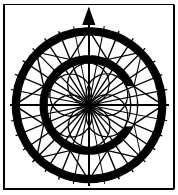

CHEMONICS INTERNATIONAL INC.

BOLIVIA PEA: GUIDANCE MANUAL FOR THE ENVIRONMENTAL DESIGN, IMPLEMENTATION AND OPERATION OF TOURISM AND ECO-TOURISM FACILITIES AND ACTIVITIES

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1. Introduction

The Tropics of Cochabamba, commonly called the Chapare, has been the focus of a range of alternative development projects to eradicate the cultivation of the coca plant in this region. Tourism including ecotourism has been identified as one possible sector to provide alternative income opportunities and livelihoods for local families and farmers.

Although mentioned under the Investment Promotion Alternative Development Program, tourism and ecotourism activities were not evaluated in sufficient detail as required by USAID regulations. Consequently, a tourism-specific Programmatic Environmental Assessment (PEA) was commissioned to comply with agency regulations.

The purpose of the PEA is to assess the environmental issues associated with tourism and ecotourism activities in order to develop tools that will aid in the implementation of mitigation measures that will help minimize or eliminate the potential adverse environmental impacts of these activities. The PEA accomplished this by performing an analysis of the significant direct and indirect environmental effects of the proposed alternatives for such facilities, and by developing this guidance manual.

As part of the PEA, the *Guidance Manual for the Environmental Design, Implementation and Operation of Tourism and Eco-Tourism Facilities and Activities* shall serve as a tool and source of reference to possible tourism, ecotourism or tourism service projects that may arise for future consideration by any funding source.

Therefore the manual is designed to provide:

- Planning and design tools;
- Specific mitigation measures for generic issues as well as ones unique to the Chapare;
- Best Practices for siting, planning, constructing and operating tourism and ecotourism facilities and activities.

2. Scope and Application of this Manual

2.1 Scope and Limitations

This guidance manual is to serve as a practical tool for aiding in the sustainable development of the tourism sector in the Tropics of Cochabamba. Applying this manual to existing or planned tourism and ecotourism facilities and activities should assist in the proper selection of sites, the application of effective mitigation measures for possible environmental impacts during planning, construction and operation of any such facility or activity.

2.2 Applicable Laws and Regulations

All USAID-financed activities in Bolivia are subject to regulations, laws, norms and standards of both USAID and the Government of Bolivia (GOB). Both entities manage environmental impacts of development activities through a series of environmental procedures that exist to identify and mitigate, avoid, or eliminate adverse short-and long-term impacts on the physical and socio-economic environments.

This chapter presents both the Bolivian and USAID environmental regulations with which the tourism and ecotourism activities in the Tropics of Cochabamba must comply.

2.2.1 Bolivian Laws and Regulations

When planning and implementing any tourism and ecotourism project the following Bolivian laws have to be adhered to:[1]

- Law 1333, Law of the Environment, and the respective Regulation of the Law of the Environment D.S. No. 24176;[2]
- Law No. 2074, Law for the Promotion and Development of Tourism Activities in Bolivia;[3]
- Regulatory Order No. 26085, Regulation for Tourism Accommodation Establishments;[4]
- Supreme Order No. 24781, Regulation for Protected Areas.

Law No. 1333 – Law for the Environment

Principal objective of the law is the protection and conservation of the environment by regulating activities of man in relation to nature and promoting sustainable development in order to improve the quality of life of the population.

Bolivia's Public Law 1333 establishes the country's environmental and natural resources protection framework. The law regulates the impact of human activities on the environment and promotes the sustainable development of activities designed to improve the population's quality of life.

Law 1333 requires all public and private projects involving activities with the potential to cause negative impacts to undergo an environmental review and to develop mitigation measures to minimize these impacts. The law states that no public or private project involving these potentially impacting activities can be carried out without an environmental license. The environmental license is issued by the authorities when approving the environmental review and planned mitigation measures. The environmental review process is structured into two different procedures.

The difference in procedures is caused by the fact that Bolivian Law 1333 came into effect on April 27, 1992, while the regulations for Law 1333 that define the technical and judicial details of the same did not come into effect until December 8, 1995.

[1] The list of laws and regulations presented in this section does not claim to be complete. There are additional norms, such as building regulations and codes that apply and differ depending on the type and location of a project, or the stipulations under Supreme Order No. 22940 that establishes the Carrasco National Park.
[2] Ley No. 1333 – Ley de Medio Ambiente, 27 de abril 1992
[3] Ley No. 2074 – Ley de Promoción y Desarrollo de la Actividad Turística in Bolivia (14/04/2000)
[4] Decreto Reglamentorio No. 26085 – Reglamento de Establecimientos de Hospedaje Turístico (24/10/2001)

Therefore projects or activities that were initiated prior to 1996 fall under the System of Control of Environmental Quality (Sistema de Control de Calidad Ambiental, CCA). The CCA requires the elaboration of an Environmental Manifest (Manifesto Ambiental, MA). The manifest identifies the impacts and classifies them according to the environmental norms included in the regulations. The MA points out the parameters of the project or activity that are within or outside the norms.

Depending on the impacts identified and the parameters outside the norms, the company has to develop a Plan of Environmental Adjustment (Plan de Adecuación Ambiental, PAA). The PAA outlines how the company will get the parameters that are outside any norms within the same. The authorities allow for a period of five years for achieving and fulfilling the PAA.

The Environmental Manifest and the PAA, if required, will be revised by the relevant authority. If accepted and approved, the authority issues the Declaration of Environmental Adjustment (Declaratoria de Adecuación Ambiental, DAA) to the company. The DAA is the environmental license for any project or activity initiated prior to 1996 and represents the legal document confirming compliance with the stipulations of Law 1333.

Projects, facilities or activities, public or private, initiated in 1996 or thereafter, fall under the Evaluation of Environmental Impact (Evaluación de Impacto Ambiental, EIA). This procedure requires that prior to the initiation of construction and operation the owner elaborates an Environmental Fact Sheet (Ficha Ambiental, FA). The FA, prepared during the pre-feasibility stage of the project, has to identify the foreseen extent of the environmental impacts caused by the planned activity.

Based on the information provided in the Environmental Fact Sheet, the authorities classify the project according to the degree of environmental review required. There are four categories:

- A project where a full study of the EIA of the action is required;
- A project where a specific study of the EIA of sub-activity(ies) is required;
- A project where a conceptual environmental review is required;
- A project where no environmental review is necessary.

If classified into category 1 or 2 the project will, if the EIA is approved by the appropriate environmental authority, be issued a Declaration of Environmental Impacts (Declaratoria de Impactos Ambientales, DIA). Again, the DIA is the environmental license confirming legal compliance. Category 3 and 4 do not need any environmental impact study and are equal to or represent the environmental licenses. All work and studies under the EIA procedure have to be carried out by authorized and approved consultants.

With reference to protected areas article 60 to article 65 of Law 1333 establish that said areas have to be administered in accordance to management plans in order to protect and conserve the natural resources, but also to allow for recreation, education and promotion of ecotourism.

Norms for the creation, management and conservation of protected areas will be established in special legislation (see below section on Regulation for Protected Areas).

Law No. 2074, Law for the Promotion and Development of Tourism Activities in Bolivia and Regulatory Order No. 26085, Regulation for Tourism Accommodation Establishments
The regulatory order No. 26085 stipulates the operation of tourist accommodation establishments and assigns responsibility to implement, supervise and verify tourism activities and policies to the Tourism Units at the Prefectures of each Department.[5]

Accordingly accommodation establishments have to register their activity in the Departmental Register of Tourism. The different tourism establishments are classified into categories such as hotels, hostels or inns, lodges, and hotel boats (*floteles*). To legally operate a tourism accommodation establishment the owners or operators have to apply to the Tourism Unit at the Prefecture and submit the following documents:

- Testimony or contract of the Company, if applicable
- Opening balance
- Registration with the National Service of Business Register (Servicio Nacional de Registro de Comercio (SENAREC)
- Inscription in the tax roll (Registro Unico de Contribuyentes, RUC)
- Letter of authority for the legal representative, if applicable
- Identification document for the owner (individual businesses)
- Characteristic of the tourism accommodation establishment, describing installations and infrastructure.

Once the Tourism Unit has reviewed and verified compliance of the submitted documentation, the authority issues the authorization to operate and register the company in the Departmental Register of Tourism. Unauthorized tourism accommodation establishments are considered "intruismo empresarial" and will be sanctioned.

Further the law exceeds compliance with applicable laws regulating the sector and refers to the Departmental Health Services for health and safety norms. Regarding any tourism accommodation establishment operating in a protected area the law stipulates that any such activity has to comply with the norms established by the National Service for Protected Areas (SERNAP).

[5] Bolivia is structured into Departments instead of states or provinces (Departamento). The Departments are governed and administered by the Prefecture (Prefectura).

Supreme Order No. 24781, Regulation for Protected Areas

The Regulation for Protected Areas was established in reference to the Law 1333 and to biological diversity legislation[6] to regulate the administration of said areas. Objective of the administration of Protected Areas is:

- To support the conservation of the natural heritage and biodiversity of the country through the establishment of the National Service for Protected Areas;
- To guarantee participation and responsibility of the local communities in the management and upkeep of the protected areas;
- To ensure that operating and conserving the Protected Areas contribute to improving the quality of life of the local population and regional development; and
- To develop capacity within the local and regional population to enable the communities to support and develop planning, management and conservation of Protected Areas.

The principal objective of any tourism activity in Protected Areas is environmental education and ecological awareness of the visitors. Tourist activities and visitor access is restricted to areas designated for public use based on the management plan or the annual operative plan. Furthermore visitor access can be restricted on the basis of administrative requirements such as carrying capacity, maintenance, or monitoring in protection of the areas' natural resources.

The management plan addresses issues such as zoning, location of tourist areas with their respective infrastructure, facilities and services. Tourism planning within Protected Areas requires setting up a methodological system to evaluate, control and mitigate negative impacts or damaging effects of the natural resources or the population as a result of any tourist activity.

The construction of infrastructure and the provision of services are only allowed when they have been applied for and if they are in accordance with the Tourism Program of the management plan or the annual operational plan.

Construction of infrastructure and services are limited to: trails, interpretive centers, shelters, lodges, ecological hotels, visitor centers including basic food services, documentation and exhibition centers, local museums and signage.

Any construction will have to be designed in harmony with the natural environment, use local materials and local architectural styles on a small scale, with low impact and low density. Projects should favor renewable energies.

Tour operators and tour guides have to be trained to promote conservation of Protected Areas. Tour operators have to obtain a license and tour guides need to be accredited by the administrative authority of the Protected Area. In this context the authorities will promote

[6] Convenio sobre Diversidad Biológica aprobada por la Ley Nº 1580 de 15 de junio de 1994

training of local guides of the communities and indigenous population from the Protected Area or from communities that live close by.

2.2.2 USAID Regulations

Further to national legislation support and implementation of any USAID-funded project or activity is obliged to adhere to USAID Environmental Regulations (22 CFR 216). The following explains the process by which USAID missions overseas are to design environmental review processes that:

- On one level, have to ensure that project impacts do not harm the global or U.S. environment and;

- On a more local level, also have to ensure that impacts within that country's borders are addressed.

These regulations move through a series of analysis that begin at the macro-level – major programming activities – and then lay out how environmental issues are taken into account for specific activities and finally how site-specific analysis will be done. Below is a brief description of these series of analysis.

Initial Environmental Examination – This is the first action taken by the USAID Mission in a country or region to review the reasonably foreseeable effects of a proposed action (or group of actions) on the environment. The purpose of the IEE is to gather basic pertinent information on the environment and the actions. This information is analyzed and organized into a brief environmental statement describing the situation. This brief statement serves as the factual basis for the USAID Bureau Environmental Officer (BEO) Environmental Threshold Decision on the action(s).

Environmental Threshold Decision (ETD) – This is the formal USAID decision that uses the information contained in the IEE to determine whether a proposed action is a major action significantly affecting the environment. Threshold decisions can result in a categorical exclusion, a negative determination or a positive determination.

Positive Determination – This is given to actions determined to be major actions significantly affecting the environment. The positive determination signifies that action must be taken by the Agency (mission) to define procedures that identify and mitigate adverse environmental impacts for this category of actions. To accomplish this, the positive determination may request that an environmental assessment (EA), an environmental impact statement (EIS), or a programmatic environmental assessment (PEA) be conducted before the major action is implemented.

Categorical Exclusion – This is issued to actions that fall under certain criteria described in USAID regulations 216. These actions are exempted from the need to perform an environmental assessment or environmental impact statements. Conditions of extreme emergency, activities in training or education are types of activities that can be given a decision of Categorical Exclusion.

Negative Determination – This is given to actions that are determined to not be major actions significantly affecting the environment. This determination can be given to actions that are small and very local in scope and that are already adequately addressed with respect to environmental impact by existing Agency (mission) procedures.

Environmental Assessment – This is a detailed study of the reasonably foreseeable significant effects, both positive and negative, of the proposed action on the environment of a foreign country or countries. Its purpose is to provide USAID and host-country decision makers with a full discussion of the significant environmental issues and effects of the proposed action(s). Environmental assessments can be prepared for activity types, for programs of similar activities and for specific sites.

Environmental Impact Statement – Performed for actions that are determined to significantly affect the global environment or areas outside the jurisdiction of any nation (e.g., oceans), the environment of the United States, or other aspects of the environment at the discretion of the Administrator. It is a specific document with a definite format and content as provided in NEPA and CEQ regulations. The actions being undertaken in the tourism and eco-tourism facilities and activities in the Chapare Region will not warrant an EIS.

Programmatic Environmental Assessment (PEA) – The PEA is conducted in order to assess the environmental effects of a number of individual actions and their cumulative environmental impact in a given country or geographic area, or the environmental impacts that are generic or common to a class of agency actions, or other activities that are not country-specific. To the extent practicable, the form and content of the PEA should be the same as for project assessments. Supplemental EA on major individual actions are only necessary where such follow-on or subsequent activities may have significant environmental impacts on specific countries where such impacts have not been adequately evaluated in a former study.

Environmental Management System – The entire process described by the 22 CFR 216 procedures designed for a particular action or set of actions, resulting in a set of guidelines, processes, decision-making nodes and assignments of roles and responsibilities.

2.3 Definitions of Concepts, Facilities and Activities

This manual has been prepared to guide the environmental design, implementation and operation of tourism and ecotourism facilities and activities in the tropical region of Cochabamba. Current and planned tourism initiatives in the Chapare focus on developing and promoting the natural treasures of the area and its surroundings. The majority of tourism sector stakeholders in the Tropics of Cochabamba wishes to promote an active nature and adventure tourism in the region. Hence the potential of the Chapare lies in ecotourism.

The development and promotion of ecotourism is growing throughout the world and has inevitably caused a certain abuse of the terminology and consequently some misunderstanding about what ecotourism is. In order to avoid any confusion about the concept of ecotourism and what it entails, the following present the most common definitions:

- Responsible travel to natural areas that conserves the environment and sustains the well being of the local people (*The International Ecotourism Society*);

- "Environmentally responsible travel and visitation to relatively undisturbed natural areas in order to enjoy and appreciate nature that promotes conservation, has low visitor impact, and provides for beneficially active socio-economic involvement for local populations" (*World Conservation Union, IUCN*).

Consequently the design, implementation and operation of facilities and activities that are being promoted under an ecotourism concept and want to serve the market of ecologically interested and oriented tourists should integrate the following elements:

1. Conservation and promotion of nature
2. Respect for local cultures and benefits to the local communities
3. Economically feasible development and operations
4. Quality interpretive experiences for the visitors.

Existing facilities and activities in the Chapare

The hotel infrastructure in the Chapare includes establishments of very different standards. Most documentation studying the Chapare accommodation infrastructure uses the following three categories to classify the establishments: hotels, lodges (alojamientos) and hostels or inns (hostales).[7]

Capacity of the accommodation establishments in Villa Tunari ranges from 3 rooms at the San Silvestre to 35 at the Hotel Victoria Resort.[8] The uncompleted Chapare Tropical Resort is designed to offer 118 rooms.

The overall number of accommodation establishments in the Villa Tunari area varies according to the source. The Hotel Association for the Tropics of Cochabamba (Ashtropic) reports 42 establishments as members including private residences offering bed and breakfast during high occupancy holidays. However, with the decline in tourism since 2000 several properties have been rented out to institutions or have temporarily closed down operations. For example the following places listed by Ashtropic are currently not operational as hotels: Las Pozas, Los Tucanes, San Martín and Chapare Tropical Resort.

It is important to note that the majority of establishments in the Chapare classifies under the category lodge or hostel and serves a clientele with reasonable demands looking for an economic lodging solution.

[7] The Decreto Reglamentario No 26085 categorizes establishments offering accommodations as follows:
- A hotel is defined as having a minimum of 20 rooms with individual bathrooms and a restaurant offering full service;
- A lodge (alojamiento) is defined as featuring 10 rooms and more with individual or common bathrooms as well as breakfast service; and
- A hostel or inn (hostal) is defined as having a minimum of 10 rooms and common bathrooms with no food service.

[8] The Hotel Victoria Resort features 26 rooms and 9 cabañas that according to the Resident Manager can accommodate up to 120 guests.

When categorizing hotels according to size classification systems refer to the quantity of rooms. Therefore a hotel:

- With up to 50 rooms is considered small
- With 51 to 150 rooms is classified as medium
- With more than 150 rooms is categorized as big.

The established indicators for water and energy consumption to benchmark environmentally friendly hotel operations have been developed according to the above classification considering the infrastructure and the installations of the hotel.

In the case of the Chapare all accommodation facilities would be classified as small with the single exemption of the non-functional Chapare Tropical Resort (CTR). The CTR with 118 rooms would be considered a medium-sized hotel. For the purpose of this guidance manual it seems to be more appropriate to adjust the classification of size to the existing infrastructure and the definitions given in the above quoted legislation. Therefore this guidance manual and the PEA refer to:

- Small-scale tourism facilities for accommodation establishments with up to 10 rooms
- Medium-scale tourism facilities for accommodation establishments with 11 to 50 rooms
- Large-scale tourism facilities for accommodation establishments with more than 50 rooms.

Activities

The principal activities or attractions in the Villa Tunari area are:

- The Cave of the Guacharos (also called oil bird, Cavernas de Repechen) in the Carrasco National Park
- Machia Park, a tropical property featuring trails, walkways and wild as well as domesticated animals adjacent to the town
- La Jungla, a canopy walk with various fairly rustic swings
- The Orchid Garden with museum at the entrance to Villa Tunari

The most frequented attraction is the Cave of the Guacharos that received 3,479 visitors in 2003 or an average of 10 visitors a day. Other activities such as “La Jungla” have barely received any visitors since the decline in tourism in the year 2000. In addition there are a few tour operators, partly based in Cochabamba, that offer rafting, hiking, or mountain biking in the Chapare on special request.

3. Environmental Impacts of Tourism in the Chapare

3.1 Tourism in the Chapare

Villa Tunari serves as entry point to the Chapare for travelers coming from Cochabamba. The town accounts for most of the tourism infrastructure in the Chapare and lists around 30 accommodation establishments being located within or nearby the city limits.

According to a study of the local hotel sector prepared by the "Fundación Bolivia Exporta" the properties that had been investigated reported a capacity to accommodate 667 guests[9]. The study assumes that an occupancy rate of 100 percent is achieved during a total of 45 days of the year with 27 of these days being scheduled around national and local holidays. The provided data calculate into approximately 30,015 guest nights or an average annual occupancy rate of 12.8 percent for the establishments of the study.

Regarding the origin of the guests, the study reports that about 70-80 percent are national tourists, between 10 to 30 percent are foreigners and around 10 percent are guests coming from institutions, for example, project staff for alternative development efforts. No data could be found for the average lengths of stay of the tourists to Villa Tunari.

Due to the social unrest that has been erupting since 2000, visitor numbers have dropped considerably and various establishments could not be located or were not operating as hotels.

Although estimates of average occupancy for all establishments in the Chapare vary between the 13 percent established in the above quoted study to 20 percent mentioned by representatives of the sector, it becomes clear that hotel infrastructure in the Chapare has been underused and suffers from overcapacity.

3.2 Ecosystems

The climate in the Chapare is dominated by high levels of precipitation. The yearly amount of rainfall in the Villa Tunari area can reach up to 6,000 mm per square meter. Further east toward Chimoré and Bulo Bulo the annual rainfall is lower (around 3,000 mm).

The geography is dominated by numerous rivers running from the mountain ranges on the west, and the south of the valley to the north, toward the Amazon basin. The change and movement of river beds has been affecting various hotel properties. Six of the hotels visited during the field trip have lost considerable sections of their terrain to the meandering rivers.

The region is located in the subtropical region of the upper Amazon basin. It borders on several biologically distinct ecological units that occur due to the unique climatic and topographic features of the area.

Following the terrain from northeast to southwest, elevation changes abruptly along the southwestern margin of the program area. This change in elevation, coupled with the latitude of the area and the local climactic conditions, has produced an interesting assemblage of life zones that cross between the tropical and subtropical latitudinal regimes. Depending on the system of

[9] As the study did not include all establishments, it did not capture total capacity, which is estimated around 1,000 beds.

classification used, one could identify numerous discrete zones that result from the various microclimates created by the regions topography. To simplify the issue, the Holdridge Life zone classification was used to describe the region in ecological terms.

There are basically five principal Holdridge Life Zones represented in the study area. The largest of these in surface area is the *Tropical Wet Forest Zone*. This zone occupies the lowlands east of the mountains and generally covers the entire CONCADE program area. It is characterized by generally warm temperatures throughout the year coupled with a large volume of annual rainfall. This is also the most disturbed forest type in the region as much of the land has been cut for timber and converted to agricultural use.

The floristic component of the forest in this zone is characterized by dense evergreen tree communities of 40 to 50 m composed of rapid-growing species such as *Ceiba pentadra, Hura crepitans*, *Terminalia amazonica*, *Dipterix odorata,* and *Swietenia macrophylla*. The pioneer vegetation, typically found on riverbanks, generally consists of *Tessaria integrifolia, Gynerium sagitatum, Salíx humboldtiana,* and *Oplisnemus hirtellus*.

Along the northwestern margins of the program area lie the next life zone. This is the *Subtropical Premontaine Wet Forest.* The change in elevation and increased complexity of the mountain topography depresses the annual temperature but maintains a relatively high rainfall for the area. Dense, mostly evergreen forest dominates the area but tree heights are typically less than 30 m. These communities exhibit a relatively high biodiversity and are characterized by palm trees associated with tree species such as *Euterpe precatoria, Astrocarium aculeatum, Iriartea deltoidea, Attalea princep. C*haracteristic species include *Cardulovica palmate, Swietenia macrophylla, Cederla lilloi, Juglans boliviana, Myroxilum balsamum.*

The *Subtropical Lower Montaine Wet Forest* component lies further up the mountain slope and is a dense, mostly evergreen assemblage with tree heights typically less than 25 m. Trees are typically covered with an abundance of epiphytes. Representative species include *Polylepis incana, Budleja andina, Baccharis spp, Escallonia racemosa, Esperomeles ferruginea,* and *Cyathea boliviana.*

The fourth zone is the *Subtropical Montaine Wet Forest* or cloud forest. This area is usually shrouded in fog with the relative humidity at 100 percent virtually 100 percent of the time. It is located in the higher parts of the eastern mountain range where the temperature remains relatively cool. This forest type is characterized by dense evergreen growth. The trees typically do not exceed 25 m in height. This forest is particularly rich in biodiversity, and owing to its key location within the mountains and this region of forest is particularly important for the protection of the upper mountain soils, and watersheds. Representative species include *Cyathea boliviana, Myrica cerifera, Nephelea incana, Boconia frutescens, Brunellia coroicoana, Weinmania microphylla, Weinmania crassifolia, Fucchia boliviana, Freziera angulos,* with a rich assemblage of epiphytes.

The last zone is the *Paramo* located at the top of the mountains. This is an elevation of approximately 4,000 m and reflects the effects of both temperature and rainfall reduction. At this elevation, much of the moisture has been removed from the easterly winds and cloud development is typically at a slightly lower altitude reflected in the cloud forest formation. Trees

at this altitude are dwarfed and, at slightly higher elevations, near the crest of the mountain ridges, grasses dominate. This is likely an effect of human intervention as the elevation is not above the tree line for the region. The climate is cool and frost or sleet can develop as conditions permit.

Regional protected areas or lands with special status include:

- *Multiple Use Forest.* (Ministerial Resolution No. 066/92). Includes untouched primary forests and others that have been heavily impacted, significant expanses of secondary forest, and fallow land. This is the area where the forest companies still log.

- *Chapare immobilized forest.* (Ministerial Resolution No. 065/92). Includes primary forests with productive potential, suitable for forest concessions to private entities and local social associations (ASL, Spanish acronym).

- *Yuqui Native Communal Land.* (Supreme Decree No. 2311). Lowlands, principally with primary forest, with high potential for ongoing production.

- *Yuracaré Native Communal Land.* (Immobilization Resolution RAI-TCO-0006). Lowlands, principally with primary forest, with high potential for ongoing production.

- *Carrasco National Park.* (Supreme Decree No. 22940). Includes the administrative centers of the settled areas between 350 and 4,500 m.a.s.l. with a high level of biological diversity, access in relatively good condition. The park currently has high importance and great potential for ecotourism. The park is threatened by agricultural expansion.

- *Territorio Indígena Parque Nacional Isiboro Sécure* (TIPNIS) [Indigenous Territory of the Isiboro Sécure National Park]. (Executive Order 07401/1965 and Supreme Decree No. 22610 of 1990). Forest lands between 200 and 2,500 m.a.s.l., with a high level of biological diversity, medium to high potential for forest production in the lowlands. Currently almost 100,000 hectares. Settled, strong human impact, heavy logging and stockbreeding activities.

3.3 Potable Water Extraction and Treatment

In the Chapare there are several providers of potable water. Villa Tunari has a municipal drinking water system sourced from an arroyo located about 15 kilometers south-west of the town close to boundary of the Carrasco National Park. The system provides fresh water to residences and businesses in and around the city of Villa Tunari. Due to limitations in design and increasing demand, the system cannot serve all its customers. Currently the municipality is extending the area of extraction for its water supply and plans to install a filter system prior to the already existing chlorination.

Villa Tunari Public Water Collection System

Other providers have stepped in and there are several cooperatives that extract water from subsurface sources and have installed distribution systems. Some businesses, private residences and dwellings use well water or water from creeks close or adjacent to their properties.

In general potable water in the Chapare is gained from sources on the surface, such as small rivers or creeks mainly on the foothills of Carrasco National Park. Fresh water treatment is limited to chlorination. However, due to transportation and temporal storage in tanks by the end users any residual chlorine injected at source has been used up by the time the water reaches the consumer. Although the Chapare benefits from high levels of rainfall, the harvesting of rainwater is rarely used.

3.4 Wastewater Treatment

As of February 2004 there was no complete municipal sewage system operational in the entire Tropics of Cochabamba. Villa Tunari has a sewerage system in the central part of town, but according to the mayor's office the pipe network is old and in need of repair or replacement. Although the wastewater is collected from properties in town, there is no treatment plant. Instead the untreated sewage is discharged into one of the rivers.

The town of Ivirgarzama has a wastewater collection system, but was also lacking a treatment facility. A new treatment plant (oxidation ponds) is under construction and should become operational within 2004.

Oxidation ponds of Ivirgarzama's new wastewater treatment plant

With no municipal sewerage system available outside the city centers, most properties including the hotels visited by the PEA team have septic tanks to partially treat their wastewater. Design and construction details could not be confirmed, but from the information provided it has to be assumed that the majority of the septic tanks in the area are "one chamber holding tanks" that allow liquid waste to drain basically untreated into the subsurface as unsettled sewage.

Improvement of Basic Infrastructure

Within the "Municipal Strengthening" component of the Support Program to the Alternative Development Strategy[10] implemented by PRAEDAC, a European Union funded project, the municipalities of the Chapare are assisted in implementing several basic infrastructure projects, such as:

- Construction of a wastewater drainage system for the urban population of Entre Rios
- Construction of two wastewater treatment plants for 5,000 inhabitants
- Improvement of the potable water system for Shinahota including a new water intake and an 8 inch pipe supplying an 80,000 liter storage tank.
- Construction of a new wastewater treatment plant for the town of Ivirgarzama.

Although these projects should improve the situation of fresh water supply and wastewater treatment, improvements will be limited to urban areas. Consequently any tourism facility outside the developed urban areas will have to treat the wastewater it generates on property.

[10] Programa de Apoyo a la Estrategia de Desarrollo Alternativo en el Chapare

3.5 Solid Waste Generation and Management

PRAEDAC data indicate that 14,992 tones of waste are generated per year in the Chapare. Of this quantity 6,996 tons or 47 percent are organic.

Currently waste management in the municipalities of the Chapare is limited to the most basic service. For example the mayor's office of Villa Tunari and Ivirgarzama organize collection of solid waste in the city centers. In Villa Tunari solid waste is collected twice a week on Mondays and Thursdays. For this service the crew operating the truck for the recollection charges residents $1 Bolivar, and hotels and businesses $3 Bolivars per pick-up. Villa Tunari has no official dump site or landfill; instead the waste is dumped in different locations, often close to river banks. According to the person responsible for the Department of Forestry and Environment in the mayor's office, the waste is spread out, sprayed with diesel and burnt.

Solid waste dump site close to Ivirgarzama

Hotels in the Villa Tunari area that are not serviced by the municipal waste collection service are forced to manage their solid waste on site. Waste management ranges from basic separation of some recyclables to burning and burying the waste on property.

3.6 Energy Supply and Consumption

All hotels in Villa Tunari and surroundings that were visited by the PEA team are connected to the electrical supply grid operated by ELFEC, the regional electricity provider. According to the ELFEC office in Villa Tunari there is no supply shortage in the Chapare. The power company operates a substation in Chimoré that is supplied by various power plants from outside the region.

All properties visited have electricity meters and receive monthly invoices reflecting demand, kilo-Watt-hours (kWh) consumed, and cost. Although none of the hotels had documented their

consumption and cost for electricity, the revision of the September 2003 invoice of one hotel reflected the following details:

- Fixed basic rate: $19.70
- Cost per kWh: $0.556
- Charge for 20kW demand: $405.80
- Public lighting: 10.445 percent of the sum of 1, 2 and 3

In this specific case the consumption was 930 kWh and total cost $1,041.50 Bolivars, or $1.12 Bolivars/kWh. The invoice does not reflect any tax, however value aggregated tax is included and claimed by the company's accountant. ELFEC applies a sliding tariff whereby the cost per kWh varies depending on consumption. But the example shows that with an average cost of almost 14.5 U.S. cents per kilo-Watt-hour[11] the price for electricity is high and will make up a considerable component within the operational budget of any tourism or eco-tourism facility that is consuming electricity from the local grid.

3.7 Social and Cultural Aspects

The population of the PEA study area in the Tropics of Cochabamba is distributed by "Municipios" or municipal divisions as indicated in Table 3.1.

Table 3.1 Population of Tropics of Cochabamba

Province Division	Capital of division	Total Population	Urban Population	Rural Population
Chapare				
Division III	Villa Tunari	53,996	8%	92%
Carrasco				
Division IV	Chimoré	15,264	25%	75%
Division V	Puerto Villarroel	39,518	16%	84%
Tiraque				
Division I	Tiraque	35,017	12%	88%
(includes Shinahota)				

Source: 2001 National Population and Housing Census. The data presented above include the entirety of Division I of the Tiraque province because it was not possible to separate the population that lives within the Tropics of Cochabamba (including, for example, Shinahota) from those who live outside it.

The majority of the population speaks Quechua as its mother tongue. Aymara is the third most common mother tongue after Spanish. Together the presence of the two indigenous languages reflects the directed and spontaneous settlement of the lowlands. The indices of social development in the area indicate gaps in meeting basic needs in 2002. Less than 8 percent of the

[11] In February 2004 the exchange rate fluctuated around $7.8 Bolivars per 1 US dollar.

population had access to sewer services; just 28 percent of the inhabitants had access to drinking water systems, and approximately 20 percent of the population does not know how to read or write.

The demographic profile of economic activity reflects the importance of agriculture, which is the primary activity of approximately one third of the economically active population in the region. By contrast, the tourism sector is still a small component of employment in the region, as suggested by the data on the hotels and restaurant sector, which accounts for approximately 1.3 percent of the total economic activity in the Tropics of Cochabamba.

3.8 Local Political and Social Structure

Organizational and institutional characteristics of the Cochabamba Tropics are represented by civil society institutions and organizations that support economic and social development, governmental agencies. These fall under the framework of administrative decentralization in the country, international cooperative organizations, and private non-profit institutions.

Civil society organizations are represented by:

- The Special Federation of Rural Workers of Cochabamba
- The Special Federation of Colonists of the Carrasco Tropics
- The Special Federation of Colonists of Chimoré
- The Sole Federation of United Centers
- The Special Federation of Traditional Zones of the Chapare
- The Special Federation of the Chapare Tropics
- The Federation of Rural Workers of the Tiraque Tropics

At the community level, the organizational unit is the Agrarian Labor Union that unites the members of a denominated colony. The supra-community organization is represented by the central labor unions, which is further articulated in federations. There are 85 centers and 892 labor unions to which are affiliated 41,694 rural workers. There are 77 Farming and Livestock Producers Associations in the Cochabamba Tropics, 50 Water Administration Committees, and Base Territory Organizations.

Indigenous groups are organized in municipal indigenous districts at the community level and are further articulated at a higher organizational level in the indigenous people's centers. In our case, the Yuracaré indigenous groups belong to the Beni Indigenous Group Center (CPIB) and the Yuqui indigenous group to the Cochabamba Tropics Indigenous Group Center (CPITCO).

In the past 20 years, the indigenous peoples of the east mobilized in pursuit of a territory in which they could live and develop; this process occurred after many years of being marginalized while their vital spaces were invaded. In 1997, the INRA Law recognized the indigenous peoples' right to own Native Communal Land (TCO, Spanish acronym). Title to the TCO of the Yuracaré People has now been properly cleared and turned over. The land also has dual status as a National Park (Indigenous Territory of the Isiboro Sécure National Park); TIPNIS (Spanish acronym); title to the Yuqui TCO was provisionally turned over by Supreme Decree.

4. Guidelines and Best Practices for Eco-tourism Facilities and Activities

On the outset the guidance manual was intended to provide guidelines for the design, implementation and operation of tourism and ecotourism facilities and activities. When investigating tourism activities in the Chapare, it became obvious that the tourism potential of the region rests in its nature, biodiversity, flora and fauna and geography. All tourism activities, if existing or planned, focus on promoting or developing the natural treasures of the area and its surroundings.

With the Chapare's potential as an ecotourism tourism destination, the *guidelines are geared more toward serving the ecotourism concept*, which represents the product the tourism stakeholders in the region plan to market in the future.

Furthermore as a result of the findings of the Supplemental CONCADE Programmatic Environmental Assessment (PEA) for Tourism Activities in the Tropics of Cochabamba, USAID will no longer support the addition of room space to the region relying instead on market forces to drive such investments. In accordance with the PEA, future aid activities will focus on assistance to existing operations and in the development of regional tourism attractions.

Although this decision and the preferred alternative No.3 focus on support for activities and itineraries, but consider only limited construction support confined to repair, renovation and rehabilitation of existing establishments and possible new small-scale facilities, the guidelines do include sections on planning, design and construction of ecotourism facilities because:

- Several of such facilities are currently planned, e.g., a number of cabins along the Laguna Paraíso as part of a project implemented by PRAEDAC, and shelters or possibly cabins as support infrastructure to the "Trail above the Clouds,"[12] a project implemented by Conservation International and PRAEDAC.

- Existing hotels or accommodation facilities might want to add room capacity and eventually.

- New facilities might be constructed by private sector initiatives if the market demands such investment.

In all cases the present manual should serve as a source of reference to environmentally sound planning, implementation and operation for existing and future ecotourism facilities and activities.

4.1 Planning and Design

The principal idea of ecotourism is to offer environmentally responsible travel and visitation to relatively undisturbed natural areas in order to enjoy and appreciate nature. Consequently, the planning and design of an ecotourism facility in an area marketed as ecotourism destination will have to integrate these aspects.

[12] Locally the project is referred to as "Camino sobre las nubes" or "Camino Antigua."

But planning, designing, and building an ecotourism facility takes more than an architect. S/he may be asked to work with a biologist, ecologist, landscape architect and sociologist or anthropologist. The goals of this design team would be to:

- Design common facilities including water and waste management infrastructure, recreational facilities, health, safety and emergency services, employee housing, and circulation systems;

- Protect the natural environment throughout the implementation of the project;

- Work with local institutions to improve site planning and design as needed;

- Meet many of the informational requirements and provide the basis for the preparation of the Environmental Impact Assessment required under national legislation;

- Prepare the final facility development plan that achieves integrated design of the entire area, including cost estimates and recommendations for phasing development.

4.1.1 Site Selection and Site Design

In general the success of an ecotourism facility depends partially on the initial processes of site selection. In the current context of ecotourism development in the Chapare, facility development is foreseen as support infrastructure of the so-called circuits, tours or itineraries. This simplifies the site selection process, because the facility will be within one of the tours or activities being developed in the Chapare.

Nonetheless the process of site selection for ecotourism facilities is one of identifying, weighing, and balancing the attractiveness (natural and cultural environments) of a site against the costs inherent in its development (access, hazards, operation and maintenance). The site should support the facility development within biophysical and natural resource limits while offering visitors a diversity of experiences particular to the place. Some of the issues that need to be considered in the site selection process are:

- Views, slopes, hydrology, soils, climate, and vegetation.
- Ease of accessibility and transportation resources.
- Existing infrastructure – water, wastewater treatment, electricity, telephone.
- Proximity to potential markets.
- Effects of seasonal change.
- Potential impacts of development.
- Limits of acceptable change, i.e., the tolerance of the site and region to withstand change.
- Proximity to outstanding natural, historical, and cultural attractions.
- Availability of inputs (energy, materials, labor, products).
- Availability of acceptable locations for disposal of waste outputs.
- Proximity of goods, services and housing.
- Property rights.

Of the above, the three issues that play a crucial role in the success of an ecotourism facility, and need to be addressed in detail, are:

- Access
- Potential impacts of development
- Communities participation

Access

When considering access issues for ecotourism facilities, it is important to considerthe following:

- Access to local resources and services (food, building materials, fuel, labor, water sources)
- Access to quality environmental values (e.g., natural ecosystems, local culture and history)
- The nature of the development in relation to these factors
- The tourism appeal of the area

The means of access will determine the total travel time, thus affecting the mood of visitors and influence their expectations of the ecotourism experience. Sites, which involve longer – possibly more tiring – travel time, and diverse means of transport will create different expectations of a destination than shorter and singular means of access.

1. Consider proximity of the ecotourism facility to airports and major transportation routes in the region.
2. Consider travel distance and the natural and cultural features that can be accessed from the site as criteria for site selection.
3. Strike the right balance between ease of approach and minimization of negative impacts on the natural environment.
4. Seasonal conditions will have potentially significant impacts on travel conditions and convenience. Be certain that seasonal climatic variations and commercial transportation schedules will not disrupt guests' ability to either enjoy or reach the facility.
5. Consider ease of access when deciding on a site for a shelter. Particularly consider the most likely visitors (disabled visitors, older people, young children.) when deciding between ramps, stairs and distances between amenities/public areas and shelters.
6. Capitalize on expectations by exploiting the pace and drama of arrival and access through the site by carefully surveying access routes.

Assessing Impacts of Development

This is a preliminary "brainstorming" component of the site selection process. The assessment of the impacts should be evaluated at a number of scales, such as the immediate site of the tourism

facility and the surrounding local environment. At each scale, the assessment of direct impacts should acknowledge different site conditions and characteristics and therefore different site responses to activities.

All aspects of the development – access, population, activities, design of accommodations and services, management and monitoring of the facility – depend on this factor. If the initial assessment of the site for the facility is not properly conducted, the development could seriously threaten the environment and degrade the very experience desired by eco-tourists.

Ecotourism developments, if facilities or activities, must be determined on the basis of what the ecosystem of a proposed site can sustain. One technique for evaluating the tolerance of an environment to change is called “limits of acceptable change.” This technique evaluates the extent to which an environmental condition or factor is susceptible to change and then establishes a threshold value, “the limit of acceptable change” that should not be exceeded in order to protect the resource. The limits of acceptable change need to be determined at an early stage. This provides the framework for planning, design development and detailing of the facility or activity.

1. Make environmental and cultural impact lists for each of the sites selected for both the construction and operation phases of the development of the facility. For example, will the development prevent or restrict the traditional use of the land or resources by local cultures?

2. Consider short-, mid- and long-term scenarios for development impacts.

3. Determine the limits of acceptable change. Ask questions such as:

- What are the acceptable environmental values and conditions of an area?
- How much natural change is anticipated and, given that baseline, how much man-made change would be acceptable in a given setting?

Site Analysis

Once the optimal site has been selected, a more specific analysis must be carried out. An ecotourism facility is not separable from the natural site in which it is located, and for this reason analysis of the natural and cultural characteristics of the site must take place before the design and building stages.

Key members of the design team should spend at least two to three days on site to research the characteristics of the site. It is recommended that the design team either meet with or be joined by a member of the local community who is familiar with the site’s natural and cultural conditions.

Since tourism developments are placing increasing demands on natural resources, new and better tools are required by planners and landscape architects for analyzing the potential impacts of planned new developments in the selected area. Satellite imaginary is widely used in the Chapare and in connection with Geographic Information Systems (GIS), a computer-based technology.

Both techniques can provide supporting information necessary to effectively plan facilities and activities and monitor their impact.

Three main issues need to be addressed when conducting a site analysis:

- Bio-physical features
- Cultural and heritage features
- Existing infrastructure

Biophysical Features

It is important to be familiar with the most common landscape features before beginning to analyze them on the specific site. They can play a significant part in the development of ecotourism facility the Chapare. In any of these common features, there are six biophysical features that are crucial to a successful facility and activity development: climate, geology, hydrology, topography, vegetation and wildlife.

Analyze the site with regard to major biophysical features:

- **Climate:** Monthly and yearly mean precipitation, monthly temperature variations: mean, maximum and minimum; temperature variations (day/night), absolute and relative humidity; solar incidence all through the year; solar intensity; local potential for generating solar energy.

- **Geology:** Sedimentary, igneous, and metamorphic rocks; seismic characteristics of the site; resistance and compaction of soil; fitness for different types of foundations.

- **Hydrology:** Presence of arroyos, streams, rivers, lagoons; flood plains, risk and frequency of floods, depth of water table, water quality.

- **Topography:** Dominant landscape forms, including the horizon.

- **Vegetation:** Dominant, characteristic and threatened floristic species; identification of focal (flagship) floristic species (if any) from the ecotourism attraction viewpoint and precise location of specific individual plants of particular interest or beauty.

- **Wildlife:** Types and estimated number of species of native fauna (mammals, birds, reptiles, amphibians, fish and invertebrates); their seasonal use of the habitat in terms of resident, and or transient species; identification of focal species regarding their degree of ecotourism attraction (the most beautiful, singular or rare).

Cultural and Heritage Features

Apart from the biophysical features discussed in the preceding section, it is equally important to perform an analysis of the local cultural elements (both of the past and the present). This analysis will also provide important input for the subsequent design and construction stages.

Local history and people are the existing matrix into which visitation must fit. Sustainability principles should seek balance between existing cultural patterns and new development.

Promoting an understanding of local cultures and seeking their input in the development processes can make the difference between acceptance and failure.

Study the local population and their distribution and distance from the proposed facility or activity. This analysis will help to determine use of local labor, benefits to local people, and the architectural style of the facility.

Identify the noteworthy cultural and historical elements, that are near the site in terms of:

- Specific ethnic groups
- Traditional settlements
- Local traditions and folklore: language, architecture, clothing, handcrafts, dance, music, ceremonies, magic, and religion
- Potential for integrating design with cultural environment
- Ways of avoiding negative impacts on local culture

Analyze the limits of acceptable change of the local and heritage features.

Study the cultural and heritage features in terms of health and safety. Are there health or safety problems in presenting the resource to eco-tourists?

Obtain permission for your guests to view or participate in cultural events.

Existing Infrastructure

An analysis of the available infrastructure and local services at the location of the facility or activity and its vicinity is important, considering the remoteness of the Chapare and the adjacent National Parks that are included in the development of tours and activities.

It is important to mention that frequently in those sites, which are more appropriate for ecotourism facilities development, there are limited or no infrastructure elements or public services because of typical isolation and remoteness.

Analyze the existing infrastructure that is present on and around the site. Some of the infrastructure that needs to be researched are:

- Conventional systems for providing electricity, drinking water, sewage, telephone line, public lighting. The quality and quantity of electrical power can have a major effect on the proposed ecotourism facility. Availability of potable water can determine whether there will be a need to tap ground water, surface water or rainwater. Public sewer facilities can eliminate the use of on-site septic tanks and efficient telephone connections can help toward necessary communication needs.

- Communication means: roads, trails (tracks), airport, landing fields, rivers. Travel distances from all the major transport modes in the region to the site should be analyzed. This research will be of help during the planning stages.

- Emergency medical services. The type of services and facilities, medical personnel qualifications, location, evacuation procedures, and response times must be well documented in order to determine how to provide this type of service to guests.

- Garbage collection and disposal, schools, commercial facilities, etc. Close proximity to garbage disposal will eliminate the need for costly on-site waste disposal facilities.

- Local means of transport: land motor vehicles (bus, taxi, rent-a-car); regular commercial, charter, or private flights, motor boats, ferries.

Roads, Trails and Walkways

Building a road into a pristine site is a serious intervention that will change the site forever as roads tend to create irreversible impacts.

Since trails are meant to be interpretative, it is very important that they be designed and planned hand in hand with the rest of the site. The information obtained from the site analysis is vital and should be used to prepare an inventory of the various landscapes and wildlife that exist in the nature trail area.

In an ecotourism facility, even the visitor walkways should follow the natural settings in their pattern and their attributes.

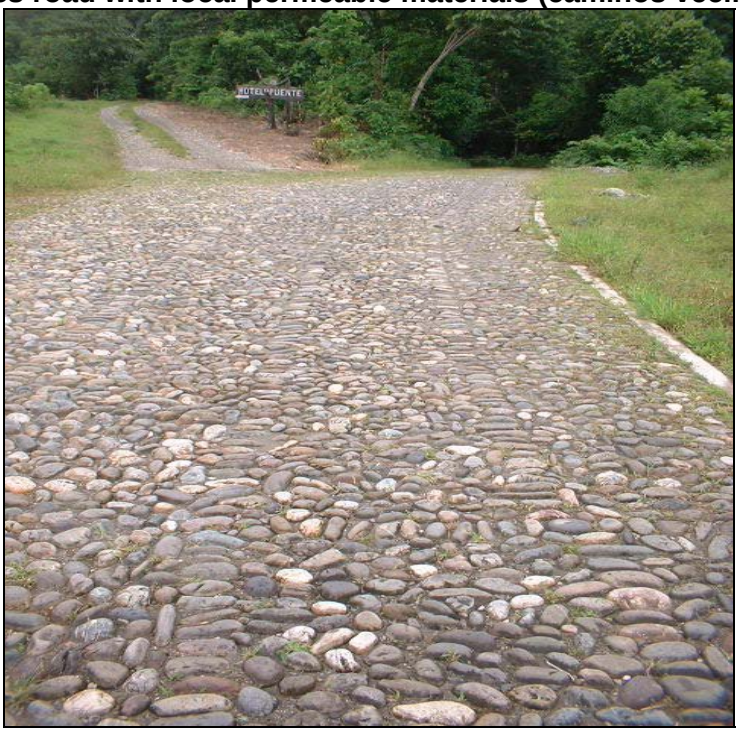
1. Provide erosion controls for all roads, trails and walkways. Deviate water flow away from trails and roads before it attains too much speed and intensity and starts creating erosion problems. Also, control vegetation on the sides of the trail, periodically trimming as to avoid invading the path or disturbing circulation.

2. Always use low impact and low profile techniques and materials. The surface of any trail and walkway should be resistant to continuous use, but avoid the use of concrete or asphalt and synthetic pavements, if possible. It is better to use natural permeable materials or surfaces that allow water absorption by the ground and not surface flow. Use materials such as gravel, sand, wood shavings, small cross sections of tree trunks or branches or boards.

3. All roads, trails and walkways should respect wildlife movement patterns and habitat requirements, as well as location and growth and expansion patterns of the local flora.

4. Organize the walkways within the facility in organic patterns. People coming to your facility are looking for natural settings. Provide that to them, even in the walkway patterns.

Access road with local permeable materials (caminos vecinales)



Grading and Drainage

Every tourism facility site is in a watershed, and everything the developers and eco-tourists do on a site has an impact on the watershed's condition. Sediment from soil disturbance, oil leaks from tourist cars, and fertilizers pollute streams, while excessive runoff aggravates flooding and erosion.

Grading: Any necessary grading should maintain a natural, gradual appearance. Grading should not encroach upon the drip lines of trees to be preserved, unless tree preservation techniques such as tree wells are utilized. Nor should any heavy equipment or topsoil storage occur within drip line zones.

Storm Drainage: In a modified landscape, consideration must be given to the impacts of storm drainage on the existing natural system of drainage and the resulting structures and systems that will be necessary to handle the new drainage patterns.

1. Keep site grading to a minimum and avoid alteration of existing drainage systems and vegetation.

2. Use vegetated trenches or ditches as a natural way of conveying concentrated runoff. This is more environmentally friendly and more aesthetic than structural gutters or pipes. When runoff contacts vegetation and porous soil, its volume is reduced and pollutants are filtered.

3. Avoid disturbing natural storm water runoff channels but, regulate (when necessary) runoff of new storm drainage channels to provide protection from soil erosion.

4. Note any drainage ditches that need to have unimpeded flow.

5. Reduce disruption to watercourses and existing drainage patterns. Disruption of existing water flow patterns will result in damage to plant life downstream.

6. Avoid allowing heavy equipment storage to occur within drip line zones.

7. Keep site construction and earthwork away from drainage courses as this preserves vegetated buffers and protects stream quality.

8. Require the use of erosion control devices and temporary silt fences during the construction process to avoid erosion or surface runoff. Runoff during construction must not cause damage to adjacent properties.

9. Do not directly channel runoff from ecotourism facilities rooftops or other impervious surfaces into manmade or natural water bodies, unless methods of infiltration are provided. Diversion of runoff into existing natural trenches is encouraged.

Native Plant Landscaping

Site design that emphasizes native trees, vines, shrubs, and perennials also helps to maintain the biological diversity of a region and preserve the character of regional landscapes. Native plants have become adapted to natural conditions of an area such as seasonal rainfall, pest problems, and native soils. The native landscape as it exists in its present state can be an asset. On the other hand, non-native plants increase demands on soil improvement or fertilization. A higher demand for water, a concern with non-native plants in other regions, does not seem to be a problem in the Chapare in view of its high annual precipitation rate.

Working with what the land has to offer is the key to creating a human-made environment that exists in harmony with the natural one.

Interpretation of the restoration areas will inform and educate the public on the value of native landscape restoration. Protection of existing resources in the ecosystem is the fundamental purpose of sustainable design.

1. If native plant populations exist on a selected site, it is crucial that they be preserved through careful site planning. Existing trees should be protected by avoiding cut and fill in root zones and preventing heavy equipment from disturbing the area around and under them.

2. Around the facility try to plant native trees and other native floral species. Remember that trees provide shade, climatic and erosion control, possess high aesthetic contents and provide suitable habitats for birds, lizards, butterflies and other animals. When reforesting, combine different native species.

4.1.2 Community Participation

The development and promotion of tourism is new to the Chapare. Although the Tropics of Cochabamba has been a transit area since the completion of the main road connecting Santa Cruz with Cochabamba, the traffic of goods and persons and hence the contact between local population and visitors is confined to the principal road and the service and support infrastructure alongside that road.

There is no tourism or hospitality tradition in the Tropics of Cochabamba and the development of tourism in more remote areas of the Chapare is of a more recent nature. The local population is not necessarily accustomed to the reception and treatment of visitors and tourists from outside the region. Actually the traveler is frequently advised to exercise care in the choice of destinations in the Chapare, a situation partly caused by the socio-economic background of the region. The socio-ethnic composition of the Chapare might also play a role in local sentiments toward persons foreign to the region. The Tropics of Cochabamba has for the past decades seen the immigration of settlers originating from other regions of Bolivia. The indigenous population has been pushed to the southern parts of the Tropics of Cochabamba and today the Chapare is home to a variety of ethnic groups.

Therefore it is essential for any tourism or ecotourism project to actively involve the local community at the location where the activity is planned to be implemented. The example of the "Trail above the Clouds" has shown that sometimes a community is not interested in the development of a tourism activity in its immediate area.[13]

Site selection decisions have to take into account the values, ways of life and interests of the local communities. Perhaps first and foremost, planning for any tourism facility or activity must ensure local acceptance, approval and interest in participation. The idea of nature and ecotourism is the active involvement and participation of local communities. Thus local residents will be able to share their environment and culture with visitors and secure a source of income that can help them sustain their ways of life.

Respect the privacy of the local people. Prevent any action that may cause intrusion on their privacy, religious beliefs, and cultural values.

1. Ask the following questions during the site selection process:

- What cultural features (both past and present) are found at or near the site?
- Be certain that the privacy of the local people is respected in the conduct of tourism activities.
- What benefit will the local people receive from the development of the facility or activity?
- Does the site have any sacred significance to local communities?
- What is the availability of human resources in existing communities to construct and service the facility?

[13] When consulting local communities in the project area if they would like to participate in the development of the trail, one community declined and stated it was not interested.

- What is the organizational structure of the local communities?

1. Check if the site for the facility has any claims from local families or indigenous groups. If so, try to reach a settlement before initiating the design process. Also consider the property rights and the right of way through adjacent lands for future excursions.
2. Protect traditional sites (fish camps, settlements, and animal grazing areas) for their continued use – whether located in protected areas or elsewhere.

4.1.3 Permits and Licenses

The basic procedure to obtain the environmental license required under Bolivian Law 1333 and its regulation has been explained in chapter 2.3. The following lists laws and regulations that have to be complied with when planning the construction and operation of a tourism or ecotourism facility or activity:

- Law No. 2074, Law for the Promotion and Development of Tourism Activities in Bolivia[14]
- Regulatory Order No. 26085, Regulation for Tourism Accommodation Establishments[15]
- Law 1333, Law of the Environment, and the respective Regulation of the Law of the Environment D.S. No. 24176
- Supreme Order No. 24781, Regulation for Protected Areas.

4.2 Building Design

The concept and objective of ecotourism should be reflected in the building of an ecotourism facility in order to allow the visitors to experience and learn about the aesthetic, biological, physical and cultural values of the natural environment. Sustainable design balances human needs with the limits of acceptable change of the natural and cultural environments. It minimizes environmental impact, importation of goods and energy, as well as generation of waste. The ideal situation would be that if development was necessary, an ecotourism facility should be constructed from natural sustainable materials collected on-site, generate its own energy from renewable sources such as solar or water, and manage its own waste.

Sustainable building design must thus seek to:

- Use the facility as an educational tool to demonstrate the importance of the environment in sustaining human life

- Promote new visitor values and lifestyles to achieve a more harmonious relationship with local, regional, and global resources and environments

- Increase public awareness about appropriate technologies and the energy and waste implications of various building and consumer materials

[14] Ley No. 2074 – Ley de Promoción y Desarrollo de la Actividad Turística in Bolivia (14/04/2000)
[15] Decreto Reglamentorio No. 26085 – Reglamento de Establecimientos de Hospedaje Turístico (24/10/2001)

- Nurture living cultures to perpetuate indigenous responsiveness to, and harmony with, local environmental factors.

Physical Structure Siting

1. Properly position the ecotourism facility on its lot. The following is a typical list of features to evaluate in designing an overall concept for the location of all physical structures:
   - Note the best natural views from the site. Provide signage for these areas to enhance the visitors' appreciation.
   - Preserve the existing vegetation and other natural habitats. Provide signage for these areas to enhance the visitor's appreciation and to help protect the resources.
   - Avoid blocking the views that adjacent owners have of mountains, rivers, jungle.
   - Proper sun orientation can provide adequate shade during the summer as well as desirable light in living areas.
   - Locate your driveway to meander around trees and other natural features.
   - Avoid building on low areas of the site where humidity will be higher and breezes lower.

1. Note the location of the utility corridor in front of your facility.

2. Site the buildings on the most disturbed parts of the site. The best parts of the site should be retained and protected. By building on degraded or disrupted parts of the site the building process can actually be one of repair not damage. Particularly look for erosion gullies, graded or cleared areas, old roads or tracks, quarries, or stock affected areas as potential sites.
3. Locate treatment facilities, pumping stations, and sewage treatment plants, solid waste disposal sites and other mechanical equipment where view, odor and noise will not be a problem, or where visual screening and noise controls are feasible.
4. Locate roads, trails and parking areas to minimize erosion and interference with the natural flow of surface water.
5. Preserve the best mountain or river views for shared functions that people really enjoy. Remember that provision of a room with a view is not the only criteria for a good guestroom.
6. Avoid harmful discharges, and provide for adequate mixing by locating discharge points at a suitable distance from, e.g., fresh water sources (wells).
7. Consider any servicing issues (water, power, and waste) in the location of the ecotourism facility. Service trenches, cables and pipes can cause significant site damage unless well sited or avoided.

Climate Sensitive Design

Climate is a critical factor to consider in the design of sustainable tourism or ecotourism facilities. Designing for climate:

- Can provide for the reduction of energy consumption through controlling and utilizing the sun and wind
- Is a primary influence on the type of construction and the materials used for construction
- Can provide a basis for the form or style of the facility

The local microclimate is a main determinant in the direction that buildings should be oriented. Traditional hotels are oriented toward the best view, whether sea, mountains or rivers, regardless of the actual direction. This puts an extra load on the energy consumption through higher air conditioning and ventilation demands.

Each climatic region requires a different approach to building design, construction and material selection. It should be noted that the conditions specific to a particular site, or its microclimate, can have a significant influence on the most appropriate design solutions.

The application of the building orientation toward the prevailing winds using wind catches and appropriately designed openings, shade and shadow, fountain and water surfaces, cross-ventilation, heat resistant and thick walls, and other passive and natural techniques are all free and accessible.

Heating, Cooling and Ventilation

Sharp differences in temperature between closed and open spaces can create an unpleasant, even unhealthy, environment for guests. The best solution to overcoming these problems is to employ passive ventilation systems whenever feasible, and to limit the use of mechanical air conditioning to conditions where it is essential.

Properly designed facilities require much less heating and cooling energy, and cheaper, simpler heating and cooling equipment to maintain standards of comfort higher than can be achieved in hotels that are not energy-efficient. Controllable cross-ventilation aided by ceiling fans, windows and louvers that seal tightly when closed, can avoid or limit the need for artificial cooling:

- Investigate passive solar design, especially to reduce solar gain (and resulting space cooling needs). Aim to reduce internal heat load through good solar design.
- Consider evaporative cooling systems, e.g., the use of internal courtyard fountains and pools. Moisten the air blowing into the building by allowing it to pass over water in a pool, in earthenware containers and wide, shallow bowls, or through vegetation. To enhance cross-ventilation it is more advisable to employ floor plan elongated solutions, instead of compact ones.
- Good insulation, verandas, landscaping and natural ventilation can also reduce internal heat gain.
- Foster cross-ventilation in the design, which implies placing openings in opposite and parallel walls so as to induce natural airflow from outside and cooling interior spaces.
- Evaluate the comparative economic benefits of using appropriate HVAC systems by calculating the cost savings associated with (a) initial cost of the equipment; (b) operational and maintenance costs of the systems; (c) availability and cost of maintenance labor skills; and (d) availability and cost of spare parts.

Indigenous Architectural Styles

If time is a factor, traditional buildings are usually cheaper and more sustainable than conventional reinforced concrete structures. But, it does not suffice to merely copy the native forms. The general form of buildings should be responsive both to the environment and the objectives of the development. However, these factors can both constrain and influence the form of a building.

1. Before drafting the first design for the facility, visit the site and talk to the local people and the local master builders. Study the local architecture and develop a set of intrinsic guidelines for the design before it is drafted. These guidelines should analyze and explain the meaning of the local architectural elements and vocabulary used.

2. Consider local and traditional building forms and building processes. Natural local stone walls can provide countless variations for architectural designs, yet they contribute to a uniform and harmonious landscape. They are gentler, modern in thought, and are more appropriate to their sites. Their natural texture and color may be left intact, or when necessary, light colors that protect the building's inner environment may be used.

3. Remember that the main reason for an eco-tourist coming to the facility is the opportunity of being in close contact with nature (in some cases, supplemented by interesting cultural elements). Therefore in the facility, the architectural form should not compete with the natural landscape and the surrounding vegetation, but should be harmoniously integrated with the environment.

4. Take into account the following four basic principles when determining the form or shape of buildings:

    - Form should be appropriate to the site
    - Design should minimize visual impacts
    - Forms should have gentle contrast
    - Forms should follow the contours of the land and the vegetation

5. Incorporate modern appropriate technology so as to adapt the traditional forms to the present requirements of hygiene and life style of the contemporary tourist.

6. Use colors that harmonize with the natural environment: the forests, the plants, the rivers, and the mountains.

Lighting

Every activity in a facility or building has its own lighting need and every individual conducting these activities might have a different lighting need. Day-lighting should be incorporated wherever possible in the building as it will increase the quality of the indoor environment, provide a more natural ambience, and reduce lighting loads. Take the first step toward environmentally conscious lighting and carefully consider opportunities for natural lighting.

With advances in modern technology, several different types of low-voltage lighting are available, from LED to fluorescent light fixtures.

1. Avoid over-lighting, especially in hallways and other public areas. Use natural lighting whenever possible.

2. Use fluorescent lights wherever possible, as they are at least three times as efficient as low voltage lights and five times as efficient as incandescent lights.

3. Low voltage lighting is not low energy lighting. If used, it should be restricted to critical display applications only. Lower wattage globes are preferable to the more widely used 50-watt low voltage bulbs.

4. Use energy efficient lighting systems. Typically, good lighting design will include ambient lighting for general background definition, task lighting for individual work, and accent lighting to feature certain areas or objects.

Building Materials

Considering the main objectives and essence of ecotourism facility development, the basic materials used for the construction of the facilities can be a determining factor in the success of the facility. Most experts agree that, since ecotourism facilities should be built within the natural landscape and need to represent the local authentic architectural style and character, natural building materials should be used. However, blending with nature is not the only factor in the use of building materials, but also in the way these materials are extracted, treated and used.

It is important to have in mind certain climatic considerations, such as heat, humidity, rainfall, in order to choose the most suitable building materials. If access by road or highway implies covering long distances, the transportation of materials supplied from far away sources may imply high freight costs and fuel consumption.

The selection of materials for the construction and furnishing of the facility (and other communal buildings) will determine the:

- Impact of the facility on local, national and regional resources
- Ease of the construction process and therefore overall savings
- Possibilities for staging and growth
- Level of short term (during construction) and long term (during operation) site damage
- Ongoing maintenance required
- Reaction of visitors to the appropriateness of the facility.

The use of local materials has a number of economic and environmental benefits, provided the impacts of extraction and processing are not substantial. These include:

- Creation of new business and employment opportunities in the local economy.
- Reduction of transport costs and its associated environmental impacts.

- Availability for ongoing maintenance and repair needs.

1. When addressing issues of availability, durability, and cost-effectiveness, carefully investigate traditional building materials. First, the architect should ensure that the materials used are renewable and abundant in supply. The materials should also be durable and not require frequent replacements; they should be able to withstand the forces of nature.

2. Whenever possible employ materials that are naturally found in the area (rock, stone, wood, thatch palm) and whose extraction is reasonably easy and low impact. Only when some of these materials are scarce or non-existent or correspond to threatened native species should you opt for bringing materials from elsewhere.

3. When using local materials, extract them in such a way that the minimum environmental impact is produced.

4. Use of locally available materials will probably benefit from the fact that local builders are already skilled in the use of these materials.

5. Building specifications should reflect the environmental and conservation concerns as related to timber products and other building materials. If you utilize wood, it is important to know its source. Ensure that the wood is from a certified sustainable source (the C-23 project can assist with the identification of sustainable harvested wood in the Chapare).

River stones locally used for foundations and walls

4.3 Construction

Managing the construction process must be an important goal so that it causes the minimum amount of negative impacts on the site. The construction process may cause major site disruption that may take time and money to repair. Building in the least sensitive places, limiting site access, minimizing construction time, and reducing waste are important basic strategies to be considered in achieving this goal.

Probably the greatest damage to a site takes place during the construction phase. Hence it is critical that for any facility or building, a detailed construction plan specifies each one of the steps that need to be taken and identifies the responsible parties for each task.

1. Site damage can be reduced by considering the following:

    - Selection of contractors to construct the works should be based on past performance with fragile sites and the ability to organize and build in rural remote areas

    - Building contracts for the works that specify environmental misconduct and related fines

    - Available storage areas on or near the site and areas of land that are clearly off limits

    - Methods of materials delivery and on site handling that are acceptable

    - Machinery and tools that can be used on the site

    - Where and how the building team can be accommodated during construction, and all associated energy, water and waste issues associated with this construction camp

2. Avoid disturbing high quality areas. Work with natural topography as much as possible. Time construction to avoid migratory and spawning seasons. Apply grading controls and require rapid re-landscaping of disturbed areas.

3. Building construction areas should be minimized. This can be achieved by carefully planning and controlling activities with the use of fencing in order to reduce disturbance to existing soil, hydrology, vegetation and fauna.

Construction Equipment and Facilities

The equipment used for construction should consume little energy and be non-toxic. For example, generators produce waste fuel that needs to be collected and reused or disposed off.

1. Plan the exact location of storage areas for building materials, tools, machinery and equipment before you start to build. Optimize distances to cover for ease of construction.

2. Storage, temporary or otherwise, of equipment or materials should not be permitted under the drip line of trees. Storage should occur within driveway and parking limits of the site.

3. Pre-construct/pre-fabricate to the maximum extent possible. This construction technique will minimize site damage, and can potentially improve quality, and ensure timeliness. At a minimum, this type of construction technique may be particularly appropriate for employee housing, maintenance and storage structures.

4. Given the remoteness of many sites, be certain *prior to construction* that there will be a skilled workforce, availability of all tools, parts, hardware, fixtures, and fuel.

5. On-site facilities and storage should be kept to a minimum and tightly controlled.

6. Hand excavate foundations whenever possible, avoiding heavy machinery to minimize environmental impacts.

7. Construction worker housing will need to be either provided or its availability verified. The construction workers housing may be transformed to the employee housing at the conclusion of the construction phase of the development.

8. If the workforce resides at a considerable distance from the site then reliable means of transportation for their commute needs to be verified, and/or provided.

9. Provide toilet facilities for the workers on the job site in a discreet location.

10. When and where appropriate containerized transport equipment may be especially cost effective. The containers can serve many purposes such as for transport, safe and secure storage of materials on site, and as methods for removing waste from the site at the conclusion of the construction.

Traditional Construction

The economics of building forms may be easily understood by looking at traditional building processes and buildings that utilize these traditional technologies. The advantage of traditional construction processes is that they employ local builders and building materials at local rates with minimal costs for transportation or accommodation. It also provides the local community with temporary and permanent jobs in the area of construction and building maintenance. The use of appropriate technologies also encourages the development of local traditions.

1. Whenever possible use traditional building procedures (or at least be based on them) and try to employ local hand labor in the construction process in order to generate regional socio-economic benefits.

2. Incorporate traditional construction techniques in the design and construction of the facility.

3. Whenever possible, use the output of site extraction to produce local building materials. This will save a substantial component of the project investment budget, and will also boost the local culture and employment market.

4. Use local craftsman for finishing and installation even where raw materials may need to be brought in from outside the region (wood products).

Modern Construction

A successful scenario for a tourism facility may involve a combination of traditional and modern building techniques, drawing on those aspects of each that have the least ecological impact and that are most efficient in use and maintenance over the long term.

In the search for sustainable technology, architects should not discard modern knowledge. At times, modern building technology can be of significant ecological value to the facility through energy-efficient tools and methods of construction.

1. Any modern technology that you choose to apply in the facility should be environmentally friendly, non-hazardous, energy-efficient, and respectful of local cultural conventions.

2. Consider applying energy-efficient methods of construction, such as hand-operated vibrators for roofing sheets, block-presses for making stabilized earth blocks, appropriate passive and active solar technology, and clean modern prefabrication systems for building.

3. Use modern materials that meet criteria such as low energy costs and minimum pollution associated with production, procurement and transportation, as well as contribution to the local economy.

4. In applying modern materials, the architect should emphasize the use of environmentally friendly options such as ceramic tiles made from crushed light bulbs and recycled clay, and decking from a composite of sawdust and bits of plastic.

Construction Waste Disposal

The construction process produces a considerable volume of solid waste material, which must be contained and disposed of properly. One effective measure is to fence the construction site to help contain small cans and waste paper (boxes, wrappers, cement bags, and other packaging materials). Another useful measure would be to bury and re-grade sites where construction debris is disposed of, rather than leaving unsightly mounds at the back of an otherwise attractive new development site.

Re-using and recycling will avoid waste disposal costs and may generate income from the sale of surplus materials.

1. A general policy should be that all building wastes be removed from the site. The more prefabricated parts, the less waste generated and the less damage to the site during construction.

2. Open trash piles should be prohibited. Construction debris should be placed in dumpsters or wood boxes. Waste compactors should be made available at a designated site for solid waste.

3. Use suppliers who will take back unused materials.

4. The size and shape of pre-fabricated materials should be considered carefully to minimize unused off cuts. Some thought and effort at the time of ordering can bring large financial savings as well as environmental benefits.

5. Produce the minimum amount of waste possible and appropriately treat all your refuse, recycling and reusing as much as you can.

6. Topsoil or material extracted from footings should be redistributed on or near the site.

4.4 Infrastructure, Support Systems and Operation

Early in the facility planning process, innovative infrastructure and systems must be identified as well as measures to assure environmental compatibility including the treatment and management of wastewater effluent, solid waste, protection from contamination and efficiency in distribution systems.

The least expensive initial investment often may prove not to be the best course of action. Proper facility design and equipment selection may require high initial costs, but this initial investment can often be recovered quickly through savings in operation costs.

In addition to the selection of appropriate technologies, a carefully performed cost analysis should also reveal other sources of potential cost savings. These factors include economies of scale that may be achieved by partnering with the local community; determination of the availability of skilled labor to repair infrastructure systems; and access to spare parts that would be essential for maintenance and repair operations.

4.4.1 Energy Management

Ecotourism facilities should be a showcase for energy management techniques and equipment. By reducing energy use and harvesting energy from renewable sources, reduction in the contamination of the air both on the site and in the wider environment can be achieved. Just as the site of a facility has primary natural and cultural resources, it has primary renewable energy resources, such as the sun or water streams. The availability, potential, and feasibility of primary renewable energy resources must be analyzed early in the planning process as part of a comprehensive energy plan. The plan must justify energy demand and supply and assess the actual costs and benefits to the local, regional, and global environments.

With known technologies, the intelligent use of primary renewable energy resources can benefit any development. Solar applications range from hot water preheating to electric power production with photovoltaic cells. Small hydro-powered generators can provide electricity and pumping applications in some areas.

Lighting is also one of the easiest areas to make the biggest impact on cutting energy consumption. Currently, new low-energy lighting options can save almost half of the energy costs used in small hotels, cabins or shelters.

1. In the design stage, you should anticipate avoiding the use of high-energy consumption equipment and hazardous materials.

2. Use waste heat to increase the energy efficiency of some processes. For example, waste heat from refrigeration or air conditioning equipment may be used to pre-heat water.

3. Staff should be trained and assisted in developing an environmental awareness that includes applying measures to conserve energy.

4. Highly efficient motors are commercially available, and reduce energy consumption cost-effectively. Ask suppliers for written information on motor efficiency.

5. Avoid using an oversized pump and motor, which unnecessarily add to capital and running costs.

6. Explore the feasibility of using waste heat from power generation facilities to produce potable water and/or to heat water.

7. Explore natural methods for drying clothes. Create sunrooms with translucent roof tiles.

Although electrical power is readily available in the Chapare, more remote locations are lacking a grid connection. Therefore any facility should install energy efficient equipment when considering air conditioning systems, water heating systems, and pumps. As stated, part of the selection process for equipment should consider the option to recover heat from any equipment.

Excessive energy consumption also caused by inefficient use of energy results in increased operating cost, reduces profitability and needlessly increases the facility's impact on the environment. Energy conservation is not limited to the bigger installations such as air conditioning and water heating. Other energy conserving features include the installation of:

- Energy saving (fluorescent) light bulbs
- Occupancy sensors or key-cards to operate guest room a/c units
- Photo sensors to operate exterior lighting
- Automatic controls that operate equipments such as pumps or a/c units
- Conveniently located and identifiable switches

The most energy efficient equipment might still unnecessarily consume energy if operated inappropriately. Providing staff with training and clients with information can encourage both to contribute to the energy conservations initiative of the hotel. For example staff can be instructed to:

- Ensure that all lights, the TV and the a/c unit are turned off when cleaning and after leaving the room;

- Set the a/c unit to a defined temperature if the guest wishes his or her room to be cooled continuously;

- Close curtains to reduce exposure to direct sunlight that will heat the room;

- Review rooms immediately after check out, and switch off all lights and equipment.

Solar Power and Solar Water Heaters

As a way of decreasing use of gas and other polluting fuels, the use of solar energy is highly recommended, especially in areas where solar radiation is high. The technology is economical, easy to install, and its operations practically done without much expense.

Photovoltaic (PV) cell technology is available in Cochabamba and small PV systems have been installed in some health stations in the Chapare. Advantages of solar power include:

- No moving parts and therefore low ongoing maintenance
- No noise generated

With current technology it is possible to provide power at 240 volts allowing the use of standard appliances and the simple reticulation of power around a much larger site with either 12-volt or 24-volt power.

1. Study the costs, benefits, and drawbacks of different options of PV technology that can be used in the facility.

2. Avoid locating PV systems on the shadow areas of buildings. Study the shade patterns before placing solar panels.

3. Orient solar energy water heaters toward the south with an inclination similar to that of the geographical latitude of the site.

4. Consider using solar water heating and solar pumps for swimming pools.

5. Use efficient fluorescent lights to attain a higher efficiency in your PV system.

6. Research all the various solar technologies available locally and their costs and compare with those that are available overseas.

Solar water heating is a proven and readily available technology that uses the sun's energy to replace or supplement conventional water or pool heating systems. Solar water heaters are environmentally friendly, consuming no fossil fuels and producing no pollution.

They are used in Cochabamba and there are several companies that install systems. Although climate conditions between Cochabamba and the Tropics of Cochabamba vary considerably, in particular regarding the level of precipitation,[16] the majority of rainfall takes place throughout three month of the year and solar radiation might be sufficient to achieve satisfactory results with solar water heaters.

[16] Annual rainfall around Villa Tunari with 4,000 to 7,000 mm per year is several times higher than in Cochabamba.

4.4.2 Fresh Water Management

In an ecotourism facility development, where health considerations are paramount, water issues center on providing safe drinking, washing, cooking, and toilet-flushing water. The cornerstone of any water supply program should be conservation. Water conservation also includes using water of lower quality such as reclaimed wastewater effluent, graywater, or runoff from ground surfaces for toilet flushing or irrigation of vegetative landscape or food crops.

Visitor education and awareness are key to a successful water conservation program. At a facility development, the visitor should receive interpretation about the source of the water and how it is disposed. Positive reinforcement should be provided to visitors by informing them of their actual water savings as well as their responsibility in achieving the goal of water conservation.

In facilities, excessive amounts of natural and chemical nutrients contained in wastewater should be eliminated as this causes algae overgrowth in local creeks and rivers.

1. Carry out a moderate and rational use of fresh water. Apart from enhancing guests' ecological experience, it contributes to the educational component of ecotourism.

2. Minimize water consumption by installing low-flow showerheads and toilets, and flow aerators in faucets.

3. Install laundry and kitchen dishwashing water features and use pool covers to reduce evaporation at night.

4. Install flow meters and check regularly for distribution system leaks.

5. Identify the extent to which innovative water conservation measures can reduce water supply requirements and design supply facilities accordingly.

6. Avoid using fresh water for irrigation. Instead, use recycled water.

7. All installations need to be regularly maintained in order to ensure efficient operation.

The degree of treatment required to ensure that the fresh water supplied to the facility's installations does not pose a health risk to guests and staff depends on the water quality of the source. The water quality has to be examined on a regular basis. Testing and laboratory analysis of water samples will establish the water quality of the source and show possible contamination.

Fresh water treatment can reach from merely chlorinating to reduce the content of pathogens in the water[17] to a more elaborate treatment including sand and active carbon filters. Depending on the hardness of the water the facility might have to consider installing a water softener.

[17] Potable water supplied in the area of Villa Tunari is not treated or purified, but only chlorinated as in the case of the municipal water source.

In order to reach potable water quality more sophisticated systems would be required such as a reverse osmosis plant or a filter system including an ultra violet filter for additional disinfection. In case the facility does not process its fresh water to potable quality, it will have to inform its guests and staff accordingly and provide bottled water for hygienic use in guest bathrooms.

Harvest and Use of Rainwater

The area of Villa Tunari receives around 6,000mm/m^2 per year of rain and any facility should take advantage of this resource.

Properly harvested rainwater is clean and chemically pure and can thus be used in most facility operations that do not require potable water.[18] The principal benefits of harvesting and using rainwater are presented below:

1. The use of rainwater instead of hard tap water in the laundry can significantly reduce the consumption of detergents and other laundry chemicals. For example, a 1 grain/gallon (17 mg/liter) reduction in the hardness of the wash water can reduce the consumption of some detergent by up to 1 oz/100 lb of linen.

2. The use of rainwater water in the laundry can greatly reduce or eliminate the need to treat the wash water in a water softening column or with water softening chemicals.

3. Rainwater is naturally soft and does not deposit scale in water lines, plumbing fixtures and water heaters.

4. Rainwater harvesting reduces the amount of rainwater that is discharged to the ground or river during storms. This in turn reduces surface runoff, soil or river bank erosion, and the water logging problems that often affect the performance of soak-aways and tile fields during the rainy season.

[18] Rainwater is naturally soft and virtually free of iron and total dissolved solids (TDS).

Rainwater harvest at Los Tucanes

4.4.3 Wastewater Treatment

The discharge of untreated wastewater harms the environment. Water samples showing the presence of coliform bacteria indicate that the rivers of the Chapare, which also serve as a tourist attraction, are already contaminated with untreated sewage.

With municipal sewerage networks at best being available in urbanized areas such as Villa Tunari or Ivirgarzama, any facility outside city limits has to treat the wastewater it generates on property. There are several options to treat wastewater, such as activated sludge plants, oxidation ponds, and septic tanks with leachfields, graywater separation and collection.

Adopting sound wastewater management practices will help optimize the performance of the facility's wastewater treatment and disposal system. The facility should practice the following wastewater management practices regardless of the manner in which it will treat and/or dispose of its wastewater flows.

1. Do not discharge any untreated liquid waste into any river or other water bodies. This would mean ruining the resource base of any ecotourism activities on the region's rivers.

2. Arrest all liquid wastes on the site and filter/treat before reuse.

3. Use products that minimize liquid waste and are non-toxic. Use only biodegradable soaps and detergents.

4. Use water efficiently to reduce the volume of wastewater sent to the treatment/disposal system. Reducing the wastewater flow can greatly improve the performance of septic tanks, tile fields, soak-away pits, or a possible wastewater treatment plant.

5. Use graywater and clean wastewater flows for irrigation in order to reduce the volume of wastewater sent to the treatment/disposal system.

6. Avoid discharging problematic wastes into the drainage system, including sanitary napkins, cooking oil, grease and fat, lint, and wet-strength paper towels. These wastes clog drainage pipes and sewers, obstruct the outlet tees of septic tanks, reduce the holding capacity of the septic tanks, and can reduce the absorption capacity of tile fields and soak-away pits.

7. Minimize the use of harsh and toxic chemicals on-site to avoid harming the bacteria that purify the wastewater in septic tanks, tile fields and wastewater treatment plants. Harmful products include:

    - Bleach
    - Many toilet, sink and tub cleaners
    - Disinfectants
    - Drain cleaners
    - Strong acids and caustic

8. Make sure that maintenance chemicals (e.g., motor oil, spent solvents, paint) are disposed of properly rather than dumped down the drain. Some maintenance chemicals can severely disrupt the operation of septic tanks, tile fields and wastewater treatment plants.

9. Make sure that kitchen drains are equipped with well designed and well maintained grease traps. In order to ensure the proper performance of its grease traps, the property should:

    - Clean them regularly (by manually skimming the floating grease and solids, and removing the solids from the bottom of trap);
    - Not use chemicals, such as drain cleaners and acids, to dissolve the grease and solids that accumulate in the trap;
    - Not use hot water to dissolve and flush out the grease collected in the trap;
    - Minimize the discharge of solids and grease into the kitchen sinks; and
    - Make sure the grease traps are equipped with effective outlet tees.

10. Minimize water surges into the wastewater collection system. For example, roof gutters should never be connected to the wastewater collection system because the high flows produced during storms can easily overload septic tanks, tile fields, soak-away pits and wastewater treatment plants.

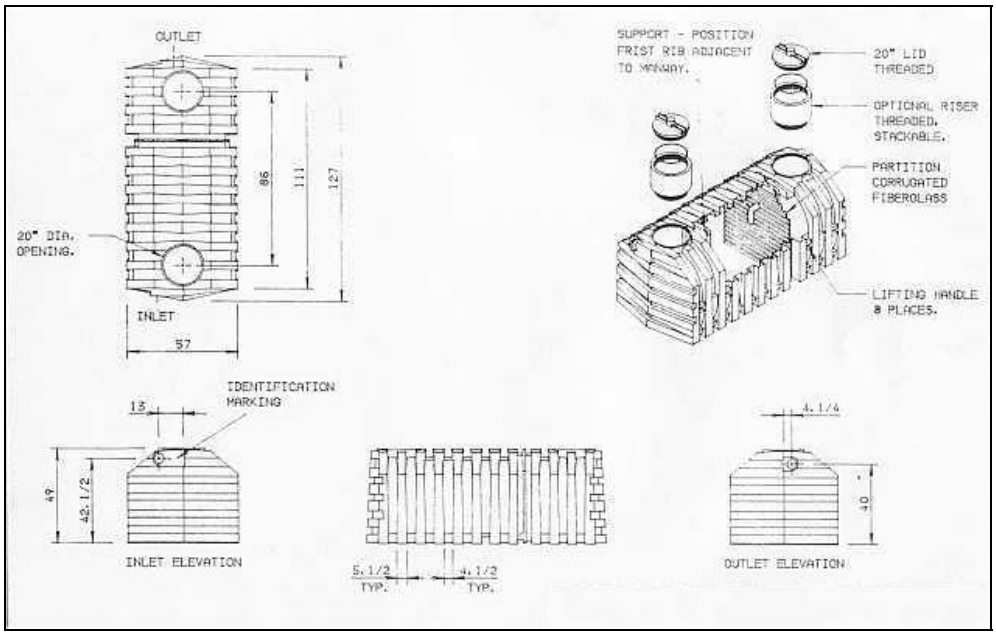
11. In addition to implementing the wastewater management practices listed above, any facility operating its own wastewater treatment system should make sure the plant operator is well trained and regularly test the quality of the treated effluent. This

training and quality control is particularly important if the treated wastewater is used for irrigation.

Septic Systems

A septic system consists of two main parts: the septic tank and the drain or leach field. The tank is a large, underground, watertight container that receives the wastewater of a house or building. While a typical septic tank might have a capacity of 1,000 gallons, the actual size of the tank is determined by the amount of wastewater that it receives. The tank can be made of concrete, fiberglass or polyethylene and is mostly rectangular or cylindrical.

Drawing of a prefabricated two compartment septic tank



To determine the required size of the tank, different formulas are used, but the principal idea is to allow a retention time of five days for the wastewater that flows into the tank during one day. Therefore the volume of a tank should be five times the volume of the average daily flow rate into the tank. The most common use for septic tanks is with residential applications for a fairly limited number of users. Sizing a septic tank for a small hotel might need to be calculated differently. A formula used for higher loads calculates the volume of a tank for a wastewater flow rate of up to 1,500 gallon per day as volume = flow rate multiplied by 1.5. For flow rates higher than 1,500 gallons per day the volume recommended calculates as flow rate multiplied by 0.75 plus 1,125.[19]

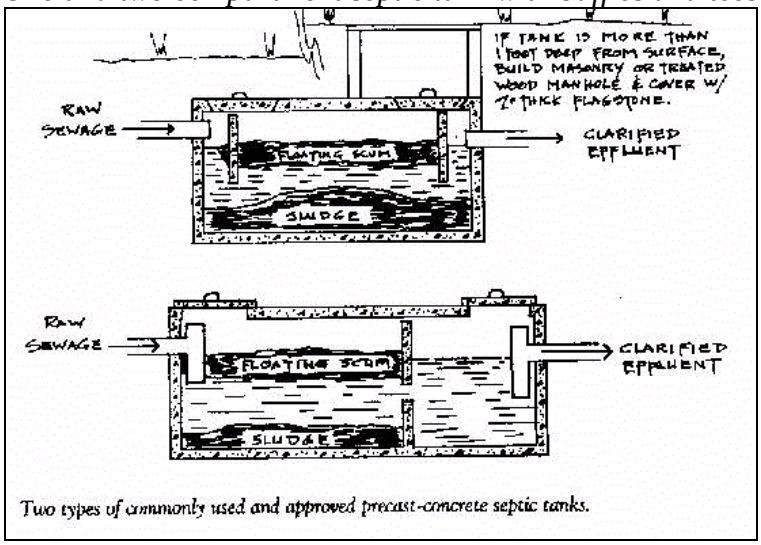
The need to allow for a five day retention time to achieve good treatment results causes either a considerable size of a septic tank for a small hotel or a number of smaller tanks serving, e.g., a limited number of rooms. In order lower the load on the septic system and keep its size within

[19] Wastewater generation in small to medium-sized hotel can vary between 70 to 150 gallons per person per day. The amount to the septic tank can be greatly reduced if graywater is separated and treated separately.

manageable proportions, it is important that the property implements water saving measures to reduce water consumption within its operation.

Septic tanks are built with one compartment or two compartments. A two compartment tank achieves a better settlement of the solids and hence a higher degree of treatment and quality of effluent. The inlet of any tank should be equipped with a tee or a baffle that slows down incoming wastewater and reduces disturbance of the settled sludge. The outlet should feature the same tee or baffle in order to keep the solids and scum in the tank.

One and two compartment septic tank with baffles and tees



Two types of commonly used and approved precast-concrete septic tanks.

As soon as the wastewater has flown into the tank, the heavier solids separate from the liquid and settle on the bottom of the tank as sludge. The lighter solids such as soap, fat or grease float on top of the wastewater and form a layer of so-called scum. Most of the sludge at the bottom of the tank is decomposed by bacteria, although some sludge remains.

After solids have separated, the wastewater passes a certain retention time and than flows out of the tank through a network of distribution pipes into the drain or leach field. The pipes in the drain field are perforated and the wastewater drips into the gravel, soils or sand that the pipes are bedded in. The soil below the leach field provides the final treatment and disposal of the wastewater. The effluent trickles from the pipes, passes a biological filter that naturally grows around the pipes and percolates through the soil toward the ground water. It is important that the septic tank and the drain are built at a sufficient distance to any freshwater well or surface water body on or close to the property.

A well designed and built septic system achieves good wastewater treatment results if it is used and operated properly. It is important that the treatment process in the tank is not affected by grease, oil, harsh cleaning products, pesticides or any other agent that would unbalance the anaerobic, bacterial process inside the tank.

In order to ensure correct operation of the septic system, the tank has to be cleaned in regular intervals (to be determined by inspection). Sludge and scum have to be pumped out by a professional cesspool operator that discharges the load into an adequate sewage treatment plant.

Pit Latrines

Pit latrines are the most rudimentary method for disposal of human fecal matter. It is not advisable as the permanent solution, but may be justified during the construction stage or at the very beginning of the operation, as well as in remote camping areas or in distant portions of nature trails. Actually pit latrines are widely used in the Chapare in particular in farm houses or dwellings.

A pit latrine is a hole in the ground (covered by a cabin) in which human fecal material is dropped. When the hole is filled up to about 1 m from the surface, the cabin with the defecation platform must be moved somewhere else and the hole completely covered by soil. A new hole is dug near the previous one.

Toilets must dispose of human waste safely and hygienically. Sensitive ecosystems can be adversely affected by the nutrients in human wastes, and the environment may also be affected by large quantities of contaminated water that are consumed and released by toilets.

1. In the case of sloping terrain, all pit latrines should be placed below the point where the local water source is found, and at least 1.5 m above the water table to avoid contamination. It is not convenient to use pit latrines in sandy soils that are too close to the water table.

2. To avoid unpleasant smells and proliferation of flies that occur in traditional pit latrines, it is highly recommended to use improved ventilated latrines, preferably with the pit offset from the latrine. Place an external ventilating pipe (diameter of 6” or 8”) coming directly out of the pit (fix a wire netting on the upper end of the vent to keep flies away). Paint the vent black so that the air inside will heat up, creating an ascending current and this will avoid bad odors from seeping into the latrine cabin.

3. Pit latrines should not be located near water sources or in depressions or runoff areas.

Dry Composting Toilets

A dry toilet, also called a composting toilet, consists of a large tank located directly below the toilet room. Wastes enter the tank though a larger diameter chute connecting to the toilet, and decompose in an oxygen-rich environment. No water is used for the toilet, but a bulking agent (such as wood shavings) is added to improve liquid drainage and aeration and to provide fuel. A small fan draws air through the tank and up the vent pipe to ensure adequate oxygen for decomposition and odorless operation. Internal components (such as ducts, baffles, and rotation tines) enhance the composition process. The finished compost can be removed from the lower end of the tank about once each year and used as a soil fertilizer. There are several commercial options of dry toilets in many countries around the world. In sunny climates, a black painted vent pipe may replace a fan.

Some composting systems use worms to speed up decomposition. The moisture content must be kept down so the worms do not drown. Compostable kitchen scraps can also be added to dry toilets.

1. Use composting toilets, and not flush toilets. If flush toilets are used, where water is more plentiful, use a dual flush system with a low capacity (3 liters half flush and 6 liters full flush).

2. Moisture levels must be monitored, as biological activity will stop in toilets that are either too wet or too dry.

Graywater

Due to the absence of wastewater treatment options, ecotourism facilities in the Chapare should make every effort to reduce and recycle wastewater. Wastewater from showers, bathroom basins and other wash-sinks is known as graywater. Water from kitchen sinks, dishwaters, and washing machines where the water is more heavily contaminated with food particles, grease, and detergents is known as blackwater. However, if you use biodegradable detergents the vast amounts of water from washing machines and kitchen sinks should be just fine for irrigation and flushing toilets.

The graywater from the above sources is then treated and filtered using sand, gravel, mechanical, and biological filters. It is absolutely vital that no toxic or harmful substances are used in the water that goes into the system or it will be impossible to filter and reuse it. The filtered graywater is then piped from a storage tank for use in the landscaped areas and flushing toilets. The blackwater should be treated to the extent possible and then be properly disposed of.

1. Reuse wastewater (both gray and black) as much as possible. Create systems in which water goes through several uses before being disposed of, utilizing it as irrigation or fertilizer for cultivation, flushing toilets.

2. In case both graywater and blackwaters are reused, separate lines and septic systems must be installed.

3. Use only treated graywater in irrigation and toilets.

4. Avoid irrigation during daylight hours and use drip irrigation systems.

5. Identify safe disposal locations, materials handling techniques, and specialized receptacles that may be necessary for the disposal of blackwater.

4.4.4. Solid Waste Reduction and Management

The management of waste is a crucial conservation problem in and around ecotourism facilities, particularly due to the presence of wildlife and indigenous flora, which stand to suffer from the adverse effects of the irresponsible handling and disposal of waste. Therefore, the design of a facility should carefully address the issue of waste management in an attempt to avoid any harm to the surrounding natural resources.

Waste is produced both during the construction phase and during the operation of a facility. Waste can not only cause visual pollution of the site, but also has the potential to cause contamination of the soil, water and air with nutrients, chemical residues, and fumes.

Strategies for minimizing waste go far beyond recycling materials and using composting toilets. They must also reflect local circumstances, including the waste management infrastructure available and the nature of the ecosystems that may be affected.

A clear and achievable strategy for managing solid waste is essential in ecotourism developments. The types of waste likely to be produced should be comprehensively identified. A waste management system of sorting, safe storage and disposal should be incorporated in the management structure of the facility. Adequate secure sorting and storage space should be provided – and the processes of collecting and safely transporting waste off-site should be carefully designed. Every accommodation facility has two basic sources of solid waste:

- Materials acquired and used by management
- Materials brought in by guests

Much of the growing volume of solid waste is generated from the use of disposable consumer products and excess packaging. Without a well-managed plan for the disposal of solid waste, there is a clear danger that wastes will continue to contaminate and litter the Chapare environment.

There is no municipal solid waste collection that would service any facility outside the city limits of the principal towns in the Chapare. Neither does the area have an adequate disposal site.[20] Therefore any facility will have to manage the solid waste generated by its operation initially on-site. A facility can significantly facilitate the required waste management if it implements a waste management program that focuses on waste reduction measures, such as waste minimization, reuse, composting, recycling and separation of toxic or hazardous waste products.

With regard to the required installations, the facility should allocate an area where the solid waste can be processed and stored. This area should have a section with concrete flooring and a roof in order to store hazardous products and process and store recyclable products without any of these products being able to contaminate the surroundings or being affected by rain. In addition the solid waste area should include space to set up and manage a compost that allows processing all biodegradable waste into compost. The compost can be used as organic fertilizer.[21]

The composition of solid waste generated in accommodation facilities is classified as domestic and consists mainly of food, glass, plastic, metal, paper and organic waste. In order to reduce the amount of waste that is generated and minimize the environmental impact, the facility should consider the following measures:

[20] At the time of this review PRAEDAC, a European funded technical assistance agency, was implementing a project with the objective to build sanitary landfills in five municipalities in the Chapare.

[21] Studies have shown that up to 40 percent to 50 percent of solid waste generated in hotels is biodegradable. Fideas, a project partly supported by PRAEDAC, and located in Chimoré, successfully experiments with compost and worms (vermiculture or lombricultura).

Reduction

As a first step to reduce the amount of waste generated in its operation, the facility should review its purchasing decisions. Taking into account environmental aspects when purchasing can be achieved by giving preference to:

- Environmentally friendly products and chemicals
- Products sold in bulk or concentrate (to reduce packaging)
- Products sold in refillable containers or reusable packaging
- Products that are supplied with a minimum amount of packaging
- Products that are made from or contain recycled materials

- Products that are reusable and durable (instead of disposable items)
- Products manufactured locally

Reuse

Whenever possible the facility should reuse items in their original form for the same or a different purpose rather than disposing them. Examples of standard reuse measures include:

- Only serve beverages that are packaged in refillable bottles or kegs that can be returned to the supplier.
- Use the back side of computer and office paper to print draft documents or internal memos.
- Give preference to vendors that supply their products in returnable or refillable containers.
- Replace the plastic liners that are used in guestroom garbage bins only when they are soiled or unsuitable for further use.

Recycling and Composting

There does not exist a formal recycling infrastructure in the Tropics of Cochabamba, Therefore any facility should consider contacting recycling services in Cochabamba to investigate requirements for companies to accept recyclable products from Villa Tunari and the region.[22]

Garden waste should be kept separate and used in the facility's compost. The compost produced from an actively managed decomposing process will enrich (fertilize) the soil of the facility's gardens. Once the compost site for grass clippings and leaves is operational, staff could introduce organic waste from its kitchen, such as fruit and vegetable leftovers.

Toxic or Hazardous Products

Most important any facility should separate toxic or hazardous waste products and deliver them to adequate disposal systems or sites. [23] Hazardous waste includes:

- Oil filters of vehicles or any other motor driven equipment

[22] The currently planned landfill site could serve as collection and storage center for recyclables in order to reach economically viable volumes for a recycler.

[23] For example, Cochabamba has a project that offers its citizens to dispose of old batteries in containers located in central locations such as supermarkets or office buildings.

- Mineral oil (motor oil) and vegetable oil (from kitchen operations)
- Rugs soaked with oil
- Batteries
- Fluorescent lamps
- Car batteries
- Electromagnetic or electronic ballasts of fluorescent light tubes
- Spray paint or insecticide cans
- Biomedical waste, such as medicines

Most of these waste items do not take up to much volume, but have great potential to contaminate the environment or subsurface when buried. Therefore the operators should consider separating these items, storing them in appropriate containers and transporting them to Cochabamba where the city operates an adequate sanitary landfill.

Integrated Pest Management

Integrated Pest Management (IPM) uses biological controls as a first defense. If such non-toxic controls fail, carefully timed targeted pesticides are used. Biological controls include parasitic insects, which destroy pests, pheromone (sex-scent traps, and natural pesticides like pyrethrum and companion planting).

Some sites can contain large populations of noxious insects, organisms that serve as disease vectors, and spiny and poisonous plants. When these are natural inhabitants at a site, they must remain at the site and it would be prudent to select another site.

1. Minimize and eliminate the use of high maintenance lawns, if possible. Most turf grasses typically require more input of water, maintenance, and chemicals than other types of plants. Native or drought tolerant turf species or beds planted with shrubs, groundcovers, and perennials can replace non-native lawns. The use of annual plants should also be minimized.

2. Consider alternatives to the use of pesticides such as mulching, alternative mowing, and composting to maintain plant health. Organic mulch around plantings conserves water and maintains favorable soil temperatures. Cleared or trimmed vegetation can be chipped economically for mulch. Composting plant debris in piles or bins hastens this breakdown. The compost is then used as a soil amendment. Compost maintains soil fertility better than chemical fertilizers and helps plants resist pests and diseases without pesticides.

3. Emphasize the employment of integrated pest management (IPM) against insects and weeds and make sure that the landscape contractor is bound by an agreement. IPM uses biological controls as a first defense and these include parasitic insects, which destroy pests.

4. Instruct visitors on how to live most comfortably with the plants and animals who have priority over them in this particular habitat. Make visitors aware of any risks.

5. Impact and Mitigation Checklists

5.1 Tourism and Ecotourism Facilities

ACTIVITY	GUIDELINES
Planning and Design	Evaluate local conditions with regard to: • Physical conditions • Social elements • Health and safety • Transportation • Security • Logistics and service
Site selection and site design	Some of the issues that need to be considered in the site selection process are: • Views, slopes, hydrology, soils, climate, and vegetation. • Ease of accessibility and transportation resources. • Existing infrastructure – water, wastewater treatment, electricity, telephone, etc. • Proximity to potential markets. • Effects of seasonal change. • Potential impacts of development • Limits of acceptable change, i.e., the tolerance of the site and region to withstand change. • Proximity to outstanding natural, historical, and cultural attractions. • Availability of inputs (energy, materials, labor, products). • Availability of acceptable locations for disposal of waste outputs. • Proximity of goods, services and housing. • Property rights.
Access	1. Consider proximity of the eco tourism facility to airports and major transportation routes in the region. 2. Consider travel distance and the natural and cultural features that can be accessed from the site as criteria for site selection. 3. Strike the right balance between ease of approach and minimization of negative impacts on the natural environment. 4. Seasonal conditions will have potentially significant impacts on travel conditions and convenience. Be certain that seasonal climatic variations and commercial transportation schedules will not disrupt guests' ability to either enjoy or reach the facility. 5. Consider ease of access when deciding on a site for a shelter. Particularly consider the most likely visitors (disabled visitors, older people, young children) when deciding between ramps, stairs and distances between amenities/public areas and shelters.

ACTIVITY	GUIDELINES
	6. Capitalize on expectations by exploiting the pace and drama of arrival and access through the site by carefully surveying access routes.
Assessing impacts of development	1. Make environmental and cultural impact lists for each of the sites selected for both the construction and operation phases of the development of the facility. For example, will the development prevent or restrict the traditional use of the land or resources by local cultures? 2. Consider short-, mid-, and long-term scenarios for development impacts. 3. Determine the limits of acceptable change. Ask questions such as: • What are the acceptable environmental values and conditions of an area? • How much natural change is anticipated and, given that baseline, how much man-made change would be acceptable in a given setting?
Cultural and heritage features	1. Study the local population and their distribution and distance from the proposed facility or activity. This analysis will help to determine use of local labor, benefits to local people, architectural style of the facility, etc. 2. Identify the noteworthy cultural and historical elements, that are near the site in terms of: • Specific ethnic groups • Traditional settlements • Local traditions and folklore: language, architecture, clothing, handicrafts, dance, music, ceremonies, magic, and religion • Potential for integrating design with cultural environment • Ways of avoiding negative impacts on local culture 3. Analyze the limits of acceptable change of the local and heritage features. 4. Study the cultural and heritage features in terms of health and safety. Are there health or safety problems in presenting the resource to eco-tourists? 5. Obtain permission for your guests to view or participate in cultural events.
Existing infrastructure	• Analyze the existing infrastructure that is present on and around the site. Some of the infrastructure that needs to be researched: • Conventional systems for providing electricity, drinking water, sewage, telephone line, public lighting. The quality and quantity of electrical power can have a major effect on the proposed ecotourism facility. Availability of potable water can determine whether there will be a need to tap ground water, surface water or rainwater. Public sewer facilities can eliminate the use of on-site septic tanks and efficient telephone connections can help toward necessary communication needs.

ACTIVITY	GUIDELINES
	• Communication means: roads, trails (tracks), airport, landing fields, rivers. Travel distances from all the major transport modes in the region to the site should be analyzed. This research will be of help during the planning stages. • Emergency medical services need to be carefully evaluated. The type of services and facilities, medical personnel qualifications, location, evacuation procedures, and response times must be well documented in order to determine how to provide this type of service to guests. • Garbage collection and disposal, schools, commercial facilities, etc. Close proximity to garbage disposal will eliminate the need for costly on-site waste disposal facilities. • Local means of transport: land motor vehicles (bus, taxi, rent-a-car); regular commercial, charter, or private flights, motor boats, ferries.
Community participation	1. Ask the following questions during the site selection process: • What cultural features (both past and present) are found at or near the site? • Be certain that the privacy of the local people is respected in the conduct of tourism activities. • What benefit will the local people receive from the development of the facility or activity? • Does the site have any sacred significance to local communities? • What is the availability of human resources in existing communities to construct and service the facility? • What is the organizational structure of the local communities? 2. Check if the site for your facility has any claims from local families or indigenous groups. If so, try to reach a settlement before initiating the design process. Also consider the property rights and the right of way through adjacent lands for future excursions. 3. Protect traditional sites (fish camps, settlements, and animal grazing areas) for their continued use – whether located in protected areas or elsewhere.
Permits and licenses	Assure compliance with the following laws and regulations: • Law No. 2074, Law for the Promotion and Development of Tourism Activities in Bolivia [24] • Regulatory Order No. 26085, Regulation for tourism accommodation establishments[25] • Law 1333, Law of the Environment, and the respective Regulation of the Law of the Environment D.S. No. 24176 • Supreme Order No. 24781, Regulation for Protected Areas.

[24] Ley No. 2074 – Ley de Promoción y Desarrollo de la Actividad Turística in Bolivia (14/04/2000)
[25] Decreto Reglamentorio No. 26085 – Reglamento de Establecimientos de Hospedaje Turístico (24/10/2001)

ACTIVITY	GUIDELINES
Building design	
Physical structure siting	1. Properly position your ecotourism facility on its lot. The following is a typical list of features to evaluate in designing an overall concept for the location of all physical structures: • Note the best natural views from your site. Provide signage for these areas to enhance the visitors appreciation. • Preserve the existing vegetation and other natural habitats. Provide signage for these areas to enhance the visitor's appreciation and to help protect the resources. • Avoid blocking the views that adjacent owners have of mountains, rivers, jungle. • Proper sun orientation can provide adequate shade during the summer as well as desirable light in living areas. • Locate your driveway to meander around trees and other natural features. • Avoid building on low areas of your site where humidity will be higher and breezes lower. • Note the location of the utility corridor in front of your facility. 2. Site your buildings on the most disturbed parts of the site. The best parts of the site should be retained and protected. By building on degraded or disrupted parts of the site the building process can actually be one of repair not damage. Particularly look for erosion gullies, graded or cleared areas, old roads or tracks, quarries, or stock affected areas as potential sites. 3. Locate treatment facilities, pumping stations, and sewage treatment plants, solid waste disposal sites and other mechanical equipment where view, odor and noise will not be a problem, or where visual screening and noise controls are feasible. 4. Locate roads, trails and parking areas to minimize erosion and interference with the natural flow of surface water. 5. Preserve the best mountain or river views for shared functions that people really enjoy. Remember that provision of a room with a view is not the only criteria for a good guestroom. 6. Avoid harmful discharges, and provide for adequate mixing by locating discharge points at a suitable distance from, e.g., fresh water sources (wells). 7. Consider any servicing issues (water, power, and waste) in the location of the ecotourism facility. Service trenches, cables and pipes can cause significant site damage unless well sited or avoided.

ACTIVITY	GUIDELINES
Climate sensitive design	1. Orient your buildings in the direction of prevailing winds and natural air flow, whenever possible. This will allow for improved natural ventilation and the reduced amount of solar radiation in that direction. In the southern elevation, use light and horizontal shading elements to generate maximum shade when the sun is in azimuth. 2. Climate tempering has historically best been achieved with large porches to shade the summer sun. In addition, operable shutters and blinds have been used to provide shade and privacy while admitting breezes. Also, lattice work and screens provide sun and pest control on porch areas. 3. Eastern openings and windows might be attractive especially in early morning to allow low-energy sun light into the guest rooms, but keep them small and vertical as possible. 4. Allow the visitor to experience the day to day cycles of the place. The line between comfort and separation should be carefully considered. The micro-climatic design of the facility should consider how a specific local extreme climatic condition could be successfully filtered without totally isolating visitors from the place.
Building materials	1. When addressing issues of availability, durability, and cost-effectiveness, carefully investigate traditional building materials. First, the architect should ensure that the materials used are renewable and abundant in supply. The materials should also be durable and not require frequent replacements; they should be able to withstand the forces of nature. 2. Whenever possible employ materials that are naturally found in the area (rock, stone, wood, thatch palm) and whose extraction is reasonably easy and low impact. Only when some of these materials are scarce or non-existent or correspond to threatened native species should materials from elsewhere be brought in. 3. When using local materials, extract them in such a way that the minimum environmental impact is produced. 4. Use of locally available materials will probably benefit from the fact that local builders are already skilled in the use of these materials. 5. Building specifications should reflect the environmental and conservation concerns as related to timber products and other building materials. If wood is used, it is important to know its source. Ensure that the wood is from a certified sustainable source.
Construction	1. Site damage can be reduced by considering the following: • Selection of contractors to construct the works should be based on past performance with fragile sites and the ability to organize and build in rural remote areas. • Building contracts that specify environmental misconduct and related fines. • Available storage areas on or near the site and areas of land that are clearly off limits. • Methods of materials delivery and on site handling that are acceptable. • Machinery and tools that can be used on the site.

ACTIVITY	GUIDELINES
	• Where and how the building team can be accommodated during construction, and all associated energy, water and waste issues associated with this construction camp. 2. Avoid disturbing high quality areas. Work with natural topography as much as possible. Time construction to avoid migratory and spawning seasons. Apply grading controls and require rapid re-landscaping of disturbed areas. 3. Building construction areas should be minimized. This can be achieved by carefully planning and controlling activities with the use of fencing in order to reduce disturbance to existing soil, hydrology, vegetation and fauna.
Site preparation	1. The sustainable construction of the facility should aim to avoid factors such as the use of non-renewable resources of energy, air, soil, water, and noise pollution and erosion of the site and roads. 2. During the design development stage, evaluate every construction method, material used, and the disposal of construction waste. 3. Preplan the construction processes and identify alternative methods that minimize resource degradation. Flexibility in revising construction plans should be allowed to change materials and construction methods based on actual site impacts. 4. Plan for regeneration of damaged areas before construction begins. For example, removed vegetation can be temporarily replanted, for later re-establishment. 5. Ensure that the construction supervisor is knowledgeable about the design intent and environmental philosophy of the project. Throughout construction, resource indicators should be monitored to ensure that resources are not being adversely affected.
Infrastructure, support systems and operations	
Energy management	1. In the design stage, anticipate avoiding the use of high-energy consumption equipment and hazardous materials. 2. Use waste heat to increase the energy efficiency of some processes. For example, waste heat from refrigeration or air conditioning equipment may be used to pre-heat water. 3. Staff should be trained and assisted to develop an environmental awareness that includes applying measures to conserve energy. 4. Highly efficient motors are commercially available, and reduce energy consumption cost-effectively. Ask suppliers for written information on motor efficiency. 5. Avoid using an oversized pump and motor, which unnecessarily add to capital and running costs. 6. Explore the feasibility of using waste heat from power generation facilities to produce potable water and/or to heat water. 7. Explore natural methods for drying clothes. Create sunrooms with translucent roof tiles.
Fresh water management	1. Carry out a moderate and rational use of fresh water. Apart from enhancing guests' ecological experience, it contributes to the educational component of ecotourism. 2. Minimize water consumption by installing low-flow showerheads and toilets, and flow aerators in faucets. 3. Install laundry and kitchen dishwashing water features and use pool covers to reduce evaporation at night. 4. Install flow meters and check regularly for distribution system leaks.

ACTIVITY	GUIDELINES
	5. Identify the extent to which innovative water conservation measures can reduce water supply requirements and design supply facilities accordingly. 6. Avoid using fresh water for irrigation. Instead, use recycled water. 7. All installations need to be regularly maintained in order to ensure efficient operation.
Wastewater treatment	1. Do not discharge any untreated liquid waste into any river or other water bodies. This would mean ruining the resource base of any ecotourism activities on the region's rivers. 2. Arrest all liquid wastes on the site and filter/treat before reuse. 3. Use products that minimize liquid waste and are non-toxic. Use only biodegradable soaps and detergents. 4. Use water efficiently to reduce the volume of wastewater sent to the treatment/disposal system. Reducing the wastewater flow can greatly improve the performance of septic tanks, tile fields, soak-away pits, or a possible wastewater treatment plant. 5. Use graywater and clean wastewater flows for irrigation in order to reduce the volume of wastewater sent to the treatment/disposal system. 6. Avoid discharging problematic wastes into the drainage system, including sanitary napkins, cooking oil, grease and fat, lint, and wet-strength paper towels. These wastes clog drainage pipes and sewers, obstruct the outlet tees of septic tanks, reduce the holding capacity of the septic tanks, and can reduce the absorption capacity of tile fields and soak-away pits. 7. Minimize the use of harsh and toxic chemicals on site to avoid harming the bacteria that purify the wastewater in septic tanks, tile fields and wastewater treatment plants. Harmful products include: • Bleach • Many toilet, sink and tub cleaners • Disinfectants • Drain cleaners • Strong acids and caustic 8. Make sure that maintenance chemicals (e.g., motor oil, spent solvents, paint) are disposed of properly rather than dumped down the drain. Some maintenance chemicals can severely disrupt the operation of septic tanks, tile fields and wastewater treatment plants. 9. Make sure that kitchen drains are equipped with well designed and well maintained grease traps. In order to ensure the proper performance of its grease traps, the property should: • Clean them regularly (by manually skimming the floating grease and solids, and removing the solids from the bottom of trap); • Not use chemicals, such as drain cleaners and acids, to dissolve the grease and solids that accumulate in the trap; • Not use hot water to dissolve and flush out the grease collected in the trap;

ACTIVITY	GUIDELINES
	• Minimize the discharge of solids and grease into the kitchen sinks; and • Make sure the grease traps are equipped with effective outlet tees. 10. Minimize water surges into the wastewater collection system. For example, roof gutters should never be connected to the wastewater collection system because the high flows produced during storms can easily overload septic tanks, tile fields, soak-away pits and wastewater treatment plants. 11. In addition to implementing the wastewater management practices listed above, any facility operating its own wastewater treatment system should make sure the plant operator is well trained and regularly test the quality of the treated effluent. This training and quality control is particularly important if the treated wastewater is used for irrigation.
Solid waste management Reduce, reuse, recycle and compost	**Solid waste reduction by giving preference to:** • Environmentally friendly products and chemicals • Products sold in bulk or concentrate (to reduce packaging) • Products sold in refillable containers or reusable packaging • Products that are supplied with a minimum amount of packaging • Products that are made from or contain recycled materials • Products that are reusable and durable (instead of disposable items) • Products manufactured locally
	Examples of standard reuse measures: • Only serve beverages that are packaged in refillable bottles or kegs that can be returned to the supplier, • Use the back side of computer and office paper to print draft documents or internal memos, • Give preference to vendors that supply their products in returnable or refillable containers, • Replace the plastic liners that are used in guestroom garbage bins only when they are soiled or unsuitable for further use.
Separation and adequate of hazardous waste	**Hazardous waste includes:** • Oil filters of vehicles or any other motor driven equipment • Mineral oil (motor oil) and vegetable oil (from kitchen operations) • Rugs soaked with oil • Batteries • Fluorescent lamps • Car batteries • Electromagnetic or electronic ballasts of fluorescent light tubes • Spray paint or insecticide cans • Biomedical waste, such a medicines

5.2 Tourism Activities

ACTIVITY	GUIDELINES
Permits and licenses	As in guidelines for facilities
Local Communities	• What cultural features (both past and present) are found at or near the trial or circuit? • Be certain that the privacy of the local people is respected in the conduct of tourism activities. • What benefit will the local people receive from the development of the activity? • Does the area have any sacred significance to local communities? • What is the organizational structure of the local communities? • Protect traditional sites (fish camps, settlements, and animal grazing areas) for their continued use – whether located in protected areas or elsewhere.
Roads, trails and walkways	• Provide erosion controls for all roads, trails and walkways. Deviate water flow away from trails and roads before it attains too much speed and intensity and starts creating erosion problems. Also, control vegetation on the sides of the trail, periodically trimming as to avoid invading the path or disturbing circulation. • Always use low-impact and low profile techniques and materials. The surface of any trail and walkway should be resistant to continuous use, but avoid the use of concrete or asphalt and synthetic pavements, if possible. It is better to use natural permeable materials or surfaces that allow water absorption by the ground and not surface flow. Use materials such as gravel, sand, wood shavings, small cross sections of tree trunks or branches or boards. • All roads, trails and walkways should respect wildlife movement patterns and habitat requirements, as well as location and growth and expansion patterns of the local flora. • Organize the walkways within the facility in organic patterns. People coming to the facility are looking for natural settings. Provide that to them, even in the walkway patterns.
Safety and emergency management	• Identify local wildlife, e.g., reptiles that might be poisonous and prepare for possibility of snake bite. • Establish emergency evacuation procedures in case of accident.
Conservation of protected areas	Ensure that developed trails in Protected Areas are not colonized.

6. Certification of Tourism Facilities and Activities

6.1 Environmental Management Systems

One of the more efficient ways to incorporate the Best Practices listed above into the daily operation and routine of a facility or activity can be achieved by implementing an environmental management system. Environmental management is a systematic approach to finding practical ways to improve the operating efficiency for hotels without compromising the quality of guest service. Given that tourism facilities such as hotels use large amounts of water, energy, chemicals and materials, even small efficiency gains can lead to large cost savings. In addition,

conservation and waste reduction help protect a tourist destination's natural beauty and ensure the long-term sustainability of tourism in a specific region.

An Environmental Management System (EMS) is a tool that helps organizations improve their environmental performance by integrating environmentally beneficial actions into their activities, products and services. Hence, an EMS is a system for coordinating, managing and improving existing processes to help a company to achieve its environmental objectives.

Adopting environmental Best Practices and supporting their implementation through an EMS can help a property stand out from the competition and be recognized through certification programs, awards, tour operator programs, and other special promotions. Getting recognized for a commitment to environmental management can enhance a property's image with environmentally conscious guests and tour operators.

The implementation of an EMS is a prerequisite for all major certification programs.

6.2 Trends in Certification

In the 1980, countries in the European Union began experimenting with applying Total Quality Management (TQM) principles to environmental management. The result was the Environmental Management Audit System or EMAS. In response to the success of EMAS and ISO 9000 (TQM) the International Standard Organization (ISO) started to develop internationally recognized EMS standards. The result of this effort was ISO 14001, which heavily draws on the EMAS scheme and TQM principles embodied in ISO 9000. In 1994 a group of tourism and hotel sector professional presented the Green Globe 21 (GG21) standard. GG21 incorporates many of the EMS principles laid out in EMAS and ISO 14001, yet tailored them specifically to the tourism industry and added components contributing to a more sustainable development of tourism.

The trend to address environmental impacts of tourism has resulted in various initiatives over the past years:

- The World Tourism Organization (WTO) has passed a "Global Code of Ethics for Tourism" that includes a call for tourism developments to safeguard the natural environment and save rare and precious resources.
- The same WTO has convened the First International Conference on Climate Change and Tourism in April 2003 that resulted in the "Djerba Declaration on Tourism and Climate Change."
- The International Hotels Environment Initiative (IHEI), founded in 1992, encourages continuous improvement in the environmental performance of the entire hotel industry.
- The Tour Operators Initiative for Sustainable Tourism is a group of European based tour operators that promotes sustainable tourism activities within the member companies and with non-member business partners.
- A global initiative by the WTO presented at a regional meeting in Bahia, Brazil in September 2003, encourages governments to support the creation of national systems for the certification of sustainability in tourism.

6.3 Certification Programs in the Region

Although there are numerous certification schemes for environmentally conscious operating hotels or attractions worldwide, the application and certification of the majority of these programs is limited to specific regions or tourist destinations. The most widely known are EMAS, ISO 14001 and Green Globe 21. But, e.g., EMAS is only certifiable in Europe and ISO 14001, although certifiable worldwide, is applicable to any kind of industry.

As a result more and more tourism oriented companies opt for the certification of Green Globe 21. GG 21 is a standard that focuses on the tourism industry and helps participating businesses to develop a more sustainable approach to operate and at the same time contribute to the development of a more sustainable tourism.

The most recent certification program being developed in Latin America is the Costa Rican Certification for Sustainable Tourism (Certificación para la Sostenibilidad Turística, CST). The program has been implemented successfully in the country and currently Costa Rica is evaluating possibilities to offer CST in other Latin American countries. Certain program specifics include:

- The funding of its implementation by the Costa Rican Government that made it available free cost to the participants.
- The administrative structure that requires the cooperation of several public and private sector entities.
- Complicated duplication of the CST in other countries that are missing these prerequisites.

In the context of developing a national certification initiative the Government of Bolivia could involve the Center for Promotion of Sustainable Technologies (Centro de Promoción de Tecnologías Sostenibles, CPTS).[26] The CPTS is part of the National Chamber of Industry in La Paz. In other countries, e.g., in Central America and in México, Cleaner Production Centers are assisting industry including the tourism sector to improve their environmental performance, reduce environmental impacts and achieve certification, if possible.

Initial assistance provided by the CPTS to Bolivian hoteliers and related tourism businesses could focus on promoting and implementing Best Practices. In view of the hotel infrastructure in the Chapare that is dominated by small establishments, the implementation of Best Practices, for example through the local hotel association, might be the most feasible and appropriate solution.

6.4 Benefits of Certification

The potential benefits of certification to the hotel industry include:

- Certification serves as a stamp of approval that can be advantageous for relations with customers, regulators, tour operators and local communities and improves the hotel's image.

[26] The CPTS was established in 1998 resulting from a agreement between the national Chamber of Industry (Cámara Nacional de Industria) and the Vice-Ministry of Energy and Hydrocarbons.

- Certification can support marketing and sales efforts for hotels that wish to promote their property and destination to potential customers and tour operators in, e.g., environmentally conscious countries of Europe.
- Certification that in general is based on an environmental management system opens opportunities to reduce operational cost through the reduction in the consumption of resources.
- The combination of certification and environmental management can contribute to long-term conservation of the local environment that is one of the principal products marketed in tourism and even more so in ecotourism destinations.

The application of Best Practices combined with the implementation of an Environmental Management System (where feasible) and the certification of environmentally conscious tourism enterprises have proven to be a successful voluntary mechanism to improve environmental performance and contribute to a reduction of environmental and social impacts of tourism development.