

## EXPERT OPINION

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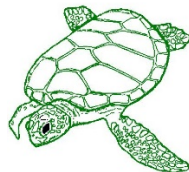
Assessment of the Impact of  
the Renovation and Development of the  
Cheval Blanc Seychelles Hill View Resort  
on Nesting Sea Turtles and their Habitat  
at Intendance Beach, Mahé, Seychelles

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Prepared and submitted by

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For Mr Karl Ammann

October 2024

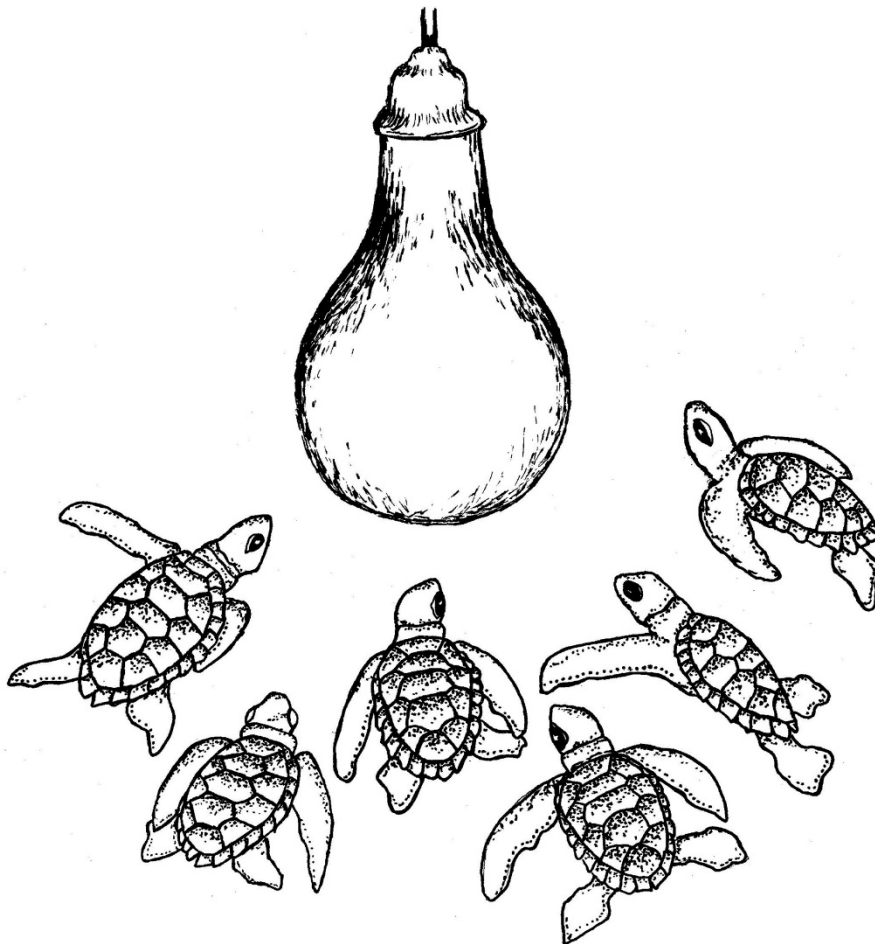
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## AIM OF EXPERT OPINION

Since development / renovation of the Hotel commenced in 2020, there have been concerns about non-compliance with the Environmental Impact Assessment (EIA) prepared by DJ Environmental Consultants in November 2020.

That EIA highlighted the importance and vulnerability of the marine turtle nesting population at Intendance and stipulated how to minimize the impact of the development.

The author of this Expert Opinion visited the site, before and after dark, on 5 October 2024 to assess what impact the development is likely to have on the nesting turtles.

The author of this Expert Opinion has worked with marine turtle biology and conservation since 1973, in more than 20 countries on 5 continents. Much of that time (since 1981) focused on the marine turtle populations of the Republic of Seychelles, their behaviour and ecology and the natural and anthropogenic threats they face.

This Expert Opinion assesses the current situation and level of anthropogenic disturbance faced by nesting turtles at Anse Intendance, the extent to which the development poses a threat to the sea turtle nesting population, and whether the mandates of the EIA were followed.

It also offers solutions to mitigate examples of non-compliance to the EIA so that the *Cheval Blanc* development and nesting sea turtles might share the nesting beach in harmony.

## EXECUTIVE SUMMARY

### A. Background (pages 8-10)

Historically, killing of turtles was the greatest threat sea turtle populations faced in Seychelles.

Today, destruction of nesting habitat has become an equally serious threat.

Anse Intendance is recognized as one of the most important turtle nesting beaches remaining on Mahé.

Factors most likely to destroy turtle nesting habitat include:

- Artificial light pollution
- Inadequate set-back lines.

### B. EIA Report Produced in 2020 for *Cheval Blanc* (pages 11-17)

All details contained in the EIA that are relevant to sea turtles and their nesting habitats are presented in section B of this report, and focus on the following points:

- National importance of the turtle nesting population at Anse Intendance.
- The need to mitigate the impacts of Artificial Light Pollution during both the construction phase and after construction is completed. To this end the EIA recommended the following measures:
  - No artificial light should be visible from the beach.
  - Only “turtle friendly lights” should be used.
  - Internal light should be minimized with the use of curtains and/or blinds.
- Setback lines from the sea would be based on the footprint of the previous (Banyan Tree) development.
- Beach vegetation would be maintained and replanted as necessary.

Evidence of non-compliance with EIA mandates:

- Set-back lines. Ebrahim (2023) found evidence of non-compliance.
- Building height. Ebrahim (2023) found evidence that extra stories were added to some buildings. Light from taller buildings is more likely to be visible on the beach.
- Artificial Lighting. Evidence of non-compliance in mitigating the impacts of Artificial Lighting is described in the following sections of this report.

### C. What is “Turtle Friendly Lighting”? How it also Benefits People! (pages 18-21)

**Problem UV/violet/blue light:** <560 nanometer wavelengths. Humans and animals perceive light differently. Sea turtles are particularly sensitive to high-energy, short-wavelength UV/violet/blue light which will disorient them and disrupt their behaviour on the nesting beach. But these wavelengths, although not clearly visible to humans, are detected subliminally and are known to cause physical damage to the retina of the human eye and disrupt circadian rhythms in people. It follows that eliminating the short wavelengths in the UV/violet/blue light range would benefit both humans and sea turtles.

**Spectral curve.** What humans see as “white light” comprises light from across the visible spectrum. Depending on its spectral curve, white light contains varying amounts of blue light.

**LED lights** are energy efficient and can be smart controlled to eliminate problematic wavelengths (such as blue).

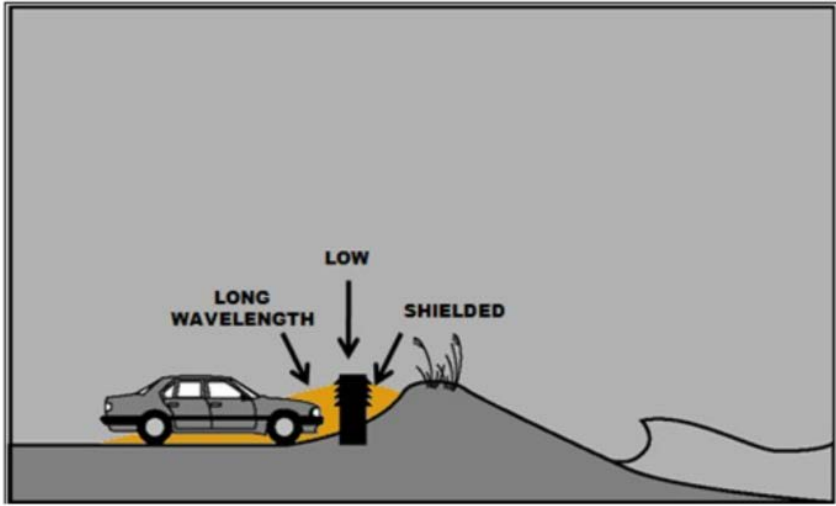
**Correlated colour temperature (CCT)** describes the colour appearance of white LED. “Warmer” lights with less cool bluish colour have a CCT between 1,000 K and 3,000 K and are more appropriate for a turtle beach (and also for human health).

Both “**direct light**” from an unshielded lamp and “**skyglow**” which creates a glow in the atmosphere through reflection and refraction are detrimental to nesting turtles.

#### **D. Guidelines to Minimize Impacts of Artificial Light Pollution** (pages 22-29)

International guidelines have been developed to minimize the negative impacts of artificial light pollution. The most important principles are the following:

1. **Maintain natural darkness insofar as possible.** It has conservation value in the same way as clean water, air and soil and should be protected through good quality lighting design.
2. **Use adaptive controls.** Smart controls and LED technology can control quality of light. Automatic systems can be implemented to shut blackout blinds and curtains.
3. **Light only the targeted area (avoid light spill).** Shield lights to avoid lighting up anything but the target areas.
4. **Use the lowest intensity light appropriate for the task.** Use low wattage and low glare light.
5. **Use non-reflective, dark-coloured surfaces** on outer walls, balconies, etc.
6. **Keep indoor lighting indoors.** After sunset and before dawn use blackout blinds, curtains, or shutters that close automatically. Use non-reflective tinting on all windows and doors.
7. **Use lights with reduced or filtered-out blue, violet & ultraviolet wavelengths:**
  - o Maximum CCT: Outdoors lights: <2,700 K; Indoor lights: <3,000 K
  - o Avoid: halogen, metal halide, or fluorescent lights
  - o Best lighting: Amber LED (590-610 nanometers); Low pressure sodium

	<p><b>Keep it LOW:</b> mount the fixture as low as possible to the <u>ground</u> and use the lowest <u>wattage</u> necessary.</p> <p><b>Keep it LONG:</b> use long <u>wavelength</u> (greater than 560 nm) light sources such as amber, orange, and red LEDs.</p> <p><b>Keep it SHIELDED:</b> use fixtures that shield lamps.</p>
<p>Golden rules of Wildlife Lighting Criteria</p>	

## **E. International Guidelines, Regulations & Mandates: “Turtle Friendly Lighting”**

(pages 30-32)

**State and national governments** of some countries that host important sea turtle nesting populations have implemented regulations and even compulsory mandates to control beach lighting along highly developed and extensive stretches of coastline, including those with tall buildings.

Especially:

- Florida USA
- Australia

**Convention of Migratory Species (CMS) Guidelines.** CMS produced “Light Pollution Guidelines for Migratory Species in 2024, and encourages its Signatory States to abide by these guidelines. Seychelles has been a Signatory State Party to CMS since 2005.

## **E. How to Address Problems of Non-Compliance at *Cheval Blanc*** (pages 33-36)

The most easily addressed issues of non-compliance with the 2020 EIA involve Artificial Light Pollution. These include:

### **1. Light spill from internal light sources:**

*Solutions:*

- Tint all window glass with non-reflective tinting (<42% visible light transmittance).
- On all windows, install automatic opaque blinds that are configured to close automatically after sunset and before sunrise.

### **2. Upward directed luminaires with vertical light:**

*Solution:*

- Remove upward directed lighting. It produces “skyglow”, is disruptive, and usually only decorative in purpose.

### **3. Decorative & elevated outdoor lighting:**

*Solution:*

- Remove lighting that is purely decorative.
- Lower or remove elevated outdoor lighting.
- Where lights are needed for safety, position them close to the ground and shield them.

### **4. Outdoor paint / surfaces / and fixtures = too white & reflective:**

*Solution:*

- Darken the surfaces; or
- Make surfaces less reflective, for example by using stucco or a matte finish.

### **5. Characteristics of light waves from the luminaires:**

*Solution:*

- Ensure all lights visible on the property at night adhere to the following:
  - Maximum CCT = < 2,700 K
  - Avoid: halogen, metal halide, or fluorescent light
- Use following standard lighting:
  - Amber LED (590-610 nm) or low pressure sodium lighting
  - LED should not contain short wavelength blue light.

## **A. Background**

### **1. Importance of protecting sea turtle nesting habitat in Seychelles**

Seychelles hosts the most important sea turtle nesting beaches in the Western Indian Ocean for both hawksbill and green turtles. As such, Seychelles has a responsibility towards the wider region to ensure that sea turtles are able to breed successfully and disperse throughout the region.

#### **1.1 Over-exploitation vs habitat destruction.**

Historically within Seychelles, the greatest threat to sea turtles was over-exploitation of nesting females in the vicinity of the nesting beach. Turtle populations declined to dangerously low levels prior to introduction of the ***Wild Animals (Turtles) Protection Regulations, 1994*** which prohibits killing any sea turtle or eggs in Seychelles. In response, turtle populations have increased throughout much of the country.

Today, however, destruction of nesting habitat has become the most serious threat to the turtle nesting populations. If not controlled this disruption is likely to undermine and reverse previous conservation successes. Well-regulated coastal development can be compatible with healthy turtle nesting populations, but without environmental controls both the habitat and the nesting population are easily destroyed.

### **2. Anse Intendance, Mahé: Historical and current status of turtle nesting**

#### **2.1. Early 1980s**

In the early 1980s (1981-1984), it was legal to kill nesting female hawksbill turtles on the beaches of Mahé Island, and almost all nesting females were killed during that period. At the time, national legislation required people to declare any hawksbills they killed to the Police Station (“Declaration of Caret”) in order to procure a permit to sell the shell.

During that period, at each of more than 20 beaches on Mahé more than 5 female hawksbills per beach were reported to have been killed annually (Mortimer 1984). One of the most important of these beaches was Anse Intendance where reportedly 11 to 20 females were killed annually (Mortimer 1984)—i.e., equivalent to 88 to 160 turtle nesting emergences (turtle tracks on the beach) had the turtles not been killed. (The average female hawksbill emerges onto the nesting approximately eight times within a nesting season, including both unsuccessful and successful (i.e., egg laying) emergences.)

#### **2.2. Early 2000s**

By the early 2000s (2003-2004), turtles had been legally protected but poaching continued on Mahé, including at Anse Intendance. But by that time, only seven (7) nesting beaches on Mahé were still hosting significant nesting activity every season with more than 3 females per beach per nesting season. These included the 7 beaches in south Mahé along the coastline between Anse Capucins and Anse Intendance (Mortimer 2004).

During that period, based on nesting beach monitoring data collected by personnel of the Ministry of Environment and the Marine Conservation Society of Seychelles (MCSS), an estimated 3 to 8 females were nesting annually at Anse Intendance (Mortimer 2004). This represents a serious population decline since the early 1980s (when there were an estimated 11-20 females nesting each year (Mortimer 1984)).

### **2.3. 2004 to the present**

Since 2004 to the present day, monitoring of the seven most important nesting beaches of Mahé has continued under the leadership of personnel of MCSS and the Ministry of Environment. Anse Intendance has been identified as one of the most important of the seven beaches of South Mahé. And while nesting populations at the other six beaches have either remained stable or declined since 2004, the nesting population at Anse Intendance has increased (MCSS, unpublished data). Unfortunately, that upward trend of the Anse Intendance nesting population is now seriously threatened by disruption caused by the recent Cheval Blanc development.

Turtle nesting populations do recover when turtles are protected from poaching. There are many examples of such recovery throughout Seychelles including in both the Inner Islands (Mortimer 2004, Allen et al. 2010) and the Outer Islands (Mortimer et al. 2010). But such population recovery is only possible when the nesting habitat is also protected.

## **3. Factors destructive to turtle nesting habitat**

Two of the factors having the most destructive impact on nesting habitat and nesting turtles are the following:

- Artificial light pollution.
- Inadequate set-back lines.

A recent survey conducted on 5 October 2024 at Intendance Beach by the author of this report determined that neither of these factors appear to have been properly regulated in the *Cheval Blanc* development.

### **3.1 Artificial light pollution.**

When artificial light is visible on a nesting beach it negatively impacts both nesting females and hatchling turtles. Adult marine turtles avoid nesting on beaches that are brightly lit at night, and adult and hatchling turtles can be disoriented and unable to find the ocean in the presence of direct light or skyglow; (Witherington and Martin 1996; Thums et al., 2016; Price et al., 2018). There is no reason to assume that daytime nesting female hawksbills are immune from disturbance caused by artificial light, and certainly their offspring are not immune.

### **3.2 Inadequate set-back lines.**

Set-back lines of at least 30-75 m above the high tide line are important to ensure that female turtles will find adequate undisturbed nesting substrate where they can lay their eggs. Wide set-back lines also ensure that there will be enough vegetation between the nesting beach platform and the structures placed behind the beach to shield the nesting turtles and their offspring from the impacts of artificial lighting.

## **B. EIA Report Produced in 2020 for *Cheval Blanc***

### **1. Details of EIA relevant to nesting sea turtles & nesting habitat**

The following 13 points refer to comments made in the Original EIA produced in 2020 that are relevant to nesting sea turtles or their nesting habitat at Anse Intendance. The most important statements are shaded in green.

#### **1. 4.3 Project Description: Re Sea Turtles**

On page 66 the following statement is made:

*“Lighting will be discrete and for selective mood scenes and will enhance the architecture. A “Green Philosophy” will be adopted to ensure that lighting is energy efficient and turtle-friendly where required.”*

On page 81 the following statement is made:

*“Investigation and protection into the sensitive, protected indigenous species with specific reference to the sea turtles and terrapins will be undertaken in collaboration with the relevant authorities and specialists in the field. The recommendations and mitigatory measures as proposed by the specialists will inform the rehabilitation and protection strategy.”*

#### **2. 4.8.4 Erosion Control and Landscaping**

*“In interest of beach preservation, dune lands and coastal vegetation will not be disturbed.”*

#### **3. 5.6.3. Biological marine environment**

Page 96 highlights the importance of sea turtles:

*“Marine fauna and flora, specifically turtles, form part of the regions natural capital. Anse Intendance is in the unique position of having both nesting Hawksbill (*Eretmochelys imbricata*) and Green turtles (*Chelonia mydas*) on the beach.”*

#### **4. 6.1.4 Sensitivity of the site**

Page 102 identifies the following highly sensitive areas:

*“ii. the native beach crest which is a habitat important for 2 species of IUCN red list nesting turtles (Green turtle and the Hawksbill)”*

#### **5. 6.1.6.3. Impacts on the coastal vegetation and fauna**

Pages 109-110 discuss importance of coastal vegetation to turtles and the need for sensitivity.

**6. 6.2 Species of Special Conservation Concern of Intendance Beach & Wetland**

**6.2.1 Nesting Sea Turtles**

Pages 110- 115 discuss the status and importance of the nesting population in south Mahe and especially at Anse Intendance, including the following statement:

*“To contextualize the importance of Anse Intendance as turtle nesting grounds, this beach came second to only Anse Cachee in terms of highest recorded emergences for the past nesting season, 2019-2020, with 18% of the total recorded emergences on the beaches monitored under the Temporal Protected Area Project\*, that have recorded the highest turtle nesting activity on Mahé.”*

**7. Identification of possible impacts to the nesting sea turtles**

**6.4.2 Beach**

Page 121 discusses the sensitivity of not disturbing turtles during construction.

*“The potential longer-term implications of this disturbance would be detrimental to both the conservation of nesting turtles and ecotourism opportunities.”*

**8. 6.8.3 Visual Impact**

**6.8.3.2. Zone 2 – the Beach**

Page 156.

*“The Beach zone has the highest visual impact probability as the beach can be accessed by the public and is visible to tourist boats that use Intendance Bay. To mitigate the visual effects the proposed renovations to the Beach Villas will have, **the existing setback lines from the sea have been maintained**. The number of Beach Villas has been reduced. This will reduce the massing of the resort allowing more space for further indigenous planting of the sand dunes and screening between the villas.”*

**9. 7.2 Biodiversity, Vegetation and Rehabilitation Surveys**

**7.2.1 Reducing impact to the beach crest**

Page 159:

*“Beach access for each villa should not be allowed. Instead a single access for a cluster of villas is more eco-friendly.”*

**10. 7.3.2 Beach**

Page 161 describes how to protect turtles during demolition & construction:

- Ideally, all demolition and renovation of the infrastructure near or along the beach should take place **outside of the Hawksbill nesting season (October to March)**.
- As nesting Green turtles, as well as emerging Hawksbill hatchlings, may use the beach outside of that period, it is recommended that a **barrier is erected for the mitigation of noise, debris and anthropogenic disturbance to nesting turtles, as far back on the beach as possible, well behind the vegetation and high water mark.**

· *It is recommended that all employees involved in the demolition and renovation works are sensitized on the correct conduct in the case of turtle encounters. The awareness and education training will happen in an induction session with the ECO to ensure all construction staff understand the Do's and Don'ts on site.*

· **No artificial light should be visible from the beach during demolition and construction. Both nesting and hatching turtles are extremely sensitive to light, which is how they navigate safely back to sea. Artificial lights thus dis-orient them, causing them to get lost or stuck in developed areas, which, frequently in the case of hatchlings, leads to mortality.**

#### **11. 7.3.5 Promotion of biodiversity**

On page 162:

- Both guests and staff of the hotel should be sensitized on the importance of the beach and wetland habitats and their species.
- Behavioural guides on nesting and hatchling turtles should be distributed to all guests of the resort and hotel security staff should be trained on the correct conduct when encountering emerging turtles and hatchlings.
- The shoreline should be stabilized to reduce erosion and destroyed turtle nests through the rehabilitation of beach fringe vegetation, in particular *Scaevola taccada*, which is suitable for turtle nesting habitat. To support this effort, beach access should be kept to a minimum of 3 pathways.

· **If artificial light outside infrastructure along the beachside is crucial once the development is complete, only turtle-friendly lights should be used in these areas, and *only* outside of the nesting season, while internal lights should be minimized with the use of curtains and/or blinds.**

#### **12. Replant and manage the beach crest and plateau along the coast**

On pages 170-171:

*The beach crest is quite intact, in good condition and consists of native species. It is a habitat that is extremely important for the 2 nesting turtle species. There are disturbed patches in the beach crest vegetation created by footpaths for beach access. These footpaths will have to be vegetated with the appropriate species like *Veloutye*, *Bwa savon* and the *Morning glory (Patatran)*. Considering the effects of climate change, which leads to beach erosion, there might be a need to first line the targeted areas with geotextile mats to hold the substrate and then plant the seedlings in the mat. The Plateau behind the beach crest is in need of re-vegetation with appropriate species like *Takamaka*, *Bwadroz*, *Porse*, *Bwa blan* and *Bonnen kare bordemer*.*

**13. 8.3 Impacts and Mitigation Measures**

**8.3.1 Beach Villas**

**8.3.1.1. Demolition**

On page 186.

4	<p><i>Interference with turtle nesting activities. Noise and excessive lighting are conditions that affects turtle nesting activities. Reduction of turtle nesting activities is a reduction in turtle population growth in the region.</i></p>	<p><i>All demolishing works at coastal areas must be done noting Turtle Nesting events and mindful of Acoustics and Vibrations. Site Hoarding is a must. MCSS will be activated under SOP for any Turtle emergence and nests are to be carefully identified, photographed and data provided to MCSS. <b>A vegetation buffer between the beach and villa area will be maintained as to provide sufficient conducive and protected turtle nesting zones for continuous turtle nesting and eggs hatching activities.</b></i></p>
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**2. Discussion of EIA comments relevant to turtles & nesting habitat**

The EIA produced in 2020 highlights the importance of the Anse Intendance turtle nesting population in the following points that are described above in:

B. EIA Report Produced in 2020

1. Details of EIA relevant to nesting sea turtles & nesting habitat

The most important points raised in the EIA relevant to nesting sea turtles and their nesting habitat are the following:

- Importance of the nesting population at Anse Intendance
- Mitigating impacts of Artificial Light Pollution
- Set back lines
- Importance of maintaining healthy beach vegetation

**2.1 Importance of the turtle nesting populations at Anse Intendance**

In the EIA, the text and accompanying Figures and Tables clearly make the point that the nesting turtle populations of Anse Intendance are very sensitive and very important.

This information is presented in the following sections described above:

“4”: 6.1.4. Sensitivity of the site

On page 102.

“6”: 6.2 Species of Special Conservation Concern of Intendance Beach & Wetland  
6.2.1 Nesting Sea Turtles  
On pages 110- 115.

## **2.2. Need to Mitigate Impact of Artificial Light Pollution**

The EIA mentions the importance of mitigating the impact of artificial light in the following sections (that are also presented in more detail in section B. 1.):

“1”: 4.3 Project Description: Re Sea turtles

On page 66. *“Lighting will be discrete and for selective mood scenes and will enhance the architecture. A “Green Philosophy” will be adopted to ensure that lighting is energy efficient and turtle-friendly where required.”*

On page 81. *“...The recommendations and mitigatory measures as proposed by the specialists will inform the rehabilitation and protection strategy.”*

“10”: 7.3.2 Beach

On page 161. *“No artificial light should be visible from the beach during demolition and construction. Both nesting and hatching turtles are extremely sensitive to light, which is how they navigate safely back to sea. Artificial lights thus dis-orient them, causing them to get lost or stuck in developed areas, which, frequently in the case of hatchlings, leads to mortality.”*

“11”: 7.3.5 Promotion of biodiversity

On page 162. *“If artificial light outside infrastructure along the beachside is crucial once the development is complete, only turtle-friendly lights should be used in these areas, and only outside of the nesting season, while internal lights should be minimized with the use of curtains and/or blinds.”*

**Point “11” is critically important:** It specifies what needs to happen **AFTER** the development is completed, including:

- **If artificial light outside infrastructure along the beachside is crucial...**
- **only turtle-friendly lights should be used**
- **and only outside the nesting season**
- **while internal lights should be minimized with the use of curtains and/or blinds**

Based on the observations made on the evening of 5 October 2024, during the sea turtle nesting season, the stipulations presented in **item “11” have not been complied with.**

### 2.2.1. Expert Opinion (Ebrahim, 2023) regarding Artificial Light Pollution

The EXPERT OPINION produced by Dr Ameer Ebrahim (October 2023) highlights issues related to light pollution. This discussion can be found on pages 2-3 of that document (Ebrahim 2023).

Ebrahim (2023) notes that the EIA proposed “to use the existing footprint of the resort and limit new buildings to the minimum.” But, found instead that: “... there has been significant extension to the existing footprint of the resort. For example, there are new buildings on the rocks, lap pools along the beach villas, a large lap pool in front of the Presidential Villa, concrete garden beds and new dining terraces.”

Ebrahim (2023) also reported that: “In numerous instances, the developers have built higher on the existing foundations than anticipated by the approved site plan.” Ebrahim (2023) notes a second floor has been added to some of the double room beach villas and provides evidence that a second floor has been added to the main lodge and to the five-bedroom Owner’s Villa. A new structure was also added next to the swimming pool which will result in greater visual impact when viewed from the sea.

As noted by Ebrahim (2023) these modifications will influence the coastal vegetation, and disrupt nesting turtles along the beach through additional noise and light pollution.

Increasing the height of the infrastructure adjacent to the beach will enable artificial light to reach the turtle nesting beach and disrupt the turtles, especially the hatchling turtles. Coastal vegetation alone will not be sufficient to block the light pollution. Additional measures will be necessary to keep the beach dark at night. These would include the **removal of all outdoor light fixtures, and also the mandatory use of blackout blinds and curtains every day between sunset and sunrise.**

### 2.3. Need for Adequate Setback Lines

The EIA mentions setback lines in the following sections (also presented in more detail in section B. 1.):

“8”: 6.8.3 Visual Impact  
6.8.3.2 Zone 2 – the Beach

On page 156. “To mitigate the visual effects the proposed renovations to the Beach Villas will have, **the existing setback lines from the sea have been maintained.**”

**Point “8”** highlights a lost opportunity to stipulate more ecologically appropriate setback distances. Removal of the original buildings from the Banyan Tree complex offered a (lost) opportunity to require wider setback distances from the high tide line.

**Wider setback distances would benefit the nesting turtles.** More beach substrate would have been available to the turtles, and there would also have been a better opportunity to plant native vegetation that would shield the turtle nesting habitat from human activity and disturbance associated with the infrastructure.

To avoid inundation of sea turtle nests by high water ideally the setback line should be defined based on the distance from the HWM at a High Tide of 2.1 m.

**Wider setback distances would have also benefited the infrastructure.** Given rising sea levels, all construction along the coastline of Mahé will eventually be subject to risk of sea water inundation. So, it is in the interest of the hotel development to place the infrastructure as far away from the sea as possible.

Ideally the **setback line** should be at least **30 metres**. Unfortunately, limitations in available beach platform along the coastline of the granitic Inner Islands of Seychelles often make it difficult or impossible to enforce a 30-metre setback line. These challenges, however, do not obviate the need to maintain an adequate setback line in the interests of protecting the coastal ecosystems, the wildlife, and the infrastructure from inundations. Nor do they exonerate the Government from the responsibility to enforce an adequate setback line.

### **2.3.1. Expert Opinion (Ebrahim, 2023) regarding Setback Lines**

The EXPERT OPINION produced by Dr Ameer Ebrahim (October 2023) provides an excellent discussion of the history and importance of regulations pertaining to “setback line” and their application to the Cheval Blanc development. This discussion can be found on pages 3-4 of the document (Ebrahim 2023).

Ebrahim (2023) notes that the EIA proposed *“the removal of the built-up lawn frontage of each Beach Villa further allocating additional 4m to 14m varying along the coastal belt, for vegetation densification and turtle nesting enhancement programs.”* But, in fact, *“the vegetation belt has diminished considerably, in most areas being less than 20m wide (Appendix 9), and in some cases there is virtually no vegetation.”*

Ebrahim (2023) also provides data collected by drone surveillance in late July-August 2023 (Appendix 9 of Ebrahim (2023)). Those data report the distances in metres between the “HWM at a High Tide of 2.1 m” and the “existing construction” to range from 13 m to 23 m. Based on those data one can conclude the **setback is inadequate** to provide enough distance between the HWM and the infrastructure to maintain a truly healthy sea turtle nesting population.

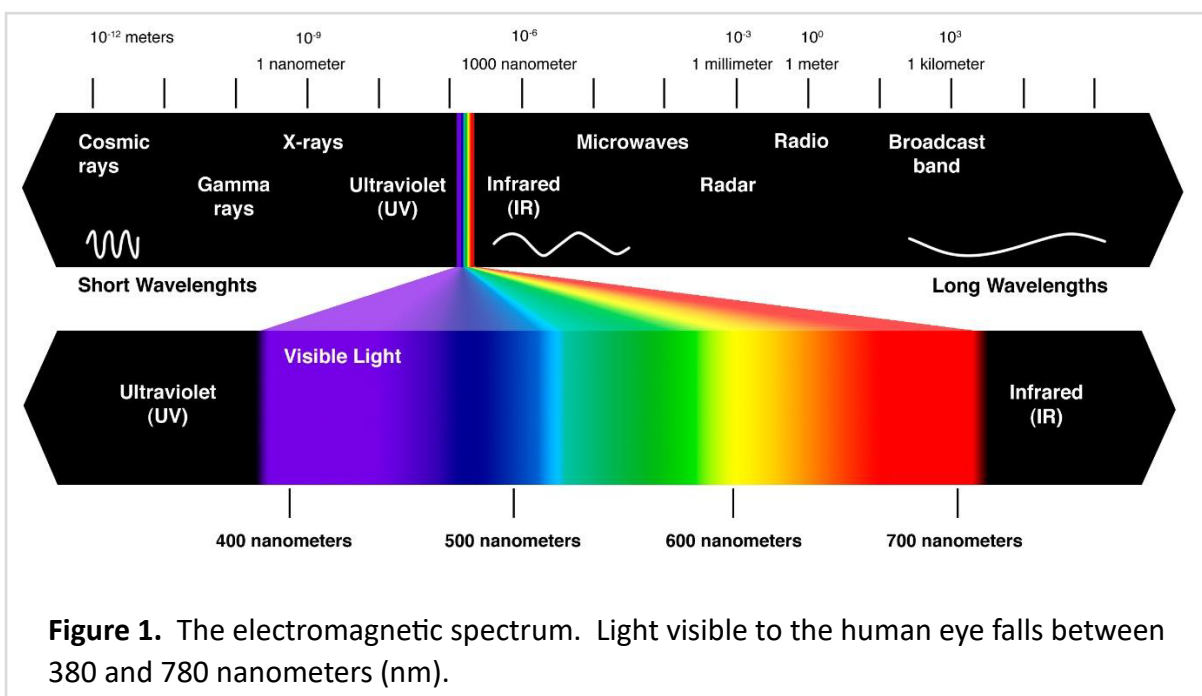
In addition, Ebrahim (2023) indicates (on page 7, item “10”) that the coastal zone setback not only *“does not seem to have increased, but rather decreased with additional development (e.g. lap pools and dining terraces).”* If true, this indicates **non-compliance with the EIA.**

## C. What is “Turtle Friendly Lighting”? & How it also Benefits People!

### 1. What do People See? What do Animals See?

The perception of different wavelengths as ‘colour’ is subjective and characterized by how the human eye perceives light: red (700 nm), orange (630 nm), yellow (600 nm), green (550 nm), blue (470 nm), indigo (425 nm) and violet (400 nm) (Figure 1). Generally, this is not how animals see light.

Humans and animals perceive light differently (Figure 2), and the impacts of artificial light vary by species and need to be considered on a case-by-case basis.

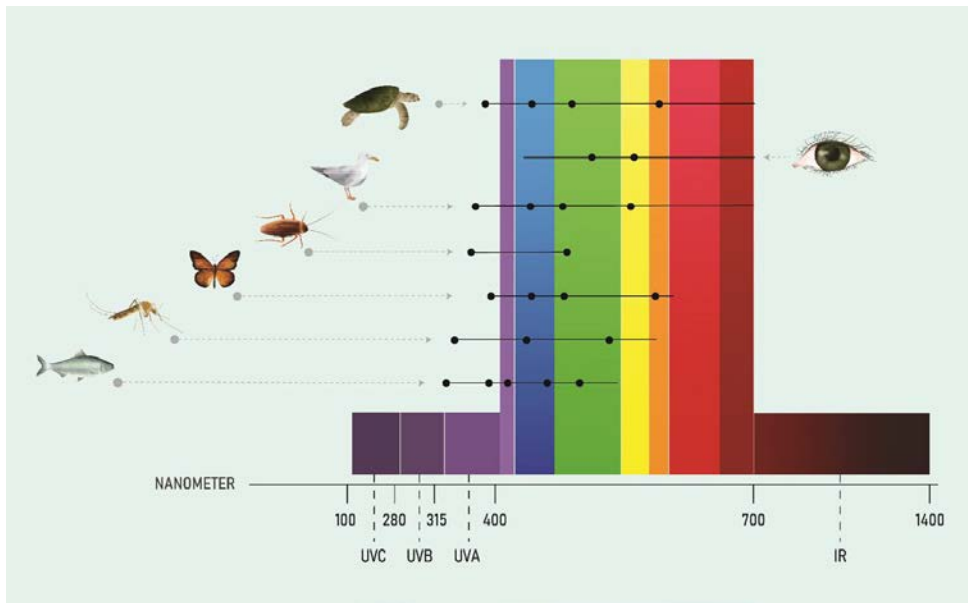


**Figure 1.** The electromagnetic spectrum. Light visible to the human eye falls between 380 and 780 nanometers (nm).

#### 1.1. Sensitivity to blue light

Sensitivity to high-energy, short-wavelength **UV/violet/blue light** is common in wildlife (including turtles). These short wavelengths, although not all visible to humans, are known to cause physical damage the photoreceptors in the retina of the human eye, and are also known to disrupt circadian rhythms in people. (Hence the recommendations for people to wear ‘blue-blocker’ glasses when working on their computers in the evening.) They also disorient turtles and disrupt their behaviour on the nesting beach.

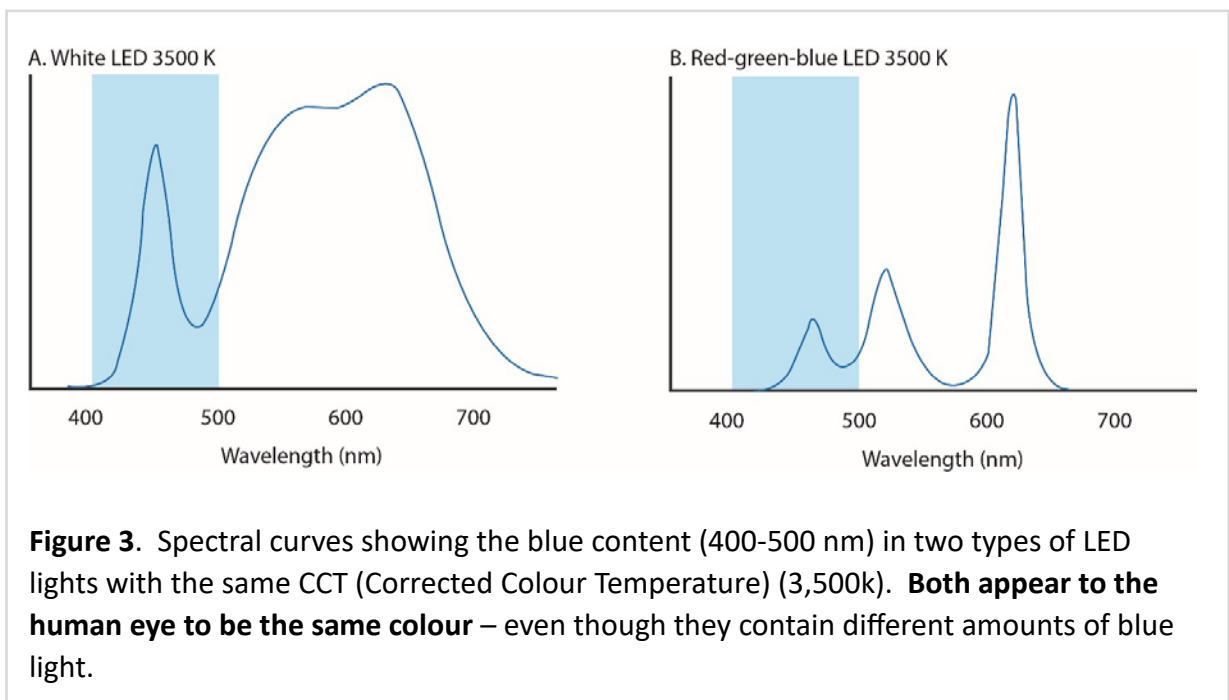
It follows that **eliminating the short\_wavelengths of light in UV/violet/blue light range would benefit both humans and sea turtles.**



**Figure 2.** Ability to perceive different wavelengths of light in humans and wildlife is shown by horizontal lines. Black dots represent peak sensitivity. Note the common sensitivity to short-wavelength light across all wildlife.

### 1.1.1. White Light – Spectral Curves

White light is made up of wavelengths of light from across the visible spectrum. White light includes high levels of shortwave UV/violet/blue light as in the following graph:



**Figure 3.** Spectral curves showing the blue content (400-500 nm) in two types of LED lights with the same CCT (Corrected Colour Temperature) (3,500k). **Both appear to the human eye to be the same colour** – even though they contain different amounts of blue light.

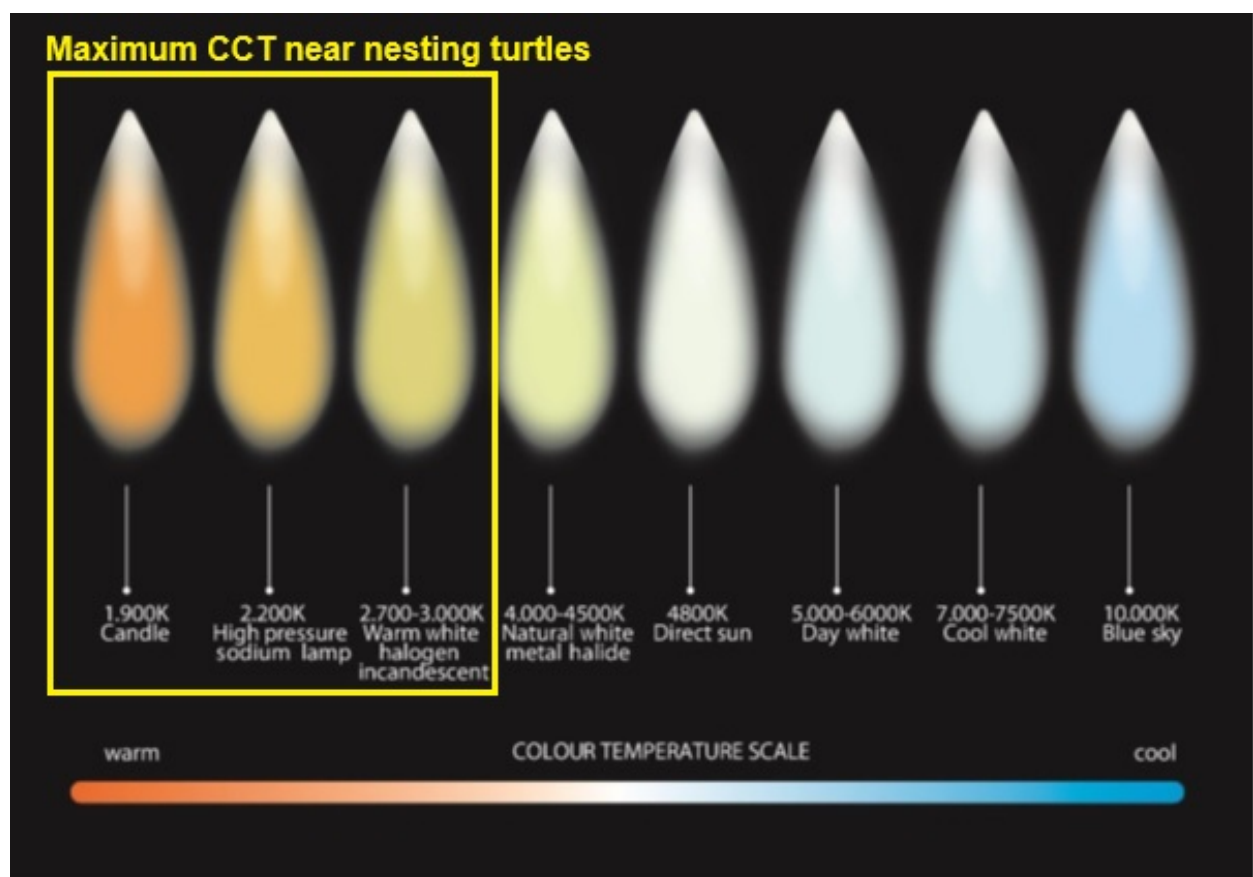
### 1.1.2. Light-emitting diodes (LEDS)

LED lights are rapidly becoming the most common light type globally, as they are more energy efficient than previous lighting technology. They can be smart controlled, are highly adaptable in terms of wavelength and intensity, and can be instantly turned on and off.

LED technology allows for tuneable red-green-blue (RGB) colour management. This has the potential to enable species-specific management of problematic wavelengths – for example, blue for most wildlife (and also for people).

### 1.1.3. Correlated colour temperature (CCT)

CCT describes the colour appearance of a white LED. It is expressed in degrees Kelvin, using the symbol K, which is a unit of measure of absolute temperature. CCT describes the perceived “warmth” of lamps (see Figure 4).



**Figure 4.** Lamps with a warm yellowish colour have a CCT between 1,000 K and 3,000 K, while lamps with the cool bluish colour have a CCT over 5,000 K.

### **Safe Lighting Near Turtle Nesting Beaches:**

**Maximum CCT** (Correlated Colour Temperature). See Figure 4.

- Outdoor lights: maximum **2,700 K**
- Indoor lights: maximum **3,000 K**
- **Avoid**: halogen, metal halide, or fluorescent lights

### **1.2. Direct Light versus Skyglow**

Light may appear as either a **direct light** source from an unshielded lamp with direct line of sight to the observer, or as **skyglow**.

Skyglow is the diffuse glow caused by source light that is screened from view but creates a glow in the atmosphere through reflection and refraction. Skyglow is affected by cloud cover and other particles in the air. Blue light scatters more in the atmosphere compared with yellow-orange light. Clouds reflect light well, adding to skyglow.

Both **direct light** and **skyglow** are detrimental to nesting turtles.

## D. Guidelines to Minimize Impacts of Artificial Light Pollution

### Source documents:

Over recent decades several sets of guidelines have been produced for both local and international audiences about how to minimize the impacts of artificial light pollution in the vicinity of sea turtle nesting beaches. These include the following, which are available either as Appendices to the present document or through internet links:

- Witherington B.E. & Martin R.E. (1996) *Understanding, Assessing, and Resolving Light-Pollution Problems on Sea Turtle Nesting Beaches*. Florida Marine Research Institute Technical Report TR-2. 73p.  
<https://renatura.org/wp-content/uploads/2019/08/Witherington-B.-E.-and-R.-E.-Martin.-1996.-Understanding-assessing-and-resolving-light-pollution.pdf>
- Mortimer J.A. (2004) *Guidelines to Minimise the Negative Impacts of Artificial Lighting on Sea Turtles: making coastal development more "Turtle Friendly."* IN: Seychelles Marine Ecosystem Management Project (SEYMEMP): Turtle Component. Final Report. Vol 1: Text, 243 pages. Vol 2: Appendix 1-11, 158 pages. **(Appendix 1, this document)**
- Florida Fish & Wildlife Conservation Commission (2018) *FWC Sea Turtle Lighting Guidelines*. 8 pages. <https://myfwc.com/media/18511/seaturtle-lightingguidelines.pdf>
- DCCEEW (2023) *National Light Pollution Guidelines for Wildlife*, Department of Climate Change, Energy, the Environment & Water, Canberra, May. CC BY 4.0. 205 pages. <https://www.dcceew.gov.au/sites/default/files/documents/national-light-pollution-guidelines-wildlife.pdf>
- CMS (2024) *CMS International Light Pollution Guidelines for Migratory Species*. 144 pages. <https://www.cms.int/en/publication/international-light-pollution-guidelines-migratory-species>

### Compilation and Summary:

The following sections provide a compilation and summary of the information available in the above documents. More detail can be obtained within those documents listed above.

Good lighting design incorporates the following design principles. They are applicable everywhere, especially in the vicinity of wildlife.

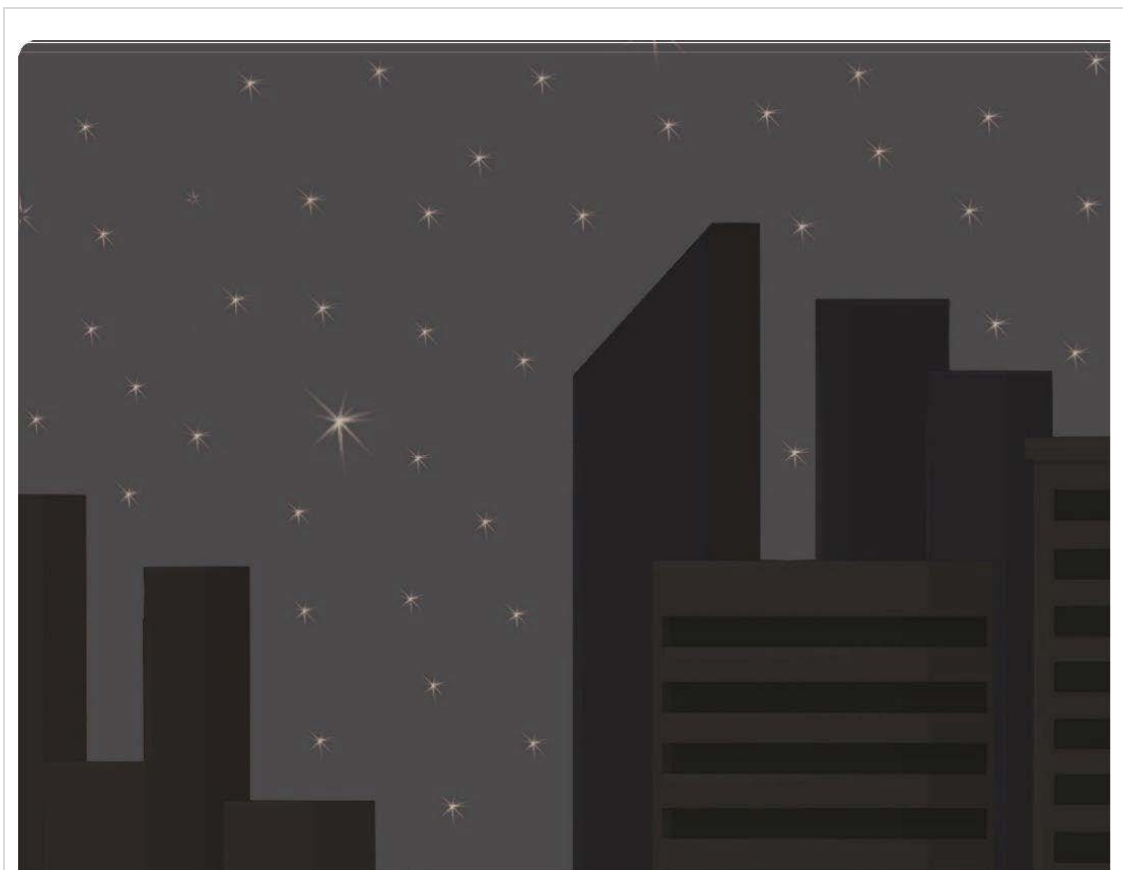
## 1. **Maintain natural darkness insofar as possible**

**Natural darkness** has conservation value in the same way as clean water, air and soil and should be protected through good quality lighting design. The starting point for all lighting designs should be natural darkness. Artificial light should only be added for specific and defined purposes and only in the required location for the specified duration of human use.

**Values of natural darkness** include:

- a) **Protects nesting turtles.**
- b) **Enables turtle tourism** (another source of income).
- c) **Protects human health** (from high-energy, short wavelength UV/violet/blue light which can damage human eyesight & circadian rhythms).
- d) **Enables Astronomical Tourism** (i.e., Astro-Tourism & Astrophotography), a multi-million dollar tourism industry. People living in cities can no longer see the stars. Clear skies can be sold as a tourist attraction.

<https://www.astronomictourism.com/>



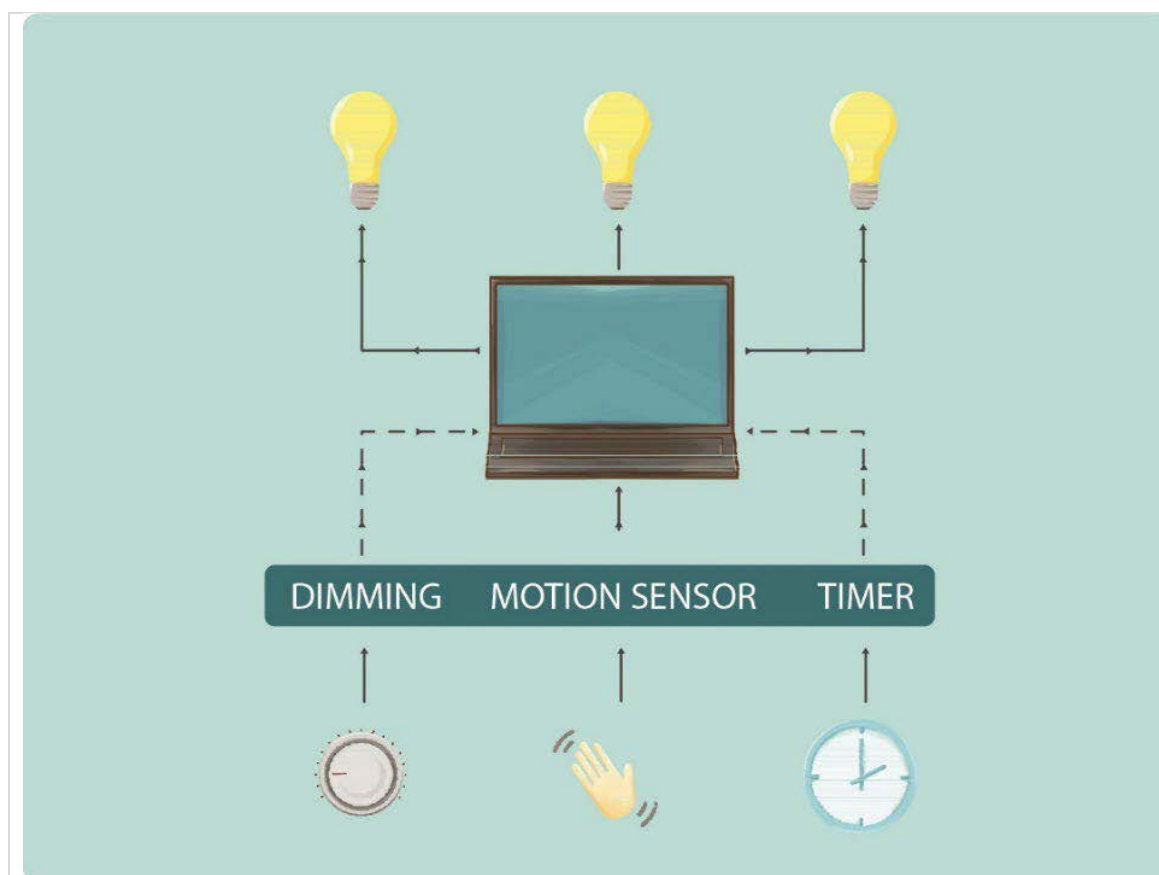
**Figure 5.** Maintain natural darkness insofar as possible.

## 2. Use adaptive controls

Recent advances in smart control technology provide a range of options for better controlled and targeted artificial light management.

Smart controls and LED technology (Figure 6) allow for:

- remotely managing lights (computer controls)
- instant on and off switching of lights
- control of light colour (emerging technology)
- dimming, timers, flashing rate, motion sensors, well defined directivity of light.
- Automatic shutting of blackout blinds and curtains—after sunset & before sunrise.

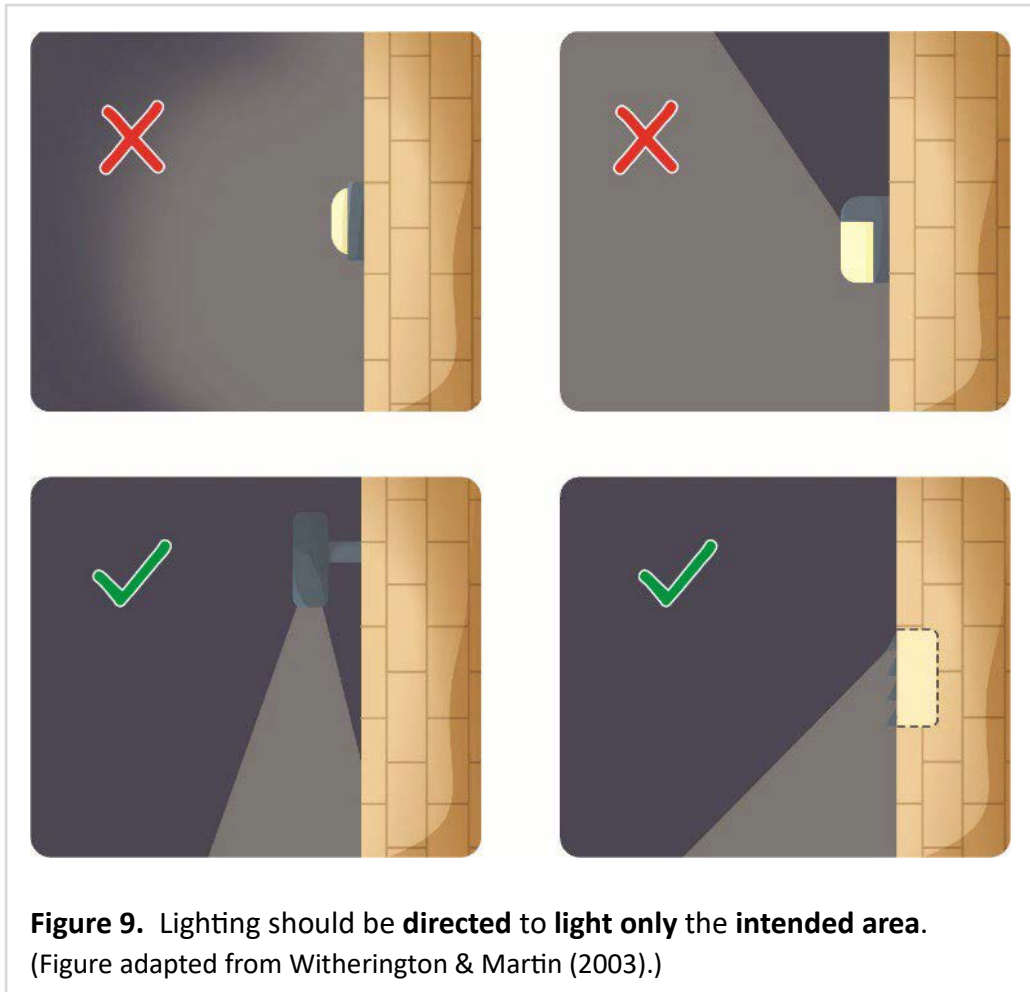


**Figure 6.** Use adaptive controls to manage light timing, intensity and colour.

### 3. Light only the area intended (avoid light spill)

**Light spill** is light that falls outside the area intended. Light that spills above the horizontal plane contributes directly to **artificial skyglow**. Light that spills into adjacent areas on the ground can disrupt wildlife in adjacent areas.





**Use shields.** All light fittings should be located, directed or shielded to avoid lighting anything but the target object or area (Figures 7, 8, 9, 10). Modify existing lights by **installing a shield.**

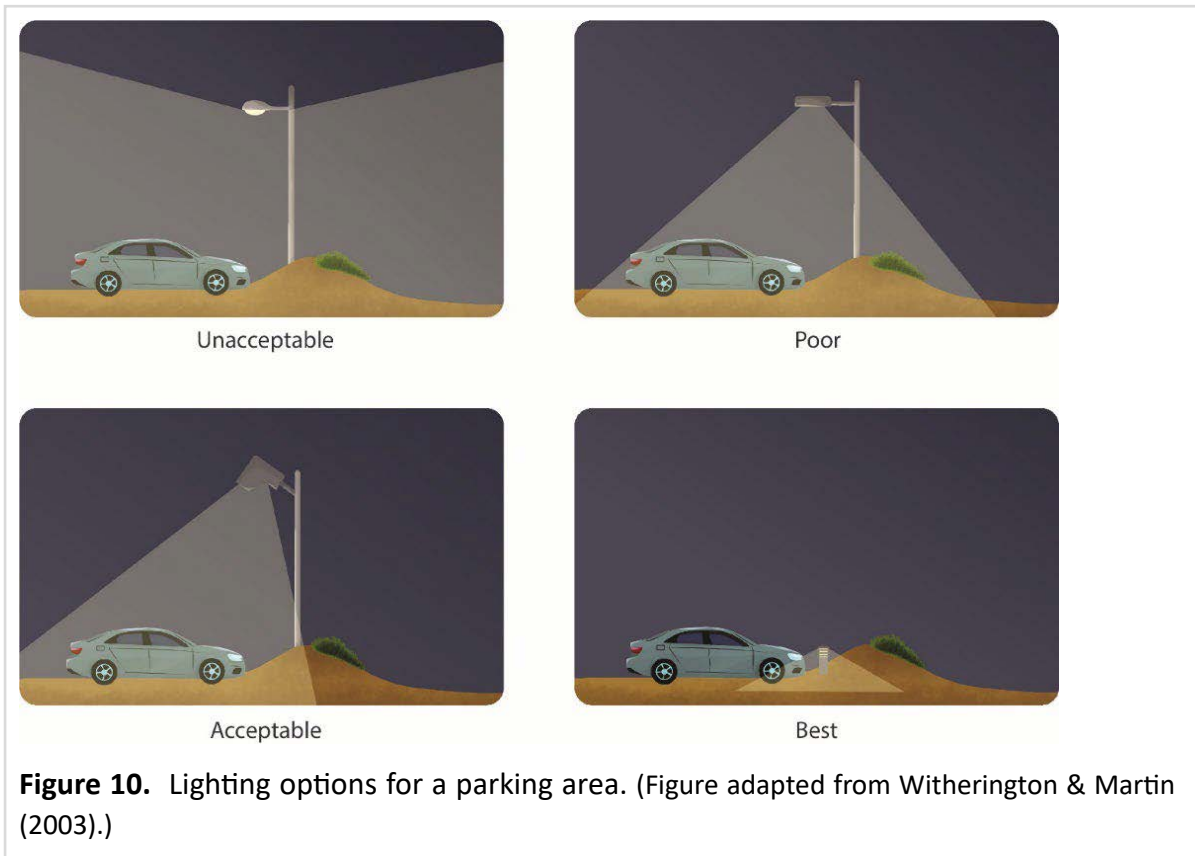
**Prevent light from shining above the horizontal plane.** Artificial light can be prevented from shining above the horizontal plane by ensuring the luminaire is mounted horizontally relative to the ground and not at an angle. Can also be mounted on a building so that the structure prevents the light shining above the horizontal plane, for example recess a light into an overhanging roof eave. When determining angle of the mounting, consideration should be given to the reflective properties of the receiving environment.

**Floodlighting** should be **avoided** as much as possible. When it is used it should be top-down and fully shielded.

**No upward lights or vertical illumination** that shines into the sky. Do not illuminate the building, vegetation or other structures using upward lighting.

**Avoid purely decorative** lighting that lacks a practical purpose.

**No lighting permitted on roof.**



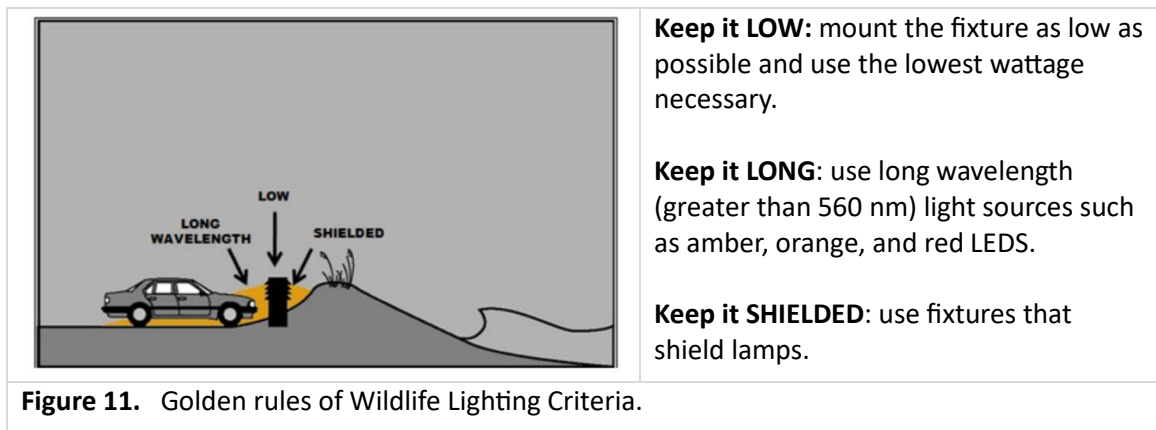
#### **4. Use the lowest intensity light appropriate for the task.**

##### **Use the minimum light needed.**

Lighting intensity should be appropriate for the activity. Starting from a base of no lights, use the **minimum number** and **intensity of lights needed** to provide safe and secure illumination for the area.

##### **Use low-glare lighting.**

High-quality, low-glare lighting should always be a high priority. Low-glare lighting enhances visibility for the user at night, reduces eye fatigue, improves night vision and delivers light where it is needed.

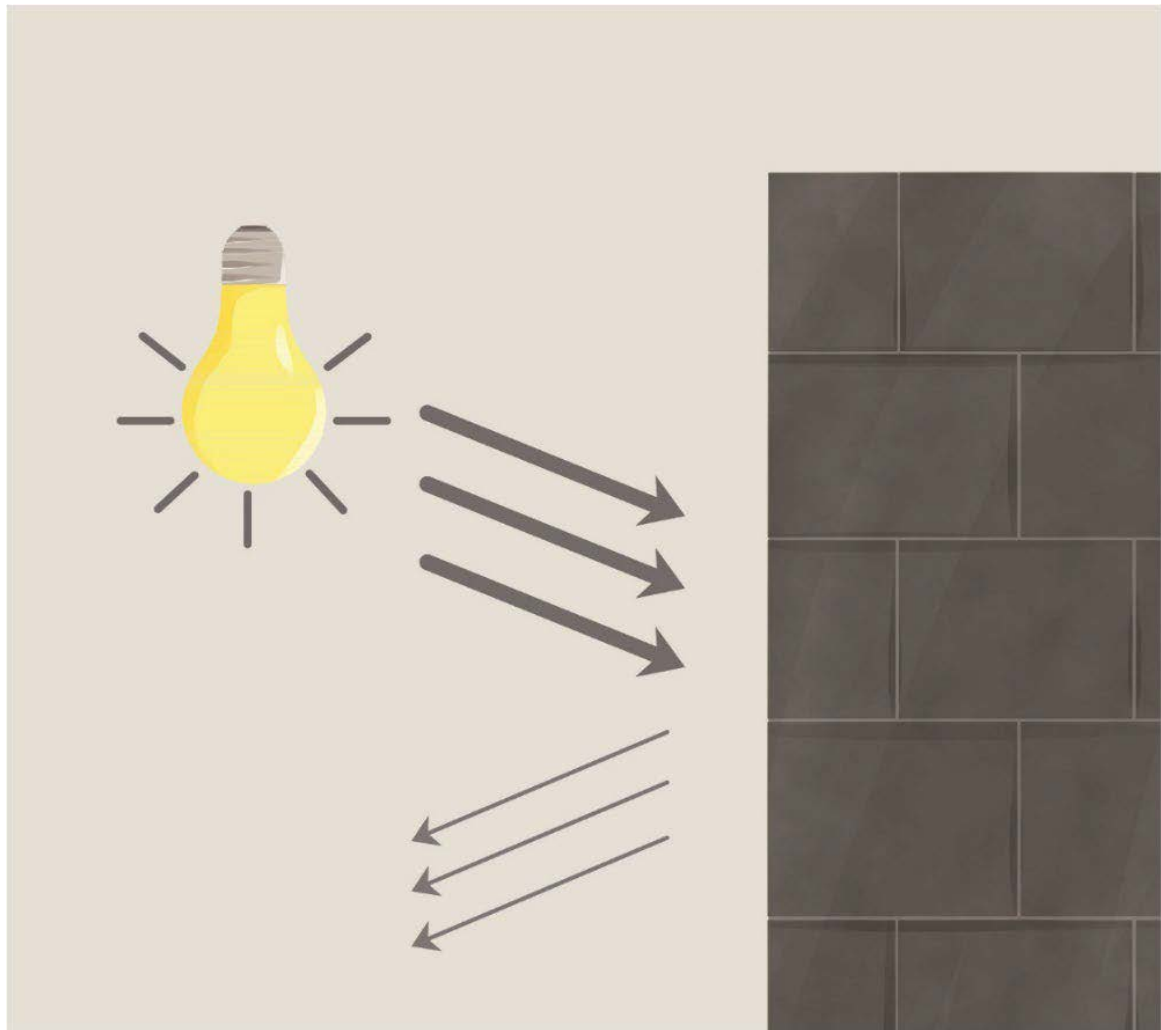


**5. Use non-reflective, dark-coloured surfaces – outer walls, balconies, etc.**

**Avoid light-coloured reflective surfaces on the outer walls of buildings (Figure 12).**

Light reflected from highly polished, shiny or light-coloured surfaces such as white painted infrastructure, polished marble or white sand can contribute to skyglow.

**Open water should not be illuminated** because it reflects light directly upward into the night sky.



**Figure 12.** Use non-reflective dark-coloured surfaces on outside of buildings and structures.

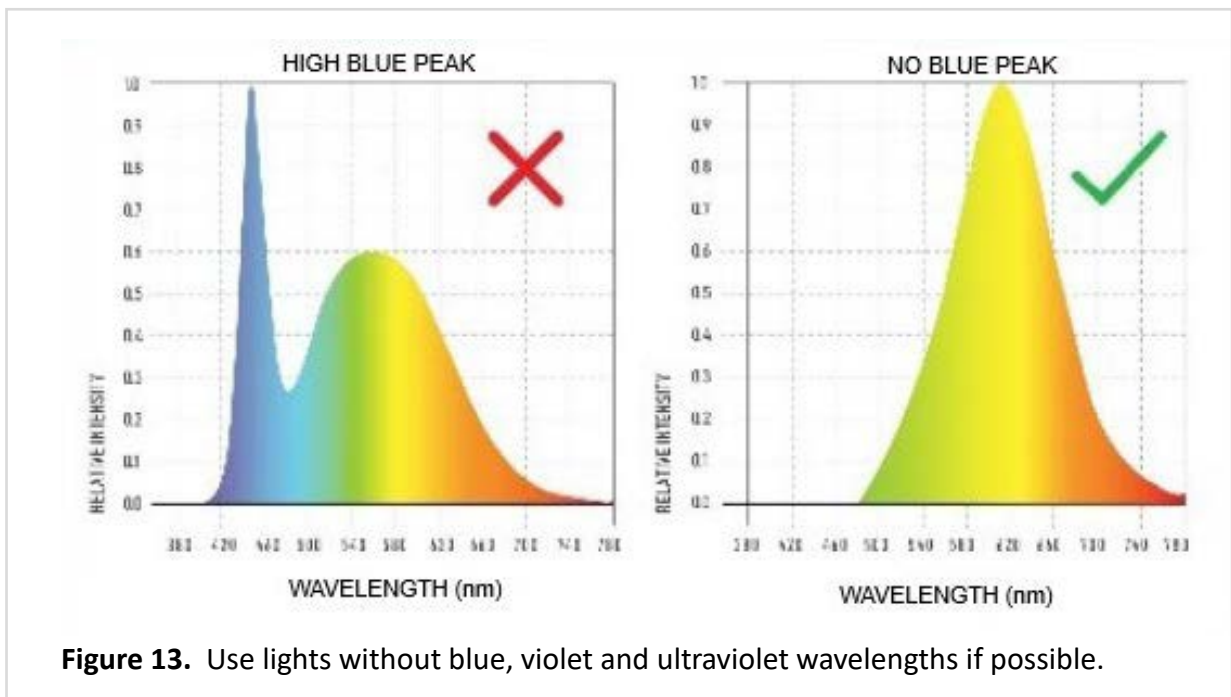
## 6. Block light spill from internal light sources.

### **Keep indoor lighting indoors!**

After sunset, no artificial lighting inside the building should be visible outside the building. Prevent light spill.

- Use **block-out blinds, curtains** or **shutters** for transparent portions of a building, including skylights.
- Fit all windows and doors with **automatic opaque blinds** configured to **close automatically** and remain closed after sunset until before sunrise.
- All windows and doors should be **tinted** with **non-reflective tinting**, <42% visible light transmittance.

## 7. Use lights with reduced or filtered-out blue, violet and ultraviolet wavelengths



### **Maximum CCT (Correlated Colour Temperature)**

- Outdoor lights: maximum 2,700 K
- Indoor lights: maximum 3,000 K
- Avoid: halogen, metal halide, or fluorescent lights

### **Best lighting:**

- **Amber LED (590-610 nm)**
- **Low pressure sodium**

## E. International Guidelines, Regulations & Mandates: “Turtle Friendly Lighting”

### 1. International Guidelines and Mandates

State and national governments in some countries that host important sea turtle nesting populations have successfully implemented regulations and mandates to restrict beach lighting even along highly developed and extensive stretches of coastline, including those adjacent to tall buildings. Some examples include the following:

#### 1.1. Florida, USA

The state of Florida implemented Section 161.163, Florida Statutes which requires the Florida Department of Environmental Protection to designate coastal areas utilized or likely to be utilized by nesting sea turtles, and to establish guidelines for local government regulations that control beachfront lighting to protect hatchling sea turtles.

<https://myfwc.com/conservation/you- conserve/lighting/ordinances/>

#### 1.2. Australian Government guidelines & mandates

Australia produced national guidelines in 2020, which were updated in 2023:

<https://www.dccew.gov.au/environment/biodiversity/publications/national-light-pollution-guidelines-wildlife>

In some parts of Australia, local government has taken the guidelines a step further and made them **mandatory**. One such location is the “**Beachfront Buddina**” in Queensland Australia.

#### 1.3. Convention on Migratory Species (CMS) Guidelines

**CMS (Convention on Migratory Species)** produced **Light Pollution Guidelines for Migratory Species** in **2024** and encourages its Signatory States to abide by these guidelines.

- CMS (2024) CMS International Light Pollution Guidelines for Migratory Species. 144 pages. <https://www.cms.int/en/publication/international-light-pollution-guidelines-migratory-species>

**Seychelles has been a Party to the Convention on Migratory Species (CMS) since 2005.**

### 2. Mandatory Lighting Design Criteria for *Beachfront Buddina* development

Some locations in Australia have taken the guidelines a step further and made them **mandatory**. One such location is the “**Beachfront Buddina**” in Queensland Australia. To enable development of 73 luxurious residences, within six-story building, adjacent to an important sea turtle nesting beach (Endangered Loggerhead turtles (*Caretta caretta*)), clear regulations have been **mandated**. They are presented in detail in Appendix 2 of this document.

**Following is a summary of those MANDATORY CRITERIA:**

- A. Construction restrictions during turtle season:
  - 1. Construction **works restricted to daylight hours**;
  - 2. **No flood lighting**.
  
- B. At all times:
  - 1. Must maintain or reduce **sky glow values** to those existing at adjacent nesting grounds.
  - 2. **Hire qualified lighting consultant** to undertake “Artificial Light At Night” surveys.
  
- C. **Post-development light surveys** to be conducted regularly
  
- D. **Indoor and outdoor lighting** and signage to follow below guidelines:
  - 1. **Minimize light spill** and **skyglow** by implementing the following criteria:
    - Reduced light intensity
    - Long wavelengths lights (red end of spectrum)
    - Lights fitted with shields
    - Outdoor lighting low to the ground
    - Outdoor lighting directed only to specific areas of interest
    - Use low reflectance building surfaces and paint
    - Tinted windows only.
  - 2. All **windows** and **doors**:
    - Tinted with non-reflective tinting, <42% visible light transmittance.
    - Fitted with **automatic opaque blinds** configured to **close automatically** and remain closed after sunset until before sunrise.
  - 3. All **outdoor paint/surfaces/fixtures** (whether enclosed or unenclosed) must be **matte and dark in colour**
    - With maximum reflective value of 30%
  - 4. **Maximum CCT** (correlated colour temperature):
    - Outdoor lights: max 2,700 K
    - Indoor lights: max 3,000 K
    - Avoid: halogen, metal halide, or fluorescent lights
  - 5. Standard lighting: **Amber LED (590-610 nm)** or **low pressure sodium** lighting
    - LED lights must not contain short wavelength blue light
  - 6. **Number & wattage** of light must be **minimized**
  - 7. **All outdoor lights** (including balcony lighting) must be:
    - Recessed into structures and/or roof /ceiling.
    - Fitted with appropriate shields.

- Directed away from beach.
  - Avoid direct illumination of beach, ocean, and sky at night.
8. **No lighting permitted on roof**
9. **Outdoor feature lighting** to the building must be:
- Positioned below 10 metres in height.
  - Turned off between sunset and sunrise during turtle season.
10. **No upward lights or vertical illumination** of the building, vegetation or other structures using lighting that that shines into the sky.
11. **All outdoor lighting** must be **activated** by proximity sensors or **motion detectors**.
12. **Smart lighting technology** must be incorporated for all indoor and outdoor lighting **above the 1<sup>st</sup> storey** to reduce light emissions.
13. **No decorative outdoor lighting**.
14. **Pool lighting** must be **switched off** after sunset.

## F. How to Address Problems of Non-Compliance with the EIA at *Cheval Blanc*

The following are some examples of non-compliance with the EIA of 2020 by the *Cheval Blanc* development. Also indicated are ways to mitigate these problems.

### 1. Problems with Artificial Light Pollution

#### 1.1. Light spill from internal light sources

In each of the photos below (Figures 14, 15), light spills out of the interior through the numerous large glass windows at night. This is a problem common to **all of the buildings** located along the beach of this development.

**Solutions:** This problem can be mitigated by implementing the following measures:

- **Tint all window glass** with non-reflective tinting (<42% visible light transmittance).
- On all the windows, install **automatic opaque blinds** that are configured to **close automatically** just after sunset, and open again just before sunrise. [People would still be able to enjoy sunrise and sunset and views of the outside environment all day long. But, at night when there is no reason to look outside, the turtle nesting beach would be shielded from the light spill of internal light sources.



**Figure 14.** New main public area which is different from the original master plan. Large picture window need to be fitted with automatic opaque blinds, curtains, and tinted glass.



**Figure 15.** Light spill is a problem coming through all the large picture windows on both the ground floor and the new upstairs rooms. Opaque blinds, curtains and tinted glass are need.

## **1.2. Upward directed luminaires with vertical lighting**



**Figure 16.** Upward directed luminaires such as those shown in this photo are inappropriate in the vicinity of a turtle nesting beach. They need to be removed.

### 1.3. Decorative & elevated outdoor lighting



**Figure 17.** The luminaires indicated in this photo are primarily decorative and serve no practical purpose.

They will shine onto the nesting beach, and glare.

If they are needed to light a walkway, they should be positioned **closer to the ground** and **shielded** to direct the light only to where it is needed.



**Figure 18.** All the lights associated with the second floor of this building need to be turned off after sunset until before sunrise. They are purely decorative and disruptive.

### **1.3. Outdoor paint / surfaces / and fixtures too white & reflective**



**Figure 19.** Virtually all of the buildings on the property are **light-coloured** and **reflective**, producing **Skyglow**. Ideally the outer walls of the buildings should be **darkened** or in some way made **less reflective** (for example by using stucco, or a matte finish).

### **1.5. Characteristics of the Light Waves from the Luminaires**

All lights visible on the property at night need to adhere to the following codes:

1. **Maximum Correlated Colour Temperature (CCT):**
  - Outdoor lights: max 2,700 K
  - Indoor lights: max 3,000 K
  - Avoid: halogen, metal halide, or fluorescent lights
2. **Standard lighting:**
  - **Amber LED (590-610 nm) or low pressure sodium** lighting
  - LED lights **must not contain short wavelength blue light**

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- Allen, Z.C., Shah, N.J., Grant, A., Derand G-D, Bell, D. (2010) Hawksbill turtle monitoring in Cousin Island Special Reserve, Seychelles: an eight-fold increase in annual nesting numbers. *Endangered Species Research* 11:195-200. doi:10.3354/esr00281
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- Ebrahim, A. (2023) Assessment of the Environmental Impact Assessment (EIA) of the Proposed Renovation and Development of the Hill View Resort (The EX Banyan-Tree Resort), Seychelles. Prepared and Submitted for Mr Karl Amman. 57 pages.
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- Witherington B.E. & Martin R.E. (1996) *Understanding, Assessing, and Resolving Light-Pollution Problems on Sea Turtle Nesting Beaches*. Florida Marine Research Institute Technical Report TR-2. 73p. <https://renatura.org/wp-content/uploads/2019/08/Witherington-B.-E.-and-R.-E.-Martin.-1996.-Understanding-assessing-and-resolving-light-pollution.pdf>