

Sustainable Building



“Decarbonising the buildings and construction sector is critical to achieve the Paris Agreement commitment and the United Nations Sustainable Development Goals”

Dr Fatih Birol, Executive Director, International Energy Agency &

Inger Andersen, Executive Director of the UN Environment Programme and Under-Secretary-General, United Nations



Resort buildings and guest accommodation at Evolve Back Kabini are created in the style of the local Kadu Kuruba tribe using local labour and materials.

WHY

The window for keeping within less than a 1.5% rise in global warming and avoiding climate catastrophe is shrinking rapidly. [The construction and operation of buildings accounts for the largest share of global energy use, 36%, and 39% of CO2 emissions.](#)ⁱ 11% of emissions are from building materials and products such as steel, cement and glass. [If the cement industry were a country, it would be the third largest carbon dioxide emitter in the world](#) with up to 2.8bn tones, surpassed only by China and the US.ⁱⁱ Planning for water efficiency, waste management and the sustainable use of natural resources are further critical issues.

The impact of existing buildings needs to be improved to achieve the Paris Agreement goals. New buildings are called to be carbon neutral or carbon positive, energy and water efficient, and sensitive to the landscape and cultural settings in which they sit and the resources they draw on.

[Green architecture is good for business reducing operating costs, enhancing asset value and improving health and wellbeing.](#)ⁱⁱⁱ Using local materials and labour is good for local economies bringing benefits to local communities. The use of vernacular building styles using low impact materials, enables local cultural traditions to flourish and enhances guests' experience of a destination. The most successful developments restore denuded landscapes, avoid sound and light pollution and allow wildlife to thrive without blocking wildlife corridors or draining natural resources.



Easy Wins

- Consult with local community stakeholders and obtain a no objection certificate from the Gram Panchayat
- Ensure all the requisite environmental and regulatory clearances are in place for planning, design and construction
- Maximise the proportion of natural, green space and **avoid cutting down trees where possible**
- Use local, sustainable materials where possible and local skills and labour
- Maximise the use of natural light and ventilation
- Use energy and water efficient fixtures and fittings
- Create waste segregation facilities
- Avoid unnecessary noise and light pollution
- Integrate indigenous and wildlife-friendly planting into your landscaping
- Allocate space to grow your own produce
- Use natural materials for pathways in place of concrete
- Leave boundaries unfenced or use natural fencing.

Going for Gold

- **Plan to achieve the lowest ecological impact**
- Design to blend with the natural surroundings and reflect local cultural traditions
- **Maximise the efficiency of your building envelope to retain heat or cooling**
- Install renewable energy and plan to be zero carbon from the outset or over a five year timescale
- Install sub metering for water and energy to facilitate monitoring and energy/water saving
- Install water treatment technologies to maximise water recycling
- Retain or restore landscapes with indigenous planting and keep them natural to maximise water retention
- Create rainwater harvesting facilities to recharge groundwater
- Provide facilities for people with special needs.

See further tips and sources of information in Resources section.

EXAMPLES OF GOOD PRACTICE

Lodges in traditional and contemporary style



Tiger Tops Tharu Lodge is built in the traditional Tharu longhouse style with local materials and labour.



The traditional design and use of local materials and furnishings is carried through the interior design.



Water is heated using solar power. Wastewater is treated in septic tanks. Read more in case study.



Kanha Earth Lodge, a winner of the All India Stone Architectural Awards, incorporates contemporary and traditional design. Buildings are made from locally sourced stone, mud plaster, terracotta tiles and recycled or sustainably sourced timber.



Guest cottages constructed with local materials reflect local Gond tribal architecture. Grounds restored with indigenous trees and grasses are left natural.



The common area exploits the use of natural light and air. Furniture is made from waste wood and recycled railway sleepers. Roofs are triple layered to trap air to keep interiors cool to help conserve energy. Read more in case study.



Large windows and sliding doors maximise the use of natural light and ventilation at **Dhole's Den**.



High ceilings, combined with tree planting and wide eaves enable rooms to be kept cool without fans or air conditioning.



A 10 Kwh micro wind and solar power hybrid generator produces power to meet all the lodge's energy needs apart from the water pump. Read more in case study.



Guest cottages at **Forsyth Lodge** are built with local materials using compressed mud, straw, claw tiles in the local style to blend into the surrounding area. A natural thicket fence is used around the property to avoid injuries to wildlife.



All guest rooms have a master key one switch system to save electricity.



Lily ponds outside each guest room are part of a natural water treatment system enabling grey water to be recycled. (See Water case study).

Larger Lodges/Resorts



The main buildings and 52 guest cottages at **Spice Village Thekkady** are inspired by the indigenous dwellings of the local Mannan tribe using local wood, elephant grass thatch and wide eaves.



Furniture is made from upcycled pine cases.



Infrastructure includes solar power, a biogas plant, effluent and sewage treatment plants enabling water to be recycled, recycling facilities and a 78-tank vermicomposting system. Read more in case study.



Guest accommodation and facilities at **Evolve Back Kabini** are built to reflect the local vernacular style and include an interpretation centre with a museum, butterfly garden and lily pond.



Interiors are designed to exploit natural ventilation and light to minimise energy use.



The resort is carbon positive thanks to two off-site wind farms. It also uses on-site solar power amongst a range of positive eco practices. Read more in case study.



Barahi Jungle Lodge with 34 guest rooms and one family suite combines contemporary design with local materials. Grounds have been extensively restored and left wild. Infrastructure includes solar power meeting 50% of the lodge's energy needs.



Large windows maximise natural light with shading provided by thatched balconies.



Interiors blend contemporary and traditional Nepalese furnishing using natural materials such as wood, bamboo and elephant grass.

Heritage



Set in 40 acres of indigenous trees, grasses and shrubs left natural, **Mahua Koti – Taj Safaris** has tastefully renovated the original homestead retaining its period features. Grounds include a large organic kitchen garden.



Twelve guest cottages or kutiyas (jungle village huts) have been built to reflect the local vernacular style. Each cottage is accessed via a spacious private courtyard with shaded seating and traditional stone floor. Walls are made with mud and husk for natural insulation. Handmade local pottery tiles are used for the roofs.



Interiors continue the traditional theme with wooden shutters, hand plastered mud walls washed with lime, and roughly hewn wooden rafters. Floors are dressed in katni stone strips set in mortar. The rooms are decorated with wooden puppets and geometric tribal patterns reflecting local culture.



Mela Kothi - Chambal Safari Lodge has transformed a 19th century heritage property into an eco-enterprise maintaining the integrity of the period features.



Guest accommodation has been built in traditional style to reflect local architecture using local materials. Trees planted throughout the site help to provide natural cooling.



Energy is conserved by using LED and CFL lights throughout the property. Water is conserved through the installation of aerated water taps, low-flow showerheads and dual flush toilets. Natural pathways, tree planting and water bodies help to replenish ground water.

Treehouse



Construction of **Pench Tree Lodge** was limited to 2% of the area. No trees were felled during construction. The landscape has been left natural and extensively restored with indigenous planting. Rainwater harvesting helps to recharge ground water levels.



The six tree houses are built out of local sal wood from approved forestry sources and recycled timber. Rooms and bathrooms have been designed to maximise natural light and air with natural cooling provided by the trees.



To reduce the building's carbon footprint, the design utilised an existing water tower and foundation for a large dining hall for the seating and dining area. Read more in case study.



Treehouse Hideaway is designed to blend seamlessly into its forested environment with only five tree houses and a lounge and dining area built around a tree, pictured here. Natural light is maximised with 360 degree views of the undisturbed surrounding wooded landscape. Wood, the predominant material, is recycled timber or from approved forestry sources.



The 21-acre grounds include a substantial water body for wildlife and rainwater harvesting, with a discrete machan providing an inspiring platform for wildlife watching with lodge naturalists, and alfresco dining.



Furniture is crafted from recycled and sustainably sourced timber. The five guest rooms have star rated energy efficient water geysers and air conditioning and a one switch system to minimise energy use. Bathrooms feature dual flush toilets to minimise water use. Guests are encouraged to save water and energy through notices.

Tented



Banjaar Tola – Taj Safaris is designed with a light footprint to protect the riverine environment with 18 tented suites set in 90 acres extensively planted with indigenous trees, grasses and shrubs. Pathways are left natural avoiding the use of concrete. There is no fencing towards the core zone of the park and Banjaar River to enable the free passage of wildlife. **DIFFERENT IMAGE PLEASE JPG**



Large glass doors exploit natural light. Wall panels, flooring (and furniture?) are made of bamboo, a fast growing, sustainable material. Roofs are made of canvas. Rooms throughout the lodge are decorated with local Bastar and Gogra handicrafts.



A key one switch system is in place to conserve energy. Aerated taps and dual flush toilets help to conserve water. Indigenous planting and a water body help to recharge groundwater. Waste water is appropriately treated and bath and kitchen water recycled into the ground through soak pits.



Tents at Khem Villas, part of their accommodation offer, are set in a restored landscape and made from local canvas.



Showers use natural materials including bamboo. Aerated taps, low flow showerheads and dual flush toilets are used to minimise water use.



Water is heated by solar power on top of the water treatment plant **LAURA TO CLARIFY** which enables grey water from guest accommodation to be reused for irrigation. Part of the lodge's energy requirements are met by solar photovoltaic panels.

Special needs

Minimising sound and light pollution



Providing facilities for the disabled is good practice followed by a range of lodges. Pictured here, Jaagir Lodge which has a guest room catering for special needs. Ramps are available to provide access to shared public spaces.



Noise free and less polluting diesel generator sets to control noise and emissions are in wide use, pictured here at Aahana, The Corbett Wilderness. Aahana has constructed an underground conference hall to control noise levels.



Vanghat Lodge uses no exterior lighting to avoid light pollution in a landscape which now sees migrating elephants pass by in a restored landscape where previously only a solitary male was to be found.

Landscapes and rainwater harvesting



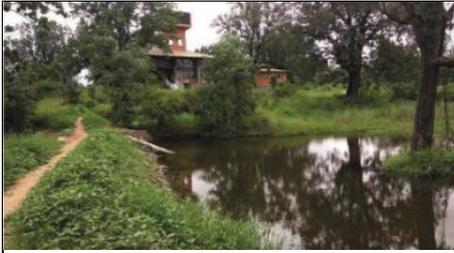
The landscape at Khem Villas has been extensively restored with indigenous trees, shrubs, grasses and six water bodies. The cottages and villas are roofed with local thatch to blend into the landscape. Rainwater harvesting combined with landscaping and water conservation measures allows the lodge to put back more water than it consumes. See Water case study.



Only about 5% of Reni Pani lodge's 35 acres are built on; the remaining area is covered with indigenous trees, plants and grasses left wild. Fencing is made from natural materials including lantana to avoid injury to animals. See case study.



The extensively restored landscape at Evolve Back Kabini includes a water body and a 2.5 acre butterfly garden.



*JPG PLEASE MANAV THIS IS SCREENSHOT
Pench Tree lodge has created earthen
dams in the property to collect rainwater
to help recharge groundwater levels. See
further examples in Water section.*



*Numerous lodges allocate space for
growing vegetables to reduce their
carbon footprint. Pictured here the
organic farm and garden at Tiger Tops
Tharu Lodge.*



*Natural pathways allow water to
percolate back into the ground to
recharge water level, avoid the carbon
footprint of materials such as concrete
and add to the ambience of being in
nature. Picture here, natural pathway at
Banjaar Tola - Taj Safaris.*

See also Energy, Water, Waste and Cultural Heritage sections of the resource.

RESOURCES

Case Studies

- **Evolve Back Kabini, Kabini** X
Sensitive architecture set within verdant, restored landscape
- **Tiger Tops Tharu Lodge, Chitwan, Nepal** X
Keeping traditional Tharu architecture alive
- **Dhole's Den, Bandipur** X
A happy marriage of contemporary architecture and eco design
- **Spice Village Thakkady, Periyar** X
A multiple award winning eco resort
- **Kanha Earth Lodge, Kanha** X
Award winning design combined with rustic charm
- **Pench Tree House Lodge, Pench** X
Providing a low impact window on nature
- **Vanghat Lodge, Corbett** X
Blending with the wilderness
- **Reni Pani Jungle Lodge** X
A hidden gem concealed in the forest
- **The Teak House at Svasara Resorts, Tadoba** X
Applying building design wisdom from the Maratha kings
- **Red Earth, Kabini** X
Low carbon impact using a traditional rammed earth technique
- **Barahi Jungle Lodge, Chitwan, Nepal** X
A blend of contemporary elegance and local materials

Checklist of Good Practice X

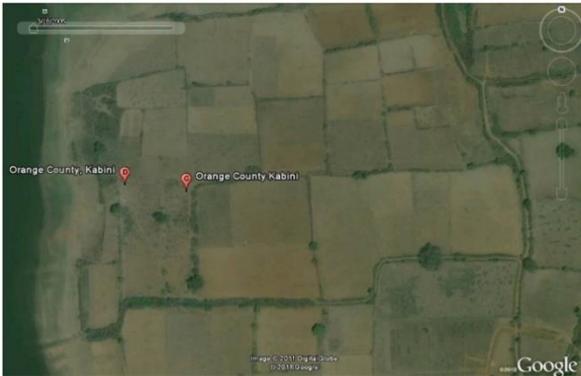
Useful Organisations and Links X

Useful Publications X

References X

Evolve Back Kabini, Nagarhole

Sensitive architecture set within verdant, restored landscape



The original plot of denuded farmland.



Buildings occupy c.12% of the site and blend into the restored landscape.



Resort buildings and guest huts are built in the style of the local Kadu Kuruba tribe using local labour and materials.

The design and construction of Evolve Back Kabini, part of Orange County Resorts & Hotels, is rooted in the parent company's policy of conserving natural and cultural heritage whilst providing a high standard of accommodation for guests. Buildings occupy only about 12% of the sixteen acre plot adjacent to the river Kabini which runs through Nagarhole National Park. The rest has been transformed by planting indigenous trees and shrubs and creating a waterbody benefitting wildlife and harvesting rains to recharge ground water.



Trees provide shade and natural cooling.

Resort buildings and the 37 guest huts are built to reflect the architecture of the local Kadu Kuruba tribe. Trees planted around buildings provide natural cooling. The use of local thatch renewed each year enables buildings to blend into the landscape.

Interiors are designed to exploit natural ventilation and light to minimise energy use. Rustic furniture has been created



Natural light and air are maximised.

out of waste wood.

The infrastructure includes recycling facilities, solar power for hot water, cluster based monitoring for electricity, a 100 KLD sewage treatment plant enabling water to be reused for irrigation, and a swimming pool filtration unit for water recycling. Off-site wind farms run by the Resort's parent company, put back more energy than their resorts consume. (See Water, Energy and Waste sections for more information).



Harnessing solar power.



Cluster based monitoring to identify energy saving.



Sewage treatment plant facilitate water recycling for irrigation.



Swimming pool water filtration unit enabling water recycling.

Tiger Tops Tharu Lodge, Chitwan, Nepal

Keeping traditional Tharu architecture alive



Traditional longhouse Tharu architecture

Tharu Lodge, built in 1980, is a celebration of traditional design emulating the longhouse style of Tharu architecture using local materials and labour. The core structure is local Sal timber with a tile roof. Walls are made with reeds, mud and dung which serve as a natural antiseptic to keep the bugs out. The traditional theme is carried through the interior design with traditional fabrics and local art.

The buildings occupy about 10% of the 25-acre site. The grounds have a substantial certified organic vegetable garden and dairy and a large elephant enclosure. The rest is covered with indigenous trees, shrubs and wild grasses. Paths are natural to allow water to percolate back into the ground.



Traditional theme carried through into interiors using local, natural materials.

Solar power is harnessed for heating hot water. Black and grey water is treated in septic tanks. A small biogas unit produces biofuel for cooking drawing on cow dung from the lodge's dairy and reducing the amount of LPG required.

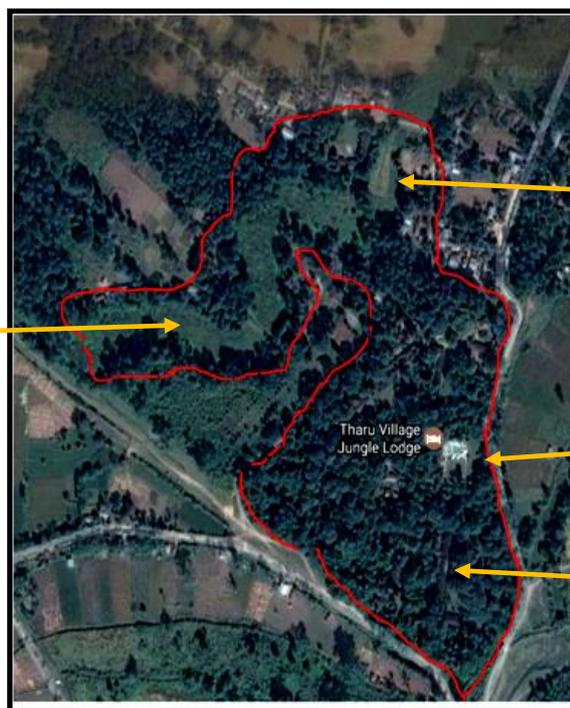


Solar water heaters.

Elephant area



Natural pathways.



Low building impact and extensive indigenous planting.



Organic veg garden/farm.

Swimming pool

Cottages

Dhole's Den

A happy marriage of contemporary architecture and eco design



Large windows, sliding doors and wide eaves maximise the use of natural light and ventilation.

Dhole's Den is a shining example of a safari homestay built in a contemporary, minimalist style to high eco standards. The main building and guest accommodation with five spacious guest rooms has been designed to maximise natural light and ventilation with large windows and sliding glass doors giving panoramic views of the Nilgiri Hills. High ceilings combined with tree planting and wide eaves enable rooms to be kept cool without fans or air-conditioning. Local materials have been used where possible. Rooms incorporate traditional stonework, a technique which had been disappearing from the locality replaced by high carbon materials such as concrete. Ramps have been installed to accommodate guests with disabilities.



Traditional stonework is incorporated into the exterior.



Interiors maximise natural light and ventilation. There is no air conditioning or fans.



High ceilings, tree planting and wide eaves keep rooms cool.



Local, traditional stonework, a design feature of interiors.

A 10KWh micro wind and solar power hybrid generator produces sufficient power to meet all the lodge's energy needs apart from the water pump. Separate decentralised rooftop solar panels have been installed for use in the kitchen bungalow and other areas. Guest rooms have a one-key system to turn off electricity.



Micro wind and solar power hybrid generator.



Decentralised solar rooftop panels.



Biogas unit.

The buildings occupy only about 5% of the site. The natural landscape has been retained and rejuvenated with indigenous shrubs, grass and trees. Rainwater is harvested from rooftops and captured in a water body. Natural pathways and the landscape allow rainwater to percolate back into the ground. Wastewater is treated with an eco-friendly sewage treatment plant using root zone technology and recycled for irrigation. Fixtures in the lodge include aerated taps and dual flush toilets to conserve water. A biogas unit using kitchen waste provides fuel for cooking.



Grounds feature a water body for rainwater harvesting, root canal water treatment, indigenous planting and an organic vegetable garden.

Spice Village Thekkady

An outstanding multiple award winning eco resort



The traditional design is modelled on the native Manan tribe.

Spice Village, one of the oldest resorts in Thekkady near Periyar, is modelled on the native Manan tribe of the region. A pioneer in sensitive eco design, the lodge offers 52 spacious cottages set in a natural landscape with indigenous trees, plants and naturally grown wild grasses.

Buildings are thatched annually with local elephant grass using traditional skills and local labour. Wide eaves provide natural cooling; the cottages have no air conditioning. Furniture is made from upcycled pine cases sourced 25 years ago from the nearest ports. Floors are made of stone with natural coir mats.



Buildings have wide eaves for natural cooling and are thatched with elephant grass annually.

One cottage is set aside to cater for special needs.

A sewage treatment plant combined with an effluent treatment plant enable 45kl of water to be recycled daily, 40% of their usage. The swimming pool has a water recycling unit. Aerated water taps combined with dual flush



Guest room furniture is made from upcycled pine cases.

toilets help to conserve water further. The grounds have a rainwater harvesting system to enable ground water to be

recharged during monsoon rains.

A 65 KW solar power plant has been installed to reduce the resort's carbon footprint providing **a third of its energy consumption. WEBSITE SAYS 75% - PLEASE CONFIRM.** Water is heated through solar power. All guest rooms have a key one switch system to turn off electricity when guests exit their rooms. Lighting is LED, the most energy efficient, throughout the property. Guest refrigerators are CFC free. A biogas plant converts kitchen organic waste into methane for cooking.



The traditional design is carried through all building. Swimming pool recycles its water.



65 KW solar power plant.



Biogas unit.



A sewage treatment plant and an effluent treatment plant is in place enabling 45kl of water to be recycled daily.



Waste segregation facilities.

An area is set aside for segregating waste.

A vermicomposting system with 78 tanks enables solid food waste to be recycled on site and turned into valuable organic manure for the resort's two-acre grounds. The grounds include a certified organic kitchen garden.



Vermi-composting operation to recycle food waste.



Certified organic kitchen garden.



Keeping the grounds clean and facilitating recycling.



Blending into the natural, wooded landscape.

Kanha Earth Lodge, Kanha

Award winning design combined with rustic charm



Trees and wide eaves provide natural cooling.

The common area exploits the use of natural light and air. The twelve guest cottages are built using traditional techniques, materials and labour inspired by Gond tribal architecture. Buildings are located adjacent to trees to benefit from natural shading. Wide eaves in the local style combined with triple layered roofs to trap air provide natural cooling.

Kanha Earth Lodge marries inspiring architecture and rustic charm with a concern for the environment. Buildings are constructed of locally sourced stone, mud plaster, terracotta tiles and rough-hewn sustainably sourced and recycled timber. Furniture is hand crafted from waste wood and railways sleepers which combined with the construction, earned the lodge the accolade of winning the All India Stone Architectural Awards in 2010-11.



Rustic eco elegance in the common area - local stone, Gond art and furniture made from waste wood and recycled railway sleepers.



The main building - contemporary design and local materials.

The sixteen-acre grounds, restored with indigenous trees and grasses, have been left natural helping to recharge groundwater levels during the rainy season with not a single tree lost during construction.

Pathways and water pipes have been designed to channel rainwater into a 25-foot deep well. Sand, pebbles and small stones are used for pathways instead of concrete, a carbon

intensive material, to allow rainwater to percolate into the ground. Dual flush toilets, aerated taps and showerheads are in place to reduce water use.



Guest cottages reflect local Gond architecture and are constructed of local materials with local labour.



Interiors have large windows to maximise natural light and air. Ceilings are triple lined for natural cooling.

Pench Tree House, Pench Providing a low impact window on nature



Restored landscape.

BEFORE
(2013)



AFTER
(2018)



Pench Tree Lodge was built in an under-developed zone to support the conservation policy of not overcrowding an area and making it unsustainable. Construction was limited to 2% of the area. No trees were felled during construction. The landscape has been left natural and extensively restored with indigenous planting. Earthen dams have been created to harvest rainwater and recharge ground water.



Trees houses benefit from the natural cooling of trees.

The six tree houses are built out of local sal wood from **sustainably sourced and recycled timber (MANAV TO CONFIRM)** and give guests an immersive experience of nature. Rooms and bathrooms have been designed to maximise natural light and air with natural cooling provided by the trees. Rooms have a master switch to turn off all electricity. Bathrooms have aerated showers and taps. The interior design combines vintage furniture and natural materials.



Interiors maximise natural light and air.



Utilisation of an existing water tower and foundations ...

To reduce the construction's carbon footprint, eco architect Dean D'Cruz incorporated the existing water tower and foundations for a dining room inherited with the site into the design of the lounge and dining area. Large windows set within wooden framing reflecting the surrounding trees, provides an abundance of natural light.

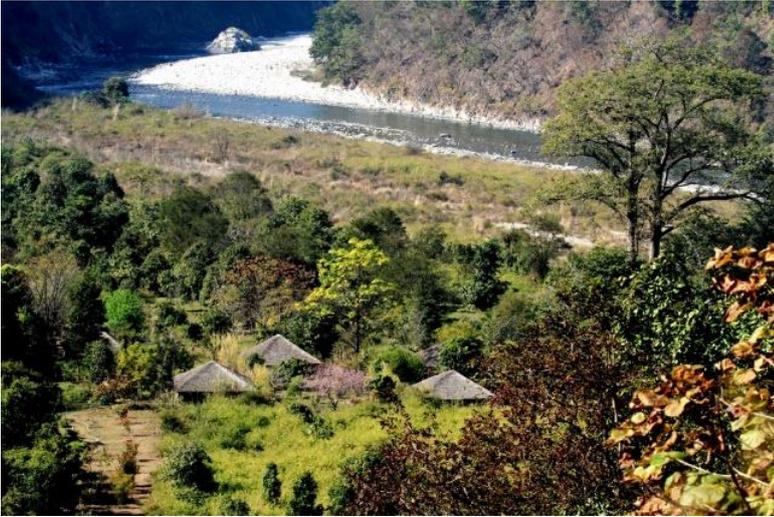


... to create a light and airy lounge and dining area.



Rainwater harvesting through the creation of earthen dams.

Vanghat Lodge, Corbett Blending into the wilderness



Guest accommodation in restored landscape. Photo Nishit Gupta.

Accessible only via a two kms walk in the buffer zone around Corbett Tiger Reserve, Vanghat Lodge blends seamlessly into the wild landscape. Denuded farmland has been transformed into wildlife habitat through extensive planting with indigenous shrubs and trees.

The lodge, with its nine guest cottages, is built almost entirely of local materials including locally sourced clay, riverine stones, savannah thatch and wood inspired by traditional Vangujar tribal architecture. The use of mud provides

natural cooling. SYCOM - CORRECT? The stone cottages, harnessing the skill of local masons, binding riverine stones with clay, are set at a height to allow birdwatching from the balconies. There is no outdoor lighting to avoid disturbing wildlife. A herd of elephants can now be seen regularly passing along this natural corridor where previously, only a bull was in evidence.



Mud cottage. Photo Kishon John.



Stone cottage veranda. Photo Christopher Mills.

SYCOM HAS THIS LODGE BEEN RE-AUDITED? AN AWARD NOMINATION MENTIONS PLANS FOR SOLAR POWER???

Reni Pani Jungle Lodge, Satpura

A hidden gem concealed in the forest



Reni Pani Jungle Lodge - buildings hidden in 30 acres of restored natural landscape giving guests a taste of the wild.

Built on 35 acres of degraded forest, Reni Pani is constructed using locally sourced materials to blend with the surrounding regenerated forest. Existing trees on the site were retained. A further 2,500 indigenous saplings planted since 2009 have restored the site to a thriving forest and habitat for wildlife including breeding sloth bears, leopards, wild boar, porcupine, rusty spotted cat, jungle cat, palm and Indian civets, sambar deer, resident herd of spotted deer and numerous bird species.



Guest cottages with ceilings naturally lined with bamboo chatai, strips of woven bamboo.

Twelve cottages in three distinct styles - nallah, forest and hill units - and luxury tents are designed with viewing decks to provide a magical experience of the wild. Buildings incorporate mud and dung plaster and local tiles to reflect local architecture. Ceilings are lined with bamboo chatai, a sustainable material. Furniture, room fixtures and lights are made from recycled and refurbished material.



Traditional wall paintings made by local women using natural paints and extensive use of local Gond art reflect local culture. Dustbins are made by local weavers. Pathways are made with sawdust avoiding the use of cement. Aerated taps and flow flow showerheads and dual flushing toilets help to minimise water use. Solar power is used to heat water in staff accommodation. The use of LED bulbs is maximised to save energy.



Discretely spaced, low impact tented accommodation.



Tent interiors decorated with local art.



Guest accommodation platforms for wildlife watching.



Traditional wall decoration by local women.



Gol Ghar maximising natural light and air with shading provided by the eaves.



Shop selling local artefacts made with traditional, mud wall and local tiles.

Barahi Jungle Lodge, Chitwan, Nepal

A blend of contemporary elegance and local materials



Contemporary reflection of local Tharu architecture blending into the restored landscape.

Barahi Jungle Lodge, was built in 20XX adjacent to the river Rapti on a 30 acre site which has been restored from overgrazed farmland to wildlife-friendly habitat. Over 5,000 trees, elephant grass and more than 130 species of native flora planted in the grounds attract a myriad of birds with a family of jackals and a rhino amongst other species who have also taken up residence. The thirty six cottages and reception areas are built to blend into the surroundings and occupy only c.4% of the site. One of the cottages is set aside for disabled visitors.



Buildings were constructed with extensive use of local materials including thatch, sustainably sourced wood (WHERE WAS IT SOURCED FROM), bamboo, mud and stone (PLEASE CONFIRM WHAT MATERIALS WERE USED AND WHAT THE WALLS ARE MADE OF) using local labour. Interiors blend contemporary and traditional design and furnishings using local textiles and natural materials such as bamboo. PLEASE CONFIRM.

WHICH ROOM IS THIS combining local materials with natural landscaping.

Large windows opening out onto guest room balconies shaded by well insulated thatched roofs maximise the use of natural light and ventilation. LED lights are used throughout the property. A one key system is used for all guest rooms to ensure energy is saved when guests leave the room. Water efficient



Large windows to maximise natural light, shading from thatched balconies.



Guest room interior combining contemporary design with natural and traditional materials. NATURAL PAINTS? MUD WALLS?



Dining Hall maximising natural light and using local, natural materials for decoration.

DRAFT 12/6/20

fixtures including aerated water taps, low flow showerheads and dual flush toilets are used in guest rooms to conserve water.

A X KW solar plant (SPEC please) was installed from the outset (PLEASE CONFIRM) and meets 50% of the lodge's energy needs. Water is heated using solar power. A biogas unit utilises gas from biodegradable waste for cooking alongside LPG, a cleaner source of power than wood. The lodge has a reverse osmosis water filtration plant for cleaning water for drinking and cooking, positive for reducing plastic waste. HOW IS WASTE WATER TREATED?

The lodge segregates its waste into biodegradable (green) and non-biodegradable (blue) waste with bins in the grounds for segregation and three separate storage rooms for waste segregation and disposal.



A solar plant supplies 50% of the lodge's energy needs (OR IS THIS SOLAR THERMAL?)



Biogas unit producing fuel for cooking alongside LPG.



Grease trap skimming of oil and fat from the kitchen.



Dustbins in the grounds segregating rubbish.



Reception area combining local, natural materials and contemporary design.



Wildlife viewing balcony outside the dining hall looking towards the river across natural landscape.

Red Earth, Kabini

Low carbon impact using a traditional rammed earth technique



Island bar on one of the created waterbodies built with rammed earth and grass roofing.

All buildings at Red Earth Kabini are constructed using a traditional rammed earth technique with minimal usage of steel or cement. The construction was undertaken with the assistance of Professor Yogannand of the Indian Institute of Science in Bangalore. Soil for the construction was excavated from the site and the holes converted into two water bodies now teeming with endemic fish. No plastic or cement lining was used and instead the lake bottom is lined with clay from local tanks. The lakes were sited adjacent to sloping ground to maximise water from rainwater harvesting.

Roofing is made of elephant grass, with no concrete shell, enabling the cottages to keep cool at all times. Buildings are painted naturally with the mud used for construction. The flooring is a combination of terracotta tiles and handmade glass tiles from Karaikudi in Tamil Nadu. Furniture is antique and sourced from different parts of the

country to reduce the requirement to cut trees. One of the twenty guest cottages is equipped for physically challenged visitors.

All hot water is provided by solar heating. Dual flush toilets, aerated taps and low flow showerheads in guest rooms help to minimise water consumption. Wastewater is treated by a sewage treatment plant and recycled for irrigation using drip lines.

LED and CFL lights are used throughout the property. Star rated air conditioning with invertors is a further positive step for energy conservation along with key tags for guest rooms which switch off power within one minute after the key is removed. Construction was undertaken in compliance with regulations - sanctions from the DCs office, pollution control board, town planning, and the Tourism Ministry and in consultation with local communities through the Gram Panchayat.



One of twenty guest cottages built using indigenous local materials and traditional building technique.

The Teak House at Svasara Resorts, Tadoba **Applying building design wisdom from the Maratha kings**



The Teak House, a building for outdoor dining and showing wildlife documentaries at Svasara Resorts, harnesses the wind for natural air conditioning, modelling its construction on the garden pavilions popularised by the Maratha kings of yore. The building is orientated NW-SW to catch the predominant SW wind and to keep the summer sun out while allowing the winter sun in. Deep roof overhangs provide shade.

To keep the carbon footprint low, the construction used locally available stone and recycled teak and white Allahabad roof tiles from old dismantled buildings. A strategically placed central post and hip ridges at the two ends has replaced trusses traditionally used resulting in a high and airy roof. Walls are finished with broom plaster.

Checklist of Good Practice

Legislation, Planning and Consultation

- Assess park and destination carrying capacity and whether your business model is viable in relation to existing lodge provision. **JULIAN CONFIRM**
- Factor in a risk assessment to inform the location and planning of your property to avoid pollution.
- Ensure compliance with statutory regulations from National or State government authorities including State Pollution Control Boards and forest departments.
- Obtain clearance from Ministry of Environment, Forests and Climate Change (India) for projects falling under eco-sensitive zones.
- Consult with the local Gram Panchiyat and community/local stakeholders, assess potential impacts on local resources, access points and waste disposal etc and obtain a no objection certificate.
- Plan to have the lowest ecological impact. Assess the availability of water in the area, valuable habitats in and around your property and wildlife corridors to protect, and natural resources that you can sustainably harvest.
- For larger lodges or resorts, conduct an Environmental Impact Assessment.

Landscape

- Maximise the percentage of the site which has green cover.
- Avoid tree felling during construction where possible.
- Plant indigenous trees, shrubs, grasses and flowers to maximise biodiversity.
- Leave landscape natural to maximise water retention and help to recharge groundwater levels.
- Create water bodies to harvest rainwater and provide drinking water for wildlife.
- Allocate space for a kitchen garden to grow organic vegetables and for composting.
- Use natural materials such as sand and pebbles for pathways to reduce your carbon footprint and to allow rainwater to percolate back into the ground.
- Use natural fencing to avoid injury to wildlife or no fencing to avoid blocking wildlife movement.

Design and Build

- Design buildings which blend with the landscape, complement local vernacular styles and cultural traditions and/or eco designs which maximise natural light, air and renewable energy.
- Harness local skills and labour.
- Carry through traditional local designs, motifs, fabrics and arts and crafts into interiors.
- Position trees adjacent to buildings to provide natural cooling.
- Use the natural features of the site to assist with drainage and rainwater harvesting.
- Use natural, sustainable, low carbon, local materials where possible and/or certified eco-labelled materials (eg [GreenPro](#) in India) (see also A-to-Z of building materials in Sustainable Hotel Siting, Design and Construction, [Operational Design](#) for an overview of building materials).
- Use recycled materials where possible for construction and furniture and consider the lifecycle of other materials you use, and their potential for re-use.
- Use natural paints, flooring, carpets and upholstery where possible or those which don't emit harmful substances such as formaldehyde.
- Plan buildings to be low carbon, zero carbon or carbon positive.

Waste segregation

- Incorporate waste segregation facilities for effective waste management, collection and recycling including safe storage for hazardous materials.
- Develop composting, vermicomposting and/or biogas for biodegradable waste.
- Install litter bins in the grounds to avoid littering and facilitate waste segregation.

Water

- Install a sewage treatment plant, natural (such as Root Zone or Phytoid) and/or other water treatment systems (see Water treatment) to maximise water recycling for irrigation and flushing toilets and to avoid pollution.
- Design rainwater harvesting systems – such as water bodies, wells and/or roof run off systems (see Water treatment for examples) to recharge groundwater levels and provide water for wildlife.
- Install sub-metering to monitor water consumption (eg kitchen, laundry, landscape, guest accommodation) and to facilitate setting targets for water saving initiatives.

Energy

- Plan building orientation and design to take advantage of natural light and ventilation balancing the use of natural light against the potential for cooling demand.
- Where possible, use devices such as tree planting and wide eaves to reduce or negate the need for air conditioning.
- Maximise the efficiency of the building envelop to minimise energy use/loss using natural insulation where possible.
- Install sub-metering to monitor energy use and increase energy saving.
- Install LED lights to maximise energy efficiency.
- Install solar water heating.
- Install or plan for solar photovoltaic panels on rooftops or elsewhere and other renewable energy as appropriate to maximise energy from renewable sources.
- Install one key master switches in guest rooms to turn off electricity on exit.
- Use occupancy sensors in appropriate areas.
- Install energy efficient equipment and appliances (BEE in India – 5 star is best).
- Select approved low or zero-GWP (global warming potential) refrigerants. Avoid commonly used refrigerants which are particularly harmful.^{iv}
- Make provision for electric vehicle recharging points.
- Provide storage for bicycles.

In India, please refer to the Energy Conservation Building Code.

Differently abled people

- Provide non-slippery ramps for easy access to main public areas.
- Provide dedicated guest room/s for differently abled.
- Provide toilets in public areas for differently abled.

Pollution

- Use no noise, less polluting diesel generators where required.
- Plan to avoid noise pollution for the wellbeing of your guests and wildlife.
- Avoid unnecessary outdoor light pollution.
- Provide safe storage for chemicals, oils, paints and other hazardous materials away from waterways.

Useful Organisations and Links

INDIA

- **[Indian Green Building Council](#)**
IGBC, part of the Indian Confederation of Industry, is a not for profit council encouraging builders, developers, owners, architects and consultants to design and construct green buildings.
 - [GreenPro](#) is an internationally certified ecolabelling scheme covering more than 800 building products
<https://igbc.in/igbc/>
- **Bureau of Energy Efficiency**
BEE was set up as the statutory body to facilitate the implementation of the Energy Conservation Act 2001. Its activities include [BEE star labelling of equipment and appliances](#) for energy efficiency and the [Energy Conservation Building Code](#) for commercial and residential buildings. Resources include [a list of ECBC Expert / Design Professionals](#).
<https://beeindia.gov.in/>
- **Ministry of Environment, Forest and Climate Change, Government of India**
 - See Central Pollution Control Board <https://cpcb.nic.in/>
 - See [Eco Sensitive Zones](#)
<http://moef.gov.in/rules-and-regulations/environment-protection/15469-2/>

NEPAL

- **[National Reconstruction Authority, Nepal](#)**
The National Reconstruction Authority is leading standards and guidelines for green construction in Nepal.
<http://www.nra.gov.np/>

INTERNATIONAL

- **[World Green Building Council](#)**
A global network leading the transformation of the built environment to make it healthier and sustainable with a goal to accelerate action to ensure all buildings are net zero emissions by 2050.
 - [What is green building?](#)
 - [How can we make our buildings green?](#)
 - [Case study library](#)

SYCOM PLEASE ADD ANY ADDITIONAL APPROPRIATE OTHER ORGANISATIONS IN INDIA AND NEPAL

Useful Publications / Links

- [National Rating System for Green Buildings, Ministry of New & Renewable Energy](#), Govt. of India
- [Indian Green Resorts Rating System, Pilot Version, Abridged Reference Guide](#), November 2018
- [India Cooling Action Plan, Ozone Cell](#), Ministry of Environment, Forest & Climate Change, Government of India, March 2019
- [Net Zero Carbon Buildings: A Framework Definition](#), UK Green Building Council, April 2019

- [Sustainable Hotel Siting, Design and Construction](#), International Tourism Partnership, first published 2005, Digital Release 2014
 - 1 [Inception](#)
 - 2 [Pre Design](#)
 - 3 [Creating the Design Brief](#)
 - 4 [Architectural and Physical Design](#)
 - 5 [Operational Design](#)
 - 6 [Construction and Refurbishment](#)
 - 7 [Commissioning and Operation](#)
 - 8 [Interior Design](#)
 - 9 [Monitoring Performance](#)

References

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- ⁱ [2019 Global Status Report for Buildings and Construction, Towards a zero-emission, efficient and resilient buildings and construction sector](#), Global Alliance for Buildings and Construction, International Energy Agency and the United Nations Environment Programme, 2019
- ⁱⁱ [Concrete, the most destruction material on Earth](#), the Guardian newspaper, 25 February 2019
- ⁱⁱⁱ See data in [World Green Building Trends 2018](#), Dodge Data & Analytics, 2018
- ⁱⁱⁱⁱ [Hotel Carbon Measurement Initiative v.1.1 Methodology](#), World Travel & Tourism Council and International Tourism Partnership, December 2016 See Appendix 3: Global Warming Potential (GWP) of Refrigerants for GWP listing of different refrigerants.

Compiled for TOFTigers by Positive Nature and Sycom Project Consultants, May 2020
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The TOFTigers Initiative is a trading enterprise of the Nature Stewardship Alliance, UK Charity No. 1172519