

Revitalizing the Rímac

Environmental Quality and Nonformal Education in Peru

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ABSTRACT

The following paper explores the use of nonformal environmental education programs as a supplement to existing environmental education under the national curriculum in Peru. The paper delves into the history of nonformal education and environmental education in Latin America and Peru, and exposes existing environmental concerns in the city of Lima and the Provincial District of Callao. Using the Municipal Government of Callao Department of Environmental Control's Environmental Education Program as an example, the paper demonstrates how nonformal education can be used as a tool to improve environmental quality in urban areas of Peru.

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INTRODUCTION

Formal environmental education became mandatory in public primary and secondary schools in Peru in 2007 under the National Law of Environmental Education. However, with an ever-increasing population, and consequently an increasing number of informal *barrios* and coastal settlements, the environment of the city of Lima and the Provincial District of Callao is in a desperate state of disrepair. Formal environmental education alone, particularly as a segment within the greater educative sector of the natural sciences, is not sufficient to tackle the metropolis' growing environmental needs.

The Peruvian economy is heavily based in the mining sector, thus the primary goal is resource exploitation while little attention is paid to the health of the environment. A lack of political will and public and private sector interventions have left citizens to their own initiative when constructing and developing their own neighborhoods. Thus it should come as no surprise that there are, “deficiencies in services, legal tenure, and formal approvals.” (Steinburg and Miranda Sara, 2000) The national government is centralized. The President's closest advisors are the heads of each ministry who compose the Presidential Cabinet. Many government functionaries, up to the most minute of positions in rural areas, are appointed by the President and his council and the majority of public funds are at the central government's disposal. Consequently, regional and municipal governments who are ultimately responsible for the local environment and well being of the people, receive minuscule funding for daily operations.

Public educative institutions (*instituciones educativas*, or IEs) are among those that suffer from the inadequate local and regional budgets, and while the basic curriculum is thorough it does little to highlight the importance of environmental stewardship; the environment is included only as a segment of general biological science classes. As I will demonstrate in this paper, nonformal education has the potential to enhance existing curricula, producing future stewards of the environment and improving environmental quality.

This paper discusses whether nonformal environmental education can play a significant role in improving sustainable environmental quality in areas where formal education falls short in urban areas of Peru. The paper examines the history and rolls of nonformal and environmental education in Latin America, followed by a careful examination of the current state of the environment in the densest urban areas of Peru – the city of Lima and the Provincial District of Callao – as it relates to environmental education. The paper uses the Municipal

Government of Callao Department of Environmental Control's Environmental Education Program as a case study, analyzing the program's effectiveness in reducing environmental contamination in the immediate area. The Environmental Education Program is analyzed to highlight its achievements, as well as evaluate whether it is fulfilling its purpose of supplementing the national environmental education curriculum. Finally, a short series of potential solutions is offered, illuminating one of the many paths forward for the urban environment and nonformal education in Peru.

CHAPTER ONE

The Missing Links

There is a great deal of literature available on nonformal education: its strengths and weaknesses, its origins, its evolution, and reasons for its existence. However, there is very little literature on nonformal education in Latin America or on Peru in particular. There is also a great deal of literature available on the topic of environmental education, and environmental education specific to Latin America. But again, there is very little literature available on environmental education, formal or nonformal, in Peru. There is a no man's land that has yet to be breached between the two fields of nonformal education and environmental education that in so many cases go hand in hand. The current state of the environment in Lima and Callao would suggest that current environmental education and community outreach programs are falling short. While the effects of these programs will not necessarily be immediate, something must be done to improve environmental quality in this densely populated urban area, and nonformal environmental education could be an important part of the solution.

Concepts and Definitions

Nonformal Education

Nonformal education has been a part of the realm of education since the beginning of time. Early hunter-gatherers taught their children which plants were safe to eat and how to hunt, early farmers taught their children how to grow crops and when to harvest. Thus, there are many definitions for the term. From close-knit community meetings to revolutionary literacy radio broadcasts and apprenticeships, nonformal education is a wide umbrella that encompasses many educative practices outside the realm of traditional organized schooling. However, nonformal education is best defined not by its technical definitions, but by its goals. *Nonformal* education is not to be confused with *informal* education that is education obtained passively in an informal setting. Nonformal education is usually structured and often has its own curricula and standards separate from formal education.

Informal education is the 'lifelong process by which every person acquires and accumulates knowledge, skills, attitudes and insights from daily experiences and exposure to the environment; nonformal education is 'any organized, systematic, educational activity carried on outside the framework of the formal system to provide selected types of learning to particular subgroups in the population, adults as well as

children'... The third or formal mode of learning is defined... as the 'institutionalized, chronologically graded and hierarchically structured educational system, spanning lower primary school and the upper reaches of the university. (Coombs and Ahmed, 1974, as quoted by La Belle, 1982; 161-162)

According to Thomas J. La Belle, nonformal education refers to, "organized out-of-school activities designed to enhance the participant's decision-making power and socio-economic status." (La Belle, 1976: 328)

Allan Rogers, one of the leading authors on nonformal education in the developed world, suggests that nonformal education is semi-structured education in the work place, community, or elsewhere that is not recognized by the formal education system. (Rogers, 2005: 2) In Rogers' words, "education through schooling is primarily to incorporate the younger generations into society... to reproduce and strengthen the dominant culture, to provide what people lack... [and] to bring about social change in strictly limited... directions only." (Rogers, 2005: 31)

Philip Coombs suggests that nonformal education is, "simply a convenient label covering a bewildering assortment of organized educational activities outside the formal system that are intended to serve identifiable learning needs of particular subgroups in any given population." (Coombs, 1976: 282). Coombs best describes the array of niches that nonformal education can fill within the field of education as a whole.

For the purposes of this paper, nonformal education refers to organized education programs reproduced within and outside of the formal schooling system, but that are not part of the formal curricula, and including all age groups regardless of the amount of schooling participants have received.

Environmental Education

Environmental education first made an appearance as part of the environmental movement during the 1970s in Europe. A working definition was established at the IUCN/UNESCO International Working Meeting on Environmental Education in the School Curriculum, held in Carson City, Nevada in 1970:

Environmental education is the process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the inter-relatedness among man, his culture, and his biophysical surroundings. Environmental education also entails practice in decision-making and self-formulation of a code of behavior about issues concerning environmental quality. (IUCN/UNESCO, 1970)

The working meeting in Nevada established a foundation for the international community, as well as publicly acknowledging the importance of environmental education at all levels of society.

The International Environmental Education Programme (IEEP) was then launched at the UNESCO/UNEP International Workshop on Environmental Education in Belgrade, Yugoslavia, in 1975. (Palmer, 1998) Out of the Workshop came the Belgrade Charter. The Belgrade Charter established a more formal definition of environmental education,

Environmental education, properly understood, should constitute a comprehensive lifelong education, one responsive to changes in a rapidly changing world. It should prepare the individual for life through an understanding of the major problems of the contemporary world, and the provision of skills and attributes needed to play a productive role towards improving life and protecting the environment with due regard given to ethical value. (UN, 1975)

The Belgrade Charter also created a series of education objectives, including awareness, attitude, skills, evaluation ability, and participation, and established guiding principles for environmental education programs. These education objectives and guiding principles for environmental education programs provided a lead into the UNESCO Intergovernmental Conference on Environmental Education in 1977. It was the aim of the Belgrade conference to involve both educators and politicians in order to translate any environmental education recommendations into policy at the national level in countries where environmental education had not yet been incorporated into the classroom. (Palmer, 1998)

The UNESCO Intergovernmental Conference on Environmental Education was held in Tbilisi, in what was then the USSR, in 1977. On its agenda, the Conference included major environmental problems in contemporary society; the role of education in facing environmental problems; current efforts at the national and international levels for the development of environmental education; strategies for the development of environmental education at the national and international levels; and regional and international cooperation for the development of environmental education. Many Conference participants acknowledged the importance of acting quickly and efficiently in an effort to stay intractable environmental problems, to be achieved through a widespread knowledge of the human and natural environment. The Conference expanded upon previous international definitions of environmental education, setting out ideas for what environmental education programs should look like. There was consensus in

that environmental education should span all dimensions of education, including in the creation of education policy at the national and international levels. Emphasis was placed on international cooperation, as it was admitted that, “the unity of purpose of all peoples and of all governments was necessary in order to forestall and solve environmental problems.” (UNESCO/UNEP, 1978)

In 1980, a joint effort by the IUCN, UNEP, and the WWF produced the World Conservation Strategy. The Strategy called for a complete change in attitude and behavior toward the biosphere, suggesting that the long term task of environmental education is to foster a new environmental ethic wherein human societies live in harmony with the natural world. All organizations involved in the creation of the Strategy agreed that although there has been progress made in spreading environmental awareness, current (1980) environmental education efforts were insufficient. While there had been a widespread increase in the overall amount of environmental literature, it had not necessarily been effective in persuading members of the general public, or even prominent decision makers of the importance of conservation and environmental education. (IUCN-UNEP-WWF, 1980)

For the purposes of this paper, environmental education represents the life-long learning model of the Belgrade Charter of 1975 that invokes ethics and responsibility to mold students into environmental stewards prepared to adapt to a changing world and to develop sustainable solutions to environmental problems.

Nonformal Education in Latin America

Nonformal education began in earnest in Latin America in the early 1940s under the name Fundamental Education. National programs were usually sponsored by Catholic churches, and were delivered in many forms, including in-person trainings and teachings broadcast via radio. Literacy programs sponsored by international organizations such as UNESCO were delivered by cultural missionaries who were trained in certain life-skills. Such internationally sponsored programs redirected their attention in the early 1950s to focus on community development as inspired by Mohandas Gandhi and Pajendra Pradesh in India. The intent of these community development programs was to demonstrate that local people could help themselves to develop using local resources. (La Belle, 2000: 22-23)

In the 1960s nonformal education programs adopted a revolutionary role in Latin America in the battle against the region’s dependency on the developed world. (La Belle, 2000:

24) Brazilian author Paulo Freire's infamous *Pedagogy of the Oppressed* highlighted the importance of literacy in escaping one's state of oppression below the boot heels of industrialized nations. (Freire,) Freire is known best for his "consciousness raising," that provided opportunities for people to participate in local politics. (La Belle, 2004)

In the late 1970s and early 1980s nonformal education took on the task of modernizing the Latin American region. Nonformal education used in the development process was focused mainly on the individual – providing entrepreneurial skills and encouraging the exploration of one's talents for the benefit of the whole. The 1970s also saw the emergence of "creative pedagogy" outside of the formal schooling system, manifesting itself in the form of community schools. (La Belle, 2000: 26)

The economic crisis of the 1980s brought development of the nonformal education sector to a standstill. With improvement in health care and quality of life, mortality rates in Latin America fell at the same time as population rates rapidly expanded, leaving many young job-seekers unaccounted for in the stagnant economy. This disequilibrium led to the formation of the so-called informal economy, a caste of workers made up of volunteers, domestic workers, and criminals. Between 30 and 40 percent of workers at that time in Latin America were employed in the informal economy. (La Belle, 200: 27) The informal economy still holds sway today in many Latin American countries. Since the formal system was affected so severely by the economic downturn and shift in the governments' financial foci, increasing attention was paid to the nonformal education sector and how it could play a role in preparing younger generations for participation in the informal economy. The popularity of nonformal education in Latin America is beneficial to the success of nonformal environmental education programs today.

Nonformal education played a significant role in the field of education as a whole in Latin America between 1950 and 1980. However, in the 1990s and into the 2000s an increase in large-scale, internationally funded formal education projects led to the field's demise in the region. In part this change was due to a world-wide push to increase enrollment in primary schools because of the Millennium Development Goals. With the rush of students on both primary and secondary schools throughout Latin America, expensive nonformal education programs were pushed by the way-side. (La Belle, 2000: 22)

As highlighted by La Belle, the majority of nonformal education programs in Latin America have emerged out of development efforts in the region. La Belle asserts that the

region's underdevelopment can be attributed to one of two theories: dependency and deprivation. Thus nonformal education goals have been created within the framework of these two theories of underdevelopment. (La Belle, 1976: 330)

Environmental Education in Latin America

An introduction to formal environmental education in Latin America is provided by authors such as Edgar González Gaudiano in his work, "Another lecture on the history of environmental education in Latin America and the Caribbean." (González Gaudiano, 1999) However, such histories fail to discuss the nonformal aspect of environmental education in the region, focusing solely on formal education practices.

The most thorough work on environmental education in Latin America was published in 1978 by Alejandro Teitelbaum in his *Paper on Environmental Education in Latin America*. Teitelbaum asserts that the environmental problem in Latin America has not arisen from over-consumption, but rather from a lack of basic elemental needs. This concept has been demonstrated in Peru where only recently have environmental issues come to the fore where previously the government was primarily concerned with eradicating extreme poverty. Teitelbaum encourages us to remember that the school is not *in* the environment but *a part of it*. Teitelbaum knowledgeably asserts that creating a specialized environmental education program requires a thorough study of the surroundings including population, housing, history, economy, social structure, infrastructure and services, political structure, and culture; environmental education is education in which everyone plays a role. Environmental education should incorporate a plethora of pedagogical styles and teaching methods; the environment itself becomes the principal teaching tool. Teitelbaum highlights issues such as lack of funding and rigid public curricula that have posed obstacles to environmental education in Latin America. (Teitelbaum, 1978) Teitelbaum's paper is more of a "how-to" manual than an explanation of the current state of environmental education in Latin America. His incorporation of diverse teaching styles and environments attests to La Belle's explanation of the diversification of nonformal education in Latin America during the 1970s.

Trélez Solís provides yet another perspective on the history of environmental education in Latin America. In Trélez Solís' view, the 1990s saw a triumph for environmental education in Latin America with the institution of environmental education programs at the primary and secondary levels in public schools, as well as an increased emphasis at the university level.

Tréllez Solís' "eco-pedagogy" has created an alternative dynamic in regards to environmental education, developing students' critical thinking skills, "holistic vision" of the material, and integration of knowledge from different backgrounds. (Tréllez Solís, 2006) Tréllez Solís notes that every culture and every society has different experiences and visions for the future that ultimately affect environmental education and pedagogical styles in general.

Education in Peru

The education system in Peru has seen vast improvements over the last few decades, with recent plans to eradicate illiteracy by 2011. (Ministerio de Educación, 2007) With a current literacy rate of 89.6 percent, the Peruvian Ministry of Education has a short period of time and much ground to cover in order to reach its target.

As of 2010, the Peruvian population stands at roughly 29 million people. (Fondo de Población de las Naciones Unidas – Perú, 2009) Approximately 30.3 percent of the population is aged between zero and 14 years, thus of primary and secondary school age. (UNdata, 2010) Government expenditure on education as a percentage of Gross Domestic Product (GDP) between 2005 and 2008 was approximately 2.5 percent annually. (UNdata, 2010) Violence between 1980 and 2000 perpetrated by the Marxist *Sendero Luminoso* or Shining Path movement caused a massive displacement of rural mountain dwellers and a dramatic increase in the urban population, now at 71.3 percent, the majority of whom live in Lima and Callao. (UNdata, 2010) Political unrest at this time also shifted the budgetary focus from social services, such as education, to national security, rehabilitation, and defeat of the rebel forces. Despite recent quelling of the violence, Peru's GDP growth rate is one of the highest in South America at 9.8 percent in 2008. (UNdata, 2010) Even with a high GDP growth rate, approximately 3.8 million people live in extreme poverty, 2.1 million of which are children. (UNICEF, 2004)

Primary school enrollment in some urban school districts, particularly Lima and Callao, is close to 100 percent; however, there are significant differences between districts, with the average primary school completion rate of just 77.7 percent for the nation. (Ministerio de Educación, 2009 (¿Cuántos niños tienen primaria completa y acceden a secundaria?)) National rates for the completion of secondary school are 17 percentage points lower at 60.7 percent. (Ministerio de Educación, 2009 (¿Cuántos jóvenes tienen secundaria completa?)) These rates notably improve when higher age brackets are considered, 94.1 percent of the population have completed primary school by the time they have reached 19 years of age. (Ministerio de

Educación, 2009 (¿Cuántos niños tienen primaria completa y acceden a secundaria?)) Similarly, 73.9 percent of the population has completed secondary school by the age of 24. (Ministerio de Educación, 2009 (¿Cuántos jóvenes tienen secundaria completa?)) The recent influx of people in urban centers has resulted in a significant socio-economic disparity in access to education between rich city dwellers and their counterparts living in outlying *invasiones*, or informal shantytowns. However, the severest disparity in education is between rural and urban children, particularly at the secondary school level.

Regional offices of the Ministry of Education are responsible for distributing education funds to their respective institutions based on each region's annual budget. Execution, supervision, and evaluation of education laws, curricula, and national development plans are the responsibility of the national office of the Ministry of Education. (Ministerio de Educación, 2008)

Quality of education in Peru is assessed by the Education Quality Measuring Unity (*Unidad de Medición de la Calidad Educativa*, or UMC) that produces an annual report on the state of education at the primary and secondary levels. (Unidad de Medición de la Calidad Educativa, 2009) The UMC is part of the Ministry of Education and is charged with developing the national education evaluation system. (Unidad de Medición de la Calidad Educativa, 2007) Evaluations cover basic literacy, communication, and mathematical skills, placing students at one of three levels (with three being the highest level of academic achievement). As of 2009, the majority of the student population was at the second level of achievement for each category in primary education. (Ministerio de Educación, 2009 (Resultados de la Evaluación Censal de Estudiantes)) Quality in education, while important to the Ministry of Education and individual educative institutions alike, is not uniform across the country.

Nonformal Education

The Peruvian Ministry of Education has created an Alternative Basic Education, or DIGEBA (*Dirección General de Educación Básica Alternativa*), program whereby students of all ages are brought up to date with the national curriculum. The program is provided specifically for people of low socio-economic status, those who do not have access to formal education, and teenagers and adults who have to balance work with education needs. (Ministerio de Educación, ND) Formalized nonformal education programs, such as the DIGEBA program in Peru, are common throughout Latin America. What began as non-standardized nonformal education programs were

absorbed into the formal sector to become an integral part of education in Peru, encompassing not only basic education, but education for development and employment (vocational education).

Environmental Education

Current studies on environmental education specifically in Peru, are lacking in the depth and detail needed for thorough analysis. Recent initiation of nation-wide voluntary and mandatory environmental education programs in primary and secondary schools means that there is relatively little literature available on the effectiveness, short-term or long-term, of existing programs. Nonformal education, regardless of topic or funding, often flies under the radar, also leaving little fodder for analysis.

International academic research in environmental education in Peru is limited. Fiorella Ceruti is one of the few authors published in the field. Ceruti provides a brief introduction to the topic, touching upon both formal and nonformal environmental education. Ceruti suggests that Peruvians are only likely to adhere to sound environmental practices, and readily adopt environmental education only when the benefits of resource conservation are obvious. (Ceruti, 1992) Now that the nation is well on its way to achieving education for all, the educational focus can shift from ensuring access for all students, to quality and improvement of curricula. Ceruti suggests that a combination of “irrational land use” and lack of government support for environmental education programs have left the country ill prepared for addressing environmental problems. (Ceruti, 1992) However, with its newfound economic stability, the central government has shifted its resources toward improving environmental quality and overall quality of life for its citizens, thus adopting and recognizing the importance of environmental education.

National Law of Environmental Education 2007

Environmental education was made mandatory in 2007 with the passing of the National Law of Environmental Education. The law created rules and regulations for environmental education in all public IEs that include propositions and actions for education for sustainable development, and the conservation and responsible use of ecosystem services. The law united Regional Directorates of Education (*Direcciones Regionales de Educación*, or DRE), the Units of Local Education Management (*Unidades de Gestión Educativa Local*, or UGEL), IEs, corresponding departments of local and regional governments, and civil society to create an effective and

sustainable national environmental education initiative. Under the new law, the DRE, the UGEL, and IEs are responsible for developing environmental education action plans and projects for each IE to incorporate the unique needs and characteristics of the local and regional environment. For purposes of environmental education development and as part of the law environmental education action plans must be incorporated into all areas of the national curriculum of primary and secondary schools, programs should be catered to individual IEs, and programs should include the creation of environmental committees, brigades, and clubs. The Ministry of Education (*Ministerio de Educación*, or MED) holds the power of oversight, but collaboration with local environmental organizations and businesses is encouraged. The National Directorate of Community and Environmental Education (*Dirección de Educación Comunitaria y Ambiental*, or DIECA), the DRE and the UGEL are all responsible for providing technical and pedagogical assistance to IEs as well as monitoring, supervision, and evaluation for environmental education programs. The aforementioned entities are also delegated the task of encouraging communication between IEs, corresponding governments (local or regional), NGOs, businesses, communities, and universities. (Ministerio de Educación, 2007 (Directiva N° 14))

Safe, Clean, and Healthy Schools 2007

The social mobilization campaign, “Safe, Clean, and Healthy Schools 2007” was created as an evaluation process for environmental education and management in IEs of Peru, as well as projection of the campaign’s goals to the greater community. The evaluation is completed using a point scale of achievement with the following levels: start, in process, expected achievements, and prominent achievements. The evaluation process is broken up into the IE, local, national, and regional levels. Entities responsible for oversight, monitoring, and evaluation at the grassroots and local levels are the IEs themselves, specifically the Director, or principal of each IE, and the UGEL. Entities responsible for oversight, monitoring, and evaluation at the regional level are the DRE and the Chief of Pedagogical Management. Entities responsible for oversight, monitoring, and evaluation at the national level are the DIECA and, ultimately, the MED, specifically the Director of Pedagogical Management and the Director of DIECA. At each level, those responsible for oversight are also responsible for the creation of an integral Evaluation Commission that ultimately evaluates the achievement level of the IE. In addition to the point system, awards and incentives, such as flags and scarves, are offered to IEs and their respective students to encourage participation and competition. Albeit simple, these awards acknowledge

the achievements of IEs and their students, encouraging others like them to participate in local, regional, and national environmental efforts. (Ministerio de Educación, 2007 (Directiva N° 093))

CHAPTER TWO

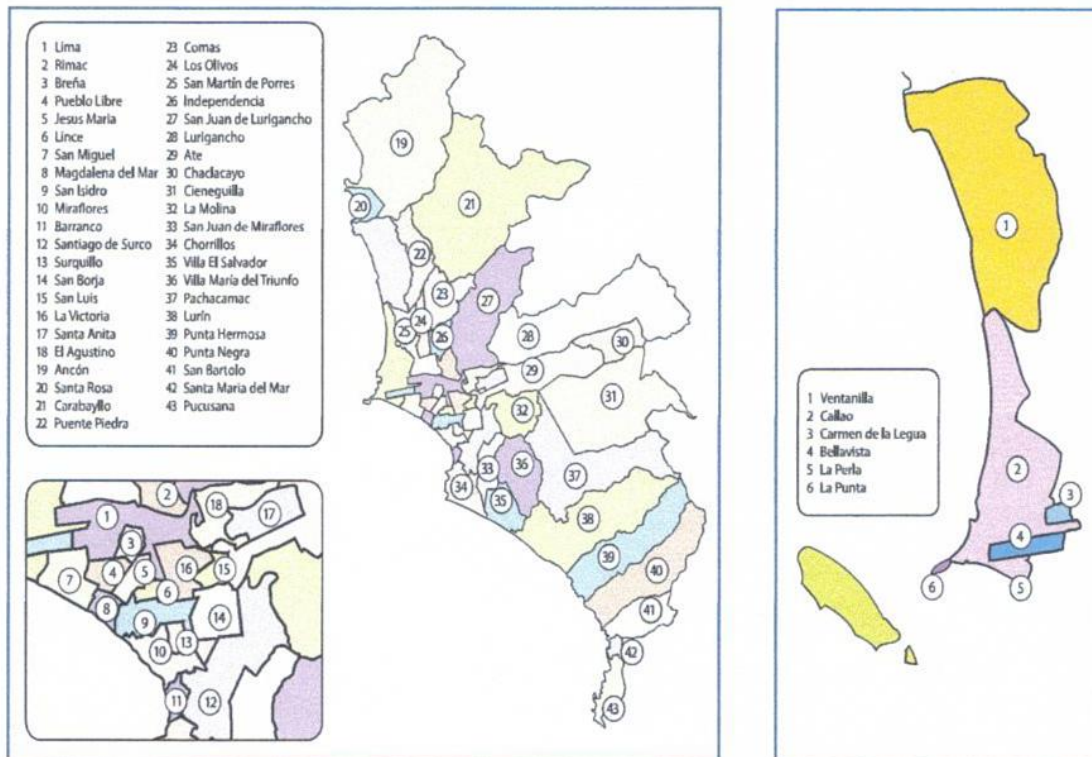
The State of the Environment in Lima and Callao and Implications for Environmental Education

From Grupo GEA and the Universidad Científica del Sur's 2010 Environmental Report from Lima and Callao for 2010 sampled below it would appear that Lima and Callao are on their way to improving environmental conditions. However, there are some key components that are holding the metropolitan area of Lima and the Provincial District of Callao back from achieving sustainable environmental quality. Factors such as reducing air pollutant emissions, cleaning up the three major rivers, encouraging proper waste disposal, and adapting to climate change should be top priorities for local and national governments, and including the Ministry of the Environment and the Ministry of Education; local, national, and international NGOs; private businesses; and the public.

Finding solutions to innumerable environmental problems is no easy task, but perhaps one of the most obvious of avenues, and one that is pointed to time and again with any issue, is education. Nonformal education has the potential to supplement existing environmental education under the national curriculum as well as reaching beyond the student body to the greater community. Environmental concerns, such as water quality of the River Rímac, are concerns that will take a great deal of time, effort, and resources to address and their respective solutions will come only with the help and support of local and national communities. The environmental report from Lima and Callao, called upon here to exhibit the strengths and weaknesses of the metropolis' environmental quality, serves not only as an indication of what areas need improvement, but also as a potential path for environmental education. Rather than relying solely on environmental education through the existing national curriculum, environmental educators must find a way to supplement the existing formal education system to more promptly address the following environmental concerns.

With approximately 9 million inhabitants as of 2010, the metropolitan area of Lima and the Provincial District of Callao constitute the largest urban area in Peru, and account for roughly one third of the country's population. The metropolis continues to grow, attracting approximately 136,000 new inhabitants per year. Lima covers an area of 2,819.26 square kilometers and is divided into 43 districts, the most heavily populated of which is San Juan de Lurigancho. (See Map 1) Callao covers an area of 146.98 square kilometers and is divided into

6 districts, the most heavily populated of which is Callao Cercado. (See Map 2) (Grupo GEA and Universidad Científica del Sur, 2010) Despite complaints from the international community that developing countries must curb their unruly population growth, the Peruvian population is growing relatively slowly at only 1.6 percent annually. (INEI, 2007)



Map 1 (Right): The Metropolitan Area of Lima. Map 2 (Left): The Provincial District of Callao
Source: Grupo GEA and Universidad Científica del Sur, 2010

In 2007 members of local, regional, and national governments in Peru, as well as NGOs and private institutions signed the Urban Environmental Pact, beginning the Plan for a Green Lima and Callao, and demonstrating the metropolis' environmental concern. The Pact prioritized eight activities including the formation of an urban environmental commission (*Comisión Ambiental*, or CAM), the creation of a communication campaign to raise awareness of the Pact, an inventory of urban green areas, the creation of zones to protect sensitive and environmentally important areas, and the creation of an environmental fund for Lima and Callao. (Grupo GEA and Universidad Científica del Sur, 2010) In addition, the newly founded Ministry of the Environment created a National Plan of Environmental Action in 2010 creating a list of environmental quality improvement objectives to be achieved by 2021. (Ministerio del

Ambiente, 2010) Despite these leaps forward, the metropolis is only at the beginning of its path to environmental quality, as is evidenced by the following environmental problems.

Air pollution is perhaps the most pressing of concerns *limeños* and *chalcos* face. Air quality is measured by the General Directorate of Environmental Health as well as the National Hydrology and Meteorology Service. There are five stations in Lima and Callao that measure air quality indicators including polluting gases NO^2 and SO^2 , and particulate matter (PM) (both PM 10 and PM 2.5). In 2009, PM 2.5 exceeded the national air quality standard of 15 micrograms per meter cubed ($\mu\text{g}/\text{m}^3$) at every monitoring station, in some cases exceeding the national standard by up to $54.9 \mu\text{g}/\text{m}^3$. Particulate matter is at its severest during the winter months between May and August when dense clouds trap pollutants, preventing them from being released into the upper atmosphere. NO^2 and SO^2 were found to be well below the national standards. A pollutant of major concern is lead; Peruvian gasoline is still leaded creating a significant air quality hazard. While there has been movement to phase lead out of gasoline, and while numbers have been dropping over recent years, it is still of concern because of the associated negative health impacts. Health impacts include mental retardation, respiratory disease, severe headaches, and, in severe cases, death. (Grupo GEA and Universidad Científica del Sur, 2010) Lead pollution is of particular import in Callao where unprocessed lead ore is delivered on trucks to holding centers before being exported internationally. Private businesses dealing in the import, storage, and export of raw minerals are responsible for 84 percent of the environmental damage caused by lead in Callao. (Grupo GEA and Universidad Científica del Sur, 2010)) The Municipal Government of Callao has created a series of nonformal education programs informing *chalcos* of lead-associated risks and contamination prevention, as is discussed in the following chapter, but efforts have been focused primarily on prevention of human ingestion rather than pollution prevention.

The majority of air pollutants are emitted by the transportation and industrial sectors. An antiquated vehicle fleet, a deficient system of public transport, poor urban planning, leaded gasoline, lack of monitoring and evaluation, and lack of accountability measures in both sectors are to blame. Both the public and private vehicle fleets are antiquated with an average age of 15 years for private vehicles and an average of 21 years for vehicles used for public transport. The public transportation fleet is not only antiquated, but also largely informal, making it difficult to monitor and regulate. While there is a system of registration and mapping, few chauffeurs in the

realm of public transport bother to register their vehicles. For example, out of the approximately 220,000 taxis on the streets of Lima and Callao, only 60,000 of them are registered. This is in part because of the failure of government to enforce the regulation of vehicles. There are approximately 18,914 businesses in Lima and Callao, only 7 percent of which have voluntarily carried out environmental studies. The majority (52 percent) of businesses are privately-owned, informal micro-businesses. While businesses pose a significant threat to air quality in Lima and Callao, 86 percent of atmospheric pollutants are released by the transportation sector, suggesting that it should be the primary area of focus for pollution reduction. (Grupo GEA and Universidad Científica del Sur, 2010) Many *limeños* and *chalcacos* have voiced their desire for improved air quality. With a multitude of governmental organizations responsible for monitoring and enforcement of transportation and industry, it is difficult to develop a concise plan of attack. In the case of air pollution, education alone will not be enough to quell polluters. It will take a combination of education, monitoring, and enforcement to improve air quality.

Lima and Callao are situated in a coastal desert, receiving an average rainfall of 9 millimeters per year, suggesting that the area is at particular risk from drought. The city lies across three river basins, the rivers Rímac, Chillón, and Lurín. (See Map 3) All three rivers are born in the heart of the Andes Mountains in an intricate network of above and below ground reservoirs, tunnels, and glaciers. The primary glacier that feeds the River Rímac is the Ticlio Glacier in the Cordillera Blanca. The River Rímac provides the majority of the water supply for Callao and the center of Lima. The public water supply provides water resources to 87 percent of the population of Lima and Callao, and the remaining 13 percent relies on private wells. Many residents in outlying suburbs of Lima and remoter parts of Callao, included in the aforementioned 87 percent, rely on weekly water delivery via truck from private companies. Average daily water consumption is lower than the regional average at 173 liters per person per day, but water scarcity should be of significance to all residents. In the face of this scarcity the city has implemented a system of water reuse for small businesses and public green areas (86 and 14 percent respectively). The scarcity of water as well as an ever-increasing population has led to the almost doubling of the cost of the production of potable water for the city's residents, costing approximately 785 million soles (US\$283 million), or 1.19 soles (US\$0.43) per m³ in 2008. Those who pay for water delivery via truck pay higher rates of up to 14 soles (US\$5.05) per m³; coincidentally these are often the poorest residents, and those who tend to suffer more

from water-borne illnesses because of inadequate or unclean water storage facilities. On average, 724,000 inhabitants of Lima and Callao do not have access to potable water. (Grupo GEA and Universidad Científica del Sur, 2010) The National Water Authority (Autoridad Nacional del Agua, or ANA) is responsible for the management of the National System of Hydrological Resources Management that manages the public water sector. In addition there are many private outreach and education campaigns, such as the Radio Programs of Peru (RPP) “care for the water” campaign, that encourage water conservation and careful use tactics. Water conservation is perhaps one of the most important topics to be addressed by environmental education. If *limeños* and *chalcos* continue at current rates of water usage, water will be of even greater scarcity for future generations.

The River Rímac not only provides the majority of the city’s water supply, it is also the most contaminated of the three rivers in the area. Among other contaminants, the waters of the Rímac have high levels of the heavy metals iron, zinc, lead, copper, and the metalloids arsenic; all substances that are extremely toxic to humans, animals, and plants. All of the aforementioned metals exceed national water quality standards. Of particular concern are the high levels of lead and arsenic, chemicals that are extremely harmful to human health, and can prove deadly if ingested in high enough quantities. Heavy metals are not the only concern in the River Rímac; incidences of coliform bacteria are also extremely high. In 2008 the coliform count was 32,236 count per 100 milliliters (ml) higher than the national standard of 2,000. (Grupo GEA and Universidad Científica del Sur, 2010) With such a high level of coliform bacteria in the metropolis’ water supply, it should come as little surprise that incidences of water-borne illness are also relatively high, particularly amongst those living in poorer *barrios* along the banks of the river. Callao has a significantly high incidence of water-borne illness, with 225,000 reported cases in 2009. (Grupo GEA and Universidad Científica del Sur, 2010) If ever there was an opportunity for education and outreach, this would be it. Water-borne illness is unnecessary and preventable, especially in the most economically prosperous area of the country. Heavy contamination also results in increased water treatment costs, an environmental externality whose cost is assumed by private businesses. (Grupo GEA and Universidad Científica del Sur, 2010) Like air quality, polluters are difficult to monitor and regulate. Education, both formal and nonformal, is the best place to begin in the case of the River Rímac where thousands of people dump their wastes daily. In 2010 the Ministry of the Environment launched a new

campaign to rehabilitate critical environmental zones as part of its National Plan for Environmental Action, including the reservoir that feeds the River Rímac. Including the input of various private businesses, local and international NGOs, and local government groups the campaign aims to bring the River Rímac up to national water quality standards by 2021. (Grupo GEA and Universidad Científica del Sur, 2010)



Map 3: The Chillón, Rímac, and Lurín Rivers. Source: Google Maps.

Over the last decade, Lima and Callao have doubled the amount of solid waste that they produce. This doubling is due not only to population increase, but also an increase of solid waste production at the individual level. Roughly 52 percent of solid waste is made up of organic matter that biodegrades quickly. The majority of solid waste is recovered by municipal government services and taken to one of six refuse collection centers throughout the metropolitan area. However, approximately 14.2 percent of all solid waste (or roughly 1,054 metric tons per day) is not accounted for by public refuse services, and is generally burned or

discarded in the streets or rivers, becoming a significant source of air and water pollution. Those who do not have access to public refuse services are generally those who live in the outlying suburbs of Lima and Callao; they are often those who are of lower socio-economic class, those who do not have access to clean water and sanitary living conditions, thus they are more susceptible to disease. An estimated 1.1 million people in Lima and Callao are at risk from disease caused by exposure to high levels of environmental contamination (air, soil, water). (Grupo GEA and Universidad Científica del Sur, 2010) Municipal governments have been encouraging recycling programs in local primary and secondary schools as a part of nonformal environmental education initiatives (explored further in the next chapter). There are also informal “recyclers” who collect recyclable materials to later sell for profit to recycling compounds. Since solid waste disposal services already exist in Lima and Callao, expanding services and informing residents of the importance of proper solid waste disposal through education and outreach initiatives would significantly reduce incidences of air and water pollution and risk of disease.

Peru contributes only 0.4 percent of the world’s annual greenhouse gas emissions, and yet it is number 42 on the list of countries most vulnerable to climate change. The majority of greenhouse gas emissions in Peru come from the transportation sector, private businesses, and solid wastes. Lima and Callao account for approximately 46 percent of net energy consumption in the country, and consume 41 percent of all liquid fuels. (Grupo GEA and Universidad Científica del Sur, 2010) While there still is no comprehensive study on the potential impacts of global climate change on the metropolitan area of Lima and Callao, it is thought that the metropolis will be more vulnerable to the impacts of climate change than other parts of the country because of the high population density, and because of its critical location as the central hub of communication and industry for the nation. Among others, one of the greatest worries for the metropolis is freshwater supply. Over the past 35 years Peru has witnessed the loss of 22 percent of its glaciers thanks to a warming climate. (Grupo GEA and Universidad Científica del Sur, 2010) If the melting trend continues, the water supply for Lima and Callao will be in jeopardy. Another concern that accompanies global climate change is the increasing intensity of natural disasters. Peru has suffered the increasing wrath of El Niño in recent decades, bringing unusually heavy rains to the desert. With heavy rain comes flooding in an area and amongst a population unaccustomed to rainfall, and with flooding comes destruction, water-borne illness,

and death. While there is no existing plan to reduce greenhouse gas emissions in the city, local governments and NGOs have convened to discuss plans of adaptation for Lima and Callao. As part of the Municipal Government of Callao's Environmental Education Program, several IEs in the area are participating in nonformal environmental education that incorporates information about climate change.

Environmental education assumes no easy task. Finding solutions to the aforementioned environmental problems will be difficult, and will require the input of valuable time and resources. However, it is certain that policy solutions, such as monitoring, evaluation, and enforcement, will not be enough to combat environmental degradation. As is evidenced in the following chapter about the Municipal Government of Callao's Environmental Education Program, future generations must be molded into environmental leaders, and community members must not be underestimated in their intimate knowledge of local environmental issues. Air and water quality, water scarcity, proper disposal of wastes, and adapting to climate change are environmental issues that cannot be ignored, and thus should be at the top of the agenda for formal and nonformal environmental education in Lima and Callao.

CHAPTER THREE

Nonformal Environmental Education by the Municipal Government of Callao

Municipal and regional governments are those primarily responsible for the maintenance of green areas, monitoring of local environmental quality, and oversight of local curricula, including environmental education. While each municipal government is organized differently, the majority of municipal governments have a Department of Environmental Control, or the equivalent, that is responsible for coordinating the municipality's environmental education and community outreach efforts. The Municipal Government of Callao is no different in that regard; the municipal government's Department of Environmental Control has an active environmental education program that encompasses local primary and secondary schools, as well as incorporating members of the local community. The following is an overview of the Department of Environmental Control's Environmental Education Program, as well as a study of the program's activities based on the author's observations and participation over a three month period in 2008.

The Department of Environmental Control is a small department within the Municipal Government of Callao that focuses on the compliance with and enforcement of local environmental laws, as well as community outreach and education. (See Appendix I for a complete schematic of the Department) The staff consists of a manager, an environmental lawyer, several inspectors, a community outreach coordinator, two environmental consultants, a design coordinator, and the head of the environmental education program, which includes a varying number of interns from local universities, mainly from the Environmental Engineering Department at the University of Callao. As part of the community outreach and education program, the Department has created a nonformal environmental education program in coordination with local primary and secondary schools. (Municipalidad del Callao, 2008 (Department of Environmental Control Organization Schematic))

The Environmental Education Program works with local primary and secondary schools, organizing workshops, giving lectures, and creating activities to educate students and teachers alike on environmental issues. The Program works with a total of 45 primary and secondary schools in Lima and Callao. Schools are visited daily and on a rotating basis. While maintaining a positive relationship with faculty and students is a primary goal, staff time and funding are limited. It is the role of interns, the majority of whom are from local universities, to aid the only

full time staff member in his or her duties by ensuring that goals are met, meeting with faculty, working with students, and helping to construct and implement new projects. Lectures and activities are initiated during school hours and student participation is mandatory (as per the orders of their respective IEs). The Program is referred to as nonformal in this instance as it is not a formal requirement – schools participate on a voluntary basis to supplement the mandatory environmental education that is part of the new national curriculum on environmental education passed in 2007.

In addition to the in-school program, the Environmental Education Program is responsible for the coordination of the Neighborhood and School Environmental Brigades (BAVs and BAEs) that serve as direct links with the local community. The Program is also responsible for the coordination and partnered sponsorship of community events pertaining to the environment, such as World Environment Day. The following is a description of the events, activities, lectures, and meetings sponsored and coordinated by the Department of Environmental Control's Environmental Education Program over a three-month period (mid-May through mid-August) in 2008.

Neighborhood Environmental Brigade

The “*Brigadistas Ambientales Vecinales*,” or BAVs in the Spanish acronym, are a direct link between the municipal government and the local community. BAVs serve as representatives and the voice of the local community with respect to local environmental concerns, while at the same time helping the municipal government to spread its environmental knowledge to a broader segment of the local population. According to the municipal government's official definition, BAVs are, “environmental leaders that work together with the municipal government to generate conscience, participation, and environmental culture among the people and organizations of their [respective] neighborhoods.” (Municipalidad del Callao, 2007) Functions of the BAVs include: replicating their environmental knowledge, promoting the active participation of neighbors in local environmental initiatives, contributing to the identification and solution of environmental problems, and being vigilant to arising environmental problems. (Municipalidad del Callao, 2007)

In 2008 the Environmental Education Program met bi-weekly with BAVs to discuss their environmental concerns and potential solutions, as well as participation in any up-coming activities. In return for their work, BAVs were awarded a small stipend, thus providing a small,

but effective incentive for participation. Many of the BAVs participating in the program in 2008 were local mothers who spent much of their time working from their homes, looking after their children. While their children were at school BAVs had the time to meet with the Environmental Education Program officers, and meeting with other mothers and neighbors was an added incentive. Generally refreshments were provided at meetings, and BAVs gathered in a circle for the discussion, making the meetings more informal and inviting. BAVs were forthcoming with their thoughts in such an informal atmosphere surrounded by their peers, and thus were effective in their positions.

School Environmental Brigade

The “Brigadistas Ambientales Escolares,” or BAEs in the Spanish acronym, are a direct link between the municipal government and local primary and secondary schools. BAEs serve as representatives of local primary and secondary schools, while at the same time serving as model environmental stewards for their respective IEs and student peers. According to the municipal government’s official definition, BAEs are, “Are environmental children and youth organized to generate consciousness, participation, and environmental culture in the members of their respective educative institutions and local organizations.” (Municipalidad del Callao, 2008 (Department of Environmental Control Organization Schematic)) The functions of the BAEs are as follows: to defend environmental rights; to replicate environmental knowledge; to motivate the participations of members of IEs in environmental activities and campaigns; to contribute to the identification and solution of environmental problems; and, to develop and promote good environmental practices in their respective IEs, neighborhoods, and communities. (Municipalidad del Callao, 2008 (Department of Environmental Control Organization Schematic))

In 2008 BAEs were responsible for aiding the Environmental Education Program in its community and in-school activities, such as coordination of the World Environment Day celebration, and of the Ecological Theater Competition. No meetings were held between the environmental education program director and BAEs during the three-month period of this study, suggesting that they are not meeting with the Department of Environmental Control regularly. During school visits it was difficult to tell which students were BAEs as they do not bear any distinct marking or uniform that separates them from the general student body. The assumption

can be made that BAEs meet within their individual educative institutions, but no record of this is kept by the municipal government.

Municipal Government-Sponsored Lectures

The Department of Environmental Control Environmental Education Program director is responsible for coordinating, among other tasks, a series of monthly lectures delivered to local primary and secondary school students as a supplement to the standard environmental education offered by the national curriculum. Lecture topics in the three-month study period in 2008 included climate change, solid wastes, recycling, lead pollution prevention (at affected schools), and water. Lectures were short, informative, and engaging in the hopes that students would glean some knowledge of their local environment through the hour-long session. As an incentive, small prizes (such as pencil cases) were awarded to students who correctly answered a series of questions pertaining to the lecture. It is interesting to note that the lecture series covered environmental topics according to their severity, corresponding with the unassociated environmental report for Lima and Callao released by Grupo GEA and Universidad Científica del Sur in 2010.

The lecture series is intended to supplement the current national environmental education curriculum. The series is not mandatory, and student participants are chosen based on the predilection of each IE. During the 2008 series, participant group size varied greatly from 20 participants at some IEs to more than 100 at others. Lectures were often more effective with smaller groups of students. Smaller groups allowed for students to ask questions, and the intimate environment allowed for more vigilant supervision of students by teachers and program coordinators. Classroom space is variable dependent upon the IE; the Environmental Education Program does not distinguish between public and private IEs, it offers its lectures to those IEs who are interested. Thus the Program lectures in different educative environments with students from varying socio-economic backgrounds.

Municipal Government-Sponsored Activities

In order to more fully engage students and their respective IEs in local environmental issues, the Department of Environmental Control's Environmental Education Program is responsible for creating and implementing district-wide activities. Some of the activities organized by the municipal government in 2008 were an environmental drawing contest for local school students

aged six to 12; a parade for World Environment Day (June 5th); duel coordination of the fourth conference of Safe, Clean, and Healthy Schools; an ecological theater competition for select student groups from different IEs; bi-weekly meetings with BAVs; and, the launch of a new education campaign related to lead pollution awareness and prevention.

The environmental drawing competition was held on Saturday, the 31st of May, 2008, with the theme “A Happy Planet has Happy Children.” Over 300 students gathered at IE “General Prado” in Callao Cercado to participate in the competition. There were three categories: six to eight years, nine to 10 years, and 11 to 12 years, and every student was given one and a half hours to complete his or her drawing. First and second place winners were chosen for each category; first place winners were awarded a bicycle, second place winners a drawing kit. Prizes were publicly awarded during the World Environment Day parade on June 5th. Every participant was given a “Happy/Sad Planet Earth” mobile spinner. On either side of the spinner was a personified version of the planet Earth – one side was happy while the other was sad. As the top portion of the spinner was turned facts were revealed to the viewer about the environment and steps that can be taken to help the planet. The happy Earth encouraged participants to follow steps to better care for the environment, while the sad Earth listed existing environmental problems. This token, while small and perhaps seemingly insignificant, proved a valuable educational tool. The event was sponsored by the Department of Environmental Control (through the Municipal Government of Callao) and the private business BSH, producer of Bosch and Coldex electronic and refrigerant products in Peru.

In celebration of World Environment Day on June 5th 2008 students from 19 local schools paraded through the streets of Callao Cercado bearing signs and banners that encouraged local residents to care for the environment. Students were extremely enthusiastic about the parade, creating costumes, songs, and dances for the event. Embellished pennant prizes were awarded to group participants who had the greatest numbers, those who had the most creative costumes and accessories, and those who were the most punctual. The event was sponsored by the Department of Environmental Control and was a noted affair, with attendants including the Deputy Mayor of Callao. Each group also voluntarily created IE fliers that described the importance of World Environment Day, demonstrating their avid enthusiasm.

Every year the Department of Environmental Control plays host to a meeting of educative leaders, community members, and select businesses and organizations regarding the

aforementioned social mobilization initiative, “Safe, Clean, and Healthy Schools.” In 2008 the conference was held at IE Callao in Callao Cercado. Throughout the day-long event, panelists presented environmental concerns and potential solutions. Not only was the event an opportunity for educators to learn more about the environmental issues at their doorsteps, it was also an opportunity for them to network and share ideas with one another about how to better address environmental issues through education. Conference panelists included representatives of a variety of local businesses and organizations including DIGESA, the government agency for environmental health, and RAPID LatinoAmerica, a private company for emergency search and rescue operations. Each professor was given a guide to the initiative published by the Ministry of Education boasting ideas and activities for how to implement and truly create a safe, clean, and healthy school. (Ministerio de Educación, 2007 (Guía Instructiva de la Movilización Social Escuelas Seguras, Limpias y Saludables))

The Provincial District of Callao is known throughout Peru and South America for its elaborate seafood platters, its salsa music, its colorful colonial history, and perhaps most of all for warnings against visiting its crime-ridden streets unless absolutely necessary. In recent years the municipal and regional governments of Callao have been working to clean the district’s reputation, making it a destination for locals and international tourists alike to enjoy. Part of the district’s makeover included remodeling the local theater. The Department of Environmental Control was able to take full advantage of this new addition to the community in 2008 with its Ecological Theater Competition between local IEs. The 2008 competition theme was, “Callao, A Healthy City, 2008.” Student groups from each selected IE entered a short performance with an environmental theme. Student groups that passed a pre-selection process were allowed to perform their entries at the theater on the second of July. Each group was allowed to contain no more than 15 actors, and an unlimited number of student volunteers to help with backstage setup and scene changes. Prizes donated by the theater director and the Municipal Government of Callao included first place through third place trophies, and scholarships were given to the best actor and actress. Students were extremely enthusiastic about participating in the event, and were able to express their knowledge and concern for the environment through their passionate performances.

Throughout the year, and aside from the aforementioned activities, the Department of Environmental Control was responsible for the initiation and monitoring of a district-wide

recycling competition between IEs. IEs were assigned recycling bins for plastic bottles, and encouraged students to bring their recyclables from home. IEs with the most bottles collected and the least contamination of bins at the end of the year were to receive a prize. The competition coincided with a zero waste campaign, also launched by the Department of Environmental Control in 2008.

Another on-going conversation between the Department of Environmental Control and the local community in Callao in 2008 was lead pollution prevention. The Department of Environmental Control recognized the increasing severity and incidence of lead-related illness and birth defects, particularly among young students studying in IEs close to the port at Callao. BAVs were the first to approach the Department of Environmental Control about their concern for the wellbeing of their communities, thus a new campaign was born. The lead pollution prevention campaign was slow to start, and was just gaining local support at the end of the study in 2008. If the program is still in existence, its effects are extremely localized as incidences of lead-related illness are still common in Callao.

The variety of activities hosted by the Department of Environmental Control draws attention to the numerous stakeholders involved in the nonformal Environmental Education Program in Callao. Not only does the Program seek to engage students and teachers of local public and private educative institutions, it also seeks to engage the wider community. The Environmental Education Programs partners with local businesses and organizations to better fund their projects, as well as in the attempt to instill an environmental conscious in an area notorious for its environmental contamination.

CHAPTER FOUR

Analysis

It is clear from the Environmental Report from Lima and Callao by the NGO Grupo Gea and the Universidad Científica del Sur that current tactics to improve environmental quality need a boost, as does environmental education under the national curriculum. The Municipal Government of Callao's Department of Environmental Control has recognized the importance of education in solving complex environmental issues, and thus has created the Environmental Education Program.

Visitors from the Environmental Education Program in 2008 were warmly welcomed by IE directors, teachers, and in many cases, students. There was a growing sense that teachers and directors had a will to develop environmental education programs in their schools, and it was an added benefit that the program was sponsored by the municipal government. However, since the Environmental Education Program staff turnover rate is quite high, enthusiastic IE directors and teachers were met with varying levels of interest and enthusiasm on the part of Program staff. Interns from the Department of Environmental Engineering at the University of Callao are required to complete a six month internship before completing their studies. An informal sample of interns working with the Environmental Education Program in 2008 demonstrated that the majority of interns were hoping to move on to the mining sector or applied engineering where economic profits are much higher rather than remaining with local government or NGOs. Some interns that were recruited from the local community did not have any formal academic background or environmental training, which could be considered both an asset and deficit to the program – an asset because members of the local community were showing a growing interest in environmental issues, a deficit in that training time and costs were higher.

Activities sponsored by the Department of Environmental Control not only motivated student participants to be more concerned about local environmental issues, they also drew the attention of community members. The theater competition allowed participating student groups to express their concern for the environment in a personalized manner, as well as encouraging their student peers to become more involved in environmental issues. Creating competition between IEs through the recycling competition, the ecological theater competition, and the environmental drawing competition encouraged students to put their best effort forward in addition to drawing attention to otherwise invisible environmental problems.

That the program does not distinguish between public and private educative institutions is a positive gesture that demonstrates the importance of addressing environmental issues regardless of socio-economic class or the classroom environment. For the sake of its people and the environment, the municipal government cannot afford to be selective; as many IEs as possible must be included in the nonformal education programs so as to best supplement the national curriculum and work toward improving environmental quality.

While the Department of Environmental Control's Environmental Education Program has created a successful series of nonformal environmental education programs in Callao, there are some elements of the programs that need improvement. For example, BAVs are well organized and easily identifiable by their blue vests, while BAEs are indistinguishable from the rest of the student body, making them difficult to identify. The Department of Environmental Control has not established regular contact with BAEs. To better understand the intricacies of the effectiveness of the BAE portion of the Environmental Education Program, the Department of Environmental Control must establish regular communication with the BAEs. Finally, and perhaps most importantly, a lack of oversight and consistency of staff members means that both internal and external communication is limited and inconsistent. When IE directors are constantly dealing with new staff members, it is difficult to follow through with programs and activities initiated by the Department of Environmental Control. BAVs who rely on constant contact with the Department of Environmental Control have difficulty maintaining their posts and communication ties with the Department, and limited funding means that their participation is conditional and unstable.

Mothers, whose children are the future generation and thus the inheritors of long-term environmental problems, have a very high stake in improving environmental quality. Thus the inclusion of the BAVs, of whom the majority are mothers and homemakers, in the Environmental Education Program is both ingenious and practical. Loss of communication and stability between the Department of Environmental Control and the BAVs would be a significant loss to the municipal government, to the Environmental Education Program, and to the community as a whole.

Shortly after the end of the study of the Municipal Government of Callao Department of Environmental Control's Environmental Education Program in 2008, the program was forced to halt some of its activities. Among the activities temporarily halted were the BAVs and the lead

pollution awareness and prevention campaign. This temporary set-back was due in part to budget cuts and a high staff turnover rate. Due to the high staff turnover rate the consistency of all programs within the Department of Environmental Control is questionable, but particularly that of the Environmental Education Program. With only one full-time staff member, and a heavy reliance on interns from the local university, it is difficult to maintain a consistent long-lasting relationship with local IEs, BAEs, and BAVs. Thus the program, while effective in short-term practice, struggles over the long-term.

Since 2008, and long after the aforementioned study was completed, the BAVs have been regaining their strength and are still active in parts of Callao. While communications with and activities of the BAVs are internally monitored, there is very little information as to their progress available publicly aside from the local news. Thus further analysis of their progress, as well as the progress of the BAEs and the Environmental Education Program as a whole would require another study.

Implications for Nonformal Education in Lima and Callao

Despite a high staff turnover rate and limited funding, the Municipal Government of Callao Department of Environmental Control's Environmental Education Program has been relatively successful in implementing nonformal education as a tool for improvement of environmental quality in the immediate vicinity. While the surrounding environment still shows signs of degradation, more inhabitants are becoming aware of the intricacies of the environmental problems and choices they face on a daily basis. Whether the municipal government's nonformal Environmental Education Program will be enough to put a stop to environmental degradation in the metropolis is doubtful. One nonformal environmental education program in one municipality will not be enough to improve overall environmental quality for the city of Lima and the Provincial District of Callao. However, if the Department of Environmental Control's Environmental Education Program can be used as a model for other municipalities, and with the support and leverage of local NGOs and the national government, nonformal environmental education could be the jump-start that brings improved environmental quality to Lima and Callao.

Creating, funding, and initiating nonformal environmental education programs throughout Lima and Callao is no easy task. It will require the input and enthusiasm not only of local and national NGOs and local, regional, and national governments, it will also take the input

and cooperation of local businesses, and perhaps most importantly, community members.

Community members must first recognize environmentally harmful practices before they can make decisions as to whether to engage in, ignore, or speak out against those practices.

Nonformal education presents a viable education alternative outside of the rigid formal education structure whereby participants can glean an environmental familiarity without prior knowledge or educational background. Unlike in the formal education system, municipal governments have the flexibility to partner with local NGOs and businesses to fund and administer nonformal education programs. This flexibility not only gives program leaders the chance to reach a larger audience, but also the chance to include people of all ages and all walks of life.

Overall, the Department of Environmental Control's Environmental Education Program can be proclaimed a short-term success. The program succeeded in raising environmental awareness not only in local IEs, but also in the greater community. The BAV program is truly an asset, and should be used as a model for similar nonformal environmental education and outreach programs. The Department of Environmental Control must work on stabilizing its communications, as well as maintaining its staff; granted, since funding is out of the Department's control, it is difficult to know from one year to the next what should be expected.

CHAPTER FIVE

Conclusion

Based on evidence provided by the above case study of the Municipal Government of Callao Department of Environmental Control's Environmental Education Program, nonformal environmental education can fill a niche in the realm of environmental education in Peru. Students who participated in the program, particularly those from smaller group settings and those that became further involved in municipal government-sponsored environmental activities became active in their respective educative communities and gained a thorough understanding of local environmental issues. BAVs who had had no previous environmental education became active community leaders, tapping into an internal environmental knowledge few new existed. However, one nonformal environmental education program alone will not be enough to turn the tables of environmental degradation in Lima and Callao, particularly considering the mercurial nature of the Department of Environmental Control.

There, of course, remains the question of developing a wider environmental conscience; residents will not be concerned about their environment if they are not able to first meet the needs of themselves and their families. While Peru's economy has improved drastically in recent decades, there are many people even in wealthier urban areas, such as Lima and Callao, that struggle to make ends meet. Many people in outlying *invasiones* struggle to keep themselves and their families healthy despite a lack of access to clean water and sanitation facilities, poor access to quality education, and a job market that is bleak at best. Those who are preoccupied with meeting their needs may have concern for the environment, but it can be assumed that they are unlikely to act on their concern unless they are provided an incentive. The same can be said for the Department of Environmental Control. The limited staff is under a great deal of pressure to fulfill an endless task list under a meager budget and strict employee policies. Staff turnover rate is high because of the exceeding pressure and the continuous scramble to find higher-paid employment.

Nonformal environmental education programs allow their creators the flexibility needed to cater curricula to program participants, thus allowing them to create incentives, monetary or otherwise, when necessary, and the ability to expand the population base. Nonformal environmental education is a commonly over-looked tool to approaching environmental problems, and a tool that is often not taken as seriously as it should be.

Proposed Solutions

It is easy for an outsider to peer in through the windows of a temporary visit and point out what he or she believes to be problems. It is also easy for said outsider to recommend temporary solutions. However, solutions offered by outsiders are often not sustainable nor do they fully take into consideration the needs and wants of the local community. Thus the solutions offered here are conditional and would need to be adapted based on the input of local experts, community members, and various other stakeholders.

The flexibility of nonformal education suggests that not only can nonformal environmental education lead to environmental change it can also create an environment for the formation of relationships that might not have been previously considered. (Wals and van der Leij, 1997) The BAVs in Callao, for example, are a canny tie between the municipal government and the local community. The Department of Environmental Control has benefitted from a much more thorough understanding of local environmental issues, and the needs of the local community, and BAVs have emerged as community leaders. Many environmental education programs fail to meet their goals of establishing an environmentally knowledgeable population. (Wals and van der Leij, 1997) However, nonformal environmental education programs have the opportunity of working with a wider range of people. Formal environmental education is very specific in its demographic target, while nonformal environmental education does not hold to such rigid boundaries. One solution offered by Wals and van der Leij cuts to the chase:

Environmental education that is concerned with *human development*, rather than with *human behavior*, could contribute to the formation of new lenses for examining our lifestyles... connections with the earth, and connections with other (human) beings in order to develop alternative pathways for living. (Wals and van der Leij, 1997; 13)

Environmental education, nonformal or otherwise, cannot solely focus on changing the behavior of its recipients; it must also focus on changing the way in which we develop as a species. Formal environmental education focuses on a series of tangible outputs or standards, but nonformal environmental education can look beyond the standards to include the quality of the education received, the individual experiences of learners, and the environment and context in which they learn.

In addition to changing the nature of environmental education, it is also crucial to

acknowledge the importance of expansion, outreach, and incorporation. Vaughan, et. al. make a considerable point when they say that,

Many teachers recognize the importance of investing their time and energy in students, because children constitute a captive audience, represent future environmental stewards, and are more easily taught and influenced than adults. However, decades must pass before children become environmental policymakers. (Vaughan, Gack, Solorazano, and Ray, 2003)

Changing the formal environmental education curriculum in Peru would only target the portion of the population of school age, ignoring a significant portion of the population that is either beyond school age or does not have access to education. Given the success of the nonformal Environmental Education Program of the Department of Environmental Control, it would be a viable option not only to expand the program to incorporate other municipalities, but also to incorporate a wider segment of the population. With the help of international interests, the program has the potential to blossom into something great, and with previous experiences and local knowledge the program could be maintained over a longer time frame.

There are several pathways to improved environmental quality in Lima and Callao, and indeed in urban areas in general in Peru. However, it would be foolish to start from scratch when examples of successful pathways, such as the Department of Environmental Control's Environmental Education Program, already exist and could be maintained with further funding and resource support. So often we in the developed world attempt to solve problems of the developing world while thinking that we know best, that we have the answers. But in many cases sustainable solutions already exist internally, they simply must be discovered.

I will leave you with a quote from the authors of the Environmental Report from Lima and Callao, "To learn the value of environmental preservation, diversity, and honesty cannot be achieved with a whiteboard and pen. It is evident that one must not learn definitions, but attitudes." (Grupo GEA and Universidad Científica del Sur, 2010, p.21; translated by author) Perhaps nonformal environmental education is the key needed to tip the scales of environmental degradation in urban areas of Peru, and to help *limeños* and *chalcacos* to develop a positive environmental attitude.

APPENDICES

Appendix I

Source: Maps of the World, 2011.

Political Map of Peru



Appendix II

Source: Daniel Villena Sandoval and Dalia Villena Sandoval, Callao, Peru.

Photographs of the River Rímac



The River Rímac in Callao at dusk. To the right is an informal *barrio* that discards its waste directly into the river.



A close-up view of untreated waste water entering the River Rímac from the *barrio* seen above.



Trash discarded at the side of a bridge over the River Rímac in Callao.



The mouth of the River Rímac where it meets the Pacific Ocean in Callao.

Appendix III

Source: Municipal Government of Callao - Department of Environmental Control, 2008.

Department of Environmental Control

Vision:

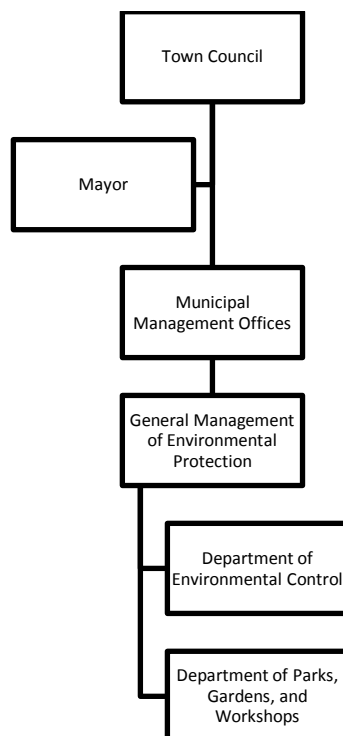
The Municipality of the Provincial District of Callao counts on a system of efficient system of environmental management that has permitted the municipal government to reduce levels of environmental pollution and modify behavior of local actors to the benefit of the quality of life of the local population.

Mission:

To fortify the management, planning, and development of the execution of actions of environmental control compatible with the preservation of the environment, and to guarantee the health of the population and the availability of pertinent information for informed decision making.

Organic Structure of the Organization

Municipal Order Number 000004-2004-MPC approved the Regulation of Organization and Functions that includes the chart of the Municipality of the Provincial District of Callao, and the corresponding functions of every municipal management office.



Article Number 85 establishes functions of the Department of Environmental Control:

Control and oversee the compliance of the regulation of the protection and conservation of the environment.
Respond to complaints from neighbors regarding environmental contamination.
Oversee, evaluate, and control the management of public cleaning services.
Update and control the execution of the Integral Plan for the Environmental Management of Solid Wastes (PIGARS).
Evaluate the focal points of environmental contamination by wastes and other sources, detecting their origins, and appointing sanctions in accordance with established laws.
Evaluate the environmental aspects of industrial and commercial activities, as well as the services that grant the Certificate of Environmental Conformity.
Promote, support, and execute environmental actions and campaigns, and the diffusion of information relating to environmental protection, while encouraging local participation in educative activities.
Effect all changes and functions assigned by the General Management of Environmental Protection.

Environmental Policy

Municipal Ordinance Number 000037

Definition: To establish the principals and features to secure the effective exercise of the right to a healthy life and environment.

Objectives:

To guarantee the betterment of the quality of life for the population of Callao.
To conserve, protect, and better the quality of the environment.
To adequately use and recover natural resources.
To promote environmental education and citizen participation.

Principles:

Sustainability.
Prevention.
“Polluter Pays.”
Environmental Responsibility.
Promulgate, publish, and execute local environmental laws.

Features:

Approve and execute environmental projects.
Promote the exchange of successful environmental experiences.
Promote the use of clean technologies.
Promote environmental education.

Management of the Department of Environmental Control

Air

Committee for the Initiative of Clean Air for Lima and Callao.

Integral Plan to Clean-Up the Atmosphere.
Emissions Inventory.

Noise

Inter-institutional Coordination of the Management of Environmental Noise Pollution.
Action for oversight of noise pollution.
Elaboration of the Plan for Noise Pollution.

Water

Effluent inventory (with the 102 certified businesses).

Solid Wastes

Integral Plan for the Environmental Management of Solid Wastes (PIGARS).
Advancement of PIGARS
Realized actions of the Adequate Management of Solid Wastes.
Participation in DIADESOL activities.

Integral Plan for the Environmental Management of Solid Wastes – PIGARS Callao

Responsible Party: Engineer Miriam González Chuchullo

Activities:

Supervision of public cleaning services that provide the following services: ESLIMP CALLAO and PETRAMAS S.A.C.; sweeping, collection, and disposal of waste.
Elaboration of sweeping, collection and waste disposal programs provided by ESLIMP CALLAO and PETRAMAS S.A.C.
Elaboration of reports so that the General Management can confirm the services provided by EPS-RS, ESLIMP CALLAO, and PETRAMAS S.A.C.
Attention to the accusations regarding solid waste contamination that arrive at the Department of Environmental Control.
Attention to documents that arrive from the Rent Management Office regarding public cleaning concerns.
Elaboration of the Institutional Operation Plan (POI) and points of evaluation pertaining to public cleaning services and the Solid Waste Treatment Plant Project.
Elaboration in coordination with the Provision Management Office, ESLIMP CALLAO, and the budget of public cleaning services under the Rent Management Office.
Assistance with meetings pertaining to the environmental management of solid wastes organized by different organizations, such as the Ministry of the Environment and the Ministry of Health.
Grant transport authorization for common wastes so that they will be elevated to the supervision of the General Management of Environmental Protection.

Management Instruments

Certificate of Environmental Conformity

Requirements for obtaining and altering the certificate of environmental conformity:

Procedural Denomination	Requirements	Right of Payment with respect to the UIT	Office of Origin	Authority that is ultimately responsible for resolution
<p>Certificate of Environmental Conformity (CCA) for Industrial and Commercial Businesses, or Services that use supplies or generate wastes that are harmful or produce a negative environmental impact.</p>	<p>1. Formal request to the mayor indicating the amount and date of the payment. 2. Any of the following documents: a) A copy of the environmental impact evaluation for the corresponding sector. b) A copy of the PAMA approved by the appropriate sector. c) Another environmental document approved by the appropriate sector. d) An environmental study completed by an environmental firm or professional registered with the General Management of Environmental Protection. e) The constancy of not having to be in accordance with the aforementioned requirements. f) A sworn statement of no significant environmental impact for the following: bakery,</p>	<p>7.6 % cash payment.</p>	<p>The Management of Document Reception and General Archives.</p>	<p>- Reconsideration: General Management for Environmental Protection. - Appeals: Mayor. - Interpretation of administrative materials is for 15 days peremptory or must be resolved within 30 days.</p>

	artisan industry, jeweler, metal workshop, mechanic, tire manufacturers, lubricant manufacturers, construction material and scrap dealers. 3. Payment.			
Alteration of a Certificate of Environmental Conformity.	1. Formal request to the mayor indicating the amount and date of the payment. 2. In the case of industries that have not presented an environmental impact evaluation, PAMA, DIA, EVAP, or other environmental document, they must present a document that has been approved by the corresponding sector. 3. Payment.	5.6% cash payment.	The Management of Document Reception and General Archives.	- Reconsideration: General Management for Environmental Protection. - Appeals: Mayor. - Interpretation of administrative materials is for 15 days peremptory or must be resolved within 30 days.

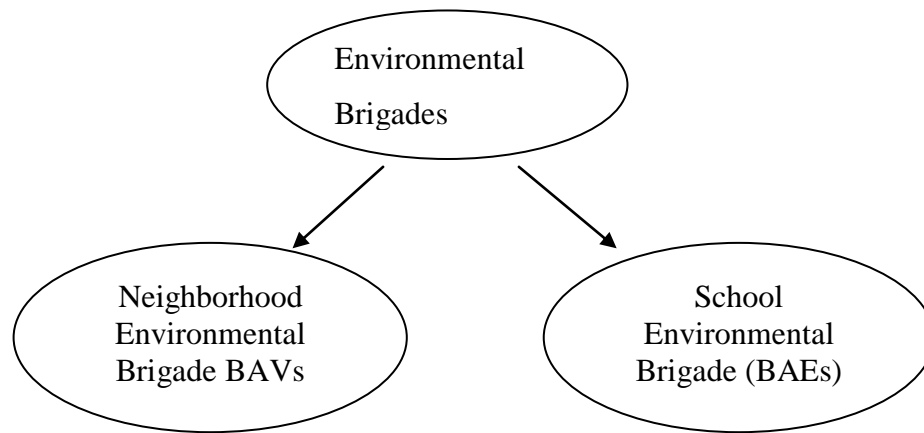
Environmental Education Program (PEA)

Vision of Callao for 2011:

Callao will count on citizens that have gained an environmental conscious to exercise their environmental citizenship with responsibility, with the understanding that the processes of general environmental management contribute to the sustainable development of the province.

Mission of Callao for 2011:

Callao promotes environmental education under the framework of local environmental law and the local system of environmental management as a strategy to achieve a change in the thoughts, feelings, and actions of citizens when faced with local environmental problems.



BAVs: Are leader environmental citizens who work in conjunction with the municipal government, contributing to the generation of consciousness, participation, and environmental culture in people and organizations in their respective neighborhoods.

Functions:

- Replicate their environmental knowledge.
- Promote the active participation of neighbors in local environmental initiatives.
- Contribute to the identification and solution of environmental problems.
- Be vigilant to arising environmental problems.

Activities:

- Training Workshops: July 7th, August 4th, September 1st, October 6th, November 10th.
- Pro-Environment Campaigns: 10th – 13th September (DIADESOL); 14th September (Clean-up Campaign); 28th September (Waste Separation Campaign); 19th October (“Fixing up my garden” Campaign); and 7th December (Clean-up Campaign).
- Technical Assistance and Replication: July- December.
- Competition: 1st – 3rd November (The Cleanest and Best Organized Neighborhood)

BAEs: Are environmental children and youth organized to generate consciousness, participation, and environmental culture in the members of their respective educative institutions and local organizations.

Functions:

- Defend our environmental rights.
- Replicate environmental knowledge.
- Motivate the participation of members of educative institutions in environmental activities and campaigns.
- Contribute to the identification and solution of environmental problems.
- Develop and promote good environmental practices in their respective educative institutions, neighborhoods, and communities.

Activities:

Training Workshops: 16th July – 9th November.

Environmental Education Visits: 29th August, 7th September, 5th and 12th October, 9th November.

DIADESOL Celebration: 14th September.

Regional Science and Technology Conference: October.

1st BAEs General Meeting: 15th and 16th November.

Attention to Complaints and Accusations by the Community of Callao

Written and phone complaints and accusations will be attended to with immediate solution.

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