were not quite comfortable about the idea of being interviewed particularly by the Environment Planning and Management Department for fear of being questioned about their migration inside the perimeters of Clark. The assistance of the Officer-in-Charge of the Community Development Department of CDC was solicited. The survey team in the barangay was composed of the project proponent, the Officer-in-charge of the Community Development Department and five staff of the EPMD.

Prior to the actual conduct of the survey, the project proponent met with the officials of the barangay together with the barangay elementary school teachers to explain the purpose of the study. Please see Figure 8 for the conduct of survey at Barangay Macapagal Village. Realizing the importance of the study, the barangay kagawads volunteered to accompany and guide the survey team in going around the community. In case the respondents were not around for the interview, the guide question was left for the respondent to fill up. Collection of the questionnaire in this case was done five days after distribution.

FIGURE 8. Survey/Interview at Barangay Macapagal Village



6. Evaluating the Benchmark Data

Profile of the Respondents

The total number of respondents was 71. The respondents were composed of forty-seven from the residents of Barangay Macapagal Village, twenty from the employees of Environment Planning and Management Department of Clark Development Corporation and four from the media center. There were forty one male and thirty female respondents representing 58% and 42% of the total number of respondents, respectively. Table 3 shows the distribution of respondents by sex.

Table 3. Distribution of Respondents by Sex

Sex	Number	Percent (%)
Male	41	58
Female	30	42
Both Sexes	71	100

Table 4 shows the age ranges of the survey respondents. Twenty- one respondents have ages ranging from twenty to twenty-nine years old representing 30% of the total number of respondents. This was followed by twenty respondents having ages from thirty to thirty-nine years old representing 28% of the total respondents. Fifteen respondents have ages below twenty years old representing 21%. Seven respondents were aged 50-59, five respondents aged 40-49, and three respondents aged 60 and above representing 10%, 7% and 4% of the total number of respondents, respectively.

Table 4. Distribution of Respondents by Age

Age Range	Number	% of total
Below 20	15	21
20-29	21	30
30-39	20	28
40-49	5	7
50-59	7	10
60 above	3	4
TOTAL	71	100

Table 5 shows that forty-four respondents are married representing 62% of the total number of respondents while twenty-seven are not married representing 38% of the total number of respondents.

Table 5. Distribution of Respondents by Civil Status

Status	Number	% Total
Married	44	62
Single	27	38
TOTAL	71	100

Table 6 shows that twenty-eight of the respondents obtained elementary education representing 40% of the total number of respondents. This group of people comes from the residents of Barangay Macapagal Village. Twenty-five respondents have college education representing 35% of the total number of residents. Most people in this group come from EPMD. All the media people in this group are college graduates. Five respondents obtained vocational education while three obtained post graduate education representing 7% and 4%, respectively, of the total number of respondents.

Table 6. Distribution of Respondents by Educational Attainment

Education	Number	% Total
Elementary	28	40
High School	10	14
Vocational	5	7
College	25	35
Postgraduate	3	4
TOTAL	71	100

Benchmark Survey Results on Perception of Stakeholders on Contamination in CSEZ

Table 7 shows the benchmark survey on the opinion of all the respondents about contamination in Clark Special Economic Zone. The survey revealed that the respondents believed that the wastes possibly left by the Americans at Clark were hazardous. Sixty five percent (65%) answered the question on the affirmative while thirty two percent (32%) answered on the negative. Three percent (3%) did not give an opinion or did not have answer to the question.

More respondents (49%) believed that the wastes left by the Americans did not include radioactive wastes; forty four percent (44%) believed that the wastes are radioactive; seven percent (7%) did not answer the questions. Fifty one percent (51%) opined that there is no widespread radioactive contamination in Clark while forty two percent (42%) believed that there is widespread contamination at Clark. Seven percent (7%) did not have answer to questions. The respondents also believed that there is no widespread radioactive contamination in Clark that would imperil the health of individuals there. Fifty nine percent (59%) answered affirmatively on this question while thirty one percent (31%) answered negatively. Ten percent (10%) did not answer to the questions.

Asked whether agricultural products grown at the farm inside Clark were safe and not radioactive, most of the respondents believed (77%) that the

products have no radioactive contamination and safe to consume. Those who answered affirmatively on this question mostly come from the residents who were mostly farmers. Twenty percent (20%) did not believe that they are not safe to consume while three percent (3%) did not give answer to the questions. The respondents, mostly the farmers, also agreed (82% versus 14% who did not agree) to consume the vegetables grown within the perimeters of Clark. Four percent (4%) did not answer the question.

Regarding the question on whether they believed that all hazardous wastes contained radioactive contamination, 54% of the respondents answered affirmatively while 32% answered negatively. 14% did not give answer to the question.

Table 7. Benchmark Survey on Opinion of Respondents about Contamination in CSEZ

Opinion	Yes		No		Don't Know	
	number	%	number	%	number	%
1. Belief that wastes left in CSEZ is harmful	46	65	23	32	2	3
2. Belief that wastes left in CSEZ not radioactive	35	49	31	44	5	7
3. Belief that there is NO Widespread radioactive contamination in CSEZ	36	51	30	42	5	7
4. Belief that there is NO widespread radioactive contamination in CSEZ that is harmful to health	42	59	22	31	7	10
5. Belief that plants/vegetables in CSEZ NOT radioactive and safe for consumption	55	77	14	20	2	3
6. Agreed to consume plants/vegetables planted in CSEZ	58	82	10	14	3	4
7. Belief that hazardous wastes include radioactive waste	38	54	23	32	10	14

C. Validating the Absence of Contamination in CSEZ by Experimentation

The Benchmark Survey on Opinion of Respondents showed that stakeholders believed hazardous contamination includes radioactive contamination even as there was a pattern of acceptance that there are no radioactive wastes in CSEZ (items # 1, 2 & 3). A validation of the absence of radiation contamination in CSEZ by experimentation was deemed necessary by the proponent to strengthen the previous findings of the Philippine Nuclear Research Institute that there was no radioactive contamination in Clark Special Economic Zone. The results of the validation study will be used in the social

marketing of the idea that radioactive contamination does not exist within the Clark Special Economic Zone.

The project proponent secured the support of the PNRI management in conducting the research study to determine the presence, if any, of the radionuclide cesium-137 in soil and plants specifically grown at the farm formerly used by the Americans as ammunition dump area. As earlier noted, cesium-137 is a radioactive element that exists in the environment as a result of nuclear weapons tests and nuclear accidents. Since nuclear techniques can also be used to determine elemental composition of environmental samples, the stable heavy metal lead was also analyzed in soil and plant samples. Lead is the most ubiquitous toxic metal and has been mined for centuries. Its major uses are in batteries, gasoline and paint.

1. Collection and Preparation of the Soil and Plant Samples

The project proponent mobilized the Project Management Team in the conduct of the research study. The assistance of the manager of the Environmental Planning and Management Department of Clark Development Corporation was solicited by the proponent in identifying the project site. The cooperation of the farmers in allowing the Project Management Team to conduct the research study on their farm land was sought by the project proponent.

Samples of soil and vegetables were collected from a ten-hectare experimental farm located at the former ammunition dumpsite. Three hectares of the farm was, at the time, planted with rice, eggplant, amargoso and patola. The

rest of the farm was being prepared for the next plant crop. The farm area was divided into ten parts as sampling locations. This was determined by setting up a grid, measuring one hectare each over the farm. The exact coordinates of the experimental farm was determined using a Global Positioning System (GPS). The coordinates are 15°12.54N and 120°32.8E, respectively.

Since the area was covered with lahar from the eruption of Mount Pinatubo in 1991, 30 cm surface soil (average depth of lahar) was removed prior to soil sampling. Soil samples were taken from the five cores distributed uniformly throughout the one hectare grid. The soil from the five cores constituted one sample. An aggregate of about three-kilogram soil per grid was collected. (Please see Figure 9). The soil was placed in plastic bags, sealed and labeled with codes. For samples of rice, eggplant, amargoso and patola, about five-kilogram each of plant sample type was collected, placed in plastic bags and labeled with codes. The samples were then transported to PNRI for laboratory analysis.

FIGURE 9. Collection of Soil Samples at Farm Site



2. Radioactive Cesium-137 Analysis

Soil samples for cesium-137 analysis were prepared in the laboratory by separating the stones, roots, grass and other impurities from the soil. The soil was weighed and placed in the convection oven to dry to constant weight at 105°C. The dried sample was pulverized and homogenized either by using the Wiley mill or by mortar and pestle. The sample was placed in 1-L Marinelli beaker and re-weighed. This was then analyzed for cesium-137 radioactivity by gamma spectrometry which uses a high purity germanium (HPGe) detector. (Please see Figure 10.) Counting time for radioactivity concentration was more than 1000 minutes per sample.

For plants, the samples were cut into small pieces, weighed, and oven-dried to constant weight at 105°C. The sample was pulverized and placed in a 250-ml polyethylene bottle. This was then counted for more than 1000 minutes also using the high purity germanium detector. Radioactivity concentration of cesium-137 was reported in terms of activity mass concentration in Becquerel per kilogram (Bq/kg) of the sample.

Gamma spectrometry is a nuclear measuring technique used to determine the levels of concentrations of gamma-emitting radionuclides in air, soil, food, water, milk or any other sample. It is suitable for the surveillance and monitoring of radioactivity originating from the operation of nuclear plants, tests on nuclear weapons and releases from nuclear accidents. Gamma emitters may have energy range of 50 to 2000 KeV. The

spectrometer used are NaI(Tl) scintillation detector and/or High Purity Germanium (HPGe) semiconductor detector (36).

FIGURE 10. Analysis of Radioactive Cesium by Gamma Spectrometry



3. Heavy Metal Lead Analysis

For the analysis of lead, about five grams of homogenized soil and plant samples was pelletized. This was then analyzed with a KEVEX 771 XRF Spectrometer using Ag secondary target (30 KV, 0.5 mA). Please see Figure 11. Spectrum processing was done using the IAEA Quantitative X-ray Analysis System (QXAS) software. Quantization of lead was done using the QAES software of Josef Stefan Institute, Slovenia.

X-ray energy spectrometry is a method of carrying out elemental analyses based on the phenomenon of X-ray fluorescence (XRF). When sufficiently energetic photons or charged particles interact with matter, one result is the ejection of atom's inner shell electrons. When an outer shell

electron subsequently drops into the vacant inner orbital, the energy released is emitted as a photon (XRF) or as an electron of equivalent energy. The energies of the fluorescent x-rays are characteristic of the element that emitted them, and their intensity is proportional to the mass of the element undergoing excitation. Thus, the XRF phenomenon creates the possibility of performing both qualitative and quantitative analyses of elements (37).

Determining the elemental composition of samples is important in studies of the environment, the workplace, and the home. This is especially true when toxic elements are present in the very fine, respirable portion of aerosols. The XRF technique offers several advantages. The technique is nondestructive, and the sample does not become radioactive. Sophisticated calculation routines that run on ordinary desktop computers have greatly simplified data reduction. With some sample preparation, the XRF technique is applicable to liquids as well as solids.

FIGURE 11. Analysis of Lead by XRF Spectrometry



4. Evaluation of Results and Report Preparation

Cesium-137 Radioactivity Concentrations

The results of the analysis of ^{137}Cs activity concentrations in soil and plant samples are showed in Table 8. The radioactivity concentrations of ^{137}Cs in the soil and plant samples analyzed ranged from lower limit of detection (LLD= 0.2 Bq/kg) to 1.06 ± 0.13 Bq/kg with a mean activity of 0.50 ± 0.32 Bq/kg. This mean value is lower compared to the baseline ^{137}Cs activity data in Pampanga taken in 1983, which is 1.18 ± 0.27 Bq/kg (38). The mean values are also lower compared to the measurements made by PNRI in 1996-1998, which has ^{137}Cs radioactivity values ranging from 0.98 Bq/kg to 4.64 Bq/kg. These values are lower than the activity range concentration of ^{137}Cs in soil samples collected from the entire country, which is 0.09 Bq/kg to 12.77 Bq/kg dry weight.

In plants, of the five samples analyzed, four were found to be below the lower limit of detection (LLD) and only one sample had an activity of 0.72 ± 0.20 Bq/kg. These values are lower than the results of ^{137}Cs in specific food items collected at Clark from 1996 to 1998, which ranged from 0.07 ± 1.34 Bq/kg. These values are also lower compared to the activity range concentration of ^{137}Cs collected in the country from 1980 to 1992, which is from 0.7 to 1.32 Bq/kg.

The results of analysis of radioactivity in soil and plants from the former ammunition dump area at Clark indicate that ^{137}Cs activity concentration are within allowable standards and do not pose any risk to public health.

Table 8. Cesium-137 Activity Concentrations in Soil and Plant Samples.

Sample Code	Type	^{137}Cs Activity Concentration, Bq/kg
CDC-S1	Soil	0.85 ± 0.14
CDC-S2	Soil	0.30 ± 0.10
CDC-S3	Soil	0.56 ± 0.11
CDC-S4	Soil	< LLD, LLD = 0.20
CDC-S5	Soil	< LLD, LLD = 0.20
CDC-S6	Soil	< LLD, LLD = 0.20
CDC-S7	Soil	1.06 ± 0.13
CDC-S8	Soil	0.71 ± 0.14
CDC-S9	Soil	<LLD, LLD = 0.20
CDC-10	Soil	0.70 ± 0.20
CDC-A7	Ampalaya	< LLD, LLD = 2.99
CDC-P7	Patola	< LLD, LLD = 4.32
CDC-T7	Talong	< LLD, LLD = 1.97
CDC-R8	Rice plant	< LLD, LLD = 0.83
CDC-R9	Rice plant	0.72 ± 0.20

Lead (Pb) Concentrations

The results of analysis of lead concentrations in soil and plants are shown in Table 9. Lead concentration in the ten soil samples ranged from 12 to 38 mg/kg with a mean concentration of 22.2 ± 7.19 mg/kg. These values are lower compared to the measurements by the Bureau of Soils and Water Management (BSWM) in Luzon in 1995-1997, which range from 15 mg/kg to 76 mg/kg (39). In plants the concentration of lead in all the five samples analyzed are below the detectable limit of the equipment used. The BSWM

measurements in Luzon made from 1995 to 1997 showed lead concentrations ranging from non-detectable to 22 mg/kg. The concentration of lead in soil at the former ammunition dump area is way below the industrial risk base concentration (RBC), which is 1000 mg/kg.

Table 9. Lead Concentrations in Soil and Plant Samples.

Sample Code	Type	Pb (mg/kg)
CDC-S1	Soil	38 ± 5
CDC-S2	Soil	27 ± 4
CDC-S3	Soil	19 ± 3
CDC-S4	Soil	26 ± 4
CDC-S5	Soil	12 ± 4
CDC-S6	Soil	18 ± 4
CDC-S7	Soil	20 ± 4
CDC-S8	Soil	24 ± 4
CDC-S9	Soil	22 ± 4
CDC-S10	Soil	16 ± 4
CDC-A7	Ampalaya	< DL, DL = 4
CDC-P7	Patola	< DL, DL = 7
CDC-T7	Talong	< DL, DL = 6
CDC-R8	Rice plant	< DL, DL = 9
CDC-R9	Rice plant	< DL, DL = 7

Industrial Risk Base Concentration (RBC) = 1000 mg/kg

Report Preparation

A technical report, entitled "Analysis of Radiation and Lead in Soil and Vegetables at the Former Ammunition Dump Area in Clark Special Economic Zone" was prepared by the project proponent. (Please see Appendix F). The technical report is authored by the project proponent as senior author and by members of the Project Management Team as co-authors. The report will be used in the social marketing strategy as basic information material in delivering the message that endeavors to stimulate the change in the

behavior of the target adopter. The technical report will also be submitted to the Philippine Nuclear Journal, a publication of the Philippine Nuclear Research Institute, or to The Nucleus, the journal of the Radioisotope Society of the Philippines, for publication.

D. Conducting the Social Marketing Campaign

1. *Design of a Promotion Program to Disseminate Information*

A communication plan was prepared to deliver the intended message and generate social acceptability of the Philippine Nuclear Research Institute's environmental radioactivity monitoring findings at the former ammunition dump area in Clark Special Economic Zone. The main purpose of the social marketing plan is to deliver the message that will stimulate a change of behavior in the target adopter. The marketing plan consisted of delivering an information, education and communication (IEC) campaign in the heart of the community living within Clark Special Economic Zone, at the chapel of Barangay Macapagal Village, Mabalacat, Pampanga where sufficient members of the community can be accommodated.

One-to-one meetings with journalists/media men at Clark Media Center was also made by the project proponent and explained to them the methodologies and findings of the scientific study done at Clark Air Base. The help of journalist/media men was solicited to deliver the intended message to the target audience.

The IEC campaign, in the form of a seminar was conducted at the Barangay chapel. Please see Figure 12. The communication materials included a powerpoint presentation on the results of the research study done on soil and plants samples nearest their community, including results of the previous studies on radioactivity monitoring done by PNRI in the entire Clark Special Economic Zone. The communication materials in the form of powerpoint presentation is attached to Appendix G. Other forms of communication materials given to target adopters were pamphlets, flyers, brochures and annual reports of the PNRI.

FIGURE 12. IEC Campaign in the Form of Seminar



2. Conduct of Seminar to Disseminate Information

The information campaign in the form of a seminar was conducted on November 9, 2002 before fifty-eight of the seventy-one target adopter respondents to the survey. Present during the seminar to grace the occasion was the Director of the Philippine Nuclear Research Institute, Dr. Alumanda Dela Rosa and the Manager of the Environmental Planning and Management Department of Clark Development Corporation, Mr. Jose Miguel Fuentes. The

presence of the guests also meant to give credence to the promotional campaign of the project proponent and influence the change in the behavior of the target audience.

The message of the plan was ***“Kaalaman sa Radyasyon: Gabay sa Kalusugan, Kabuhayan at Kapayapaan”***. This theme was meant to motivate the target audience to pay attention to the message and accept the idea being marketed. It was important that they be knowledgeable about the objectives of the campaign and realized the value of their participation in the program. For better understanding by the target audience, the project proponent used the Filipino language during the seminar. In plain and simple terms, he discussed the results of the experiment done on soil and plants grown at the farm within Clark. The seminar lasted for one hour followed by a fifteen-minute open-forum. The outline of the powerpoint presentation was as follows:

- a.) Title and objectives of the research study
- b.) Experimental farm at the former ammunition dump area
- c.) Methodology for sample collection and preparation
- d.) Analysis of samples at PNRI laboratory
- e.) Presentation of the results of analysis
- f.) Conclusions
- g.) Overview of previous studies made by PNRI in Clark

3. On-the-spot Demonstration of Consumability of Farm Produce

The project proponent set aside the plan of on-the-spot demonstration

of consumability of farm produce, for these reasons: a.) there were no available farm products ready for harvest at the time of the seminar, and b.) the initial survey showed that the respondents would agree to consume plants grown around Clark since they were the ones who planted these farm products.

4. Documentation of Proceedings from Seminar Indicating Acceptability of PNRI Findings on Non-radioactive Contamination at CSEZ.

4.a. Acceptability of Stakeholders by Raising of Hands

The participants in the seminar on November 9, 2002 were requested to fill up the registration form (Appendix H) provided at the entrance of the hall as they came. Before the lecture was given, the project proponent as lecturer requested the forty-four participants who were respondents in the survey questionnaire to raise their hands whether they believed or not, that there is radioactive contamination left in Clark by the Americans. On this question, nine or 20% of the respondents raised their hands saying affirmatively that they believe that there is radiation contamination left in Clark by the Americans. Eight or 18% believed that there is no radioactive contamination left in Clark while the rest (62% of the respondents) did not raise their hands indicating that they were not sure about what to answer to the question.

After discussing extensively the results of the scientific experiments to the audience and selling to them the idea that there is no contamination in the soil and vegetables grown at the farm formerly used as ammunition dump

area in Clark, the project proponent once again asked the respondents the same question whether they now believed or not believed that there is radioactive contamination left at Clark. On this, all the forty-four respondents raised their hands and expressed unanimously that they now believed that there is no radioactive contamination at Clark. These results indicate that the percentage of the respondents who positively believed that there is no radioactive contamination in CSEZ went up from 18 percent to 100 percent. The 82 percent who initially were not sure about the contamination or who believed negatively that there is no radioactive contamination in CSEZ changed the mindsets into positive belief. The entire proceedings of this seminar were recorded in the video tape recorder provided by the Information Services Section of the Philippine Nuclear Research Institute.

4.b. Results of Post Survey Questionnaire

After the seminar (information, education and communication campaign), post survey questionnaires were fielded in order to assess the social acceptability of the message being purveyed by PNRI relative to the non radioactive content of the CSEZ environment. The data on the proportion of the target respondents before social marketing (IEC campaign) was compared to the proportion of the target respondents after the social marketing campaign. A statistical analysis (Z Test), to test the difference of the two parameters was performed (40). Please see attached Statistical Analysis done by NSO in Appendix I. Over all, the statistical analysis of data indicated that increase in the proportion of the target respondents was significant, which meant the change in the perception of the target

respondents about the message purveyed to them. The results of data analysis are shown in the following Tables:

Table 10 will show that after the social marketing campaign, the distribution of target respondents who believed that the wastes left in Clark Special Economic Zone were harmful went down from 65% to 45%.

Table 10. Distribution of Respondents By Belief that Wastes Left in CSEZ are Harmful

Time of Survey	Believed Harmful		Believed Not Harmful		Don't Know	
	Number	Percent	Number	Percent	Number	Percent
Before Soc Mktg	46	64.79%	23	32.39%	2	2.82%
After Soc Mktg	32	45.07%	32	45.07%	0	0.00%

Table 11 will show that after the social marketing campaign, the distribution of the target respondents who believed that the wastes left in CSEZ is NOT radioactive went up from 45% to 85%.

Table 11. Distribution of Respondents By Belief that Wastes Left in CSEZ are NOT Radioactive

Time of Survey	Believed Not Radioactive		Believed Radioactive		Don't Know	
	Number	Percent	Number	Percent	Number	Percent
Before Soc Mktg	35	49.30%	31	43.66%	5	7.04%
After Soc Mktg	60	84.51%	11	15.49%	0	0.00%

Table 12 will show that after the social marketing campaign, the distribution of target respondents who believed that there is NO widespread radioactive contamination in and around CSEZ went up from 51% to 82%.

Table 12. Distribution of Respondents By Belief that there is NO Widespread Radioactive Contamination in and Around CSEZ

Time of Survey	Believed No Widespread Radioactive		Believed There is Widespread Radioactive		Don't Know	
	Number	Percent	Number	Percent	Number	Percent
Before Soc Mktg	36	50.70%	30	42.25%	5	7.04%
After Soc Mktg	58	81.69%	13	18.31%	0	0.00%

Table 13 will show that after the social marketing campaign, the distribution of target respondents by belief that there is No widespread contamination in CSEZ that is harmful to health went up from 59% to 86%.

Table 13. Distribution of Respondents by Belief that there is NO Widespread Radioactive Contamination in Clark that is Harmful to Health

Time of Survey	Believed No Widespread Radioactive Contamination Harmful to Health		Believed Radioactive That is Harmful to Health		Don't Know	
	Number	Percent	Number	Percent	Number	Percent
Before Soc Mktg	42	59.15%	22	30.99%	7	9.86%
After Soc Mktg	61	85.92%	10	14.08%	0	0.00%

Table 14 will show that after social marketing campaign, the distribution of target respondents by belief that plants and vegetables planted in and around Clark is not radioactive and safe for consumption went up from 77% to 93%.

Table 14. Distribution of Respondents by Belief that Plants and Vegetables in CSEZ are NOT Radioactive and Safe for Consumption

Time of Survey	Believed Plants/Veg Have NO Radioactive Contamination & Safe to Consume		Believed Plants Have Radioactive Cont. & NOT Safe to Consume		Don't Know	
	Number	Percent	Number	Percent	Number	Percent
Before Soc Mktg	55	77.46%	14	19.72%	2	2.82%
After Soc Mktg	66	92.96%	5	7.04%	0	0.00%

Table 15 will show that after social marketing campaign, the distribution of target respondents by agreement to consume plants and vegetables planted in and around CSEZ went up from 82% to 96%.

Table 15. Distribution of Respondents By Agreement to Consume Plants/Vegetables Planted in and Around CSEZ

Time of Survey	Agreed to Consume Plants Planted in and around CAB		Disagreed to Consume Plants Planted in and around CAB		Don't Know	
	Number	Percent	Number	Percent	Number	Percent
Before Soc Mktg	58	81.69%	10	14.08%	3	4.23%
After Soc Mktg	68	95.77%	3	4.23%	0	0.00%

Finally, Table 16 will show that after social marketing campaign, the distribution of respondents by belief that hazardous wastes in CSEZ DO NOT include radioactive contamination went up from 32% to 92% with a marked increase of 60%. It must be noted that PNRI considers the result of this survey most significant.

Table 16. Distribution of Respondents By Belief that Hazardous Wastes In CSEZ Include Radioactive Wastes

Time of Survey	Hazardous Wastes Include Radioactive Contamination		Hazardous Wastes Do Not Include Radioactive Contamination		Don't Know	
	Number	Percent	Number	Percent	Number	Percent
Before Soc Mktg	38	53.52%	23	32.39%	10	14.08%
After Soc Mktg	6	8.45%	65	91.55%	0	0.00%

4.c. Newspaper Reports

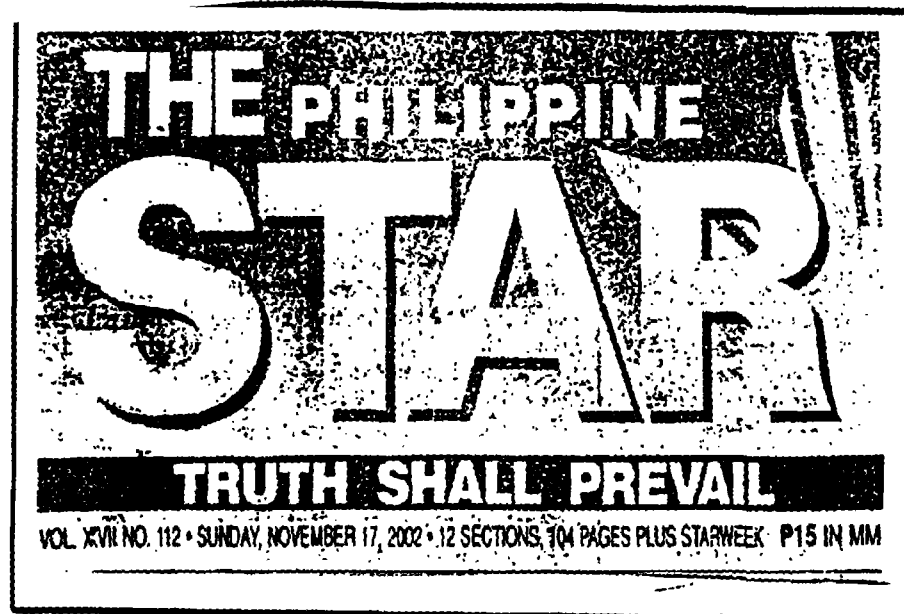
Media mix is the combination of communication channels that can be used to deliver message to the target audience. Through the media, other channels of communication like the print, radio and television can be used to compliment the face-to-face communication with the target audience. Mass media plays a role in reaching large and dispersed audience.

In this particular project, the proponent included the journalists at Media Center based in Clark as stakeholders. The newspaper reporters were connected to newspaper companies with nationwide distribution and region wide distribution. The information, education and communication (IEC) campaign made by the proponent in Barangay Macapagal Village was amplified by journalists through the articles that they wrote in the newspapers. The articles appeared in four newspapers: two at the Philippine Star and Today which are distributed nationwide (Figure 11 and 12, respectively) and two at the Sun Star and Angeles Observer which are distributed in the region (Figures 13 and 14, respectively). The Sun Star is

the only newspaper published daily in north Luzon. The Angeles is being distributed weekly.

4.d. Radio Broadcast

The information on the studies made by the project proponent at Clark Special Economic Zone was also aired in the radio through the radio station DWRW-FM on Saturday, November 9, 2002. The news report on radiation at Clark was discussed by radio broadcaster Terry Pangan. The publisher of the Sun Star newspaper is the owner of the radio station DWRW-FM and the news that come out in the Sun Star daily are discussed over the radio.



SUNDAY, NOVEMBER 17, 2002

The Philippine STAR **NATION**

19

No radioactive danger at Clark ecozone, concludes PNRI study

CLARK FIELD, Pampanga — There's no danger of radioactive exposure anywhere in this 4,500-hectare special economic zone, which used to be a US Air Force base.

This was the conclusion of a final study by the Philippine Nuclear Research Institute (PNRI) which utilized state-of-the-art equipment, including a rare device that was used to determine the extent of the world's worst nuclear accident in Chernobyl in 1986.

Teofilo Garcia, PNRI senior science specialist, told local reporters in a briefing that veg-

etable, soil and water samples tested had lead content way below the average tolerable limits.

He said another study done at the former US naval base in Subic also yielded negative results on radioactivity.

Garcia said the latest PNRI study covered the former ammunition dumpsite of the US Air Force here, which the Clark Development Corp. (CDC) initially feared could be the most probable contaminated site in the ecozone.

In its latest study completed last month, the PNRI used an in-

strument called the gamma ray spectrometer which Garcia said is one of the few existing equipment of its kind in the world.

He said the Vienna, Austria-based International Atomic Energy Agency donated the equipment, which is known to be quite sensitive and capable of distinguishing between natural and man-made radionuclides.

"The same instrument was used in the Chernobyl accident in Ukraine in the former USSR (Union of Soviet Socialist Repub-

By DING CERVANTES

lics) in 1986," Garcia said.

The PNRI used it to detect traces of Cesium-137, a man-made form of radioactive gamma ray.

Tests revealed that soil samples had only 0.98 to 4.64 becquerel or bq. (unit of measurement for gamma ray) per kilogram, while vegetable samples from a 10-hectare farm in the ecozone had 0.07 to 1.34 bq. per kilogram. These were way below the national Cesium-137 average range of .09 to 12.77 bq. per kilogram for soil and 0.7 to 1.33 bq. per kilogram for plants.

Using standards of the Bureau of Soils and Water Management, the PNRI also measured lead levels and concluded that soil and vegetable samples from the control site here were safe from lead.

"Results of the analysis are within background values and thus, do not pose any hazard to public health," Garcia said.

Garcia recalled that the PNRI conducted two other studies on radioactivity here in 1997 and 1998, virtually covering the entire 4,500-hectare ecozone.

Both studies also revealed no

radioactive danger in any part of the ecozone.

In these studies, the PNRI used a mobile gamma ray spectrometer to detect any radioactive elements in the air as well as in water from wells.

The studies covered three former US military landfills, two igloo armories, an abandoned military hospital, two incinerators, the Mimosa resort and the Philippine Air Force housing areas, the Heroes cemetery, the former motorpool area, the CDC's main office area, the firing range and the road networks.

FIGURE 13. NEWSPAPER REPORT, THE PHILIPPINE STAR, NOV. 17, 2002

FRIDAY

NOVEMBER 15, 2002
No. 3,200

TODAY

FRIDAY, NOVEMBER 15, 2002

NATION TODAY

3

Radiation in former military bases in Clark, Subic at safe level, PNRI says

CLARK FIELD, Pampanga—A study conducted by the Philippine Nuclear Research Institute (PNRI) recently in the Clark Special Economic Zone and the Subic Bay Metropolitan Authority (SBMA) areas showed that radiation levels in the two former US bases are lower and safer than that in the entire country.

The study, called "An Analysis of Radiation and Lead in Soils and Vegetables at the Former Ammunition Dump Area in the Clark Special Economic Zone," was conducted in

October to determine the radiation levels in Clark and Subic, both former US military facilities.

The study was conducted at the old ammunition dump that was used by the American forces during their occupancy of Clark until 1991. The 10-hectare area is now being used for agricultural purposes and is planted with vegetables.

Plant and soil samples were taken from the study site to determine the level of radiation. It revealed that no dangerous levels of radiation were found in the area.

PNRI Senior Science Research Specialist Teofilo Garcia said results of the study revealed that the radiation levels in Clark and Subic are much lower than those studied in the rest of the country.

Garcia, however, stressed that their study only covers radiation levels and not the much-vaunted toxic waste contamination in the former US military bases.

He cited that measurements taken showed that only 25.3 monogrey radiation level was noted inside Clark, while

Subic registered only 13.5 monogrey radiation level.

He said that the radiation levels in Clark and Subic are well within and do not exceed the 1,000 monogrey level standard as compared with the radiation level in the country, which has been pegged at 44 monogrey level.

"The results of the analysis are within the background values and do not pose any hazard to public health. There is no unsafe radiation level or even danger in Clark," the PNRI study concluded.

Garcia said that the most common form of radiation is Cesium 137, a man-made radioactive element found and used in nuclear power plants and nuclear-powered machines used in medicines.

Garcia noted that the soil samples taken at the ammunition dump showed a level of 1.06 radiation, while plant samples registered a 0.72 level.

These levels, the PNRI research specialist said, means they are not harmful to humans.

The October study was one of a series of similar radiation-level studies

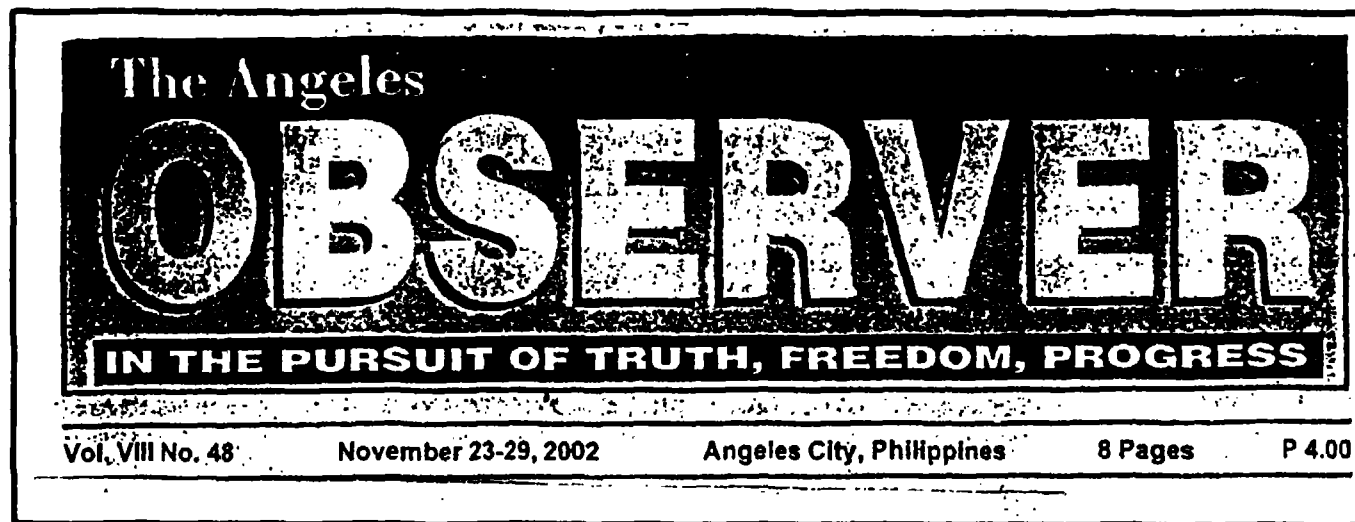
conducted by the PNRI in Clark. The earlier studies were conducted in 1997 and 1998.

Garcia said a total of 4,178 measurements were taken in Clark, while a total of 6,018 measurements were taken in Subic.

A study of the radiation level was also conducted at the former Clark Air Base Command evacuation center that formerly housed more than 6,000 labor-affected families until they were moved to permanent resettlement sites in Pampanga.

J. Due

FIGURE 14. NEWSPAPER REPORT, TODAY, NOV. 15, 2002



No radioactivity at all at CSEZ

CLARK FIELD, Pampanga - Using state-of-the-art equipment, including a rare one used to determine the extent of the world's worse nuclear accident in Chernobyl in 1986, the Philippine Nuclear Research Institute (PNRI) bared yesterday its third and final study showing no radioactive danger anywhere in this 4,500-hectare former US Clark air force base.

Teofilo Garcia, PNRI senior science specialist, briefed local media here on the results of the recently concluded study which also covered vegetable, soil and water samples which also tested way below the average

tolerable limits for lead content. He also bared one study conducted at the former Subic US naval base also yielded negative results in radioactivity.

Garcia said that the PNRI's latest study covered the former ammunition dumpsite of the US air force here, now the Clark special economic zone. The site was recommended by the Clark Development Corp. (CDC) as the most probable contaminated site here.

In the latest study finished last month, the PNRI used an instrument called gamma ray spectrometer which Garcia said is one of the few such existing equipment in the

world. He said it was donated by the International Atomic Energy Agency based in Vienna, and is known to be quite sensitive and capable of distinguishing between natural and man-made radionuclides.

"The same instrument was used in the Chernobyl accident in the Ukraine in the former USSR in 1986," Garcia said. It was used by the PNRI here to detect any Cesium-137, a man-made form of radioactive gamma ray.

The instrument revealed only 0.98 to 4.64 becquerel or bq. (a unit of measurement for the gamma ray) per kilogram in soil samples and 0.07 to

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1.34 bq. per kilogram in vegetable samples from a 10-hectare farm planted in the area. These are way below the national Cesium-137 average range of .09 to 12.77 bq. per kilogram for soil and 0.7 to 1.33 bq. per kilogram for plants.

Using standards of the Bureau of Soils and Water Management (BSWM), the PNRI also measured lead elements, the PNRI also concluded that soil and vegetable samples from the control site here were safe

from lead. "Results of analysis are within background values and so not pose any hazard to public health" Garcia said.

Garcia recalled that the PNRI also conducted two other studies on radioactivity here in 1997 and 1998, virtually covering the entire 4,500-hectare economic zone. Both studies also revealed no radioactive danger in any part of the 4,500-hectare economic zone.

In these studies, the PNRI used a mobile gamma ray spectrometer to detect any radioactive elements in the air as well as in water from wells here. The areas covered three former US military landfills,

two igloo armories, an abandoned military hospital, two incinerators, the Mimosa resort housing area, the Philippine Air Force housing area, the Heroes' cemetery, the former motor pool area which was used as an evacuation for people affected by the eruption of Mt. Pinatubo in 1991, the CDC main offices area, the firing range, and the road networks in this economic zone.

The PNRI noted that while the Philippines has an average of 44 monogray (unit of measurement for natural radiation) per hour, the rate at Clark averaged only 25.3, and only about 13.5 at Subic.

FIGURE 15. NEWSPAPER REPORT, THE ANGELES OBSERVER, NOV. 23 - 29, 2002

II. ACHIEVEMENT OF THE APP OBJECTIVE

The social marketing process on which this work plan was based guided this proponent in the achievement of the APP objectives in the implementation phase of the APP. The activities were accomplished except for some delays in the timetable due to some unavoidable events (like the lack of needed logistics and the unavailability of some contact persons). In general the proponent fulfilled the objectives of a social cause campaign.

Through an effective coordination and collaboration, the proponent had successfully organized and mobilized the members of the Project Management Team as well as those from other members of the PNRI community in the collection of environmental samples from Clark Special Economic Zone and in the preparation and analysis of the samples at PNRI laboratory.

The partnership with the Manager of the Environmental Planning and Management Department Corporation contributed greatly to the attainment of the project objectives. The Manager's openness, cunningness and leadership made the proponents' activities inside Clark easy. During the experimental phase at the farm and in the social marketing campaign at the barangay, the Manager was always there to give a hand.

Another very important factor in attaining the objectives of the APP was the regular consultation with the Faculty Adviser. Her advisory role in the implementation of the APP was vital in the successful achievement of the

project activities. The unequivocal support of the Institutional Partner to the proponent was also helpful.

The proponent has accomplished the following objectives:

1. Ensured the social acceptability of the results of the environmental radioactivity studies made by PNRI at Clark Special Economic Zone; and
2. Validated the previous findings of low levels of radiation by conducting measurements of radioactivity in soil and plants grown within the former ammunition dump area at CSEZ.

III. RECOMMENDATIONS

A. Post – APP Activities

The Philippine Nuclear Research Institute has not done anything about social marketing before. But just as there is a market for soap and medicine, there is also a market place for ideas. The idea that PNRI can “market” certain PNRI-monitored area as free from radiation contamination can be successfully adopted by the target audience. Change from an adverse idea of behavior or adoption of new ideas and behaviors is the goal of social marketing. Ideas and behaviors are the “products” to be marketed. Social marketing combines the best elements of the traditional approaches to social change in an integrated planning and action framework and it utilizes advances in communication technology and marketing skills. The PNRI could

look at the social marketing approach for its program and projects in its task of reaching out to the internal and external sector.

Another recommendation that can be made is the close collaboration of the scientists with journalists. Effective communication strategy for target adopters can be achieved through partnerships among the media people and scientists.

IV. EVALUATION OF MANAGEMENT THEORIES

The social marketing process as a strategic management theory offers a different perspective in the conduct of social cause campaign. It is a system, which seeks to use the elements of commercial marketing to "sell" an idea. The social marketer's focus is a behavior change in the target adopter. As an information tool, it does not confine itself to giving out information based on a perceived need but on developing a systematic strategy for generating acceptability of an idea including scientific data. It is a process that seeks the participation of the target adopter. It has also changed the perspective that a government policy, program or project can be marketed as product using the 5P's of social marketing.

CHAPTER FOUR. THE APP EXPERIENCE AND MY BEING A PUBLIC MANAGER

The experience that I had with the APP is one that I will never forget. I had experienced how to panic and become frustrated with myself but not so much because of the approaching deadline but the will to start to work. I realized that it was all because of lack of external pressure and my lack of resolve to do something about the problem. I felt disappointed with myself and so I had to re-evaluate myself and my priorities.

I know that there are difficulties, trials and distractions that we encounter in life every now and then. I had the experience of being hospitalized during the period of my studies, once due to a heart problem and once due to severe back pain. I had serious financial problems. My salaries in PNRI were withheld for seven months due to some technicalities on my partial scholarship under the DOST scholarship program. As a consequence, I had to sell my car to support my studies and my daily existence. I also had the scary experience of being held up on my way home from DAP and robbed of my wallet and cellular phone. There were many more, but the intensity of these will only depend on how much we are willing to be affected by it. For me, the APP was more of managing oneself more than anything else. I felt that the longer I entertained these distractions, the sorrier I become because it will affect my chances to graduate as scheduled. It is because of this reality, which helped me realize the importance of managing oneself as a necessary precondition to becoming a good manager and a better person.

It is not so much the implementation part of the APP that will be most remembered but the difficult experience of my own weaknesses and learning from them. It is not so much the intellectual ability that enables one to accomplish one's goals but the will to overcome one's weaknesses and in this aspect, diligence and perseverance play a pivotal role. The APP implementation was quite important but what makes the whole experience beautiful is the realization that I was able to triumph over my weaknesses.

The cooperation, assistance and sincerity of my friends in the Action Learning Set will also be remembered. The informal group did not fail to respond to my request. Even in the implementation site, the friends were more than willing to assist. They shared resources and expertise even if my activity coincided with their own activity. The APP experience has all the more reinforced to me the need to develop goodwill with our fellow human beings not because we have intentions to collect it some future time but because the good and kind deeds bring in positive vibrations that help us hurdle our own battles in an explainable way. The good deeds are being returned not by the people we directly help, but through other people.

I must admit that social marketing as an approach to my APP was a venture into the unknown. I felt that I did not know what to do on how to manage. It is hard to admit that one does not know how to do something. Social marketing has been in practice but it has never been practiced in the Philippine Nuclear Research Institute before. This experience is useful in future undertakings as one goes beyond one's comfort zone in the accomplishment of projects.

The implementation of the APP was a very challenging experience to me as a public manager. It gave me a lot of insights, inspiration and courage to do things, which I had never done before. In all aspects of the APP implementation, I was able to mobilize all the necessary support available in the agency. I attributed this to proper consultation with the concerned staff and management of PNRI starting at the early stage of conceptualizing the project, not to mention the fact that the APP was designed to complement the existing commitments of PNRI under the Philippine Task Force on Toxic Wastes in Former U.S. Military Bases, the main objective of which is to formalize the institutional mechanism that will address the bases clean-up issue.

Regarding the lessons learned vis-à-vis behavior change on the basis of pre and post-social intervention, it showed that proper planning and coordination will draw forth cooperation and participation among individuals who are target of appeals for change by social marketers. The use of local dialect and easy-to-understand campaign materials were effective tools in communicating with people. Initially, it was evident that the residents of the barangay were not quite comfortable about the idea of being interviewed particularly by the Environment and Planning Management employees of Clark Development Corporation, for fear of being questioned about their migration inside the perimeters of Clark. They were also hesitant in attending the seminar which was aimed at disseminating information on the results of PNRI studies at Clark. But because of proper coordination with the officials of

local government unit and teachers of the barangay elementary school, the participation and cooperation of the residents were made possible. The LGU officials and teachers helped in expounding and elucidating the purpose of the marketing intervention. The results of PNRI studies were thoroughly understood by the target adopters using layman's terms supported by video presentations.

The APP has illustrated the value of working together in the pursuit of a common goal and purpose of a particular program including the nuclear information and awareness program of PNRI. It has proven that the success of a particular project cannot be accomplished by one sector of the organization alone. In addition, it is best if there is support not only from the top but also from the lower ranks. Collaboration and consultation with the concerned individuals, groups and institutions are good mechanisms to synchronize efforts and actions. The role of the manager is to steer and promote an atmosphere of working together.

Finally, I have always believed in the Supreme Being that gives inspiration and enlightenment no matter how difficult the situation is. He is always important in every undertaking as He assured ***"Come to me all of you who are heavily burdened, and I will give you rest, For my yoke is easy and my burden is light"***.

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Appendix A

SUMMARY LIST OF STUDIES CONDUCTED ON THE TOXIC/HAZARDOUS WASTES IN CLARK (Listed in Chronological Order)

TITLE/SUBJECT OF STUDY	AUTHORS/DATE PREPARED	AREAS COVERED	SUMMARY OF MAJOR FINDINGS	PRIORITY ACTIONS RECOMMENDED BY THE STUDY/REPORT
1. The Environmental Review of the Drawdown Activities of Clark Air Base (The Allen Report)	Col. John J. Allen, USAF, 13 September 1991	Clark	<p>Study reviewed by People's Task Force on Bases Cleanup/US NGO network, 1997: "a preliminary and incomplete study which identifies some sites where hazardous materials were stored, used, and disposed of, sites where spills had taken place and where samples were taken showing varying levels of contamination."</p> <p>Statement by CDC Pres. and CEO R. David, 16 June 98: the report "did not identify any environmental concern for the (Centennial Expo) site except the asbestos landfill." The asbestos has been packed in plastic bags and wooden boxes and buried; this does not pose any threat in such a condition</p>	
2. Initial health monitoring report	People's Task Force on Bases Cleanup	Clark Evacuation Center/ CABCOM	<p>Cited in House Resolution 395, 1997: study conducted on 30,000 families living in the former motorpool area of Clark showed "there were cases of illnesses and disorders reported ranging from skin diseases, miscarriages, cancer to genetic and neurological disorders that were similar to the health problems experienced by residents near the Kelly Air Force in San Antonio, Texas where chemicals used in aircraft maintenance and industrial operation, such as trichloroethylene (TCE), dichloroethylene, benzene, vinyl chloride, heavy metals and traces of hazardous wastes were supposedly stored and dumped.</p>	

TITLE/SUBJECT OF STUDY	AUTHORS/DATE PREPARED	AREAS COVERED	SUMMARY OF MAJOR FINDINGS	PRIORITY ACTIONS RECOMMENDED BY THE STUDY/REPORT
3. Military Bases Closure, US Financial Obligations in the Philippines	US General Accounting Office, January 1992	Subic and Clark	<p>The report states: "The services have identified contaminated sites, such as fire-fighting training facilities and underground storage tanks. The cost of bringing all contaminated sites into compliance with U.S. environmental standards could approach Superfund proportions, according to Air Force and Navy officials. However, under the current agreement (1947 MBA), the United States has no liability for this damage. DOD regulations require the services to comply with the environmental pollution control standards of general responsibility in the host country, but they do not impose any specific responsibility for environmental restoration, and the services have no plans for restoration. While the proposed new basing agreement (1991 Treaty) contained an expanded environmental provision, the Philippine Senate's rejection of the agreement made the issue of increased U.S. environmental liability a moot point."</p> <p>[Footnote: "The Superfund is administered by the Environmental Protection Agency to clean up the nation's worst hazardous waste sites. The average cost of construction per site is \$25 million.]</p>	Only recommendations for the severance pay of terminated bases employees are discussed.
4. An Environmental and Health Impact Report on Known and Potentially Contaminated Sites at Former US Military Bases in the Philippines	Unitarian Universalist Service Committee (UUSC); Paul Bloom, Ph.D; Alex Carlos, MS; Jorge Emmanuel, Ph.D; Theodore Schettler, MD; 13 August 1994	Subic and Clark	<p>Known contaminated sites in Clark include: Mechanical Room Bldg. 7509; Supply Storage Yard adjacent to DRMO; Clark Subic pipeline; Philrock Products Compound Bldg. 18; Asbestos Landfill; 10 other sites identified as potentially contaminated.</p>	Restrict access to all known or potentially contaminated sites; the US government's offer of information and technical assistance should be considered; fishing in Subic Bay should be

TITLE/SUBJECT OF STUDY	AUTHORS/DATE PREPARED	AREAS COVERED	SUMMARY OF MAJOR FINDINGS	PRIORITY ACTIONS RECOMMENDED BY THE STUDY/REPORT
			<p>Known contaminated sites in Subic include: Public Works Center (Sanitary landfill; Power Plant Bldg. 1800; Fleet Mooring/Sandblasting Yard); US Naval Station (Old dumpsite; UST Structure 1459 Navy Exchange Taxi Compound; Ship Repair Facility (Sandblasting facility and causeway; Foundry shop bldg. 30); Naval Supply Depot (Tank Farm UST Structure 1758); naval Magazine (Wood Preservation and Treatment Facility Bldg. 2259); Cubi Point Naval Air Station (Fuel Farm; Firefighting Training/Crash Crew Training area Tank Structure 8061; Washtrack Holding Tanks Structure No. 8415 and 8416; Cubi Power Plant); Other area (DRMO yard); 12 other potentially contaminated on-site areas and 5 off-site areas are listed.</p>	<p>restricted; identification and testing of all sites immediately; locate and retrieve all hazardous materials, and prevent scavengers from carrying them off for selling.</p>
5. Health First Participatory Health Survey	Dr. Rosali Bertell, International Institute of Concern for Public Health/ University of Toronto, February-June 1996	Clark	<p>Letter of Dr. Bertell to Pres. Ramos and PTFBC, 9 Oct 1997: "The International Institute has been investigating directly the health of over 700 households on and in the near vicinity of the former Clark Air Force Base. The level of kidney diseases and symptoms of kidney problems reported in this area is startling high. It is apparently connected with both water and air exposures...The study is not completed, and the relationships are complex and requiring more analysis."</p>	
6. Initial Site Characterization Study for Clark	Weston International/Asiastar Group, August 1996	Clark	<p>The report provides an initial list of sites identified to be contaminated: Landfills, Fire Training areas, Jet Engine Test Cell, Storage Tanks (underground and above ground), Drum Disposal Area, PCB spills (Communication facilities,</p>	

TITLE/SUBJECT OF STUDY	AUTHORS/DATE PREPARED	AREAS COVERED	SUMMARY OF MAJOR FINDINGS	PRIORITY ACTIONS RECOMMENDED BY THE STUDY/REPORT
			Power Plants, Transformers), Munitions-related areas, Industrial Shop areas, Base Laundry, Base Motor Pool, Wastewater Treatment Plant.	
7. Geophysical Survey of Asbestos in CSEZ	Clark Development Corp., December 1996	Clark	Press release by CDC, 16 June 1998: "CDC engaged the services of a professional team to exactly delineate the location and configuration of the asbestos landfill site through a geophysical survey by seismic refraction. This is to prevent any excavation and earthworks in the area and expose the public in danger. The seismic refraction exactly identified the location of the asbestos landfill covering an area of 588 square meters at a depth ranging from 5 meters to 13 meters."	Asbestos landfill site was excluded in the contract for the Expo site to ensure that it will not be disturbed until cleanup is effected.
8. Environmental Baseline Study; Soil and Water Baseline Study	Weston International 1997	Clark	<p>Press release by CDC, 16 June 1998 states: "The environmental baseline study identified eight sites with contamination ranging from oil and petroleum lubricants, pesticides, PCB, and lead. These are contaminants found elsewhere in places where you have aviation and motorpool areas. Some water production wells registered levels of arsenic and dieldrin above Philippine National Standards (PNS) but the quality of the water being taken from the taps pass the required national standards...The contaminated sites have been covered with top soil and have been restricted if they are not isolated areas. The contaminated wells have been shut down and secured."</p> <p>Letter from CDC CEO Romeo David to Sec. Siazon, 9 Sept 1998: "based on the results of soil sampling, Weston</p>	<p>Based on the study, CDC recommended immediate request for US funding for the following remediation activities:</p> <p>Permanent removal of asbestos landfill; permanent removal of PCB contaminated soil in two sites tested and the remaining parts of the transformer, including underground pipelines, permanent removal of soil from established</p>

TITLE/SUBJECT OF STUDY	AUTHORS/DATE PREPARED	AREAS COVERED	SUMMARY OF MAJOR FINDINGS	PRIORITY ACTIONS RECOMMENDED BY THE STUDY/REPORT
			identified three sites as potentially high risk, five medium risk and four (4) low risk. The potentially high risk sites are the decommissioned power plant, a portion of the former California Bus Line area, and a portion of the former Philippine Exchange Motor Pool."	contamination sites, well head treatment for wells that exhibited high traces of dieldrin .
9. Radiological Test for Priority Sites in the Main Zone	Philippine Nuclear Research Institute, November 1997	Clark	Press release by CDC, 16 June 1998 states: "The radiation levels gathered from these sites were below acceptable standards and do not pose any risk to public health."	
10. Health Impact Assessment Study	UP Institute of Public Health, December 1997	Clark	Note: according to DOH, the study was not completed due to lack of funds	The study group advised CDC on measures to ensure public safety.
11. Comprehensive Radiological Test in Clark using Carborne Gamma Spectrometer	Philippine Nuclear Research Institute, April 1998	Clark	Press release by CDC, 16 June 1998: "Initial results indicate that the radiation values are within allowable standards. This means that workers and residents in Clark are free from dangers of exposure to radiation.	

NEWSPAPER REPORTS ON THE HAZARDOUS WASTES ISSUES IN
CLARK SPECIAL ECONOMIC ZONE

FRIDAY, JULY 30, 1999

TODAY

Toxic waste now a given

By MALOU TALOSIG
Reporter

THE government has finally acknowledged that the two former military bases of the United States in Clark and Subic are contaminated with toxic waste left by US forces.

The interagency task force looking into the toxic waste problem in the former US bases finished its review yesterday of 15 independent surveys conducted in Clark and Subic. The body said the surveys show that the former bases were indeed contaminated.

"We need to answer the issue whether there is contamination or not. Well, there is. That's why we have an interagency task force to address it," said Gerry Sanchez, chief of the Environment Management Bureau of the Department of Environment and Natural Resources.

The environment department and the Department of Foreign Affairs are co-leading the interagency task force on toxic waste. The other members are: the Department of Science and Technology, Department of Health, University of the Philippines, Bates Conversion Development Authority, Clark Development Corp., Subic Bay Metropolitan Author-

ity and the Philippine Nuclear Research Institute.

Sanchez cited the Weston International Baseline Study in 1996 at the former Clark Air Base in Pampanga, which identified four "potentially high-risk" areas of contamination. These are in the waterpool, California Baseline Station, aviation and maintenance facilities.

He said, though, that the PNRI study showed there is no radioactive waste found at the former Subic Naval Base in Zambales. Meanwhile, he thinks that the study undertaken by Woodward Clyde International which gave a clean bill of health in the former home of the US Seventh Fleet needs to be "re-examined."

DFA Assistant Secretary Clemencia Montesa clarified that the interagency task force would need to verify all the data presented to the government by these independent surveys. This verification process will take a year.

Task force officials refused to estimate how much this "verification" would cost the government. The CDC spent US\$28,000 for Weston to undertake the study, while Woodward Clyde was funded by a US\$630,000 loan from the World Bank.

Sanchez stressed, though, that the verification process is only a minor detail in the comprehensive plan of action being drawn by the task force.

16 FRIDAY, JULY 30, 1999

Gov't agencies confirm toxic wastes at Clark

By AUREA CALICA

Government agencies bared yesterday a clean-up plan as they finally confirmed the contamination by toxic wastes of areas at the former Clark Air Base in Angeles City, Pampanga that has caused sickness and deaths of children.

Officials from the foreign affairs and environment departments said government findings showed that the contamination was heavy in at least five sites at Clark and they are seeking to validate the results of the studies through the formation of a Presidential Task Force on Toxic Wastes.

The officials expressed hopes the US government would provide support for the clean-up, which US President Bill Clinton himself agreed to during a meeting with former President Ramos and Foreign Affairs Secretary Domingo Sison Jr. in 1996.

President Estrada also got the same commitment from US Vice President Al Gore during the Asia-Pacific Economic Cooperation meeting in Malaysia last year.

Gerry Sanchez, a chemical engineer of the Environmental Management Bureau, said there were 132 chemicals analyzed and that illnesses contracted by children in the area can be attributed to the contamination.

Reports showed hapless children born with missing fingers and deformed

bodies caused by the toxic wastes left behind by American soldiers.

But Sanchez said the results of the analysis would still have to be validated, a process that could take a year to finish.

"We still have to assess (how serious the contamination is) and the volume of toxic wastes," he said, adding that the presence of solvents used for aircraft and ship maintenance was detected at Clark.

So far, however, the Philippine Nuclear Research Institute has yet to verify the radioactive substances in the area.

The difficulty of assessing the toxic waste contamination is due to the loss of inventory lists and other pertinent documents, some of them during the Mount Pinatubo eruption. The American soldiers also failed to formally turn over the bases' records, Sanchez said.

Foreign Affairs Assistant Secretary Clementio Montesa said concerned government agencies are rushing the plan of action to be submitted to Makaringsaw. President Estrada could sign the executive order creating the task force.

Montesa said the EO was important for the task force to get the funds for the validation of the toxic waste contamination and eventually for clean-up operations that would require massive technology and resources.

160 drums of hazardous chemicals found in Z'bales

SAN FERNANDO, Pampanga—A total of 166 drums containing hazardous chemicals were found abandoned in a farmland in Castillejos, Zambales.

The drums found by field personnel of the Department of Environment and Natural Resources (DENR) regional office here have been subjected to laboratory analysis and found out to be containing traces of heavy metals such as chromium, copper, and zinc.

Deputy Regional DENR Director Wilfredo Sarao said that the laboratory analysis conducted by the Environmental Management Bureau (EMB) showed that waste and slurry from the drums were positive of .62 milligrams of chromium per liter and the sludge contained 116.98 milligrams of copper per kilogram and 15.06 milligrams of zinc per kilogram.

Sarao said that chromium is a highly carcinogenic chemical used in electroplating industry while copper and zinc are used as protective coating for iron and steel.

The content of the drums, however have been found to

be negative to polychlorinated biphenyls (PCBs) which are being used in the manufacture of automobile batteries and are highly toxic to humans.

Local EMB authorities have dispatched environmental engineers and chemist to cordon off the area where the drums were found and put up warning signs pending results of a parallel metal analysis of the chemicals.

Local DENR authorities also have requested the PNP Crime Laboratory in Camp Crame, Quezon City and the Philippine Nuclear Research Institute (PNRI) to help in the investigation of the contents of the drums.

Earlier, Environment Secretary Antonio Cerilles ordered an investigation and analysis of the contents of the drums following receipt of complaints from the People's Task Force on Bases Clean-up (PTFBC).

It was learned that the drums have been in Castillejos since 1992 or shortly before of the US Navy military personnel left the Subic Bay Naval Base because of the eruption of

Mt. Pinatubo.

DENR regional executive director Gregorio Nisperos explained that Republic Act 6969, otherwise known as the "Toxic Substance and Hazardous and Nuclear Wastes Control Act of 1990" classifies as a criminal offense acts which cause, aid or facilitate the storage, importation or bringing into the Philippine Territory any amount of hazardous and nuclear wastes, and provides for imprisonment of up to six years. (Fred Roxas)

WEDNESDAY, OCTOBER 4, 2000

PNP, nuke agency asked to help hunt toxic waste owner

BY TONETTE OREJAS
PDI Central Luzon Desk

SAN FERNANDO, Pampanga—The regional environment department on Monday asked the Philippine National Police Crime Laboratory and the Philippine Nuclear Research Institute to help identify who dumped the 160 drums containing three hazardous chemicals in a remote Zambales village 10 years ago.

Lornelina Claudio, regional Environmental Management Bureau chief, said the PNP and the PNRI were asked to help in the probe after laboratory tests showed that the drums contained high traces of chromium, copper and zinc.

Dominador Gallardo of the People's Task Force for Bases Cleanup, the *INQUIRER* and local officials tracked down the drums in Sitio Aliundayat, Barangay Old San Agustin, Castillejos last Aug. 12.

Claudio said a team of chemists and environmental engineers was sent to the village to cordon off the area and put up warning signs.

It was the second set of drums suspected to have been spirited out of the former Subic Naval Base located some 20 km south of Castillejos, the PTTBC said.

The EMB commissioned the CKL Environmental Corp. in Clark to do the test while the Department of Environment and Natural Resources did a parallel metal analysis, Claudio said, citing the test and the investigation that Environment Secretary Antonio Cerillos ordered last month.

The liquid waste and slurry taken from the drums were negative polychlorinated biphenyls (PCBs).

Gallardo, a former chemist at the former Subic Naval Base, suspected that the drums, some of which have been tampered with, contained PCBs, a highly toxic substance used in industrial equipment like transformers, capacitors and circuit breakers.

Chromium, according to Claudio, is a highly carcinogenic chemical used in electroplating industries. Copper and zinc are used as protective coating for iron and steel.

The person who could have facilitated the storage of the drums in Aliundayat would be criminally liable, according to lawyer Wilfredo Sarnos, deputy director of the regional Department of Environment and Natural Resources.

Republic Act 6969, also known as the Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990, classifies as criminal offenses acts which cause, aid or facilitate the storage, importation or bringing into Philippine territory any amount of hazardous and nuclear wastes, Sarnos said.

The law provides for an imprisonment of up to 16 years for violators, Sarnos added.

Joseph Pastidio, the caretaker of the land owned by one Froilan Gervacio and on where the drums were dumped, said a certain Teresito Malicosi brought these on July 7, 1991 or less than a month after Mt. Pinatubo erupted.

These were loaded in two container vans, Pastidio told Gallardo, the *INQUIRER* and acting Mayor Wilma Billman.

The National Power Corp. used to operate an electric power plant at Subic base and therefore also produced PCBs, Gallardo recalled.

He said he used to see similar drums at the base's public works center. The Aliundayat drums, however, bore no markings at that time were owned by the United States Navy.

Reporters in Zambales had called attention to those drums during the term of former Mayor Enrique Maysa. Billman recalled.

Gregorio Nisperos, DENR regional executive director, said his personnel in Zambales could not be at fault since they only got to learn of the drums after reading the *INQUIRER* report last Aug. 13.

Billman and Councilor Resty Villarin accused the DENR of inaction.



YOUNGSTERS offer candles to victims of toxic waste left behind in the former American military bases at Clark and Subic. Around 100 people held a prayer rally calling on the United States government to clean up their waste at the Dasdap resettlement site in Mabalacat, Pampanga.

PHOTO BY DENNIS SABANGAN

PDI Nov 1 2002

A day of grieving for victims of toxic waste

By Tonette Orejas
PDI Central Luzon Desk

MABALACAT, Pampanga—For victims of toxic waste poisoning in the former American bases, All Souls' Day is "still a day of grieving, of seeking justice."

In between sobs, Herondina Valencia told a crowd of some 150 still surviving victims and their family mem-

bers: "Ours is a different case because our loved ones died due to the environmental injustice of the United States and little action from our own government."

The mourners, from communities around the former Subic and Clark military bases, gathered at dusk the other day. Before photographs of their dead relatives, in a grassy field illuminated

by candles, they stood side by side and arm in arm.

They prayed, offered flowers and sang songs to implore eternal peace for their dearly departed.

Valencia, a 28-year-old mother, said toxic waste victims met slow deaths from drinking water contaminated with hazardous metals and substances and from working, living in or right next to

polluted sites in the former US bases.

"It's not simply a day of remembering our dead," she said.

Valencia pasted photos of her late daughter, Crisel Jane, on a placard. The photos included images of Crisel from the time she was a toddler up to when she was 6 years old, when she was bald, pale and dying of leukemia.

ADAY A 1

A day of grieving for victims of toxic waste

From page A1

Cruzet died in February 2000 just as American troops resumed the holding of large-scale war games in Luzon for the second year.

Hailed as a "toxic warrior," Cruzet called attention to the need to rid the US bases of harmful substances.

She did so through her crayon drawings that were made into cards. The cards have been raising money for a children's medical fund, according to the People's Task Force for Bases Clean Up.

Many more were remembered in Wednesday's rites.

The ceremony has been held annually since 1997 to remember toxic waste victims.

At the task force's latest monitoring report, at least 153 people have died around Clark in Pampanga and 70 others from Subic in Zambales. They have died of various forms of cancer, nervous and reproductive systems disorders, kidney problems, miscarriages or birth defects, the report said.

Wallstone remembered

Wednesday's rites also honored the late US Sen. Paul Wellstone, who championed the cause of Filipino toxic waste victims in the US Senate.

The senator, his wife, a daughter and three staff members were killed in a plane crash on Oct. 25.

The senator had written an amendment to the US Department of Defense's authorization bill. It required the department to assess environmental information to the public and to cooperate in the interpretation of information.

His intent was to "make nations such as the Philippines completely environmental and to tell them exactly what has been left behind," Wellstone said in a speech before the 1999 International Grassroots Summit on Military Bases Cleanup in Washington, D.C.

The bill was eventually weakened, however, and limited the scope of the information to move to the former Subic Naval Base in Subic Bay, Luzon, and Zambales.

The task force said the bill exempted other bases, which were assumed to be without harmful information. It also re-



WOMEN offer candles to victims of toxic waste during Wednesday's prayer rally in Mabalacat, Pampanga.

JOYCE MANALISA

including Clark in Pampanga.

Several studies, two of which were state-funded, confirmed the varying presence of hazardous, toxic and persistent substances in the soil and water of the two former bases.

Wellstone's death, the task force said, was a "great loss" to the bases cleanup lobby in the United States.

Best evidence

At the rites, 65-year-old Braulio Padilla said his body carried the best evidence of injustice.

After 15 years of replacing the asbestos sheet in the engine rooms of US warships on a daily basis, Padilla is diagnosed as having a severe lung ailment.

More than 10,000 Subic shipyard workers are reportedly affected with the same disease.

"We come together every year to

seek physical and moral strength for those still fighting to live more days and fortitude for their caregivers," he said.

For Padilla, All Souls' Day has become an occasion to come to terms with the reality of dying.

"We all die but in our case, it's an unjust way of dying because we only wanted to earn by working in the base (Subic). We ended up losing our health," he said.

Joyce Manalisa said she joined the occasion to find more courage.

Through the Sama Samang Linyayan ng mga Paralya Bikmaning Toxic Waste sa Clark, Manalisa and her husband have found support while caring for their child Jeremy.

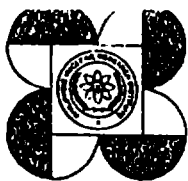
The couple's Jeremy has a neurological condition and was diagnosed as having Kawasaki-Measles Syndrome, a rare form of cancer.

Manalisa said she conceived Jeremy while working at the Red Bull Corporation, which is near Clark's former motor pool. The family also lived at the Clark Air Base Command (CABCOM) evacuation center, which was closed after studies confirmed the presence of mercury and other heavy metals in water wells.

At the garments factory, Manalisa said she and her fellow workers suffered stomach trouble from drinking tap water. The management then replaced the supply with bottled purified water.

She has three left wrists and a finger in her right hand, the result of a long battle with rheumatoid arthritis.

The United States has continually raised demands for a cleanup of the area, Subic and the medical complex in Mabalacat, but the cleanup has not started.



Republic of the Philippines
Department of Science and Technology
PHILIPPINE NUCLEAR RESEARCH INSTITUTE

Address: Commonwealth Avenue, Diliman, Quezon City
P.O. Box Nos. 213 U.P. Quezon City; 932 Manila; 1314 Central, Quezon City
Telephone Nos. 929-6010 to 19 Fax. No. 920-1646

Appendix C

September 23, 2002

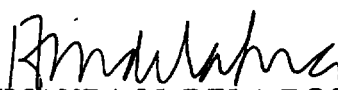
PNRI SPECIAL ORDER NO. 411
Series of 2002

SUBJECT: Creation of a Management Team to implement the Action Plan and Project (APP) on Generating Acceptability of PNRI Environmental Radioactivity Monitoring Studies at the Former Ammunition Dump Area in Clark Special Economic Zone.

In the interest of the service and in connection with the agency-based APP of Mr. Teofilo Y. Garcia under the Public Management Program in the Development Academy of the Philippines, a Project Management Team (PMT) is hereby created to implement the project plan on the said APP. The PMT shall be composed of the following personnel of this Office:

Teofilo Y. Garcia - Project Leader
Eliza B. Enriquez - Member
Fe M. dela Cruz - Member
Preciosa Corazon Pabroa - Member
Antonio A. Asada, Jr. - Member

The PMT shall be in effect for a period of about one month, from September 23 to October 30, 2002. The above-named personnel shall perform the project-related tasks that maybe assigned by the Project Leader based on the project plan. The APP activities shall be performed in addition to their respective regular functions.


ALUMANDA M. DELA ROSA, Ph.D.
Acting Director

PNRI Records/Unit
Rec'd No. 15
Time :
Date : 5/20/94
Ref. No.: 634

Appendix D MEMORANDUM OF AGREEMENT

KNOW ALL MEN BY THESE PRESENTS:

This Agreement entered into and executed this 20th of March 1993, at Clark Development Corporation by and between:

The PHILIPPINE NUCLEAR RESEARCH INSTITUTE (PNRI), a government agency with office at Commonwealth Avenue, Diliman, Quezon City, herein represented by its Officer-in-Charge, DR. ALUMANDA M. DELA ROSA, Ph. D., hereinafter referred to as the "Institute":

-and-

The CLARK DEVELOPMENT CORPORATION (CDC), organized and established under Executive Order No. 80, series of 1993 and registered with the Securities and Exchange Commission with office address at Building 2122 C.P. Garcia Street corner E. Quirino Street, Clark Special Economic Zone (CSEZ), Clark Field, Pampanga represented by its President and Chief Executive Officer, ROMEO S. DAVID, hereafter referred to as "CDC".

WITNESSETH:

WHEREAS, CDC's goal for balanced and sustainable development necessitates a sound and comprehensive environmental protection and management within CSEZ;

WHEREAS, CDC continually builds up its environmental baseline data to determine the presence and extent of any possible contamination as a result of Clark's being used as a former US Military Base;

WHEREAS, CDC recognizes the need to monitor radioactivity concentrations in Clark to establish background radiation levels;

WHEREAS, the Institute has the capability and is willing to undertake the task of monitoring ambient radioactivity concentrations through out the entire area of the CSEZ;

WHEREAS, the Institute will provide the technical staff to monitor radioactivity concentrations in the air and a car-borne gamma spectrometry system to be used for this purpose;

Alumanda M. Dela Rosa

WHEREAS, in the event that a significant level of radioactivity concentrations is measured, the Institute will collect soil samples of contaminated area for specific radionuclide analyses to be measured at the Institute;

WHEREAS, CDC will provide the technical staff of the Institute with a vehicle to carry the gamma spectrometry instrument while it is being used in monitoring radioactivity within the CSEZ area;

WHEREAS, CDC shall provide board and lodging to the technical staff of the Institute during the total period of monitoring radioactivity within CSEZ which is expected to last for six (6) days,

WHEREAS, CDC shall replenish consumable materials that would be used in the analyses of soil and/or water samples in the event of significant radioactive concentrations;

NOW THEREFORE, for and in consideration of the above premises and of the mutual covenants hereinafter set forth, the parties herein have agreed, as they hereby agreed on the following:

I. OBLIGATIONS OF PNRI:

- A. Radioactivity monitoring of the entire CSEZ Main Zone using its own car-borne gamma spectrometer and staff for a period of about six (6) days or until the entire monitoring is completed,
- B. Collection of soil and/or water samples for radionuclide analysis if contamination is established;
- C. Preparation of a report on the level of radioactivity within the CSEZ within three (3) months from actual field work. For national interest, clearance should be properly secured from CDC before any publication or dissemination of information to any other entity.
- D. Shoulder the cost of deploying its staff and its monitoring equipment for the duration of the exercise on top of the expense items to be borne explicitly by CDC.

by [signature] for [signature]

II. OBLIGATIONS OF CDC:

- A. Provide fuel and oil for the PNRI vehicle that will carry the airborne gamma spectrometer around the CSEZ area throughout the period of monitoring for radioactivity;
- B. Provide board and lodging to the PNRI staff throughout the duration of radioactivity monitoring;
- C. Replenish consumable materials used in the analyses of soil and/or water samples if contamination is established; and
- D. Authorize publication and dissemination of the results as long as they do not pose any danger to national security

III. JOINT OBLIGATIONS OF THE INSTITUTE AND CDC:

- A. The Institute shall designate a radiological group composed of research staff from the Health Physics Research Section while CDC through its Estate and Environmental Management Department shall assign its personnel staff to assist the PNRI group identify route to be traversed to cover the entire CSEZ grounds.
- B. On a daily basis, the Institute and CDC shall discuss the day's operations and address problems that may crop up during its implementation.

IV. OTHER AGREEMENTS:

- A. The terms and conditions of this Agreement, including its validity, may be amended by either party by serving written notice to and acceptance by the other party at least thirty (30) days prior to the effectivity date of the proposed amendment and the acceptance in writing of the other party to the proposal, subject to Philippine Laws.
- B. This Agreement and the rights and obligations of the parties hereunder shall be construed and interpreted in accordance with and be governed by Philippine Laws.
- C. This Agreement is made effective upon signing of both parties.

Rm

Rm


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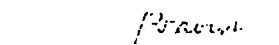
Dr. Maria Ines P. Pineda

IN WITNESS WHEREOF, the parties hereto have hereunto affixed their respective signatures at the Clark Special Economic Zone on this [26th] of March 1998.

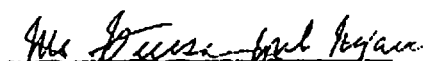
PHILIPPINE NUCLEAR
RESEARCH INSTITUTE

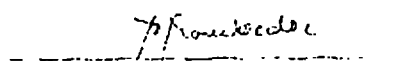
CLARK DEVELOPMENT
CORPORATION


DR. ALUMANDA M. DELA ROSA
Officer-in-Charge


ROMEO S. DAVID
President and CEO

SIGNED IN THE PRESENCE OF:


MA. TERESA YULO-NAZAREA
OIC, Health Physics Research


MARIZA O. MANDOCDOC
Manager, Estate and Environment
Management Department

ACKNOWLEDGEMENT

REPUBLIC OF THE PHILIPPINES) S S
)

BEFORE ME, A Notary Public in and for _____
on this _____ day of _____ 1998 personally appeared the
following:

<u>Name</u>	<u>Res. Cert. No.</u>	<u>Date/Place Issued</u>
ROMEO S. DAVID In his capacity as President and CEO of Clark Development Corporation	<u>17171208 E</u>	<u>1-6-98/ Mab. Pangasinan</u>
Dr. ALUMANDA M. DELA ROSA In his capacity as Officer-in-Charge of Philippine Nuclear Research Institute	<u>634504</u>	<u>1-27-98 - K. C.</u>

known to me to be the same persons who executed the foregoing instrument and acknowledgement to me the same is their free and voluntary act and deed, as well as the free voluntary act and deed of the principals herein represented.

This document, consisting of five (5) pages including this page where the acknowledgement is written, refers to a Memorandum of Agreement signed by the parties and their instrumental witnesses on every page thereof.

WITNESS MY HAND AND SEAL on the date and place first above written.

Notary Public

Doc. No. _____
Page No. _____
Book No. _____
Series of 1998.

ENV500Y0Y0R3M0A-CDC-PH11 DOC

Appendix E

QUESTIONNAIRE

Instruksyon:

1. Ang hangarin ng questionnaire na ito ay kunin ang inyong kaalaman tungkol sa kontaminasyon (radioaktibo o nakakalason) sa mga lupain at tanim sa Clark Special Economic Zone (CSEZ).
2. Kayo po ay pinakikiusapan na punan ng kasagutan ang mga sumusunod na tanong tungkol sa bagay na ito kabilang na ang ilang katanungan sa inyong personal na katayuan sa buhay.

Part I. Demographic Data

Edad: _____ Okupasyon: _____

Tirahan: _____

Kasarian: Lalake ☐ Babae ☐

Civil Status: Walang asawa ☐ May asawa ☐

Edukasyon:

Elementarya ☐ High School ☐ Vocational ☐ College ☐ Post Grad ☐

Part II. Mga katanungan:

1. Sa palagay ba ninyo ay mapanganib ang “wastes” na naiwan sa Clark Air Bases?
Oo _____ Hindi _____
Bakit? _____
2. Naniniwala ba kayo na ang “wastes” na naiwan sa Clark ay hindi radioactive?
Oo _____ Hindi _____
Bakit? _____
3. Naniniwala ba kayo na walang malawakang “radioactive contamination” sa paligid ng Clark?
Oo _____ Hindi _____
Bakit? _____
4. Naniniwala ba kayo na walang malawakang radioactive contamination sa Clark na maaaring nagdulot ng panganib sa kalusugan ng tao?
Oo _____ Hindi _____
Bakit? _____

5. Naniniwala ba kayo na ang tanim sa paligid ng Clark ay hindi radioactive at ligtas kainin?

Oo _____ Hindi _____

Bakit? _____

6. Papayag ba kayong kumain ng gulay, ect. na itinanim sa paligid ng Clark?

Oo _____ Hindi _____

Bakit? _____

7. Naniniwala ba kayo na kapag sinabing hazardous waste ay meron ding radioactive contamination?

Oo _____ Hindi _____

Bakit? _____

Appendix F

ANALYSIS OF CESIUM-137 AND STABLE LEAD IN SOIL AND PLANT SAMPLES GROWN AT THE FORMER AMMUNITION DUMP AREA IN CLARK SPECIAL ECONOMIC ZONE

Teofilo Y. Garcia, Eliza B. Enriquez, Fe M. dela Cruz, Antonio A. Asada

Health Physics Research Section, ARD, PNRI

and

Preciosa Corazon B. Pabroa

Analytical Measurement Research Section, ARD, PNRI

ABSTRACT

Soil and plant samples from a farm formerly used by the US Air Force as ammunition dump area in Clark Special Economic Zone in Angeles, Pampanga were analyzed for cesium-137 (^{137}Cs) and stable lead (Pb). ^{137}Cs radioactivity concentration was analyzed by gamma spectrometry while stable Pb concentration was analyzed by X-ray fluorescence (XRF) spectrometry. Results showed that the mean activity concentration of ^{137}Cs in the ten soil samples analyzed was 0.42 ± 0.40 Bq/kg. This ^{137}Cs concentration is lower than the baseline data previously obtained for the province of Pampanga which has a mean concentration of 1.18 ± 0.27 Bq/kg (n=9). In five plant samples analyzed

for ^{137}Cs , the radioactivity observed was essentially less than the lower limit of detection (LLD). These values are lower than the activity concentrations of ^{137}Cs in specific food items collected in Clark, which ranged from 0.07 Bq/kg to 1.34 Bq/kg. For stable Pb, the mean concentration obtained in soil samples is 22.2 ± 7.14 mg/kg, while in plant samples, the concentration was less than the detectable level of the equipment used. The stable Pb concentration in soil is way below the industrial Risk Base Concentration (RBC), which is 1000 mg/kg. ^{137}Cs radioactivity concentration and stable Pb concentration in soil and plants collected from the farm are within normal background values and do not pose any risk to public health.

INTRODUCTION

Clark Air Base, presently renamed Clark Special Economic Zone (CSEZ) was once the biggest air base facility outside the United States. Comprising a total of 4,400 hectares, the base served at its time as a major destination and refuel/transit point for US military aircraft within the Asia-Pacific Region. The rejection of the 1991 Treaty of Friendship and Cooperation, which sought to extend the Military Bases Agreement between the United States of America and the Republic of the Philippines, paved the way for the Americans to relinquish the Clark Air Base. In June 1991, Mt. Pinatubo erupted and this caused the United States to abandon the base completely. The accumulation of volcanic ash and lahar made the operations of the US facilities more dangerous. Furthermore, the active state of the volcano itself had made the conditions in the area

unpredictable. Thus, on 26 November 1991, the United States ended nearly a half-century of continued presence in its oldest and largest overseas base in the world (1).

Today, Clark as a special economic zone is being transformed into a site of commercial, industrial, residential, tourism and recreation center and the Philippines' future premier international airport. The issue of hazardous wastes purportedly left by the Americans in Clark is a continuing and a growing concern. Various studies have been conducted to determine the presence of hazardous wastes in the former Clark Air Base. The Philippine Nuclear Research Institute (PNRI), the government agency mandated to monitor environmental radioactivity in the country, measured radiation level at Clark. Major findings of these measurements indicate that the radiation levels were within allowable standards and do not pose any risk to public health. Despite these findings however, reports on the hazardous wastes issue including radioactive contamination at Clark have proliferated.

Given this background, the Philippine Nuclear Research Institute conducted this study with the objective of determining the presence, if any, of the radionuclide ^{137}Cs and stable Pb in soil and plants specifically grown at the farm formerly used by the Americans as ammunition dump area. According to an environmental report written by the Unitarian Universalist Service Committee, a non-government organization (NGO) based in Massachusetts, USA, heavy

metals like lead and nuclear waste may have been discarded or discharged onto soil at the dumps of the former US Military Base resulting in environmental contamination (2). The former ammunition dump area at Clark Special Economic Zone is now used for agricultural purposes and is now planted with vegetables and rice.

Among the artificially produced radionuclides, ^{137}Cs is considered the most significant contributor to radiation dose due to consumption of agricultural farm products. ^{137}Cs exists in the environment as a result of atmospheric nuclear weapons test and nuclear accidents. The heavy metal, Lead, on the other hand, is the most ubiquitous toxic metal and is used primarily in batteries, gasoline and paint. Lead can cause cognitive and neurologic deficit and can also induce anemia and renal dysfunction. The radioactivity concentration of ^{137}Cs is analyzed using gamma spectrometry while the heavy metal lead is analyzed using x-ray fluorescence spectrometry.

MATERIAL AND METHODS

Sampling

Samples of soil and plants were collected from the ten-hectare agricultural farm located at the former ammunition dump area used by the American Air Forces during their occupancy in Clark until 1991. Three hectares of this farm was, at the time of sampling, planted with rice, eggplant, bitter melon (amargoso) and gourd (patola). The rest of the area was being prepared for the next plant

crop. The farm area was divided into ten parts as sampling locations. These were determined by setting up a grid measuring one hectare each over the farm. The exact position of the farm was determined using a Global Position System (GPS). The coordinates of the farm are 15°12.54N and 120°32.80E respectively. A map showing the CSEZ agricultural farm is presented in Figure 1.



Figure. 1. Map of CSEZ showing the farm area.

Since the area is covered with lahar from the eruption of Mt. Pinatubo, 30 cm surface soil (average depth of lahar) was removed prior to soil sampling. Soil samples were taken from five cores distributed uniformly throughout the one-hectare grid. The soil from the five cores constituted one sample. An aggregate of about three-kilogram soil per grid was collected. The soil was placed in plastic bags, sealed and labeled with codes. For samples of rice, eggplant, amargoso and patola, about five kilogram each of the plant sample were collected, placed

in plastic bags and labeled with codes. The samples were then transported to PNRI for laboratory analysis.

Cesium-137 Analysis

Soil samples for ^{137}Cs analysis were prepared by separating the stones, roots, grass and other impurities from the soil. The soil was weighed and placed in the convection oven to dry at 105°C to constant weight. The dried sample was pulverized and homogenized either by using the Wiley mill or by mortar and pestle. The sample was placed in 1-L Marinelli beaker and weighed. This was then analyzed for ^{137}Cs using a high purity germanium (HPGe) detector. Counting time for radioactivity concentration was more than 1000 minutes per sample. For plants, the samples were cut into small pieces, weighed, and oven-dried at 105°C to constant weight. The sample was pulverized and placed in a 250-ml polyethylene bottle. It was then counted for more than 1000 minutes also using the high purity germanium detector. Radioactivity concentration of ^{137}Cs was reported in terms of activity mass concentration in Becquerel per kilogram (Bq/kg) of the sample.

Lead Analysis

For the analysis of the heavy metal lead, about five grams of the homogenized soil and plant samples was pelleted. This was then analyzed with a KEVEX 771 X-ray Fluorescence (XRF) Spectrometer using Ag as secondary

target (30 KV, 0.5 mA). Spectrum processing was done using the IAEA Quantitative X-ray Analysis System (QXAS) software. Quantization of lead was done using the QAES software of the Josef Stefan Institute, Slovenia.

RESULTS AND DISCUSSION

Cesium-137 Concentrations in Soil and Plants

The concentrations of ^{137}Cs in the soil samples are shown in Table 1. The radioactivity concentrations of ^{137}Cs in the ten soil samples analyzed ranged from lower limit of detection (LLD = 0.2 Bq/kg) to 1.06 ± 0.13 Bq/kg with a mean activity of 0.42 ± 0.40 Bq/kg. This mean value is lower compared to the baseline ^{137}Cs activity data obtained in 1983 for the province of Pampanga, which is 1.18 ± 0.27 Bq/kg (3). The mean values are also lower compared to the measurements made during the period 1996-1998, which has ^{137}Cs radioactivity concentrations ranging from 0.98 Bq/kg to 4.64 Bq/kg (4). The values are also low compared with the radioactivity concentrations of ^{137}Cs in soil samples collected from the entire country, which ranged from 0.09 Bq/kg to 12.77 Bq/kg dry weight (2). These results indicate that the soil is not contaminated from hazardous wastes when corrected for decay.

Table 1. Cesium-137 Radioactivity Concentrations in Soil Samples

Sample Code	Type	¹³⁷Cs Activity Concentration, Bq/kg
CDC-S1	Soil	0.85 ± 0.14
CDC-S2	Soil	0.30 ± 0.10
CDC-S3	Soil	0.56 ± 0.11
CDC-S4	Soil	< LLD
CDC-S5	Soil	< LLD
CDC-S6	Soil	< LLD
CDC-S7	Soil	1.06 ± 0.13
CDC-S8	Soil	0.71 ± 0.14
CDC-S9	Soil	< LLD
CDC-10	Soil	0.70 ± 0.20
	mean	0.42 ± 0.40
	n	10

LLD = Lower Limit of Detection

Of five plant samples analyzed, four were found to have an activity below the lower limit of detection (LLD) and only one sample had an activity of 0.72 ± 0.20 Bq/kg. Please see Table 2. These values are lower than the results of ¹³⁷Cs in specific food items collected in Clark, which ranged from 0.07 Bq/kg to 1.34 Bq/kg (5). These values are also lower compared to the activity concentration of Cs-137 collected in the entire country from 1980 to 1992, which is from 0.7 to 1.32 Bq/kg.

Table 2. Cesium-137 Radioactivity Concentrations in Plant Samples

Sample Code	Type	¹³⁷Cs Activity Concentration, Bq/kg
CDC-A7	Amargoso	< LLD
CDC-P7	Patola	< LLD
CDC-T7	Eggplant	< LLD
CDC-R8	Rice plant	< LLD
CDC-R9	Rice plant	0.72 ± 0.20

LLD = Lower Limit of Detection

The results of analysis of radioactivity in soil and plants from the former ammunition dump area at Clark indicate that ¹³⁷Cs activity concentrations are within allowable standards and do not pose any risk to public health. This study would also show that nuclear waste, specifically ¹³⁷Cs, had not been found discarded or discharged by the US Military onto soil at the former ammunition dump area in Clark Special Economic Zone, and therefore could not have resulted in environmental radioactive contamination.

Lead Concentrations in Soil and Plants

The results of analysis of Pb in soil and plants are shown in Table 3. Pb concentrations in ten soil samples ranged from 12 to 38 mg/kg with a mean concentration of 22.2 ± 7.19 mg/kg. These values are lower compared to the measurements made by the Bureau of Soils and Water Management (BSWM) in Luzon in 1995-1997, which ranged from 15 mg/kg to 76 mg/kg (6). The analytical

technique used by BSWM for stable lead analysis was acid digestion followed by atomic absorption spectrometry. In plants, the concentrations of Pb in all five samples analyzed are below the detectable limit of the equipment used. Please see Table 4. Assessment of potential hazard to human health due to contamination is made by comparing soil analytical results with EPA Region III Risk-Based Concentration (RBC) criteria for soil, with a value of 1000 mg/kg. The average concentration of Pb in soil (22.2 ± 7.19 mg/kg) at the former ammunition dump area is way below the industrial risk base concentration, and therefore, does not pose any danger to human health.

Table 3. Stable Lead Concentrations in Soil Samples

Sample Code	Type	Pb (mg/kg)
CDC-S1	Soil	38 ± 5
CDC-S2	Soil	27 ± 4
CDC-S3	Soil	19 ± 3
CDC-S4	Soil	26 ± 4
CDC-S5	Soil	12 ± 4
CDC-S6	Soil	18 ± 4
CDC-S7	Soil	20 ± 4
CDC-S8	Soil	24 ± 4
CDC-S9	Soil	22 ± 4
CDC-S10	Soil	16 ± 4
	mean	22.2 ± 7.19
	n	10

Industrial Risk Base Concentration (RBC) = 1000 mg/kg
LD = Detection Limit

Table 4. Stable Lead Concentrations in Plant Samples

CDC-A7	Amargoso	< DL
CDC-P7	Patola	< DL
CDC-T7	Eggplant	< DL
CDC-R8	Rice plant	< DL
CDC-R9	Rice plant	< DL

LD = Detection Limit

REFERENCES

1. Herman Joseph S. Kraft and Renato C. De Castro. US Military Presence in Southeast Asia: Forward Development in the Post-Bases Era. CIRSS Report No. 4. Center for International Relations and Strategic Studies, Foreign Service Institute. 1994
2. Paul Bloom, Alex Carlos, Jorge Emmanuel and Theodore Schettler. Environmental and Health Impact Report on Known and Potentially Contaminated Sites at Former Military Bases in the Philippines. Unitarian Universalist Service Committee. August 1994.
3. Unpublished Data. Health Physics Research Section. Atomic Research Department. Philippine Nuclear Research Institute.
4. PNRI Report. Comprehensive Radiological Tests in Clark Using Carborne Gamma Ray Spectrometer. Philippine Nuclear Research Institute. April 1998.

5. PNRI Report. Radiological Tests for Priority Sites in the Main Clark Special Ecozone. Philippine Nuclear Research Institute. November 1997.
6. BSWM Report. Lead Measurements in Soil and Plants Collected in Luzon from 1995 to 1997. Bureau of Soils and Water Management. 2002.
7. Weston International. Soil and Water Baseline Study Report. Executive Summary Prepared for Clark Development Corporation. August 1997.

APPENDIX G

IEC MATERIAL IN THE FORM OF POWERPOINT PRESENTATION ENTITLED “ANALYSIS OF RADIATION AND LEAD IN SOIL AND VEGETABLES GROWN AT THE FORMER AMMUNITION DUMP AREA IN CSEZ”

The information, education and communication (IEC) material was presented by the Student Manager during the seminar at the chapel of Barangay Macapagal Village in Mabalacat, Pampanga on Nov. 9, 2002. The theme of the social marketing campaign was: *KAALAMAN SA RADYASYON: GABAY SA KALUSUGAN, KABUHAYAN, AT KAPAYAPAAAN*. About sixty (60) people attended the seminar consisting of residents of Barangay Macapagal Village, teachers of Barangay Macapagal Elementary School, officials of the local government unit of Brgy. Macapagal Village, and employees and officials of Clark Development Corporation. Also present in the seminar to lend support to the Student Manager were Dr. Alumanda M. Dela Rosa, Director of the Philippine Nuclear Research Institute, Mr. Juan Miguel B. Fuentes, Manager of the Environment Planning and Management Department of Clark Development Corporation, and the staff of the Information Services Section of PNRI headed by Ms. Rhoda Leonin.



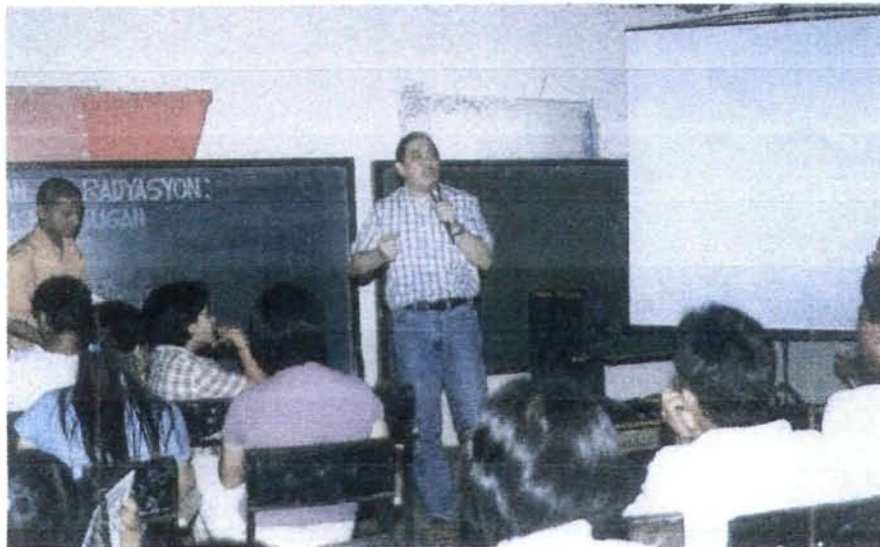
The Student Manager (extreme left) with LGU Officials and School Teachers of Barangay Macapagal Village, Mabalacat, Pampanga



**Ms. Rhoda Leonin, Chief of Information Services Section
Philippine Nuclear Research Institute**



**Dr. Alumanda M. Dela Rosa, Director of the
Philippine Nuclear Research Institute**



**Mr. Juan Miguel B. Fuentes, Manager of Environmental Planning
and Management Department, Clark Development Corporation**



Clark Development Corporation Employees



**Barangay residents raising their hands to express acceptability of
PNRI findings of non-radioactive contamination at the
former ammunition dump area in CSEZ**



Mr. FIL GARCIA, the Student Manager



**The PHILIPPINE NUCLEAR RESEARCH INSTITUTE
Commonwealth Avenue, Diliman, Quezon City**

Analysis of Radiation and Lead in Soil and Vegetables Grown at the Former Ammunition Dump Area in Clark Special Economic Zone

By

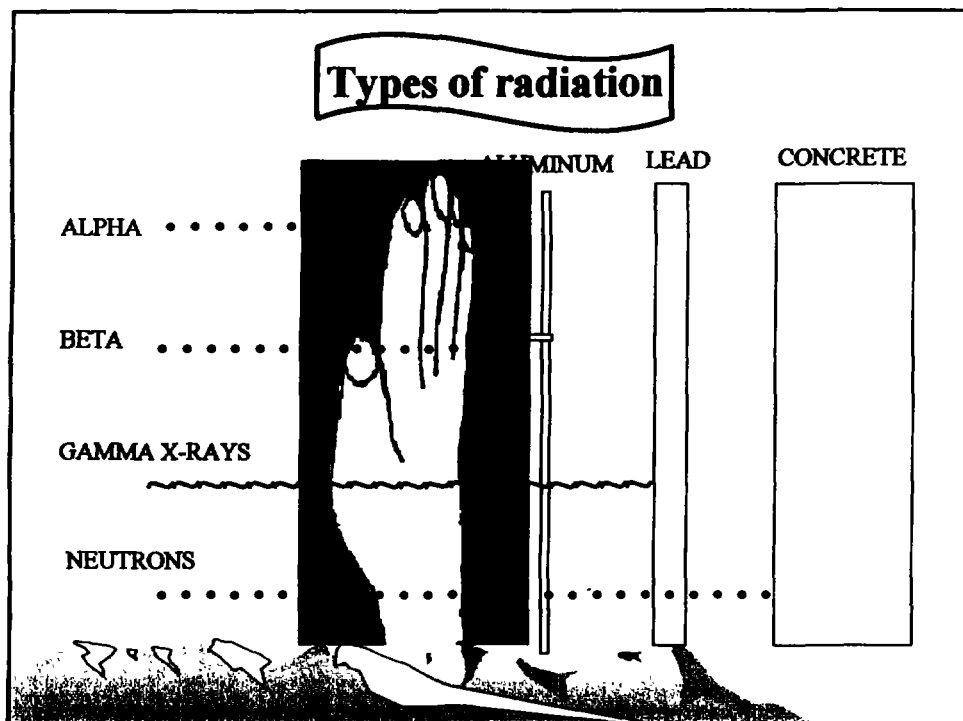
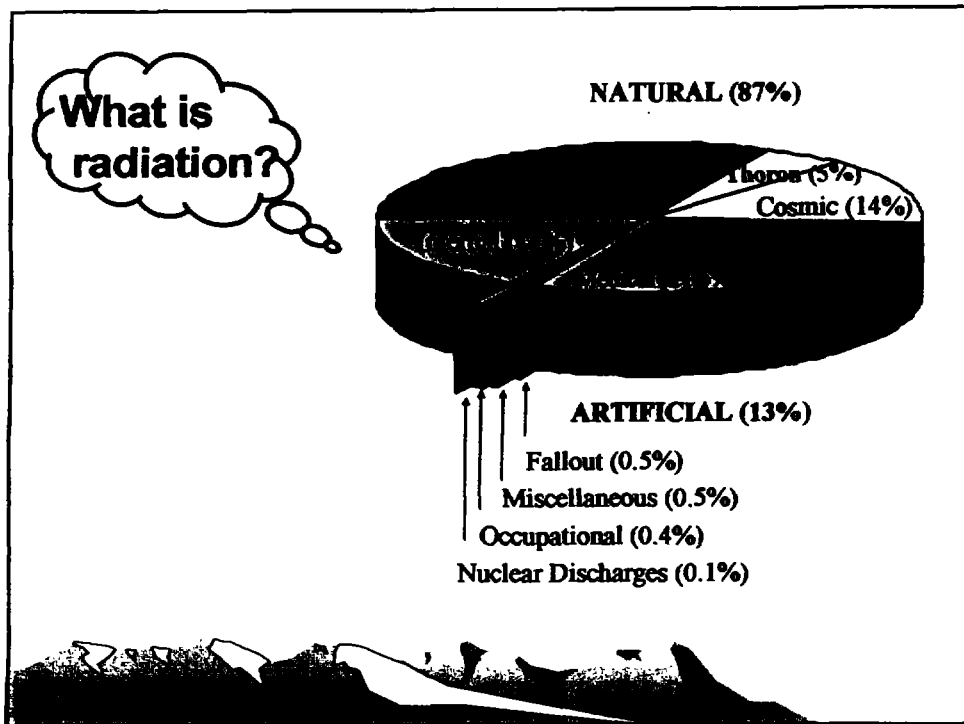
Teofilo Y. Garcia
Philippine Nuclear Research Institute

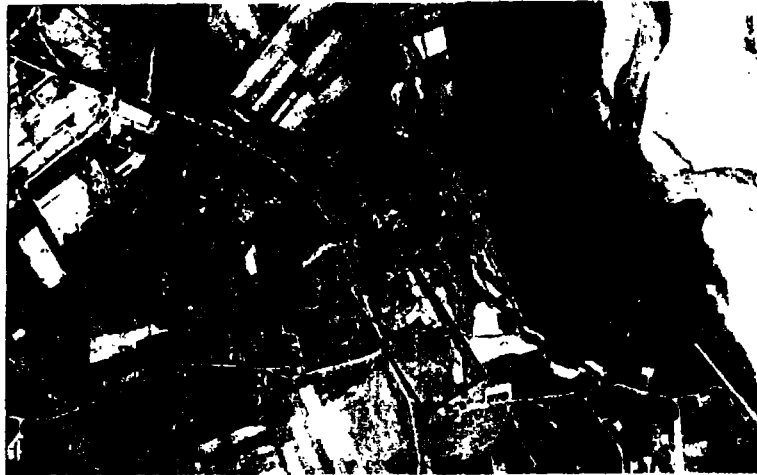


Objectives:

- To determine the presence of Cs-137 radioactivity in soil and plants at the former ammunition dump area in CSEZ
- To determine lead concentrations in soil and plants.





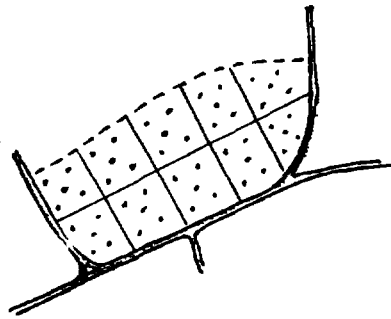


Map of Experimental Farm located at the Former Ammunition Dump Area



The Experimental Farm

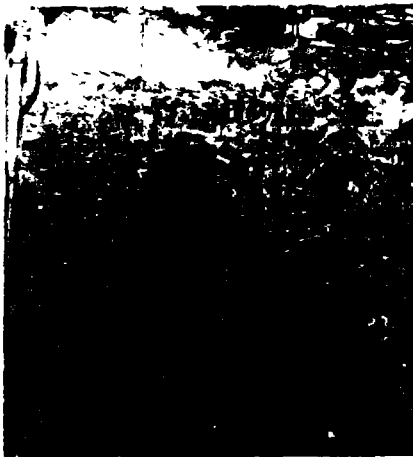




Grid of Farm and Soil Sampling Cores



Methodology



Soil Sampling





Plant Sampling



Philippine Nuclear Research Institute



Laboratory Procedures

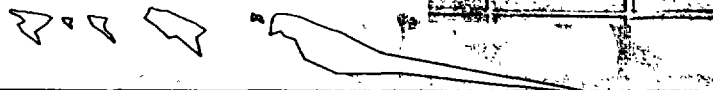


Cutting of plant samples

Weighing of samples
(initial weighing)



Drying of samples in
convection oven

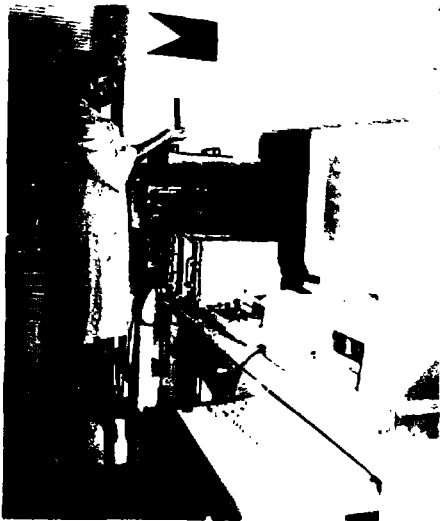




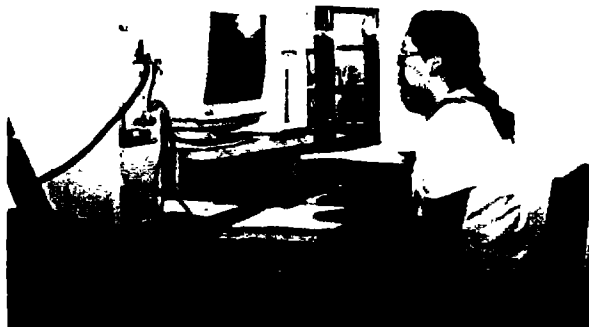
Pulverizing of samples with mortar and pestle



Grinding of samples with Wiley Mill



Gamma spectrometry of Cesium-137



XRF analysis of Lead

Results of Analysis

Cesium-137 radioactivity concentration in (2002)

Soil = LLD (background) to 1.06 Bq/kg

Plants = LLD (background) to 0.72 Bq/kg

Results of previous monitoring at Clark (1996-1998):

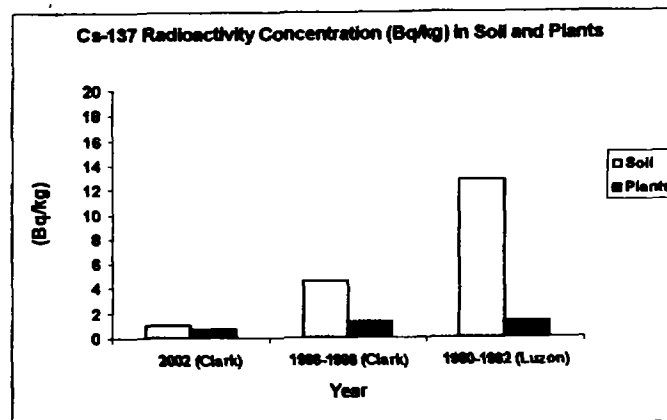
Soil = 0.98 to 4.64 Bq/kg

Plants = 0.07 to 1.34 Bq/kg

Cs-137 activity range concentration in the country (1980-1992):

Soil = 0.09 to 12.77 Bq/kg

Plants = 0.7 to 1.33 Bq/kg



Results of Analysis

Lead concentration in (2002):

Soil = 12 to 38 mg/kg

Plants = ND (non-detectable)

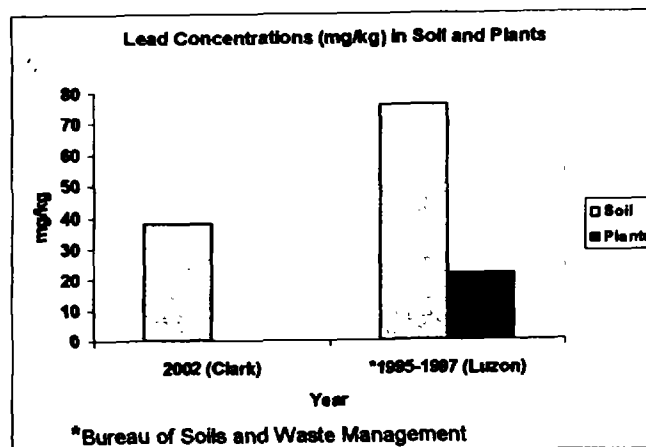
Lead measurements by Bureau of Soils and Water Management (BSWM) in Luzon (1995-1997):

Soil = 15 to 76 mg/kg

Plants = ND to 22 mg/kg

Industrial Risk Base Concentration (RBC):

RBC = 1000 mg/kg



CONCLUSION

**Results of analyses are within background values
and do not pose any hazard to public health.**

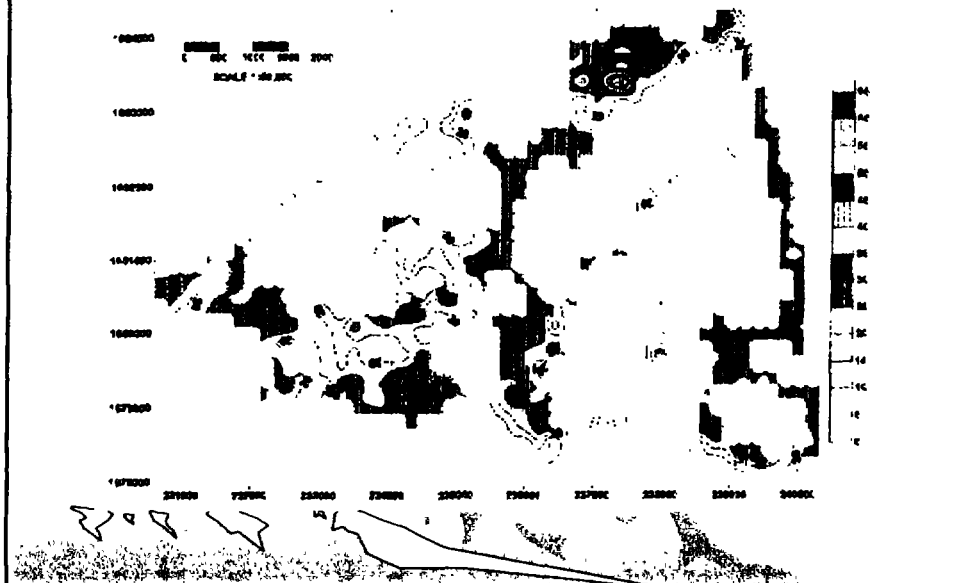
Previous Research Studies Made by the Philippine Nuclear Research Institute at Clark Special Economic Zone



Photo by AQI/late

Measurement of air gamma dose rates with car-borne gamma ray spectrometer (Exploranium GR-850). This equipment is sensitive and can distinguish natural from man-made radionuclides. A similar type was used to delineate contaminated areas in Europe following the Chernobyl accident and to locate the radioactive debris of COSMOS-954.

Radiation Levels in Air at Clark Special Economic Zone



Radiation Levels in Air In Suspected Sites at CSEZ

LOCATION	n	AIR GAMMA DOSE RATE (nGy/h)
Landfill 1	55	26.99 ± 3.57
Landfill 2	137	28.67 ± 3.57
Landfill 3	65	30.63 ± 3.43
Igloo Type Armory (inside)	392	37.93 ± 4.67
Igloo Type Armory (outside)	269	26.49 ± 3.06
Magazine Armory (building)	392	30.04 ± 3.70
Abandoned Hospital	140	29.29 ± 3.34
Incinerator 1 (near hospital)	23	25.21 ± 1.86
Incinerator 2	21	31.65 ± 4.15
Mimosa Housing	173	18.58 ± 1.68
PAF Housing	295	15.47 ± 1.36
Freedom Ring	84	13.27 ± 1.27
Heroes Cemetery	110	30.19 ± 3.90
CSEZ Road Network	4719	23.83 ± 2.44
AVERAGE		26.30 ± 6.68

This table indicates the specific areas where more detailed survey of radiation levels in air were conducted the number of measurements (n) and the average air gamma dose rate in the areas of interest. The areas that were most likely to have radioactive contamination based on previous land use were selected. The dose rates observed, including inside the armory, are within background levels.

Background Radioactivity Levels Due to Natural Sources in the Philippines

Average Air Gamma Dose Rate

Cosmic Radiation:	21 nGy h ⁻¹
Terrestrial Radiation:	23 nGy h ⁻¹
Total Dose:	44 nGy h ⁻¹
Number of Locations:	1645

A nationwide survey of background radioactivity was conducted throughout the Philippines. The average air gamma dose rate due to terrestrial radiation in the Philippines is 23 nGy/h. This serves as a benchmark in assessing any increase due to man-made sources.



Sampling of water from CABCOM well which was used by Mt. Pinatubo refugees for drinking water.



Analysis of Drinking Water from Clark

LOCATION	¹³⁷ Cs mBq/l	³ H mBq/l
Well water #1	ND	ND
Well water #2	ND	ND
Cabcom well water	ND	ND
CDC Main Office	ND	ND

ND = not detected

Cesium-137 and tritium which are good indicators of radioactive contamination were not detected in the water samples.



Soil samples from suspected sites were collected for radionuclide analysis. The firing range is one of the areas surveyed because of the current use of depleted uranium as bullet shells.



Comparison of Levels of Natural Radionuclides in Soil Samples

Radionuclide	Clark Average Activity Bq/kg dry	Country Average Activity Bq/kg dry
^{238}U	12 \pm 6	14 \pm 11
^{232}Th	14 \pm 4	16 \pm 13
^{40}K	142 \pm 45	212 \pm 115

The average activity concentration of predominant natural radionuclides including ^{238}U in soil samples collected from Clark are within the range of values observed in soil from other parts of the country.



Cesium-137 in Soil Samples from Suspected Sites

LOCATION	^{137}Cs Bq/kg dry	LLD
Landfill 1	ND	
Landfill 2	0.96 \pm 0.29	0.92
Landfill 3	4.64 \pm 0.51	1.41
Old Hospital	1.14 \pm 0.32	1.00
Old Hospital Incinerator	ND	
Armory	ND	
Firing Range	ND	
CDC Main Office	ND	
Mabalacat Landfill 1 m deep	ND	
Mabalacat Landfill surface	ND	
Old Landfill construction area	ND	

ND = not detected

^{137}Cs Activity Range in the Country: <0.09 to 12.77 Bq/kg dry

The activity concentration of ^{137}Cs in soil samples were either not detected or within the range of background levels due to nuclear weapons tests conducted in the late 1950s abroad.



**THE APPLICATION OF VEHICLE BORNE AND GROUND GAMMA RAY
SPECTROMETRY IN ENVIRONMENTAL RADIOACTIVITY SURVEY AND
MONITORING: EXAMPLES FROM THE PHILIPPINES**

**Rolando Y. Reyes, Christina A. Petrache, Nardo Q. Garcia,
Estrellita U. Tabora and Julie G. Juson**
*Nuclear Materials Research Group, Atomic Research Division,
Philippine Nuclear Research Institute, Diliman, Quezon City, Philippines*
rolyreyes@yahoo.com

Teofilo Y. Garcia and Alejandro Q. Nato, Jr.
*Health Physics Research Group, Atomic Research Division,
Philippine Nuclear Research Institute, Diliman, Quezon City, Philippines*

**Presented at the International Nuclear Conference 2002
Kuala Lumpur, Malaysia
October 15-18, 2002**



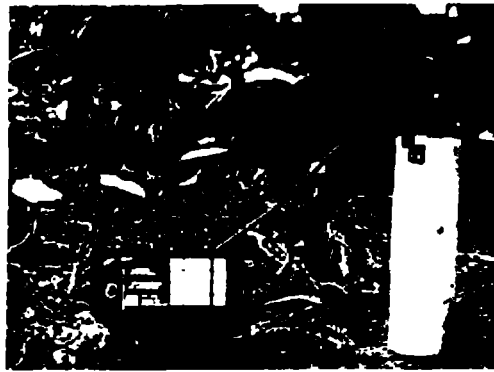
CARBORNE (VEHICLE BORNE) SURVEY



4 x 4 x 16 inches [NaI(Tl)] prismatic detector
Speed of vehicle = 10-20 Km/h
Measurements of K, U and Th every 5 s
Measurements of locations every 5 s
by Global Positioning System (GPS)



FOOTBORNE (GROUND) SURVEY



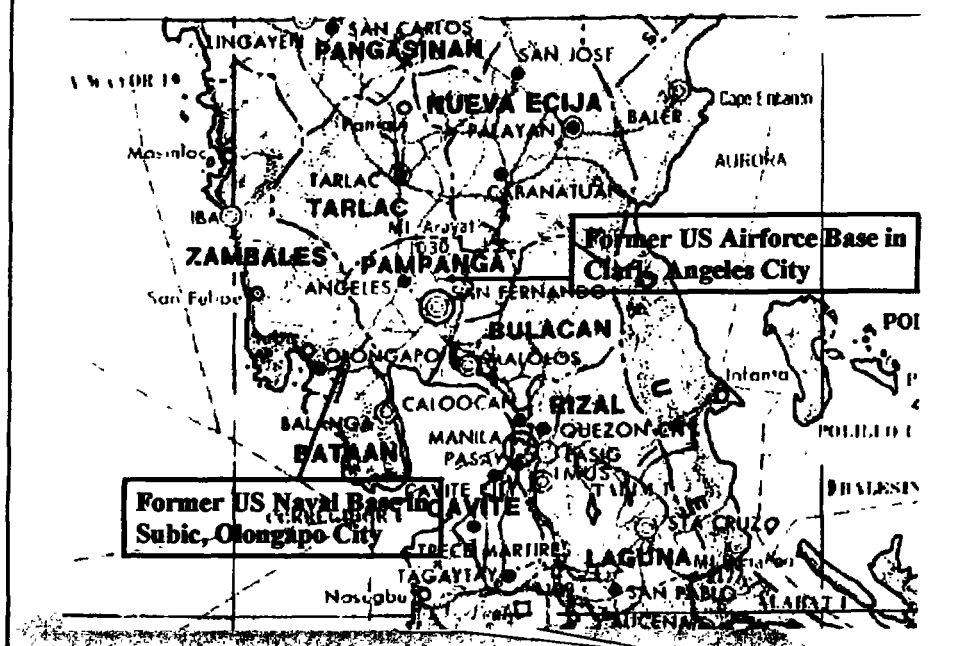
PORTABLE GAMMA RAY SPECTROMETER
3 x 3 inches [NaI(Tl)] crystal detector



Armory and magazine area



Radiological Surveillance of Former US Bases: Clark and Subic



RESULTS

1. No observed significant increases in the ratio indicative of the absence of man-made sources of radiation.
2. Natural radiation levels:
 - a. CLARK - 5.6 to 89.4 nGy/y, average = 25.3 ± 9.9 nGy/h (4,178 measurements)
 - b. SUBIC - 0.6 to 73.4 nGy/y, average = 13.5 ± 6.8 nGy/h (6,018 measurements)
3. Averages $\ll 44$ nGy/h – Philippine average natural radiation level



dacal pong salamat!!!



Appendix H

•SEMINAR ON ENVIRONMENTAL RADIOLOGICAL STUDIES
AT CLARK SPECIAL ECONOMIC ZONE. •

• NOVEMBER 9, 2002 •

• Agency: PHILIPPINE NUCLEAR RESEARCH INSTITUTE (PNRI)-DOST.

REGISTRATION FORM

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• NOVEMBER 9, 2002 •

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• NOVEMBER 9, 2002 •
• Agency: PHILIPPINE NUCLEAR RESEARCH INSTITUTE (PNRI)-DOST •

[illegible]

Q1

Table 1. Proportion of Respondents Who Do Not Believe that Wastes Left in CAB is Harmful
(number of respondents who said NO to Q1)

	Number	Proportion	Percent
Before	23	0.32394	32.39%
After	32	0.45070	45.07%

Ho: $P_0 = P_1$ Ha: $P_0 < P_1$ where P_0 is the proportion before social marketing
 P_1 is the proportion after social marketing

$$P_{ave} = \frac{23+32}{71+71} = \frac{55}{142} = 0.387324$$

$$\text{Test Statistic: } z = \frac{-0.12676}{0.08176} = -1.55041$$

$$z = \frac{-0.12676}{\sqrt{0.237304 * 0.028169}}$$

$$= \frac{-0.12676}{\sqrt{0.006685}}$$

$$= \frac{-0.12676}{0.08176}$$

$$= -1.55041$$

$$z(\text{tab}) = -1.64 \text{ at } 95 \% \text{ level of confidence}$$

$$z(\text{tab}) = -1.29 \text{ at } 90 \% \text{ level of confidence}$$

Decision: If $z \geq z(\text{tab})$, accept H_0 If $z < z(\text{tab})$, reject H_0

Conclusion:

1. Since $Z > Z(\text{tab})$, there is no reason to reject the null hypothesis at 95% level of confidence thus, there is no reason to say that the proportions of respondents NOT believing that wastes left in CAB are hazardous differ before and after introducing social marketing
==> increase in proportion (change in perception for the better) is NOT significant
2. Since $Z < Z(\text{tab})$, the null hypothesis is rejected at 90% level of confidence thus, the proportion of respondents NOT believing that wastes left in CAB are hazardous after social marketing is introduced is greater than that when social marketing is not yet introduced
==> increase in proportion (change in perception for the better) is significant

Q2

Table 2. Proportion of Respondents Who Believe that Wastes Left in CAB is NOT Radioactive
(number of respondents who said YES to Q2)

	Number	Proportion	Percent
Before	35	0.49296	49.30%
After	60	0.84507	84.51%

Ho: $P_0 = P_1$

Ha: $P_0 < P_1$

where P_0 is the proportion before social marketing
 P_1 is the proportion after social marketing

$$P_{ave} = \frac{35+60}{71+71} = \frac{95}{142} = 0.669014$$

$$\text{Test Statistic: } z = \frac{-0.35211}{0.078978} = -4.45834$$

$$z = \frac{-0.35211}{\sqrt{0.221434 * 0.028169}}$$

$$= \frac{-0.35211}{\sqrt{0.006238}}$$

$$= \frac{-0.35211}{0.078978}$$

$$= -4.45834$$

$$z(\text{tab}) = -1.64 \text{ at } 95 \% \text{ level of confidence}$$

$$z(\text{tab}) = -1.29 \text{ at } 90 \% \text{ level of confidence}$$

Decision: If $z \geq z(\text{tab})$, accept Ho
If $z < z(\text{tab})$, reject Ho

Conclusion:

1. Since $Z < Z(\text{tab})$, the null hypothesis is rejected at 90% and 95% levels of confidence thus, the proportion of respondents believing that wastes left in CAB are NOT radioactive after social marketing is introduced is greater than that when social marketing is not yet introduced
==> increase in proportion (change in perception for the better) is significant

Q3

Table 3. Proportion of Respondents Who Believe that There is NO Widespread Radioactive Contamination in and around CAB (number of respondents who said YES to Q3)

	Number	Proportion	Percent
Before	36	0.50704	50.70%
After	58	0.81690	81.69%

$H_0: P_0 = P_1$ $H_a: P_0 < P_1$ where P_0 is the proportion before social marketing
 P_1 is the proportion after social marketing

$$P_{ave} = \frac{36+58}{71+71} = \frac{94}{142} = 0.661972$$

$$\text{Test Statistic: } z = \frac{-0.30986}{0.079393} = -3.90285$$

$$z = \frac{-0.30986}{\sqrt{0.223765 * 0.028169}}$$

$$= \frac{-0.30986}{\sqrt{0.006303}}$$

$$= \frac{-0.30986}{0.079393}$$

$$= -3.90285$$

$$z_{(tab)} = -1.64 \text{ at } 95 \% \text{ level of confidence}$$

$$z_{(tab)} = -1.29 \text{ at } 90 \% \text{ level of confidence}$$

Decision: If $z \geq z_{(tab)}$, accept H_0
 If $z < z_{(tab)}$, reject H_0

Conclusion:

1. Since $Z < Z_{(tab)}$, the null hypothesis is rejected at 90% and 95% levels of confidence thus, the proportion of respondents believing that there is NO widespread radioactive contamination in CAB after social marketing is introduced is greater than that when social marketing is not yet introduced
 ==> increase in proportion (change in perception for the better) is significant

Q4

Table 4. Proportion of Respondents Who Believe that There is NO Widespread Radioactive Contamination in and around CAB that is Harmful to Health (number of respondents who said YES to Q4)

	Number	Proportion	Percent
Before	42	0.59155	59.15%
After	61	0.85915	85.92%

Ho: $P_0 = P_1$ Ha: $P_0 < P_1$ where P_0 is the proportion before social marketing
 P_1 is the proportion after social marketing

$$P_{ave} = \frac{42+61}{71+71} = \frac{103}{142} = 0.725352$$

$$\text{Test Statistic: } z = \frac{-0.26761}{0.074911} = -3.57229$$

$$z = \frac{-0.26761}{\sqrt{0.199216 * 0.028169}}$$

$$= \frac{-0.26761}{\sqrt{0.005612}}$$

$$= \frac{-0.26761}{0.074911}$$

$$= -3.57229$$

$$z(\text{tab}) = -1.64 \text{ at } 95 \% \text{ level of confidence}$$

$$z(\text{tab}) = -1.29 \text{ at } 90 \% \text{ level of confidence}$$

Decision: If $z \geq z(\text{tab})$, accept Ho
 If $z < z(\text{tab})$, reject Ho

Conclusion:

1. Since $Z < Z(\text{tab})$, the null hypothesis is rejected at 90% and 95% levels of confidence thus, the proportion of respondents believing that there is NO widespread radioactive contamination in CAB that is harmful to health after social marketing is introduced is greater than that when social marketing is not yet introduced ==> increase in proportion (change in perception for the better) is significant

Q5

Table 5. Proportion of Respondents Who Believe that Plants/Vegetables in and around CAB is NOT Radioactive and Safe for Consumption (number of respondents who said YES to Q5)

	Number	Proportion	Percent
Before	55	0.77465	77.46%
After	66	0.92958	92.96%

Ho: $P_0 = P_1$ Ha: $P_0 < P_1$ where P_0 is the proportion before social marketing
 P_1 is the proportion after social marketing

$$P_{ave} = \frac{55+66}{71+71} = \frac{121}{142} = 0.852113$$

$$\text{Test Statistic: } z = \frac{-0.15493}{0.05958} = -2.60037$$

$$z = \frac{-0.15493}{\text{sqrt} (0.126017 * 0.028169)}$$

$$= \frac{-0.15493}{\text{sqrt} 0.00355}$$

$$= \frac{-0.15493}{0.05958}$$

$$= -2.60037$$

$$z (tab) = -1.64 \text{ at } 95 \% \text{ level of confidence}$$

$$z (tab) = -1.29 \text{ at } 90 \% \text{ level of confidence}$$

Decision: If $z \geq z (tab)$, accept Ho
 If $z < z (tab)$, reject Ho

Conclusion:

1. Since $Z < Z (tab)$, the null hypothesis is rejected at 90% and 95% levels of confidence thus, the proportion of respondents believing that the plants/veg in and around CAB has NO radioactive contamination and safe for consumption after social marketing is introduced is greater than that when social marketing is not yet introduced
 ==> increase in proportion (change in perception for the better) is significant

Q6

Table 6. Distribution of Respondents Who Will Agree to Eat Vegetables, Etc. Planted in and around CAB
(number of respondents who said YES to Q6)

	Number	Proportion	Percent
Before	58	0.81690	81.69%
After	68	0.95775	95.77%

Ho: $P_0 = P_1$ Ha: $P_0 < P_1$ where P_0 is the proportion before social marketing
 P_1 is the proportion after social marketing

$$P_{ave} = \frac{58+68}{71+71} = \frac{126}{142} = 0.887324$$

$$\text{Test Statistic: } z = \frac{-0.14085}{0.053069} = -2.65399$$

$$z = \frac{-0.14085}{\sqrt{(0.09998 * 0.028169)}}$$

$$= \frac{-0.14085}{\sqrt{0.002816}}$$

$$= \frac{-0.14085}{0.053069}$$

$$= -2.65399$$

$$z_{(tab)} = -1.64 \text{ at } 95 \% \text{ level of confidence}$$

$$z_{(tab)} = -1.29 \text{ at } 90 \% \text{ level of confidence}$$

Decision: If $z \geq z_{(tab)}$, accept Ho
 If $z < z_{(tab)}$, reject Ho

Conclusion:

1. Since $Z < Z_{(tab)}$, the null hypothesis is rejected at 90% and 95% levels of confidence thus, the proportion of respondents who will agree to eat plants/veg in and around CAB after social marketing is introduced is greater than that when social marketing is not yet introduced
 ==> increase in proportion (change in perception for the better) is significant

Q7

Table 7. Distribution of Respondents Who Believe that Hazardous Wastes Include Radioactive Contamination
(number of respondents who said NO to Q7)

	Number	Proportion	Percent
Before	23	0.32394	32.39%
After	65	0.91549	91.55%

Ho: $P_0 = P_1$ Ha: $P_0 < P_1$ where P_0 is the proportion before social marketing
 P_1 is the proportion after social marketing

$$P_{ave} = \frac{23+65}{71+71} = \frac{88}{142} = 0.619718$$

$$\text{Test Statistic: } z = \frac{-0.59155}{0.081477} = -7.26031$$

$$z = \frac{-0.59155}{\sqrt{(0.235668 * 0.028169)}}$$

$$= \frac{-0.59155}{\sqrt{0.006639}}$$

$$= \frac{-0.59155}{0.081477}$$

$$= -7.26031$$

$$z(\text{tab}) = -1.64 \text{ at } 95 \% \text{ level of confidence}$$

$$z(\text{tab}) = -1.29 \text{ at } 90 \% \text{ level of confidence}$$

Decision: If $z \geq z(\text{tab})$, accept H_0
 If $z < z(\text{tab})$, reject H_0

Conclusion:

1. Since $Z < Z(\text{tab})$, the null hypothesis is rejected at 90% and 95% levels of confidence thus, the proportion of respondents believing that hazardous wastes include radioactive contamination after social marketing is introduced is greater than that when social marketing is not yet introduced
 ==> increase in proportion (change in perception for the better) is significant

Table 1. Distribution of Respondents By Belief that Wastes Left in CAB is Harmful

Time of Survey	Believed Harmful		Believed Not Harmful		Don't Know	
	Number	Percent	Number	Percent	Number	Percent
Before Soc Mktg	46	64.79%	23	32.39%	2	2.82%
After Soc Mktg	32	45.07%	32	45.07%		0.00%

Table 2. Distribution of Respondents By Belief that Wastes Left in CAB is NOT Radioactive

Time of Survey	Believed Not Radioactive		Believed Radioactive		Don't Know	
	Number	Percent	Number	Percent	Number	Percent
Before Soc Mktg	35	49.30%	31	43.66%	5	7.04%
After Soc Mktg	60	84.51%	11	15.49%	0	0.00%

Table 3. Distribution of Respondents By Belief that there is NO Widespread Radioactive Contamination in and Around CAB

Time of Survey	Believed No Widespread Radioactive		Believed There is Widespread Radioactive		Don't Know	
	Number	Percent	Number	Percent	Number	Percent
Before Soc Mktg	36	50.70%	30	42.25%	5	7.04%
After Soc Mktg	58	81.69%	13	18.31%	0	0.00%

Table 4. Distribution of Respondents By Belief that there is NO Widespread Radioactive Contamination in and Around CAB that is Harmful to Health

Time of Survey	Believed No Widespread Radioactive That is Harmful to Health		Believed Radioactive That is Harmful to Health		Don't Know	
	Number	Percent	Number	Percent	Number	Percent
Before Soc Mktg	42	59.15%	22	30.99%	7	9.86%
After Soc Mktg	61	85.92%	10	14.08%	0	0.00%

Table 5. Distribution of Respondents By Belief that Plants/Vegetables in and Around CAB is NOT Radioactive and Safe for Consumption

Time of Survey	Believed Plants/Veg Have NO Radioactive Contamination & Safe to Consume		Believed Plants/Veg Have Radioactive Contamination & NOT Safe to Consume		Don't Know	
	Number	Percent	Number	Percent	Number	Percent
Before Soc Mktg	55	77.46%	14	19.72%	2	2.82%
After Soc Mktg	66	92.98%	5	7.04%	0	0.00%

Table 6. Distribution of Respondents By Agreement to Consume Plants/Vegetables Planted in and Around CAB

Time of Survey	Agreed to Consume Plants/Veg Planted in and around CAB		Disagreed to Consume Plants/Veg Planted in and around CAB		Don't Know	
	Number	Percent	Number	Percent	Number	Percent
Before Soc Mktg	58	81.69%	10	14.08%	3	4.23%
After Soc Mktg	68	95.77%	3	4.23%	0	0.00%

Table 7. Distribution of Respondents By Belief that Hazardous Wastes Includes Radioactive Contamination

Time of Survey	Hazardous Wastes Includes Radioactive Contamination		Hazardous Wastes Do Not Include Radioactive Contamination		Don't Know	
	Number	Percent	Number	Percent	Number	Percent
Before Soc Mktg	38	53.52%	23	32.39%	10	14.08%
After Soc Mktg	6	8.45%	65	91.55%	0	0.00%

Table 8. Sex Distribution of Respondents

Sex	Number	Percent
Male	41	57.75
Female	30	42.25
Both Sexes	71	100.00

Table 9. Age Distribution of Respondents

Age (in years)	Number	Percent
Less than 20	15	21.13
20-29	21	29.58
30-39	20	28.17
40-49	5	7.04
50-59	7	9.86
60 and over	3	4.23
All ages	71	100.00

Table 10. Distribution of Respondents by Civil Status

Civil Status	Number	Percent
Married	44	61.97
Not Married	27	38.03
Total	71	100.00

Table 11. Distribution of Respondents by Educational Attainment

Educ. Attainment	Number	Percent
Elementary	28	39.44
High School	10	14.08
Vocational	5	7.04
College	25	35.21
Post Graduate	3	4.23
Total	71	100.00

Appendix J



TEOFILO Y. GARCIA
The Student Manager

The student manager is a Senior Science Research Specialist of the Philippine Nuclear Research Institute (PNRI), an agency of the Department of Science and Technology in Diliman, Quezon City. He conducts scientific researches along the field of Health Physics particularly on environmental radiological surveillance programs of the Institute. He acted as team leader in the environmental radiological survey made at Clark Special Economic Zone and at Subic Freeport and Economic Zone. The radiological survey was part of PNRI's commitment under the Philippine Task Force on Toxic and Hazardous Wastes in Former US Military Bases. Presently, he serves as team leader of various projects at

Health Physics Research Section of PNRI, particularly in the establishment of the Comprehensive Nuclear Test Ban Treaty Organization (CTBTO), which include the National Data Center (NDC-N137) located at PNRI and the International Monitoring System Radionuclide Station (RN-52) located in PAGASA Meteorological Station in Tanay, Rizal.

Mr. Garcia has been with PNRI since 1974. He has received special trainings on nuclear research and development in various countries including the United States, Australia, Austria, Japan, China, Pakistan, Malaysia and Indonesia. He has authored or co-authored about thirty technical papers published in scientific journals here and abroad. Mr. Garcia obtained the degree of B.S. Chemistry from the Far Eastern University and has taken graduate courses (27 units) on MS Chemistry at the University of Sto. Tomas. Tenth among the thirteen children of Hermenegildo Garcia and Olympia Yuzon, he was born in San Jose City, Nueva Ecija on February 28, 1952.