EDUCATIONAL MATERIAL FOR LAS PERLAS ARCHIPELAGO, PANAMA

By

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1. INTRODUCTION

1.1 THE DARWIN PROJECT INITIATIVE

The Darwin project initiative coordinated by Smithsonian tropical Research Institute (STRI) and Heriot Watt University aims to build up research and habitat information about the marine and coastal environment of Las Perlas Archipelago to properly enable it to be designated as a Protected Area. One of the methods that helps achieving the target is by increasing awareness and promoting the designation of the Protected Area so that the Archipelago’s important marine natural and commercial resources could be protected and sustainably managed. This dissertation aims to prove the importance of education on environmental issues on areas that are facing potential designation of natural protected areas and especially around areas with population that are still undeveloped and poor such as Las Perlas Archipelago. A literature review on the socioeconomic surveys in other areas around the world will help to justify the fact that designation should come after education. A twelve days field trip in Las Perlas Archipelago helped me to collect data on the people’s perception about environment and protected areas in order to identify the key aspects that should be mentioned in preliminary educational material in the form of brochures that we are hoping to produce before the area is designated. On top important feedback on environmental education should be drawn in order to make suggestions to the Ministry of Education for improvement of the existing program as well as to promote public consultation to initiate dialogue on the subject of environment and protected areas.

1.2 SOCIETY AND ENVIRONMENT

It is has become apparently important subject in the social sciences and especially in Sociology, the relationship of humans and their environment. For my hypothesis I am
considering the term environment as the natural environment including all living creatures and natural phenomena trying to distinguish it from the general term that usually sociology uses for environment as anything around us, a car, our house, a street. The environment was always a vital part of the humans’ life, because every activity is connected, directly or indirectly, with it. The interaction is taking place in every single moment. We need to build a shelter to protect ourselves from the environment (weather), we draw our food from the environment, we travel using the environment and in general we take and give everything to the environment inevitably.

All the living organisms are part of the same system, the nature, which can be considered to be a global environment divided to sub-environments according to physical, chemical and biological characteristics. In general we can define environment as the context which provides the conditions for the existence of the human species, and for the multifarious other living creatures and vegetation (Cudorth, 2003).

On the other side, the society encloses all those activities of the human social life. It is important to notice that the interaction of the society and environment is real, because the environment changes the social life and behaviour of the people as well as the human social life may change the environment and although a few thousand years ago the effects of the human social life on the environment were not of particular scale, nowadays we have all noticed that the environment changes every day due to our activities. However an important aspect of the social life and nature is the environmental education, which is going to be discussed thoroughly on the next paragraph.
1.3 TOWARDS AN ENVIRONMENTAL SOCIETY

As it was mentioned before the increasing effects of humans’ activities on the natural environment has drawn the international intention of the governments and organizations the last 50 years and particularly the importance of the education in this aspect of the society. At the United Nations Conference on the Human Environment that held in Stockholm in 1972 stated for the first time as a common conviction that:

“Education in environmental matters for the younger generation as well as adults, giving due consideration to the underprivileged, is essential in order to broaden the basis for the enlightened opinion and responsible conduct by individuals, enterprises and communities in protecting and improving the environment in its full human dimension…” (UNEP, 1972).

The statement refers particularly to underprivileged populations, in our case the communities in which significant poverty exists, in terms of quality of life, access to technology, economic development and social stratification. It had been shown the significant link of poverty and environmental degradation (Sachs, 1998) and the personal experience by visiting the archipelago of Las Perlas Islands makes this link a fact that should be changed for the prosper of the local communities. Especially nowadays environmental education is an essential part of sustainable development for the undeveloped societies.

Since then, the subject was thoroughly mentioned in other international meetings such as the 1977 UNESCO conference on environmental education and the World Conservation Strategy as part of sustainable development. A historical background on the key events for the development of Environmental Education is given in Appendix 1.
1.4 SUSTAINABLE DEVELOPMENT.

The concept of sustainable development became an official issue in 1992 at Rio De Janeiro when 100 countries met under the United Nations conference on the Environment and Development, they adopted a plan for achieving international sustainable development called Agenda 21. Within the main objectives of the plan is to combat poverty, protect and promote human health conditions, promote the conservation of the environment and the biological diversity. At the same time the plan strengthens the role of the lower, in the social stratification, classes as well as the low influence groups such as farmers, workers, non-governmental organization, women and children (UNDESA, 1992). In general the terms sustainable development is particularly difficult to be defined exactly. According to the World Bank sustainable development is the development that meets the needs of the people today without compromising the ability of future generations to meet their own needs. Sustainable development implies economic growth together with the protection of environmental quality, each reinforcing the other. The essence of this form of development is a stable relationship between human activities and the natural world, which does not diminish the prospects for future generations to enjoy a quality of life at least as good as our own. (Mintzer, 1992).

1.5 THE IMPORTANCE OF ENVIRONMENTAL EDUCATION

According to Vinke (1993) Environmental Education is one instrument among others, namely command-control (regulatory) and market-based (or economic) instruments (taxes, charges) that are used to cope with environmental problems such as over-exploitation and pollution. In other words act as another policy maker for those that are working on policies and of course it is essential to be considered as a policy as soon as the complexity of the modern society has to deal with many different factors.
Nevertheless nowadays policy makers are more and more promoting the public consultation but even this action should follow education. The public consultation is a tool for the governments to have some feedback and listen to the public opinion on a specific subject. But how can public consultation be effective when there is poor understanding of the subject from the point of the local communities? Of course the answer is that public consultation is not effective at all (Fraser and Jamieson, 2003).

Education is also central to development. It provides to people knowledge and information about technology, sciences. It spreads around the world different ideas and concepts opening the people’s minds to much different mental stimulation. An educated person can judge better a situation and can also react more effectively in difficult conditions. In other words not only it expands the mind but also develops the spirit. Indeed environmental education is a life long teaching/learning approach that has the potential to strengthen people’s capacity to address environmental and development issues, to be more aware of and better understand such complexity, to develop knowledge, values and attitudes, life skills and ethical behaviours consistent with sustainable development as well as effective participation in decision making (Rose and Bridgewater, 2003). This statement by Rose and Bridgewater describes all the aspects that environmental education influences but also strengthens.

It is obvious that since environmental problems have increased in number and complication, the education is the right tool to fight the global environmental problems. Much of the environmental destruction is taking place because of ignorance. For example the overexploitation that leads to habitat and species destruction, could easily be avoided if the people knew and understood that nature is not an unlimited source of products, but a well tuned balance and that since
equilibrium has changed then nature is under threat. The same happens with pollution with litter and waste disposal.

However environmental education does not only provide direct solutions, it can also be very effective source of information. In other words it can be used to exert pressure on governments, private enterprises or even individuals, but in general on groups that have economic, political power to act on behalf of the people and for the protection of the environment. It is difficult to manipulate and convince a group of people with an informed background that there is no problem, and even harder to convince them that the solution that has been adopted is the best. In general the manipulation of the people was always based on their ignorance. Therefore every information source can be an educational tool. However information may be misleading and distracting some times. Take as an example the media and the press. Nowadays is the most popular way for getting information, but it involves some serious dangers. Environmental education permeates various fields and its applicability can therefore been seen in various context (Figure 1).

![Figure 1. Applicability of Environmental Education (Fihlo, 1998)](image)

1.6 MEDIA AND EDUCATION

The media has always been an influential sector in public life. Representative example of such influence is the Exxon Valdez in Alaska. The multinational oil
company Exxon paid billions of dollars not only to clean the oil from the coasts but also on compensations and recovering operations, just due to people’s pressure and under the threat of collapse of the company’s image. And not only the company was more careful and concern after this incident for environmental issues, but also the governments took extra measures to prevent such catastrophes, made their legislation more strict and impose higher standards in the industry. It should be mentioned at this point that media may be responsible for the strategies of the Multinational Enterprises like BP to promote environmental education and environmental protection by investing on production of educational material for schools, providing an environmental friendly image to the society (BP educational service, 1993). Therefore the media can play the role of the educator as soon as they are not affected by political or economic influences and they are objective. Unfortunately such a thing cannot be guaranteed nowadays and it is common phenomenon for parts of the media to follow a specific political line, support a government or a big enterprise. Even worse media are distorting the truth leading people to wrong conclusions. However even this problem can be solved with appropriate education. Therefore education is the tool to criticise the educator. The more education someone has the greater quality of education he is demanding.
2. AIMS AND OBJECTIVES

GENERAL OBJECTIVE:
To prove the importance of education on environmental issues on areas that are facing potential designation of natural protected areas and especially around areas with population that are still undeveloped and poor, like Las Perlas Archipelago in the Central Pacific, Panama.

SPECIFIC OBJECTIVES:
1. To prove the importance of environmental education in the target area before the designation as a natural protected area.

2. To identify the key aspects that should be mentioned in preliminary educational material.

3. To identify the target population for the educational material.

4. To locate possible gaps in the actual program from the Ministry of Education that could be covered with the environmental education plan that will be proposed as a result of the Darwin project initiative.
3. LITERATURE REVIEW

3.1 THE PROBLEMS ARISE WITH THE DESIGNATION OF PROTECTED AREAS.

As it was mentioned before, environmental education is essential especially in areas where we are trying to promote sustainable development. The sustainable development assumes protection of the natural environment, its habitats and its organisms. However we have always to bear in mind that the local populations have to keep their social identity intact, for this reason we have to provide solutions that will not affect the traditional way of living, the customs, the religion and the social organization of the people because then we destroy our initial target which is the human community. Thus protection of the environment is the first step taken for developing an area for the future respecting always the local communities.

The most common method of protection that has been adopted by most governments around the world is the designation of natural parks, natural reserves, protected areas and many other schemes adopted by the politicians and policy makers to satisfy not only the local legal regime but also the scientific indications. By scientific indications we mean all the noticeable environmental degradation either due to pollution or due to overexploitation or even due to natural causes. The designation can have national or international character depending on the importance of the area historically or environmentally. The leading organization for the sustainable development IUCN (International Union for Conservation of Nature and Natural and natural resources shortened to The World Conservation Union) has identified 6 main management categories for the protected areas (Table 1). These categories may vary from areas that every human activity is restricted to sites that monitoring and controlling is considered enough for protection (Horst, 1985).
Table 1. List of Protected areas (IUCN)

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>PROTECTED AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.</td>
<td>Strict Nature Reserve/Wilderness Area</td>
</tr>
<tr>
<td>II.</td>
<td>National Park</td>
</tr>
<tr>
<td>III.</td>
<td>Natural Monument</td>
</tr>
<tr>
<td>IV.</td>
<td>Habitat/Species Management Area</td>
</tr>
<tr>
<td>V.</td>
<td>Protected Landscape/Seascape</td>
</tr>
<tr>
<td>VI.</td>
<td>Managed Resource Protected Area</td>
</tr>
</tbody>
</table>

However the designation of an area is not a simple matter and experience has shown that encounters many dangers, especially for the local communities that happen to live in or around a candidate area.

The problems that have risen due to environmental designations are mainly social, because usually the government forces the local people to abandon traditional methods of living, feeding, clothing etc. For example indigenous people have to find other sources of food because the hunting is banned and the deforestation for agricultural use is strictly control or forbidden. This may be particular important in areas where there is high population growth like in Africa and Asia. Of course it depends on the kind of designation that occurs, because this may vary from strict control and banning of the use of all the natural resources till the moderate control and loose restrictions that prevent overexploitation. In any case the local communities should be taken strongly under consideration due to the fact that sustainable development means also respect to social, economic and political stratification of the designated areas.
3.2 SOCIO-ECONOMIC SURVEYS IN PROTECTED AREAS.

Many researchers have carried out surveys around the world to locate the source of the problems caused with a designation. Most of them have been concentrated on the community’s attitudes towards a national park or actions taken by the government with respect to wildlife management. Usually is wildlife management from outsiders that creates conflicts within a designated area and socio-economic problems are the main concern. It has also been noticed that location and ethnicity affect the community’s behaviour towards the protected areas (Noss & Cuellar, 2001). Some people may have better perception for the environment and therefore they have developed traditional concepts about the protection of it, for example they may no collect alive wood but only wood from trees that are dead. The same concept may follow for hunting with no hunting juveniles or injured animals. These values are passing from generation to generation and usually the leaders of the communities are responsible for imposing such traditional laws. However there are also communities that they do not follow the same concepts and the idea that nature is infinite and the natural resources are never ending, is a belief that usually the current management groups are trying to change. The native cultures of many countries are used to teach social and environmental knowledge and values (Caduto and Bruchac, 1988). However this does not seem to happen with the communities of Las Perlas Archipelago. I believe that the reason for this is that the communities do not have real roots in the area, as long as they reach the area as slaves in the 16th century, and they never consider this land as their real land, the land where their ancestors live and create.

Furthermore Fiallo and Jacobson (1995) identified three other primary factors influencing the attitudes of rural residents, the lack of direct involvement in the
establishment, management and decision making of the protected area, the lack of perceived benefits from the protected site, which will make it attractive to the local residents and finally the interaction between the local residents and the people that are working for the policing of the protected area. The enforcement of the environmental law is held by staff employed by the government and usually not originated from the protected area (Heinen, 1993). Empowering local people may improve management as soon as they have better understanding of the community’s problem and they can be the missing link between governmental groups and locals. This also will provide solution to the problem identified by Hough (1988) who supported that the difficulties of communication between a park authority and local populations may interfere for establishing any form of cooperation. A table with the summary of the observations from different researchers around the word is given in the Table 2.

<table>
<thead>
<tr>
<th>Factors Influencing Attitudes Towards Conservation and Protected Areas Around the world (Fiallo and Jacobson, 1995)</th>
<th>Ecuador</th>
<th>Costa Rica</th>
<th>Nepal</th>
<th>South Africa</th>
<th>Botswana</th>
<th>Tanzania</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>*</td>
<td>nr</td>
<td>nr</td>
<td>Nr</td>
<td>nr</td>
<td>nr</td>
</tr>
<tr>
<td>Ethnic group</td>
<td>nr</td>
<td>nr</td>
<td>*</td>
<td>Nr</td>
<td>nr</td>
<td>nr</td>
</tr>
<tr>
<td>Affluence</td>
<td>-</td>
<td>nr</td>
<td>-</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>*</td>
<td>nr</td>
<td>*</td>
<td>*</td>
<td>-</td>
<td>a</td>
</tr>
<tr>
<td>Knowledge</td>
<td>*</td>
<td>nr</td>
<td>a</td>
<td>Nr</td>
<td>nr</td>
<td>nr</td>
</tr>
<tr>
<td>Relationship with park staff</td>
<td>*</td>
<td>a</td>
<td>a</td>
<td>A</td>
<td>a</td>
<td>*</td>
</tr>
<tr>
<td>Benefits</td>
<td>*</td>
<td>a</td>
<td>-</td>
<td>*</td>
<td>*</td>
<td>nr</td>
</tr>
<tr>
<td>Problems with wildlife</td>
<td>-</td>
<td>nr</td>
<td>a</td>
<td>Nr</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Shortage of land</td>
<td>a</td>
<td>-</td>
<td>nr</td>
<td>A</td>
<td>a</td>
<td>*</td>
</tr>
<tr>
<td>Residence length</td>
<td>a</td>
<td>nr</td>
<td>nr</td>
<td>Nr</td>
<td>nr</td>
<td>*</td>
</tr>
<tr>
<td>Perception of poor management</td>
<td>nr</td>
<td>nr</td>
<td>a</td>
<td>Nr</td>
<td>a</td>
<td>*</td>
</tr>
</tbody>
</table>

* statistically significant
a anecdotal
- no effect
nr no report
3.3 LAS PARLAS ARCHIPELAGO. EDUCATE BEFORE DESIGNATE.

The Panamanian Government has many plans for the development of the Archipelago of The Pearl Islands, but scientists are concerned about this and they want to promote sustainable development but also designate the area as a protected site before the actual developments. However as it was said before there is very little scientific information and the only research that has been done was for the pearl oysters and their disappearance. The Darwin initiative has allocated other researchers to work in different aspects of the area. A geographer is mapping the area according to vegetation cover; three postgraduate students from Heriot Watt University are working on the marine environment fisheries and species that are under threat. On top of that is promoting the designation of the protected area but at the same time it encourages the sustainable development as well. For this reason special care is given to the environmental education of the local communities. The objectives of environmental education at this level are the following:

- Inform the people about the problems identified in the area. It is very important to explain and show the actual threats that the environment is facing. Although some of the problems may be obvious and most of the people know them, it is vital to concentrate the actual education on the groups of people that are causing environmental problems through their work and of course the young population which is the future of the society.

- Describe the use of the protected site in the area and give information about its functioning aims and dissipated results that such a designation should have.

- Suggest solutions to the people to solve the problems. It is essential as soon as the threats are clear, to produce solutions in order to achieve efficient protection. Convince the local communities that everyone can help to restore
the environment and not only the above mentioned groups; however they are still going to be the primary target (children and local stakeholders).

- Promote the public participation in the decision making as soon as the education is effective.

- Last but not least to make people care about the environment. The archipelago is a huge area. No matter what designation takes place still there must be someone to police and make sure that the laws and by-laws are imposed. The Panamanian government will be responsible for this task, but no matter how high police force it uses, the area is so big that the communities themselves should guard and protect their environment. The support of local people is vital for protected areas, because public support provides, long term viability, political and financial support, better enforcement and cooperation, and improved management by local knowledge (Sheppard and McNeely, 1998). If the local communities protect and respect the environment, then most of the targets will be achieved and the environment will start to recover to its initial condition.
4. STUDY AREA

4.1 LAS PERLAS ARCHIPELAGO

The Peal Islands Archipelago is a group of islands in the Gulf of Panama, Pacific Ocean, and located 70 Km from Panama City (Map 1 & Appendix 11). The group consists of 53 islands and many islets with relatively low inhabitants (McNiven, 2003). Not all of the islands are inhabited and therefore the anthropogenic impact should not be significant.

However the area has been very little monitored and although there is noticeable environmental degradation, especially as far as the marine environmental is concerned, it is not still clear what caused it. Scientists at the moment consider both human and natural causes responsible for the degradation and for this reason one of the future plans for the area is to be designated as a protected site, nevertheless, at the same time there plans for major tourism development on the islands. The production of educational material for the local communities will help them to understand the benefits of the designation and convince the people in the area that only if they care
about their environment, development will be more effective, sustainable and long term.

4.2 HISTORY OF LAS PERLAS ARCHIPELAGO (ARCHIPIELAGO DEL LAS PERLAS)

The history of the Pearl Islands goes back over five hundred years when the new world was discovered by Christopher Colombus. The archipelago was brought to Old World's attention because of the pearls that its waters contain. The name was given to the archipelago after the black-lipped pearl oysters (Figure 2) that were in abundance in the past.

![Pearl Oyster from Las Perlas Archipelago](image)

The fishery of the pearl oysters appears in historical records since 1500 and it was the reason that brought Vasco Nunez de Balboa, the discoverer of the Pacific Ocean, after the testimony of an Indian-native guide that the islands were rich in pearls. Of course that shifted the attention of the Spanish to the area and after fighting and killing one of the local Indian kings who resisted the Spanish occupation, they start exploiting the area for pearls. Within two years all of the native Indians of the islands were dead.
despite the cooperation that they showed after the fights (Doggett, 2001). This is probably the reason why there is no history in the area before the Spanish arrived; nobody survived to pass the history to the next generations. The Spanish covered the working force of the Indians with slaves that they brought from Africa. The populations of the islands are descendants of these slaves (Doggett, 2001). Apart from the Spanish, pirates also operated in the area. The morphology of the coastline with many small natural harbours was a perfect hideout for the pirate boats; furthermore the pearls were always attracting pirates. At the begging of the 20th century the oyster fishery was well developed, by this time the important products were coming from the mother-of-pearl oyster for buttons and the meat. By 1920 the oysters fishing stocks declined and almost disappear by 1940 (McKenzie, 1999).

The archipelago from 1513 that discovered from Vasco Nunez De Balboa until the Second World War was relatively unknown apart from the pearl fisheries (Heckadon-Moreno, 1996). However the San Jose Island has been also used from the United States of America for a chemical warfare program that dates back to the 1930’s (CBW, 1999). The US government had deployed a large military force for the protection of the Canal Zone and the US Ministry of Defence included chemical weapons as part of the defence strategy of the Canal. The United States, Great Britain and Canada collaborated closely in the 1940s on testing and development of chemical weapons mainly against the Japanese. The chemical weapons had been introduced in the First World War and the mustard gas was used for the first time ever in battle.

The allies were looking for a place in the tropics to test and develop chemical weapons. San Jose island (Map 2) in Las Perlas archipelago was satisfying the specifications of the Chemical Warfare Service for a place that lacked human habitation, was a safe distances to nearby islands, had tropical jungle, good water,
absence of diseases and poisonous snakes. The description was perfectly matching San Jose.

The project with the code name “The San Jose Project” formally started on 6 January 1944. The island stationed more than 400 enlisted men and nearly 200 officers and civilians. The chemicals that mostly used in the island were mustard gas and distilled mustard, phosgene, cyanogens chloride, hydrogen cyanide and Butane.

With the completion of the project and more important with the handing of the Canal over to the Panamanian government a lot of ammunition was dumped. At the south of the Archipelago and the island of San Jose there is a dumping site of chemical weapons, where the bathymetry of the sea bottom increases significantly by the presence of a trench.
A recent chemical assessment was carried out in March 2002 in order to identify the condition and contamination level of the island (Tregonning, 2002).

There is already a tourism development, The Hacienda del Mar Resort and there is some concern how safe this is for the people. In general Las Perlas Archipelago is being promoted by the Panamanian government for tourism development (Map 3). San Jose Island must be assessed before any further development in order to decrease the potential danger for tourists and visitors who lack of knowledge of the past. The rest of the islands should also be assessed for economical and social factors in order to achieve sustainable development. The environmental education of the local communities must have a leading character in the developing process not only because of the future tourism development but also for the current environmental problems that have been noticed in the area.

The pearl islands as it was mentioned above are a large group of islands scarcely inhabited. However there is a significant size of population concentrated in some of
the islands. The total population of the archipelago according to the last census carried out by the government is 2336. From this number the people over 18 years old represent 63%. Although the poverty is very high and this can be seen from the fact that many everyday facilities like electricity, drinking water and electricity is not available to everyone. For example the 26% of the households in the archipelago have not access to drinking water; almost the 30% do not have proper sanitary facilities and the 89% of the houses do not have telephone. It should be noted however that the remaining 11% that have telephone are concentrated only in Contadora Island and the town of San Miguel in Ray Island However most of the villages and towns have at least one public phone located in a phone box that everybody can use.

As far as the information sector is concerned, newspapers and press is generally not reaching the archipelago but TVs and radios are quite common with the 68% and 73% of the households to have access respectively. From personal experience one of the places that are facing most of the problems is the village Martin Perez, at the south west coast of the Ray Island (Map 4).

In Martin Perez there is not electricity at all, there was a small scale power plant that was covering the need of the village but it is out of order for 2 years now, with significant implications to the local community.
Apart from the fact that the electrical appliances are out of use, there is no refrigeration either, to preserve goods, food and especially fish. The people from Martin Perez are mainly farmers and fishermen. However they only work to satisfy local needs, because they cannot store goods due to lack of fridges. Some times they may travel to San Miguel, which is the largest town of the archipelago, and trade some of their products but still this is very limited and cannot support the commercial activities of the village that is the basic source of income. This has as a result that the adult men commute or leave the island for the sake of a job in the rest of the islands and especially Contadora and Saboga where there have been some tourism development undergoing in the last few years. It should be noted at that point that the village of Martin Perez does not exist in the map and the government does not include this area in the latest census, therefore official statistical records do not exist.

There are schools almost in every main village, however not all of them are working. In general terms most of the children are going to school in their villages or at least to the nearest town, but usually they will have to quit in order to start working. However most of the people are completing at least the primary school and therefore the illiteracy level is not high -only 3% do not attend school until the 3rd grade- as it could be expected comparing to the general development and poverty. This is a significant result of my observations in the area, because that means that the local population has the minimal education and therefore we can refer to them with written material as well. As far as the official environmental education by the government is concerned unfortunately it is no existing as I realised from the conversations that I had with the teachers, but more information will follow later in chapter 6.
5. METHODOLOGY: THE SURVEY INSTRUMENTS

5.1 TEACHERS SURVEYS

The survey of the teachers was carried out according to a questionnaire, which is available in Appendix 2. Due to the fact that our team had limited time on each village for surveys, the questionnaire was usually handed in early in the morning as soon as the school was opening with the commitment to pick it up just before the school closes in the afternoon. Because of that no explanations to the teachers could be given during the completion of the questionnaire with all the implications that this could cause of misunderstanding any of the sections in the survey.

5.2 STUDENTS SURVEYS

The surveys for the children were base on oral questioning of the students in the class. The schools from which the students were surveyed are, San Miguel, Martin Perez, Contadora and Pedro Gonzalez (Appendix 11). Unfortunately the day that we visited Saboga there were not lessons in the school and therefore the student of Saboga were not surveyed. The examination of the student was based on the plan available in the Appendix 3.

The questions are examining the knowledge and understanding the children of primary and secondary education level have about the two main problems, pollution and overfishing. Simple questions of the form “Who knows what pollution and overfishing is” and “Can you identify those problems around you?” are inviting the children to express their thoughts and believes about the problems.
Most important the answers that the student would give can be used for the development of educational material as an indication on which level they understand the two main problems in the area of the archipelago.

5.3 GENERAL SOCIO-ECONOMIC SURVEYS

The socio-economic surveys were carried out by Inez Cambell (Darwin fellow) in two main parts, the second part which I attended was during the same period with my surveys and the population sample was taken on the same islands that I visited (Appendix 11). The results will be published shortly providing a very important indication for the production of the educational material, because it will give a general social description of the area. Part of the questionnaire is very similar to the one that I had prepared, but for efficiency reasons, one questionnaire was used that covered both researchers’ needs. However this particular survey covers aspects that are important to draw conclusions for the public idea about the concept of Protected Areas as well as the noticeable environmental degradation the Archipelago has gone through the last years. The results provided from this survey are limited to the islands that I had the opportunity to visit. A version of my general questionnaire can be seen in Appendix 4

5.4 EDUCATIONAL MATERIAL

The final tool that is going to be used to achieve our objectives is the educational material. The actual educational material will be divided for two main target groups, students and fishermen. This is because according to the surveys and the information that we have from the latest census, these two groups are representing a large number of the active population. Considering as well that young people is always the target of education simply because they have better learning capability and they are the main future users of the environment. However this statement should not be misunderstood
that we are trying to provide solutions for the future. The educational material will be
developed in order to solve the current problems and promote a better future through
sustainable development.
6. RESULTS

6.1 TEACHERS SURVEYS

The schools that were surveyed were Contadora (1 teacher), Saboga (2 teachers), San Miguel (2 teachers), Pedro Gonzalez (1 teacher) and Martin Perez (1 teacher). Casaya was not surveyed because the school was no working, because the ministry of education has not allocated teacher there.

In Contadora the school is consisted by one class of 7 students and covers simultaneously the 1st, 3rd, 4th and 6th grade of the primary school (multi-grade system). Similar structure has the multi-grade school Pedro Gonzalez with two classes covering the 1st, 3rd and 5th grade and 2nd, 4th, and 6th grade in classes with 25 and 16 children respectively. In Saboga island there is another example of multi-grade school with a class covering the 1st, 3rd and 6th grade of the primary educational level. Finally in Martin Perez we found a class of 21 children covering as well only primary level.

On the other hand San Miguel is the only town in the archipelago that has secondary level of education. It has not multi-grade system but it covers teaching until the 9th grade and it has 205 students in total. As far as the surveys are concerned we managed to survey 8 out of the 13 in total teachers in the area that we visited.

In the question “which are the limitations in your school or class for teaching topics related to the marine environment?” Seydi Ortiz from Contadora answered that she needs visual material like posters and pictures. Mileya Cortiz and Sonia Madero from Saboga wrote that they have some basic material to work on from a guide to marine environment that was given to the school by the Ministry of Education, but they do not believe that is useful. In Pedro Gonzalez, Aquilino Guerra Jimenez and his colleague
identified as basic limitations the lack of relevant documentation and the lack of time that they have according to the teaching schedule provided by the Ministry of Education. In San Miguel Luis E. Herrera and Rubiela Rodríguez answered both that one of the constraints and probably the most important according to them is the limited budget, but Rubiela also mentioned the lack of basic work material for this specific topic. Finally Jessica de Villanueva from Martin Perez mentioned the limited budget and the lack of basic material to work with.

As far as the question that covers the activities that the teachers may have done so far about the marine environment, all the teachers (6) from Saboga, Pedro Gonzalez, Martin Perez answered that they have not done or planned to do any activities so far. On the other hand in Contadora the teacher has covered the topics of “Ecosystem” and “Food Chain”. The other positive answer that we took from this question was coming from the other teacher from San Miguel that she wrote that she has taught in the class ‘Fishing” and “Animal’s Anatomy” in other words some very basic marine biology.

In the section ‘Which of the next materials (Basic material like colour pencils and paper, books, TV and Video) are available for using in your class’, in Contadora children have access only to the basic materials described before, in Saboga they have all the material included TV and video as well as in San Miguel, but in Pedro Gonzalez and Martin Perez the teachers can provide to the children only the basic materials and some books.

The question ‘Which type of information about the marine environment in Las Perlas Archipelago and the National Natural Parks will be useful for your class?” presented the greater diversity in answers. In Contadora and Pedro Gonzalez the teachers believe that the type of information that they need is posters and books related to the
marine environment and especially the environment of Las Perlas In San Miguel and Saboga the teachers were more specific and asked for information about the beach pollution, over fishing, marine life (as a compliment to the main resource in the area) and its conservations as well as vegetation in the area, the life in Mangroves and coral reefs. Unfortunately the teacher in Martin Perez did not answer the question she just wrote that she has not information at all about the marine environment or the National Natural Parks.

The next question assumes that we are going to develop a teacher’s guide and for this reason we were asking “Which types of activities you would like to see in the teacher’s guide?” The two teachers that were surveyed from San Miguel answered that they would like to see guided fieldtrips to the beach, art projects, suggested homeworks, group games and models. In Contadora the answer was group games, experiments, art projects, models and individual or group homeworks. In Saboga and Martin Perez all of the teachers suggested group games and guided fieldtrips to the Beach. On the other hand the teachers from Pedro Gonzalez did not suggest anything specific just everything that can be done in the class but they also mentioned that they need activities that will motivate the children.

The sixth part of the questionnaire tries to identify how important for the educational system is the teaching of environmental issues by asking the teachers to tell us how many hours they can allocate for environmental education. In San Miguel they are using 1 hour per week for the primary school and 3-4 hour per weeks for the classes of the secondary level. In Pedro Gonzalez on the other hand the answer we got was 40 minutes per week (I assume that 40 minutes is the period of an academic hour), but it was underlined by the teacher the fact that it is very difficult in multi-grade classes to teach this subject, because the time is limited when they have to teach three classes.
at the same time. In **Contadora** the time the teacher is usually spending environmental education is also an hour per week, 3 hours per week in Saboga, and 1-2 hours per week in **Martin Perez**.

The next section was asking the teachers ‘In case that you cannot allocate extra hours for environmental education, which do you believe that are the other classes that can be combined with the environment?’”. The answers were almost similar to most of the schools, noting that ‘Social Sciences’, ‘Natural Sciences’, “Agriculture” are the most appropriate classes except a teacher in **San Miguel** who mentioned only “Art” classes and the teachers in **Pedro Gonzalez** and **Martin Perez** that answered “Technology”!

In the question ‘Is it possible to go with your student to the beach?’ all of them answered positively, but in **San Miguel** one of the teachers also mentioned that for such an activity it is needed the authorization from the Director of the school and the permission from the parents.

The last part of the questionnaire was providing some space for the teachers to write their comments. The only who respond to this task was the teacher from **Contadora**. She identified the importance of the environmental education, but at the same time she believes that apart from the students and the children in general, effort should be made for the rest of the members of the community. She suggested public talks, fieldtrips and posters placed in central locations would be a way of educating everybody.

### 6.2 STUDENTS SURVEYS

In general terms most of the students were showing interest in our questions however not all of them were willing to answer us. In the section of pollution most of the students showed knowledge of the subject. Most popular answers for the question of
what is pollution and where is around us, were concentrated on the polluted air, water and litter. For this reason most of the answers related to proposed measures against contamination were involving cleaning up the streets and the beaches.

As far as the overexploitation is concerned the questions were refereeing specifically to over-fishing. Overall the answers were less than the first section and only the students from the secondary education were able to provide some sufficient answers. However the most of the answers were referring to something that is going wrong with the fishing and for that reason the fish stock is reducing. None of the students gave exact and confident definition about over-fishing. It should be noted at this point that all the primary students (in Contadora, Pedro Gonzalez and Martin Perez) were unaware of the term. Nevertheless we provided some further explanation of the term when the feedback was not satisfactory, in other words we explained the term, in order to continue the examination. The next question which was referring to the possible animals that they know that have been overexploited, the answers we got were coming from the general talks that they had heard from their parents and therefore they answered that lobsters, red snapper and octopus were the most endangered species. Tables with all the results from every school are available in the Appendix 5.

6.3 GENERAL SOCIO-ECONOMIC SURVEYS

The total number of the people that were surveyed was 253 and they were chosen randomly from the streets of the islands. The 60% of the people are fishermen and only the 18.6% are farmers. However the rest of the people are occupied with other professions like shop-keepers or labourers. The highest percentage of labourers is observed in Contadora Island, mainly because it is the only island with tourism
development, therefore there is building activity as well as hotels that are employing workers for the job of cleaning, gardening, maintaining and others. However the village of Casaya is dominated by 80% with fishermen.

The surveys showed that the level of the illiteracy amongst people is low (5%), a bit higher than the official census, but in such a level that allows the use of written material for the production of educational material. According to the rest of the educational level only the 8.3% has attended a university and from this the 20% is in Contadora. As far as the rest of the people are concerned, 43.1% has attended a primary and another 43.5% has also attended secondary schools. Again Contadora is higher with 58.6% of its residents that have secondary education as well as San Miguel with 56.5%, are the places with the most educated people.

Finally the last section that interests my research is based on the Protected Areas (P.A). In the question ‘what is a protected area according to your opinion?’, only 45.8% answered an acceptable definition for a PA. San Miguel, once more, presented the highest percentage (66.6%) and second came Casaya with 55%. Due to the fact that the percentage of questionees actually knowing what is a PA was low and in order to pass to the next question we spent some time to explain to those that they did not know or answered wrong, what a PA is. Then we were ready to appoint the next question which was ‘Would you support a protected area in the Pearl Islands Archipelago?’. A very satisfactory result of 90.5% of the overall surveyed people answered that they would support it. The lowest was in Pedro Gonzalez with 87.2% and the highest in Casaya where all the people answered positively (100%). The final question was referring to who believes that the designation a PA in the archipelago is going to affect the income of the local communities. The 78.7% answered yes, the PA will affect their income. The most people that answered yes were from Casaya with
95% and the less in Saboga with 71.4%. A table with all the results according to each town is given in the Appendix 6.

6.4 THE DEVELOPMENT OF EDUCATIONAL MATERIAL

As it is mentioned in the “Methodology” section the target groups to whom the material is pointing are the children and the fishermen. As far as the contents of the material are concerned, it was decided that four important topics should be mentioned, explained and promoted. The topics that will be covered in the educational material are:

- Pollution
- Overexploitation
- Deforestation
- Protected areas

The first three subjects are covering the most significant threats in the archipelago and the last topic is our objective for promoting sustainable development.

Pollution

The threat of pollution is currently very significant, because it is very evident in the archipelago, especially in the villages and the beaches near the villages. Litter is one of the primary reasons (Figure 3). Official gathering of the domestic wastes does not exist and the local population is usually burn waste to get rid of it. Of course this is not the best solution, because most of the wastes are plastic wrappings and bags. However it is the only way that they have to dispose of their wastes. In general I noticed a very important difference between the society in Las Perlas archipelago and our modern one. The people in the archipelago were used to use equipment that was
not disposable. Plastic was not something common and most of their every day things were made out of wood or metal and therefore they were not throwing them after using them. Nevertheless nowadays the small shops that exist in the villages are selling food and drinks in plastic wrappings. The people do not seems to understand that plastic cannot be recycled naturally, like the mainly organic matter that they are used to dispose of and the phenomenon of people littering the streets and the sea is very common in the archipelago. The only exception is the Contadora Island where due to tourism the owners of the Hotels try to keep the island in a clean condition.

Figure 3. Common view from the most beaches near the villages in the Archipelago

**Overexploitation**

Overexploitation is a threat that affected the archipelago quite early in the history. As we mentioned in the historical background of the area, Las Perlas Islands were exploited since the discovery of them by Vasco Nunez de Balboa for their pearl oysters. Other reason that makes fishermen one of the target groups, apart from the
fact that is the most common profession in the area, are the actual problems that are occurring in the marine environment through over-fishing. Although the pearl oyster fishery has collapsed since 1948 and has not recovered yet (Machenzie, 1999), it is not the only overexploited specie in the area. Another animal that has disappeared from the sea in the archipelago in the last 10 years is a mollusc (Class: Bivalvia, Family: Pectinidae) which the local people call ‘conchuela’ or ‘churuleja’ (Figure 4). Although it is still under investigation why the animal has disappeared, there is strong evidence of over-fishing in many of the islands. The
shells from the mollusc has been used for decoration purposes (Figure 5, 6), especially in Contadora where there is the most tourism development, but also the people was fishing the animal for food consumption. In Casaya Island for example the beach next to the village is covered with a thick layer of dead shells that was produced by the intensive fishing for their meat. However scientists at the moment are also investigating natural reasons that may have caused the collapse of the fishery, like El Nino, pollution, temperature rise. Through the surveys for the students, it seems that people are familiar with the problem, because the children pass to us what they hear from the adults and their parents. Lobsters, red snappers and octopus are some of the animals that are getting hard to catch day by day. This is very important to note, because assuming that the people know about the problem of the over-fishing, we can concentrate our attention and more space in the educational material eventually, on methods to prevent the problem.

**Deforestation**

The last problem that has been noticed to threaten quite significantly the environment of the Archipelago is the deforestation of the islands. The increase of the population has created significant demand for more agricultural areas to satisfy the food demand. Moreover the need of money in the society that is modernizing, adds extra pressure for higher production of goods to be traded in Panama City or the islands around the area.

Unfortunately the method for deforestation that the local population are using is related to fire. It is the cheapest and easiest way for clearing out an area from vegetation, but it involves many dangers. Usually the fire cannot be controlled very easily especially during the dry season and when the area is heavily covered with
vegetation. The catastrophic results of uncontrolled fires are obvious in many areas, where many hectares of no particular usefulness has been burnt, killing of course every single organism that had inhabited them (Figure 7).

Figure 7. Deforested area in Las Perlas using fire

Protected Areas

The most important subject of our research is the value of the protected areas on places that are planned to be developed and already present environmental problems. Experience has shown that designating an area may cause problem to the life of the local communities living in or around such an area (Fiallo and Jacobson, 1995). As far as Panama is concerned, it is country with a lot of designated areas and indigenous people living in them. Although pearl islands’ communities are not inhabited by Native Americans, but African Americans, we still have to treat them as indigenous
people, because they have been living in this area for almost half a millennium. The Kunas in San Blas and Darrien regions are one of the examples that designation may cause problems to the indigenous people if education and information has not been introduced before.

The protected area is hopefully going to be part of the solution of the problems that are threatening the archipelago. It should be noted at this point that protected area is not a National Park. The term National Park usually, according to the national legislation of each country, is a site that prohibits almost every human activity. In extreme cases it prohibits even the human presence, like the marine National Park of Sporades in Greece. Nevertheless the plans for the Las Perlas Archipelago are to designate a protected area. The protected area will be a site where the authorities will monitor and control the human activities that interact with the environment. For example after the designation, the government will have an idea about the average catching of each species in the area, and with the help of the scientist, it will suggest management plans for the right exploitation, the season in which it should be carried out and even the exact areas that should be avoided or preferred. Similarly the deforestation will be taking place within limits that are acceptable for the environment and with methods that are not dangerous for major destruction. The pollution control can be significantly increased with the appropriate information and with an integrated system of collection of those wastes that cannot be degraded naturally.

The concept of the protected area should be promoted as a concept of sustainable development and not prohibition. As the general surveys by Inez Cambell showed, the majority of the residents of the islands believe that the designation means prohibition and that it will cause problems to the local economy, because the natural resources will be locked and guarded by the government. It is very important to convince
through the educational material that the designation is going to help the local economy and the environment. On top of that it must introduce to the people terms like ecotourism. The most of the population of the archipelago believes that the only solution for the development of the area is tourism and the government is planning to invest on that. Ecotourism is the travelling to relatively undisturbed or uncontaminated natural areas with the specific objectives of studying, admiring and enjoying the scenery and its wild plans and animals as well as any existing cultural manifestations found in the area. (Ceballos-Lascurain, 1987). However the designation should be prior to development in order to establish and implement the legislation that will protect and control any further human activity. Ecotourism is the proper development for the area. It promotes sustainable development and attracts people for the natural gifts of the area, helping to maintain the environment at its highest level. As Jacobson and Robles (1992) stated education and training is a prerequisite for allowing local people to more fully participate in the economic benefits of the tourism system and as we mentioned before in the Chapter 2 this is one of our main objectives for the communities of the Pearl Islands Archipelago.

As it was written before the target groups are two and the main issues that should be covered are four, children, fishermen, pollution, overfishing, deforestation and protected areas. Most comfortable and affordable solution for the starting the educational process was decided to be material in the form of brochures. Two main brochures were designed the first for children of all the ages in the archipelago and a second brochure for the most popular profession in the area, the fishermen.
6.4.1 BROSHURE FOR CHILDREN

This brochure should contain all the important issues that we believe the children should be aware of but in simple language. Although the children do not have the same ability and perception according to their age, for example in the primary school the children have not yet been trained to compartmentalise their learning into separate subjects as they will have to do in secondary and higher education (UNESCO-UNEP), the educational brochure will be addressed to all the children. The young people of the archipelago are growing in an environment close to nature and their contact with it, is an every day activity, therefore we can assume that they are quite mature, at least environmentally, to address them with problems and solutions. This is also shown by the answers that we took with the talks that we had with them.

The brochure will be divided into four sections:

1. Overfishing: where a simple explanation of what overfishing is will be given, with examples and very briefly mention how we can reduce the threat.

2. Pollution: again a simple definition with examples will be provided and ways of reducing the problem.

3. Deforestation: the definition of the term will be given with examples of how we can have this kind of destruction with particular addressing to fire methods for clearing out the vegetation, followed by simple recommendations of how to avoid the fire to spread or who to call in case a fire is spotted.

4. Protected areas: this will be the final section of the brochure in which an explanation of the term will be given as well as its importance and its functioning. Particular attention will be given to prove that the protected area is the integrated solution of the previous problems.

A suggested plan of the brochure can be seen in Appendix 7 and 8.
6.4.2 BROSHURE FOR FISHERMEN

The second brochure will be designed for the fishermen. They are the most popular profession and they are closely related to the biggest threat of the archipelago, the overfishing. The brochure will be divided into five main paragraphs:

1. Overfishing: This paragraph will provide a definition of the term overfishing.
2. Overfished species: An account to the animals that are under threat in the archipelago will be given, to make clear which commercial important animals are endangered.
3. Fishing Methods: In this paragraph a brief description of fishing methods with drawings and text will be provided in order to prepare the reader for the next section which will be fishing methods that should be avoided.
4. Fishing methods that should be avoided: This paragraph concentrate much attention, because is providing the solution to the major threat of the archipelago.
5. Examples of stock collapsed in the past: The last section describes the two main fisheries that have collapsed so far in the archipelago, the pearl oyster and the “conchuela”.

A general plan of the brochure is given in the Appendix 9and 10.
8. DISCUSSION

The educational material is the first step towards sustainable development and environmental protection. Panama has not yet included environmental education in the schools curriculum as U.K has done for almost thirty years now (Palmer and Neal, 1994). Our attempt was limited for the development of two brochures for children and fishermen as soon as the results from the surveys showed that these two groups concentrate the value and potentials of the local society in Las Perlas archipelago. The brochures have to be direct and simple, because there is not background knowledge from the school to support further and deeper education. The examination of the students showed that the young people have a general idea of the problems exist in the area, helping us to provide material with not only simple aspects, but a brochure with explanations of scientific terms and suggestions. In a similar case in Colombia for National Natural Park of the Gorgona island, Pacific Ocean, an attempt to inform the communities around the park was developed with the production of a brochure for children, a video in a documentary form that describes the park and its importance, a colour illustrated book and a monitoring plan of the area for the five years following the beginning of the project (Barrios, 2002).

The children of the San Adres and Providence Archipelago, Caribbean, Colombia, were also chosen as the main target group from Coralina for the production of bilingual educational material (Spanish and English) promoting the environmental protection and importance of the area. However the material produced for this project was tempting the children by illustrated stories about the sea and the protection of the sea turtles (Coralina, 2001). This is another way for promoting environmental awareness through children stories either with local heroes, myths or invented characters that care and appreciate the environment. Following the same concept in
the North America numerous attempts have been concentrated on stories and myths about the Indians and their relationship with the “Mother Earth” (Caduto and Bruchac, 1988).

Unfortunately during my field trip in the Archipelago, I tried to collect information about local myths and stories, but without success. I believe that was due to the fact that the local communities are not really connected with the area as, it was mentioned before, and their history in the Archipelago is relatively short. No important characters or even events have stigmatised the area. For this reason the educational material for the children was limited on scientific facts and explanations.

As far as the Fishermen’s brochure is concerned, its development promotes the information on overfishing but also it encourages the training on sustainable fishing methods. Although the training program has not been developed yet and it is a future plan as soon as the awareness attempt is successful, the brochure targets to suggest new methods that can be demonstrated on demand. Previous examples of training projects in Tanzania (Howe, 2001) and in Costa Rica (Jacobson and Robles, 1992) showed that training can be very effective at short time. Often for long term effects data does not exist, because assessment of education project can be fragmented and incomplete with very little feedback on the long term effectiveness. Similar attempts in Equator with educational material designed for fishermen by the National Institute for Fisheries, contain information about the shrimp fishery in the area such as the life cycle of fish with suggestion about the fishing methods to maintain the following years average catching. However this informative material has the form of a bulletin published in frequent time intervals (monthly) permitting for continues updating of data for the area. Such an attempt should be backed up by monitoring program that provides the data for the next publication (Burgos, 1998).
8. RECOMMENDATIONS

The design and development of the educational brochures should be only the first step of approaching the local communities of Las Perlas Archipelago for environmental issues. A variety of other methods can also be used. As soon as the official records show that a very high percentage of the population have radio and television, small spots could be used to attract the people’s attention. Even a short documentary of the area played by the public channels will provide not only information to the local population but also it can be used as an indirect advertising for sustainable development and environmental protection. At the same time the local populations will feel pleased because their area will be under attention. It should be mentioned at this point that a lot of people does not seems very pleased with the overall activity in the area from the government and they feel in general terms isolated from the rest of the country. The spots can be divided into two different types. The first type is those spots that in general promote the area and its beautiful environment emphasising the fact that the most important source of future development is the natural beauty. The second group of spots should be more specific and be addressed to the local communities, informing about the threats of the archipelago and promote the concept of the protected area.

As it was mentioned in paragraph 6.1, one of the questions that the teachers were asked was assuming the development of a teachers guide. The training of teachers about environmental aspects is very important issue, because the teachers will take over the responsibility of the children’s education. A teacher guide is essential to explain all the environmental aspects of the area as well as the threats and the solutions. Furthermore the teachers guide will suggest activities for the children. Such activities can be fieldtrips at the nearest beach or forest for identifying animals and
plants or cleaning the beach from the garbage. Many claims have been made about the benefits of outdoor education. Research has suggested strong links between outdoor adventure and aspects of social and personal development (Cooper, 1998). Furthermore, individual and group homeworks will lead the children to spend more time on the subject and explore themselves the natural environment. Finally, posters can also be produced. Small and simple posters are cheap and can be used to all the central places in every village. These posters would be direct and they will call the local people to respect the legislation and the protected areas. They can address the threats of the Archipelago (overfishing, deforestation) and suggest solutions or if this is very extensive, provide contacts to where the people can find information about the problem.

The problem of finding information about a subject that is particularly unknown in an area can be solved with appropriate guides. Taking as an example a teacher that is aware at the moment for the problems the environment is facing in Las Perlas Archipelago and needs more information for his/her students. A guide to resources for environmental education can be very helpful. Many countries and especially U.K that have adopted a strategy for environmental education produce such guides with sources or directories that people can refer to for information activities and suggestions on environmental education and sustainable development (SEEC, 1994 and DES, 1981).
9. CONCLUSIONS

This project was aiming to provide with initial educational material the communities of Las Perlas Archipelago for environmental issues prior to the future designation of a protected area. The initiative for this try was launched from the previous experience that existed in terms of behavioural attitudes of local communities for protected areas and national parks. In general terms the project explores the problem encountered in other areas around the world, it discovers the characteristics of the communities in the Archipelago and according to that it provides the first step, in terms of educational material, of a long path for providing environmental education to a community that faces major changes from development.

The practical output of the project was the designing and development of two brochures as well as a number of other suggested methods for future development.

The personal profit of this work is undoubtedly important. The contact with the communities of the Archipelago was a unique chance of discovering the level of poverty and the problems that these people are facing at the beginning of the twenty first century. As long as we aiming to help the people, we had first to identify what is worrying them and this is vital to us so as to produce effective solutions. Knowing the people’s problem and history we can design educational material that will promote their cultural identity.

Although the importance of providing environmental education to the young people and those stake holders influencing the environment, is essential, it should not be ignored the fact that environmental education and training should be pointing also for every member of the society. Everybody interacts with the environment and everybody has his own responsibility for his actions…”we learn the best when we care the most…” (Jones, 1968).
### APPENDIX 1

**DEVELOPMENT AND HISTORY OF ENVIRONMENTAL EDUCATION (Palmer, 1998)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
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<tbody>
<tr>
<td>1948</td>
<td>IUCN Conference - Paris - first use of term 'Environmental Education'</td>
</tr>
<tr>
<td>1949</td>
<td>Founding of IUCN</td>
</tr>
<tr>
<td>1965</td>
<td>First use of term Environmental Education in the UK</td>
</tr>
<tr>
<td>1968</td>
<td>UNESCO Biosphere Conference, Paris</td>
</tr>
<tr>
<td>1970</td>
<td>Founding of CEE (UK) IUCN meeting, Nevada, USA, Definition of Environmental Education</td>
</tr>
<tr>
<td>1972</td>
<td>UN Conference on the Human Environment, Stockholm, Sweden</td>
</tr>
<tr>
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<td>UNESCO - First Inter-governmental Conference on Environmental Education, Tbilisi, USSR</td>
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<td>1988</td>
<td>European Resolution on Environmental Education</td>
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<td>1990</td>
<td>Publication of National Curriculum Documentation for Environmental Education in England</td>
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<td>1991</td>
<td>Publication of Caring for the Earth: A Strategy for Sustainable Living (IUCN et al.)</td>
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<td>1992</td>
<td>UN Conference on Environment and Development-&quot;The Earth Summit&quot;</td>
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<tr>
<td>1996</td>
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APPENDIX 2
CUESTIONARIO PARA PROFESORES

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<td>Sexo:</td>
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<tr>
<td>Nombre de la institución</td>
<td>Primaria: ___ Secundaria: ___</td>
</tr>
<tr>
<td>Materia:</td>
<td>Grado:</td>
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El presente cuestionario forma parte de un proyecto general que viene siendo llevado a cabo por el Smithsonian Tropical Research Institute (STRI) en el Archipiélago de las Perlas y que tiene como fin la preservación de los ambientes marino-costeros del área. El principal objetivo de este cuestionario es identificar los temas o elementos básicos que deberán ser mencionados en una guía para profesores sobre educación ambiental a nivel escolar, la cual muestre los más importantes temas relacionados con la protección del ambiente marino.

Agradecemos entonces los minutos que usted pueda invertir contestando este cuestionario y compartiendo con nosotros cualquier comentario o sugerencia que tenga sobre el tema.

1. Cuales son las limitaciones que hay actualmente en su escuela o clase para enseñar temas relacionados con el ambiente marino? (p.e. presupuesto limitado, guías, material básico de trabajo, etc.)

2. Describa por favor alguna actividad educativa, relacionada con el ambiente marino, que usted haya enseñado en su clase.

3. Con cuáles de los siguientes elementos cuenta usted para desarrollar sus clases:
   - Material básico (pegante, pintura, tijeras, papel de colores, lápices de colores, pinceles de pintura)
   - Libros
   - Computadores, Televisión, Video

4. Qué tipo de información relacionada con el ambiente marino del Archipiélago de las Perlas y del Sistema de Parques Nacionales Naturales sería útil para su clase?

5. Qué tipo de actividades le gustaría ver en la guía para profesores (p.e. juegos para desarrollar en grupo, rompecabezas, experimentos, proyectos de arte o maquetas, tareas individuales, salidas guiadas a la playa, etc.)
6. ¿Cuántas horas de enseñanza puede usted dedicar para educación ambiental?

7. En caso de no poder dedicar horas de su catedra a este tema, cuáles otras clases de su colegio podrían ser combinadas con la educación ambiental o dedicar tiempo al mismo?

8. Es posible ir con sus estudiantes a la playa?  Si ☐  No ☐

Muchas gracias por el valioso tiempo que ha dedicado para completar este cuestionario. En los siguientes renglones agradeceríamos colocar cualquier comentario adicional que tenga sobre el tema.
APPENDIX 3

PREGUNTAS PARA ESTUDIANTES

CONTAMINATION

1) Cuantas de ustedes saben que es contamination?

2) Preguntar que es contaminacion!

Luego explicar

3) Ven contaminacion alrededor de ustedes?

4) Saben como reducir contaminacio?

SOBREPESCA

1) Cuantos de ustedes saber que es sobrepesca?

2) Preguntar que es sobrepesca?

   Explicar que es y porque es malo

3) Que der ejempos de sobrepesca?

4) Saben como reducir la sobrepesca?
APPENDIX 4  
CUESTIONARIO  

AREA: ARCHIPELAGO DE LAS PERLAS  
SECTOR: ........................................ (pueblo, villa, caserio, etc)  
GPS: ...........N...........W  

INFORMATION PERSONAL  
Nombre y apellido (opcional): ...............................................  
Edad: .........  Sexo: femenino ☐ masculino ☐  
Nivel de educación:  
Escuela primaria ☐ escuela secundaria ☐ técnico ☐ universitario ☐  
Estado civil: Soltero(a) ☐ Casado(a) ☐ Otro ☐  
Tiene hijos: si ☐ no ☐  
Cuantos hijos:  
Salario mensual (opcional):  

1) SABE USTED QUE ES UN PARQUE NACIONAL NATURAL-PNN? SI ☐ NO ☐  
2) EN CASO AFIRMATIVO, EXPLIQUE BREVEMENTE QUE CONSIDERA USTED PUEDE SER UN PNN? ..............................................................  


3) NOMBRE LOS PNN QUE USTED CONOCE EN PANAMA: .....................  


4) HA VISTO ALGUN DETERIORO EN EL ARCHIPELAGO, SEA MARINO O TERRESTRE DURANTE LOS ULTIMOS 10 AÑOS? YES ☐ NO ☐  


5) EN CASO AFIRMATIVO, MENCIONE LO QUE CONSIDERE MAS IMPORTANTE Y DONDE (AREA)? ..............................................................  


6) QUE CONSIDERA USTED HA CAUSADO ESTOS CAMBIOS EN EL AMBIENTE DEL
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<tr>
<th>School</th>
<th>no of students</th>
<th>Grade</th>
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<th>How to reduce pollution</th>
<th>How many know</th>
<th>what is overexploitation</th>
<th>examples of overfishing</th>
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## TABLE OF THE SOCIO-ECONOMIC SURVEYS

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</table>
SOBREPESCA

La sobre pesca es la explotación excesiva de los sitios de pesca que conlleva a la reducción de las poblaciones de peces existentes en los mares. Es producida por el uso indebido de redes con ojo de malla muy pequeño que capturan todos los tamaños de peces, inclusive aquellos muy pequeños (juveniles). Sin los juveniles no hay animales que puedan crecer y reproducirse para continuar el ciclo de vida natural en los mares. De igual manera, cuando estamos pescando hay una gran posibilidad de capturar peces que están listos para desovar (actividad de reproducción en los peces). Si nosotros permitimos que estos últimos pez se mueran, estaríamos matando al mismo tiempo cientos de pequeños peces que no tendrían la posibilidad de nacer y enriquecer nuestros mares para convertirse en fuente de alimento y recurso económico.

¿QUE PODEMOS HACER?

- Si estas pescando NO USE6 redes con ojos de malla tan pequeños, permite que los juveniles crezcan.
- Si encuentras un pez en tu red que está listo para desovar, regresalo al agua...
- Respete a los animales marinos así como ellos te respetan preveiniendo con alimentación y recursos económicos.
- Explica a aquellos que no saben que significa sobrepesca.

POLUCIÓN

Polución es generalmente la presencia de una sustancia que, debido a que es un residuo químico o que se encuentra en grandes cantidades, puede causar problemas al medio ambiente en el que se encuentra y a la salud de la población que vive en el residuo. La naturaleza puede, en la mayoría de los casos, degradar la basura si ésta es natural, en caso contrario dicha basura puede permanecer en el ambiente mucho, muchos años. Dentro del grupo de materiales o elementos que no deberían ser arrojados al ambiente sino colectados para disponer de ellos apropiadamente se encuentran los materiales plásticos, vidrio, metal, químicos (como detergentes, cloros, pinturas, etc.), gasolina o derivados de petróleo y papel.

<table>
<thead>
<tr>
<th>Material</th>
<th>Descomposición</th>
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<tbody>
<tr>
<td>Cítrico de naranja</td>
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</tr>
<tr>
<td>Lata de aluminio</td>
<td>50-100 años</td>
</tr>
<tr>
<td>Botella plástica</td>
<td>10-20 años</td>
</tr>
<tr>
<td>Botella plástica</td>
<td>Cientos o tal vez miles de años</td>
</tr>
</tbody>
</table>

¿QUE PUEDES HACER?

- No botes plásticos, lata ni botellas de vidrio al ambiente.
- Colócales en el recipiente de basura dispuesto para ello.
- Trata de limpiar el área cerca a tu casa, ya verás que bien se ve cuando esté limpio.
- Cométale al resto de tus amigos y vecinos para que hagan lo mismo.

DEFORESTACIÓN

Deforestación es la remoción de árboles, producto generalmente de actividades humanas. Es un práctica común utilizada por el hombre durante miles de años para limpiar la tierra cuando ésta va a ser usada para agricultura (cosechamiento de cultivos), ganadería o pastoreo de animales y, por supuesto, desarrollo industrial. Sin embargo la deforestación debe realizarse con control y autorización debido a que los bosques son extremadamente importantes para el hombre y para el ambiente en general del archipiélago. Los bosques nos proporcionan árboles maderables para construir nuestras casas y elaborar muebles (mira a tu alrededor y verás la gran cantidad de cosas que están hechas de madera). Los bosques también mantienen los terrenos y los suelos estables, protegiéndonos de deslizamientos y erosion que podrían ser catastróficos a costar muchas vidas. No olvidemos por su puesto, que los árboles también remueven el dióxido de carbono del aire y nos protegen del efecto invernadero y del calentamiento global que tanto preocupa a los científicos hoy en día.
ÁREAS PROTEGIDAS

"Son áreas marinas y/o terrestres especialmente dedicadas a la protección y mantenimiento de la diversidad biológica, así como de las recursos naturales y culturales asociados" (EUON)

Las áreas protegidas son cuidadosamente vigiladas por el gobierno con el fin de mantener sus recursos naturales, ayudando al mismo tiempo a desarrollar las comunidades que viven dentro o alrededor de éstas. Su objetivo no es prohibir actividades en el área sino monitorearlas para asegurar un adecuado uso de los recursos, de acuerdo con las recomendaciones de los científicos. Las áreas protegidas son la solución a la contaminación, polución, deforestación y el turismo incontrolado. Ayudan a proteger estas áreas protegidas y protegen la vida, así las Perlas serán aquel lugar único en el mundo donde todos quisiéramos vivir o ir a visitar.

ACTIVITIES

CROSSWORD

FIND THE HIDDEN WORDS
**FISHING METHODS**

**NET**: Net are usually long net and it is attached at the surface edge and supported at the top edge by 10 ft. All the ends of the netting threads are caught in the box. 

**LINER**: Long depth and lines far commonly used. Long depth is used to keep the water with heavier water current. Net are small. The line is stretched at both ends and lying in the surface indicates the fish float. 

**TRAWLING**: In this method, net is being anchored and the line that are carrying fish. 

**PURSE SEINE**: This method is also not draining any discrimination in the catch. However, it is very small, even the very small size fish cannot avoid being caught. This method is very effective in catching the fish that is swimming in the water. 

**COMMERCIAL FISH SPECIES IN LAS PERLAS ARCHIPELAGO**

- Red Snapper
- Lobster
- Shrimp
- Shark
EXAMPLES OF OVERFISHING

Las Perlas Archipelago has been overfished and totally devastated quite a lot. For several years, there was no sea life in the archipelago. The largest species of fish was the Blainville's Chub, but now it is critically endangered due to overfishing.

It was estimated that the population of fish had decreased by 90% due to overfishing. The species of fish that were once abundant are now rare or extinct. The fish populations in the archipelago have been depleted due to overfishing.

The government has taken steps to regulate fishing to prevent further damage to the ecosystem. However, the damage has already been done, and the recovery process is slow.

FISHING IN LAS PERLAS ARCHIPELAGO

OVERFISHING

- Testimony

- Conservation

The government and conservation groups are taking steps to restore the fish populations in the archipelago. However, the process is slow, and the ecosystem is still recovering.

OVERFISHING

- Testimony

- Conservation

The government and conservation groups are taking steps to restore the fish populations in the archipelago. However, the process is slow, and the ecosystem is still recovering.

OVERFISHING

- Testimony

- Conservation

The government and conservation groups are taking steps to restore the fish populations in the archipelago. However, the process is slow, and the ecosystem is still recovering.
APPENDIX 11
MAP OF LAS PERLAS ARCHIPELAGO AND THE AREAS THAT THE SURVEYS WERE CARRIED OUT