CHAPTER 7

SUMMARY
THE IMPORTANCE OF EPIDEMIOLOGY

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INTRODUCTION

The previous chapters have presented the results of the four working groups to evaluate the status of environmental epidemiology in Latin America and the Caribbean (LA&C). In this the final chapter, the importance of epidemiology in setting public health and especially environmental health policy is briefly reviewed.

In conducting this exercise several common issues emerged from the independent working groups. Those issues are being further examined in this chapter. Finally, some recommendations are being proposed to develop environmental epidemiology in the Latin American and Caribbean Region.
Epidemiology and Policy

Epidemiology has been called the foundation from which public health decisions are made, implemented and evaluated (Institute of Medicine, 1988). The very origin of epidemiology in John Snow's evaluation of the 1854 London cholera outbreak, resulted in the decision to intervene by removing the Broad Street pump handle. Snow's subsequent work in later years in investigating cholera outbreaks revealed the importance of water in the transmission of this disease. This revelation set off a series of engineering innovations to improve water quality long before the Vibrio cholerae bacteria was identified. Today, when disinfection of drinking water supplies is adequately practiced, cholera, typhoid fever, diarrhea and other bacterial illnesses are virtually eliminated as major causes of morbidity and mortality.

As societies have made the transition from agricultural societies to industrialized societies, the public health problems have made the transition from problems of infectious disease associated with sanitation and hygiene to problems of chronic disease associated with the industrial process. While LA&C countries are rapidly transforming to industrialized societies, the public health problems have not made a clear transition from infectious diseases to chronic diseases. While there has been a progressive increase in chronic diseases, the prevalence and incidence of infectious diseases have remained unchanged at the high preindustrialized levels. The recent report of the WHO Commission on Health and Environment (WHO, 1992) indicated that some of the lower class segments of the population in the developing countries are experiencing high rates of mortality due to both poor sanitation and hygiene as well as to those health problems associated with urbanization and industrialization. This suggests that the traditional public health indicators need to be reevaluated. This is particularly important for environmental health as in many instances effects of environmental pollution may not be easily distinguishable from those associated with poor economic status. Furthermore, the effects of environmental pollution and poor economic status could be synergistic. The need for indicators for health and environment has been increasingly recognized and follows from development of new indicators of economic, sociological and health situations. New indicators which aid understanding and communication of the issues and processes reflected by health and environmental data should be sought.

Epidemiology has been used in all steps of environmental management from identifying the risks, determining dose-response relationships, predicting the numbers of people exposed and the health impact of the exposure, identifying appropriate risk reduction measures and finally evaluating the management decisions. The primary goal of all of these uses of environmental epidemiology is to improve public health and especially the environmental health.

Setting environmental standards is a major activity in this process. In the United States, environmental epidemiology data has been used extensively by the Environmental Protection Agency (US EPA) to set a variety of environmental standards. Near 30 pollutants have been regulated by EPA based on data provided by epidemiological studies (Calderon, 1992).

Because of the lack of appropriate local studies the practice in LA&C has been to "copy" the United States or other developed country standards or to use WHO guidelines. Slowly some countries are attempting to use local information in the setting of regulation. In Chile, regulations for arsenic in air and water are being set based on data from local sources and assessments. In Mexico, regulation of the use of lead glazes in pottery has been set based on studies locally done.
Epidemiological data, while used extensively to set environmental policy, is extremely difficult to obtain. The environmental health paradigm - a sequence of sources, environment, exposure, dose and health effects - illustrates the complexity of the scientific issues and the need to understand that environmental epidemiology research requires an interdisciplinary effort of many individuals (Sexton, 1992). However, a complete understanding of the environmental paradigm for a particular chemical is not strictly necessary to make policy decisions. The case of methylmercury poisoning in Minamata, Japan, developed during the 1950's, is an example of this issue. The study of the complete process took several years until the pollution-exposure-effect cycle was clarified and the methylmercury in the environment was identified as the etiologic factor. Prior to this, evidence obtained through epidemiological studies implicated the contaminated seafood and important decisions regarding the harvesting of fish from contaminated areas were made. Immediately, there was a decline in related diseases. As with all scientific data, it is important to understand where the data gaps are and their impact on the decision making process.

The interdisciplinary approach is essential to conducting environmental epidemiological studies. These studies rely heavily on an understanding of the exposure and hence an understanding of contaminant sources and measurement of the contaminant in the environment as well as measuring actual exposure in humans. And lastly, many of these exposures can cause multiple and frequently non specific health effects. The researchers must decide which endpoint and how best to ascertain that endpoint.
WHY EPIDEMIOLOGY?

Epidemiology provides data on human beings. It is direct evidence of effects in humans and can be thought of the gold standard by which all other data can be judged. Because it is human data, there are no uncertainties associated with animal to human extrapolations. In risk assessments, where all the evidence (animal data, environmental monitoring data and epidemiology) are weighed, epidemiology is viewed as stronger evidence. Nevertheless, epidemiology does have its limitations and they have been discussed extensively elsewhere (IPCS, 1983; Beaglehole, 1993). Most importantly, it is a body of epidemiological work that is needed rather than a single study to facilitate the policy-making process.

In deciding policy or making public health policy, there are four general steps:

1. Identification and description of the problem
2. Quantification of the problem
3. Identification of appropriate interventions and risk reduction strategies
4. Implementation and evaluation of the interventions and risk reduction efforts.

There are a wealth of examples where epidemiology has been used extensively in all of the steps mentioned above to solve major public health problems. Vaccination policies, are a prime example of epidemiology being used for all four steps. However, in the environmental area, epidemiology has been used extensively in the first three steps but less frequently used to intervene and evaluate management decisions. This has been surprising given that many environmental management decisions can involve great expenditures of economic resources. The investment in epidemiology to evaluate a management decision, can be very cost beneficial. One example of this in LA&G was the management of natural arsenic contamination of drinking-water in the city of Antofagasta, Chile, during the 1970's (Borgoño, 1977). Epidemiological studies were conducted before and after the installation of a special plant to treat drinking-water, demonstrating the beneficial impact in population health through a decrease of arsenic-associated morbidity and mortality.

Epidemiology has two major goals. The first is to improve the health of the population. Secondly, epidemiology strives to explain exposure and disease relationships. These two goals are not mutually exclusive in the development of a program in environmental epidemiology. Indeed the complexity of environmental epidemiology suggests that for many studies both goals are necessary. Very precise knowledge about the exposure and effect relationship is needed to make appropriate policy decisions.
LESSONS LEARNED

In reviewing the studies from LA&C, the work groups identified that the most significant and motivating factor in most of them was to improve the health of the population, and secondly to fill some data gap of knowledge. LA&C activities in environmental epidemiology are in process of reaching these two major goals. However, in reaching the goals mentioned above there have been several underlying difficulties that have prevented them from developing more sophisticated environmental epidemiology research programs. Some of those difficulties are featured as follows:

1. Infant Stage of Development

In general, the majority of the environmental epidemiological studies were simple in their design and undertaking. The majority of the studies were descriptive rather than analytical. This situation has been frequently discussed in LA&C and a recent survey by WHO compared the numbers of descriptive studies versus analytical studies. In a sample of 86 on-going epidemiological studies from 19 LA&C countries, the majority of them were descriptive (IDRC/WHO, 1991). Exposure is overly simplistic in its measurement or categorization. Many health endpoints of concern are simply not done and handling and analysis of data was limited and sometimes rudimentary.

2. Major Reasons for the Limited Capability

2.1 The first reason is the insufficient or inadequate measuring and monitoring programs. This includes the laboratory analytical capability as well as the availability of sophisticated technology to measure, and to store and analyze data. Where such monitoring programs existed, the issues of quality control and quality assurance in managing those programs were rarely discussed. The inadequacy of these monitoring programs made it difficult for the working groups to even estimate the numbers of people at risk due to exposure. Quality environmental epidemiology studies rely on quality exposure assessment methods for their conduct.

2.2 The second limitation was the lack of disease registries and information systems or the under utilization of those that exist. Data processing of death certificates was some times done manually. Cancer and reproductive effects were rarely cited due to the lack of either the registries themselves or the storage of the information in a readily usable form. The same was true for areas where occupational exposures and cohorts were studied. Cancer registries do exist in different stages of development in some countries (Brazil, Colombia, Costa Rica, Cuba, Mexico, among others) (IARC, 1992). Birth defects registries are active in Brazil, Mexico, Cuba, Costa Rica and Dominican Republic. However, there was very little evidence that these registries had been utilized for any environmental epidemiology studies.

2.3 The third limitation was a total lack or limited understanding of the sources of the pollution. Many contaminants have multiple sources. In many instances the characterization of
the sources mostly of anthropogenic nature was incomplete. The source contribution is extremely important in exposure assessment and identifying the appropriate risk reduction strategies.

2.4 Also there was a very weak use of multidisciplinary teams in conducting the studies. Some groups in LA&C are developing good programs in the area of environmental epidemiology but they frequently do not coordinate or communicate between them. The team approach is in its initial stages.

2.5 Poor handling of confounders was identified when reviewing the studies. It was found that the studies often lack a proper consideration of confounders to assess exposure, mainly those associated with life styles, nutritional status, and environmental factors.

2.6 The need to improve the training of human resources was an underlying issue addressed in all the reports.

3. North/South Collaboration

A significant proportion of the environmental epidemiology work being conducted relies on collaboration with institutions in the United States, Canada or Europe. These collaborations are often responsible in the LA&C countries for the majority of the training, technical support and even monetary resources to conduct the studies in this field.

4. South/South Collaboration

Besides the promotional work developed by ECO/PAHO, some few activities developed through GEENET and other initiatives undertaken by IDRC/Canada, there was limited evidence that there was any substantial national effort to coordinate activities among the various research institutions from LA&C. These relationships are important to be developed as environmental pollutants do not recognize political boundaries and some environmental health problems are common to many countries; hence regional approaches to study and regional solutions to reduce exposures should be promoted.

5. Limited Access to Information

This difficulty manifested itself in two ways. The first was the low frequency of LA&C publications in international journals. There was even a trend for many studies not to be published at all. It was unclear whether this is function of the peer review process, lack of
command of English (for international journals) or a lack of incentive for researchers to publish in this level. As an example, in a detailed bibliographic review by ECO of the recent Mexican literature on lead and on air pollution, it was found that only 7.3% of 700 publications had been published in acknowledged international journals (Centro Panamericano de Ecología Humana y Salud, 1992, 1993). The second manifestation was the general absent or restricted access to information systems whether they be specialized libraries, computerized data bases, institutional records or regional symposia. The design and conduct of these studies rely on up to date knowledge. This limited access to information may be a contributing factor to the poor South/South joint projects. For these and other reasons the large volumes of data, have to some extent failed to provide decision markers and the public with answers to even basic questions concerned with actual conditions, trends and causes (Alberti, 1991).
STRATEGY FOR THE DEVELOPMENT OF ENVIRONMENTAL EPIDEMIOLOGY

The development and design of a strategy for environmental epidemiology in the Latin American and Caribbean countries should be based on the reviews and proposals by the work groups. The goals of the strategy could be as follows:

a) First and foremost is to increase the number and quality of environmental epidemiology studies needed to improve the health of the population by identifying, describing, and reducing risks due to environmental pollution.

b) To improve the existing infrastructure and institutions by expanding the measuring/monitoring capacity and the technical capability of laboratories, by training of scientists and technical support staff and by improving access to information systems.

c) To improve the scientific and technical support needed for the decision making process on environmental health policy issues.

d) To contribute to the international scientific knowledge on human exposures and related potential health outcomes.

These goals are compatible with the current international trend of sustainable development. The present and future world population needs for food, water, and energy must be met without depleting or damaging the global resource base and simultaneously avoiding the adverse health and environmental consequences of industrialization and uncontrolled urbanization. Within this context, the information provided by environmental epidemiology research is crucial for the establishment of cost-benefit strategies to manage environmental health problems along with economic growth, environmental preservation and improvement of human quality of life.

To meet these goals the following recommendations are made:

1. Infrastructure Building

The foundations for environmental health research exist in LA&C. Those foundations need to be expanded and built upon, and a joint effort of PAHO, WHO, EPA and other international and national institutions, should be oriented to the countries to help in this expansion. The following are proposed areas of development.

1.1 North/South collaborations

These collaborations exist but need to be expanded and strengthened. These collaborations will improve the training and technical capability of local researchers. This could be expanded by developing a comprehensive North/South research program on environmental epidemiology.
1.2 South/South collaborations

The World Health Organization has instituted since 1987 a Global Environmental Epidemiology Network (GEENET). There are about 500 LA&C members in this network. However and in spite of the promotion from WHO and from ECO/PAHO, the use of GEENET for planning meetings or even identifying groups with similar interests has not been significantly exploited in LA&C. The network needs to be improved by encouraging more participation and interaction among LA&C researchers. Even though some countries like Argentina, Chile and Nicaragua, have shown some progress in this area.

1.3 Training

ECO/PAHO since early 1980’s and GEENET/WHO since 1987 have promoted and sponsored many training workshops and long term graduate courses in LA&C, but this area still needs more development and new proposals. A special effort could be developed to implement an international fellowship program to face the need for in-depth and extensive training of epidemiologists in LA&C. This would help to increase the number of researchers with skills and knowledge in different disciplines essential for the studies in environmental epidemiology area. Comprehensive and well designed follow-up of these experiences would help to consolidate individual and institutional capacities and expertise in LA&C.

Additionally, PAHO in conjunction with WHO, USEPA, IDRC and others should in the short term expand its role in offering courses and training opportunities in environmental epidemiology, risk assessment and related subjects.

1.4 Quality control/Quality assurance programs

There is an urgent need to institute systematic activities on QC/QA for supporting the quality of environmental epidemiology studies. As analytical laboratories and monitoring programs develop and expand, a quality assurance and quality control program should be implemented.

1.5 Access to information

The PAHO/ECO has been compiling country specific bibliographies on various environmental contaminants. A recent bibliography on environmental pollution and health gathered 1 440 citations on Mexico published over the last 10 years. This type of activity needs to be expanded both in PAHO/ECO and at country level.

GEENET/WHO have initiated a global project to create at the country level the "environmental health library collections" (EHLC). Efforts to increase access to information should take into account this initiative.
The role of clearinghouse of ECO should be promoted and funded. Additionally, special national projects to facilitate the access to information should be also promoted in the countries of LA&C. Furthermore, investigators need to be encouraged to publish their studies not only in local Spanish or Portuguese language journals but in international journals as well.

1.6 Investment

Investment by national and international agencies is needed to improve and expand the infrastructure. In particular, investment in laboratories, information and library facilities, should be promoted and encouraged. Funding sources for intervention projects should also be sought.

2. Improve the Science

To promote quality epidemiological studies in LA&C the following three areas could be implemented by the LA&C countries:

2.1 The environmental problems discussed in this Report are not unique to Latin America and the Caribbean. It is also clear that for each one of these problems there is a great demand for knowledge to improve the policy making process in all countries. This Report identifies many populations and exposure conditions that may contribute to the international body of knowledge.

2.2 This Report also identifies a few of the critical areas for research on some of the air pollutants, heavy metals, pesticides and solvents in LA&C. Specific recommendations on priority research areas are outlined in each chapter of this Report. Based on these recommendations, taking into account proposals and on-going activities developed by WHO on these specific areas and with the support of various granting and financial agencies, some of these research recommendations should be undertaken.

2.3 Additionally there is an increasing interest of some LA&C countries on risk assessment and comparative risk assessment methodologies which may benefit from the findings of the environmental epidemiology research projects to be undertaken. Any training or development of risk assessment programs should be an opportunity to discuss the value of data provided by epidemiological studies.

3. Improve the Decision Making Process

The following are critical issues identified through this exercise that should be considered among others to improve the decision making process in LA&C countries
3.1 A significant number of environmental epidemiology studies conducted in LA&C are funded by external sources. This frequently implies that the motivating factor for conducting a study is some other country’s need for information on exposure and effects. As a result there are many isolated studies or studies not necessarily conducted in ideal situations of exposure, demographic approach and technical capability. This also means that while a study may have been technically sound, its applicability to understanding a local problem may be limited. Therefore, an in-depth analysis on this issue should be expected from the LA&C countries in order to move national research in this area from an opportunistic approach to another more systematic and local problem oriented approach.

3.2 Although this Report documents several studies conducted in LA&C, most countries usually adopt unilaterally regulations set by the United States Environmental Protection Agency, Canada or other developed country. The consequence of this approach is a reduced compliance of the adopted regulations and unenforceable laws which end up to be non beneficial and often expensive.

3.3 While North/South collaboration should be continued and promoted, it should not be viewed by the local governments as an excuse for not committing local interest and resources. A major objective for LA&C should be for local governments to share in the investment and to assume the primary responsibility to support the needed studies.

3.4 A major area of improvement is the urgent need for open or improve dialogue between the policy makers and the scientists. While this problem is not unique to LA&C, to solve it will be absolutely essential in allowing countries to develop environmental management policies that will improve the health of their populations. An open dialogue gives priority to areas for research and management, improves the decisions making process and ultimately increases local responsibility for research and management.

Finally and implicit into these recommendations, there exists a number of general and specific proposals that could be timely implemented. A list of these proposals is presented in the Appendix of this chapter. These proposals came out during the meeting held at PAHO Headquarters on February 1993 when the work groups’ reports were presented and discussed.


APPENDIX

GENERAL AND SPECIFIC RECOMMENDATIONS TO DEVELOP THE ENVIRONMENTAL EPIDEMIOLOGY IN LATIN AMERICA AND THE CARIBBEAN

1. Two parallel approaches are recommended for developing projects:

   1.1 A general approach oriented to strengthening capabilities and to helping build infrastructures.
   1.2 Support and development of specific studies or issues in an effort to fill main information gaps detected in phase 1.

2. Proposals from the four reports and from this meeting should be successfully integrated in order to obtain a comprehensive proposal.

3. The following categories are proposed to be worked:

   3.1 Infrastructure (network)

      a) Training (in research, to decision makers, etc.)
      b) Monitoring
      c) Policy/Regulatory

   3.2 Studies/Surveillance

      a) Studies (mortality)
         Designs - Cluster - Capture/recapture
      b) Exposure assessment
      c) Behavioral, life style, cultural and social factors
      d) Anthropologic
      e) Interventions
      f) Surveillance systems: exposure and effects
3.3 Laboratory

- QA/QC
- Toxicology
- Biomarkers
- Biomonitoring

3.4 Conferences/Seminars/Communication between field workers (network).

4. In the infrastructure and capabilities strengthening approach:

4.1 To identify weak areas in LA&C and prepare specific remedial plans for them. General criteria valid for the whole region and separate specific proposals that may apply for particular countries should be deduced from the final report recommendations.

4.2 Special promotion of programs on QA/QC.

4.3 Environmental monitoring projects, to create new systems or to improve the existing programs.

4.4 To prepare a plan to develop national capabilities to evaluate and to solve environmental health problems, including a broad training project (on the basis that American researchers are interested in LA&C problems). It could include the formation and training of toxicologists and epidemiologists, new mechanisms to train people of LA&C in the USA, scholarships for LA&C professionals on environmental health (preferential responsibility to LA&C countries to choose their candidates), training activities in the developing countries monitored by the institution of the developed countries, training programs on analytical chemistry and on specific survey techniques, special project to train researchers to perfect the whole process of research, and finally developing methodologies and training activities on EIA for socioeconomic projects.

4.5 On the information issue, to make an effort to incorporate LA&C information into international databases and to develop proposals for a better access to information sources, including work with editorial boards of main Latin American journals of public health.

4.6 To promote integration of local groups to develop specific research (e.g., mercury in Brazil, air pollution in large cities, arsenic in Chile).
4.7 To promote the processes of producing "good epidemiological data" in order to improve exposure assessment (to help risk assessment) and to improve economic analysis (to help risk management).

4.8 Regarding the institutional development recommendations were made to extend examples of North/South collaboration, to strengthen relations with international agencies, to use existing networks, to support with special budgets selected LA&C institutions now working on environmental health, and to promote support to LA&C from institutions of developed countries in complex technical issues. Special attention should be conferred to promotion and support of environmental epidemiology surveillance systems/programs.

5. In the filling gaps area:

5.1 Priority areas proposed for studies are the following:

a) On air pollutants:
   - mortality studies
   - indoor pollution and biomass
   - intervention studies
   - CO exposure

b) On heavy metals:
   - arsenic metabolism and chronic toxicity
   - relative contribution of various sources to exposure to lead
   - characterize mother and child exposure to mercury

c) On pesticides:
   - incidence of acute poisoning plus intervention studies
   - chronic neurologic effects associated with organophosphates exposure
   - reproductive effects
   - exposure to dithiocarbamates

d) On solvents:
   - neurobehavioural effects plus intervention studies
   - cancer follow-up in Brazil
   - surveillance to identify exposure related diseases
5.2 It is advisable that criteria and priorities for research arise from the national levels and aiding agencies to support these interests.

5.3 General proposals:

a) Inventories of stationary sources of pollution by selected places in some countries for some priority pollutants, and characterization of their emissions.

b) Characterization of exposed populations in various specific situations.

c) To improve the diagnostic of exposure by monitoring selected chemicals in drinking water and food, based on a previous plan to strengthen laboratories and QA/QC programs.

d) Studies on chronic effects associated with selected chemicals.

e) Validation of biomarkers through use of reference standards.

f) To include intervention studies in the context of risk management process and to assess trends of adverse health effects after interventions.

g) To include anthropological and sociological issues in environmental health research when needed in order to know reasons explaining morbidity/mortality patterns and approaches communities develop to solve specific problems (appropriate for this would be the pesticide area).

h) Emphasis should be given to characterize adverse health effects rather than environmental levels of pollutants.

i) To set regular external auditing for quality control of research proposed (study design, cross reference, standards, etc.).

j) Better and more frequent use of mortality data, which are highly useful and more benefit should be drawn from their analysis.

k) Whereas high exposures will be difficult to be significantly reduced in the short term, opportunities to implement prospective studies should be considered.

l) Preferential support to studies addressed to identify solutions of problems and to decrease exposure more than to those strictly academic oriented.

m) Diagnosis of the situation regarding the transfer of hazardous industries to Latin American and Caribbean countries.
5.4 Specific proposals:

a) On air pollution:
   - assess health effects of exposure to ethanol and aldehydes from ambient air in cities
   - studies of chronic effects associated with exposure to air pollutants in large cities

b) On heavy metals:
   - assess exposure to mixtures: lead and pesticides
   - studies of chronic effects associated with exposure to arsenic in Chile and Mexico and to mercury in Brazil

c) On pesticides:
   - assess exposure to pesticides in rural children working on agricultural activities
   - develop methodologies to study exposures and effects in rural, poor, migrant populations
   - studies of chronic effects associated with current exposure to pesticides, with emphasis on carcinogenic effects

d) On solvents:
   - profile of the solvent industry in Latin America and Caribbean
   - determine levels of occupational exposure to solvents
   - study the situation of addiction to solvents through inhalation
   - reproductive effects of exposure to solvents in working women
   - list of solvents usually used in pesticide formulations, for exposure studies purposes (mixtures)
   - evaluate the disposal of solvents wastes and the non occupational exposure
   - intervention studies in selected specific industries of the solvent area

6. Complementary recommendations considered as strategic issues useful to achieve the previous proposals:

6.1 The proposal for the second phase should be widely circulated among potentially involved institutions from developing and developed countries.
6.2 National institutions should be formally and officially involved in the Latin American Program on Environmental Epidemiology and a list of national collaborating centers for each working group has to be prepared.

6.3 To identify ongoing national and international projects or programs where activities in the second phase could be integrated or inserted.

6.4 To include some of the current and coming activities of GEENET. There should also be a consultation to GEENET members of USA and Canada on their potential interest to collaborate with this project through resources, advisory, and others.

6.5 Evaluation and reduction of acute poisoning should be first priority, specially that related to pesticides and metals exposures. Priority approach to face acute environmental health problems should be intervention. Research should consider a proper combination of this strategy with the analysis of local conditions for intervention in the risk management context.

6.6 Emphasize the preventive approach of environmental health subjects to avoid competing for resources when compared with more prevalent diseases.

6.7 Some NGOs should be chosen to work on specific subjects of this project, specially in the intervention assessment area.

6.8 To open a work line with LA&C journals editors to perfect publishing quality.

6.9 Economical issues should receive special attention in the following items:

   a) to develop proposals to incorporate the economic analysis component

   b) to compile and evaluate the cost-benefit information produced by countries (World Bank publications)

   c) to insert the economical issue in solving environmental health problems; cost-benefit and cost-effectiveness on selected chemicals (Pb, air pollutants)

   d) to assess the economical factors of environmental health problems

   e) to promote the use of EIA methodology in socioeconomic development projects

   f) to consider the issues of export/import of technologies to reduce environmental pollution levels and related economic/cost factors.

6.10 Inventories of institutions, personnel, local resources, bibliography and others in the environmental health area.

6.11 To create an ad hoc mechanism to regularly evaluate the progress and results of the project's second phase.
7. Funding sources:

7.1 To identify local funding sources.
7.2 To consider "national commissions for science and technology development".
7.3 Private sector, specially for the training area and environmental monitoring according to local health plans, and its presence in scientific events like seminars, symposia, congresses, etc.
7.4 To identify already programmed or ongoing investments projects (World Bank, Inter American Development Bank, etc.).
7.5 To emulate experiences like the Corbana Law from Costa Rica.
7.6 To co-participate in ongoing projects on environmental health, like the UNAMAZ (eight Amazonian countries working on EIA and on mercury exposure and health effects).