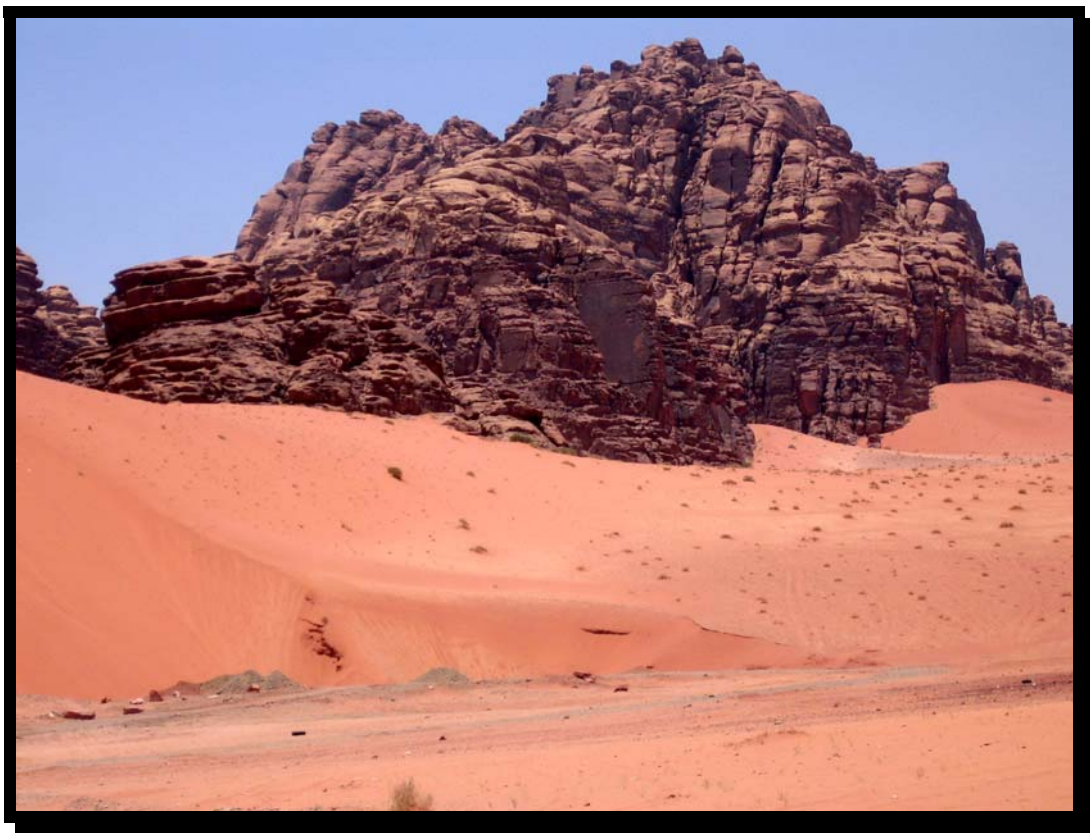


Planning, Design and Construction Guidelines for Desert Ecolodges Kingdom of Saudi Arabia

Hitesh Mehta
August 2005



Acknowledgements

This Desert Ecolodge Guidelines manual has been authored by **Hitesh Mehta**, an Ecolodge Architect, Landscape Architect and Ecotourism Planner based out of Ft. Lauderdale, Florida. This document is the climax of dedicated efforts of a number of other people. In particular, i would like to thank the following contributors:

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The author has gone to great lengths in these guidelines to graphically illustrate information that is both interesting and useful to both developers and consultants alike. This booklet will hopefully save many hours of research and expenses in the design and construction of ecolodges in KSA desert environments, and in turn help towards the conservation of both natural and cultural resources in the Kingdom of Saudi Arabia.



About this manual

The main purpose of this manual is to propose a set of guidelines for the planning, design and construction of **Desert Ecolodges** in the Kingdom of Saudi Arabia. This manual is an effort to provide the investor, developer, design professional, engineer community with an easy to follow and read document containing an illustrative set of guidelines that help provide deeper insights into the planning, design and construction processes for the development of **Desert Ecolodges**. The Supreme Commission for Tourism (SCT) is keen that all major tourism projects achieve two objectives:

1. The application of the highest standards in planning and design.
2. The minimising of all negative human and environmental impacts.

This Manual describes how these two prime objectives are attained. The set of guidelines in this document do not constitute a blue print for what the Saudi Arabian Desert Ecolodge should be, but rather addressing a number of issues that the author thinks are most critical and relevant to date.

Each of the various categories in the site planning, architectural design and sustainable construction are first explained and then followed by a number of relevant specific guidelines. Relevant pictures and/or sketches are inserted to help visualize the issues. The main idea for utilizing this format style is to provide the investors, developers and their consultants with the core and critical issues that need to be addressed with generic and general guidelines as to how to address them.

This document is the first of its kind in Saudi Arabia. It is to be reviewed and updated regularly to include or exclude those issues which prove relevant or not. It is by itself a generic document not a concluding statement. These guidelines should also be used for any other ecotourism facility in desert environments such as Visitor Centers, Warden and Staff Houses, National Park Gate Houses etc.





Al-Ghat National Park

The sun rose above the stream
Whose calm water quivered when the east wind blew;
Fantasies of golden armour.

Abdullah Ibn Al-Mu'tazz
Arab Poet (861-908)

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INTRODUCTION

The Supreme Commission for Tourism (SCT), Kingdom of Saudi Arabia, has embarked on a project that calls for the preparation of three ecolodge models for each of the three main ecosystems of Saudi Arabia, namely the Desert, Coastal and Mountain ecosystems. These pilot ecolodge projects will be taken to the conceptual phase, reviewed and critiqued by international experts and they will then be offered and presented for investor interest.

Complimenting these pilot projects and with an intention to educate and regulate uncontrolled ecolodge development, SCT has contracted the preparation of design and planning guidelines for the development of ecolodges in each of the three ecosystems. This manual focuses on DESERT ecolodge guidelines. The extent of the desert areas are as shown in green in the map below. However, these guidelines can also be used for Rub' Al Khali which is a harsher desert environment but for which the principles of desert ecolodge planning , design and construction still apply.



Black Areas show extent of deserts in Saudi Arabia for which these ecolodge guidelines will apply *Source: ZFP*

The Desert areas of the Kingdom of Saudi Arabia are characterized by two zones, each with its own climatic conditions.

Zone 1: The arid central and north central regions of the Arabian Peninsula.

Average high temperatures: 41° C to 46° C (106° F to 115° F)
Average low temperatures: 8° C to 2° C (46° F to 36° F)
Average humidity: 45% (Winter), 18% (Summer)
Average annual rainfall: 35mm to 100mm (1.5 to 4 inches)

Zone 2: The harsh desert area of Rub' al Khali.

Average high temperatures: 42° C to 47° C (108° F to 117° F)
Average low temperatures: 7° C to 1° C (45° F to 34° F)
Average humidity: 40% (Winter), 15% (Summer)
Average annual rainfall: 20mm to 40mm (1 to 2 inches)

These figures are approximate and based on data obtained from the Meteorological and Environmental Protection Administration.

Background

In the past decade, ecotourism (niche tourism market segment) which is largely dependent on the environment and local communities has witnessed a boom. It has been the fastest growing segment of the Tourism Industry. This sector comprised 5% approximately of spending on global tourism in 2004. In addition to tourists who spend their holidays traditionally, a new sector of tourists has emerged, preferring to spend their holidays escaping the bustling noisy city life and enjoying the serenity and pureness of nature and culture. The activities of ecotourism include desert trekking, mountain hiking, bird and nature watching, desert camping, diving, snorkeling, mountain and valley discovery trips, desert crossing in carried caravans, safaris, photography adventures, heritage tours and explorations in history and culture rich locations. All these activities provide rich sources for enjoyment filled with new types of tourist activities and destinations. The concept of ecotourism has emerged as practical choice to enjoy nature and cultural heritage while preserving both of them.

This wave of environmental and cultural tourism could bring a host of social and economical benefits for the Kingdom including the overall vitalization of tourism kingdom wide, creating new job opportunities and employment opportunities, improving and enhancing local and national economics, raising attention and interest of environmental awareness and education, protection of natural and cultural resources. The physical reflection of ecotourism accommodation is the manifest in the form of **“ecolodge”**.

It is first important to understand the definition and principles of an Ecolodge before stating the various guidelines for ecolodge planning, design and construction.

DEFINITIONS and PRINCIPLES

Since the term *ecolodges* emerged in the early 1990's, there have been several interpretations by various ecotourism organizations and 'experts' using different criteria systems to evaluate accommodation facilities. This section of the paper attempts to address the term *ecolodges* and clarify its definition. In order to create authentic ecolodges, it is crucial that the particularities and requirements of ecolodges be widely understood by all concerned.

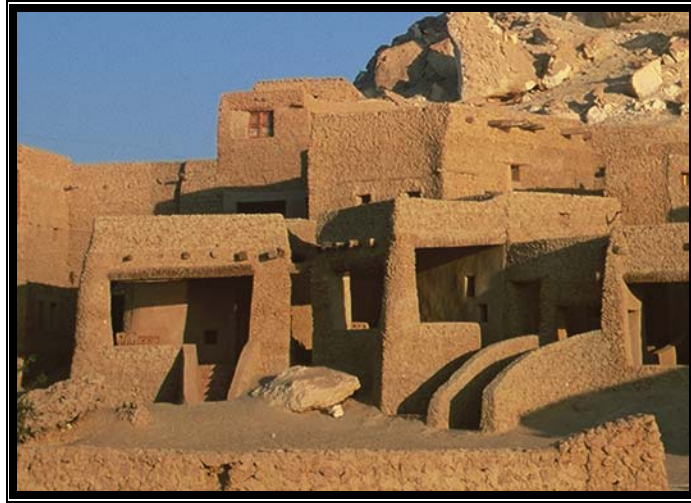
During TIES *First Ecolodge Forum* in Maho Bay, an ecolodge was defined as "an industry label used to identify a nature-dependent tourist lodge that meets the philosophy and principles of ecotourism" (David Russel et al, 1994). This definition sufficed in 1994 but it was ambiguous, not specific enough and left it to the reader's imagination. The definition was linked to ecotourism which itself has been misinterpreted and misunderstood for a long time.

In 1997, the Mexican Architect Hector Ceballos Lascurain refined the definition but the mention of the word ecotourism still brought ambiguity to the definition - "The most important thing about an ecolodge is that the ecolodge is not the most important thing. It is the quality of the surrounding environment that counts most: the nearby natural and cultural attractions – and the way ecotourism circuits are set up, operated and marketed, and the way in which local populations are actively involved in the process." (Ceballos Lascurain, 1997). The definition also did not emphasize what is considered one of the most crucial aspects of an *ecolodge* – planning, design and construction.

The author of this report felt the need in 1999 to focus on the principles that constitute an *ecolodge* because it is the basic principles that differentiate ecolodges from traditional nature lodges and hotels. Ten basic principles that constitute an ecolodge were discussed in a research paper and presented at an international conference (Mehta, 1999). This author stated in the paper that an *ecolodge* should: (1) help in the conservation of the surrounding flora and fauna, (2) have minimal impact on the natural surroundings during construction; (3) fit into its specific physical and cultural contexts through careful attention to form, landscaping and color, as well as the use of vernacular architecture; (4) use alternative, sustainable means of water acquisition and reduces water consumption, (5) provide for careful handling and disposal of solid waste and sewage; (6) meet its energy needs through passive design and renewable energy sources; (7) use traditional building technology and materials wherever possible and combines these with their modern counterparts for greater sustainability; (8) endeavor to work together with the local community; (9) offer interpretive programs to educate both its employees and tourists about the surrounding natural and cultural environments and (10) contribute to sustainable local development through education programs and research.

It would be impossible for an *ecolodge* to meet all the above mentioned principles and if an accommodation facility is located near a fresh water river or in a rainforest, it would not be necessary to spend money to have water conservation technologies. Likewise, in some areas, there may be no local materials available and therefore it would be prudent to import environmentally friendly foreign materials. With this in mind, this author developed a criteria system in 2002 for determining whether an 'ecolodge' **IS** truly an *ecolodge*. (Mehta et al, 2002). For an accommodation facility to be called an *ecolodge*, it had to satisfy five of the above mentioned criteria, three of which embodied the three main principles of ecotourism, namely protection of nature; benefits to local people and offering of interpretative programs. With this

criteria system, there was flexibility and an *ecolodge* need not have to satisfy water conservation measures if located close to an uninterrupted supply of natural fresh water.



Adreere Amalal Ecolodge – Egypt

Source: Hitesh Mehta

It should be noted that the definition of ecolodges has been evolving. In the 80's, there was very little mention of the cultural definition component but now it had become one of the main principles so much so that Maho Bay Camp, the first 'ecolodge' would fail to meet today's criteria of what constitutes an ecolodge. The social component is practically non-existent and the benefits to local communities are minimal.

Current Ecolodge Definition

After carefully considering all the various aspects of ecolodges as mentioned in *The International Ecolodge Guidelines* book (Mehta et al, 2002). ***“an ecolodge is a 5-75 room low-impact nature based financially sustainable accommodation facility that helps protect sensitive neighboring areas; involves and helps benefits local communities; offers tourists an interpretative and interactive participatory experience; provides a spiritual communion with nature and culture and is planned, designed, constructed and operated in an environmentally and socially sensitive manner” (Mehta, 2005).***

The design of an ecolodge and the activities provided within the facility should encourage close interaction with the natural and cultural environment and have an atmosphere that is appropriate to the site's specific setting. It is this metaphysical 'sense of place' that is one of the key ingredients in distinguishing ecolodges from traditional hotels. Location and resource protection of the Ecolodge operational environment is critical to its successful performance. Within these natural environments, what is important for an Ecolodges general atmosphere is the sense of "isolation" and "wilderness", and of being away from the impact of modern civilization.

The activities provided in the Ecolodge are usually based on sensory experience with the natural and cultural resources of the area to enhance the visitor's appreciation and to support the conservation of these resources. The general atmosphere of Ecolodges is characterized by their friendly, relaxed, flexible and educational environment. The design of an Ecolodge and the activities provided within

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the facility should then encourage close interaction with the natural environment. However, each Ecolodge must enjoy an atmosphere that is appropriate to the site's specific setting.

In Saudi Arabia, local distinctiveness to the physical desert environment is important. All natural or human-made elements which contribute to this distinctiveness should be addressed in the desert ecolodge layout and design. In particular, local materials should be used; local building styles used as an influence and local plant species used in the soft landscape schemes. Local climatic differences should be addressed by the architectural and landscape design (in particular, the temperature, rainfall and wind).

Additionally, incorporating the local cultural attractions is the key to the success of a desert ecolodge development. It is in the desert ecosystems where the indigenous peoples – the Bedu – inhabit that opportunities exist to involve them in more than just demonstrating traditional skills and customs. There are significant opportunities in ensuring that they have an economic stake in management in order to use conservation as a tool to bring marginal economic groups into mainstream economic development.

In respect of Islamic traditions, there is a need to design ecolodges with a more gradual transition from public through semi-public & semi-private to private. Design layouts and details should conform to Islamic or Bedu cultural traditions. In consideration of a majority of the guests at the desert ecolodges in Saudi Arabia, orientation to Mecca should be built into the various elements of the ecolodge. Local design styles (e.g Najd etc.) should also be respected. Saudi attitudes to the family, women, bachelors etc. should also be respected and therefore spatial privacy is an important concept for a Desert Ecolodge. Saudi appreciation of the desert, its beauty and its wildlife must be considered when planning a desert ecolodge.



1. Site Selection and Analysis

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SITE ASSESSMENT AND SELECTION



Consultant during a site selection trip.

Source: Hitesh Mehta

The success of a desert ecolodge can pivot on the initial processes of site assessment and selection. In this instance, the selection process is simplified because the sites for ecolodges have already been identified by the Supreme Commission of Tourism and assessed by this author. This would mean that the investors and developers will have restrictions in the development of the ecolodge and will also have to comply with the corresponding management plan of these sites.

The process of site assessment and selection for desert ecolodges 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, operations). The site should support the development within biophysical and natural resource limits while offering visitors a diversity of experiences particular to the place (South Australian Tourism Commission, 1994).

For the desert sites identified by the Supreme Commission of tourism, this author used twenty different criteria to assess the sites and a weighting scale was used to determine which site has the best potential for ecolodge development. This process has been endorsed by the Supreme Commission of Tourism and is proposed to be used for any other desert site. The criteria are:

1. Protected area

Is the site part of a protected area? If not, are there any protected areas adjacent to the site? If not, is there any potential of any adjacent areas attaining protected status.

2. Local communities

Are there any indigenous communities living in the vicinity of the site? In what way can they benefit from the development of the ecolodge? What could the possible impacts be on these populations? Can they be mitigated? What skills do local people have that could be utilized for the development of the lodge.

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3. Interpretation

Are there any interesting natural or cultural elements present in the region for the ecolodge to provide a memorable interpretative experience?

4. Water

What is the availability of clean fresh water? How far is the nearest water source?

5. Power

Are there opportunities for solar and wind power? Is it a windy site? If yes, what is the average wind velocity? How about vegetation cover?

6. Waste

Are there any solid waste collection facilities nearby? Where is the closest recycling center if any? What would be the waste disposal method and how would it impact the surrounding landscape?

7. Sewage

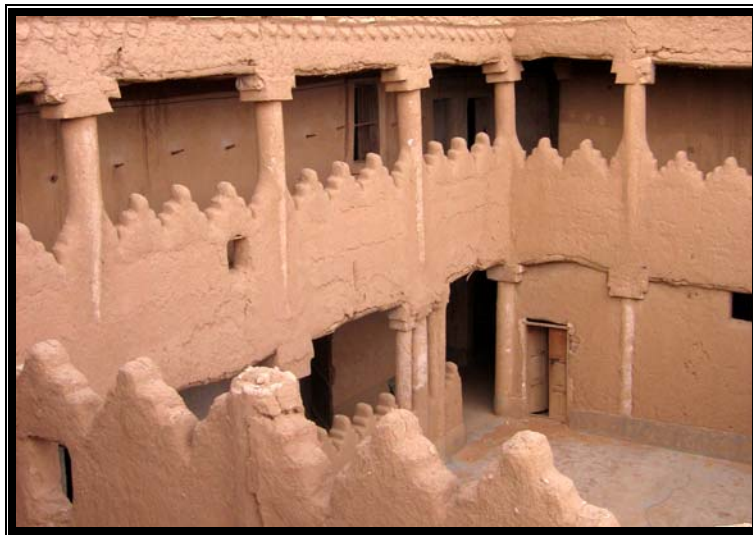
Are there any city sewer lines nearby? What kind of impacts will sewage disposal have on the environment? What are the possibilities of having environmentally friendly sewage disposal systems?

8. Physical Form

Where in the site would be the best possible location of the ecolodge and are there any particular landscape forms which could be used as an inspiration for the physical form of the site.

9. Cultural Form

Is there a distinct cultural architectural form in the surrounding villages? What are the potentials for using this form on the ecolodge site?



Distinct cultural architectural form in Old Al Ghat town. *Source: Hitesh Mehta*

10. Financial Viability

If an ecolodge were to be developed on the site would it be financially viable? What market segment would it be serving and what will be the future demand? What would be the approximate costs of construction? Does the site and surroundings have investor appeal?

11. Entry Experience

What is the entry experience from the moment the guest arrives at Riyadh Airport? Would the experience be memorable? Does it give the visitor a good taste of the country?

12. Location

Ecolodges are supposed to provide the guest with a spiritual communion with Nature. Does the location have a sense of place? Does the site capture the essence of the desert?

13. Access

What are the different access modes to the site? How long does it take to get to the site from Riyadh or any other major city and is the journey comfortable? Are there any airports close to the site?

14. Views

What are the views from the site? Are any of them breathtaking? Are the views of the desert landscape? In what direction is the sunrise, sunset and moonrise?

15. Uniqueness

Is the site unique? Does it have that special spirit that will 'wow' the guests? Is there a unique landscape feature or endangered species? How about a cultural festival?

16. Topography

What is the terrain of the site? Is it too steep? What percentage of the site is under 30% slope? Are there enough places to build an ecolodge?

17. Vegetation

Is there mature vegetation on the site? What percentage of the site is covered by native vegetation? Any particular endemic species?

18. Property Rights

Who owns the site? Is it on lease or is it freehold? What are the restrictions on development?

19. Potential Market Demand

What kind of tourists will stay at the ecolodge - domestic or international? In what way will market demands affect the costs of the project?

20. Potential Impacts of ecolodge development

What would the impacts be on the flora and fauna? In what way will be the local communities impacted. The environmental and social impacts of an ecolodge are determined together during site selection and design.

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

- Access
- Local communities and resources
- Potential impacts of development

Access



Vehicles are the only means of access to Al Ghat National Park. Source: Hitesh Mehta

When considering access issues as regards desert ecolodges, it is important to consider the following:

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

The means of access in desert locations will determine the total travel time, thus affecting the mood of ecolodge guests 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.

Guidelines:

1. Consider proximity of the ecolodge to airports and major transportation routes in the region.
2. Consider travel distance and time for travel as a siting criteria and the natural and cultural features that can be accessed from the site.
3. Strike the right balance between ease of approach and minimisation of negative impacts on the natural environment (EST, 1997).
4. Consider ease of access when siting desert ecolodges. Particularly consider disabled visitors, older people and young children when deciding between ramps, stairs and distances between attractions and ecolodges (South Australian Tourism Commission, 1994).
5. Capitalise on expectations by exploiting the pace and drama of arrival and access through the desert by carefully surveying access routes.
6. Consider the use of entrance gateways. Use sun, shade, desert colours and textures to affect the moods of visitors.

Local Communities and Resources



Bedu and camels

Source: Hitesh Mehta

The desert areas of Saudi Arabia harbor a sizable Bedouin population. Site selection decisions should take into account the values and ways of life of these peoples. Perhaps first and foremost, planning for ecolodge activities must respect the values and ways of life of these peoples. Working co-operatively will benefit both the Bedouins and the visitors to ecolodges. The local residents will be able to share their values and skills with visitors and secure a source of income that can help them sustain their ways of life.

While the number of traditional people and their collective impact on the environment is small, the uses they make of the environment (materials for handicrafts, etc.) are vital to their survival.

Guidelines:

1. Ask the following questions during the site selection process:
 - What cultural features (both past and present) are found at or near the ecolodge site?
 - What benefit will the Bedu receive from the development of the ecolodge?
 - Does the site have any sacred significance to Bedu?
 - What is the availability of human resources in existing communities to construct and service the ecolodge?
 - What is the organisational structure of the Bedu?
2. Check if your ecolodge site has any claims from local families or tribes. If so, try to reach a settlement before initiating the design process. The local Arab council might be a good venue for this resolution. Also consider the property rights and the right of way through adjacent lands for future lodge excursions.
3. Protect traditional sites (settlements and animal grazing areas) for their continued use – whether located in NCWCD protected areas, within SCT lands designated for ecolodge development or elsewhere.

Assessing Impacts of Development



Trash in the desert. Source:Hitesh Mehta

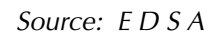
This is a preliminary "brainstorming" component of the site selection process. The assessment of the impacts should be evaluated at a number of scales, such as the immediate site of the ecolodge and the surrounding desert environment. At each scale, the assessment of direct impact should acknowledge 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 ecolodge – depend on this factor. If the initial assessment of the ecolodge site is not properly conducted, the development could seriously threaten the desert environment and degrade the very experience desired by ecotourists.

Ecolodge developments must be determined on the basis of what the desert ecosystem of a proposed site can sustain. 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 ecolodge. Limits to acceptable change acknowledge that “ **altering the ecology of environments would be inevitable through human activity. It aims to establish certain limits in relation to the environment which are acceptable to a wide range of informed locals, users and experts**” (South Australian Tourism Commission, 1994).

Guidelines:

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 ecolodge. 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 change is acceptable in a given setting?
4. Evaluate the terrain, structure of the sites and the surroundings. How will buildings be integrated into them with least environmental intrusion?



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

- Bio-physical Features
- Cultural and Heritage Features
- Existing Infrastructure

Biophysical Features



Desert plant biodiversity

Source: Hitesh Mehta

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

Guidelines:

1. Analyse the site as regards its major biophysical features:

Climate: Angle of solar incidence all through the year; solar intensity; local potential for generating solar energy; monthly temperature variations: mean, maximum and minimum; temperature variations (day/night); monthly and yearly mean precipitation; absolute and relative humidity; monthly mean and maximum wind velocities; wind orientation patterns; potential for generating wind energy.

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

Hydrology: Presence of wadis, ponds, waterfalls etc.; depth of water table; risk and frequency of flash floods.

Topography: Dominant landscape forms - including the horizon (flat, sloping, canyons etc.).

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. Consider natural plant associations of the site and surrounding area; how can they be integrated into the designs.

Wildlife: Species of native fauna; resident and transient species. Identification of focal species as regards their degree of ecotourism attraction (the most beautiful, singular or rare).

Cultural and Heritage Features



Bedu man resting in a traditional tent. Source:Hitesh Mehta

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

Local archaeology, 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.

Guidelines:

1. Study the local population and their distribution and distance from the proposed ecolodge site. This analysis will help to determine use of local labour, benefits to local people, architectural style of ecolodge etc.
2. If your site is near noteworthy cultural elements, then analyse for both past and present:
 - Specific ethnic groups
 - Traditional settlements
 - Local traditions and folklore: language, architecture, clothing, handcrafts, dance, music, ceremonies, magic, and religion
 - Archaeological features
 - Potentiality for integrating design with cultural environment
 - Ways of avoiding negative impacts on local culture
3. Analyse the limits of acceptable change (see definition in section on 'Assessing Impacts of Development', Pg. 17) of the local and heritage features. If the existing cultural or heritage resources need to be altered to preserve them, the limits of acceptable change have probably been reached or exceeded (United States Department of the Interior, 1993).
4. Research the history of the site and the surrounding desert. What has the land been used for? Are there local historical influences and features which could be used to provide an architectural theme to the development?

Existing Infrastructure



Roads and electricity are two crucial infrastructure elements. *Source: Hitesh Mehta*

An analysis of the available infrastructure and local services close to the desert ecolodge site and its vicinity is important considering that many parts of the desert areas are isolated.

It is important to mention that frequently, in those sites, which are more appropriate for ecolodge development, there are limited or no infrastructure elements or public services, because of typical isolation and remoteness. (EST, 1997).

Guidelines:

1. Analyse the existing infrastructure that is present on and around the desert ecolodge site. Some of the infrastructure that needs to be researched are:
 - Conventional systems for providing electricity, drinking water, sewage, telephone line, public lighting, etc. The quality and quantity of electrical power can have a major effect on the proposed ecolodge. Availability of potable water can determine whether there will be a need to tap groundwater or use a de-salinization plant. Consider availability of and competition for drinking and irrigation water
 - Public sewer facilities can eliminate the use of on-site septic tanks and efficient telephone connections can help towards acceptable internet access.
 - Communication means: roads, trails (tracks), airport, landing fields, docks, etc. Travel distances from all the major transport modes in the region to the site should be analysed. This research will be of help during the planning stages.
 - Postal service, garbage collection and disposal, medical services, 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, etc.); regular commercial, charter, or private flights, etc.



Photo Courtesy: Al Ghat Municipality

The clouds poured forth their gift on the desert of Ghabeet,
till it blossomed

As though a Yemeni merchant were spreading out all the rich
clothes from his trunks,

As though the little birds of the valley of Jiwaaw awakened in the
morning
And burst forth in song after a morning draught of old, pure,
spiced wine.

As though all the wild beasts had been covered with sand and
mud, like the onion's root-bulbs.

They were drowned and lost in the depths of the desert at
evening.

[Imru al Qays ibn Hujr \(500-550\)](#)

2. Site Planning and Design

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PLANNING AND DESIGN TEAM



Multi-Disciplinary planning

Source: Hitesh Mehta

It takes more than an architect to plan, design, and build a desert ecolodge. As with all successful developments, the team approach yields best results. A number of other disciplines are needed to secure the achievement of the Ecolodge planning and design process. In fact, on many ecolodge projects around the world, the architect no longer sits at the head of the table. In most cases this role has been taken over by landscape architects, planners and/or project managers.

Design and development for a desert ecolodge requires the services of a team of qualified individuals in numerous fields, including at least a landscape architect and planner, architect, market and financial analyst, desert ecologist and environmental engineer. Depending on the nature of the envisioned development activities, consulting members may include a hydrologist (especially if the site is an oasis), sand scientist, archaeologist, sociologist and others.

Guidelines:

1. The goals of the design team should 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 desert environment by identifying conservation areas;
- guide in the development and management of individual properties within the ecotourism zones;
- work with the SCT to improve site planning and design as needed;
- meet many of the informational requirements and providing the basis for preparation of the desert ecolodge EIA;
- prepare the final ecolodge development plan that achieves integrated design of the entire area, including cost estimates and recommendations for phasing development;
- abide by the development regulations as set up by the SCT and National Commission for Wildlife Conservation and Development (NCWCD), and meet the necessary approval standards.

CONSERVATION PLANNING



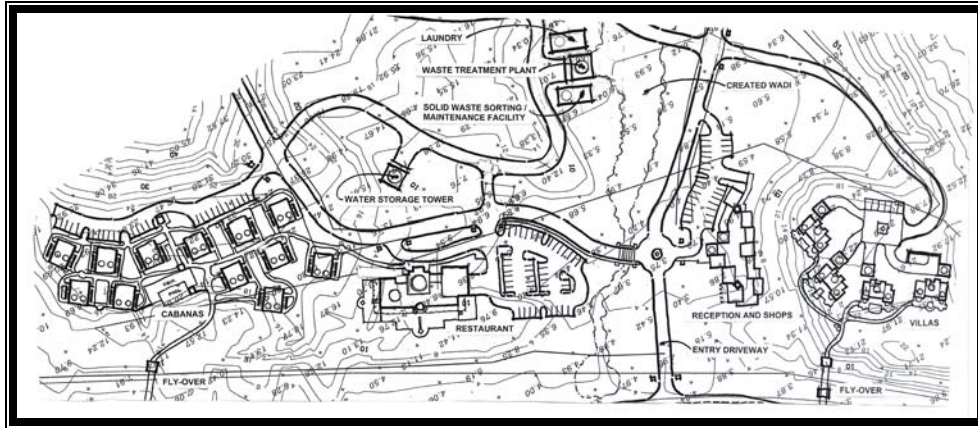
Conservation of wildlife is a must Source: Al Ghat Municipality

Ecolodges in the Saudi Arabian Deserts should play a proactive role and initiate the conservation of neighbouring natural and cultural desert resources. Since ecolodges are to be used mainly by ecotourists, who by definition are concerned with conservation matters, they should provide practical paradigms for harmonious practices of interaction with nature and culture. They should not only strive to minimise negative impacts on surrounding areas and buffer zones, but also help towards its conservation.

Guidelines:

1. Work hand in hand with SCT and NCWCD regarding the limitations and regulations governing buffer zones and restricted areas.
2. Establish conservation easements for natural areas on portions of your site.
3. Both large and small wadis in ecolodge areas should be set aside as open space to serve functional and aesthetic purposes as well as provide attractive opportunities for nature trails and access to the beach or mountains.
4. Do not design for any wildlife to be in caged areas. This creates dependency on behalf of the wildlife and semi-domesticated behaviour, all of which must be avoided. The practice of feeding wild animals is also frowned upon by ecotourists.
5. Keep in mind matters relative to control of harmful insects, reptiles and rodents. The right approach is to minimise the opportunities for intrusion, more than resorting to the extermination of noxious fauna.

LAND PLANNING



Land Plan for an Egypt desert ecolodge

Source: E D S A

New ecolodges are benefiting from regional land planning whether they are initiated privately, by non-governmental organisations (NGO's) or by government. Of all the professions, landscape architects, planners and architects (with a strong ecological and environmental foundation) are among the best trained to design a desert ecolodge. They bear a special responsibility for the design of facilities that are to be developed in pristine, ecologically rich desert areas. However, a considerable number of ecolodges around the world are being designed and built without the services of a landscape architect. In some instances, even architects are ignored. This is rather unfortunate considering that land planning is one of the most important aspects of a successful ecolodge. For desert ecolodges, it would be prudent to include a landscape architect specialising in ecologically sustainable desert planning and design as an integral member of the design team. In many projects around the world, it is becoming quite common for landscape architects to be the prime consultants, providing the lead role in the design team.

The land plan for any desert ecolodge must clearly indicate the process of ordering human actions and works in a specific tract of the desert. It must involve in an integral way the issues of land use, human circulation, structures, facilities and utilities within the desert and human environment. In addition to constituting a graphic representation (to scale) that shows location, layout, general size and shape, and orientation of the different elements of the project, it should indicate the sequence of activities that make up the desert ecolodge, clearly establishing a space-time interaction. Also, the land plan should ensure that all on-site human activities should have a minimum negative impact on the natural and human environment.

Therefore, the land use plan for an ecolodge must be, first of all, an instrument that safeguards the sustainability and conservation of the surrounding desert and cultural heritage. Not only should it conserve the desert ecosystems in the long term, but it must also contribute to repairing and restoring the ecological damages that may already be present on the site (EST, 1997).

Every land use plan should embrace a process that goes from selecting the ideal site and its zoning through the issues of infrastructure planning and services to defining the ruling aspects of architectural design.

All the elements of an ecolodge land plan must have a purpose and have in mind the following:

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- In the case of a protected area, the relationship of this area with other neighbouring areas
- Linkages between all physical facilities (including the ecolodge) and the desert and human environment
- Linkages with any other existing physical facilities on the site or nearby
- Linkages with the general management goals of the surrounding or nearby protected area



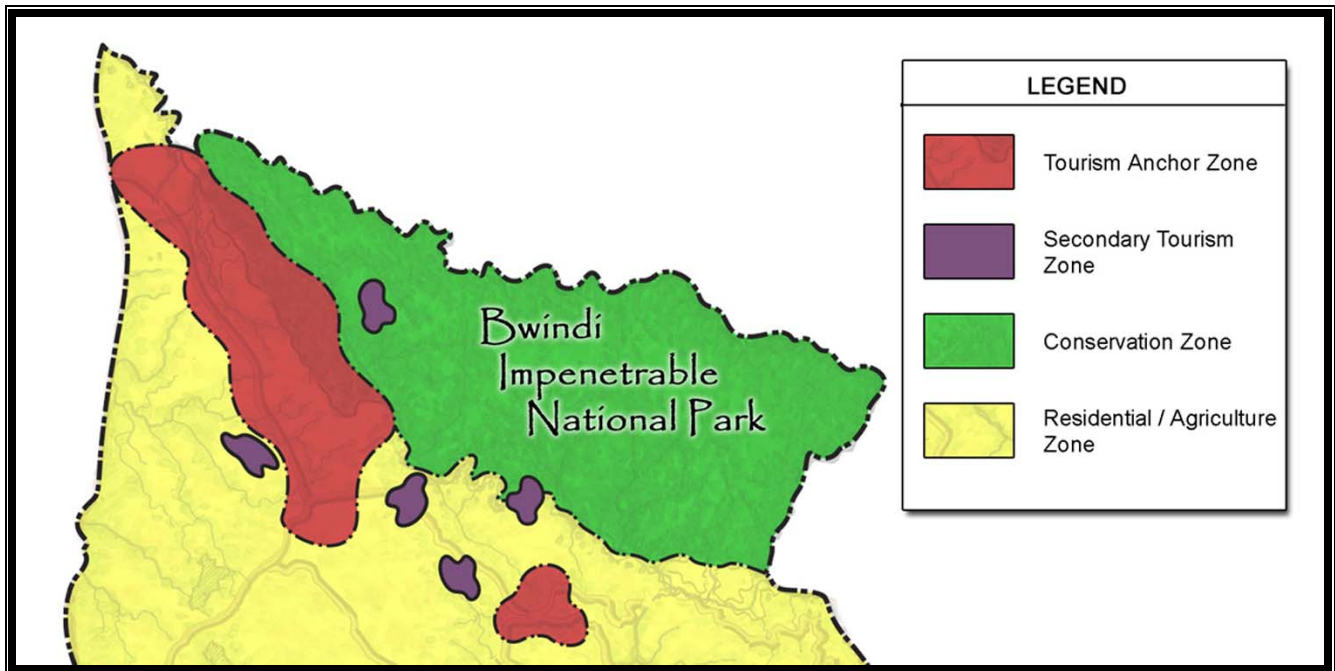
Landforms carved out by wadis and wind should be protected through sensitive planning *Source: Hitesh Mehta*

The most striking amenities of the area- pristine, uncluttered desert landscapes, the landforms carved out by wadis and wind, the pockets of vegetation at the wadi floors-are the principal natural attractions for visitors to the Desert Areas of Saudi Arabia. The beautiful settings provide the basis on which ecolodge profitability and national ecotourism revenues can ultimately depend. Sensitive Land Planning should integrate these beautiful settings to ensure economic, ecological and social sustainability.

Guidelines:

1. Illustrate ways in which land planning can enhance interactions with the environment by providing spaces that can establish strong relationships between ecotourists and the desert landscape.
2. Ensure that fences, security checkpoints or other measures will not impede access to and through the ecolodge site.
3. Create pleasant, shading and cooling areas, and place them close to accommodation areas without intruding on privacy.

Zoning Plan



Zoning helps protect sensitive areas while at the same time identifying developable areas *Source: Hitesh Mehta*

Once the most appropriate location for the ecolodge has been defined within the desert ecosystem as established by SCT or NCWCD, a zoning plan is required in order to evaluate and classify the surrounding areas, according to its most suitable use. Where a zoning plan already exists (i.e., in the case of legally protected areas), the site plan and zoning scheme for the ecolodge must be in compliance with the former).

Among other things, the Zoning Plan consists of concentrating visitation and physical facilities in certain areas and dispersing or prohibiting them in certain other areas. Apart from defining allocation of areas for different uses and services based on the limits of acceptable change of the natural and cultural resources as well as other biophysical and climatic conditions, a zoning plan should support efforts to conserve the area's natural and human resources and enhance the quality of the visitor experience.

Zoning can be an effective means of separating incompatible uses such as dune bashing and hiking, protecting particularly sensitive areas such as wadis and oasis. Each one of the proposed zones should correspond to a specific management plan, always in accordance with SCT and NCWCD objectives of the surrounding natural and cultural ecosystems. The following zoning scheme (especially for terrestrial ecosystems) is proposed:

- **Strictly protected zone:** sometimes called "sanctuary" or "absolute reserve" zones, where there is prohibition of all types of tourists and tourism infrastructure
- **Restricted ecotourism use zone:** sometimes called "wilderness" zone, allows only access to a strictly limited number of tourists, usually on foot (or, in some cases, by camel), and where rigid measures are taken to minimise impacts. Only trails (foot tracks) are included, but never highways or roads.

- **Moderated ecotourism use zone:** visitors are encouraged to enjoy activities that will endeavour to enhance environmental education and ecological awareness, as well as a conservationist ethic. These zones may have limited low-impact tourist services (mainly of an interpretative nature). If roads are to be included, they are strictly low-impact and low-speed.
- **Semi-intensive ecotourism development zone:** should always be an area of limited size, concentrated with the main tourism facilities, including the ecolodge itself and complementary services (such as an interpretative centre, staff dwellings, and – this being the case - highway or road access and parking space, etc.). Preferably, this zone is located in peripheral areas where there are clearings or which may already show a certain degree of environmental damage or deforestation.

The zoning plan should indicate where and what type of physical infrastructure and services should be provided, by means of a clear categorisation of modality and intensity of land use (and/or use of natural water resources), striving in every case to minimise negative impacts on the natural and cultural environment, as well as optimising the visitor experience. (EST, 1997). The plan should also indicate where facilities, activities or services should not be developed.

Identifying the various zones of the site will allow the development to be better integrated with its environment, and to offer visitors the maximum benefits. In many cases, these measures will also reduce initial cost and minimise site damage (South Australian Tourism Commission, 1994).

The best results are achieved when all stakeholders (government agencies, development company members, NGO's etc.) participate in defining zones and associated regulations.

Guidelines:

1. Have each one of the proposed zones correspond to a specific management plan, always in accordance with administrative objectives of the surrounding natural and cultural desert ecosystems.
2. For each of the zones, analyse aspects of density related to buildings as well as to use. Examine relative merits of concentration vs. dispersion, remembering that natural desert landscape values can normally be best conserved if the physical plan is carefully dispersed, but also inversely, having in mind that by concentrating buildings and other structures (in the semi-intensive tourism development zone) you leave more available undisturbed natural zones. Again, the challenge is striking the right balance.
3. Use zoning to define allocation of areas for different uses and services based on the LAC of the natural and cultural resources as well as other biophysical and climatic conditions. It should also support efforts to conserve the area's natural and human resources and also contribute to enhance the quality of the ecotourists' experience.
4. Demarcate the wadi system/oasis boundaries and dedicate these areas to open space in order to protect the stormwater drainage function. Preserve the aesthetic contribution to the landscape of these wadis and provide bicycle and walking trails to neighbouring attractions where appropriate.

Participatory Planning



Involve local people in the planning process Photo by: Adham Salama

We are noticing that in tourism projects, the cultural environment of the bedu is threatened as much, if not more than the desert environments, yet the local people are seldom included in either the initial planning effort or in the assessment of the potential impacts. Many projects fail simply because designers and developers failed to involve the proper local people and authorities at an earlier point in the development.

Many opportunities exist to constructively involve local people in the design and development of an ecolodge. Several recent ecolodge-planning projects have demonstrated that involving the indigenous peoples in the planning process can help towards the conservation of both the natural and cultural resources.

Participatory design is most successful¹ when it is incorporated into the lives of the indigenous communities through economic development resulting in some kind of monetary generation.

Guidelines:

1. Consider organising a two to three day intensive design workshop consisting of architects, landscape architects, engineers, developers, local people and authorities. Through this two-way participatory approach, as opposed to the traditional beneficiary one, local people feel part of the decision making process and the resultant camaraderie may help to foster community pride in the ecotourism facility.
2. Developers, land planners, and architects need to be frank and honest with the local people about their plans and should in-fact elicit the local people's help in understanding and exploring the area.
3. Avoid developing the desert ecolodge without first having discussed it with various members of the local community, since their expectations could be seriously affected by the project.

¹ Kapawi Lodge, Ecuador and Il Ngwesi Lodge, Kenya are good examples of successful participatory design. Write to mehta_h@bellsouth.net for more details.

SITE DESIGN



Existing Wadi incorporated in Site Design Source: EDSA

Sustainable site design is a process involving the sensitive integration of circulation, structures, and utilities within natural and cultural environments. The process encompasses many steps including conceptual design, schematic design, detailed design, and construction procedures. Beyond a change in basic approach, sustainable site design requires holistic, ecologically based strategies to create projects that do not alter or impair, but instead help repair and restore existing site systems (United States Department of the Interior, 1993).

Sustainable site design reinforces the holistic character of a landscape. It conveys appreciation for, and respect for the interrelationships of all parts of the natural systems and cultural context of the site.

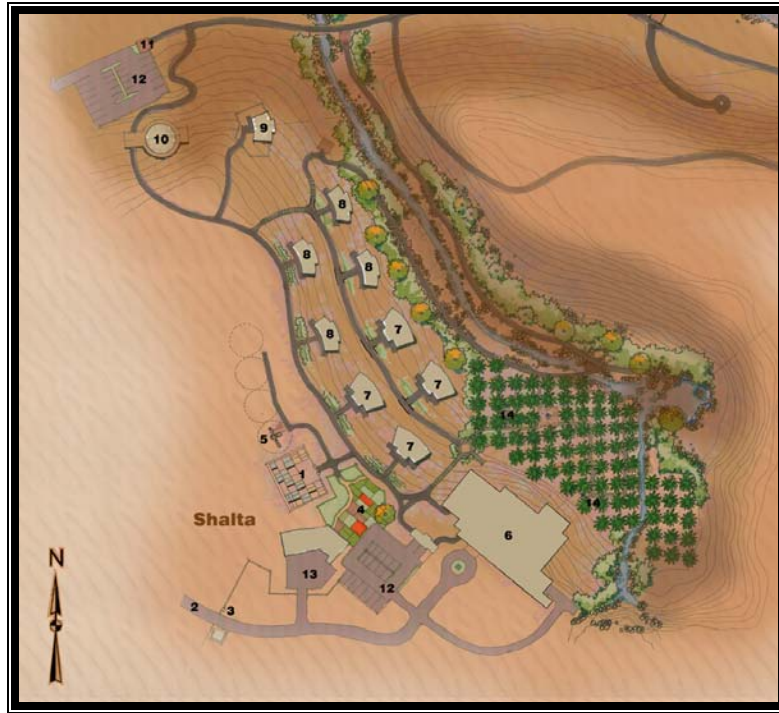
“Sustainable design is not a reworking of conventional approaches and technologies, but a fundamental change in thinking and in ways of operation – you can’t put spots on an elephant and call it a cheetah.” -Carol Franklin, Andropogon Associates, Ltd.

Increased ecological knowledge is at the core of sustainable design. Instead of human functional needs driving the site design, site components need to respond to the indigenous spatial character, climate, topography, soils, and vegetation as well as be compatible with the existing cultural context. For example, when facilities conform to the constraints of existing landforms and tree locations, the character of the existing landscape will be largely maintained. Natural buffers and small openings can be used for privacy rather than artificially produced through planting and clearing. Hilly topography and dense vegetation can provide natural ways of separating site structures.

Ecolodge site design should emphasise the principles of adaptation, reduction, reuse, recycling and energy conservation. These principles should be incorporated in the various components of site design such as siting, roads and trails, fences and retaining walls, swimming pools, planting, lighting, irrigation, etc.

1. Design facilities so as to respect Saudi and Bedu social norms, in particular the need for family privacy and decency
2. Where sports and other facilities are provided for youth, ensure they do not clash with the above.

Size of Development



Shalta Ecolodge is a 15-unit Ecolodge

Source: Hitesh Mehta

The question of size² of the ecolodge development has always been a difficult one to address. The size of your lodge will depend on market demand, the nature of the surrounding desert environment, the total area of investment, the width of your land from the main road, and the results of your EIA that will indicate the proper size that would match the specific carrying capacity of that area. A reasonable rate of return could then be achieved with quality services and proper marketing.

Most desert areas for ecolodge development are already fragile and environmentally sensitive. This affects the limits of the environmental and cultural change of these areas. Therefore, the size of an ecolodge, in principle, should be less than an average conventional hotel. Exactly how big is a question of individual cases.

Guidelines:

1. Develop within the “limits of acceptable change”. This could be determined through research and scientific methods, through consultation with involved locals and traditional owners, and through a program of evaluation including public consultation and review.
2. Remember that the more rooms you build, the more impacts will occur and the more investments will be needed to mitigate these impacts. Make it your principle: small is beautiful, and small can be profitable too.

² Size here refers to the number of lodging units per investment.

Physical Structure Siting

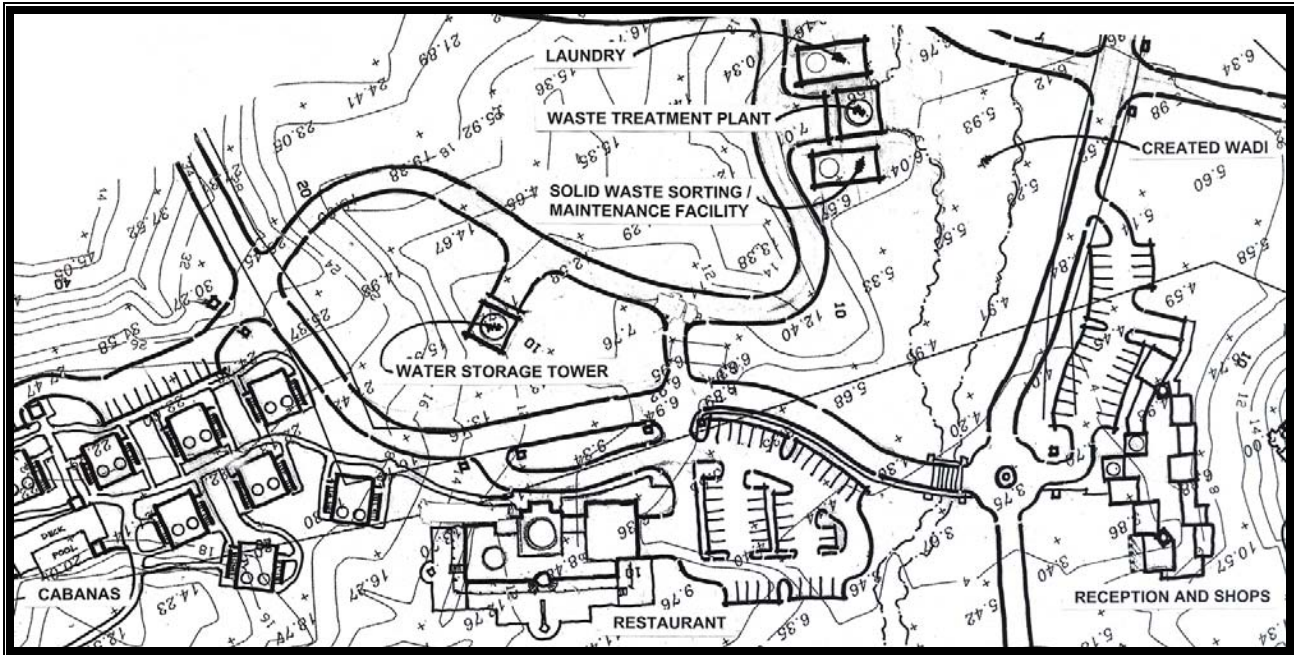


Physical accommodation structures are sited towards the view and wind movement *Source: Hitesh Mehta*

Desert topography in the Saudi Arabian deserts varies from low, flat conditions to rocky hills to sand dunes. In the case of oasis areas, building front lines may need to be held back a considerable distance from the water's edge to protect the water from being polluted and to allow native vegetation to flourish.

Guidelines:

1. Properly position your ecolodge on its lot. The following is a typical list of features to evaluate in designing an overall concept for siting your ecolodge:
 - Note the best natural views from your site.
 - Preserve the existing vegetation and other natural habitats.
 - Avoid blocking the views that adjacent owners have of wadis, oasis etc.
 - Proper sun orientation can provide adequate shade during the summer and sun in the winter, as well as desirable light in living areas.
 - Locate your entry driveway to meander around trees (if any) and other natural features.
 - Avoid building on low areas of your desert site where breezes will be lower. Avoid also building at the top of ridges where desert winds would bring in sand storms.
 - Note the location of the utility corridor in front of your ecolodge.
2. Site your ecolodge 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 and old roads or tracks as potential sites for buildings and trails.



Locate treatment facilities away from accommodation and public areas

Source: EDSA

3. Locate treatment facilities, pumping stations and sewage treatment plants, solid waste disposal sites and other mechanical equipment where view, odour and noise will not be a problem, or where visual screening and noise controls are feasible.
4. Preserve the best desert and hill views for shared functions that people really enjoy. Remember that provision of a desert view is not the only criteria for a good guestroom.
5. Avoid harmful discharges, and provide for adequate mixing by locating discharge points at a suitable distance from oasis water and other resources.
6. Consider any servicing issues (water, power, and waste) in the siting of ecolodges. Service trenches, cables and pipes can cause significant site damage unless well sited or avoided.
7. Site buildings, circulation routes, landscaping, and water and power supply systems so that a minimum of earth and vegetation are disturbed.
8. Ensure the absolute respect of sites of religious significance.
9. Help maintain sites and ideas of historical or cultural significance, promote understanding of their significance through integration into the design.

Fences and Retaining Walls



Retaining walls help keep flood waters out during the rainy season *Source: Hitesh Mehta*

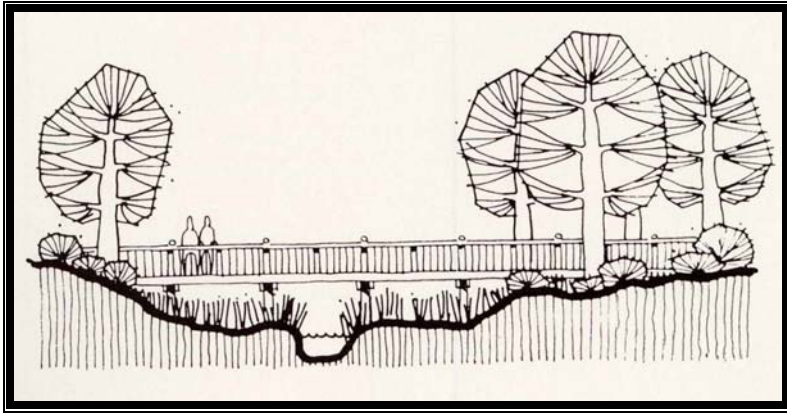
Visual preservation of the natural environment in the desert ecosystems can be realised if no fences or retaining walls were built. No fencing allows visual extension of the site beyond property line. Fences have traditionally been used as a physical and visual separation between two pieces of property and have potential for positive and negative impact on any community.

Fences and retaining walls, if not well designed, can mar the landscape. The construction of fences and walls can lead to erosion and loss of existing vegetation and drainage patterns.

Guidelines:

1. Avoid using fences, retaining walls or other elements that would prevent the local people and their domesticated animals from getting access to your site.
2. Limit fencing to sensitive functions within the facility and give the visitor a better view of the desert.
3. Consider the selective placement of fencing with planting that is related to patio, garden, or entrance. The fencing itself can be native desert trees or large shrubs that are planted and joined together with timber battens or wire.
4. Design the fencing or retaining walls to relate to the architecture. If the walls of the ecolodge are finished with natural stone, then use the same stone as a finish on the fence and the retaining wall. This will create continuity between the building and the landscape.

Grading and Drainage



Wadi's protected through sensitive design

Source: EDSA

To preserve the development goals of SCT, site grading should be kept to a minimum and alteration of existing drainage systems should be avoided. Every desert ecolodge site is in a watershed during the rainy season, and everything the developers and ecotourists do on a site has an impact on the watershed's condition. Sediment from soil disturbance, oil leaks from tourist cars, and fertilisers pollute streams and wadis, while excessive runoff aggravates flooding and erosion and deflection of rainwater from its natural paths dries out streams and wetlands.

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 utilised. Nor should any heavy equipment or topsoil storage occur within dripline zones.

Storm Drainage. The often-deep sand and gravel beds underlying wadis can be a source of groundwater storage even during dry periods. Wadis are thus both a source of ever-changing natural beauty and a means of safely channelling dangerous floodwaters. They also provide important habitats for birds and animals. For these reasons, they should be left in their natural state, with as few man-made alterations as possible.

In undisturbed landscapes, wadis typically handle 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.

Guidelines:

1. Keep site grading to a minimum and avoid alteration of existing drainage systems and vegetation.
2. Use vegetated swales 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 stormwater runoff channels (wadis) but, regulate (when necessary) runoff of new storm drainage channels to provide protection from soil erosion.

4. Note any drainage swales or ditches that need to have unimpeded flow.
5. Reduce disruption to watercourses, wadis, oasis ponds 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. Drainage improvements when required should be landscaped and constructed in a manner that replicates a natural wash. Where bridged crossings are required the design should consider clearances that allow wildlife to cross the vehicular road at a grade separation.
8. Keep site construction and earthwork away from drainage courses as this preserves vegetated buffers and protects stream quality.



All planned areas need to respect existing drainage *Source: Al Ghat Municipality*

9. Minimise wind and water erosion where cutting and filling is required.
10. 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.
11. Do not directly channel runoff into manmade or natural water bodies, conservation areas or marshes from ecolodge rooftops or other impervious surfaces, unless methods of infiltration are provided. Diversion of runoff into existing natural swales is encouraged.
12. Soils should be preserved, re-used and enhanced wherever possible. Soils are precious in any geographical location, but the very limited amount of naturally occurring bio-mass in the Arabian region makes their preservation even more important than in most places.

Native Plant Landscaping



Native Desert flower

Source: Hitesh Mehta

Site design that emphasises native trees, vines, shrubs, and perennials also helps to maintain the biological diversity of the desert and preserve the character of regional landscapes. Native plants have become adapted to natural desert conditions of an area such as seasonal drought and native sands. The native landscape as it exists in its present state can be an asset. On the other hand, non-native plants increase demands for water thereby depleting water sources.

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.

Guidelines:

1. If native plant populations exist on a selected desert ecolodge 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 your ecolodge 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.

3. Use of xeriscaping and drought tolerant plantings should be encouraged.
4. Always plant material at the smallest size possible. Only use plant material which has been hardened under a transitional shade system. Use the hardiest of plant choices. If necessary, establish an on-site nursery in which the following can be planted.

Palms: The Phoenix palm is a symbol of Saudi Arabia; they should be used widely as water efficient and Hardy plants. It is important that, when used in formal or prominent situations, they are healthy, well-maintained and matched specimens.



Phoenix Palm

Source: Hitesh Mehta

Vines and Other Climbers: These are particularly important in Saudi Arabian gardens because they are usually the most effective way to cover or soften the walls surrounding each villa or compound. However, they need not be confined by walls. They can be most dramatic when climbing up and over an arbor or trellised pavilion. Some serve very well as a flowering ground cover. Fruit-producing vines, such as grapes and some melons, can be carefully trained onto an open framework to provide both decoration and food.

5. For large sites, consider three levels of landscaping for outdoor green spaces. Level 1 - Arid areas; Level 2 - desert vegetation landscaped area requiring little irrigation and Level 3 - green oasis, which is intensively irrigated, providing shade and zones of relief, from the dry climate (<http://www.ppd.nmsu.edu/architect/design.html>)
6. Plant Natural native desert pallet of trees, shrubs and ground covers at densities matching surrounding undisturbed desert. Trees (including saguaro), and boulder features should be located no closer than 15' from back of curb. Shrubs and ground cover no closer than 8 ' from the face of the curb. (Specific Design Guidelines, Components of Scenic Corridors)
7. Existing on-site soils and sands, proposed soil sources or on-site soil making / enhancing facilities should be scheduled in to any tourist development design. Inadequate soils, polluted soils or stony soils are not to be used without treatment.

Integrated Pest Management



Composting helps maintain plant health *Source: Hitesh Mehta*

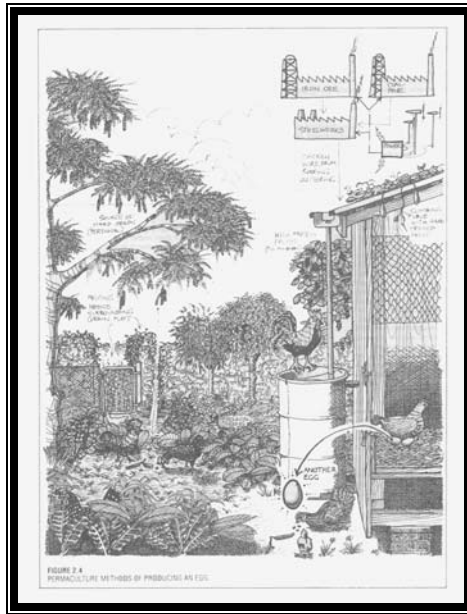
Integrated Pest Management (IPM) uses biological controls as a first defence. If such non-toxic controls fail, carefully timed targeted pesticides are used. Biological controls include parasitic insects, which destroy pests, pheromone (sex-scent traps, and natural pesticides like pyrethrum and companion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

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

Guidelines:

1. Minimise and eliminate the use of high maintenance lawns. Most turfgrasses typically require more input of water, maintenance, and chemicals than other types of plants. Native shrubs, groundcovers, and perennials can replace non-native lawns. The use of annual plants should also be minimised.
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 favourable 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 fertilisers and helps plants resist pests and diseases without pesticides.
3. Emphasise 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 defence 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.

Permaculture



Permaculture turns waste into resources

Source: Bill Mollison

Permaculture is a unique approach to site design that integrates landscapes, gardens, built structures, humans, flora and fauna into permanent systems. It is a design system that mimics the interconnectedness and diversity of animals and plants in natural ecosystems. It focuses on sustainable systems – those with no pollution and with little waste. To establish these sustainable systems, permaculture uses ecology, biology and agriculture and combines these with engineering methods and architectural design. Once the permaculture systems are well established, they require a minimum of amount of energy, materials and labour to maintain. They also minimise pollution by recycling waste back into the system.

The main concept of permaculture is to turn waste into resources and problems into opportunities. It utilises the natural cycles of plant and animal species to heat and cool buildings using arbours and berms, restore groundwater, aerate the soil, control erosion, build soil fertility, incorporate small-scale food production, utilise appropriate technology and recycling, and promote reforestation.

Guidelines:

1. Replace expensive, toxic, non-renewable chemical fertilisers with biological resources that generate fertility on site. Encourage worms and microbes to multiply rapidly by using animal and green manures and by turning under crop residues.
2. Incorporate elements with multiple relationships as this will help to stabilise the web of life.
3. Use contour planting in sloped areas, which helps control soil erosion.
4. Use gravity on a slope to move materials and water. A slope defines a flow of energy and nutrient.

Grounds Lighting



Compact Fluorescent Lighting *Source: Ecobeach Ecoresort*

With rapid urbanisation in Saudi Arabia, the desert is probably the only land environment where people can still see a clear picture of the Milky Way and can identify the different stars. This by itself becomes an attraction and an asset for ecolodge developments. To enjoy this, it is critical to control and maintain the lighting in your facility and in the surrounding area below a certain level that would satisfy this objective and yet secures a safe intensity of lighting for walking and other purposes. Remember that excessive lighting might not only prevent your guests from unique views, but would also contradict with the logic and essence of the process as to the conservation of nature and the conservation of energy and other resources.

Guidelines:

1. Use non-electric devices for grounds lighting. Direct these lighting elements downwards and try to direct them towards their target, especially in the open air for walkways and common spaces. Also consider alternative lighting elements and techniques for the same purpose. Candles and oil lamps might provide the necessary lighting needs for most purposes and will boost a more romantic and relaxed atmosphere, yet will not disturb the illuminated night sky.
2. Low-voltage lighting with photovoltaic collectors should be considered as an energy-efficient alternative. Light fixtures should remain close to the ground to minimise eye level glare.
3. Design grounds lighting to be unobtrusive in appearance or hidden from view.
4. All areas to be used by the public should be lit for safety reasons. Lighting should not be intrusive or out of character with the scheme or the cultural setting; it should concentrate light downwards and minimize general light diffusion into the night sky. Lighting can be freestanding, integrated into walls, fountains etc. or used to highlight features such as trees, sculpture etc.
5. Limit night lighting to the minimum necessary for safety to avoid obscuring the dramatic desert night sky.

Landscape Elements and Furniture



Modern Well Photo: Dr. Adham Salama

All middle-eastern gardens have landscape elements and furniture to enhance the experience and also to be able to use the outdoor spaces during the hot times of the day and year. Landscape elements include Tents, gazebos, arbors, trellis's etc while furniture include benches, trash cans etc.

WATER FOUNTAINS

1. The availability of necessary on-going quantities of water must be established at the planning stage. Emergency measures must be scheduled to cover the eventuality of a failure in the planned water supply.
2. Flowing water is therapeutic, calming and offsets the effects of intense dry heat. Water must be used efficiently (to reduce evaporation), safely (to avoid danger to humans or animals) and in a controlled way (to avoid erosion etc.).
3. Stationary and flowing water, if used judiciously, is an attractive feature in this arid climate. Because water can be recirculated, therefore not wasted, it is only the energy cost to run a water pump and maintenance cost that needs to be considered when contemplating inclusion of such a feature in a design.

TENTS

1. Tents and tent-like structures provide shelter, shade and privacy; and they allow for various outdoor uses. Where appropriate they should be integrated into a scheme at the concept and detailed design stage.

BARBECUES

1. Picnicking and barbecues are a fundamental part of the Saudi culture. Where appropriate, permanent or temporary picnicking and / or barbeque sites should be provided. The designs should be in keeping with the wider hard and soft design concepts.

3. Architectural Design

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ARCHITECTURAL DESIGN PRINCIPLES



Wind-catching devices help to cool the rooms

Source: EDSA

Architectural design in Desert Ecolodges must seek to:

- use the ecolodge as an educational tool to demonstrate the importance of the desert environment in sustaining human life
- reconnect visitors with their environment for the spiritual, emotional, and therapeutic benefits the desert provides
- promote new visitor values and lifestyles to achieve a more harmonious relationship with desert, regional, and global resources and environments
- increase public awareness about appropriate technologies and the cradle-to-cradle energy and waste implications of various building and consumer materials
- nurture living cultures to perpetuate indigenous responsiveness to, and harmony with, local environmental factors
- relay cultural and historical understandings of the desert with local, regional, and global relationships

Sustainable design balances human needs (rather than human wants) with the limits of acceptable change of the natural and cultural desert environments. It minimises environmental impact, importation of goods and energy, as well as generation of waste. The ideal situation would be that if development was necessary, an ecolodge should be constructed from natural sustainable materials collected onsite, generate its own energy from renewable sources such as solar or wind, and manage its own waste.

Desert Ecolodges should, by nature, follow the basic principles of sustainable design. They should not adversely impact the desert ecosystems in which they occur, or contribute to the degradation of the environment. Ecolodges should be responsive to the needs of visitors and the constraints of the natural and cultural environment of the desert.

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Successful ecolodges allow visitors to experience and learn about the aesthetic, biological, physical and cultural values of the natural environment. The architectural design of ecolodges should allow these experiences to occur with minimal impacts on the natural environment, and minimum use of resources and energy.

A general design approach that stresses visual blending of the buildings into the natural desert context should be developed for each ecolodge accommodation unit, while encouraging design flexibility to insure the units fit the owner's needs. Designs using muted colors, non-reflective materials, and exterior lighting which will not interfere or compete with the dramatic panoramic views of the desert and surrounding hills are encouraged. This shall allow the desert's natural context and colors to be dominant and will preserve the integrity of the overall philosophy.

(<http://www.tucsonmountainreserve.com/design.htm>)



Elements of architecture must respond to history. *Source: EDSA*

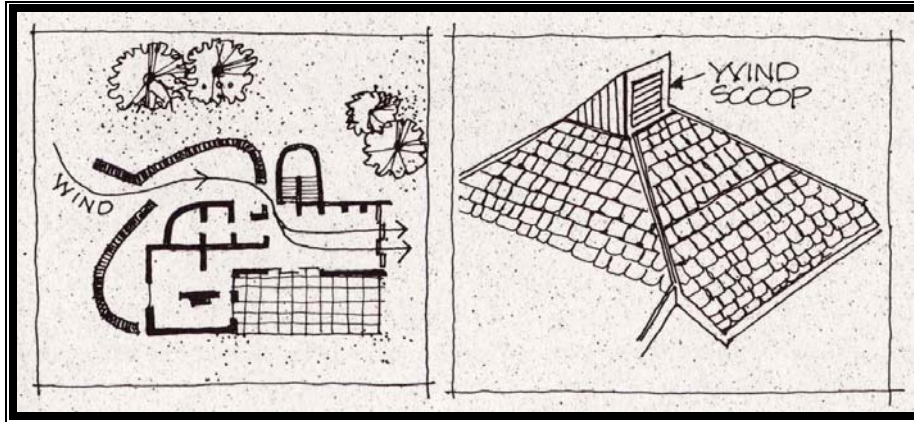
Elements of architectural design must respond to the history, culture and climate of the desert. Local material and architectural features – window and door details, perforated screens for privacy and air circulation, overhangs and use of shaded streets, courtyards and enclosures - can all help to produce an architecture which relates to the local **tradition**, is culture and environment-friendly and at the same time is **innovative**, appropriate and rich in visual experience and expression.

Like language, dress, food and poetry, a '**sense of place and culture**' is important. Architectural Design must, therefore, express and reinforce the sense of history and cultural identity, and relate to the particular social and family tradition of the area. Desert Ecolodges must take full account of the **Saudi way of life**, family structure and religious, social, cultural and leisure needs (Ernst and Young document).

Particular attention must be paid to the arrangement, sizes and heights of room, circulation, need for family privacy and orientation towards the **prayer** direction. All desert ecolodges should include proper space for prayer and separate facilities for ablutions.

Specific attention must be paid to all sectors of Saudi society not just to families; in particular, the needs of bachelors and bachelor groups should be addressed. There is a need for layouts and designs to address the needs of the disabled.

CLIMATE SENSITIVE DESIGN



Source: National Park Service, USA

The harsh desert climate is a critical factor to consider in the design of desert ecolodges. Designing for climate:

- can provide for the reduction of energy consumption through controlling the sun and utilizing the wind
- is a primary influence on the type of construction and the materials used for construction, and
- provides a basis for the physical form or style of an ecolodge.

The local desert microclimate is a main determinant in the direction that the ecolodge should be oriented. Wrong orientation puts extra loads on the energy consumption through higher air conditioning and ventilation demands.

Desert Ecolodges require a different approach to ecolodge 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.

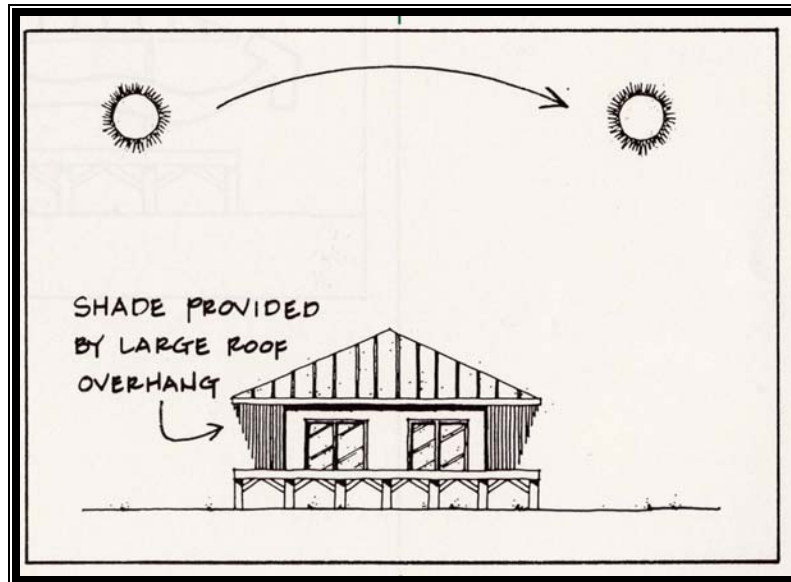
The application of the building orientation towards the prevailing winds using wind catches and appropriately designed openings, shade and shadow, fountain and water surfaces, cross-ventilation, heat resistant and thick walls, and other passive and natural techniques are all free and accessible.

The architectural form can by itself solve a lot of local climate problems. For example, if well designed, courtyards can give protection from sand and most of the wind-borne dust. On the other hand, fully exposed spaces require barriers to provide protection for overhead dust and side-swirls. In this case, protection is a function of length and height of barrier and distance from face of building.

Guidelines:

1. Orient your ecolodge in a north-south direction, whenever possible. This will benefit from the prevailing winds 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.



Source: E D S A

2. Climate tempering has historically best been achieved with large porches to shade the strong desert 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. Minimise western openings and carefully insulate western walls. 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. Promote wall and roof surfaces that either reflect the majority of the sun's heat. All external walls should be 0.5m thick so as to keep the heat away.
5. Use window lattices and screens, such as ornamental wooden-peg mashrabiya to allow air to filter freely into the rooms while additionally reducing the strong glare of direct sunlight. Also, use openings above doors.
6. 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 ecolodge should consider how a desert climatic condition could be successfully filtered without totally isolating visitors from the place.
7. Patterns of windows, doors and other openings are important; where possible they should reflect local architectural traditions. Ambient structural and climatic elements should be taken into consideration when designing facades and openings. Incorporate natural ventilation, day lighting, and passive solar heating into building design. Form should follow function.

Heating, Cooling and Ventilation



Malkaf's catch cool breezes and transport them from a higher elevation. *Source Hitesh Mehta*

Sharp differences in desert temperatures between closed and open spaces can create an unpleasant, even unhealthy, environments for lodge 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 desert ecolodges 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.

Guidelines:

1. Use wind scoops (commonly utilised in some parts of Middle East and northern Africa, such as the *malqaf* or *abdgir*) which catch cool breezes at roof level and channel them down in a shaft to lower-level living areas.
2. Investigate passive solar design, especially to reduce solar gain (and resulting space cooling needs). Aim to reduce internal heat load through good solar design.
3. Consider evaporative cooling systems, e.g., the use of internal courtyard fountains and pools. Moisten the air blowing into the ecolodge 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. Almost all the provisions above can be applied to interior landscapes. The internal courtyard is fundamental to Saudi culture.
4. Foster cross-ventilation in your design, which implies placing openings in opposite and parallel walls so as to induce natural airflow from outside and cooling interior spaces.

INDIGENOUS ARCHITECTURAL STYLES



Traditional Mosque

Source: Hitesh Mehta

Ecotourists generally look for an interesting environment with a different architectural sensibility. The ecotourist who visits the Deserts of Saudi Arabia is looking for traditional architectural forms, which are well designed and constructed. The traditional architecture of the old town of Al Ghat, for example, can be a useful source of inspiration for architects who are looking for a uniquely designed facility.

Curved roofs and massive bearing walls are also extremely functional and economically feasible, since they provide the maximum protection against the burning sun and heat of the region. If time is considered as a factor into the equation, traditional buildings are usually cheaper and more sustainable than conventional reinforced concrete structures. But, it does not suffice to merely copy the native forms (Tourism Development Authority, 1998).

Indeed, local decoration elements and architectural vocabulary might add an “image” of authenticity to your ecolodge, but these symbols and elements are not just artistic or creative products. They are the outcomes of a series of developments in the local and cultural conscious of people.

The general form of buildings should be responsive both to the desert environment and the objectives of the development. However, these factors can both constrain and influence the form of a building.

Guidelines:

1. Before drafting the first architectural design for your ecolodge, 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 your own design before it is drafted. These guidelines should analyse and explain the meaning of the local symbols and architectural elements and vocabulary used.

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2. Consider local and traditional building forms and building processes. Curved roofs or 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 colour may be left intact, or when necessary, light colours that protect the building's inner environment may be used.

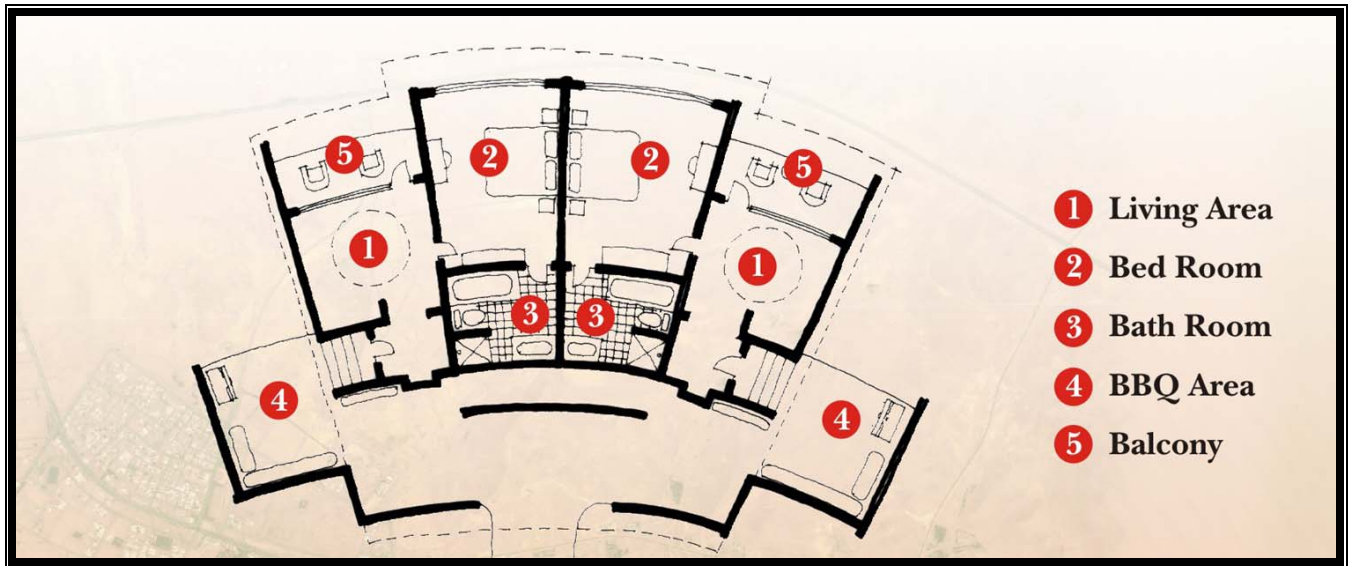


Indigenous Najd Architecture

Source: Hitesh Mehta

3. Remember that the main reason for an ecotourist coming to your ecolodge is the opportunity of being in close contact with the desert (in some cases, supplemented by interesting cultural elements). Therefore in the ecolodge, the architectural form should not compete with the desert 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 (Tourism Queensland, 1999):
 - the form should be appropriate to the desert site
 - design should minimise visual impacts
 - forms should have gentle contrast
 - forms should follow the contours of the desert 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 colours that harmonise with the natural environment: the rocks, the desert sand, the plants, and mountains (if any).

GUEST ACCOMMODATION FACILITIES



Guest Accommodation Units at Shalta Ecolodge, Al Ghat NP, Saudi Arabia

Source: Hitesh Mehta

The planning of interior guestroom spaces in desert ecolodges and their transition into exterior spaces should be given high priority. The distinction between these spaces should be less marked than in conventional lodges. Easy flow from the ecolodge to the ground should be emphasised, further integrating the site with the ecolodge and permitting easy access to the outdoors. The three important things to consider for overnight accommodations are:

- Indoor outdoor relationships
- Ambience of rooms
- Basic amenities – attached baths

Guidelines:

1. As much as possible, design for the disabled; facilitating use of wheel-chairs, providing ramps instead of steps, special-design toilet services etc.
2. From the design stage, consider ease of maintenance, cleaning, repairing and operation of your overnight accommodations in general.
3. Ensure that environmentally preferable equipment works well. For example, the quality of showers provided by water-efficient showerheads varies greatly, so careful selection is critical (Office of National Tourism, 1997).
4. Where low-flow taps are installed, 10mm pipes may often be used instead of 15mm pipes, reducing cost and heat losses in pipes, and halving the amount of water that must be drawn off before hot water reaches the tap (Office of National Tourism, 1997).

STAFF HOUSING FACILITIES



Staff Village at Lobolo Ecolodge, Northern Desert, Kenya Source: Hitesh Mehta

The desert environment might be your primary fixed asset in an ecolodge. Your staff, on the other hand, is your operational means in investing and developing these assets. It is not enough to provide adequate training for your staff, but it is absolutely critical to provide a secured and stable living environment for them. An essential part in this is healthy and comfortable housing. However, staff housing is usually put late on the priority list of conventional tourism development and is located in a remote and neglected areas from the main development (Office of National Tourism, 1997).

The development of attractive and efficient employee housing areas can be a major factor complementing the success of the project as, in simple terms, it develops a sense of community cohesiveness and permanence, thereby encouraging more tourism industry workers to settle with their families near their place of work, rather than travelling to and form a distant permanent residence.

Guidelines:

1. The development plan should provide for sufficient, suitably located land and infrastructure systems to meet the needs of employee housing.
2. Provide your staff with adequate and cheerful housing units that are close to the ecolodge itself. Also encourage your staff to have a permanent accommodation and to bring in their families. Provide a singles' cluster and a family cluster, each with its own common gathering space. Also provide a larger gathering space with the communal facilities that the staff would need for their daily life. Make this space accessible to your guests, and encourage social and festival activities to take place there.
3. Provide similar water and energy saving technology for the staff quarters as you would for the guest accommodations. Staff quarters are a major user of both water and energy and generate a lot of waste. Also, maintain the same standards of design and construction as that of the whole development. The form of the staff housing should be in the same language as the ecolodge.

KITCHEN and DINING FACILITIES



Kitchen at Basata Ecolodge, Egypt

Source: Hitesh Mehta

Ecolodge kitchens need to be designed with water and energy saving devices and areas should be designed for waste sortage and disposal. Materials chosen for a kitchen should be those that can be easily cleaned.

Regardless of the food itself, the seating arrangement in the dining room will influence the overall atmosphere of dinner. Social dinner as such plays a vital role in bringing people together and creating the sense of belonging to the place and what it stands for. However, in respect of Saudi Culture, private spaces for families should also be designed.

Guidelines:

1. The ecolodge kitchen should provide:
 - adequate and animal-proof storage for all dry goods
 - benchtops which are easily maintained
 - convenient collection points near the main preparation area for used oils, paper, glass, tin, and compost scraps. All should be well protected against insects, particularly ants.
 - a washing-up area with compost bin for food scraps, towels for degreasing plates, detergent in portion-controlled dispensers to limit the quantity used, a large drying rack to permit air-drying of plates and dishes, cutlery-drying bins for knives and forks, small wash-up basins, drying racks for tea towels. If dust proof storage is needed gasketed trunks may be used.
 - non-traditional kitchen cupboards.
2. Minimise open space design, and plan the dining area to have a number of small clusters or alcoves to fit dining tables for an average of two to four people each to provide privacy and a quiet atmosphere for social interaction. Provide different degrees of enclosure from indoor dining areas to outdoor moon light tables. Also dedicate a specific area for families with children and provide it with extra space and a circulation area that is closer to toilet facilities.

INTERPRETATION and RECREATION FACILITIES



Interpretation facility at Adrere Amalal Ecolodge, Egypt. *Source: AA Ecolodge*

One of the main components of ecotourism is interpretation and therefore facilities that provide education and interpretation to the visitors are critical to the creation of an authentic ecolodge. Interpretation facilities can be designed in many ways. It can be a small museum with sitting facilities, a visitor centre with exhibition space, an outdoor amphitheatre or simply a small gazebo at the entrance with notice board. In all instances, they need to be designed with the help of an interpretative staff member who is knowledgeable about the local flora, fauna and culture.

The physical spaces required for quality interpretation are an important element of an ecolodge. Interpretation can be seen as a process to communicate sensory and intellectual ideas and information about the surrounding natural and social environment to your ecolodge guests. Interpretation is about enhancing a visitor's experience and providing opportunities for learning in an informal context. Interpretation aims to give visitors new understandings, insights, enthusiasm and interests.

Interpretation must be reinforced in all visitor experiences and inherent in management's thinking and in the relationship of the proposed development to the larger cultural context. The value system that interpretation communicates must pervade the entire cycle of planning, design and construction.

Interpretation and environmental education services are the key elements in ensuring that visitor opportunities are experiential, and foster understanding and appreciation of the environment. Education and awareness are therefore integral components of effective environmental management of ecolodges. Interpretative facilities for education and awareness have space and design requirements that should be considered in the development planning process. The objective is to attune visitors, residents and staff to the values and fragility of the desert environment.

One of the main aspects of a desert ecolodge is that it involves providing visitors with an opportunity to learn more about the environment, while contributing to its conservation. Carefully planned recreational activities can help visitors better understand the conservation issues of the ecolodge site. Interpretation works best when visitors are at leisure.



A camel ride in the Middle Eastern Desert

Source: Al Maha Camp

Attention should be given to recreation opportunities such as providing walking and bicycle trails, camel riding, active sports, bird watching, rock climbing, indoor games, spiritual healing activities like tai chi, ayurvedic medicine, aromatherapy, etc. In our increasingly health conscious society, more and more soft focus ecolodges are recognising that the provision of a wellness center gives them a competitive edge when it comes to attracting guests.

Guidelines:

1. The primary interpretative resources of a desert ecolodge must be identified early in the planning process.
2. Design a space where an ecolodge operator can make a verbal and illustrative orientation to your guests to inform them about the lodge, the surrounding area and about the activities available and the activities prohibited. Use different presentation techniques and leave some flyers and posters throughout the lodge to remind your guests.
3. Design outdoor spaces that can accommodate the necessary recreation and interpretation activities. Determine the space required by these activities with the help of recreation and interpretation experts.
4. The size, shape, and siting of swimming pools (should you build them) must be carefully considered to achieve a feeling of compatibility with the surrounding natural elements.
5. Provide an interpretation centre at your desert Ecolodge that is accessible for all visitors, and is equipped with illustration, presentation tools and a library. This centre can act as a base for open-air visitation and trips to the surrounding attractions.
6. Carefully site the mechanical room as this can minimise routing and ducting of services and increase heat recovery potential.

Interpretative Trails



Signage is an integral part of an interpretative trail.

Source: RSSTI Library

Since trails for ecolodges 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.

Interpretative trails in desert environments can be self-guided or that in which the local guides (along with “tour leaders” in some instances, especially for organised groups) leads the way. In this case, signage could at times be a negative factor that can eliminate the more natural experience of visiting “unlabeled” trails and ecosystems. Furthermore, “unsigned” nature trails provide greater job opportunities for the guide and local experts especially for long trails in desert environments.

For self-guided trails, availability of simple trail notes and maps is crucial to an enlightening experience.

Guidelines:

1. At the desert trail’s starting point, always clearly indicate the distance to be covered, and the degree of difficulty. Along the trail, indicate unobtrusively, but clearly, the covered and remaining distances.
2. Signpost appropriately all trails, endeavoring to stimulate appreciation of the natural and cultural environment, providing interesting and pertinent information, and also encouraging suitable norms of conduct. Provide additional rules in brochures placed in the ecotourist’s rooms.
3. Design an appropriate network of nature trails (footpaths). Provide an adequate spectrum of options for different fields of interest and also physical strength of the tourist.
4. Place unobtrusive labels in those trees and bushes that are closest to your ecolodge so as to familiarise your visitors with the species that they will later be encountering in the desert trails.
5. If your ecolodge site within or near a natural wildlife habitat, establish trails and open spaces that encourage access to and protection of this habitat.

FURNITURE and FURNISHINGS



Furnishings utilize traditional Najd fabrics

Source: Hitesh Mehta

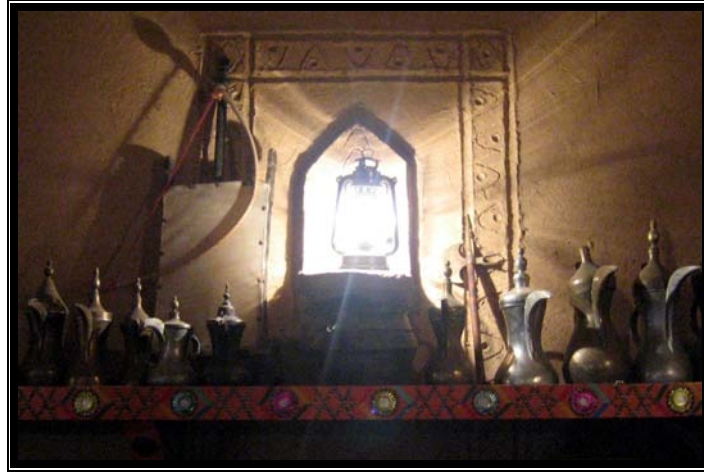
Every local culture has its own way to express its symbols, cultural customs and traditions. This can certainly be seen in the local architecture in its abstraction. However, if we really want to learn and to study this in its details, two main sources would be inevitable: the linguistic system, and the decoration motifs and furniture style. Even though the former might need specialised experience to study it, the latter might be more accessible to the broader audience of guests.

Local furniture and decoration could be part of the learning process that your guest experiences. These handmade motifs and furniture are not only an artistic expression, but also a living for many of the families.

Guidelines:

1. Whenever possible, use locally made furniture and decoration elements throughout your desert ecolodge. This will certainly enhance the authentic quality and image of the lodge, and will sustain a minimum level of economic benefits to the local community. It will also provide your lodge with appropriate, renewable and relatively in expensive furniture and decoration.
2. Use fabrics for interior furnishings that are made of cotton, unbleached linen, coir, sisal – rather than synthetics.
3. Be genuine and don't resort to cheap imitations..
4. Take advantage of local materials and hand labour, including native artists and artisans in the interior furnishing and decorating process.

INDOOR LIGHTING



Indoor Lighting in a Najd dining room *Source: Hitesh Mehta*

Every activity in an ecolodge has its own lighting need and every individual conducting these activities might have a different lighting need. The dialogue between light and darkness in a desert ecolodge will indeed improve the sensory and functional qualities and experiences. Day-lighting should be incorporated wherever possible in your ecolodge as it will increase the quality of the indoor environment, provide a more natural ambience, and reduce lighting loads. Take the first step towards environmentally conscious lighting and carefully consider opportunities for natural lighting especially in the desert where there is usually strong light.

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

Guidelines:

1. Orient your guest units and other main buildings so that maximum use is being made of natural light.
2. At night, avoid using fluorescent and other uniform artificial lighting except in the kitchen area or where it is absolutely needed. Alternately, use traditional oil lamps or direct types of lighting elements with different degrees of intensity to create areas with relatively high intense lighting levels, and other areas with very low lighting levels just to secure the basic walking needs.
3. Avoid over-lighting, especially in hallways and other public areas. Use natural lighting whenever possible.
4. Use compact 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. 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.
5. 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



Natural Building materials in Al Ghat Area *Source: Hitesh Mehta*

Considering the main objectives and essence of ecolodge development, the basic materials used for the construction of the lodge facilities can be a determining factor in the success of your investment. Most experts agree that, since ecolodges have to build with 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 only the only factor in the use of building materials, but also in the way these materials are extracted, treated and used.

For desert climates, it is important to have in mind certain climatic considerations, such as heat, wind, etc., in order to choose the most suitable building materials. If access by road or highway implies covering long distances, the transportation of materials which are supplied from far away sources may imply high freight costs and fuel consumption. When embarking on any analysis of construction aspects apply the 'life-cycle' approach in building, i.e., how much 'embodied' energy does the building material create over its entire life? This means taking into account the energy consumption of the different construction stages from the extraction of the raw material to obtaining the building product, to the amount of energy required to manufacture the material and its related products, to transport of the material from source to project site, to installing it on site, also the energy required for its cleaning and maintenance over its useful life, and the energy eventually utilised in its dismantling, relocation and reuse. This is known as a cradle-to-cradle analysis.

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

- impact of the ecolodge on local, national and world 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 ecolodge.



Strawbales for wall construction

Source: Hitesh Mehta

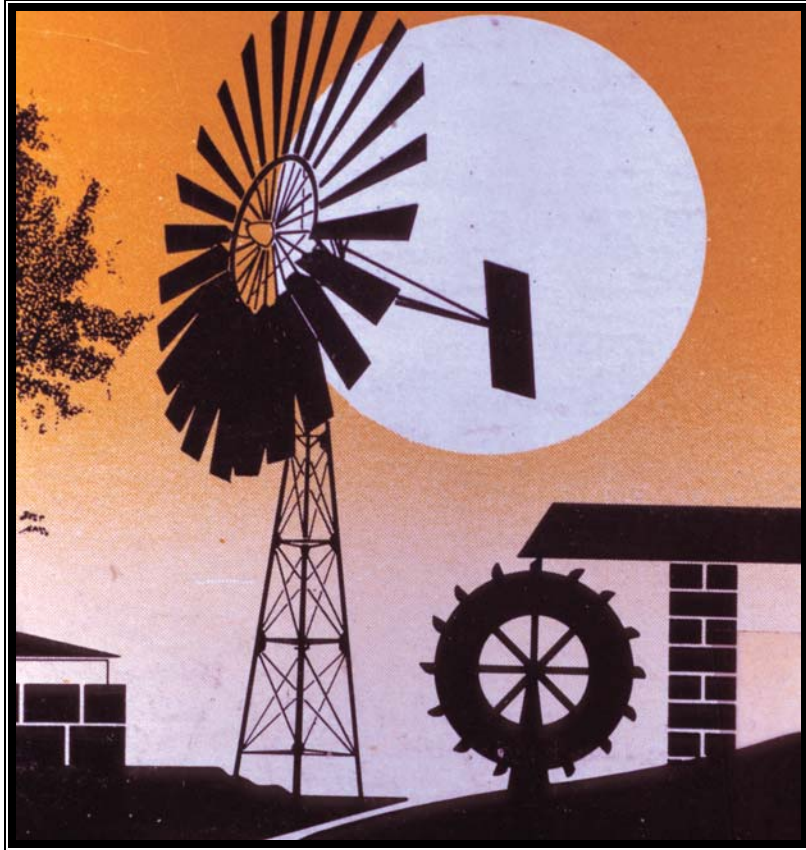
Guidelines:

1. When addressing issues of availability, durability, and cost-effectiveness, carefully scrutinise traditional building materials. First, the architect and /or landscape 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 your area (rock, stone, wood etc.) 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. Building specifications should reflect the environmental and conservation concerns as related to timber products and other building materials. If you utilise wood, it is important to know its source. Ensure that the wood is from a certified sustainable source.

4. Infrastructure and Environmental Management Systems

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INFRASTRUCTURE and SUPPORT SYSTEMS



Early in the desert ecolodge 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, pollution from windborne solid waste, protection of guests from smells, noise or unsightly facilities and operations, efficiency in distribution systems, etc.

A thorough analysis by a capable environmental desert engineering design team should identify options for minimising resource consumption and maximising operating savings. These findings may lead to changes in the design of the project, not only in the selection and use of equipment – such as generators, transformers, water supply equipment, wastewater treatment equipment, and the like – but also in basic decisions concerning site planning and building design.

Improving environmental performance does not have to increase costs or reduce comfort and convenience. As better environmental practices are being sought, there are more solutions which enable environmental, financial and client service goals to be met simultaneously. For example, sound passive solar building design reduces the financial and environmental costs of heating buildings, while improving client comfort (Office of National Tourism, 1997).

ENERGY MANAGEMENT



Windmill Power Generation in Egypt

Source: RSSTI Library

Ecolodges in the deserts of Saudi Arabia 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 an ecolodge site has primary natural and cultural resources, it has primary renewable energy resources, such as sun and wind. These are the two main alternatives and low impact energies that will be addressed in this chapter. The availability, potential, and feasibility of primary renewable energy resources must be analysed 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. Wind-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 ecolodges.

Guidelines:

1. In the design stage, you should anticipate avoiding the use of high-energy consumption equipment and hazardous materials. 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 heat water. Concerns about emissions from burning some wastes in some locations may mean that recovering of energy for the burning of wastes is not an option.
2. Automatic controls can switch (on/off) or dim lights. Care needs to be taken in setting up automatic controls and performance must be monitored.



Solar Water Heating

Source: Hitesh Mehta

3. The most basic feature of an energy-efficient lighting system is conveniently-located and labelled switches.
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 natural methods for drying clothes. Create sunrooms with translucent roof tiles.



Clothes being dried naturally

Source: Hitesh Mehta

Solar Power



Source: *Hitesh Mehta*

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

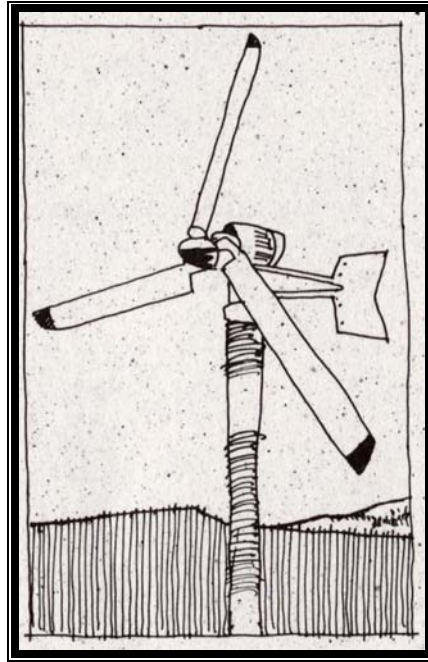
There are many photovoltaic (PV) cell technologies now available commercially and all have different comparative advantages. In every case, electric storage is by lead-acid deep-cycle batteries, similar to those used in golf carts. Advantages of solar power include:

- 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.

Guidelines:

1. Study the costs, benefits, and drawbacks of different options of PV technology that can be used in your ecolodge.
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 towards the south with an inclination similar to that of the geographical latitude of the site.
4. Use efficient fluorescent lights to attain a higher efficiency in your PV system.

Wind Power



Source: National Park Service, USA

Another alternative for generating electricity in an ecolodge in the deserts of Saudi Arabia is the use of wind power. Wind generators may be utilised at sites exposed to high wind velocities. Although there are several brands already commercially available, this technology has not yet achieved the popularity and diffusion of solar energy. However, rapid technological changes are taking place in this field and it is wise to keep abreast of future developments.

Advantages of wind power include:

- 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 than with 12-volt or 24-volt power
- may be combined with other energy forms.

Guidelines:

1. Consult with wind energy experts before deciding whether wind power would be an economical alternative as an energy source.
2. Study the wind velocities on the site over a long period of time before deciding to use windmills.
3. Consider the use of windmills in ecolodges that are located in the desert, which are likely to have enough windflows.
4. Use wind generators to pump water from wells.

WATER



Water resources are scarce in the desert

Source: Al Ghat Municipality

Water is used for a range of purposes in tourism developments, including drinking, bathing, washing and waste disposal. Since water is a scarce resource in most parts of the desert regions, the key objective of ecolodge development in natural areas should be to minimise or eliminate impacts on natural surface and groundwater flows. In an ecolodge development, where health considerations are paramount, water issues centre on providing safe drinking, washing, cooking, and toilet-flushing water.

The cornerstone of any desert ecolodge water supply program should be conservation. Water conservation also includes using water of lower quality such as reclaimed wastewater effluent, grey water, or runoff from ground surfaces for toilet flushing or irrigation of vegetative landscape or food crops.

Visitor education awareness is key to a successful water conservation program. At a desert ecolodge 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. Treated wastewater effluent should be used to irrigate landscaped areas in the setbacks and in gardens near the resort buildings. This practice reduces demand for fresh water and provides a means of disposing treated wastewater effluent.

Fresh water



Source: Al Ghat Municipality

The aim of any desert ecolodge designer should be to make visitors aware of the precious nature of fresh water at every possible opportunity. This would also significantly reduce the costs associated with pumping, storage and maintenance. To control fresh water wastage, a factor of 50% should be included in any water use calculations at the early planning stages to ensure an adequate supply is in fact possible.

Guidelines:

1. Wherever possible, utilise water as an element of design in the interior spaces of your ecolodge, providing horizontal or vertical flow (small waterfalls, lily ponds with moss-covered stones and ferns, etc.). Apart from the pleasant aesthetic effect and sense of freshness, the sound of running water produces a sedating effect.
2. Minimise 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 from desalination plants and design supply facilities accordingly.
6. Avoid using fresh water for irrigation. Instead, use recycled water.
7. Mandate low-water-use toilets (1-1/2 gallons/flush or less)

Greywater



Greywater is treated and used for irrigation

Source: Hitesh Mehta

Due to the absence of fresh water, ecolodges in the Desert regions should make every effort to recycle wastewater. Wastewater from showers, bathroom basins and other wash-sinks is known as greywater. 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, and arrestors, the vast amounts of water from washing machines and kitchen sinks should be just fine for irrigation and flushing toilets.

The wastewater 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 wastewater is then piped from storage for use in the landscaped areas and flushing toilets.

Guidelines:

1. Reuse wastewater (both grey and black) as much as possible. Create systems in which water goes through several uses before being disposed of, utilising it as irrigation or fertiliser for cultivation, flushing toilets, etc.
2. In case you re-use both grey and black waters, separate lines and septic systems must be installed.
3. Use only treated greywater in irrigation.

SOLID WASTE



Source: *Basata Ecolodge*

The management of solid waste is a crucial conservation problem in and around desert ecolodge sites, particularly due to the presence of wildlife and sensitive indigenous flora, which stand to suffer from the adverse effects of the irresponsible handling and disposal of waste. Therefore, the design of an ecolodge 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 an ecolodge. Waste can not only cause visual pollution of the site, but also has the potential to cause contamination of the soil, water, air with nutrients, chemical residues and fumes.

Strategies for minimising 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.

The types of waste likely to be produced should be comprehensively identified. Adequate secure sorting and storage space should be provided – and the processes of collecting and safely transporting waste off-site should be carefully designed.



Signage is important to educate guests on the importance of recycling.

Source: Hitesh Mehta

In planning for ecolodges, a comprehensive design strategy is needed for preventing generation of solid waste. A good garbage prevention strategy would require that everything brought into a facility be recycled for reuse or recycled back into the environment through biodegradation. This would mean a greater reliance on natural materials or products that are compatible with the environment.

Every ecolodge has two basic sources of solid waste:

- materials acquired and used by management
- materials brought in by guests.

Much of the growing volume of garbage 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 litter the desert landscape.

Unlike other waste streams, which are less tangible and thus sometimes difficult to notice, solid wastes can be highly visible and movable: desert winds and sea currents transport wastes, or litter over long distances from their point of generation. Proper management of solid wastes in tourism areas is very important, particularly in desert environments where the rate of decomposition is slow and the visibility of litter wastes is high.

Solid waste should be landfilled in an environmentally safe way at a centralised and well controlled location, and that these locations must be placed at a sufficient distance from habitation areas in order to avoid aesthetic, hygienic or odour problems or inconveniences from mosquitoes and flies. The locations should be fenced in order to prevent scattering of waste blown by the wind.

Organic waste can be used for producing compost (an excellent organic soil fertiliser) and biomass, as well as fuel. Composting of organic materials and reuse of various paper, plastic, and metal wastes are prime examples of feasible recycling programs.

In addition, public awareness and education programs are essential components of a successful solid waste management strategy, without which equipment and systems may be rendered ineffective.

Guidelines:

1. Convert biodegradable waste to compost, utilise the biomass or submit the waste to digestive anaerobic systems (EST, 1997).
2. The main opportunities for recycling waste on site are likely to be the recycling of organic waste through composting, worm farming or anaerobic digestion (with energy recovery in the latter case). If too much compost is produced for use on site, it may be possible to find beneficial off-site uses (Office of National Tourism, 1997).
3. Design spaces for on-site separation for paper, glass, aluminium, steel and plastics.



Solid waste facility in a desert camp in Oman has no on-site separation .

Source: Hitesh Mehta

SEWAGE TREATMENT



No sewage should be discharged into the surrounding desert.

Source: Hitesh Mehta

Ecolodges in desert areas should have no sewage directly discharged into the surrounding desert and accidental spills should be closely monitored and treated. The solid components of sewage should act as a fertiliser for greenery after being composted with bulking agents and moisture.

In ecolodges, it is important to use sewage treatment technologies that are biological, nonmechanical, and do not involve soil leaching or land disposal that causes soil disturbance. While a septic system can be considered, treatment methods that result in useful products such as fertiliser and fuels should be investigated. Constructed biological systems are being put to use increasingly to purify wastewater. They offer the benefits of being environmentally responsive, non-polluting, and cost-effective.

Latrines



A Pit Latrine in the deserts of Egypt

Source: Hitesh Mehta

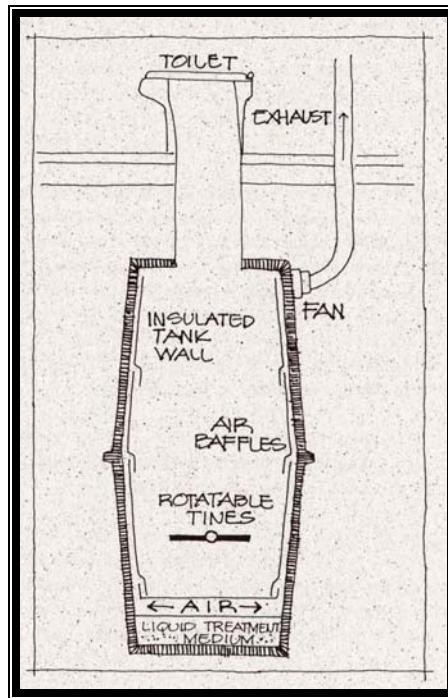
Pit latrines are the most rudimentary method for disposal of human faecal matter. It is not advisable as the permanent solution of the main body of your ecolodge, but may be justified during the construction stage or at the very beginning of your operation, as well as in remote camping areas or in distant portions of nature trails. A pit latrine is a hole in the ground (covered by a cabin) in which human faecal material is dropped. When the hole is filled up to about 1 meter 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 around ecolodges 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.

Guidelines:

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 meters 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 which 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 odours 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



Source: National Park Service, USA

A dry toilet, also called a composting toilet, consists of a large tank located directly below the toilet room. Wastes enter the tank through 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 odourless 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 be used as a soil fertiliser. 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 don't drown. Compostable kitchen scraps can also be added to dry toilets.

Guidelines:

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 litres half flush and 6 litres full flush) (South Australian Tourism Commission, 1994).
2. Moisture levels must be monitored, as biological activity will stop in toilets that are both too wet or too dry (Office of National Tourism, 1997).

TELECOMMUNICATIONS



Internet Access is important in ecolodges.

Source: Hitesh Mehta

Given the general remoteness of many desert ecolodge developments, consideration should be given to providing access – incoming and outgoing – to a wide range of current and developing communication technologies such as:

- dependable emergency contact for ambulance and aeromedical services to local and urban medical and hospital facilities
- international satellite and telecommunications
- electronic mail
- mobile phone, telephone and facsimile.

These facilities will have consequences for energy requirements in the ecolodge and should be included early in calculations of power supply. Their use should be controlled and provided in a secure location.

Guidelines:

1. Consider potential future markets in the ecolodge industry which may require multimedia facilities as a matter of course – for example, executive and academic retreats or conferences needing technologies such as Internet and email.

5. Sustainable Construction

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SITE PREPARATION and CONSTRUCTION



Construction in a Al Hofuf farm

Source: Hitesh Mehta

Developers and architects should strive to ensure that the construction phase of the ecolodge development has minimal impact on the natural environment. The complexity of site preparation and construction is magnified in desert ecolodge sites by the value of the resource, physical remoteness, and the limited availability of craftsmen and materials.

Local construction techniques and building materials should be used as long as they do not adversely affect the natural and cultural resources of the area. The methods and techniques used should ensure that there would be no residual signs of construction or environmental damage.

Guidelines:

1. The sustainable construction of your ecolodge 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 minimise 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.

POTENTIAL IMPACTS



If not controlled construction can have major impacts. *Source: Hitesh Mehta*

Managing the construction process so that it causes the minimum amount of negative impacts on the site must be an important goal. 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, minimising 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 so it is critical that for ecolodges, a detailed construction plan specifies each one of the steps that need to be taken and identifies the responsible parties for each task.

Guidelines:

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 organise 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 which are clearly off limits
 - methods of materials delivery and on site handling which 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, especially deserts. Work with natural topography as much as possible. Time construction to avoid migratory and spawning seasons. Apply grading controls and require rapid relandscaping of disturbed areas.
3. Building construction areas should be minimised. This can be achieved by carefully planning and controlling activities with the use of fencing in order to minimise disturbance to existing soil, hydrology, vegetation and fauna.

FINAL DRAFT

CONSTRUCTION EQUIPMENT and FACILITIES



Generators create diesel pollution during construction *Source: Hitesh Mehta*

Through maximised utilisation of construction equipment and the facilities, ecolodges in deserts should attempt to preserve natural resources on the site and minimise disturbance of the flora and fauna in the area during construction.

The equipment used for construction should consume little energy and be non-toxic. For example, generators produce waste fuel and this needs to be collected and re-used for other purposes.

Guidelines:

1. Plan the exact location of storage areas for building materials, tools, machinery and equipment before you start to build. Optimise 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 (International Paper Realty Corporation of South Carolina, 1986).
3. On-site facilities and storage should be kept to a minimum and tightly controlled.
4. Hand excavate foundations whenever possible, avoiding heavy machinery to minimise environmental impacts (EST, 1997).
5. All construction vehicles must comply with applicable Saudi Arabian codes, re: inspections, licensing and authorisation for operation.
6. Provide toilet facilities for the workers on the job site in a discreet location (International Paper Realty Corporation of South Carolina, 1986).

TRADITIONAL CONSTRUCTION



Rocksalt construction in Egypt

Source: Adrere Amalal Ecoodge

The economics of building forms may be easily understood by looking at traditional building processes and buildings that utilise these traditional technologies. In an area as remote as some of the deserts areas of Saudi Arabia, transportation costs of imported building materials, such as cement and reinforcement steel, can be a significant component of the balance sheet of any ecolodge development. In addition, the cost of moving and accommodating a non-local builder and staff can be an exhausting experience.

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.

Guidelines:

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



The library in Al Ghat was built using strawbale.

Source: Hitesh Mehta

A successful scenario for an ecolodge 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 ecolodge, through energy-efficient tools and methods of construction, such as use of hand-operated vibrators for sisal-cement roofing sheets, block-presses for making stabilised earth blocks, solar-powered tools for construction, and modern concepts of prefabrication of building materials. Structure – off-site prefabrication, made easier by simple geometry in building design, can reduce site impacts and facilitate the re-use of building components.

Guidelines:

1. Any modern technology that you choose to apply in your ecolodge 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 stabilised 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 emphasise 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



Source: *Hitesh Mehta*

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) which would otherwise be carried about by the wind. 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.

Guidelines:

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, including offcuts.
4. The size and shape of pre-fabricated materials should be considered carefully to minimise 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. Careful footing design and siting can minimise the quantity of this material.

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About the author



The author of this document, **Hitesh Mehta** is one of the world's leading authorities, practitioners and researchers on both the landscape architectural and architectural aspects of ecolodges. Mr. Mehta has worked in Egypt, China, Saudi Arabia, India, Kenya, Uganda, Rwanda, Brazil, DR Congo, Turks and Caicos, Colombia, Belize, Madagascar, Galapagos, Gabon, Fiji, Bahamas, St. Vincent and the Grenadines, USA and Puerto Rico.

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Mr. Mehta sits on the Executive Board of The International Ecotourism Society, advisory board of BIOSFERA (Brazilian Environmental Society) and is one of the founding members of The Ecotourism Society of Kenya. Mr. Mehta is the International Advisor for the Japan Ecolodge Association. Mr. Mehta is/was selected to be a judge and on-site inspector for the Tourism for Tomorrow (WTTC), World Legacy Awards for Heritage Tourism and Ecotourism (National Geographic/Conservation International), Ecotourism Awards (Conde Nast Traveler) and Green Hotelier Awards (Caribbean Hotel Association).