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PROSALUD

Manual Environmental Guide

HEALTH ESTABLISHMENTS

Small-scale infrastructure Renovation and construction activities

ENVIRONMENTAL GUIDE

HEALTH ESTABLISHMENTS

Small-scale infrastructure
Renovation and construction activities

CREDITS

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Maria Antonieta Alarcón Montero (CONSULTORA ARANDU Servicios Sostenibles)

INFRASTRUCTURE and EXTERNAL MANAGEMENT
Alina Manrriquez Cáceres - Especialista en Ingeniería Sanitaria y Ambiental (SpD)
José Luis Aramayo Mérida - Especialista en Ingeniería Ambiental y Salud (SpD)

EDITORIAL REVISION
Rolando Costas

LAYOUT
Studios 3640

COVER PHOTOGRAPHY
José Luis Aramayo Mérida

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PRESENTATION

The United States Agency for International Development supports health sector projects in Bolivia that aim to improve the general quality of life, provide social well-being and enable better access to health services for the Bolivian population.

Considering that any activity, work or project inevitably has a series of environmental impacts, care must be taken to avoid increasing its consequences, above all in relation to human health.

In this sense, with the aim of contributing and facilitating the process of environmental management in the distinct organizations, we are pleased to present the second version of the series of four environmental manuals, which have been contextualized on the basis of lessons learned — the fruit of these last three years — and complemented in accordance with Regulation CFR 216 and the Regulations of Environmental Law 1333 of the Republic of Bolivia.

The series includes the following manuals:

- Small-scale infrastructure – Construction activities (Renovation and construction of health establishments).
- Small-scale infrastructure – Construction activities (Water and sanitation).
- Small-scale infrastructure – Construction activities (Housing).
- Handling of solid waste from hospitals.

As in the first version, these documents will allow the agencies financed by USAID/Bolivia to incorporate environmental measures into the execution of health sector projects, readjusting activities and establishing a series of actions to mitigate the negative impacts generated by the activities, works or projects connected to the health programmes in their different phases.

The application of the present manual does not exempt its executor from complying with the legal environmental obligations that exist in Bolivia and that may not have been expressly indicated in this document.

FOREWORD

With the aim of producing the second version of this manual, Partners in Development's Environmental Office has developed a methodological strategy based on three important phases: the gathering of primary information through a questionnaire on lessons learned, with contributions from the users of the first version of the manual; the complementation of the documents with related operative instruments and directed towards compliance with Bolivian environmental regulations; and the validation of the new document through a round of participative workshops.

In the first phase a questionnaire was applied, in which the users expressed their opinions, knowledge and experiences on environmental practices used in their projects and on the application of the manual. This instrument made it possible to identify strong and weak points and was invaluable to the users in implementing the environmental variable and in applying this document.

In the second phase, after an intense period of gathering local technical information, came the design of complementary instruments that were adapted for the national context, above all taking into account the opinions contributed by the users. Once this document was structured, it was possible to proceed to the third phase; the participative. Four workshops were held in the capital cities of Tarija, Cochabamba, Santa Cruz and La Paz, with a total participation of 95 people. In these events the results obtained in the previous phases were presented, which was followed by sessions characterised by a group dynamic, in which the participants contributed and validated information. The aim of this phase was to consolidate the complementation and improvement of the manual.

Results obtained

At the point of interacting with the users it was confirmed that the main strengths of the first guide were the first two instruments: Social baseline and Environmental baseline, documents widely used both directly and indirectly. These two tools were strengthened and improved, thanks to the agencies who applied them. The users also confirmed the importance of having an instrument with which to make a preliminary evaluation of the project, giving them operative access to all the relevant environmental information before the constructive process began. This instrument, in the first version of the guides, was known as preliminary project profile. For this second version it was complemented and improved, with the name also changed so as to be better understood; it is now called Preliminary Project Evaluation.

With respect to the tables of mitigation measures included in the first version of the manual,

these had still not been exploited or broadly utilised. In the participative process the need was perceived to make this information operative so as to make its application viable. With this in mind, the following instruments were proposed:

- A table of environmental indicators.
- Format of a plan of environmental mitigation.
- Format of a programme of environmental execution.
- Format of a budgetary assignation form.
- A guide to good environmental practices.
- A description of the emergency plan, format for an emergency telephone directory, format of environmental incident report and system of signs for accident prevention.
- Description of the contingency plan.
- Format of a chronogram of implementation of mitigation measures.
- Format of an environmental monitoring form.
- Format of an environmental management report.
- Format of an environmental management balance form.

INDEX

Chapter 1
INTRODUCTION

This document represents a technical and operative tool aimed at strengthening, and above all contributing to an advance in, the process of environmental management in the development projects. It is a complimentary and contextualised instrument related to Heading 22, Part 216 of the United States Code of Federal Regulations (henceforth referred to as Regulation 216), which establishes the process of environmental evaluation for USAID cooperation.

The procedures, roles and responsibilities for putting these regulations in practice are cited in Chapter 200 of the USAID guidelines (ADS 204: Environmental Procedures), whose aim is to guarantee that exogenous factors and environmental values are integrated into the USAID decision-making process.

Similarly, Regulation 216 stipulates that all projects financed by the United States government, through USAID, must include a revision of environmental impact to avoid or diminish any negative impact on the environment and its socio-cultural context.

USAID environmental procedures and instruments are useful in:

- Providing a practical and operative methodology to establish requirements in environmental revision, guaranteeing compliance with these through specific indicators of adaptation and environmental monitoring.
- Ensuring the formal preparation of documentation in order to provide the basis for an evaluation of environmental impact in project design and to serve, fundamentally, as monitoring before, during and after the construction phase.
- Promoting an organizational and environmental culture through the incorporation of a standardised, systematic process, aimed at reducing errors and oversights common in environmental design, construction, maintenance and the phase of abandoning these installations.

This manual has been designed to orientate USAID staff and the agencies that receive USAID finance, with regard to the environmental element of the design, realization, supervision, evaluation and application of mitigation measures for the development programmes in specific sectors.

The sector included in the present text was selected on the basis of current project portfolios and mission projections in Latin America and the Caribbean.

It is expected that the process of evaluating environmental impact — applied to design and realisation of activities — will ensure the success and sustainability of development activities, minimising

damage to the environment and repercussions on the economic future and inherent social and cultural progress.

This second version of the manual considers the following dimensions:

- *Methodology*. Examines procedures for gathering, systematisation and validation of all the information necessary to create this document.
- *Brief description of the sector.* An explanation of the local context of health establishments, the levels of service offered, and factors relevant to the planning of health infrastructure.
- *Environmental management in infrastructure projects*. Illustrates instruments of proposed environmental management according to its nature (preventive, corrective, auxiliary or follow-up) in accordance with the different project's phases (pre-investment, investment, execution and closure).
- *Pre-investment phase.* This sets out the range of impacts (direct, indirect, primary and secondary) that may arise in the development of the related projects. It also establishes two instruments that are necessary for the socio-environmental management of the projects: the social baseline and environmental baseline.
- *Investment phase*. Describes potential negative environmental impact, mitigation measures and environmental indicators such as control mechanisms and verification of the project's environmental adaptation. Instruments proposed in this section include the environmental plan, chronogram of environmental execution and budgetary assignation form, as well as a list of good environmental practices and technical construction specifications.
- *Execution phase*. Contains basic formats for the provision of information related to the chronogram for implementation of mitigation measures, environmental monitoring and the elaboration of environmental reports.
- *Closing phase*. Presents an environmental management balance form, which is a checklist aimed at verifying the implementation of operative instruments throughout the entire activity, work or project. Includes also guidelines for the phases of operation, maintenance and forecasted future.
- *Glossary*. Presents a list of terms with their meanings as a conceptual framework for better understanding of the technical document.
- *References*. Presents the documentation used as support in creating this manual.
- *Appendices*. Contains a compendium of the instruments of environmental management applicable to cooperation health establishment projects.

2 Chapter 2
METHODOLOGY

The process of complementation and updating of the manuals covered four phases (see Table 1). The first phase, that of analysis and structuring, includes the collection of localised information both from primary sources (interviews with important actors) and in secondary sources such as the manuals themselves, books, newspaper articles, thematic journals, internet publications etc. Similarly, instruments for the collection of technical-environmental information for the financed projects were designed, with the aim of learning from previous lessons and replicable experiences.

1st phase	2nd phase	3rd phase	4th phase
Analysis and structuring Collection of information and bibliographical revision. Contact with key individuals and conduct of semi-structured interviews. Drawn up of: - Instruments for gathering material from outstanding experiences and lessons learned. - Interviews with decision-makers. - Checklists.	Fieldwork (gathering of information in situ) Configuration of new versions of the manuals Visits to key projects and actors. Completed by: - Oustanding experience questionnaires from the selected projects. - Interviews with those in charge of the projects.	Validation of the manuals Development of thematic workshops: Tarija: Housing. Santa Cruz: Health establishments. Cochabamba: Water and sanitation. La Paz: Health, housing, water and environment sectors.	*Synthesis, revision and complementation of the manuals, and their bringing up to date* Office work: strengthening of the technical element, processing of information and revision of the text's final structure.

Table 1. Methodological structure

The documents created to this end are detailed in Table 2; they consider the formulation of questions related to the structure of the manual, its applicability, aspects of improvement, potential for broadening, possibilities for incorporation within company and/or public policies. Also defined was the method of collecting this information based on criteria of accessibility, efficiency and logistical efficacy.

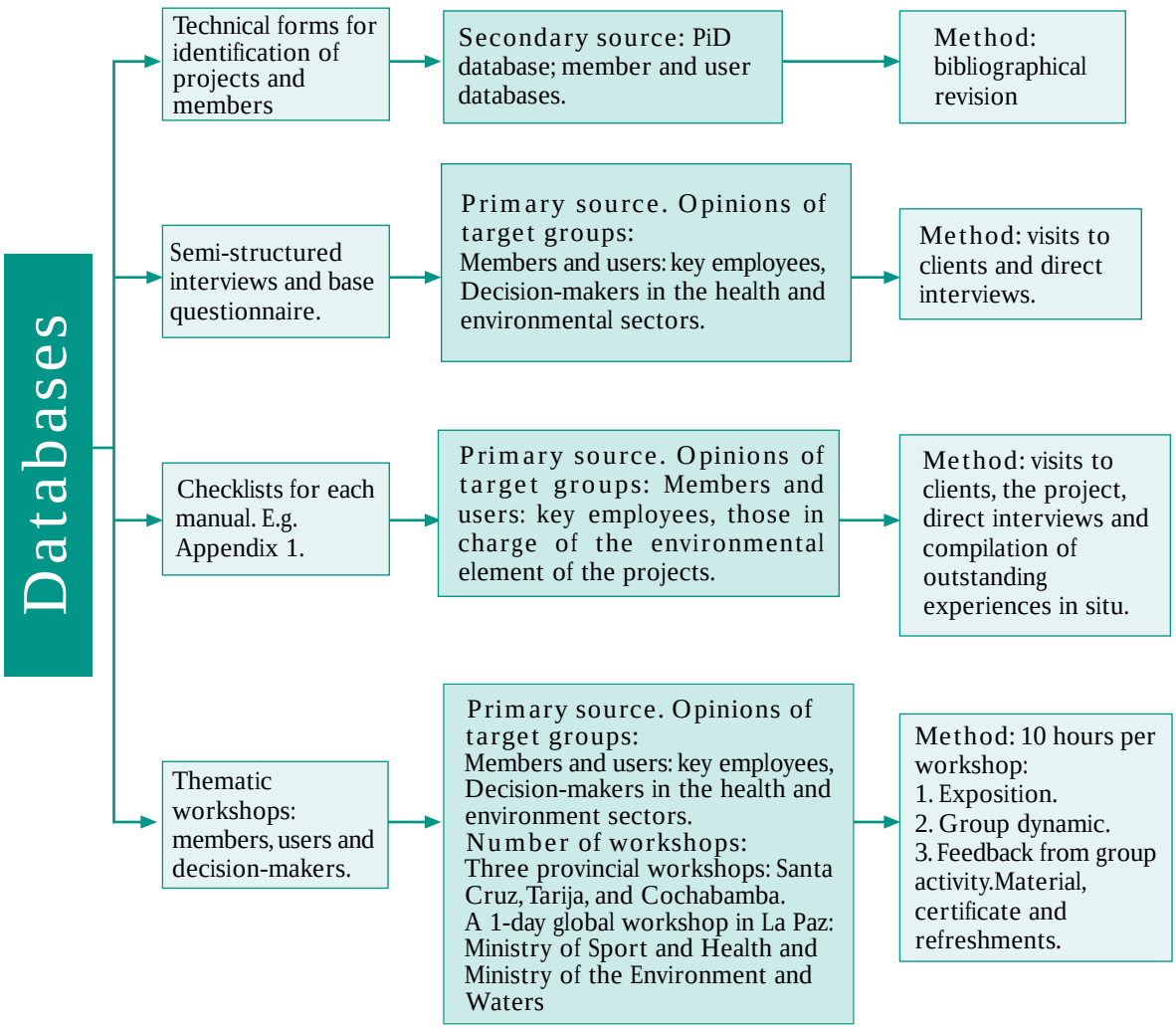

Table 2. Information-gathering instruments

Parallel to the definition of instruments and methods of collection was the configuration of new versions of the manuals. This was followed by the second phase of fieldwork, where technical, social and environmental data was gathered from the projects selected; the outstanding experiences and 'lessons learned' questionnaires were completed with the aim of obtaining information from the users and the manuals' final beneficiaries.

The third phase consisted of the validation of the information and of the results obtained in the field. Finally, the fourth phase includes the systematisation of all the information and the production of the final version of each manual.

2.1. Results

First phase

Two representative institutions were identified in the construction of health establishments:

- PROSALUD. Construction of second-level clinics in the cities of El Alto, Cochabamba and Santa Cruz.
- John Snow International (JSI) – Management of Quality in Health. Construction of health posts in the departments of Chuquisaca and Beni.

Second phase

- Visits to institutions made possible interviews and interchange of information on both projects.
- With the collaboration of those environmentally responsible for each institution, the 'outstanding experiences' form was completed and the project areas were visited.

Third phase

Method: 10 academic hours over two days.

Thematic workshop: during this phase a thematic workshop, on the subject of validation, was held in the city of Santa Cruz de la Sierra, 12th – 13th November 2009.

1. Exposition.
2. Group work.
3. Feedback from group activity.

Presentation of material and certificates; refreshments.

Number of participants: 21 people.

Participating institutions: PROSALUD, XPERTA, JSI – Management of Quality in Health, School of Environmental Engineers – Department of Santa Cruz (CIAM–SC), Santa Cruz School of Architects, Environmental Directorship of the Prefecture of the Department of Santa Cruz, of Environmental Quality Directorship, Municipal Government of Santa Cruz and Partners in Development (PiD).

Thematic workshop with decision-makers:

Method: 8 academic hours in one day.

1. Exposition.
2. Group work.
3. Feedback from group activity.

Presentation of material and certificates; refreshments.

Number of participants: 30 people.

Participating institutions: Project Concern International (PCI), International Agency Esperanza Bolivia (AIEB), School of Environmental Engineers – Departments of Cochabamba and La Paz, School of Architects of La Paz, Environmental Directorship of the Prefecture of the Department of La Paz, Vice-Ministry of Housing and Basic Services, Vice-Ministry of Health and Promotion, Directorship of Environmental Quality of the Municipal Government of La Paz, Environmental Directorship of the Municipal Government of El Alto, Drinking Water and Sanitation Company EPSAS, and Partners in Development (PiD).

Construcción de un Establecimiento de Salud. San José de Chiquitos, Santa Cruz (Bolivia)

3 Chapter 3
BRIEF DESCRIPTION OF THE SECTOR

Development in the activities of renovation and construction of health establishments is a major factor in the provision of medical services. Available health services are seen as the sum total of resources, technology, norms and logistics that make up the sanitary system's global structure. This availability is represented by the whole range of health establishments, including variations in their location, access, level of complexity, provision of beds and the human resources assigned for their functioning.

In Bolivia, health services and establishments are organized in networks that offer different levels of attention and degrees of complexity, whether they belong to the public health system, social security, Church health establishments, private institutions (which may or may not be profit-making) and traditional medicine, according to the individual case.

In accordance with each level of attention, the following availability[1] exists:

First level: health centres predominantly framed within health self-care, out-patient consultation and transitory admission. It is made up of: mobile health brigades, health posts, health centres with or without beds, policlinics and general consultancies, whether these are within the public domain, social security, churches, the NGOs, private and/or of traditional and/or alternative medicine.

Second level: made up of hospitals, clinics and health centres where more complex out-patient attention is given, and inpatient hospital treatment is available in four basic specialities (internal medicine, surgery, paediatrics and genecology-obstetrics, with anaesthesiological and optionally orthopaedic support), besides complementary services of diagnostics and treatment.

Third level: corresponds to highly complex out-patient consultation and admission concerning specialities and subspecialties. It is made up of so-called third level hospitals (such as General Hospitals) as well as institutes and specialized hospitals.

The aim of promoting health infrastructure is that of achieving optimum coverage and access, in accordance with the needs of the population for medical attention, without prohibitive cost being a restrictive factor. In this context it is important to combat the problems of social exclusion. The Pan-American Health Organization (PAHO), as a member of the World Health Organization, (WHO), has defined social exclusion in the health sector as a total or partial lack of access suffered by certain

1.- Perfil del Sistema de Salud de Bolivia, (Profile of the Bolivian Health System) 2008. P. 39.

people and social groups, to various health goods, services and opportunities from which other members of the community can benefit[2].

In the year 2000 the international community established an important challenge: "eradicating extreme poverty and improving the health and well-being of the poorest people over a period of 15 years". This challenge was part of the United Nations "Declaration of the Millennium", from which eight objectives known as the Millennium Development Objectives (MDO)[3].

Aspects of improvements in health are represented in three of the eight ODM:

- Reduce infant mortality.
- Improve maternal health.
- Combat HIV/AIDS, malaria and other diseases.

The broadening of medical service coverage and the introduction of universal access to health treatment are decisive factors in reaching these goals. Bolivia has various strategies oriented to extending health protection and health services. However the indications are that there are still challenges and barriers to be overcome in this sector.

2.- OPS/OMS. Resolution CSP26.19 "Ampliación de la protección social en materia de salud: Iniciativa conjunta de la Organización Panamericana de Salud y de la Organización Internacional del Trabajo" (Broadening of social protection in health matters: Joint initiative of the Pan-American Health Organisation and the International Labour Organisation".) Washington DC., September 2002.
3.- United Nations, 2000.

In planning the implementation of health infrastructure it is necessary to have the following information, as a baseline for prioritising, designing and financing any work related to the sector:

Source: *In-house redaction based on Isaza P. and Santana C. (1991) "Guías de diseño hospitalario para America Latina". "Guides to hospital design for Latin America", Health Service Development Programme, OPS/OMS Pp. 6-7.*

The hospital design must be drawn up by a multidisciplinary group made up of architects, who coordinate architectural and planning aspects; medical experts, to plan health services; and engineers, to determine the technical and engineering concepts and specifications that guarantee the infrastructure's long-term functionality and sustainability. This team must work in coordination and ensure that the flow of internal information is adequate and opportune.

When a health centre is designed, however small the project, it is necessary to make decisions on its form (horizontal or vertical), its building system, the interrelation between cubicles, departments or sections, the exploitation of the terrain, climatic conditions and accessibility for the population, etc. Consequently, there is a need to ponder construction alternatives so as be able finally to select the option most appropriate for both internal and external users[4].

4.- The term internal client is applied to any natural person who works within the infrastructure. On the contrary, external clients are people who attend to requirements for health services and medical attention.

Chapter 4

4 ENVIRONMENTAL MANAGEMENT IN INFRASTRUCTURE PROJECTS

Environmental management is defined as the sum total of the decisions, public or private, made in the service of environmental protection and improvement, the preservation of natural resources, and the protection of human health5. It comprises all the activities, means and techniques aimed at conserving the elements of ecosystems and the ecological relations between them, particularly in the face of alterations caused by human intervention. In this sense, all environmental management synthesises into the opportune assignation of material resources, human and economic, necessary to achieve previously-defined standards or levels of environmental quality.

The majority of small-scale development activities (housing, water supply, basic sanitation, health establishments and equipment or social installations) imply the realization of some infrastructure work. Construction includes, among other factors, activities such as demolition, site clearance and preparation, excavation, displacement and utilization of machinery or equipment, soil classification, levelling, compacting, edification of structures, etc. Depending on factors of a physical, biological or sociocultural nature, this work can eventually have impacts that are detrimental to the quality of the project environment and, consequently, affects surrounding populations.

Systems of environmental management focus on improvements in the environmental behaviour of an institution, company or project in an effort to reduce the contamination generated by its operations. The requisites for defining and implementing the continuous improvement of the environmental element are:

- The establishment of an environmental policy, where institutional commitment to the prevention of contamination is expressed.
- The identification of significant environmental impact, its causes and its classification as either favourable or detrimental to the environment.
- The definition of goals and objectives of environmental protection and control during the activities.

To this effect, operative instruments have been developed for this manual that are related to each of the project's phases and directed towards compliance with the normative environmental regulations that apply in this country. According to their character and temporality, the instruments are divided into three groups: preventive, corrective and auxiliary. The former are put into practice when adopting new plans, activities, works or projects (AOP), while the latter are applied to activities in execution or function. The third group of auxiliary instruments play the role of technical tools or resources, so that the first two may develop in an effective manner6. The chart "Instruments of environmental management for infrastructure projects" presents the types of instrument proposed:

5.- Arenas Muñoz, J.A. (2000): "Diccionario Técnico y Jurídico del Medio Ambiente" (Technical and Legal Environmental Dictionary) P. 440.
6.- Conesa Fernández –Vitora, V. (1997): "Instrumentos de la Gestión Ambiental en la Empresa" (Instruments of Environmental Management in Companies") p. 72.

INSTRUMENTS OF ENVIRONMENTAL MANAGEMENT FOR INFRASTRUCTURE PROJECTS

	Preventive	Corrective	Auxiliary and follow-up
Application:	Before the AOP.	During the execution of the AOP.	According to requirements: before, during and/or at the close of the AOP's execution.
Of a technical-environmental nature:	- Environmental baseline. - Plan of Environmental mitigation (PMA). - Programme of Environmental Execution (PEA). - List of good environmental practices. - List of technical environmental specifications. - Emergency plan.	- Contingency plan. - Corrective actions form. - Environmental incident report form. - Accident report form.	- Inductions or training programmes on constructive processes, emergency and contingency plans. - Checklists and verification. - Management and environmental monitoring report (PMA–PEA).
Of a social order:	- Social baseline. - Activities of socialization of the project: public consultation, meetings, workshops, etc.	- Contingency plan.	- Interviews and/or questionnaires for civil organizations. - Training activities: workshops or meetings with focus groups.
Of an economic order:	- Budgetary assignation form for environmental management.	- Advance and physical-financial execution form.	- Advance and physical-financial execution form. - Control of budgetary expenses.
Of evaluation:	- Prior evaluation form.	- Advance and physical-financial execution form.	- On completion: closing evaluation form. - Environmental management balance form.

As can be observed in the first line, these tools must be applied according to the corresponding phase or temporality of the project cycle which, for this purpose, consists of four parts: pre-investment, investment, execution and closure; likewise the first two are divided into phases.

- Pre-investment7: starts off from the moment that a project idea is conceived and the prefeasibility study is drawn up. It culminates when the technical-economic-social profile is designed and the decision is made to present the request for finance.

  Phase I. Identification of the need of a new health establishment:

  This phase considers variables such as the characteristics of existing medical assistance and development policies, the rates at which existing services are used and the expected demand, epidemiological and demographical development profiles, health policies and geographical characteristics. The generation of finance for the development of the new establishment is directly associated with this phase.

  Phase II. Study of alternatives to satisfy the need:

  During this phase distinct alternatives are identified, studied and compared. The definitive location of the establishment is an essential variable in this process.

  Phase III. Medical-architectural programme and pre-projects:

  During this phase the required services and spaces are defined, and pre-projects are developed which establish the functional relations and basic characteristics of the new infrastructure.

- Investment: this is under way once the finance is authorised. During this phase the most viable alternative is chosen through analysis of economic, technical and environmental alternatives. Based on the results obtained, the final project design is proposed.

  Phase IV. Project design:

  This phase sees the development of plans, technical specifications, budget and documents of tender that permit the installation's construction. This will be based on the norms and regulations of architectural design existing in the health sector and must be directed towards optimisation of the prevention and mitigation measures8.

- Phase V. Execution:

  This refers to the construction phase, in which the work's infrastructure materialises. During this phase the necessary materials, tools, working teams and equipment are moved into place so as to build the projected infrastructure.

- Closure:

  This phase implies the culmination of the construction work and the consequent abandonment of camps and other infrastructure used or conditioned for the previous phase. This means returning the environment to a condition similar to, or better than, its state at the beginning of the construction activities.

7.- Boroschek Krauskopf, Rubén and Retamales Saavedra, Rodrigo. Centro Colaborador OPS/OMS de Mitigación de Desastres en Establecimientos de Salud. (Mitigation of Disasters in Health Establishments). "Universidad de Chile". Washington D.C., January 2004. P. 10.
8.- Ministry of Health. Guía para la protección de establecimientos de salud ante desastres naturales (Guide for the protection of health establishments from natural disasters). Lima, Peru, 2005. P. 26.

The table “Account of project lifecycles and instruments of environmental management in infrastructure projects” presents an account of environmental management instruments during the project lifecycles:

ACCOUNT OF PROJECT LIFECYCLES AND INSTRUMENTS OF ENVIRONMENTAL MANAGEMENT IN INFRASTRUCTURE PROJECTS

Project cycle	Preventive	Corrective	Auxiliary and follow-up
PRE-INVESTMENT	- Environmental baseline. - Social baseline.		
INVESTMENT	- Environmental mitigation plan (PMA). - Environmental Execution Programme (PEA). - List of good environmental practices. - List of technical environmental specifications. - Emergency plan. - Activities of socialization of the project: public consultation, meetings, workshops, etc. - Budgetary assignation form for environmental management. - Prior evaluation form.		- Interviews with / questionnaires for civil organisations.
EXECUTION		- Contingency plan. - Corrective actions form. - Environmental incident report form. - Accident report form. - Advance and physical-financial execution form.	- Workshops or meetings with focus groups. - Inductions or training programmes on constructive processes, emergency plans and contingencies. - Checklists and verification. - Management and environmental monitoring report (PMA-PEA).
CLOSURE			- Closing evaluation form - Environmental management balance form.

Chapter 5
PRE-INVESTMENT PHASE

During this phase, in which the project is prepared and evaluated, several studies are carried out. These include technical, economic, financial, market research and other investigations, making it possible to ensure maximum benefits at the lowest possible cost. The process includes various phases, namely:

5.1. Project idea

During this phase it is fundamental to have a correct diagnostic. The project idea must emerge as a consequence of unsatisfied needs, and be based on action policies, development plans, or from the need to complement other programmes or projects. It is important to define which necessities must be satisfied, who are the beneficiaries and the people directly affected, and on what criteria the detection of the problem and identification of alternative solutions are based.

5.2. Project profile

In this document all the necessary antecedents are studied to form a judgement with respect to the pertinence and technical and economic feasibility of carrying out the project idea. It includes a preliminary analysis of the technical, environmental and social aspects of the project area, besides aspects of evaluation, emphasising identification of pertinent benefits and costs, utilising estimative figures and seeking to forecast what would happen if the project were not carried out. Available data are used, or else information easily obtained (without incurring costs).

In order to draw up the project profile it is necessary to have a socioeconomic and environmental diagnostic of the area of intervention. Moreover, with the aim of gathering relevant information for the project profile it is essential to complete the social baseline and environmental baseline that are detailed in the following sections.

5.2.1. Social baseline

As explained in the previous point, this instrument will be useful in collecting the relevant information from the community, neighbourhood or zone where the project will be conducted.

A set of questions is proposed which considers the following points:

- General information on the zone where an extension or new construction is planned.
- Characteristics of the population.
- Type of health establishment.
- Location.
- Characteristics and land uses on the project site and surrounding area.
- Climatological characteristics.
- Communications media and transport.
- Basic services: health services and educational services.
- Data on the community: its organization, migratory patterns, productive activities and experiences in community work.
- Consultations regarding the community's perceptions, problems and priorities.

Below the document is presented with its instructions for completion.

SOCIAL BASELINE

KEY TO COMPLETION OF THE SOCIAL BASELINE

This document's aim is to gather all relevant information of a social nature, related to the project area and the beneficiary communities. It serves in planning the project design, the selection of the site and organisation of the placement logistics for the building work.

It is important to mention that this form follows the guidelines established by community development, originating with the bases in accordance with identified necessities and set out by the future beneficiaries themselves. The social baseline must be completed by a qualified professional, with professional registration in the social or environmental areas. The relevant information may be entered through individual consultations or group meetings, taking into account the representativeness of those interviewed.

The main objective of this instrument is to contribute to the executive institutions in the planning of the project and its intervention strategy, prioritising the aspects with socio-environmental relevance and benefit.

In the introduction contains general data for the identification and spatial location of the project. It is followed, in Point 1 (*Geographical location*) by consultation regarding the lands adjacent to the beneficiary community, besides the geographical coordinates and data on ownership of the lands where the works will be sited. It is important to know if any municipal or prefectural territorial planning exists in the project area, so as to avoid conflicts over soil uses or ownership rights.

Point 2 (*Geographical dispersion*) has the objective of describing the context in which the project will be developed. To this effect the main reference for the ordering of human settlements proposed by the Vice-Ministry of Urban Development and Housing is based on a hierarchy of population size. In accordance with this document, the ordering by size analysed in relation to municipal capitals

or municipal administrative centres allowed a definition of the following categories according to populations within the entire national territory. Its description of characteristics is described in the following manner:

- Nuclear communities (under 400 inhabitants)
- Villages (from 401 to 2,000 inhabitants)
- Minor urban centres (from 2,001 a 5,000 inhabitants)
- Minor cities (from 5,001 to 20,000 inhabitants)
- Intermediate cities (from 20,001 to 50,000 inhabitants
- Major cities (over 50,001 inhabitants)

Nuclear communities:

These are groups of houses or hamlets and small peasant communities, generally linked to agricultural or livestock activities. Their important interrelation with the rural area means mutual influence from and towards the surrounding productive territory, including its dispersed population. They generally have educational facilities and community space, which in some cases allow the identification of primary physical (embryonic) urban structures.

Villages:

These rural localities, a concentration of dwellings and services, contain communal installations and economic dependencies that support agricultural and/or extractive

production. Their population is mainly active in agriculture.

Rural social relations and economic relations are integrated in agricultural regions, of primary production. In some cases they function as centres of rural supply and storage.

Minor urban centres:

These are populated centres with urban characteristics, able to concentrate population and economic influence, with activities involving transition between rural and urban areas; with relative importance in the system of cities and human settlements, their influence is mainly local.

Minor cities:

These are human settlements in the process of urban spatial consolidation, which maintain influence and interrelation with their dispersed rural hinterland. These are optional centres of micro-regional integration whose occupational pattern is one of family production and of support for production in general.

In the largest of the minor cities, urban spatial structure is small but consolidated. They have their own economic activities and services, despite continued dependence on the countryside and on larger settlements. The pattern of occupation is more diversified; they are influenced by and exert influence upon the region as a whole.

Intermediate cities:

Human settlements with a defined urban structure (central nucleus, area of expansion and growth),

where social and economic activities are mainly complementary to production, such as commercial functions and services; in some cases there is specialization in productive and administrative activities. The urban occupational pattern is diversified.

Major cities:

These are urban structures that are expansive in both qualitative and quantitative terms.

Mainly capital cities where the socioeconomic activities and policies of their region or department are concentrated, they are administrative centres for human settlement subsystems. They represent the urban phenomena of concentration, decentralization and economic specialization, regional and departmental influence, and high absorption of migrant population.

There are also cities in the process of becoming metropolises, due to sometimes extreme and significant tendencies toward conurbation, as well as to relations of functional and socioeconomic interdependency with other, lesser settlements in their micro-region. They concentrate a fundamental part of the economic activities of the country, both internally and externally. They constitute the basic systemic structure of cities and human settlements, urban-rural and regional-national, through which all the positive and negative processes of urban development are manifested.

In Point 3 (*Climatological Characteristics*) data relevant to the climate of the zone must be entered.

In Point 4 (*Characteristics of the zone's population, neighbourhood or project area*) data relevant to this theme must be entered, while Point 5 *(Communications media)* details the existing communications media infrastructure. The term road structure refers to all the routes for vehicular and pedestrian circulation that permit the displacement of people and/or merchandise, both within the populated centre and outside it. The routes that make up the road structure can be classified, for registry purposes, in the following categories:

Primary or principal routes: routes for vehicular traffic that generally connect human settlements, directly or indirectly, with other municipal and departmental centres. These are known as structuring routes, because they are important in the definition of urban structure.

Secondary routes: these are vehicular routes providing the settlement's internal interconnection.

Tertiary routes: this type includes vehicular routes interconnecting zones or deriving from primary and secondary routes within the different urban areas.

Pedestrian streets: designed for pedestrian circulation, within urban zones or neighbourhoods, their dimensions and surface do not permit vehicular traffic.

Other types of route: according to the individual characteristics of the human settlement, these may be waterways (rivers, canals, lakes) or railways, and include transport within urban areas, or alternative transport systems such as cable railways or metros.

These data will be useful at the time of organising the logistics, the chronogram for construction and the storage of materials.

Point 6 (*Basic services*) was drawn up with the aim of finding out the current situation regarding the supply of basic services: water, sanitation, energy for cooking, electrical energy and collection of solid waste in the project area. The information gathered in this point will help plan the provision of services as part of the project.

Point 7 (*Health services)* and Point 8 (*Educational services*) have been incorporated as means of getting to know the level of social assistance in these two sectors in the project area.

Points 9 to 14 on the form relate to data concerning the community, its organization, migratory patterns, productive activities and experience in works or similar projects. Documenting these data will be useful for planning the strategy and pertinence of the intervention.

Finally, in Point 15, there are miscellaneous questions eliciting additional information with environmental relevance.

SOCIAL BASELINE - HEALTH ESTABLISHMENT SECTOR

For gathering information on communal authorities, health sector personnel and teachers

GENERAL DATA			
Name of the project:			
Type*:			
Zone, neighbourhood, community or UV[11]:			
Municipality:			
Department:			
Project area**:			
Person responsible for completion:			
Profession:		Signature:	
Professional register:		Date:	

** For example remodelling, extension and/or new construction.*
*** For example urban, rural, peripheral.*

Conduct a tour of the beneficiary populations. For information-gathering, take into account that true representativeness means the participation of at least one representative of each institution identified as key. Be sure to obtain the greatest possible quantity of relevant information for the strategy of intervention.

11.- UV: Unidad Vecinal (Neighbourhood Unit).

1. Geographical Location and Characteristics of the Terrain

1.1. Indicate the features adjacent to the project site:

To the north: _____
To the south: _____
To the east: _____
To the west _____
Geographical coordinates (UTM): _____

Distance to the closest departmental or municipal capital: _____

1.2. Is the project located in communal areas or on lands that are communal property?

a) Yes b) No

If so, specify the conditions of land property:

a) TCO[12] b) TCI[13] c) OTB[14]

1.3. Will it be necessary to displace people in order to use the land?

a) Yes b) No

If the reply is affirmative, specify and clarify the mechanisms that will be used in order to carry out this displacement:

_____
_____
_____
_____
_____
_____

1.4. Will it be necessary to compensate or indemnify people for the use of the land?

a) Yes b) No

If so, specify the present situation and the solution mechanisms to be employed:

_____
_____
_____
_____
_____
_____

12.- TCO: Tierra Comunitaria de Origen (Community Land of Origin).
13.- TCI: Tierra comunitaria Indigena (Indigenous Community Land).
14.- OTB: Territorial Base Organization.

1.5. What uses are being made of the adjacent lands?

a) Pasture b) Agricultural c) Others _____ d) None

1.6. In the vicinity of the project, is there land for new settlements?

a) Yes b) No

If the reply is affirmative, what are the dimensions?_____

1.7. Is there any plan for land use or for municipal/prefectural territorial ordering that sets norms for new settlements?

a) Yes b) No

If so, explain and describe the level of compliance with this plan:

_____

_____

_____

_____

1.8. If not, is there a need to draw up, set out or propose a plan as part of the project?

a) Yes b) No

1.9. Does the land have documentation to accredit its ownership rights?

a) Sí b) No

If so, what are they?

_____

_____

_____

_____

_____

_____

1.10. Could the project cause social conflicts or clashes of values regarding the possession, the proposed use and the use of adjacent lands? Is the proposed use in conflict with existing uses, cultural characteristics or current traditions?

a) Yes b) No

If the reply is affirmative, explain:

2. GEOGRAPHICAL DISPERSION of the PROJECT AREA

2.1. Underline the characteristics of the project area:

a) Urban b) Peripheral c) Rural

2.2. Indicate which of the following groupings corresponds to the beneficiary community:

- Nuclear communities (under 400 inhabitants)
- Villages (from 401 to 2,000 inhabitants)
- Minor urban centres (from 2,001 a 5,000 inhabitants)
- Minor cities (from 5,001 to 20,000 inhabitants)
- Intermediate cities (from 20,001 to 50,000 inhabitants
- Major cities (over 50,001 inhabitants)

2.3. Indicate the type of geographical dispersion of the community[15]:

a) Concentrated b) Dispersed

3. CLIMATOLOGICAL CHARACTERISTICS

3.1. Indicate the predominant climate on the project site:

a) Cold b) Temperate c) Hot

15.- A Concentrated community is one in which the dwellings are contiguous.
A Dispersed community is one in which the dwellings are separated by a distance greater than 100 metres.

3.2. Are there predominant climatic seasons on the project site?

a) Yes b) No

What are they? _____

Which is the most critical? (For example, those causing problems or difficulties in the constructive process, in the management of the project or in its development, etc.)

4. POPULATION CHARACTERISTICS of THE ZONE, NEIGHBOURHOOD or COMMUNITY of the PROJECT AREA

4.1. What is the estimated population that lives currently in the community or zone of intervention? (Specify the number of beneficiaries, both direct and indirect).

_____

_____

_____

4.2. Socio-demographic data on the project zone:

Question	Response	Comments
How many births were reported last year?		
How many deaths were reported last year?		
What is the fertility rate existing in the community?		
What is the community's rate of growth?		
To which ethnic group does the community belong?		
Which is the language most commonly spoken?		
What religion does the community practice?		
Does the population have recourse to other alternative/traditional means? Indicate what these are and how frequently they are used.		

Source[16]:

4.3. Was there a request from the community to initiate the project?

a) Yes b) No

Explain the motivation for carrying this proposal forward:

_____

_____

16 If there is no precise information available on the community, go to official sources within departments or municipalities: INE, CNPV, ENDSA, MECOVI, SNIS, etc.; use the most up-to-date indicators that exist.

5. Communications media

5.1. Radio communication:

Question	Response
How many radio stations exist?	
Who is in charge of them?	
What is the frequency?	
What are the broadcasting times?	

5.2. Telephone:

Question	Response
What is the contact number?	
Who is the person to contact?	
Is there a public telephone service?	
Is there a mobile telephone signal? What is it?	

5.3. Transport :

5.3.1. By what modes of transport does one access the project?

a) Land b) Air c) Fluvial d) Combined

Specify the public transport service used[17].:

Mode of Transport	Days of departure	Timetable
Transport by road, by railway, etc.:		
Air transport :		
Fluvial :		
Combined transport:		

5.3.2. What type of road access (road structure) does the community have? Clarify, in the spaces given, the road surface material. For example asphalt, earth, cobblestones, etc.

a) Principal _____ b) Secondary _____

c) Tertiary or neighbourhood _____

5.3.3. Is the road transport accessible all year round?

a) Yes b) No

17.- Surface transport by road: pedestrians, bicycles, automobiles and other vehiles without rails.
Surface transport, material moved by rail.
Aquatict: transport: maritime and fluvial transport.
Combine transport: various modes of transport are used and the merchandise is transferred from one vehicle to another.

If not, indicate accessibility by season (for example good, regular, poor):

In the dry season: _____

In the rainy season: _____

6. BASIC SERVICES

6.1. Water supply

6.1.1. Is there any safe drinking water network or distribution system for the project?

a) Yes b) No

6.1.2. If not, what is the current water source supply for the project?

Community or population group	Surface source				Underground source	
	River	Spring	Source	Other (small reservoir, rainwater collection):	Manual well	Perforated well

6.1.3. Is the service by network, or through a distribution system?

Question	Response	Observations
Who administers this service?		
What is the cost?		
Is the service efficient?		
Who carries out maintenance?		
Is there any deficiency? (for example state of the plumbing, etc.).		

6.1.4. If there are taps indicate whether these are:

a) Public/communal: Nº: _____ Community _____

b) Domestic: Nº: _____ Community _____

6.1.5. Indicate whether the water supply is:

a) Permanent b) Temporary (…… hours a day)

6.1.6. Is there a water scarcity during any period of the year?

a) Yes b) No

If so, during which months, and why?

_____

_____

_____

_____

6.1.7. Has an alternative system been considered for times of drought?

a) Yes b) No

If the reply is affirmative, what kind of system?

_____

_____

_____

_____

6.2. Basic sanitation (toilets and systems for the elimination of excreta)

6.2.1. If the project is one of remodelling and/or extension: what kind of drainage is there? What is the physical condition of the existing drainage system?

_____

_____

_____

_____

What are its characteristics and conditions of functionality?

_____

_____

_____

_____

Is there a need for remodelling or refurbishment of the current sanitary system?

_____

_____

_____

_____

6.2.2. If this is a new project, what is the programmed drainage system for the health establishment?

a) Cesspit
b) Pit and septic tank
c) Sewer system
d) Other: _____

6.2.3. If the project is new isolated/ dispersed: who will take charge of the administering the water resource and sanitary system?

_____

_____

_____

_____

6.3. Supply of energy for COOKING

6.3.1. Does the proposed establishment have a particular space for cooking?

a) Yes
b) No

6.3.2. What source of energy is used by the population for cooking? (Mark all those that apply)

a) Solar energy
b) Biomass: firewood, dung, reeds, dried grass, charcoal, other: _____
c) Kerosene
d) Bottled gas
e) Electricity
f) Domestic gas

If the reply is firewood:

What kind of firewood do they use? _____

Who collects the firewood? _____

Where? _____

Is firewood abundant or scarce? _____

What, on average, is the amount of time or number of days involved in obtaining it? _____

6.3.3. If firewood is used, what kind of stove is employed?

a) Stove[18]
b) Improved stove[19]
c) Clay ovens
d) Other _____

18 In certain parts of Bolivia it is also known as concha.
19 There are various types of improved stoves: Lorena, Ceciliana, Campana, etc.

6.3.4. What system of smoke elimination will be used?

a) Chimney b) Windows c) Other_____

6.4. Electricity supply

6.4.1. Is there electric power in the project zone?

a) Yes b) No c) At times _____

6.4.2. What is the source of electricity generator used in the zone? (For example water, diesel, etc.).

_____

_____

6.4.3. Are the characteristics of the electricity service sufficient to satisfy the demands of the establishment?

a) Yes b) No

If the reply is negative:

6.4.4. What is the alternative means of generating electricity to supply the project?

_____

6.4.5. What is the installed capacity of the alternative generator and what are the characteristics of the system?

_____

_____

_____

_____

Explain the relation between the alternative source and the establishment's electricity requirements:

_____

_____

_____

_____

Explain the social and administrative management of the electricity system proposed for the establishment:

_____

_____

_____

_____

7. HEALTH SERVICES

7.1. Is there any health service within a 2-kilometre radius?

a) Yes b) No

7.2. What level of health care does it provide?

a) First level b) Second level c) Third level

7.3. Who is the person responsible? _____

7.4. What are the most common diseases in the community?

a) Chagas b) Tuberculosis c) Malaria d) Diarrhoea
e) Common cold f) Pneumonia g) Other _____

7.5. Is the population informed of levels of infestation? (Information is available through, for example, epidemiological charts, information on virus propagation, diarrheic diseases, respiratory infections, etc.).

a) Yes b) No

If the reply is affirmative: What is the general level of knowledge?

_____

_____

8. EDUCATIONAL SERVICES

8.1. Are there schools in the community?

a) Yes b) No

If not, indicate the distance from the closest school:

_____

8.2. Up to which grade or level is formal education imparted? _____

8.3. Who is the person/people responsible? _____

8.4. To what nucleus do these people belong? _____

8.5. How many teachers are there? _____

8.6. How many pupils are there? _____

9. COMMUNITY ORGANIZATION

9.1. Are there community organizations?

a) Yes b) No

If they do exist, give details:

Nº	NAME of the ORGANIZATION	ACTIVITY it CARRIES OUT	MAIN REPRESENTATIVES	DAY or DATE of MEETING
1				
2				
3				
4				
5				

9.2. What type of festivities do local people celebrate, and on what dates? Mention the most important.

FESTIVITY	DATE	IMPORTANCE

9.3. Could the project cause changes in the community culture or in patterns of conduct related to health?

a) Yes b) No

If the reply is affirmative, explain:

10. MIGRATORY PATTERNS

10.1. The migratory patterns of the community are:

a) Permanent b) Temporary c) Mixed

10.2. Between last year and the present, how many people have left the beneficiary community? (Migration over a period of one year previous to this survey):

Number of men (over 15) who migrated: _____

Number of women (over 15) who migrated: _____

Total number of migrating families: _____

10.3. Where do the majority emigrate? _____

10.4. Could the project cause immigration or resettlements from other nearby populations?

a) Yes b) No

If the reply is affirmative, explain:

_____

_____

_____

_____

11. PRODUCTIVE ACTIVITIES

11.1. What is the most common occupation in the beneficiary community?

HEADING	%	PRODUCT	COMMERCIALISES THE SURPLUS		AVERAGE QUANTITY of COMMERCIALIZATION	AVERAGE ANNUAL INCOME	SUPPORTING ENTITY
		Name	Yes	No			
AGRICULTURAL							
LIVESTOCK							
FISHING							
COMMERCE							
SERVICE							
CRAFTS							
OTHERS (mining, etc.).							

11.2. In terms of work or of productive activities, what institutions bring community members together?

Give details:

Nº	NAME of the INSTITUTION	MAIN REPRESENTATIVES
1		
2		
3		
4		
5		

11.3. During which periods does the community have time available, according to the agricultural calendar?

Describe the time of year in which the community is busiest:

a) Sowing: months from _____ to _____ Total _____ months.

b) Harvest: months from _____ to _____ Total _____ months.

c) Fishing: months from _____ to _____ Total _____ months.

d) Cattle: months from _____ to _____ Total _____ months.

e) Others: months from _____ to _____ Total _____ months.

12. REVIEW OF PROJECTS CURRENTLY UNDER WAY

In the project zone, are other development cooperation projects currently in progress, or have any recently been carried out? Give details:

Nº	Name of the project	Name of the institution	Period of execution	Main support activity
1				
2				
3				
4				
5				

13. EXPERIENCES in COMMUNITY BUILDING WORKS (other projects)

13.1. Describe the experiences of work in which the community participates/has participated:

Institution	Type of project	Was there any communal request?	Communal contribution			Women participants (%)	Period of execution of the project
			In cash	In kind			
				Days' work	Local materials		

13.2. Are there any previous examples of remodelling, construction and/or extension to health establishments in the community?

a) Yes b) No

Give details:

Institution	Was there a request from the community?	Communal contribution?		Nº of participant/ beneficiary families
		Cash	Days' work	

13.3. If the response to question 13.2 is affirmative, canvas the opinion of the families with regard to the experience of health establishment installation in their community.

13.4. Are there any appropriate places for establishing stores for non-local building materials? (Take into account old or communal stores).

14. IDENTIFICATION of HUMAN RESOURCES FOR BUILDING WORK

14.1. Describe the human resources available in the community:

Trade	Quantity	Names
Builders		
Plumbers		
Builder's assistants		
Electricians		
Grocers		
Health promoters[20]		
Building promoters		
Community Vector Information Posts[21]		

15. MISCELLANEOUS

15.1. Type of consultation:

a) Organised group _____ b) Individual non-formal consultation

15.2. Number of people consulted: _____

15.3. Indicate in order of priority the needs most keenly felt by the community:

Number from 1-3:
1. High priority (short-term).
2. Medium priority (medium-term).
3. Low priority (long-term).

a) _____ Roads.
b) _____ Irrigation.
c) _____ School.
d) _____ Health centre.
e) _____ Drinking water.
f) _____ Cleansing.
g) _____ Housing.
h) _____ Electric power.
i) _____ Telephone service.
j) _____ Others: _____

20 Also known as ACS – Asistente Comunitario de Salud (Community Health Assistant).
21 PIV: Puestos de Información de Vectores. Vector Information Posts (offer information, particularly on vinchucas - carriers of Chagas disease).

15.4. Do you consider any of the following points a problem in your community? (Mark all that apply):

Problem	YES	NO	Comments and specifications of the priority: Short-term (1 year) / Medium-term (2-5 years) / Long-term (over 5 years)
a. Water shortage			
b. Contaminated river			
c. Stagnant water			
d. Contaminated well-water			
e. Sewage			
f. Refuse (solid waste)			
g. Scarcity of firewood for fuel			
h. Deforestation			
i. Erosion			
j. Land less fertile			
k. Fires			
l. Landslides			
m. Inundations			
n. Earthquakes			
o. Droughts			
p. Disappearance/reduction of fisheries			
q. Disappearance/reduction of animals for hunting			
r. Disease-carrying insects and animals			

Interviewer's commentaries or perceptions

_____

_____

_____

15.5. Are there items of archaeological/historical/cultural value in the community?

a) Yes b) No c) Don't know / no reply

15.6. ¿Is the project located in any protected area?

a) Yes b) No

If the reply is affirmative, specify: _____

15.7. Consult the families' opinions regarding the benefits of the health projects.

15.8. Consult the families' opinions regarding problems that have resulted in, or could give rise to, remodelling and construction projects and/or health establishment extensions.

15.9. Other observations (include technical perceptions on factors supporting or opposing the constructive process):

15.10. People interviewed in the community.

Name	Organization	Position	Opinion

5.2.2. Environmental baseline

Getting to know the environmental characteristics of the project site is also a crucial factor when it comes to planning any project related to infrastructure in health. The information to be entered in this document must be compiled in the pre-investment phase and applies to all the projects, without distinction of magnitude or of context. The model format for this tool is found at the end of this section and incorporates eight relevant components, namely:

- Soil aptitude and uses (previous, current and potential).
- Factors of proximity (to urban areas, protected areas, sites of ecological interest).
- Social vulnerability and natural risks.
- Availability of sources for water supply.
- Physical and topographical characteristics of the soil and subsoil.
- Climate.
- Means of access to the project zone and its internal road structure.
- Infrastructure and public installations existing in the area.

ENVIRONMENTAL BASELINE
INSTRUCTIONS for FILLING IN the ENVIRONMENTAL BASELINE

This document's aim is to gather all the relevant information of an environmental nature, related to the project area and to the beneficiary communities. As with the social baseline, this serves in planning the project design, selecting the site and organising the logistics of siting the building work, giving consideration to prevention and environmental mitigation. The environmental baseline must be completed by a qualified professional with professional registration in environmental areas.

The main objective of this instrument is to contribute to the executive institutions in planning the project and the strategy of intervention, prioritising the aspects with socio-environmental relevance and benefit.

Begin with the general data for the identification and spatial location of the project; the next step is to fill in the characteristics, typology and soil uses. At this point it is necessary to conduct a study of soils and document the results relevant to the project or the site of intervention. Similarly, it is necessary to systemise the information relative to existing plans for soil use, soil aptitude and requirements for permits or regulatory norms for the construction.

Point 2 (Accessibility) and Point 3 (Factors of proximity) involves consultation on the means of access to the community and the road structure of the project area, information useful for planning the logistics of transporting materials and the forecasted future of the project.

Point 4 (Physical or environmental threats) must be completed with data relevant to the zone, its vulnerability to threats, their frequency and the possibility of reversing the damage. This information is useful to justify or to change the selection of the project site.

In Point 5 (Topography) details must be given of the topography of the area in which the project is sited. It is crucial to pay considerable attention to the topography of the human settlements and of the surrounding area since the choice of construction sites depends largely on the configuration and properties of the terrain.

The parameters that should be considered in the adaptation of the slopes for urban use[22] are:

- Parameter 1: from 0% to 5%, flat land, presents no problems for installing sewerage networks, roads and construction generally.

- Parameter 2: from 5% to 20%, inclination regularly adequate since, despite presenting some difficulties in installation and costs, it is considered regular.

- Parameter 3: greater than 20%, described as inadequate because of the difficulties it presents in setting out networks and its high construction costs; not apt for construction.

It is important to clarify that, in the countryside, there are settlements built on slopes greater than 20%, in installation of infrastructure and road treatment have been nonetheless been applied (for example, the mountainsides of La Paz); however, the fact that these exist does not justify the high level of investments involved in the installation of such services in these settlements.

Depending on how much the land slopes, the density of the fertile soil and the type of vegetation that it may or not receive; the slope also influences the flow of the rivers and in the runoff from surface waters, especially those of pluvial origin.

The gradient conditions human use of the soil; agriculture on terrains with a slope steeper than 15% already presents difficulties, not to mention those on irregular lands.

With regard to buildings that extend lengthwise, special attention has to be given to the existing gradient, a rule that also applies in the construction of patios, streets and plazas. The longitudinal axes of buildings must run parallel to the hypsometrical lines (contours of equal height above sea level), when these are found in undulating or mountainous terrains. This solution, besides procuring harmony with the land's configuration, avoids considerable expense on land movement and cementation works (Valenzuela, 1998).

In Point 6 (Climate) data must be included that is relevant to deciding the season in which the project is to be implemented, as well as the orientation of the dwellings.

Point 7 (Basic services), as with the social baseline, was drawn up with the aim of gleaning knowledge of the current situation and the technical parameters in supplying basic services: water, sanitation, energy for cooking, electric power and the service of collecting solid waste in the project area. The information gathered at this point will serve in planning the provision of services as part of the project.

22.- Valenzuela A., Elisa et al (1998). "Aspectos ambientales en el diseño urbano" (Environmental Aspects in Urban Design). Ministerio de Vivienda y Saneamiento Básico, La Paz, Bolivia, p. 20.

Point 8 (Availability of local materials) has been incorporated so as to make known the availability, in quality and quantity, of building materials in the project area. Also add a description of the environmental aspects of the designated supply sites: location, condition before the extraction, proximity to bodies of water, etc.

Point 9 (Ecological value of the environment) seeks to identify sites of interest and habitats of flora and fauna with ecological value in the vicinity of the project, susceptible to its effects.

Point 10 (community participation) is related to data concerning the community and the people who participated or contributed with information to this document.

Finally, Point 11 presents a topographical map on an appropriate scale, with information of socio-environmental relevance.

ENVIRONMENTAL BASELINE

"Remodelling and/or construction of health establishments"

GENERAL DATA			
Name of the project:			
Type*:			
Zone, neighbourhood, community or UV[23]:			
Municipality:			
Department:			
Project area**:			
Person responsible for completion:			
Profession:		Signature:	
Professional registration:		Date:	

** For example remodelling, extension and/or new construction.*
*** For example urban, rural, peripheral.*

Conduct a tour of the beneficiary populations. In order to collect information take note of the representativeness of the whole communal leadership; be sure to obtain the greatest possible quantity of information relevant to the strategy of environmental intervention.

23.- UV: Unidad Vecinal (Neighbourhood Unit)

1. CHARACTERISTICS, TYPOLOGY and SOIL USES

1.1. Has any soil study been carried out?

a) Yes b) No

If the reply is affirmative, describe and explain:

Information	Data	Observations
Number of samples taken for the study:		
Type of soil:		Important parameters for the design of systems for the elimination of excreta. If there is seasonal variation, please describe.
Permeability:		
Depth of the aquifer:		
Gradient:		
Firmness of the soil or its capacity for load-bearing:		
Are there surface water courses with seasonal variations, and/or subsurface water in the project area?		Specify depth and location.

1.2. If the reply is negative, circle the type of soil predominant in the community.

a) Lime/clayey b) Gravelly/sandy c) Clayey d) Rocky

e) Other:_____

Please explain and append the reference for the information:

1.3. What use is made of the lands in the project area?

Use of the terrains	Data	Observations
Previous: Register past activities, such as disposal of dangerous waste materials, abandoned industrial areas, etc., which might have, or still could, endanger the community.		
Current (at the beginning of the project): The change in the use of the terrain may cause conflicts. For example, if the neighbouring community currently uses the land for pasture, cultivation or as a water source, etc.		
Potential (soil aptitude): Gather data on territorial planning or on plans for urban expansion.		Is the terrain suited for the ends pursued?

1.4. Does the community hold any certificate for land use?

a) Yes b) No

If the reply is affirmative, append documentation.

1.5. Are the lands compatible for the proposed use?

a) Yes b) No

If the reply is affirmative, please explain:

1.6. Are there any zoning requirements, user permits or licences or regulatory norms for the design and construction of the health establishment?

a) Yes b) No

If the reply is affirmative, please explain:

_____

_____

_____

_____

2. ACCESSIBILITY

2.1. Please indicate the means of access to the project:

a) Land _____ b) Fluvial _____ c) Air _____ d) Rail _____

2.2. Circle the type of road:

a) Hard core b) Earth c) Sand d) Asphalt

e) Others (for example paved, cobbled, etc.) _____

Approximate breadth in metres _____

Please explain if the road has any special conditions that may have a bearing on the constructive or operative phase:

_____

_____

2.3. Indicate the distance to be covered from the municipal administrative centre to reach the area of greatest population density, or from the executive institution's centre of operations to the project site:

a) In the dry season: from _____ to the project[25] _____ Km.

b) In cases of detours during the rainy season: from _____ to the project _____ Km.

c) At any time of year, on foot: from _____ to the project _____ Km.

25.- Specify: What is the municipality? The plaza? If there are several possibilities, leave space to be filled

2.4. Indicate in which season it is accessible:

a) Dry b) Rainy c) At all times

2.5. Specify which kinds of vehicles (tonnage) may enter:

a) Small vehicle	b) Medium-sized vehicle	c) Large vehicle	d) Trailer
(..... ton)	(..... ton)	(..... ton)	(..... ton)

2.6. Is there public transport?

a) Yes b) No

If so, what type is it?

a) Minibuses b) Buses c) Truckd d) Other

How frequent?

2.7. Is there any alternative route to the project?

a) Yes b) No

If the reply is affirmative, explain:

3. PROXIMITY FACTORS

3.1. Indicate whether the project area is located within a 2 Km. radius of any of the following sites:

installation, habitat or activity	Yes	No	Comments
Airport			
Military zone			
Protected areas			
Bodies of water (rivers, lakes, streams)			
Sites archaeological/anthropologic al/cultural/historical			
Forested areas			
Wetlands			
Tropical rainforests			
Sites for protection of endangered /endemic species			
Ecologically endangered biological corridor			
Ecologically endangered headwaters			
Sources for local supply downstream			
Highly contaminant activity			
Highly dangerous activity			
Industrial activity			
Mining activity			

3.2. Does the use of the terrain require the construction or improvement of a road or means of access?

a) Yes b) No

If the reply is affirmative, please explain:

4. PHYSICAL or ENVIRONMENTAL THREATS

The site is vulnerable to:	Not applicable	No	YES (levels of vulnerability, frequency and reversibility[26])		
			High	Medium	Low
Flooding			F: R:	F: R:	F: R:
Landslides/ avalanches					
Earthquakes					
Forest / undergrowth /fires					
Drought					
Contamination from external sources (industry, mining, agriculture, farms with animals)					
Erosion (water, wind)					

Note: if medium and high-level threats materialise, it is necessary to select an alternate site for the construction of the health establishment or the use of effective extenuating measures.

5. TOPOGRAPHY

5.1. Describe the type of topography in which the project zone is found:

5.2. If it is a hillside, how steep is the slope?

a) Flat (0-5%) b) Semi-inclined (5-20%) d) Inclined (20-45%)

26.- Categorisation based on criteria of probability of recurrence or frequency. Write F in the corresponding space. High = more than one a year; medium = once every two years; low = once every five years. Reversibility of damage: write R in the corresponding space. High = irreversible; medium = reversible with high cost; low = reversible with low cost.

6. CLIMATE

Information	Data	Observations
Average temperature		
Rainfall pattern		
Average annual rainfall		
Predominant wind direction		
Seasons climatically marked		
Altitude		
Number of dry months a year		
Frequency of frosts		
Hours of sunshine		

Source: Complete the following as appropriate.

7. BASIC SERVICES

7.1. Water supply (visit the sampling sites)

7.1.1. Is there any network or distribution system for safe drinking water on the project site?

a) Yes b) No

7.1.2. If the reply is negative, what is the current water source supply for the project?

Community or population group	Surface source				Underground source	
	River	Spring	Source	Other: (small reservoir, rainwater collection):	Manual well	Perforated well

7.1.3. Does the service operate by network or through a distribution system?

Consultation	Response	Observations
Describe the type of system (for example tap or hydrant, channelling, distribution, storage, treatment, etc.)		
Is the supply temporary or permanent?		
How many families benefit?		
Who administers this service?		
What is the cost?		
Is the service efficient?		
Who carries out maintenance?		
Is there any deficiency? (for example the state of the plumbing, etc.)		

7.1.4. If there are taps indicate whether these are:

a) Public/communal: Nº: _____ Community _____

b) Domestic: Nº: _____ Community _____

7.1.5. Does water become scarce during any time of the year?

a) Yes b) No

If so, during which months, and why?

_____

_____

_____

_____

7.1.6. Indicate the condition in which the water source is found:

Permanent: surface/underground (specify)

a) Quantity _____ b) Use _____ c) Quality _____

(Capacity) (Simple observation[27])

Temporary: surface/underground (specify) _____

27.- Especificar la calidad por simple observación: el agua no tiene olor, sabor ni color. Indicar si existen algunas consideraciones especiales.

a) Quantity (Capacity) b) Use _____ c) Quality _____ Simple observation)

7.1.7. Has an alternative system been considered for times of drought?

a) Yes b) No

If the reply is affirmative, what type of system?

_____

_____

_____

_____

7.2. Basic sanitation (toilets and systems for the elimination of excreta)

7.2.1. If this is a remodelling project: what type of sanitary drainage does the establishment have? (Drains, sewerage or cesspit)

_____

_____

What are its characteristics and functioning conditions?

_____

_____

What remodelling activities are planned?

_____

_____

7.2.2. If this is a new project, what is the programmed drainage system for the health establishment?

a) Cesspit b) Pit and septic tank c) Sewer system

) Other: _____

7.3. Supply of energy for cooking

7.3.1. Does the establishment plan any specific space for cooking?

a) Yes b) No

7.3.2. What source of energy will be used for cooking? (Mark all those that apply)

a) Solar b) Biomass: firewood, dung, reeds, dried grass, charcoal, other: _____

c) Kerosene d) Bottled gas e) Electricity f) Domestic gas

If the reply is firewood:

What kind of firewood is used? _____
Who collects the firewood? _____
Where? _____
Is firewood abundant or scarce? _____
How much time /how many days on average do you spend obtaining it? _____

7.3.3. If firewood is used, what type of stove will be employed?

a) Stove[28] b) Improved stove[29] c) Soil d) Other

7.3.4. What system of smoke elimination is generally found inside the dwellings?

a) Chimney b) Windows c) Other _____ d) None

7.4. Electric power supply

7.4.1. Is there electric power in the project zone?

a) Yes b) No c) At times _____

If the reply is affirmative:

_____
_____
_____
_____

Are the characteristics of the electricity service sufficient to satisfy the demands of the establishment?

28.- In certain parts of Bolivia it is also known as concha.
29.- There are various kinds of improved stoves: Lorena, Ceciliana, Campana, etc.

If the reply is negative:

What alternate source of generated electricity will supply the project?

7.4.2. What is the installed capacity of the alternative generator and what are the characteristics of the system?

Please explain the relation between the alternative source and the establishment's electricity requirements:

Please explain the social and administrative management of the electrical system proposed for the establishment:

7.5. Solid waste

7.5.1. Is there a service of solid waste management? (Collection, transport, final disposal)

a) Yes b) No c) At times _____

7.5.2. If the reply is affirmative, describe the characteristics of the service (for example type, capacity, administration, cost, site of final disposal, etc.):

7.5.3. If the reply is negative, indicate what the community does in order to dispose of the refuse.

a) Burning b) Burying c) Pit d) Composting

e) Thrown into river or spring f) Other _____

7.5.4. Does the project involve the implementation of a classification system for hospital solid waste?

a) Yes b) No

If so, please describe where and how it will dispose of its waste?

_____

_____

_____

7.5.5. Are there areas for the final disposal of rubble or building waste?

a) Yes b) No

If the reply is affirmative, describe where.

_____

_____

_____

7.5.6. If not, describe or identify possible areas for disposing of the rubble.

_____

_____

_____

8. AVAILABILITY of LOCAL MATERIALS

Use the following tables according to the existence of possible local material supplies: (visit these sources, to verify their quantity and quality)

8.1. Sand

N°	Name of the zone/community or ranch	AVAILABILITY			Indicate the place from which the material will be brought		
		Existence (Yes) (No)	Quantity (sufficient) (insufficient)	Quality (good) (bad)	Name of the place	Distance (in Km.)	Cost (in Bs/ quantity)
1							
2							
3							
4							

8.2. Hard core

N°	Name of the zone/community or ranch	AVAILABILITY			Indicate the place from which the material will be brought		
		Existence (Yes) (No)	Quantity (sufficient) (insufficient)	Quality (good) (bad)	Name of the place	Distance (in Km.)	Cost (in Bs/ quantity)
1							
2							
3							
4							

8.3. Stone

N°	Name of the zone/community or ranch	AVAILABILITY			Indicate the place from which the material will be brought		
		Existence (Yes) (No)	Quantity (sufficient) (insufficient)	Quality (good) (bad)	Name of the place	Distance (in Km.)	Cost (in Bs/ quantity)
1							
2							
3							
4							

Other materials:

8.4. Cane

N°	Name of the zone/community or ranch	AVAILABILITY			Indicate the place from which the material will be brought		
		Existence (Yes) (No)	Quantity (sufficient) (insufficient)	Quality (good) (bad)	Name of the place	Distance (in Km.)	Cost (in Bs/ quantity)
1							
2							
3							
4							

8.5. Joists or tree trunks (wood)

N°	Name of the zone/community or ranch	AVAILABILITY			Indicate the place from which the material will be brought		
		Existence (Yes) (No)	Quantity (sufficient) (insufficient)	Quality (good) (bad)	Name of the place	Distance (in Km.)	Cost (in Bs/ quantity)
1							
2							
3							
4							

8.6. Clay

N°	Name of the zone/community or ranch	AVAILABILITY			Indicate the place from which the material will be brought		
		Existence (Yes) (No)	Quantity (sufficient) (insufficient)	Quality (good) (bad)	Name of the place	Distance (in Km.)	Cost (in Bs/ quantity)
1							
2							
3							
4							

8.7. Water for construction

N°	Name of the zone/community or ranch	AVAILABILITY			Indicate the place from which the material will be brought		
		Existence (Yes) (No)	Quantity (sufficient) (insufficient)	Quality (good) (bad)	Name of the place	Distance (in Km.)	Cost (in Bs/ quantity)
1							
2							
3							
4							

8.8. Other material (example bamboo)

N°	Name of the zone/community or ranch	AVAILABILITY			Indicate the place from which the material will be brought		
		Existence (Yes) (No)	Quantity (sufficient) (insufficient)	Quality (good) (bad)	Name of the place	Distance (in Km.)	Cost (in Bs/ quantity)
1							
2							
3							
4							

8.9. Environmental aspects of the designated supply sites:

8.9.1. Is it necessary to obtain any municipal permission or authorisation?

a) Yes b) No

If so, please explain what permission and where it must be obtained:

_____

_____

(If permission has already been obtained, include a photocopy in appendices).

8.9.2. Mention the environmental measures to be taken into account before the extractio

8.10. Indicate the sources of supplies of non-local material close to the site of intervention:

Material	Location of the source	Distance from the project area	Type of transport available and approximate time involved

9. ECOLOGICAL VALUE of the ENVIRONMENT

9.1. Describa la flora y el tipo de cobertura vegetal.

COMMON NAME	SCIENTIFIC NAME	ZONE	USE

9.2. Indicate forestry resources existing within a 2 Km. radius of the project zone:

		Forestry Resources		
Timber-yielding species:	Distance to zones of exploitation	Type of exploitation (intensive/extensive)	Institution or project	Observations

9.3. Mention the importance of the forestry resource for the protection and conservation of basins.

9.4. Identify the ecological value/ environmental service of the flora in the project zone (protective function of the vegetation cover, rarity of ecosystems, presence of endemic species, diversity of species):

9.5. Mention the main species of vertebrates with economic value

COMMON NAME	SCIENTIFIC NAME	ZONE	ECONOMIC IMPORTANCE
a) Mammals:			
b) Birds:			
c) Fish:			
d) Reptiles:			

9.6. Indicate whether there are endemic species[30]:

COMMON NAME	SCIENTIFIC NAME	ZONE	ECONOMIC IMPORTANCE
a) Mammals:			
b) Birds:			
c) Fish:			
d) Reptiles:			

9.7. To what extent could the project cause damage to the environment's flora and fauna?

10. COMMUNITY PARTICIPATION

10.1. People interviewed in the community for the environmental baseline (name and community organization):

30.- The term 'endemic species' is applied to those species originating in a given environment, with ecological value for the natural equilibrium of that space.

11. Topographical map

Include a map of the project area (depending on the magnitude of the project select the appropriate scale that shows, with sufficient detail, the bodies of water, hydrographical basins and sub-basins, existing settlements and infrastructure. Activities identified as “matters of proximity” must be clearly identified).

5.3. Prefeasibility study

Also known as pre-project, this must be used to measure the benefits and costs previously identified. The potential environmental impact should be calculated, as well as the analysis of conditioning elements such as size and location, and the institutional and legal terms in which the project is framed. According to Bolivian environmental legislation (Law 1333 and its regulations) this phase corresponds to the creation of an environmental form for the activity, work or project whose objective is to calculate and quantify the environmental impact, setting out the necessary mitigation measures. Below are presented some guidelines and lists of potential environmental impact that will orient the identification and quantification of impacts on the environmental form.

5.3.1. Construction activities: potential environmental impacts and their causes

The term ‘environmental impact’ is used for all those events that may result from some project, work or activity, having a positive or negative effect on some environmental factor: soil, water, air, flora, fauna and/or human resources. The environmental impacts of construction are both direct and indirect, and must be considered before the project is set in motion.

Direct environmental impacts are the primary impacts of a human action, occurring at the same time and in the same place. An example of a direct environmental impact is the filling of a swamp for use as a project site.

Similarly, the implementation of a system of irrigation on a small scale requires the construction of a new road, an access route or the improvement of an existing road, so as to permit the access of materials and equipment to the project site. The implementation, construction or improvement of access is considered as indirect environmental impact, secondary to or associated with the main activity, and has its own set of environmental impacts.

The extension and the reach of primary and secondary effects can broaden with time, or through the accumulated effects of the construction of minor installations.

Construction can also have significant effects on public health: the roads can constitute a medium for the spread of contagious diseases. Construction workers themselves can be carriers of these diseases.

Some examples of *indirect impacts* are:

- The influx of population to take advantage of schools, health centres and other social infrastructure.
- The propagation of diseases due to insect vectors that multiply in pools and sources of materials (areas from which building materials are extracted)[31].

Another example is the unsustainable exploitation of timber, which contributes to the degradation of forests.

Primary impacts are those generated directly from agents in an emitting system.

Secondary impacts are effects generated as a result of the action of the primary impacts.

During this phase of the project all positive and negative impacts must be considered; these latter must be arranged in order of importance and, as far as possible, mitigated; the most significant impacts must be attended to first.

As in any project, the best way of achieving this is through careful planning and the incorporation of mitigation measures during the phase of planning and design of the project.

The negative environmental impacts causing greatest preoccupation are those that involve damage to sensitive or valuable land ecosystems.

Construction in swamps, wetlands or other sensitive ecosystems could destroy — or produce significant damage to — the exceptional natural resources and services that these areas provide.

This damage could reduce economic productivity, harming essential functions in the ecosystems (such as the control of floods or the habitat for the reproduction of species of edible fish) or degrading the recreational value of these resources.

31.- This list incorporates questions included in Checklist 2 – Building – Construction in the environmental evaluation manual produced by the Canadian Development Agency (see Appendix 6).

The compacting of the soil and levelling of the site could change patterns of drainage and aquifer levels, altering access to water for animals, vegetation and people, as well as affecting water quality itself (see below, contamination of water sources). On another level, the extraction of building materials such as wood, stone, gravel or clay could be done in such a way as to damage land ecosystems (the wood could come from unmanaged wild forests).

Sedimentation of aquatic surfaces

The removal of natural soil covering through excavation, extraction of materials and other activities related to construction could produce soil erosion. This erosion, in turn, could lead to sedimentation in the receptor waters. The sedimentation could (1) reduce the capacity of lagoons and reservoirs, increasing the potential for flooding; (2) make substantial changes to aquatic ecosystems, by changing the beds of streams or lagoons and altering the conditions of other bodies of water.

Contamination of the sources of surface and subterranean waters

Toxic materials are frequently used in construction. Some examples are solvents, paints or fluids for the maintenance of vehicles (oils, cooling fluids, etc.) and fuels.

If these liquids are spilled into the soil or water currents, they can contaminate surface or subterranean water sources, which may cause damage to the local community, as well as to the populations living downstream. It could likewise damage land and aquatic ecosystems, micro-fauna and fauna living in the area. If adequate sanitary installations are not provided for construction teams, human waste could contaminate the water resources.

Negative social impacts

Construction could displace local inhabitants or reduce their access to environmental resources (for example the farmers' income or subsistence could be reduced).

Construction in or near sites of cultural importance (cemeteries, areas of religious worship, green areas, meeting-places) may generate conflicts with the local community. If the new installation provides a valuable service that is not available elsewhere, it could cause migration into the area.

Noise, suspended particles and waste materials generated at the site could disturb local residents, generating respiratory problems, as well as causing environmental contamination through noise.

It is also important to consider the risk of accidents among the construction workers. Not using local manpower could also prove counterproductive at a socioeconomic level.

Propagation of diseases

The arrival of construction workers from other regions or the construction of a new road could introduce new diseases to the local population or increase the rate of local infections. This is a preoccupation especially in the case of sexually transmitted diseases.

Certain specific installations, such as those for healthcare, basic sanitation and the disposal of solid waste, may also increase the propagation of a series of diseases.

New or improved roads can become routes for the spread of diseases.

Damages to the aesthetic value of the site or the area

If the structure is too large, the architectural style is not compatible with the local architectural style or is designed in such a way as not to be compatible with the characteristics of the existing panorama, the works could affect the visual or "landscape" quality of the area.

5.3.2. Specific guidelines for the sector

It is recommendable to implement the best possible practices. To this effect is important to define and apply the most adequate building practices, according to the type of project. Based on successful previous experiences, this could include the participation of the local population in planning, decision-making, finance and even in the construction itself, with special attention given to women's participation, the use of an adaptable management process, etc.

In the phase of planning and design of the building, it is necessary to consider the complete range of possible impacts on the project environment. Once this stage is completed it will be necessary to evaluate the various possible mitigation measures, in accordance with the types of negative impacts previously enumerated (direct, indirect, primary, secondary).

The evaluation of indirect impacts is of particular importance for large infrastructure development projects, since they incorporate inherent activities that are not always under rigorous control of those responsible for the project in question. The secondary, accumulative and sociocultural impacts can occur on any scale. Meanwhile, the negative impacts will probably be proportional to the magnitude of the project.

The following aspects, organized according to the project's phases, are intended to promote the consideration of the complete range of negative impacts. Once the impact is identified, with the aid of this environmental baseline questionnaire, consult the mitigation and monitoring tables to observe the measures intended to address these impacts.

Selection of the terrain[32]

The selection of the terrain is of vital importance, since in certain ways it conditions the achievement of good design. It is considered necessary to take into account the following minimum requisites:

Topography: the site should preferably be flat and should not affect surrounding areas with problems such as smells, noises, proximity to factories or cemeteries and other incompatible characteristics.

Accessibility: the terrain must be located in an area that is central or close to the beneficiary population, taking urban development into account, and must be connected to the most important main routes, so as to link the health centre with institutions of higher or lower level for the reference and counter-reference of patients. This concern with accessibility must take into account the most usual public transport systems, as well as feasibility of ambulance access, traffic problems, congestion, etc.

Public services: the availability of basic services (water, light and sewage drainage) is an essential requisite. If implementing health services in deprived areas, the project design must incorporate the additional costs of supplying such systems.

Access: in principle, access is required for outpatients and inpatients, as well as for personnel. Access to general services and emergencies is essential. All these aspects determine requirements for internal and external circulation.

Horizontal solution vs. vertical solution: the former term refers to health centres with a single floor, while the latter applies to centres with two or more. In each case, the selection depends on the available terrain, regulations and patterns of soil use, norms of urbanisation, if applicable, and advantages and disadvantages according to the type of service to be offered.

Characteristics of flexibility and growth: it is necessary to consider as a specific objective the attainment of maximum flexibility in redistributing spaces for expansion, both at the level of the sections and that of the health centre as a whole. A hospital construction that assures growth and

32.- Isaza P. and Santana C. (1991). "Guías de diseño hospitalario para América Latina". Programa de Desarrollo de Servicios de Salud. (Guides to hospital design for Latin America"). Health Service Development Programme. OPS/OMS. Pp. 24-32.

change can possibly have a prolonged useful life, adapting to new technologies that diminish the risk of it turning into an obsolete structure. Installations must be checked by means of horizontal and vertical ducts, that facilitate their maintenance and possible change, taking into account that the useful life of the installations is approximately 10 years and that of the building is longer.

Structure and cementation: degree of firmness of the terrain, recommended type of cementation, design of structural and design modules.

Air conditioning: depending on the climate, it may be necessary to install air conditioning, which can operate through a central system or units for each body of the infrastructure. It is considered convenient to install air conditioning in operating theatres, delivery rooms, paediatrics, laboratories and X-rays. In general services it is necessary to place systems of air extraction and injection to create an environment more conducive to the development of the activities.

Hydraulic, sanitary and electrical installations: it is proposed that the distributions cross the ceilings horizontally, and that vertical distribution should be by means of ducts whose location is carefully studied so as to give maximum architectural flexibility and permit easy maintenance of the installations.

Electric power requirements for health centres vary in accordance with their size and aims, and have to do with the degree of use of electrical equipment that can be fed by other sources of energy, such as steam or natural gas. Energy requirements vary between 1.5 and 3.5 kw per bed. The specific value varies inversely to the number of beds. The connected charge for air conditioning can be calculated at approximately 30 a 40 w/m2 of the area to be conditioned. The design of the electrical system must incorporate a circuit for normal service and an emergency circuit.

The former comprises the entire electrical system or charge in full function, and is fed by the local network through a transformer, while the latter is an additional system designed for approximately 33% of the total health centre charge. This system is fed by an electrical plant (motor or own separate generator) with its corresponding automatic transference panel. Regarding the lines of distribution, these must be sealed in such a way that they allow good voltage stability (with maximum permissible drop in power of 3%) and the maximum detection of faults.

Water consumption and storage tank: for minimum supply, around 450 litres of water per bed per day should be calculated. Depending on the type of service, the infrastructure and the existing space, storage must be anticipated for at least 2 or 3 days. The capacity of the tank must be between 25 and 30% of the Centre's daily consumption. If the construction site does not have a constant supply network, the construction elements must incorporate preventive measures that guarantee the necessary minimum.

The distribution of the water supply must be designed in such a way that it supplies apparatus and equipment with the minimum quantity of water necessary to satisfy pressure and velocity registers.

The pipes must be of a hard-wearing material, free of manufacturing defects, pores, fissures, etc.

The network system must be subjected to corresponding hydraulic tests to check all aspects of assembly.

The supply from water pipes must be fitted with a stopcock, so that the supply to the building may be shut off.

Distribution of the networks must be done in such a way that it fits with the architectural design and does not interfere with the structural, electrical and mechanical design.

The apparatus or sets of apparatus that form a unit must be fitted with a valve to channel the flow of water, without interfering with supply to other units.

A stop valve must be placed on exit pipes on all the storage tanks.

Every storage tank must have:

- Door or window for access.
- Adequate ventilation.
- Free border of 1.5 cm.
- Depression at the bottom for suction in the tanks.
- Overflow of adequate diameter and location.
- Connection for cleaning at the bottom.
- In the buildings there must be an air chamber of 30 cm. to relieve excessive pressure.

5.4. Feasibility study

This phase must focus on the detailed study of the most convenient alternative, considered viable in the previous phase. The benefits and costs of the project must be measured and calculated as precisely as possible. The feasibility study must be a profound analysis and study of all the variables that affect the project, advancing towards its optimization and thus including

the aspects relating to the physical work (location, size), the programme of outlay and the organization for the setting in motion.

5.4.1. Preliminary evaluation of the project

Once the project design is finalised, the next step is to fill in the project's preliminary evaluation form, the objective of which is to ensure that all the environmental aspects have been considered within this design and in the constructive planning. Those responsible for execution must adjust the project so that it takes on the critical problems identified in the lists of environmental impacts. If adjustments to the project design are not made, as a response to the concerns identified, then the entire environmental evaluation process lacks any sense.

Below the document is presented with its respective instructions for completion.

PRELIMINARY PROJECT EVALUATION

KEY to FILLING IN the PRELIMINARY PROJECT EVALUATION

This document must be completed by the personal manager of the environmental component of the project, with professional registration in environmental areas, and revised by the work's environmental supervisor and/or environmental consultant.

It contains general information on the project including the final design, description of the proposed housing modules, questions on the modality of construction, anticipated protection measures, the basic services planned as part of the project, their management once the constructive phase is over, and the most important component: the identification of environmental impact.

Each identified environmental impact must be accompanied by a proposal for appropriate mitigation measures, planning for their implementation and a chronogram for execution and monitoring.

Finally there is a section containing conclusions and recommendations, which must be filled in either by the environmental supervisor and/or by the work consultant. This will depend on the organic structure of the project and of the counterpart.

PRELIMINARY PROJECT EVALUATION

"Extension, remodelling and construction of health establishments"

GENERAL DATA			
Name of the project:			
Type*:			
Zone, neighbourhood, community or UV[33]:			
Municipality:			
Department:			
Project area**:			
Objective of the project:			
Applicant, managing or promoting institution:			
Financial institution:			
Person responsible for completion:			
Profession:		Signature:	
Professional registration:		Date:	

** For example remodelling, extension and/or new construction.*
*** For example urban, rural, peripheral.*

1. BASIC CHARACTERISTICS

General information on the project	Data	Comments
Surface of terrain:		
Surface a construct:		
Covered surface:		
Free surface:		
Potential for beneficiaries:		
Type of service it will offer:		
Detail area: area of attention to outpatients or inpatients, etc.		
Demarcation of spaces or sections of the health establishment: internment rooms, surgery, paediatrics, orthopaedics, kitchen, toilets, pantry, etc.		

33.- UV: Unidad Vecinal (Neighbourhood Unity).

2. GENERAL DESCRIPTION of the PROJECTED HEALTH ESTABLISHMENT [34]

	Area	Materials: Floor	Wall	Roof	Artefacts	Covering
1	Rooms					
2	Toilets					
3	Kitchen					
4	Corridors					
5	Infirmaries, operating theatre, others.					

2.1. What construction modality will the project follow?

a) Direct administration b) Administration (contractor)

2.2. If direct administration, where will the staff come from?

2.3. If direct administration, where will the workers' camps be situated?

2.4. Will local employment be generated?

a) Yes b) No

If the reply is affirmative, expand:

2.5. Will the construction programme coincide with the local productive seasons (agriculture, fisheries, commerce, crafts etc.)?

a) Yes b) No

34.- Refer to the national norms of characterising health infrastructure, according to levels.

If the reply is affirmative, explain:

2.6. What construction activities will be carried out? (For example installation of camps, redesign, excavation, slab-laying, building of walls, electrical installations, sanitation, demolition, etc.)

2.7. What prevention/protection measures will be implemented for preparation, demolition, excavation and construction activities, and for the protection of the environment and the worker?

Phases of construction	Prevention/protection measures
Demolition	
Excavation	
Construction	
Rough work	
Finish work	

2.8. From what actions and elements related to occupational health and/or industrial safety will the construction workers benefit?

3. BASIC SERVICES

3.1. Water supply and sanitation

Water and sanitation	Existing	Planned	Comments
Type of source: (surface or underground)			
Location of water tap on site			
Daily capacity of the source (litres/inhabitant)			
Seasonal variation of the sources: (summer/winter)			
System of storage (wells, tanks, etc.)			
Treatment system: physical, chemical and biological processes			
Quality of the water (bacteriological, physical-organoleptic, physical or chemical characteristics)[35]			
Distribution system (ramified or closed network)			
Sanitation system through sanitary installations			
Sanitation system through pluvial installations			
Treatment system of sewage to adapt the quality of the discharge to the permissible limits[36]			
What is the receptor body and the use made of it?			

3.1.1. If installations are to be constructed for the water supply and basic sanitation ¿have they been designed in accordance with the manual "Water and sanitation"37?

a) Yes b) No

If the reply is negative, please specify the measures and the adaptation times:

_____

_____

35.- In concordance with the NB 512.
36.- Refer to Law 1333, its regulations and existing national norms.
37 Environmental manual for small-scale infrastructure: "Water and sanitation".

3.2. Supply of energy for cooking

Services	Existing	Planned	Comments
Infrastructure for cooking (types of cooker, types of oven)			
Sources of energy for cooking (gas, electricity)			
Projection of energy demand in five years (gas, electricity)			

3.2. Supply of energy for cooking

Services	Existing	Planned	Comments
Services for electricity generation: (type of source: network, solar panel, diesel generator, wind generator, micro-hydroelectric, etc.)			
Capacity of the source: (kW or kWh, depending on the individual case)			
Availability of the service: (24/7, only in the afternoon or at night, only when it rains, only when it is sunny, only when there is wind, only if there is combustible, etc.)			
Extension of public lighting: (distance, materials utilised, etc.)			
Current energy demand (from the health establishment)			

3.4. Domestic solid waste

Services	Existing	Planned	Comments
Previous type of treatment			
Form of collection/transport			
If there is no external transport of solid waste, how does the Centre manage?			
Manner of final disposal			
Final disposal of rubble			

3.4.1. Will the infectious waste be handled in accordance with the manual "Hospital solid waste"[38]?

a) Yes b) No

If the reply is affirmative, please specify the mechanisms and if there exists secondary or associated infrastructure:

3.4.2. If there is no external transport, does the design of the establishment incorporate an enclosure for the storage of waste materials? (For example a ditch lined with plastic/clay in order safely to bury this waste material). Please justify and support the response.

3.4.3. Does the design include plans for final stores of solid waste within the establishment?

a) Yes b) No

If the reply is positive, what are its characteristics?

3.4.4. Indicate whether the design of the establishment provides space for the separation of different types of solid waste.

Specify:

3.4.5. If dangerous materials are produced such as chemicals, waste or radioactive substances, what type of installations for their internal storage, internal collection, internal transport and internal disposal have been foreseen? (These materials include heavy metals, oils, lubricants, batteries, paints, glues, solvents, acids, etc.)

38.- Environmental manual: "Guía del Manejo de Residuos Sólidos Hospitalarios" (Guide to the management of residues generated in health establishments).

Specify:

4. MANAGEMENT of BASIC SERVICES

4.1. Indicate the institution that administers, or will administer in the future, each of the planned services, how it will be financed, what will be the annual cost and how its sustainability will be guaranteed:

	Drinking water	Sanitation	Electricity	Solid waste
Financed by: (local, municipal, regional or national government. Community: CAP/EPSA/Cooperative/ ONG. Private company)				
Service administered by:				
Future cost of the service (on average):				
Service operated by /checked by:				
Service repaired and maintained by /checked by:				
Relevant data for expansion of the service:				
Aspects of sustainability of the service:				

5. IDENTIFICATION of ENVIRONMENTAL IMPACT

For each important impact a mitigation measure must be implemented and for each moderated impact a recommendation must be presented.

Questions related to the generation of direct or indirect impacts in the operation phase	YES (negative impact important)	NO	N/A	Mitigation measure
Will the project have foreseeable impacts for endangered or endemic species?				
Will it cause deforestation, loss of habitat or biodiversity?				
Is there any dangerous or highly contaminating activity being carried out or that may be predicted in surrounding areas?				
Could past use of the terrain endanger future populations or the project itself?				
Does the site present any moderate or high risk in relation to natural dangers or threats?				
Have problems of waterlogging or floods been identified?				
Have problems of soil instability on hillsides been identified, or threats of landslides?				
Are there risks of wind or water erosion? Have measures been planned?				
Will the activities cause water contamination?				
Will the project generate gases, dust and pollutant particles to a degree that will have negative effects on health?				
Associated construction:				
Will it be necessary to create or rehabilitate an adequate means of access, such as a road?				
Will it be necessary to construct infrastructure for electricity transmission /generation?				
Will it be necessary to construct a water supply and treatment infrastructure?				
Will it be necessary to construct infrastructure for the treatment of solid waste?				

Questions related to constructive design and the selection of materials	YES	NO	N/A	Comments
Are the materials to be used for the construction the most adequate for the climatic conditions?				
Have environmental factors been considered for the exploitation of supply sites for materials?				
Have environmental factors been considered for the abandonment of supply sites?				
Will fuels or dangerous toxic substances be kept in the stores? If so, have measures been contemplated for the protection and training for the operatives and beneficiaries?				
In cases of new construction: has the predominant wind direction been taken into account in the project design?				
In cases of new construction: has the predominant wind direction been taken into account in designing systems of waste disposal, discharge and/or sewerage?				
Exclusively for the area of housing development:				
Does the design and layout include the following elements, of a type and quantity that comply with relevant norms?				
Internal routes.				
Green areas.				
Social and recreation areas.				
Prevention of dangers of fires, floods, landslides, earthquakes, etc.				
Transport needs.				
Does the design consider future expansion? (Include population growth, expansion and connections to future services).				

Questions related to the generation of impacts in the design or planning of services	YES	NO	N/A	Comments
Water				
Does the proposed system of drinking water satisfy the requirements for the establishment's current and future demand? If not, are there water sources available?				
Does the quality of drinking water comply with national norms?				Append results of water analysis.
Does the water supply system include protective barriers or others measures against possible contaminant sources?				
Are beneficiaries informed of protection measures for the water source supply? If not, will the beneficiaries be trained?				
Has a system of elimination of excreta and domestic discharges been designed for the site?				
Are beneficiaries informed in matters of operation and maintenance of their sanitation system? If not, will the beneficiaries be trained?				
Electric power and energy for cooking				
Are beneficiaries informed in matters of electrical power supply? If not, will the beneficiaries be trained?				
Is the availability of fuel for cooking proportional to the demand of the establishment?				
Are beneficiaries informed in matters of protection against risks of contracting respiratory diseases through atmospheric contamination? If not, will the beneficiaries be trained?				
Solid waste				
Has a system for the elimination of solid waste been designed?				
Are beneficiaries informed in matters of correct disposal of solid waste? If not, will the beneficiaries be trained?				

Key questions: post-construction administration

During the operation phase of a health establishment project, long-term impacts (positive or negative) may develop —for the beneficiaries, surrounding communities and the environment. Time and attention must be devoted to ensuring that the project has a long-lasting positive effect in the area. Mark the response that is most appropriate to the characteristics of the project. For each "no" it is it is recommended that a clear response plan be designed and ready to implement before the health establishment is officially handed over to the beneficiaries.

Questions related to the organization	YES	NO	N/A	Mitigation measure
Will there be a functioning management structure in the community before the establishment begins to operate?				
Will installations (toilets, drinking water, grey waters and solid waste) be ready for use when the establishment begins to operate?				
Will there be any kind of training for the project population with regard to the use of these sanitary installations?				
Have those responsible for the operation and maintenance of the installations been identified and trained?				
Is there any system of invoicing of the basic services that have been established?				
Have those responsible for the invoicing system been identified and trained?				

5.1. What effects or indirect impacts might the project have?

Indirect impact	Means of mitigation	Comments

6. CONCLUSIONS and RECOMMENDATIONS from the EVALUATION

6.1. Conclusions

6.2. Recommendations

Personal de salud en capacitación. Montero, Santa Cruz (Bolivia)

Chapter 6
INVESTMENT PHASE

This is where all the actions contributing to the project's physical execution are carried out. At this point two phases are developed:

Adjustment phase: here the architectural and engineering aspects are consolidated: final details such as the availability and characteristics of the terrain must be considered, as well as the content and dimensions of the programme in terms of needs and requirements for space and technical conditions.

Regarding the environmental component, as the relevant environmental impact is already identified, it is necessary to proceed to define the aspects of mitigation and environmental monitoring to be implemented in the execution phase.

Execution phase: in which the project materialises physically, with the construction of the property defined in the study of the project and the installation of necessary machines and equipment. Conditions and characteristics resulting from previous studies must be respected in the execution.

6.1. Aspects of mitigation and environmental monitoring for health establishment projects

Selection of the site

Matter or concern of activity	Impact*	Mitigation**	Environmental indicators
1. Site occupied or used by local residents.	1.1. Displace the residents without title or reduce the lands of the farmers, shepherds and/or gatherers.	1.1.1. Find an alternative site should this prove impossible: • Compensate those affected, as long as this compensation is accepted voluntarily and without coercion (SS).	• Previous use. • Current use. • Future use. • Aptitude of soil use. • Plan of soil use. • Percentage affected. • Percentage compensated. • Percentage of people compensated. • Property rights.

Matter or concern of activity	Impact*	Mitigation**	Environmental indicators
2. Housing located nearby.	2.1. Annoyance to local people, creation of noise and dust.	2.1.1. Carry out the construction in unpopulated areas or far from the populated centres (SS). 2.1.2. Concentrate the noisiest types of work and take steps to minimise the dust (C). 2.1.3. Use techniques to moisten the earth and/or leave the natural covering intact as long as possible (C). 2.1.4. Use isolating materials noise in the constructing the perimeter fence for the construction area (P&D).	- Plan of soil use. - Proximity data. - Provision of personal protection equipment. - System of constructive, informative and preventive signs. - Closure of the construction site. - Restriction of working hours. - Use of canvas or coverage of materials. - Moistening of the terrain.
3. The site has historical, cultural or social importance.	3.1. Offence to the local population; damage to local social structure.	3.1.1. Find some alternative site for construction (SS).	- Plan for soil use. - Proximity data.
4. Difficult access for beneficiaries to the project site (steep climb or descent, distant location).	4.1. Non-use or under-use.	4.1.1. Find an alternative site or find some way of facilitating access, for example, provide a means of transport to the health centre (SS) (O&M).	- Proximity data. - Accessibility data. - Mode of transport. - Condition of the means of land communication. - Length of the road, pedestrian path or access route.
5. The site required improvements in the roads or the construction of a new road (see: Rehabilitation of rural roads - Chapter 3. LAC guides). [These improvements or new constructions of roads would constitute a separate and independent project].	5.1. Cause one or more negative environmental impacts typical of the roads, including erosion, change in the aquifer, or providing access for illegal activities such as mining, cutting or poaching.	5.1.1. Find an alternative site. Evaluate whether a pedestrian path will be sufficient (SS) (O&M). 5.1.2. Follow guides to design, construction, operation and maintenance described in “Rehabilitation of rural roads” and the resources detailed therein.	

Matter or concern of activity	Impact*	Mitigation**	Environmental indicators
6. The ecosystem of the site is the habitat of important fauna or flora.	6.1. Destroy or cause damage a ecosystems of ecological, cultural or economic importance and/or important flora or fauna.	6.1.1. Find alternative site. If this is not possible (SS): • Design the installation in such a way as to produce the least impact (P&D). • Minimise the alteration of native flora during the construction (P&D) (C). • Retire without destroying minor vegetation coverage or, where possible, obtain seeds (C). • Sow, after construction, the plants or seeds recuperated from the original ecosystem (C).	- Plan of soil use. - Agro-ecological zoning. - Biological corridors. - Proximity data. - Surface deforested/to be deforested/to be reforested/to be revegetated.
7. The site possesses important characteristics in its landscape, archaeology or history.	7.1. Destroy or cause damage to sites with exceptional value.	7.1.1. Find an alternative site. should this prove impossible (SS): · Design the installation in such a way as to produce minimal impact (P&D). · Minimise the alteration of the site during the construction (P&D) (C). · Remove important artefacts as far as possible (C). · Provide incentives to the workers for taking care of the archaeological or paleontological elements found on the project site (SS) (C).	- Area with archaeological value. - Surface utilised, recuperated or restored. - Type of incentive to the workers. - Nº of inductions or training programmes in this respect.
8. The site is a swamp/wetland, or is adjacent to a body of water.	8.1. Destroy or cause damage to ecosystems with valuable, sensitive organisms.	8.1.1. Find an alternative site. The ecosystems of the swamps and riversides are extremely sensitive. The swamps provide important environmental services, such as the filtering of toxins and nutrients into runoff waters (SS). If there is no alternative: • Locate the installation as far as possible from the body of water/swamp and minimise the area of swamp that is destroyed in the construction (SS) (P&D). 8.1.2. Re-plant vegetation as soon as possible (C). 8.1.3. If the plan is to include sanitary installations, find an alternative site (SS).	- Plan of soil uses. - Agro-ecological zoning. - Biological corridors. - Proximity data. - Study of soils. - Aquifer. - Permeability of the soil. - Plan for alternative sites.

Matter or concern of activity	Impact*	Mitigation**	Environmental indicators
9. The site has a steep slope.	9.1. Cause erosion and damage to land and aquatic ecosystems during construction or the use of their resources.	9.1.1. Find an alternative site (SS). Should this prove impossible: • Design the installations and apply construction practices that minimise risk. Devote special attention to potential erosion and to the reorientation of the flows of water during design and construction (C) (SS) (P&D). 9.1.2. Re-plant vegetation as soon as possible (C). 9.1.3. Maintain the design characteristics (O&M).	- Gradient. - Relief. - Study of soils. - Preventive measures and protection against erosion. - Presence or application of physical, biological and structural barriers: gutters, agricultural retaining ditches, containing walls, gabions. - Revegetated surface.
	9.2. Inconvenience and difficulty in access to the centre.	9.2.1. Coordinate with the designer to improve access, or make it viable, by pedestrian routes.	- Distance and travelling time between the nearest population and the health centre.
10. The project is due to be constructed in a forested area.	10.1. Degrade the forest. Contribute to potential inundation.	10.1.1. Find an alternative site if the area is virgin forest or largely untouched forest (SS). If this proves impossible: • The project design must minimise the number of trees to be cut down (P&D). 10.1.2. Avoid the cutting of uncommon or outstanding trees. 10.1.3. Consult the local population on frequent use of the trees and their preferences with regard to conservation (SS) (P&D) (C).	- Surface deforested/to be deforested/to be reforested/to be revegetated. - Nº of timber-yielding species with commercial value. - Area of forestry concessions /unchecked forest exploitation.

Matter or concern of activity	Impact*	Mitigation**	Environmental indicators
11. Site prone to flooding.	11.1. Destruction of the site.	11.1.1. Find an alternative site or design the installations in such a way that they are above the flood level, where possible (SS).	- Presence of threats. - Frequency and duration of threats. - Constructive and protective characteristics. - Maintenance to drainage infrastructure. - Systems and structures resistant to impact. - Building materials. - Waterproof roofs, walls, skirting /base boards. - Periodic monitoring of joints and openings.
	11.2. Intense rains.	11.2.1. Select materials and structural systems that are resistant to the impact of rain and temporary humidification.	
	11.3. Put workers at risk of injury or death.	11.3.2. Use industrial safety norms (O&M).	
	11.4. Cause environmental damage through accidental spills of toxic, infectious or harmful elements, during floods (contaminating drinking water).	11.4.1. Avoid the construction of sanitary or other installations that use and/or store such elements on sites that are prone to flooding (SS). Should this prove impossible: • Design storage areas in such a way that dangerous elements are found above the surface and/or in waterproof recipients, with sealed tops that are kept closed. • Make sure the installation's operators comply with these practices (P&D) (O&M). • Choose dry sanitation options, such as dehydration toilets, instead of the wet system, such as pits (P&D).	- Constructive and protective characteristics. - Drainage systems or sanitation that is appropriate and secure against threats. - Nº of inductions or training programmes.

Matter or concern of activity	Impact*	Mitigation**	Environmental indicators
12. The area and/or the site are prone to landslides.	12.1. Distribution of the site.	12.1.1. Find an alternative site with stable soils. Should this prove impossible (SS): • Design the installation in such a way that risk is minimised. For example, plant trees around the entire construction and at key points (P&D). 12.1.2. Maintain the design characteristics (O&M).	- Building characteristics offering protection against landslides. - Construction design protecting against spills. - Appropriate drainage system. - Preventive and protective measures against landslides . - Presence or application of physical, biological and structural barriers: gutters, agricultural retaining ditches, containing walls, gabions. - Revegetated surface.
	12.2. Place the workers or inhabitants at risk of injury or death from landslides.	12.2.1. Avoid the construction of sanitary or other installations that use and store dangerous or bio-hazardous elements in sites prone to landslides (SS). Should this prove impossible:	
	12.3. Cause environmental damage through the accidental leakage of toxic, infectious or harmful elements	12.3.1. Design the storage area in such a way that dangerous elements are stored in hard-wearing recipients that are spill-proof, with sealed covers, and that these are kept closed (P&D)(O&M).	
	12.4. Contaminate the drinking water	12.3.1. Choose dry sanitation options, such as dehydration toilets, instead of wet system (septic tanks) (P&D).	

** That the activity or technology could generate.*
*** The mitigation measures apply to the specified phase of the project: Site Selection (SS); Planning and Design (P&D); Construction (C); and/or Operation and Maintenance (O&M).*

Aspect of activity	Impact*	Mitigation**	Environmental indicators
1. The area may suffer from storms, earthquakes, etc.	1.1. Destruction of the site.	1.1.1. Design the installation so as to minimise risk. For example, in areas prone to earthquakes, build structures with a framework of timber instead of concrete or brick (P&D). 1.1.2. Maintain the design characteristics (O&M). 1.1.3. Use materials appropriate to the climate. For example, in areas in which it tends to rain profusely, use stucco instead of adobe (P&D) (C).	- Construction features offering protection against climatic threats. - Construction design against geophysical threats. - Appropriate drainage system. - Preventive measures and protection from disasters. - Presence or application of physical, biological and structural barriers: gutters, agricultural retaining ditches, containing walls, gabions. - Revegetated surface. - Permanent monitoring and alarm systems.
	1.2. Expose the workers or inhabitants to the risk of injury or death.	1.2.1. Design storage areas in such a way that the dangerous elements are kept above the surface and/or in watertight waterproof recipients. Make sure that operators of installations comply with these practices (P&D) (O&M).	
	1.3. Cause environmental damage and/or contaminate the drinking water, due to the accidental leakage of toxic, infectious or harmful elements.	1.3. Cause environmental damage and/or contaminate the drinking water, due to the accidental leakage of toxic, infectious or harmful elements.	
2. The installation possesses, or will include, an improvement to the water supply (consult the guide Water and sanitation).	2.1. Exhaust surface and/or underground water courses, damaging local ecosystems or affecting communities downstream, or at a lower altitude.	2.1.1. Determine safe performance and establish a system to regulate its use (P&D) (O&M).	- Appropriate water system. - Laboratory tests of water quality. - Appropriate sanitation system. - Hydraulic tests. - Permeability of the terrain. - Useful life of the installations. - Installed capacity of the supply source.

Aspect of activity	Impact*	Mitigation**	Environmental indicators
	2.2. Poison the users with natural or chemical contaminants, such as arsenic.	2.2.1. Test the seasonal quality of the water and examine historical data concerning the water before building the installations (SS) (P&D).	
	2.3. Spread diseases with pathogenic contaminants.	2.3.1. Test the seasonal quality of the water and examine the historical data concerning the water before building the installations (SS) (P&D).	- Laboratory tests of water quality.
	2.4. Cause contamination of underground and surface waters.	2.4.1. Incorporate the location, design characteristics and operation and maintenance practices, which minimise the environmental impact described in "Water supply and sanitation" in the present guides. Include practices such as: community participation, prices in accordance with service, preventing cattle grazing near the water source, analysis of water quality in accordance with specifications of regulations concerning water contamination (Law 1333) in accordance with permissible limits or parameters in receptor bodies of water, etc. (SS) (P&D) (C) (O&M).	- System of appropriate sanitation. - Hydraulic tests. - Permeability of the terrain. - Aquifer. - Study of soils. - Useful life of the installations. - Community development activities. - Management of services. - Nº of inductions or training programmes.
3. The installation is improved, or will be improved, as regards basic sanitation (consult the guide Water and sanitation).	3.1. Discharge of untreated or insufficiently treated sewage that: • Contaminates drinking water (subterranean and surface). • Propagates diseases. • Degrades aquatic ecosystems.	3.1.1. Do not locate the site in swamps, wetlands or near streams, rivers, lakes (SS). 3.1.2. If possible, do not locate the site upstream from, or on a slope above, a source of drinking water such as a cistern (SS). 3.1.3. Do not locate the site where the aquifer is high or where the underlying geology means the probable contamination of subterraneous waters.	• Plan of soil uses. • Ecological zoning. • Appropriate sanitation system. • Hydraulic tests. • Permeability of the terrain. • Aquifer. • Study of soils. • Useful life of the installations. • Community development activities. • Management of services. • Nº of inductions or training programmes.

Aspect of activity	Impact*	Mitigation**	Environmental indicators
		Alternatively, choose dry sanitation options, such as dehydration toilets in a sealed chamber, ecological latrines instead of a wet system, either septic tanks or retention tanks (SS) (P&D). 3.1.4. Incorporate design characteristics, of commercialization educational /social programmes, construction practices, operation and maintenance described in "Water supply and sanitation" (in the current guides) and the resources enumerated therein, such as community participation, the promotion of sanitation focusing on women and children, the use of appropriate systems of natural treatment, etc.	
	3.2. Contaminates drinking water (subterranean and/or surface) due to inappropriate disposal into the soil (which may also cause damage to local ecosystems, animals or plants).	3.2.1. If waste is to be buried at the site, if possible the site should not be located where the aquifer is high, or where the underlying geology makes contamination of underground water probable. If there is no other alternative, make sure the pit is lined with waterproof material such as clay or high density polyethylene (SS) (P&D) (C). 3.2.2. Be sure to guarantee the safe disposal of waste waters coming from toilets and washing of patients' bedclothes, etc. (P&D))O&M). 3.2.3. Ensure that the system provided for disposal of human waste minimises health risks (P&D) (O&M). 3.2.4. Make sure that the water is supplied to the installation in such a way as to minimise the risk of contamination for patients and nearby communities (P&D) (O&M).	- Plan of soil uses. - Ecological zoning. - Appropriate sanitation system. - Hydraulic tests. - Permeability of the terrain. - Aquifer. - Study of soils. - Useful life of installations. - Community development activities. - Management of services. - Nº of inductions or training programmes.

Aspect of activity	Impact*	Mitigation**	Environmental indicators
4.The installation will generate solid waste (consult Management of solid waste - Chapter 5A of the LAC guides).	4.1. Spreads diseases.	Include space and elements for the separation of recyclable and organic waste at the source (common solid waste). Consider the inclusion of space and/or of a drum for organic fertilisers or worm-breeding, if the installation is to create organic waste (P&D) (C) (O&M).	- Surface or space for selective storage of waste materials. - Appropriate technology for bio-digesters or compost.
	4.2. Contaminates drinking water (subterranean and surface).		
	4.3. Degrades aquatic ecosystems		
	4.4. Generates greenhouse gases.		
	4.5. Contaminates drinking water (subterranean and surface).	4.5.1. Do not locate the site near swamps, wetlands or bodies of water (SS).	- Appropriate location and design.
	4.6. Damages local ecosystems, animals or plants.	4.6.1. Do not locate the site near swamps, wetlands, green areas or bodies of water (SS).	
5.The installation will house motor, laboratory or other industrial activities (consult Activities with micro-companies and small companies -Chapter 4 of the LAC guides).	5.1. Exposes workers or the local population to toxic, carcinogenic and teratogenic materials, such as heavy metals, oil, lubricants, batteries, dyes, glues, solvents, acids, etc.	5.1.1. Have appropriate installations for storage, transport and treatment (SS) (P&D) (C) (O&M).	- Surface for the storage of materials or dangerous waste materials. - Nº of inductions or training programmes. - Emergency plan.
	5.2. Contaminates drinking water (subterranean and surface).	5.2.1. Do not locate the site near swamps, wetlands or bodies of water (SS).	- Appropriate location and design.
	5.3. Damage local ecosystems, animals or plants.	5.3.1. Do not locate the site near swamps, wetlands, green areas or bodies of water (SS).	

Aspect of activity	Impact*	Mitigation**	Environmental indicators
6. The installation will generate waters for cooling or soaking, or water that contains suspended organic matter, mercury, lead, detergents, etc. (consult Activities with micro-companies and small companies - Chapter 4 of the LAC guides).	6.1. Expose the workers or local population to toxic, carcinogenic and teratogenic materials.	6.1.1. Incorporar tecnologías de producción más limpias en el diseño, la operación y el mantenimiento, según se describen en "Actividades con Microempresas y Pequeñas Empresas (PYME)" en las presentes guías, y los recursos que se citan allí (SS) (P&D) (C) (O&M).	- Appropriate drainage system. - Appropriate location and design. - Surface or space for selective storage of materials and waste materials.
	6.2. Contaminate drinking water (subterranean and surface).	6.2.1. Design with elements for the storage, treatment and discharge of waste waters (P&D) (O&M).	
	6.3. Damage local ecosystems, animals or plants.	6.3.1. Design with elements for the storage, treatment and discharge of waste waters (P&D) (O&M).	
7. Indirect effects.	7.1. Damage or destroy natural resources. 7.2. Increase immigration. 7.3. Damage local social and cultural integrity. 7.4. Facilitate the spread of diseases in both people and animals.	7.1.1. Investigate the indirect effects that may be associated with the specific type of installation that constructed and evaluate other possible impacts of this type. If the project is found in one of the sectors covered by the present guides, information of the pertinent sector and the resources that enumerated therein are an excellent starting-off point for this investigation (SS) (P&D) (C) (O&M).	- Rate of immigration. - Rate of urban expansion. - Most frequent diseases. - Rate of infestation.

Aspect of activity	Impact*	Mitigation**	Environmental indicators
8. Accumulative effects of a long-term development project, or of many small construction developments over a short period.	8.1. Cause excessive extraction of building materials, multiplying the impacts associated with the cutting of non-degraded forests, the extraction from quarries and deposits (see below for more detail).	8.1.1. Develop plans for tree-felling, extraction from quarries and deposits that take into account accumulative effects and include plans for recuperation (P&D). 8.1.2. Monitor compliance with the plans and the impacts of extractive practices. Modify as necessary (C) (O&M).	- Percentage of local and introduced materials. - Location of designated supply sites. - Quantity of materials extracted. - Guide to good environmental practices.

** That the activity or technology could generate.*
*** The mitigation measures apply to the phase of the project specified: Site selection (SS); Planning and design (P&D); Construction (C); and/or Operation and Maintenance (O&M).*

Construction (C)

Aspect of activity	Impact*	Mitigation**	Environmental indicators
1. Construction teams and camps.	1.1. Damage to the local habitat, compacting of soil and creation of erosion in the construction and occupation of the camps.	1.1.1. Explore the possibility of staff accommodation outside the site (P&D) (C). 1.1.2. Keep the size of the camp to a minimum. Require that staff preserve as much vegetation as possible, for example, creating and respecting defined pedestrian pathways (P&D) (C).	- Surface apt for the installation of camps. - Demarcation of spaces and soil uses. - Existing basic services adapted and planned. - Guide to good environmental practice.
	1.2. Contamination of surface waters and propagation of diseases through solid waste and fecal matter generated by the camps.	1.2.1. Provide temporary basic sanitation on the site, for example, pit latrines (presuming the aquifer is sufficiently low and the soil and geology are of appropriate composition) (P&D) (C).	
	1.3. Propagation of contagious diseases, including malaria, tuberculosis and HIV, through construction teams that come from outside the region.	1.3.1. Use of local or regional manpower, if possible. Submit potential members of work teams to medical checks for HIV and tuberculosis, and vaccinate workers against tetanus, hepatitis and other diseases.	- Percentage of local workers. - Percentage of workers brought in from other areas.

Aspect of activity	Impact*	Mitigation**	Environmental indicators
	1.4. Introduce alcohol or other socially destructive substances through construction teams.	1.4.1. Provide training and strict guides relating to contact with local residents and compliance with guides (P&D) (C).	- Guide to good environmental practices. - Code of ethics and of conduct. - Nº of inductions and training programmes.
	1.5. Devastate local animals and plants through poaching and firewood collection by construction teams.	1.5.1. Establish guides that prohibit poaching and the collection of plants/firewood, with significant consequences for non-compliance, such as the termination of employment. Provide adequate quantities of good quality food and cooking fuel (C).	
	1.6. Cause erosion due to furrows caused by tracks from heavy machinery, damage to the roads, banks of streams, etc.	1.6.1. Minimise the use of heavy machinery (P&D) (C).	- Guide of utilization of machinery, working hours and protection measures for equipment and installations.
2. Demolition of existing structures.	2.1. Cause disturbance or danger to local people due to noise, dust and rubble from demolition.	2.1.1. Recover all reusable materials (this could be a standard procedure in many developing countries) (P&D) (C).	- Instructions before, during and after demolition. - Timetable of work. - Communication with local people. - Utilization of personal protection equipment. - List of materials or dangerous waste matter used or present in the work. - Designation of sites for final disposal of rubble. - Licences or permits for final disposal.
	2.2. Contaminate soil or surface waters with demolition rubble that contains residual quantities of toxic materials (for example paint with lead).	2.2.1. Ascertain whether toxic materials are found. If so, dispose of waste in a covered sanitary refill, where possible. Otherwise, explore options for reuse of waste in areas in which the risk of contaminating underground and surface waters is low (for example, in such circumstances it could be feasible to use it as base material for roads). (See “Handling solid waste from residential, commercial and industrial installations” in the present guides for references providing further more information) (P&D) (C).	

Aspect of activity	Impact*	Mitigation**	Environmental indicators
3. Clearing and/or levelling of the site.	3.1. Damage or destroy sensitive land ecosystems during the clearing/preparation of the terrain for the site.	3.1.1. Design the installation in such a way as to produce the least possible impact (P&D). 3.1.2. Minimise disturbances to natural flora during construction (P&D) (C).	- Ecological zoning. - Surface deforested/to be deforested/to be reforested/to be revegetated. - Presence or application of physical, biological and structural barriers: gutters, agricultural retaining ditches, containing walls, gabions.
	3.2. Cause areas of denuded soil that may lead to erosion, waterlogging, changes in the natural flow of water and/or damage to aquatic ecosystems.	3.2.1. Where possible remove large plants and grass cover without destroying them (P&D) (C). 3.2.2. Use measures to check erosion, for example bales of hay (C). 3.2.3. Re-plant recuperated local flora where appropriate and as soon as possible (C).	
4. Road improvements /construction of new roads (consult Rehabilitation of rural roads - Chapter 3 of the LAC guides).	4.1. Erosion and changes in the quality of the water and in natural water flows, due to bad construction practices and poor road maintenance.	4.1.1. Find an alternative site (SS). 4.1.2. Evaluate whether some alternative method of transport would be sufficient (for example, railway, water transport or pedestrian path) (SS) (P&D).	- Means of access: roads, tracks, neighbourhood path, paved or dirt roads. - Data of proximity to zones of economic interest. - Modes of transport: before and after the project. - Guide to good construction practices. - Guide to good environmental practices.
	4.2. Provide access for illicit mining, felling, hunting, settlements and other developments that destroy natural resources and/or harm local populations.	4.2.1. Adhere to road design and maintenance specifications to keep water off road surfaces (P&D) (C) (O&M).	
	4.3. Lead to the propagation of diseases in humans or cattle.	4.3.1. Use the best design, construction, operation and maintenance practices, as described in “Rehabilitation of rural roads”, in the present guides and the resources that are detailed in them.	

Aspect of activity	Impact*	Mitigation**	Environmental indicators
		These practices include the development of plans for quarries and material deposits, following contour lines, drainage using gradients and gutters/ditches, the training of personnel for operations and maintenance, etc. (SS) (P&D) (C) (O&M).	
5. Sources of building materials.	5.1. Damage to aquatic ecosystems, due to erosion.	5.1.1. Identify the environmentally safest source of materials within budget possibilities.	- Environmental management in designated material supply sites; before, during and after. - Demarcation of supply sites. - Licences or permits for the extraction of materials. - Designation of sites for the final disposal of construction remains. - Licences or permits for the final disposal of surplus materials.
	5.2. Damage to land systems through the cutting of trees or extraction of materials.	5.2.1. Develop plans for tree-felling, quarries and material deposits that take accumulative effects into account (P&D). 5.2.2. Monitor compliance with the plans and impacts of extractive practices. Modify as necessary (C) (O&M).	
	5.3. Propagate vector-transmitted diseases when water accumulates in quarries or deposits of abandoned material, and insect vectors are produced.	5.3.1. Fill in quarries and deposits before they are abandoned (C). 5.3.2. Check run-off towards the ditch (C).	

** That the activity or technology could generate.*
*** The mitigation measures apply to specific phases of the project: site selection (SS); Planning and design (P&D); Construction (C); and/or Operation and Maintenance (O&M).*

6.2. Plan of environmental mitigation

This document is similar to the stipulations in Environmental Law 1333, and is made up of a group of measures, works or actions to be carried out with the aim of preventing, reducing, remedying or compensating for the negative effects previously identified. This instrument will contain, as a minimum, a description of the mitigation measures, its chronogram of implementation and the estimated cost of corrective and preventive measures, applicable to all the phases. Details are given below of all the mitigation and prevention measures that may be applied for each environmental factor, as applicable and necessary.

Adopt this list as a menu of mitigation measures that must be adapted in accordance with the context of the project.

Environmental factor: SOIL

Prevention or mitigation measure	Cost	Responsible	Programmed (date)	Observations
Collect documentation on land property rights				
Draw up a thematic map of soil uses, zones of intervention, economic activities, proximity to sites of social, economic and ecological interest, etc.				
Conduct a study of soils that includes texture, structure, chemical and physical properties, depth, horizons, fertility, permeability and aptitude for use.				
Conduct an inspection of the terrain, taking in situ data on gradient/relief.				
Draw up a chart of geophysical and environmental threats that includes type, duration, frequency, impact, preventive measures, corrective measures and adaptation measures.				
Design and implement soil conservation measures: physical, biological and structural barriers, gutters, agricultural retaining ditches, contention walls, gabions, etc.				
For excavations, check and minimise the duration time of the works and apply protective measures to avoid falls. It is forbidden to leave behind ditches or unprotected open holes.				
Other relevant measures.				
Partial budget (SOIL)				

Environmental factor: WATER

Prevention or mitigation measure	Cost	Responsible	Programmed (date)	Observations
Conduct an analysis or study of profundity of the aquifer.				
Re-think and redefine the final design of the of water collection system.				
Conduct tests and laboratory analyses of water quality; use minimum parameters established in norm NB512.				
Conduct hydraulic tests of the water system.				
Project and define the useful life and capacity of the water supply installations.				
Reset and redefine the final design of the of domestic discharge system (consider soil data, annual precipitation, average precipitation, rainfall patterns).				
Conduct hydraulic tests on the drainage system.				
Project and define the useful life and capacity of the sanitary installations.				
Other relevant measures.				
Partial budget (WATER)				

Environmental factor: AIR

Prevention or mitigation measure	Cost	Responsible	Programmed (date)	Observations
Buy and use canvas sheets to cover building sand and materials and protect them from inclement weather.				
Gather data in situ on the centre's orientation / wind direction and factors relative to ventilation.				
Carry out periodic maintenance of the vehicles used in the project.				
Avoid the use of old or outdated machinery which is contaminant or energy-inefficient.				
If using heavy construction machinery (grinders, bulldozers, excavators, etc.), control working times to avoid prolonged disturbance to local people. Equip staff with ear-protectors, goggles and helmets.				
Other relevant measures.				
Partial budget (AIR)				

Environmental factor: FLORA and FAUNA

Prevention or mitigation measure	Cost	Responsible	Programmed (date)	Observations
Train personnel in good environmental practices and in protection of flora and fauna.				
If applicable, draw up a revegetation and reforestation plan.				
Other relevant measures.				
Partial budget (F&F)				

Environmental factor: SOCIOECONOMIC and SOCIOCULTURAL

Prevention or mitigation measure	Cost	Responsible	Programmed (date)	Observations
Collect data on the educational sector: Nº of schools, Nº of rooms, conditions of the infrastructure, proximity to the project, type of services, relation pupils/teacher, pupils/rooms, deficiencies and limitations.				
Gather data of the health sector: Nº of Centres, Nº of rooms, conditions of the infrastructure, proximity to the project, type of services, list of most frequent diseases, Nº of medical deficiencies and limitations.				
Gather demographic data on: birth rate, mortality, fecundity, migration, growth, urban expansion, etc.				
Collect information on the number and requirement of efficient/improved kitchens, type of energy source and percentage of use, a thematic map on the firewood-extraction radius, potential areas of reforestation or revegetation.				
Design a community development plan that includes social organization and community leadership.				
Design a training plan with organization of: Nº of workshops/meetings, Nº of inductions, Nº of trainers, Nº of people trained, matters dealt with, Nº of demonstration events and field practices.				
Other relevant measures.				
Partial budget (SE&SC)				

Environmental factor: ENVIRONMENTAL SECURITY and SAFETY AT WORK

Prevention or mitigation measure	Cost	Responsible	Programmed (date)	Observations
If applicable, and above all for contractor companies or construction companies: define the list and the budget for the purchase of personal protection equipment – PPE (helmet, overalls, boots, ear-protectors, goggles, harnesses, lifelines, first-aid kit).				
Acquire the PPE and define a strategy for provision to personnel. Draw up provision lists or registers.				
Handing over of EPP to personnel.				
Implement a system of signs for information, prevention and protection, within and outside the site (works posters).				
Demarcate and enclose or fence off the site perimeter; use corrugated iron, resistant fabric, bars, belts, etc.				
Develop training or induction programmes for staff in matters of environmental security, safety at work and accident prevention.				
Implement a strategy of communication with local people on the activities, risks and dangers of the building work.				
Draw up and implement an emergency plan. Draw up a contingency plan.				
Other relevant measures.				
Partial budget (ENVIRONMENTAL SECURITY AND WORKING SAFETY)				

ENVIRONMENTAL FACTOR: MANAGEMENT OF MATERIAL SUPPLY SITES AND STORES

Prevention or mitigation measure	Cost	Responsible	Programmed (date)	Observations
Identify the supply site and surface, collect data on proximity, conditions, general characteristics, etc.				
Draw up a table of supplies of local and introduced materials, with exact data on origin, programmed and utilised quantification.				
If applicable, gather data on municipal authorisation requirements for intervention in supply sites.				
Make a list of security and protection measures before, during and after the extraction of materials.				
Quantify the percentage of generation of rubble, waste materials and construction waste within the project.				
Define and locate the sites most appropriate for the final disposal of rubble and building waste materials. If applicable, request municipal authorisation.				
Identify the location of the stores, their surface area, collect data on proximity, conditions and general characteristics, etc.				
Train those in charge of stores.				
Take precautions and security measures if storing fuels.				
Other relevant measures.				
Partial budget (GBP)				

6.3. Programme of Environmental Execution

Once the plan of prevention and mitigation is structured and the corresponding budget assigned, the next step is to draw up a table of environmental application and follow-up. The following tables present a format indicating the measure, the environmental factor addressed and those responsible, so as to guarantee their compliance in qualitative and quantitative terms. Note that the written measures are simply examples, since each agency must define its own measures around its priorities, levels of applicability and budgetary capacity.

Environmental factor: SOIL

Measure	Programmed (date)	Executed (date)	Responsible for execution	Responsible for supervision	Responsible for inspection
Carry out a study of soils in accordance with needs.					

Environmental factor: WATER

Measure	Programmed (date)	Executed (date)	Responsible for execution	Responsible for supervision	Responsible for inspection

Environmental factor: AIR

Measure	Programmed (date)	Executed (date)	Responsible for execution	Responsible for supervision	Responsible for inspection

Environmental factor: FLORA and FAUNA

Measure	Programmed (date)	Executed (date)	Responsible for execution	Responsible for supervision	Responsible for inspection

Environmental factor: SOCIOECONOMIC and SOCIOCULTURAL

Measure	Programmed (date)	Executed (date)	Responsible for execution	Responsible for supervision	Responsible for inspection

Environmental factor: ENVIRONMENTAL SECURITY and SAFETY AT WORK

Measure	Programmed (date)	Executed (date)	Responsible for execution	Responsible for supervision	Responsible for inspection

Environmental factor: MANAGEMENT of Supply sites of materials and STORES

Measure	Programmed (date)	Executed (date)	Responsible for execution	Responsible for supervision	Responsible for inspection

6.4. Budgetary assignation

The aim of this form is to document budgets, acceding to budgetary assignations and programming outlay:

Item	Budget (Bs.)	Mode of finance	
		Financed (%)	Local counterpart (%)
Soil			
Water			
Air			
Flora and fauna			
Socioeconomic and sociocultural			
Environmental and work security			
Management of supply sites			
Human Resources			
Operating costs			
General expenses			
Budget total			

6.5. Plan de emergencias

Un plan de emergencias es la respuesta integral que involucra a toda una institución, con el compromiso de directivos y empleados en permanente acción para responder oportuna y eficazmente en las actividades correspondientes al ANTES, DURANTE Y DESPUÉS de una emergencia.

Emergencias Laborales	
Incidente	Accidente
Un incidente laboral es el proceso de un evento no planeado, donde la acción o reacción de un objeto se daña sin causar y/o provocar lesiones al personal o a la infraestructura.	Accidente laboral es un evento no planeado ni controlado, en el cual la acción y/o reacción de un objeto o persona, resulta en lesión o probabilidad de lesión.

Emergencias Ambientales	
Incidente	Accidente
Un incidente ambiental es aquel evento o situación donde un contaminante cobra acceso al medio ambiente de manera accidental, intencional o por negligencia, alterando y perjudicando la calidad de algún recurso natural o la calidad de vida de la ciudadanía.	Un accidente ambiental es un evento inesperado e indeseable que afecta, directa o indirectamente, la salud y la seguridad de la población o causa impactos agudos al medio ambiente.

Para desarrollar un plan de emergencias es necesario conocer previamente las posibles afecciones a las cuales es vulnerable el proyecto, obra o actividad. Una vez conocidos los riesgos se procederá a evaluarlos y a determinar las zonas que pueden verse afectadas, así como el número de personas amenazadas por el riesgo.

El objetivo del plan de emergencias es el de definir procedimientos para actuar en caso de desastre o amenaza colectiva, y desarrollar en las personas destrezas y condiciones que les permitan responder rápida y coordinadamente frente a una emergencia. Los objetivos del plan de emergencias son:

- Evitar o minimizar las lesiones y pérdidas que se puedan causar a empleados y terceros.
- Evitar o minimizar los daños que se puedan causar al ambiente y a las instalaciones.
- Evitar o minimizar los perjuicios que se puedan causar a la comunidad como consecuencia de la interrupción de actividades y servicios.
- Contener y controlar emergencias para restablecer la operación (producción).
- Evitar o minimizar las pérdidas económicas.

6.6. Plan de contingencias

Son los planes que las instituciones públicas y privadas, y la ciudadanía deberán poner en marcha para el manejo de las emergencias, tan pronto se detecte la presencia o se anuncie la probable presencia de un determinado fenómeno considerado peligroso para la normalidad de la vida de un territorio, actividad, obra o proyecto.

Objetivos del plan de contingencias

- Analizar, evaluar y prevenir los riesgos en las actividades constructivas.
- Evitar o mitigar las lesiones que las emergencias puedan ocasionar al personal y a terceros.
- Evitar o minimizar el impacto de los siniestros sobre la salud y el medio ambiente.
- Reducir o minimizar las pérdidas económicas y daños a la infraestructura del proyecto.
- Capacitar permanentemente al personal en prevención de riesgos y brindar entrenamientos en acciones de respuestas ante situaciones de emergencia.
- Contar con los procedimientos a seguir durante las operaciones de respuesta a la contingencia.

Para cumplir con estos objetivos se deberá realizar o contar con los siguientes aspectos:

1. Organizar brigadas de primeros auxilios y rescate ante: incendios, derrames, fugas, inundaciones, derrumbes, lluvias intensas, vientos fuertes, etc.

2. Realizar una lista de equipos de protección. Ejemplos:extintores portátiles de 12 Kg., con cartucho externo, tipo ABC, con carga vigente, cilindros con arena, botiquín de primeros auxilios, alarmas, sirenas, silbatos, luces de emergencia, uniformes lumínicos, anti ignífugos, máscaras, balones de oxígeno, señalización de rutas de evacuación, sogas, linternas, barreras absorbentes, paños oleofílicos, camillas o equipos de rescate de lesionados, etc.

3. Diseñar el sistema de comunicación ante emergencias. Ejemplos:tipos de señal de alerta y de alarma a utilizar en cada caso, según los medios disponibles: si oyen sirenas, timbres o silbatos de duración continua y prolongada, indica que se trata de señal de alerta y si oyen sirenas, timbres o silbatos de duración breve e intermitente, indica que se trata de señal de alarma.

Chapter 7
EXECUTION PHASE

As mentioned previously, it is during this phase that the project materialises physically. Here, the property defined in the project study is constructed, machines are installed and the necessary equipment put in place. The conditions and characteristics established in previous studies must be respected in the project execution. Although the specifications and plans generated during the design process should be sufficient, in practice modifications and clarifications are often necessary. In these situations, it is necessary to make a detailed evaluation of the request for modification presented by the company.

Any alteration to the original project must be approved by the applicant institution, the group executor and the revising team. Any modification to the objective of protecting the establishment must be a conscious act, which must be documented. In this way it will be possible to assign correctly the real capacity of operation of the establishment within the health network of the institution.

7.1. Chronogram for the implementation of mitigation measures

The executive institutions must programme the implementation of environmental mitigation measures for each of the environmental factors, in accordance with the work's constructive planning. The following format is a base example to represent this process and above all to visualise the needs for control and environmental monitoring.

		Period of execution (in months)													
Nº	Mitigation measures	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	SOIL:	■	■												
2	AIR:	■	■	■	■										
3	FLORA and FAUNA:			■	■										
4	WATER:			■	■	■	■	■	■	■	■				
5	ENVIRONMENTAL SECURITY and SAFETY AT WORK:					■	■	■	■	■	■	■	■	■	
6	SOCIOECONOMIC and SOCIOCULTURAL:							■	■	■	■				
7	MANAGEMENT of DESIGNATED SUPPLY SITES AND STORES:							■							

The marked boxes refer to the programming of environmental monitoring or environmental supervision, with the corresponding submission of reports.

7.2. Environmental monitoring and follow-up

The checklist inserted below is also a format that must be adapted and filled in by each executive institution, with the aim of documenting and evaluating compliance in the implementation of environmental measures, as well as their quality and efficiency.

Checklist
ENVIRONMENTAL MONITORING

Project:
Place:
Date:
Period of the report:
Drawn up by:

Nº	Mitigation measures	YES	NO	NA	Comments or recommendations
1	SOIL: …….				
2	AIR: ……				
3	FLORA and FAUNA: ……..				
4	WATER: ……				
5	ENVIRONMENTAL SAFETY and SAFETY AT WORK: ……...				
6	SOCIOECONOMIC and SOCIOCULTURAL: ……...				
7	MANAGEMENT OF SUPPLY SITES AND STORES: ……				
	Total				
	Percentage of compliance				

1. general summary of environmental monitoring:

2. verification mechanisms enclosed:

Person environmentally responsible:	Director of works:	Supervisor:	General inspector:

7.3. Environmental management report

The person responsible for the environment will draw up monthly reports on the application of the programmed mitigation measures and their follow-up. The format of the report will depend on each executive agency; however it will have to contain, as a minimum, the following points:

1. General information.
2. Brief description of the month's activities.
3. Compliance with prevention and mitigation measures.
4. Verification mechanisms and photographs.
5. Other identified environmental impact.
6. Corrective and preventive actions.
7. Conclusions and recommendations.

Establecimiento de Salud en construcción. Santa Cruz de la Sierra (bolivia)

8 Chapter 8
CLOSING PHASE

8.1. Balance of environmental management

This document contains all the instruments of environmental management to be applied from the beginning of the constructive phase to its culmination. It serves to evaluate the degree of compliance and institutionalisation of the environmental component in infrastructure projects.

BALANCE of ENVIRONMENTAL MANAGEMENT

Project:
Place:
Date:
Period of the report:
Drawn up by:

Nº	Instruments of management	YES	NO	NA	Comments or recommendations
1	Social baseline				
2	Environmental baseline				
3	Preliminary evaluation of the project				
4	Programme of prevention and mitigation				
5	Plan of environmental application and follow-up				
6	Budgetary assignation form				
7	Guide to good environmental practices				
8	Technical environmental specifications				
9	Emergency plan				
10	Contingency plan				
11	Environmental monitoring				
12	Environmental Screening Report				
13	(Environmental Verification Report)				
14	Environmental management report				
	Total				
	Percentage of compliance				

1. General summary of the executive institution's environmental management:

2. Verification mechanisms enclosed:

Person environmentally responsible:	Director of works:	Supervisor:	General inspector:

9 Chapter 9 GLOSSARY

Soil compacting: Compression of the soil into a compact mass with little porosity.

Ecosystem: Embraces the entire range of living creatures that live in a given area, the factors that characterise them and the relations established among the organisms as well as between them and their physical surroundings. The abiotic medium (physical-chemical) and the biotic group of plants, animals and microorganisms, are what constitute an ecological system or ecosystem. Ecosystems are real entities (a lagoon, a forest, etc.) but also abstract entities, in the sense that they are conceptual. The ecosystem is equivalent to the biocenosis plus the biotope, also including the living creatures that inhabit a given area and its environment. The Earth is an immense ecosystem, which contains other ecosystems such as mountains, woods, lakes, wastelands, the garden at the back of the house, a piece of rotten wood, an aquarium, etc. Ecosystems can be small or enormous: a lagoon or a mountain chain. It is also the unit formed by the totality of organisms occupy a defined physical medium (a lake, a valley, a river, a coral reef, etc.), that are related among themselves as well as with the medium.

Soil erosion: the destruction of materials on the earth's surface (rocks and soil) by the physical separation of particles of any size, due to the action of external agents (wind, water, ice). The intensity of erosion depends on the energy of the erosive agent, the nature of the materials (lithology), the degree of meteorization, or the gradient on the terrain. As regards the soil, it depends on the degree of vegetation cover and of rootedness, hence it is clear that human actions on vegetation and soil can favour erosion.

Habitat: The physical place, such as a desert, forest or tree, where a plant or animal lives and which is usually described by its physical characteristics. It is the residence, place or area where an organism lives with all its factors; it may also include the immediate surroundings that occupy this space. It is the natural ambience for an organism, the place where it grows, is normally found or naturally inhabits. It is the vital space occupied by a species or individual, taking into account the group of environmental conditions which act upon it, such as microclimate, soil and biotic factors.

It is the group of elements (both physicochemical and biotic) that constitute the "environment" of an organism or of a population; this is habitat in the "broad" sense, similar to (or having similar tendencies to) environment. However, in ecology it is often used in a restricted sense, referring in particular to the physical-chemical (abiotic) environment. It is not a synonym for "ecological niche". It is a zone or part of an ecosystem that contains all the living conditions that a given species needs to survive; a situation (or a combination of ecological factors) where a plant or animal lives.

Negative impact: this refers to environmental damage whose effect is seen in a loss of values in various spheres; natural, cultural-aesthetic, or in terms of landscape and ecological productivity. It is also visible in an increase in damages deriving from contamination, erosion or silting, and other

environmental risks that are in discord with the ecological-geographical structure, character and personality of a given zone.

Mitigation measures: all those actions aimed at prevention, control, attenuation, restoration and compensation for negative environmental impact that must accompany the development of a project so as to ensure sustainable use of natural resources and the protection of the environment. Mitigation measures may be implemented previously to, simultaneously with, or posterior to the execution of the project or action.

Aquifer: The level reached by the most superficial underground freatic layer.

Natural resources: in a broad sense, resources originating in nature that are not transformed by man. They include air, water, the landscape or wildlife, to the extent that these are capable of satisfying human needs.

Sedimentation: disposal of particles previously eroded and transported by external geological agents, from a generating matrix area to a receptor area or sedimentary basin. The sedimentation of particles can obey mechanical causes such as deposit by gravity or the disposal of particles of greater size, when the transporting agent suffers a diminution of velocity and as such of kinetic energy. These can be chemical, in the case of formation of deposits by precipitation from of colloidal or ionic solutions; or biological, in the case of organic sediments of biochemical origin. The final product of sedimentary processes is generally an accumulation of non-cemented particles known as sediment.

Construcción de Puesto de Salud. Machareti (Bolivia)

10 Chapter 10 REFERENCES

- Boroschek Krauskopf, Rubén and Retamales Saavedra, Rodrigo. Collaborating Centre OPS/OMS of Mitigation of Disasters in Health Establishments "University of Chile". Washington D.C., January 2004, P. 10.

- CIDA (Canadian International Development Agency). 1997. "Checklist #2: Building Construction." in Handbook on Environmental Assessment of Non-Governmental. Organizations and Institutions Programs and Practices. CIDA: Quebec.
  Online: Manual of Evaluation Environmental of the Programmes and Projects of the Non-Governmental Organizations and Institutions
  Online: Checklist #2 / CONSTRUCTION of BUILDINGS.

- Code of Federal Regulations. 2001. Regulation 216 – ENVIRONMENTAL PROCEDURES. USAID.

- Environmental Guidelines for Development Activities in Latin America and the Caribbean. 2003, USAID. http://www.irgltd.com/Resources/Publications/LAC/2003-12%20LAC%20Guidelines-Part%201.pdf

- Environmental Guidelines for Development Activities in Latin America and the Caribbean. 2003, USAID. Chapter 2A: Small Scale Infrastructure.
  http://www.usaid.gov/locations/latin_america_caribbean/environment/docs/epiq/chap2/lac-guidelines-2-small-scale-infrastructure.pdf

- Environmental Guidelines for Development Activities in Latin America and the Caribbean. 2003, USAID. Chapter 2B: Water and sanitation activities.
  http://www.usaid.gov/locations/latin_america_caribbean/environment/docs/epiq/chap2/lac-guidelines-2-small-scale-infrastructure.pdf

- Environmental Guidelines for Development Activities in Latin America and the Caribbean. 2003, USAID. Chapter 3: Rehabilitation of Rural Roads.
  http://www.usaid.gov/locations/latin_america_caribbean/environment/docs/epiq/chap3/lac-guidelines-3-rural-roads.pdf

- Environmental Guidelines for Development Activities in Latin America and the Caribbean. 2003, USAID. Chapter 4. Environmental Issues and Best Practices for Microfinance Institutions and Micro and Small-Scale Enterprises
  http://www.usaid.gov/locations/latin_america_caribbean/environment/docs/epiq/chap4/lac-guidelines-4-micro-small-enterprises.pdf

- Environmental Guidelines for Development Activities in Latin America and the Caribbean. 2003, USAID. Chapter 5. Environmental Issues and Best Practices for Solid Waste Management A. Solid Waste Collection and Disposal Systems

http://www.usaid.gov/locations/latin_america_caribbean/environment/docs/epiq/chap5/lac-guidelines-5-solid-waste-mgmt.pdf

- Environmental Guidelines for Development Activities in Latin America and the Caribbean. 2003, USAID. Chapter 5B: Medical waste. http://www.usaid.gov/locations/latin_america_caribbean/environment/docs/epiq/chap5/lac-guidelines-5-solid-waste-mgmt.pdf

- Isaza P. and Santana C. (1991). Guias de diseño hospitalario para América Latina. Programa de Desarrollo de Servicios de Salud (*Guides for hospital design for Latin America. Programme for Health Services Development*). OPS/OMS. P. 206.

- Ministry of Health. Guia para la protección de establecimientos de salud ante desastres naturales. (*Guide for the protection of health establishments against natural disasters*). Lima, Peru, 2005. P. 71.

- Ministry of Services and Public Works; Vice-Ministry of Basic services, Drinking water and Requisites. Bolivian Norm 512. Third version. October 2004.

- Pan-American Health Organization. La salud pública en las Américas. Nuevos conceptos, análisis del desempeño y bases para la acción (*Public health in the Americas. New concepts, performance analysis and bases for action*). Scientific and Technical Publication Nº 589. 2002.

- Programming Policy - The Automated Directives System (ADS) Series 200. ADS. Environmental Procedures. USAID.

APPENDICES

Appendix 1:
Directory of emergency telephone numbers

Emergency service	Location/Direction	Contact telephone numbers
Fire service	Alarm centre	
	Station 1	
	Station 2	
Police	110	
	PAC (citizen's aid police)	
	Zonal radio patrol	
	Private physical security	
	Neighbourhood security	
Vigilance	Night Watchman Service	
Public services	Drinking water and sewerage	
	Electric power	
	Service of refuse collection	
	Local, national and international telephone	
	Maintenance of equipment	
Health services	Red Cross	
	Medical insurance	
	Hospital	
	Clinic	
	Health centre	
Municipal services	Civil Defence	
	Emergencies and natural disasters	
	Basin authorities / directorship	
Other services	Navy	
	Air Force	

Appendix 2:
Identification of environmental effects for the construction of buildings

Date/hour of the incident: _____

Date/hour of the report: _____

Place of the incident: orientation/distance: _____

Origin of the report: _____

Contacts: telephone: _____ Fax: _____

Nature and origin of the incident: _____

Confirmed: yes / no _____

Dangerous products used in the place: _____

If there are wounded people, their number and condition: _____

Identification and position in the surrounding area: _____

Nature and extension of the damage: _____

Taking of samples/Photographs: _____ Agency/organization: _____

Details of the situation: _____

Contacts: Telephone: _____ Fax: _____

Action(s) taken: _____

Details of the equipment used: _____

Additional information: _____

Appendix 3:

Example of contingency plan for the operation phase

POSSIBLE PROBLEM	ALERT SIGNAL	ACTIONS TO BE TAKEN	OBSERVATIONS
Spills of contaminants (fuels, oils and chemical or organic products) into the soil.	Occurrence of the event.	Extraction of contaminated soil with sand. Disposal in containers and labelling. Transport for disposal in an authorised dump, or for eventual reuse. Refill the excavation with clean material.	An especially identified and conditioned space will be prepared for the activities of repair and maintenance of the plant's equipment and the group generator. For accidental spills of fuel or waste oil, the design of the group generator's casing should include plans for a means of collecting and extracting the spilled liquid, with the aim of disposing of it in sealed recipients and taking them to places authorized to deal with this type

Appendix 4:

System of signs for accident prevention

SAFETY COLOURS
CHART 1

	FORMA GEOMETRICA		
COLOR DE SEGURIDAD	CÍRCULO	TRIÁNGULO EQUILÁTERO	RECTÁNGULO O CUADRADO
ROJO	PROHIBICIÓN.		EQUIPO DE LUCHA CONTRA INCENDIOS.
AMARILLO		ATENCIÓN PELIGRO.	
VERDE			ZONA DE SEGURIDAD, SALIDA DE SOCORRO, DISPOSITIVOS DE SOCORRO, PRIMEROS AUXILIOS.
AZUL	OBLIGACIÓN.		INFORMACIÓN O INSTRUCCIÓN

Appendix 5:


SALIDA ÚNICAMENTE EN CASO DE INCENDIO
EN CASO DE INCENDIO TOQUE LA ALARMA
PRIMEROS AUXILIOS
BOTIQUÍN DE PRIMEROS AUXILIOS
TELÉFONO DE EMERGENCIA
AGUA POTABLE
EN CASO DE INCENDIO TOQUE LA ALARMA
SALIDA
SALIDA DE EMERGENCIA

APPENDIX 2

IDENTIFICATION of the ENVIRONMENTAL EFFECTS of ERECTING BUILDINGS
CHECKLIST FOR THE CONSTRUCTION of BUILDINGS

IDENTIFICATION of ENVIRONMENTAL EFFECTS

This checklist, which is not exhaustive, provides a pattern that can be used to identify the environmental effects of the construction of buildings such as schools, including vocational schools, sporting facilities, health clinics, centres for small firms and workshops (tanneries, dyers, craft or communal workshops, etc.). Other types of document can help to complete an environmental evaluation.

A. Questions related to the location of the buildings:

1. What are the uses and activities in the site where the project is planned? What are the existing infrastructures? What is the urban plan? What is the legislative context? What is the rate of traffic at the site, and the proximity of the residences? What are the population's expectations?

Could the project cause:

- Population displacement (immigration, migration, transference or resettlement).
- Changes in ways of life, ruptures in the organizational structure and loss of territory. (For indigenous populations, housing development and means of subsistence introduced for the local population through the influx of "modern" production methods, without previous analysis: diminished food security due to increases in commercial cultivation or industrial activities, etc.).
- The exacerbation of social inequalities (for example, due to control by industrial enterprises).
- Incompatible uses (industrial area and residential area, sacred place, etc.) and/or social conflicts and conflicts of values among the various possible uses of the land and buildings (for example if the proposed uses are in conflict with cultural and traditional characteristics).
- Problems in the water supply, energy, firewood, materials, and other resources and services such as sanitary installations and electrical equipment.
- The deterioration or improvement in the quality of life.
- Greater sensitivity to the importance of a healthy environment.
- Increased and improved access to goods and services (teaching, medical care, community services, industry, and economy).

2. What types of environment, landscape, flora and fauna are present in the area? What is their specific importance? Are there any water masses, forested areas, hillsides, wetlands or other vulnerable

sites nearby? Is the area prone to flooding, heavy storms, tremors and other disasters? What are the characteristics of the soil texture and drainage, or of the topography? Are the soils sufficiently stable? Are there anti-erosion measures, and do they offer sufficient protection against floods and storms to prevent damage to the building and its structures? Has the resilience of the building been studied in relation to the environmental characteristics?

Could the project have an effect on any of the following?

- The environment or sites of economic, ecological, cultural, archaeological or historical importance and the natural resources (water, soil, vegetation, etc.).
- Rare, vulnerable species and/or species of economic, cultural or ecological importance (biodiversity).

B. Questions related to the construction of buildings:

1. What are the various activities associated with the preparation of the site and the construction? Will there be demolition, excavation, levelling, cutting of forests, denuding of the soil, landfill, embankments or reclaiming of wetlands? Is there any need to construct temporary accommodation and provide services such as sanitary facilities, wells, water supplies, access routes, etc.? What are the types, quantities and resources of building materials? How would the materials be moved and stored? What will be the surface, height, style and location of the buildings?

Could the project result in the following:

- Changes to, invasions of and/or destruction of the environment, or similar effects on sites with economic, ecological, cultural, archaeological or historical importance and wealth of natural resources.
- Landslides and soil instability.
- Erosion of fragile or thin soil, in slopes or near masses of water, if the cutting of trees is practiced.
- Compacting, changes in drainage, in the soil permeability and/or loss of soil fertility.
- Disturbances (bad smells, dust, noise, vibrations, traffic), risks of accidents and/or health problems for workers and the local population during the preparation of the site, the construction itself, as well as the transport with which it is associated.
- Contamination of the soil and of surface waters (both contamination of underground waters if they are infiltrated by polluted water or contaminants), and air contamination, if there is bad handling of materials and construction waste.
- Changes in visual quality (aesthetic) and/or incompatibility with the landscape, architectural style and local architectural traditions.
- The just and equitable participation of the local workforce, and a positive effect on the economy.

C. Questions related to the operative phase of the buildings:

1. What activities will be carried out during the operative phase? Is there a possibility that the area's population will increase as a result of the migration? Will this lead to spontaneous human establishments? Will there be an increase in the demand for natural, financial, energy and agricultural resources, etc.?

Could the project cause any of the following?

- A decrease in the quantity and quality of natural resources (water, wood, minerals, etc.) if these resources cannot sustain an increase in demand as a consequence of a rise in population or an increase in the extraction of resources for operational activities of different types of buildings according to damaging methods of extraction.
- Additional pressure on infrastructure and local services.
- Social conflicts or clashes over property rights and land use (especially if agreement has not been reached between the users and local authorities, if the market system for traditional products and crafts is affected, if there are local rivalries, etc.). These could also stem from a rise or drop in prices in the local market; socioeconomic developments benefitting the population and all its specific groups, and a decrease in rural exodus through socioeconomic development; a reinvestment of knowledge and earnings within the community, and a improvement in the skills of the population and all its specific groups (women, children, etc.); communities' greater participation in their own development, by means of monitoring and maintenance of the building and its operations.

2. In accordance with the use of the building, and the technological and technical activity involved, will there be generation and use of contaminants (liquid, solid or gaseous waste)? Is there the possibility that these substances will infiltrate or discharge into surface and subterranean waters, soils, habitats and the air? How will this be managed? Are the contaminants associated with disturbances (noise, bad smells, vibrations, dust, smoke, traffic), risks of accidents (transportation, spills, explosions, fires, etc.) and health risks (disease, poisoning, skin and respiratory problems) for employees, clients and the local population? Could the working environment help to avoid these problems?

More specifically:

- Could the sanitary installations contaminate surface or subterranean waters and the soil?
- Will organic and chemical toxic products be used, radioactive, volatile, liquids and/or solids (for example in medical and school laboratories, factories, etc.)?
- Will biological and medical liquid and solid waste be produced (medicines, syringes, cloth contaminated with blood, sources of bacteria and virus, animal waste, etc.)?
- Will there be heavy metals —resulting, for example, from activities of laboratory and processing

procedures — discharged into the environment where they can accumulate and cause contamination.

- Will damaging products be used (oil, lubricants, batteries, dyes, adhesive, solvents, acids, etc.)?
- Will there be a discharge of waters from cooling or soaking processes or waters with suspended materials, mercury, lead, soaps, or the other products previously mentioned, etc.

Will there be storage, selection, processing, treatment, burial or incineration of solid, liquid or gaseous waste?

Construcción de la Infraestructura de Salud. Santa Cruz de la Sierra (Bolivia)

VALIDATION PROCESS PARTICIPANTS

TALLER SANTA CRUZ

Cristina Prado	Colegio de Ingenieros Ambientales de Santa Cruz - CIAM-SC
Emilyn Troche	Consultora ARANDU
Erick R. Terán	John Snow International - JSI
Grace Ocampo	PROSALUD
José Luis Aramayo M.	Socios para el Desarrollo - SpD/USAID
Juan Ramón Rivera	Consultora XPERTA
Katty Zurita	John Snow International - JSI
Manuel Arancibia	PROSALUD
María Antonieta Alarcón	Consultora ARANDU
Mónica Muñoz	John Snow International - JSI
Saúl Camacho	Project Concern International - PCI
Sonia Barrios Padilla	PROSALUD

TALLER LA PAZ

Aldrin Fernández	Agencia Internacional Esperanza Bolivia - AIEB
Alejandra Sempertegui	Gobierno Municipal de La Paz
Alejandra Villafuerte	Project Concern International - PCI
Carlos Salazar Jiménez	Viceministerio de Vivienda y Urbanismo/MDE
Carmen Aruquipa Gutierrez	Prefectura de La Paz
Carmen Torrez Ticona	Prefectura de La Paz/Dirección de Recursos Naturales
Carmiña Janko Martínez	Sociedad de Ingenieros de Bolivia - SIB
Cintya Magne Leon	PROSALUD
Emilyn Troche	Consultora ARANDU
Flavia Mayta Rocabado	Gobierno Municipal de El Alto/Dirección de Medio Ambiente
Franklin Montesinos	Empresa Pública y Social de Agua y Saneamiento - EPSAS
Giovanna Gonzales	Viceministerio de Vivienda y Urbanismo/MDE
Huáscar Medrano H.	Colegio de Ingenieros Ambientales de Cochabamba - CIAC
Jorge Franco Palacios	Colegio de Arquitectos de La Paz
José Luis Aramayo M.	Socios para el Desarrollo - SpD/USAID
José Miranda	Gobierno Municipal de El Alto
Marco Callisaya	PROCOSI
María Antonieta Alarcón	Consultora ARANDU
Maria Claudia Calderón	Colegio de Ingenieros Ambientales de La Paz
Mario Villagra	Ministerio de Salud y Deportes - MSD
Maritza Villca Conde	Prefectura de LP
Monica Velasquez D.	Empresa Pública y Social de Agua y Saneamiento - EPSAS

Rafael Cortez	Colegio de Arquitectos de La Paz
Rafael Otazo	Ministerio de Salud y Deportes - MSD
Roberto Machicado	Prefectura de La Paz
Pedro Medina Monasterios	Técnico de Salud Ambiental/MSD
Tito Estévez	Universidad Mayor de San Andres - UMSA
Victor Hugo Perales	Centro Agua
Violeta Rojas Esprella	Colegio de Ingenieros Ambientales de La Paz
Walter Chambi	cc. Prov. Murillo

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