

APPENDIX (H): SUSTAINABILITY CRITERIA - EXAMPLES OF IMPLEMENTATION GUIDELINES

The following is the collection of criteria and implementation guidelines to be used to achieve sustainability associated with each indicator.

Air Quality

- Maximize vegetative cover
- Minimize exploitation of forestry
- Evaluate wind patterns in all seasons for detrimental/beneficial effects
- Minimize auto use and maximize walking trials
- Minimize cars and coal emissions
- Avoid thermal pollution

Water Quality and Supply

- Ensure water supplies locally
- Preserve natural drainage patterns and the underground water tables
- Prevent water pollution with chemicals, trash, or other harmful materials
- Maximize natural filtration of rainwater
- Use effective irrigation systems
- Reduce evaporation
- Use nontoxic water treatment systems to minimize drink water pollution
- Minimize the use of pesticides that contaminate groundwater
- Use low flow toilets and showers
- Use of appropriate plumbing design and fixture that provide a rationale flow rates
- Recycle/reuse gray water and surface run-off water for irrigation or drinking

Soil Quality and Land Management

- Detoxify soil and preserve top soil
- Prevent soil erosion and sedimentation
- Eliminate use of agricultural chemicals
- Encourage the formation of new soil lands
- Combat desert formation and maximize the green cover
- Conserve forest areas and reforest degraded areas
- Preserve agriculture land for food and use low-productivity land for structures

- Use natural pesticides and pest-resistant crop varieties
- Use companion planting and mixed cropping
- Use organic labor intensive methods

Energy

- Rely on the on-site energy production
- Incorporate natural energy flows into accommodations and facility design
- Minimize the use of high-level energy consumption systems, appliances, and tools
- Encourage the use of alternative renewable energy sources such as solar and wind
- Minimize the use of non-renewable energy resources
- Construct energy-efficient use of the built environment spaces
- Optimize building, roads, paths clustering and orientation to reduce the use of energy
- Use materials with low operating and manufacturing energy costs
- Maximize the use of natural ventilation, lighting, and heating systems
- Limit outdoor night lighting to low wattage, directional lighting
- Consider the use of photovoltaic power and control.
- Incorporate water heating from renewable energy sources into the design
- Prohibit the use of fossil fuels or nuclear power as primary energy sources
- Incorporate plants into the site design to reduce energy use and absorb pollutants.
- Minimize automobile use that reduce energy consumption and minimize air pollution

Biodiversity and Ecological Integrity

- Use of self-regulation for limiting stays at resource-sensitive areas.
- Use of ecologically sensitive and sustainable replacement materials.
- Maintain natural flow rates and volumes of natural streams
- Avoid use of greenhouses that causes global warming
- Follow laws and regulation during construction (e.g. silt fences, straw bales, stream bank stabilization, mulching, and turbidity curtains)

Wildlife Preservation

- Avoid disruption of wildlife travel or nesting by sensitive siting of development and by limits set on construction activity and facility operation.
- Maintain as much original wildlife habitat and corridors as possible.
- Avoid development in sensitive habitat or endangered species areas if threatened (areas that provide food, shelter, and breeding places for rare species or areas of geological interest and scarce)
- Prohibit human access to sensitive habitat areas

- Control access to less critical areas for passive recreation or education (ecotourism)
- Enhance edge zones and protect riparian habitats areas with vegetative buffers
- Avoid roads development to cross wildlife habitats or provide underpasses
- Provide shelter, cover, and breeding areas for wildlife
- Plant food species of value to local wildlife
- Provide adequate water; create ponds or wetlands for the indigenous wildlife.
- Develop systems to prevent conflicts between feral animals and the visitors.

Aquatic wildlife

- Set development back from the aquatic zone
- Avoid development in sensitive habitat areas
- Use ecologically sensitive and sustainable replacement materials

Vegetation

- Utilize plants for breezing and cleaning air
- Locate development in such to minimize disturbance to the ground and site nature
- Avoid cutting mature vegetation that prevents erosion and sedimentation.
- Incorporate natural vegetation into the built environment design to diminish visual impacts and to minimize imposition on environmental context
- Protect sensitive rare native plant species and maintain existing vegetation
- Regenerate degraded areas (natives preferred)
- Maximize non-grass vegetative cover and avoid using poisonous or toxic plants
- Locate vegetative buffers along streams and around other riparian areas.
- Line streets, paths, trails with trees, etc.
- Use vegetation for shading, aesthetic purposes, and to reduce energy use in building.
- Provide community garden space for out door activities.
- Locate vegetative screening for privacy and noise control

Natural Characteristic of the Site

Water Bodies

- Consider building orientation to capture good views
- Consider advantages of off water breezes
- Safeguard water from pollutants from the development itself and its users
- Avoid visual impact of development on waterfront zones
- Use building setbacks with reasonable beach buffer zones

Hydrology

- Locate facilities to minimize erosion and impacts on natural hydrological systems
- Safeguard hydrological system from contamination by development/activities
- Allow precipitation to naturally recharge groundwater, wherever possible
- Enhance flood control systems

Geology/Soils

- Integrate geologic features into design to enhance the sense of place
- Bring visitor in direct contact with natural resource and uniqueness of place
- Minimize soil disturbances to avoid erosion of fragile soils
- Discourage the growth of exotic plants.
- Minimize erosion by avoiding large impervious surface areas that collect rain and create concentrate runoff into site

Atmosphere and Climate Characteristic if the Site

Temperature

When climate is predominantly too hot for comfort designer should:

- Minimize solid enclosure and thermal mass
- Maximize roof ventilation
- Use elongated or fractured floor plans to minimize internal heat gain and maximize exposure for ventilation
- Separate rooms and functions with covered breezeways to maximize wall shading and induce ventilation
- Isolate heat-generating functions such as kitchens and laundries from living areas
- Provide shaded outdoor living areas such as porches and decks
- Capitalize on cool nighttime temperatures, breezes, or ground temperatures
- Consolidate functions into most compact configuration
- Insulate thoroughly to minimize heat loss
- Minimize air infiltration with barrier sheeting, weather-stripping, sealants, and airlock entries
- Minimize openings not oriented toward sun exposure

Sun

When solar gain causes conditions too hot for comfort:

- Use overhangs to shade walls and openings
- Use site features and vegetation to provide shading to walls with eastern and western exposure
- Use shading devices such as louvers, covered porches, and trellises with natural vines to block sun without blocking out breezes and natural light
- Orient broad building surfaces away from the hot late-day western sun (only northern and southern exposures are easily shaded)

- Use lighter-colored wall and roofing material to reflect solar radiation.
- Use shutters and screens, avoiding glass and exposures to direct solar gain

When solar gain offset conditions that are too cool for comfort:

- Maximize building exposure and openings facing south (facing north in the southern hemisphere)
- Increase thermal mass and envelope insulation
- Use darker-colored building exteriors to absorb solar radiation and promote heat gain

Wind

- Use natural ventilation wherever feasible
- Limit air-conditioning to areas requiring special humidity or temperature control
- Maximize exposure to favorite wind through building and spaces orientation
- Configure number, size, and position of wall and roof openings, and relationship to grade and vegetation
- Use wind scoops, thermal chimneys, or wind turbines to induce ventilation on sites with limited wind
- Consider wind effects on walls and roofs by the use of appropriate wind bracing and tie-downs

Moisture

Strategies to reduce the discomfort of high humidity may include:

- Maximize ventilation
- Induce air flow around facilities
- Vent or move moisture-producing functions such as kitchens and shower rooms to outside areas.
- Place facilities where breezes will pass over water features before reaching the facility
- Provide fountains, pools, and plants

Rainfall and Storms

- Locate development away from natural drainage to protect the environment as well as the structure.
- Provide arrangements for emergency storm shelters
- Avoid development in floodplain and storm surge areas
- Design facilities to be light enough and of readily available and renewable materials to be safely sacrificial to large storms, or of sufficient mass and detail to prevent loss of life and material

Cultural Resources Preservation

- Improve visitors and local communities' experience, awareness, and understanding of their local natural and cultural worlds by using the appropriate media.
- Use of local skilled artisans to reflect and enhance local cultural values
- Place interpretive exhibits within the development that allows visitors to be aware of resource protection.
- Encourage opportunities for visitors and local residents to interact and share their values and experiences.
- Cultivate plants within the development.

- Have local plants and site features identified by labels or in guidebooks.
- Provide sensory experiences using interpretive messages as part of the design.
- Encourage sensing, experiencing, and understanding resources in the architecture style and site design.
- Assimilate local patterns
- Develop an understanding of local culture and seeking their input in the development processes.

History

- Reinforce cultural history through design by investigating and then interpreting vernacular design vocabulary.
- Use of local design elements and character to establish an architectural theme for new development.
- Encourage and nurture cultural traditions
- Ensure local foods, music, art and crafts, lifestyles, dress, and architecture, as well as a means to supplement local incomes.
- Allow traditional harvesting of resource products to reinforce the value of maintaining the resource.

Historic and Archeological resources

- Protect archeological resources and incorporate it into designs as an educational tool.
- Provide opportunities and space to demonstrate local crafts and performing arts
- Incorporate methods for protecting and preserving significant cultural resources
- Use preservation and interpretation of archeological features to provide insight to previous cultural responses to the environment
- Reuse historic buildings whenever possible to assist in their preservation
- Incorporate the living culture as a significant part of the visitor experience
- Reuse existing buildings when they reflect part of the story of the site
- Provide learning opportunities through interpretive exhibits, literature, and guided activities
- Integrate exhibits into site design to reveal unique aspects of the development
- Feature architectural design and materials those are native to the site, renewable, and environmentally sensitive
- Provide cultural resources that are lacking in other sites and supported by locals
- Emphasize character and style of the region
- Seek balance between existing cultural patterns and new development
- Use local design elements and character to establish an architectural theme for new development.
- Allow visitors/local communities to experience local culture and traditions in an intimate sensory fashion
- Incorporate methods for protecting and preserving significant cultural resources into site planning and facility designs
- Use treatment and maintenance methods that are both environmentally and culturally sensitive and sustainable.

- Interpret cultural resources to include lessons about the environmental exploitations or sustainable, environmental successes of the past.

Public Participation

- Participate in updated environmental education programs
- Provide educational programs about the need to live sustainable, and how to do so.
- Provide accessibility to facilities, goods, and services;
- Encourage access to people (Church and McHarry, 1994)
- Provide activities and facilities for social interaction
- Provide public services, shopping, healthcare, religious services places
- Provide shuttle services for elderly and those without cars
- Allow visitors to work on restoration or enhancement of the environment
- Develop volunteer programs that allow visitors to operate site support systems
- Encourage visitor experiences that are environmentally and culturally compatible
- Involve local population in the appreciation and preservation of their resources
- Encourage direct and open communication between stakeholders
- Provide public open spaces and common spaces with features that encourage outdoor activities
- Provide appropriate human activities such as walking and cycling paths
- Provide visitors with access to educational materials to enhance their understanding and appreciation of the local environment and threats to it
- Participate in work/study programs that emphasize sustainable design values

Traffic and Transportation

- Restrict transportation to the zero emission vehicles
- Provide shuttle services for elderly and those without cars
- Encourage the use of transportation that runs on clean and renewable energy sources such as tidal hydrogen power realized from solar collection; electric power from solar; wind; geothermal sources; or magnetic levitation from superconductors within lifecycle and cost efficiency analysis
- Minimize automobile use that minimize energy use, air pollution, and the over all impact to the environment
- Provide access and extensive of public transportation in all aspects of an integrated land use plan
- Provide mass transit such as train and/or bus where population size support it
- Provide shuttle service
- Maximize walking and cycling by provide bike trails and pedestrian paths
- Keep users within walking distance to the center and other facilities
- Provide shopping, facilities, and services within walking distance
- Provide parks and recreation places within walking distance

- Plan with energy- efficient transportation systems
- Provide mass transit
- Provide shuttle service (other alternative)
- Provide food and other goods locally
- Minimize length and width of roads
- Minimize size and number of parking areas
- Prohibit cars or restrict the number per accommodation units or people
- Discourage/Minimize automobile use
- Sustainability Implementation Criteria
- Provide mass transit, bike trails and pedestrian paths, and shuttle service
- Reduce energy requirements for transportation
- Plan energy- efficient transportation systems
- Locate footpaths and bike trails for convenient access to accommodation units, commercial, recreational, services and natural areas
- Minimize energy use, air pollution, and the overall impact to the environment
- Maximize walking and cycling
- Provide access to public transportation of all aspects in an integrated land use plan
- Encourage the use renewable sources of energy for vehicle operation
- Use transportation that run on clean and renewable energy sources
- Favor the use of low-energy and non-polluting transportation
- Practice good vehicle maintenance

No Use of Toxic Products & Minimize Disposal of Toxic Wastes

- Substitute nontoxic materials; building materials, household cleaners, and water-based paints
- Avoid use of toxic materials as a substitute for elbow grease or equipment maintenance.
- Use minimum amount of nontoxic materials to accomplish task.
- Plan to avoid wasted materials.
- Provide onsite control.
- Pave and dike all areas to ensure non spilling of toxic materials to the environment
- Segregate toxic waste for offsite disposal.
- Ship wastes to offsite facility for disposal (landfill or incinerator)

Safety and Security

- Locate and design walks trails and lodging to discourage visitor contact with dangerous plants or animals.

- Consider safety from climate extremes in the design, including intense sun, high wind, heavy rainfall, and extreme humidity.
- Balanced ecological integrity with safety concerns in a development where adventure and challenge are integral to the experience.
- Limit use of artificial lighting to retain natural ambient light levels - baffle lights or use ground-mounted light fixtures to limit spillover light impacts while providing a basic sense of security.
- Enhance appropriate atmosphere and security by remote location and controlled access to the facilities
- Provide an alternate means of access to essential emergency provisions of water, food, and medicine, and a reliable communication system.