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OFFICIAL GAZETTE GOVERNMENT OF GOA

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GOVERNMENT OF GOA

Department of Environment & Climate Change

Notification

GCZMA/Mgt Plan/Turtle Nesting/19-20/01/825

Date : 27-Aug-2026

In compliance to para 8 V (3) CRZ of Goa (vii) of CRZ Notification 2011. Goa Coastal Zone Management Authority has approved the Turtle Nesting Management Plan in its 234th meeting held on 05/11/2020. The said plan is being notified in Public Interest.

This notification is issued with the approval of the State Government vide U.O No 4814/f dated 05/08/2026.

By order and in the name of the Governor of Goa.

Sachin S Desai, Director & Ex-Officio, Jt. Secretary (Environment & Climate Change).

Panaji.

1. Executive Summary

Goa has a coastline of about 120 km of which around 65km are sandy beaches. The coast is characterized by estuaries, low-lying paddy fields (Khazans), wetlands and seashores with sand dunes. This combination of varied types of eco-systems and assemblage of biodiversity makes Goa one of the best natural tourist destination of the world. At the same time, these features also make it naturally conducive for the nesting of sea turtles.

There are records of sporadic nesting of sea turtles along the coast of Goa, primarily of the Olive Ridley (*Lepidochelys olivacea*) and to a lesser extent of Leatherback (*Dermochelys coriacea*). The main nesting sites are Mandrem and Morjim in North Goa and Agonda and Galgibaga in South Goa.

These beaches have changed from relatively undisturbed areas to popular high tourist footfall areas since the year 2003, when several infrastructure and services like bridges, road, hotels, resorts, shacks etc. were established and continue to be developed. Thus the ecosystem services of these beaches support life,

livelihood and economy of multiple stakeholders including serving as critical habitat of the Olive Ridley sea turtles, especially for its nesting needs.

As per the last species threat assessment (red list) (as of year 2008) the IUCN, has classified the Olive Ridley turtles under “Vulnerable” category with a decreasing population trend. This means it is considered to be facing a high risk of extinction in the wild. All sea turtles are legally protected under Schedule I of the Indian Wildlife Protection Act, 1972 and Appendix I of the CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora), which prohibits trade in turtle products, which India is a Signatory to. The Coastal Regulation Zone (CRZ), 2019 Notification also offers protection to sea turtle nesting beaches by classifying such nesting areas as Ecologically Sensitive Areas (ESA) and categorizing them as CRZ 1. The Notification prohibits and regulates developmental activities in CRZ1 areas so as to conserve turtles and turtle nesting grounds.

Considering the above context, it is important to put in place a Sea Turtle Nesting and Habitat Management Plan or a system for the protection of the turtle nesting sites in the beaches of Mandrem and Morjim in North Goa and Agonda and Galgibaga in South Goa.

The proposed plan offers a scope for collaboration and joint actions with multiple stakeholders to address sustainability and conservation issues related to turtles and turtle nesting beach habitats.

Through the effective implementation of the management system and plan, it is envisaged to, secure the important seascape, landscape and riverine areas/routes for safety and conservation of sea turtles arriving at the nesting grounds or using the nearshore waters of the beaches for feeding/foraging/congregation.

Mitigate threats in the plan areas to the survival of turtles due to natural hazards, including climate change.

Address anthropogenic threats arising from socioeconomic and developmental aspects, including pollution.

Encourage investment and innovation in processes and systems that can secure and enhance the conservation of turtles and turtle nesting beach areas in Goa.

Establish a multi-stakeholder represented and empowered Turtle Nesting Beach Management Committee (TNBMC) specifically including the shack/resort owners and local fishing community, for each of the selected nesting sites/beaches that would be the key executing and managerial body for achieving the goals of the management system.

This plan is intended for the key Institutions management (Department of Forest, Govt. of Goa) that is mandated and authorized for conservation management measures for sea turtles in Goa and has the scope for establishing and implementing Sea Turtle Nesting and Habitat Management Plan in Goa. It also aims to support the Goa Coastal Zone Management Authority (GCZMA), Dept. of Environment and Climate Change, beachfront facility and service providers, property owners and stakeholders to identify positive actions that they may take to contribute to protecting and conserving turtles and nesting habitats.

Based on the existing sea turtle nesting conservation practices and analysis of the nesting records, it is observed that from 2002-2003 till around 2016-2017, the total number of nests on all four nesting sites per season has been generally below 10 (average value). This could be perhaps due to changing land use pattern post 2003. The survival rate of hatchlings has been erratic (ranging from 82% to 30%) which may indicate that there are still unaddressed aspects related to nest conservation and scope to improve egg recovery, rescue, rehabilitation and effective hatchery supported hatchling survival success rates. The nests have ranged from 31 to 3 during few years, which indicates that such high and low scenarios may occur. The reasons for the same need to be further explored and hence an offshore congregation study, identifying migratory routes by tagging the adult female individual who comes to nest may be pursued. Overall, it is suggested that hatchling survival rates level (70% and above) can be consistently achieved and management efforts must aim towards that.

The plan recommends general and beach-specific management measures to be implemented for protection and conservation of sea turtle nesting habitats in Goa, enabling sustainability practices and processes for development of beaches, and engaging various stakeholders to contribute to such conservation measures.

2. Introduction

There are seven known species of sea turtles that inhabit the world's oceans. They include the leatherback, green, olive ridley, Kemp's ridley, hawksbill, loggerhead and flatback turtle. Sea turtles have remarkable life cycles which makes them fascinating to both biologists and wildlife enthusiasts. They are found in all major ocean basins, and typically inhabit tropical and subtropical waters, although individuals are known to have been found in the colder waters of the Arctic.

Once they leave the beach as hatchlings, females will return to land only to nest; male sea turtles never return to land at all. Most sea turtles undertake long distance migrations, as hatchlings and juveniles, during a long pelagic phase in the open ocean, and as adults between their feeding and breeding grounds. Loggerheads migrate over 12,000 km across the Pacific from their developmental habitats in Baja California to their nesting grounds in Japan. Green turtles migrate from their feeding grounds in Brazil to nest on Ascension Island, a speck in the middle of the Atlantic Ocean.

On the east coast of India, olive ridley turtles that nest in Orissa are known to migrate to Sri Lanka and perhaps, beyond. Most species of sea turtles are listed as threatened. Worldwide, sea turtle populations face increasing threats that need to be addressed through appropriate research and conservation measures.

There are a number of international, regional and national laws and regulations that offer protection to sea turtles; however inadequate implementation and a growing conflict of interest with coastal development and expansion of the fishing industry have continued to take a toll on the species. Their global distribution and utilization of diverse habitats makes sea turtles ideal flagships of the ocean, nearshore and coastal ecosystems (Sea Turtles of India; Dakshin Foundation Bangalore 2011).

India has a vast coastline of more than 7,500 km, of which, about 5,400 km belong to Peninsular India and about 2,000 km to the Andaman, Nicobar, and Lakshadweep Islands, and with an EEZ (Exclusive Economic Zone) of 2.02 million sq. km. Five species of sea turtles are found in Indian waters. The marine biodiversity including marine turtles in India is one among the richest in the Indian Ocean.

Marine turtles have a major influence on the structure and function of marine biodiversity and play an important role in shaping the behavior and life history traits of prey species and predators that is critical for the sustainability of fisheries in the region. Factors like climate change, unsustainable resource use, marine litter and pollution affect marine turtles and their habitats.

Constitution of India recognizes the need to protect wildlife that include marine life and their environment. The provision under Article 48 A mandates the state to protect, safeguard and improve the environment with the corresponding duty under Article 51 A (g) to the citizen to protect and improve the natural environment. This clearly supports the need to carry out all necessary steps to not only protect but also improve the marine environment.

Marine turtles play a variety of ecological roles for maintaining healthy marine habitats like controlling prey populations, supporting coastal vegetation through their hatchlings etc. Their presence is an indicator of healthy marine ecosystems and provide a source of revenue for local communities through tourism. Marine turtles thus present themselves as a key indicator of healthy marine habitats and an opportunity for conservation of associated species.

The Indian coastal waters supports five species of sea turtles found worldwide. These are the Olive ridley (*Lepidochelys olivacea*), Green (*Chelonia mydas*), Hawksbill (*Eretmochelys imbricata*), Leatherback (*Dermochelys coriacea*) and Loggerhead (*Caretta caretta*). These five species of sea turtles that occur in Indian coastal waters are protected under Schedule I of the Wildlife (Protection) Act, 1972.

India is home to the largest known nesting population of olive ridley turtles. Except Loggerhead turtles, the remaining four species (Leatherback, Hawksbill, Green and Olive ridley turtles) nest along the Indian coastline and islands of India. About 40,000 to 11,00,000 turtles nest every year on the beaches of India. Number of turtles nesting varies between years and the success of sporadic nests have been observed to decline due to predation and habitat degradation.

Numerous direct and indirect pressures arising from various factors adversely impact marine turtle populations and their habitat. This also includes natural disasters such as tsunamis, cyclones, hurricanes and storms. (National Marine Turtle Action Plan 2021-2026)

Goal

1. Conserve Species, their habitat and reduce negative impacts on survival of marine turtles;
2. Improve the understanding of marine turtles and their habitats, through a coordinated mechanism;
3. Promote Awareness and Education on conservation of marine turtles and their habitats;
4. Enhance livelihoods of coastal communities through promoting sustainable ecotourism;
5. Increase national, regional and international cooperation on marine turtle conservation.

Vision

Create a viable and healthy marine ecosystem for marine turtles and associated species through a coordinated and participatory mechanism to ensure long term survival of marine turtles.

Mission

The Action Plan aims to conserve marine turtles and their habitats for maintaining a healthy marine ecosystem. (National Marine Turtle Action Plan 2021-2026)



Marine Turtles Along The Coast Of India

2.1 Sea turtles in India

Among the seven species of sea turtles found worldwide, five species are reported to occur in Indian coastal waters. These are the Olive ridley turtle, Green turtle, Hawksbill turtle, Leatherback turtle and Loggerhead sea turtle. Except for the Loggerhead, the remaining four species nest along the Indian coastline. Leatherback turtles are found to be nesting on Andaman and Nicobar islands. Main nesting sites are Galathea on the east coast and several beaches on the west coast of Great Nicobar, Little Nicobar and Little Andaman islands. Green turtle nests mainly in Gujarat state on the mainland and Lakshadweep and Andaman islands. Hawksbill

turtles nest in Lakshadweep, Andamans and a few beaches in Nicobar such as Indira Point in the Great Nicobar. Loggerhead turtle nesting has not been recorded from India. Olive ridley turtles nest throughout the Indian mainland, Andaman and Nicobar islands and to a lesser extent, in Lakshadweep islands (Anon, 2011). A significant proportion of world's 13 olive ridley population migrates every winter to the Indian coastal waters to nest on these beaches in Odisha and along other parts of Indian coast.

Conservation status of India sea turtles

Sr. No.	Common name	Scientific name	IUCN Status
1	Olive Ridley turtle	<i>Lepidochelys olivacea</i>	Vulnerable
2	Green turtle	<i>Chelonia mydas</i>	Endangered
3	Leatherback turtle	<i>Dermochelys coriacea</i>	Vulnerable
4	Hawksbill turtle	<i>Eretmochelys imbricate</i>	Critically Endangered
5	Loggerhead turtle	<i>Caretta caretta</i>	Vulnerable

2.2 Sea turtles and their habitat in Goa

Goa has the smallest coastal length of just 120 kms, among all the coastal states in India. However, this state records one of the earliest community based initiatives in sea turtle conservation, next to Kerala. The main nesting species here is the olive ridley. Sporadic nesting of olive ridley and leatherback turtles has been recorded all along the coast of Goa (Bhaskar, 1984, Das, 1985) but recent nesting records are only of olive ridleys (Giri and Chaturvedi, 2001). Of the 120 km coastline, about 8 km in Goa have been identified as major nesting sites and are being protected by the Goa Forest Department. These sites are Morjim and Mandrem in north Goa, and Galgibaga and Agonda in south Goa. Nesting takes place between October and March each year (Dongre and Shambhu 2008, Giri. V, 2001).

In fact the coastal population has taken a suo moto cognisance of the turtles' annually recurring nesting behavior and hatching success, and had initiated small scale conservation efforts in areas such as Morjim, Mandrem in North Goa and Galgibaga and Agonda in South Goa districts. The first was initiated in Morjim in 1995-96 by retired army officer Captain Gerald Fernandes, when he began an informal awareness and education campaign (Kutty 2006). This was to help the unemployed fisher folk whose fish catch was seriously declining. Interestingly, a number of religious leaders also extended their full support by mobilizing the support of their followers. Rev. Fr. Mariono of Galgibaga initiated education and awareness programme among the locals of Galgibaga and Agonda since the year 1998. He informed the local youth that whoever finds turtle nests and protects them will be rewarded. These initiatives created greater impact on the locals to start turtle conservation.

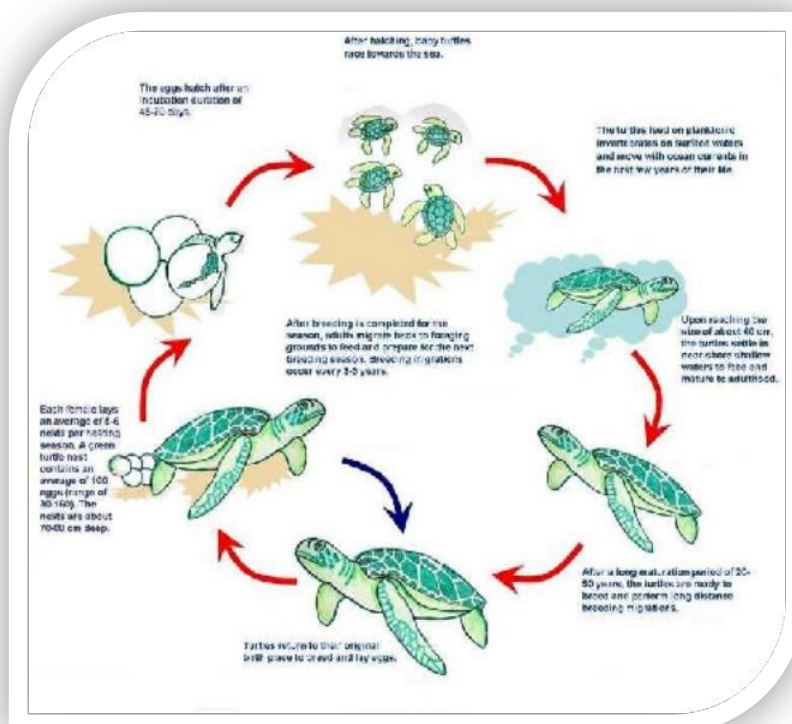
Realizing that community participation is important for the success of conservation efforts, the Goa Forest Department has involved local communities at these nesting sites, and has worked with them for the protection of sea turtles since 1997 (Dongre and Shambhu 2008). Locals are appointed as volunteers to protect turtle nests and tens of hundreds of hatchlings are released into the sea every year (Dongre and Shambhu 2008).

Beaches like Morjim in North Goa, Agonda and Galgibaga in South Goa are less disturbed and unpopulated (Giri et al 2003). Apart from these nesting sites, there are a few other nesting beaches in Goa where there were recent reports of sea turtle nesting. Giri and Chaturvedi (2002) as part of the turtle monitoring project of UNDP, categorized the beaches of Goa into three according to their suitability for turtle nesting, taking into consideration beach profile, disturbance and fresh nesting reports in the year 2001. Beaches like Querim (Keri), Morjim, Velsao, Betalbatim, Colva, Benaulim, Betul, Agonda, Talpona, Galgibaga are categorized

as high potential areas whereas Arambol, Mandrem, Ashwem, Siridao, Agassaim, Arossim, Utorda, Majorda, Varca, Cavelosim, Mobar, Palolem are medium potential areas and Calangute, Candolim, Sinquerim, Canaguim are low potential nesting areas.

3. Life history and biology of sea turtles

Sea turtles are known to travel hundreds to thousands of kilometers from their feeding to breeding grounds. There is a belief that sea turtles return to their natal beach (the beach where they were born) or group of beaches to lay eggs as adults. Genetic studies have confirmed that such return migrations do occur in several sea turtle populations. Strong natal homing was observed in the Green turtles in Australia, Suriname and Ascension Island (Carr, 1975, Limpus et al., 1992).



The life cycles of sea turtles (Source: <http://www.srilankaseaturtles.com/varieties.html>)

Males and females begin the reproductive cycle by migrating from their feeding grounds to breeding grounds. Feeding and breeding grounds may be separated by several thousand kilometers. Courtship and mating occur primarily in the offshore waters of the breeding ground; the male mounts the female, holding her with claws in his fore flipper and proceeds to mate. Both males and females may mate with several different individuals.

Several weeks after mating, only females come ashore to nest; males rarely return to land after crawling into the sea as hatchlings. Most females return to the natal beach at night. They crawl above the high water mark, find a suitable nesting site, clear away the surface sand (making a body pit), and dig out a flask-shaped nest with their hind flippers. The nest may be two to three feet deep depending on the size of the turtle.

The number of clutches and the number of eggs per clutch may vary in different species. The different species lay about 80-130 eggs in the nest and fill it with sand; they thump the nest with their body to compact the nest (Hirth, 1980). Once the turtle starts laying eggs, they go into a „nesting trance“ and are less easily disturbed during this stage. They then throw sand around the nest to camouflage it and return to the sea. Beach selection is affected by the accessibility of the beach as well as height and substrate. Different turtles prefer different types of beaches to nest. For example, olive ridleys and leatherback prefer wide beaches and

sand bars at river mouths, while Hawksbills and Green turtles prefer small island beaches. Most turtles nest more than once during a season, with roughly two weeks separating each nesting event. After they complete nesting, they return to their feeding grounds until the next breeding migration, which may be a year or several years later. Most turtles lay all their clutches within the same general area (0 to 10 km) during the nesting season. In some cases, such as with olive ridley turtles in Orissa, they may travel larger distances (a few 100 km) for re-nesting. Some leatherbacks have nested on beaches separated by more than 700 km.

Hatchlings develop in their nest over a period of 7 to 10 weeks. They hatch simultaneously over a period of a few days and then emerge from the nest together usually at night. Hatchling emergence is nocturnal to avoid predators and sunlight. Sea finding is visual; the hatchlings seek a „brighter horizon“ which is usually the moon or starlight reflecting off the surface of the sea. They also use silhouettes of sand dunes and trees to orient themselves away from land and towards the sea. As soon as they enter the sea, they orient themselves to wave direction and start to swim against it. According to the geomagnetic imprinting hypothesis, turtles imprint on the unique geomagnetic field of their natal beach at the time of hatching and use this to return to the same location to reproduce. Hatchlings and adults are sensitive to both magnetic field intensity, and magnetic inclination angle, and therefore have a compass sense that enables them to migrate to their natal beaches as adults. Less than one in a thousand hatchlings is believed to survive to adulthood.

The sex of a hatchling is determined by incubation (nest) temperature. Lower temperatures produce males; higher temperatures produce females. The pivotal temperature (i.e. the temperature that produces equal numbers of males and females) varies among species and populations but is usually around 28–32°C. The sex of the hatchling is determined during the second trimester of development. Sex ratios are likely to vary over the course of a nesting season and also between nesting beaches. Influences on nest temperature (e.g. rise in temperature from impacts of climate change) can result in skewed sex ratios – more males than females or vice versa.

Once in the sea, hatchlings spend the first few days of their lives in a „swimming frenzy“ when they use stored energy reserves to get into the open sea. Beyond this, they spend many years in a variety of juvenile habitats until they join other adults at feeding areas. Young turtles spend their lives in a variety of foraging habitats. The hatchling are usually carried on trans-oceanic gyres and currents. Sargassum drifts lines (seaweed rafts), and FADs (fish aggregating devices) have been found to be particularly important. For very long, this pelagic phase of their life was a complete mystery to biologists and was known as the “lost year.” The juveniles and sub-adults of some species spend many years in near-shore developmental habitats after the pelagic stage. They grow slowly and take between 15 and 50 years to reach reproductive maturity, depending on the species. There is no way to determine the age of a sea turtle from its physical appearance. Once they have reached sexual maturity, these turtles will migrate to their breeding grounds during the mating season to breed.

3.1 Ecosystem services provided by the sea turtles

According to a study carried out by Bjorndal & Jackson, 2003, removing sea turtles from the existing food web or reducing their numbers to drastic levels may result in a collapse of the entire marine ecosystems and commercial fisheries. Sea turtles serve as substrate and transport for a diverse array of epibionts. For example, loggerheads nesting in Georgia had 100 species of epibionts from 13 phyla (Frick et al., 1998), and loggerheads nesting at Xcacel, Mexico, carried 37 taxa of algae in total.

Sea turtles can transfer substantial quantities of nutrients and energy from nutrient-rich foraging grounds to nutrient-poor nesting beaches. In the study carried out by Bouchard & Bjorndal in the year 2000, less than one-third of the energy and nitrogen contained in eggs deposited by loggerheads in Melbourne Beach, FL, was recorded to have returned to the ocean in the form of hatchlings. Loggerheads have also been found to modify the physical structure of their habitat in some ways, including digging trenches through soft substrates in search of prey (Preen, 1996).

Several studies show the seagrass systems face a massive decline due to increasing in sulfide toxicity, self-shading, hypoxia, and infection by the slime mould (*Labyrinthula* spp.) when the grazers such as turtles controlling these factors are removed on a large scale from the system. Hence, restoring consumer populations such as sea turtle abundance to an abundance necessary to be ecologically functional is of utmost importance and is still possible because most of these species still exist, at much-reduced levels (Jackson et al., 2001).



4. Evolution of sea turtle conservation practices in Goa

The coastal population of Goa has taken a suomoto cognisance of the turtles' annually recurring nesting behaviour and hatching success, and had initiated small scale conservation efforts in areas such as Morjim, Mandrem in North Goa and Galgibaga and Agonda in South Goa districts. The first was initiated in Morjim in 1995-96 by retired army officer Captain Gerald Fernandes, when he began an informal awareness and education campaign (Kutty 2006). This was to help the unemployed fisher folk whose fish catch was seriously declining. Interestingly, a number of religious leaders also extended their full support by mobilizing the support of their followers. Rev. Fr. Mariono of Galgibaga initiated education and awareness programme among the locals of Galgibaga and Agonda since the year 1998. He informed the local youth that whoever finds turtle nests and protects them will be rewarded. These initiatives created greater impact on the locals to start turtle conservation.

The Goa Forest Department supported the community in sea turtle conservation. In order to take community participation ahead, the department appointed the local youths as volunteers. As on today, almost 15 local youths are employed to guard the nests during the nesting period which occurs from October to May every year (Dongre and Shambhu 2008). As on today, around 560 sea turtle nests have been protected along these four stretches of beaches and thousands of hatchlings have been released. Though, the conservation efforts started in the year 1996, but a scientific data record of turtle nesting has been maintained from the year 1999-2000.

The beaches of Mandrem, Morjim, Agonda and Galgibaga figured on the world map as a success of joint management of natural resources. Many domestic and foreign tourists visit these beaches exclusively to witness and understand conservation initiatives and to release hatchlings which are a spectacular phenomenon. The Turtles not only gave recognition to these places, but also have opened a huge tourism opportunities. Done scientifically, it can largely contribute to the local economy and uplift the living standards.

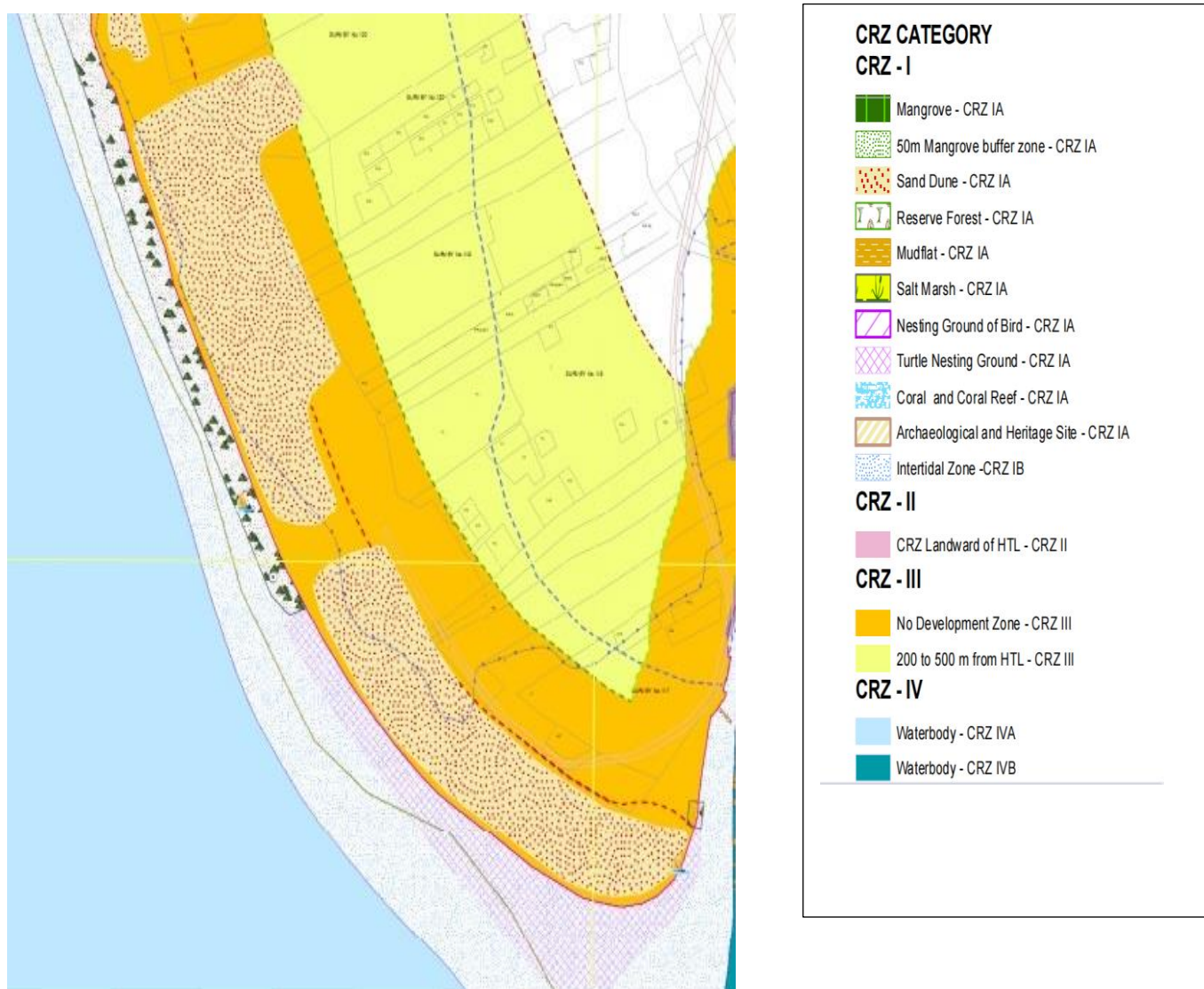
Apart from these nesting sites, there are a few other nesting beaches in Goa where there were recent reports of sea turtle nesting. Giri and Chaturvedi (2002) as part of the turtle monitoring project of UNDP, categorized the beaches of Goa into three according to their suitability for turtle nesting, taking into consideration beach profile, disturbance and fresh nesting reports in the year 2001.

5. Turtle Nesting Management practices in Morjim

Morjim is a serene and secluded fishing hamlet in Pernem taluka of North Goa. It is situated between the two world famous beaches, the Arambol and Anjuna-Vagator in North Goa. Prior to 2003, there was restricted access to the Morjim as there was only a ferry service to cross the river and then reach beach via Tembvaddo hamlet. By 2003, Morjim was well connected to major cities through newly constructed Siolm Bridge.

Once a small known fishing hamlet in Pernem taluka of North Goa, Morjim got its name on the World Map when the community in the year 1997 started protecting its beach for Olive Radley's to nest. The efforts were subsequently supported by the Goa Forest Department, various NGOs and conscious individuals. In the year 1997-98, five nests were protected and about 460 olive ridley hatchlings were released into the Sea. This modest beginning led to a long term conservation movement. Two of the turtle volunteers who joined this movement still serve with Goa Forest Department rendering untiring services to the cause of turtle conservation. The Goa Foundation, an environmental non-profit, initiated a „Save the Beach“ movement to protect fragile beach eco-systems. Morjim was one among such beaches.

The turtle nesting site as approved as per approved CZMP map 2011 is shown as (Map 1) below.



Map 1 As per approved CZMP 2011

5.1 Nesting and livelihood opportunities

Customarily, the locals with the permission from Goa Tourism Department set up temporary make-shift shacks to cater to the basic needs of tourists visiting the beaches. Prior to the year 2004, Morjim did not have any make-shift shacks as tourism was not a primary occupation for locals. From 2004 Morjim beach became niche tourists sites, and represent livelihood opportunities for several hundred people including local inhabitants. Tourism department considering demands from locals allowed shacks on Tembvaddo and VithaldasVaddo beach stretch. While excessive and unplanned tourism activities need to be controlled, locals can earn their livelihoods while protecting sea turtle nesting habitats. How can livelihood opportunities are safeguarded, while allowing these ancients to nest in peace, as they have done season after season is still a major management challenge before the State Government.

The Goa Forest Department in association with various agencies and individuals organizes yearly consultative meeting with the local residents and shack owners to discuss issues of conservation importance and to evolve an amicable solution to the problem so that both the conservation and economic activities sustain. There has been encouraging support from the shack owners to the conservation initiatives. The shack owners proactively are informing to the Goa Forest Department of nesting on the beach.

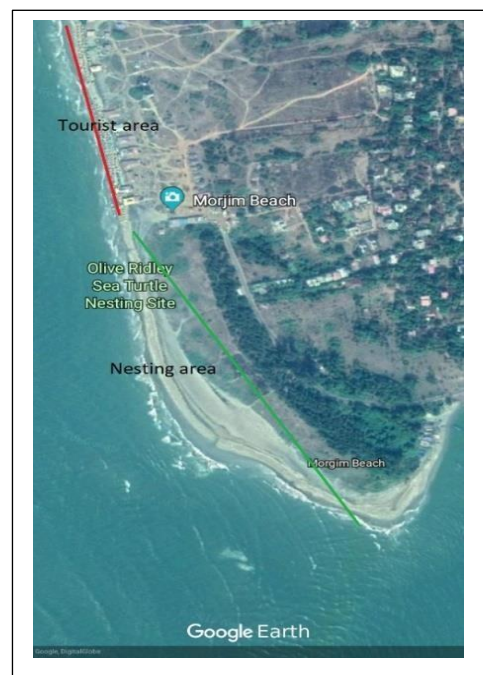
5.2 Current Management strategy in force

The Goa Forest Department, as the custodian of Sea Turtle Conservation, has through the Department of Tourism, prescribed certain restrictions to the shack owners and other establishments to follow during the nesting seasons. About 3.5 kms of Morjim beach stretch falls in two hamlets (Vaddo), Tembvaddo and Vithaldas vaddo.

As a management strategy, the beach has been divided into a No Take zone where only turtle conservation related activities are permitted in the area demarcated as turtle nesting site in the approved CZMP 2011 (Conservation Zone). Sustainable Tourism Zone is the area where beach shacks are allotted by the tourism department as per the beach carrying capacity report prepared by National center for Sustainable Coastal Management (NCSCM) where activities of tourism with strict guidelines are allowed. The remaining portion of the Morjim Beach is classified as Commercial Zone.

It has been historically known that turtles have preferred Tembvaddo beach stretch close to the Chapora river mouth for their nesting. Along this stretch, water characteristics have favored an ideal environment for turtle-nesting owing to broad and wide sandy-zone with coarse sand and high porosity. Thus, the said zone has become a safe-zone for turtle-nesting. In addition, a series of sand dunes and natural beach vegetation provide an undisturbed characteristic to the beach.

The Goa Forest Department has earmarked this stretch of about 600 meters as No Take Zone. To protect the entire beach stretch of Morjim which is about 3.5 kms, following restrictions have been imposed during the nesting season (October to May has been historically known that turtles have preferred Tembvaddo beach stretch close to the Chapora river mouth for their nesting. Along this stretch, water characteristics have favored an ideal environment for turtle-nesting owing to broad and wide sandy-zone with coarse sand and high porosity. Thus, the said zone has become a safe-zone for turtle-nesting. In addition, the presence of network of sand dunes/natural beach-vegetation has rendered undisturbed/virgin characteristic to a beach-profile. The Goa Forest department has earmarked this stretch of about 600 meters as conservation zone. To protect the entire beach stretch of Morjim which is about 3.5 kms, following restrictions have been imposed during the nesting season (October to May).



- a. No shacks or any establishments are permitted between inter tidal and or on to the dunes except as recommended in the Beach Carrying Capacity report of the NCSCM.
- b. No vehicular movement on the inter tidal or on dune areas.
- c. No destruction of sand dunes and associated vegetation.
- d. Light and playing loud music after the sun set in the conservation zone Morjim beach is prohibited.
- e. No poaching or tampering with the protected nest.
- f. The Goa Forest Department maintains a small office cum information centre on the Tembvaddo beach. Turtle Guards are present round the clock. The Guards patrol entire Morjim beach stretch during the night time, if found a turtle nesting away from the designated nesting area, they shift the nest to Tembvaddo and protect it till they hatch.
- g. In order to prevent light pollution coming from the hospitality and domestic establishments in Tembvaddo, the Forest Department has planted about 600 meters long shelter belt of casuarina along the road side starting from the mouth of the river to the beach entry point. As per the Turtle Guards observations, this has helped prevent light dispersing onto the Tembvaddo beach-stretch.
- h. To the North of the entry point of Morjim beach at Tembvaddo, entire stretch of Morjim beach has been earmarked as tourist activity area. Shacks and other facilities required for tourists are permitted. The number of shacks has now been fixed to 11 considering the Beach Shack Policy and the Beach Carrying Capacity Report. The Dy. Conservator of Forests (DCF), Wildlife prescribes certain prohibitory conditions including no light/music after sunset and that all the beach deck-beds be removed from the inter tidal zone to prevent obstruction in turtle movements.



5.3 Turtle Nesting Observation Records in Morjim

The Goa Forest Department has maintained the basic records of turtle nesting in Morjim since two decades.

Year	Total of nests	Total No. of eggs laid	Total No. of Hatchlings released	Unhatched Dead eggs/young ones	% Hatchling survived
1997-1998	5	628	456	172	72.61
1998-1999	8	783	262	520	33.46
1999-2000	14	12 68	759	509	59.86
2000-2001	31	35 68	2430	1138	68.11
2001-2002	19	23 50	1547	803	65.83

2002-2003	6	643	532	111	82.74
2003-2004	9	904	662	242	73.23
2004-2005	4	449	360	89	80.18
2005-2006	6	737	554	183	75.17
2006-2007	5	530	250	280	47.17
2007-2008	6	741	454	287	61.27
2008-2009	3	388	228	160	58.76
2009-2010	5	640	512	128	80.00
2010-2011	3	342	145	197	42.40
2011-2012	12	1216	826	390	67.93
2012-2013	3	347	226	121	65.13
2013-2014	3	318	95	223	29.87
2014-2015	6	951	331	620	34.81
2015-2016	6	641	255	386	39.78
2016-2017	11	1206	417	789	34.58
2017-2018	12	1482	935	513	63.09
2018-2019	16	1897	1175	476	61.94
2019-2020	9	1159	809	231	69.80
2020-2021	24	2062	1446	616	70.12
2021-2022	52	4739	3989	732	84.17
2022-2023	55	6250	2315	202	91.97

* Data provided by DCF wildlife Ecotourism North Goa Forest Department

The result and analysis reveals that :

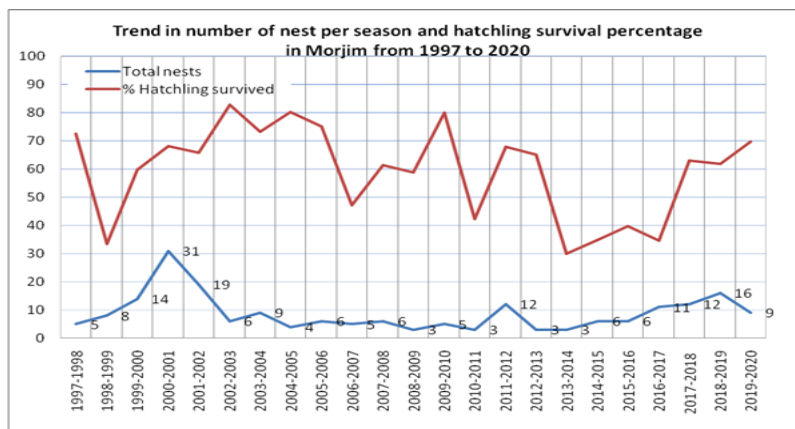
- Long term trends (year 1997 to 2023 = 23 years approx for Morjim beach)
- On an average around 9 nests are observed per season along the Morjim beach
- On an average around 115 eggs are laid per nest / clutch
- On an average around 618 hatchlings are released per season from Morjim beach
- On an average around 60% is the survival rate of eggs laid per season at Morjim beach.
- Total nests per season ranges from 31 to 3
- Total eggs laid per season ranges from 3568 to 318
- Eggs laid per nest (clutch size) ranges from 129 to 90
- Hatchling survival rates per season ranges from 82% to 30%

Survival % of hatchlings per season and presence of minimum number of nests during the season	
Survival %	Number of nests
> 50% survive	10
< 50% survive	6
>60% survive	10
>80% survive	5

While the average survival rate of hatchlings is around 60%, and average nests per season around 9; it is analysed that 80% and higher survival rates were achieved even when there were 5 nests in a season; 50% and above survival rates achieved usually whenever 10 nests were present. This may indicate that there is scope to achieve higher survival rates and also find out the reasons for such a high variation in survival rates.

Further there have been high risk situations when the nests have dropped to total 3 per season, eggs laid in a season only upto 318 and hatchling survival dropped to 30%. The reasons for the same need to be further investigated.

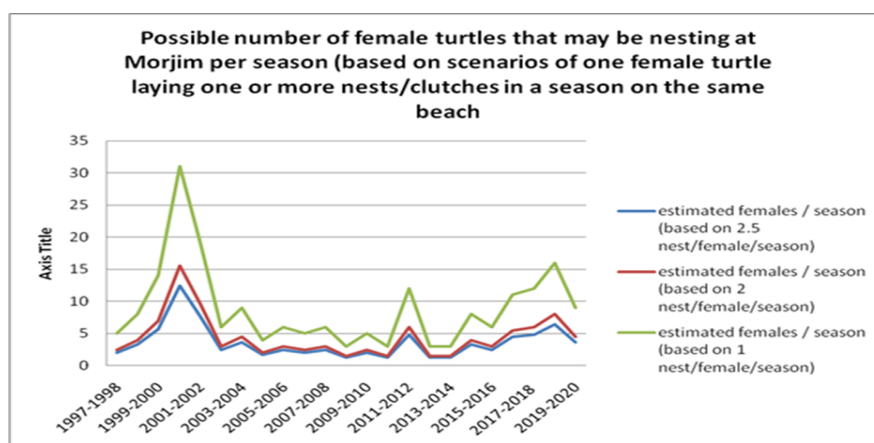
map showing silence zone for turtle nesting



The graph indicates that since 2002-2003 till around 2016-2017 the total number of nests per season has been generally below 10 (average value) and this could be perhaps due to changing land use pattern post 2003, particularly after construction of the Soilim bridge and increased accessibility of Morjim area as well as presence of shacks in inter tidal area. Compared to this the survival rate of hatchlings has been erratic (ranging from 82% to 30%) which may indicate that there are still unaddressed aspects related to nest conservation and scope to improve egg recovery, rescue, rehabilitation and effective hatchery supported hatchling survival success rates.

Considering that there may be at least 60% hatchling survival rates in natural settings of Olive Ridley sporadic nesting cases, this level may be currently being achieved at Morjim due to the existing turtle and nest conservation activities and hatchery facility at Morjim. However, this also means that assisted turtle nesting could try to achieve a higher hatchling survival rate than in natural conditions. There is therefore scope to look at the natural and anthropogenic and hatchery related factors that currently pose a challenge in achieving consistent survival rates above 70% at Morjim. This could be taken as a management target.

Silence zone should be notified with 20mtr buffer all around the hatchery site in procession of Forest department.



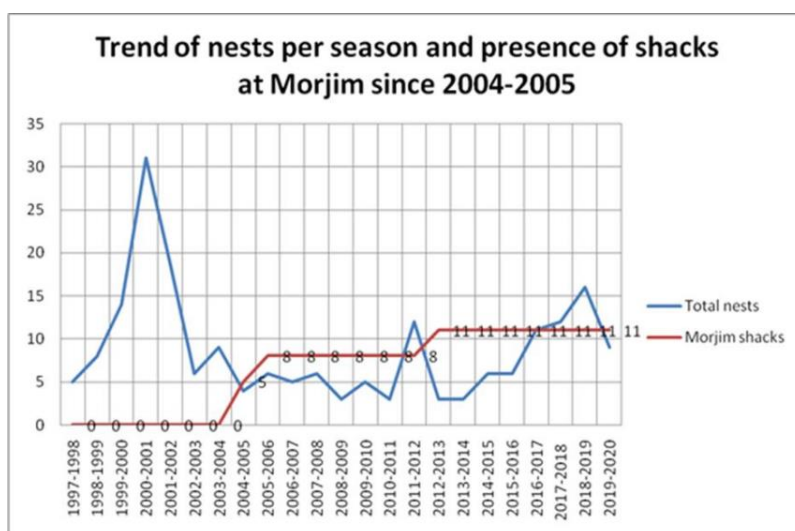
The graph indicates approximation of the number of female turtles that may be nesting at Morjim per season. The scenarios are for cases ranging from a single female turtle laying 2.5 nests, 2 nests and 1 nest per season at Morjim beach.

Thus, overall it appears that there may be consistently around 4 to 9 female turtles that may be depending on Morjim beach for nesting needs.

This scenario reveals a very high vulnerability since any disturbance, harm or hindrance to these relatively less number of female turtles arriving along Morjim beach and its nearshore waters can significantly reduce number of nests, increase incidences of false nesting and risk of egg damage.

There is therefore a scope to conduct a research study to understand the migration, congregation, foraging areas of this set of turtles dependent on Morjim and surrounding area. This will very much contribute to reducing seaward side risks and enabling appropriate nearshore/offshore management plans / activities so as to protect this small female turtle group/set arriving every season at Morjim beach.

5.4 Shack and turtle nests in Morjim



6. Turtle Nesting Management practices in Mandrem

A stretch of 2.5 kms of a beach has sporadic nesting. The Goa Forest Department which has volunteers based in Morjim patrols the beach during the nesting season. Till the year 2010, the nests were guarded where it was laid and protected till they are hatched. Of late, the Goa Forest Department has adapted a strategy of shifting of the nest to Morjim (Tembvaddo stretch) for a better and coordinated conservation effort. Yearly nesting also has been observed on a small stretch of beach which falls in a private property. The owners being himself a nature lover and conservation enthusiast, is guarding such nests by informing the Goa Forest Department. The Department volunteers keep track of such nests and ensure that the hatchling are released safe. As laid eggs at this beach is shifted to Morjim hatchery where area is demarcated by forest department for conservation and protection of eggs until hatchlings are released safely. Silence zone should be notified with 20mtr buffer all around the hatchery site in procession of Forest department.

The number of shacks has now been fixed to 10 considering the Beach Shack Policy and the Beach Carrying Capacity Report.

The turtle nesting site as approved as per approved CZMP map 2011 is shown as (Map 1) below.



As per approved CZMP 2011 Mandrem Village



As per approved CZMP 2011 Mandrem Village

6.1 Turtle Nesting Observation Records in Mandrem

The Goa Forest Department has maintained the basic records of turtle nesting in Mandrem/ Ashvem beach since 2011.

Year	Total of nests	Total No. of eggs laid	Total No. of Hatchlings released	Unhatched Dead eggs/young ones	Hatchling % survive	Eggs/Nest
2011-12	2	273	219	54	80.22	136.5
2012-13	4	484	169	194	34.92	121
2013-14	1	123	67	56	54.47	123
2017-18 (in Morim)	1	102	34	59	33.33	102
2018-19	2	212	147	65	69.34	106
2019-20	2	249	224	25	89.96	124.5
2021-2022	3	328	273	55	83.23	
2022-Mar 2023	13	1294	604	87	87.40	

Eggs from nests in Mandrem/Ashvem beaches since 2017-18 were transported to Morjim hatchery and hatchlings released at Morjim

Results:

Short term trends (year 2011 to 2020 = 5 years approx for Mandrem beach)

On an average around 2 nests are observed per season along the Mandrem beach

On an average around 118 eggs are laid per nest/clutch

On an average around 143 hatchlings are released per season from Mandrem beach

On an average around 60% is the survival rate of eggs laid per season at Mandrem beach

Total nests per season ranges from 4 to 1

Total eggs laid per season ranges from 484 to 102

Eggs laid per nest (clutch size) ranges from 136 to 102

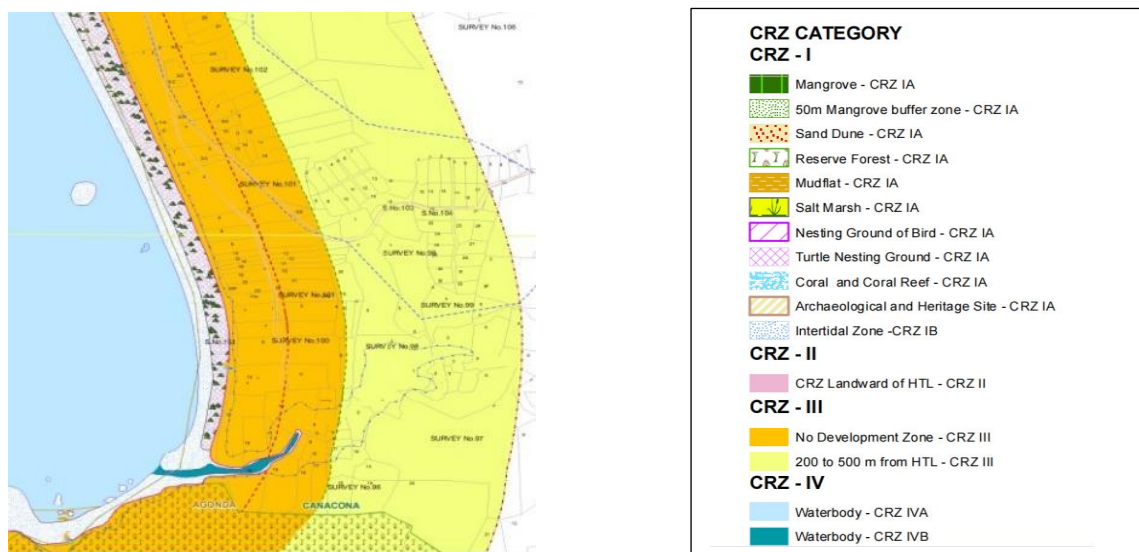
Hatchling survival rates per season ranges from 90% to 33%

7. Turtle Nesting Management practices in Agonda

This southern coastal beach-stretch having a length of approximately 2.8 kms and comprising typical sandy substrate and vegetation also attracts turtles and tourists alike. Despite the fluctuating number of shoring turtles, there are nestlings recorded annually. The Goa Forest Department continuously monitors the nesting on these beaches and their data revealed that sea turtles nest on this beach every year.

As being followed in Morjim and other turtle-nesting sites, the Department of Forest has appointed locals as „turtle-guards“ who have been trained to safeguard the turtle-nesting till they are hatched. The management strategy is similar to the initiates as followed in case of turtle-nesting site at Morjim. Beach shacks are not allotted by the Tourism Department in the Inter Tidal Zone in Agonda beach. Silent zone should be declared 20mtr all around the identified hatchery sites. Silence zone should be notified with 20mtr buffer all around the hatchery site in possession of Forest Department.

Department of Tourism does not allot any shacks on the beach, however temporary structures, shacks/cottages are permitted in the private areas. As per beach carrying capacity 0 number of shack has been considered for Agonda beach.



As per approved CZMP 2011 Agonda

7.1 Turtle Nesting Observation Records in Agonda

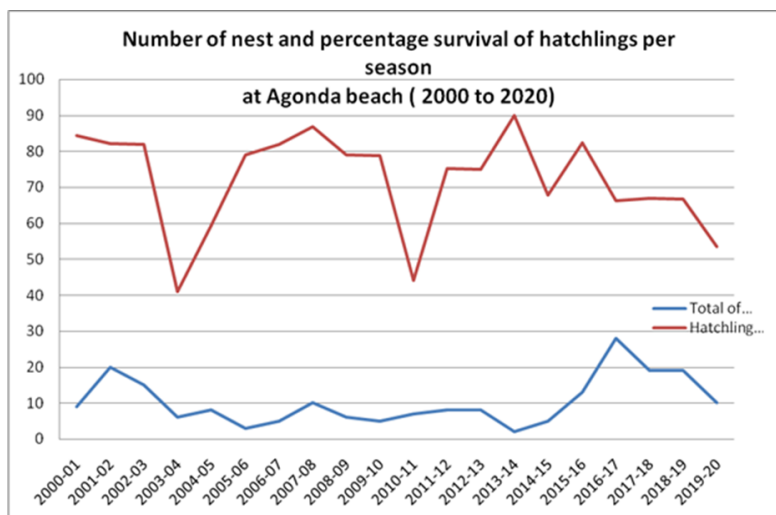
Year	Total of nests	Total No. of eggs laid	Total No. of Hatchlings released	Unhatched dead eggs/young ones	Remarks (Hatching %)
1999-2000	0	0	0	0	0
2000-01	9	846	715	131	84.52
2001-02	20	1886	1549	337	82.13
2002-03	15	1260	1033	227	81.98

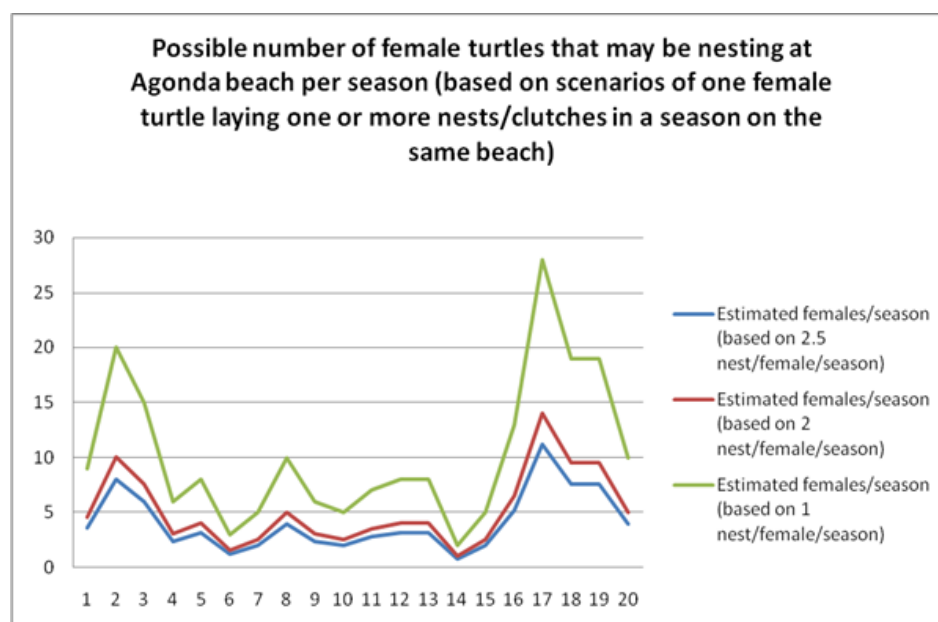
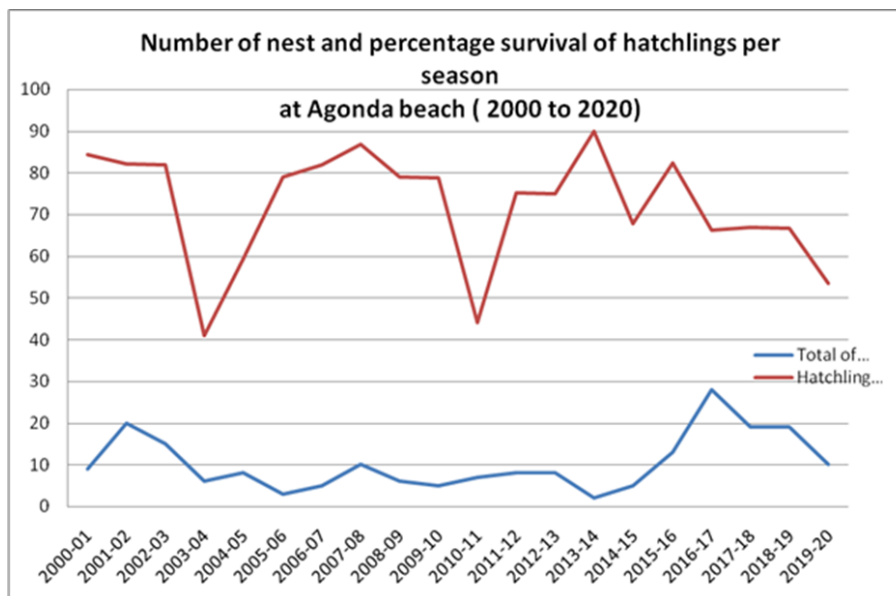
2003-04	6	519	213	306	41.04
2004-05	8	696	413	283	59.34
2005-06	3	324	256	68	79.01
2006-07	5	560	459	101	81.96
2007-08	10	1263	1099	164	87.02
2008-09	6	661	523	138	79.12
2009-10	5	579	457	122	78.93
2010-11	7	798	352	446	44.11
2011-12	8	858	645	213	75.17
2012-13	8	937	704	233	75.13
2013-14	2	191	172	19	90.05
2014-15	5	549	373	176	67.94
2015-16	13	1317	1085	232	82.38
2016-17	28	3074	2041	1035	66.33
2017-18	19	1993	1337	656	67.08
2018-19	19	2242	1495	208	66.68
2019-20	12	1341	707	634	52.72
2020-21	35	4002	3080	922	76.96
2021-22	28	3001	2735	266	91.13

* Data provided by DCF wildlife Ecotourism South Goa Forest Department

Long term trends (year 1999 to 2020 = 20 years approx for Agonda beach)

- On an average around 10 nests are observed per season along the Agonda beach
- On an average around 105 eggs are laid per nest / clutch
- On an average around 758 hatchlings are released per season from Agonda beach
- On an average around 72% is the survival rate of eggs laid per season at Agonda beach
- Total nests per season ranges from 28 to 2
- Total eggs laid per season ranges from 3074 to 191
- Eggs laid per nest (clutch size) ranges from 123 to 84
- Hatchling survival rates per season ranges from 90% to 41%





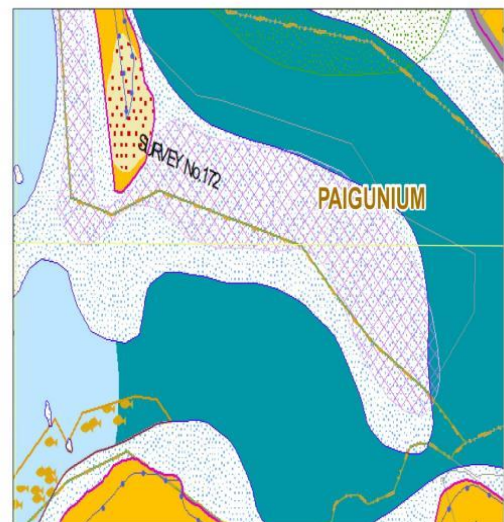
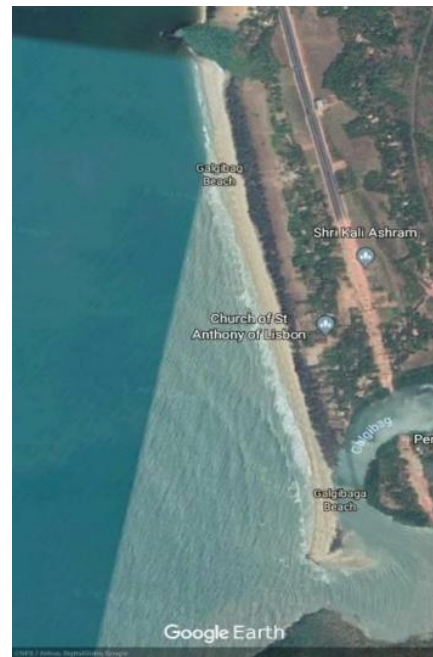
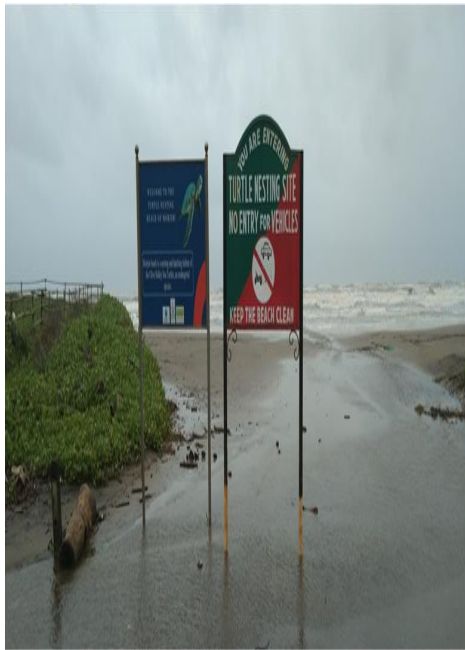
8. Turtle Nesting Management practices in Galgibaga

This is the southernmost location of turtle-nesting range. Along this stretch where River Galgibag enters the Arabian Sea, water characteristics have favoured an ideal environment for turtle-nesting owing to broad and wide sandy-zone with coarse sand and high porosity. Thus, the said zone has become a safe-zone for turtle-nesting. A series of sand dunes with natural beach-vegetation indicates an undisturbed beach profile. The turtle nesting have shown steady numbers. As being followed in Morjim and other turtle-nesting sites, the Department of Forest has appointed locals as “turtle-guards” who have been trained to safeguard the turtle-nesting till they are hatched. The management strategy is similar to the initiates as followed in case of turtle-nesting site at Morjim.

In order to declare this stretch as “Conservation Reserve”, the Goa Forest Department has acquired a land stretch along the nesting beach.

Department of Tourism does not allot any shacks on the beach, however temporary structures, shacks/cottages are permitted in the private areas.

Silence zone should be notified with 20mtr buffer all around the hatchery site in procession of Forest department.



8.1 Turtle Nesting Observation Records in Galgibag

Year	Total of nests		Total No. of eggs laid	Total no. of Hatchlings released	Unhatched Dead eggs / young ones	Remarks (Hatching %)
1999-2000	10		994	711	283	71.53
2000-01	33		3575	2571	1004	71.92
2001-02	19		1628	985	643	60.50
2002-03	19		1704	1513	191	88.79
2003-04	14		1405	922	483	65.62
2004-05	5		423	293	130	69.27
2005-06	5		538	365	173	67.84
2006-07	15		1551	1231	320	79.37
2007-08	04		439	387	52	88.15
2008-09	5		439	329	110	74.94
2009-10	10		900	347	553	38.56
2010-11	6		680	477	203	70.15
2011-12	7		454	236	218	51.98
2012-13	8		764	607	157	79.45
2013-14	3		333	215	118	64.56
2014-15	3		352	222	130	63.07
2015-16	6		614	496	118	80.78
2016-17	8		699	395	304	56.50
2017-18	7		705	321	304	45.53
2018-19	03		392	194	198	49.49
2019-20	06		596	299	45	50.16
2020-21	04		435	176	259	40.45
2021-22	11		1162	938	224	80.72

*Data provided by DCF wildlife Ecotourism South Goa Forest Department

Long term trends (year 1999 to 2020 = 20 years approx for Galgibaga beach

On an average around 9 nests are observed per season along the Galgibaga beach

On an average around 99 eggs are laid per nest/clutch

On an average around 624 hatchlings are released per season from Galgibaga beach

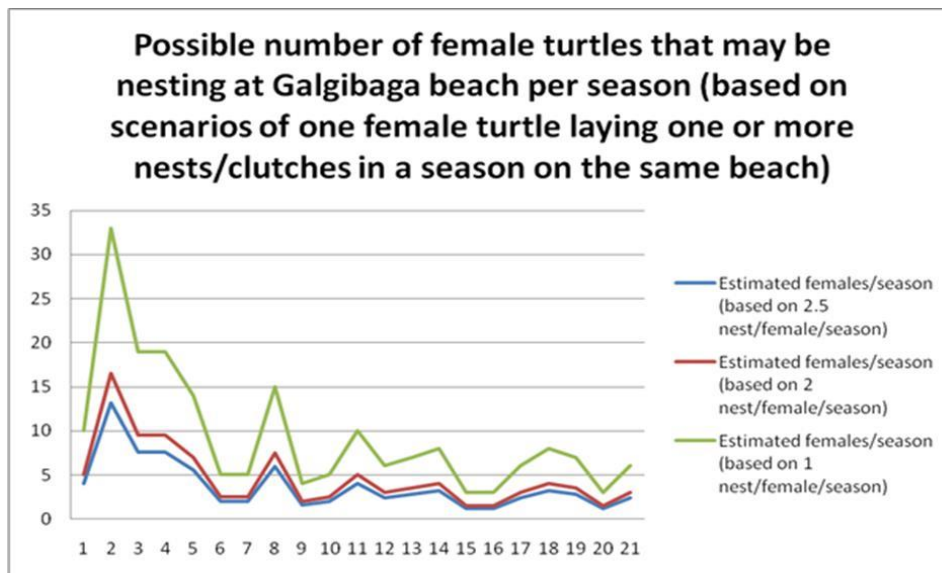
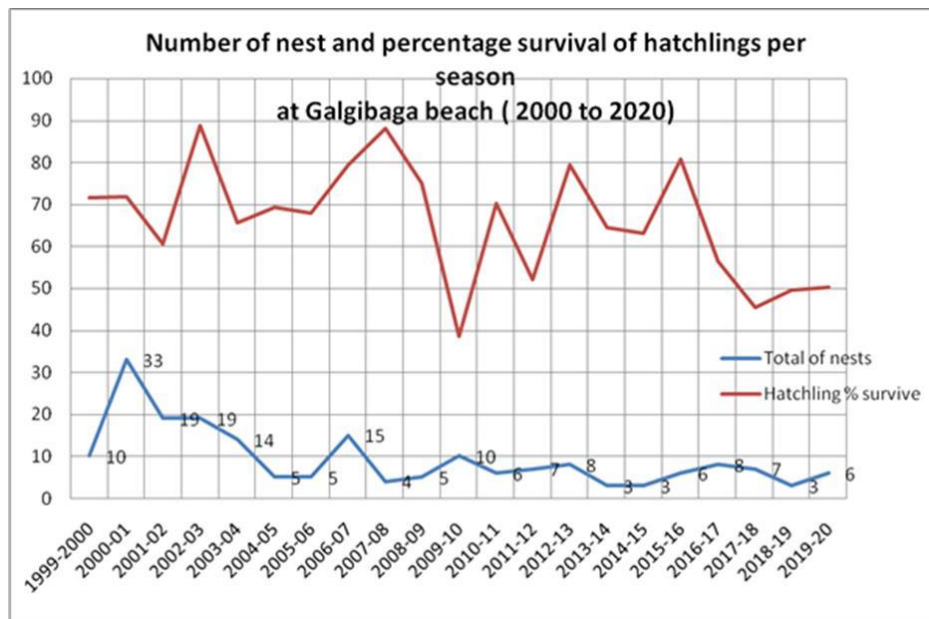
On an average around 66 % is the survival rate of eggs laid per season at Galgibaga beach

Total nests per season ranges from 33 to 3

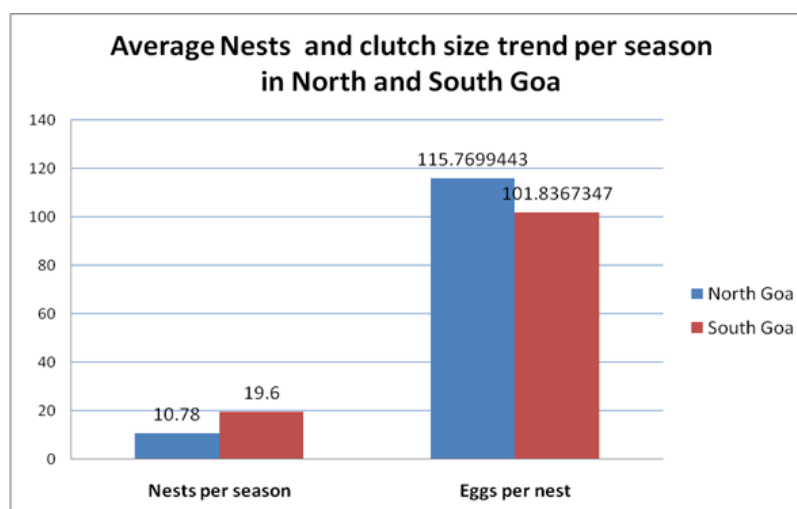
Total eggs laid per season ranges from 3575 to 333

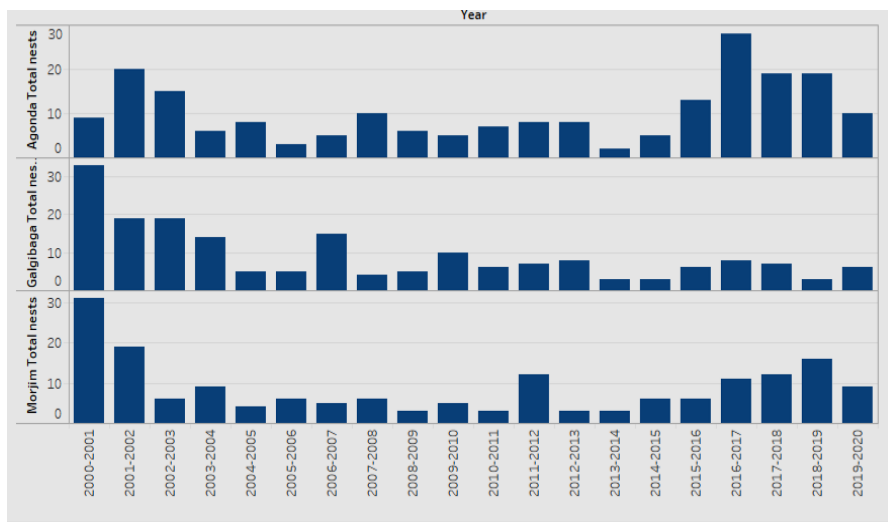
Eggs laid per nest (clutch size) ranges from 130 to 64

Hatchling survival rates per season ranges from 88% to 38%

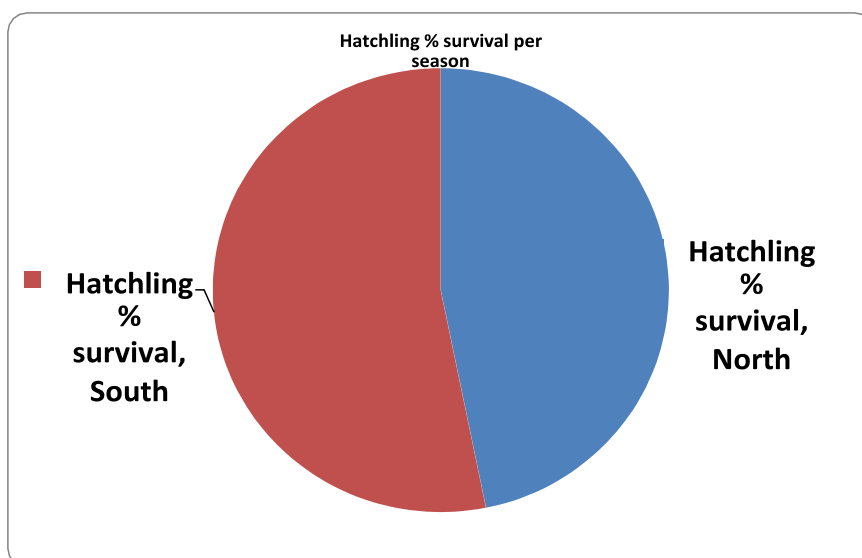
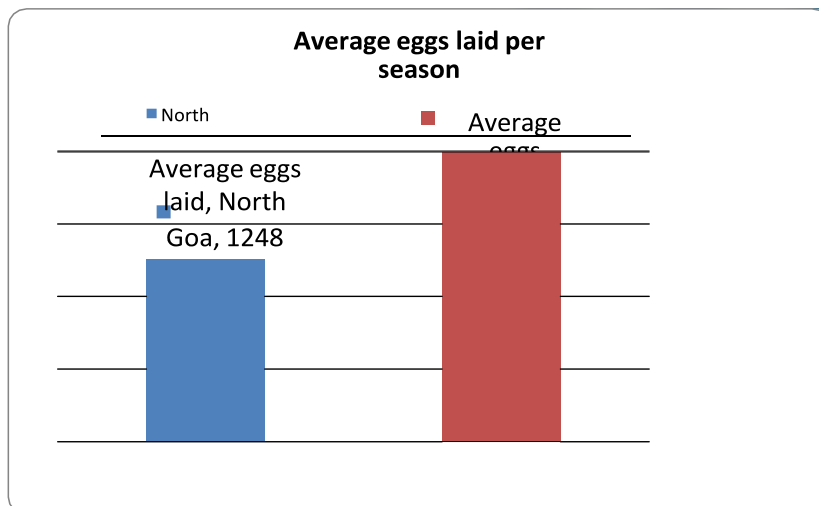


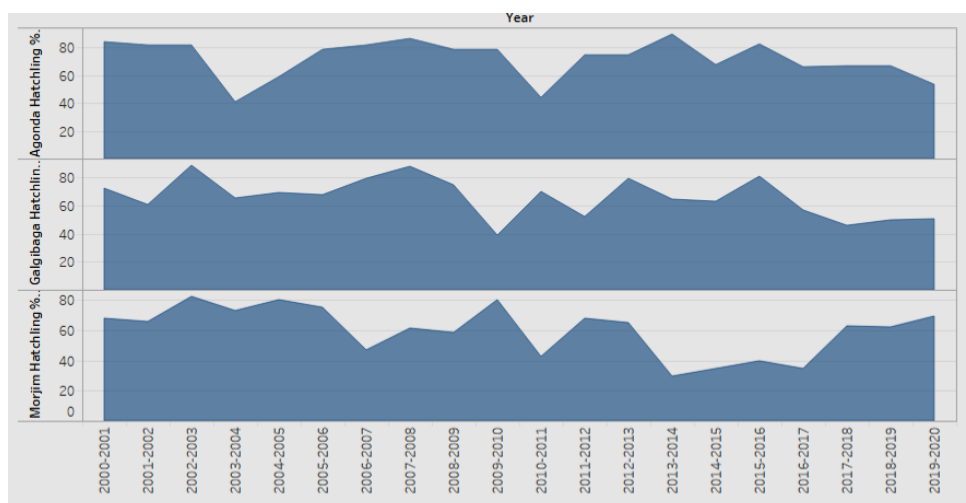
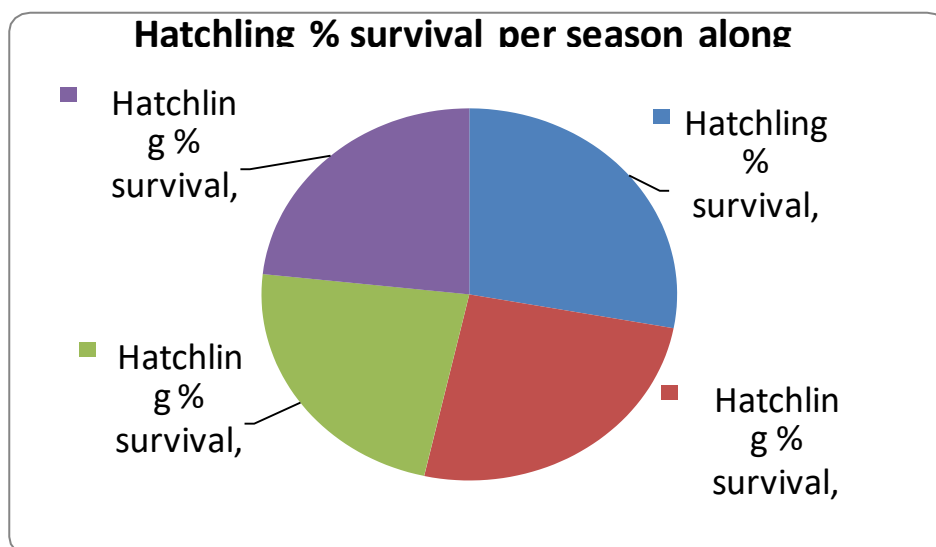
8.2 Overall trends in North Goa (Morjim, Mandrem) and South Goa (Agonda, Galgibaga)





Trend in nests per season across 2000 to 2020 in Morjim, Agonda and Galgibaga

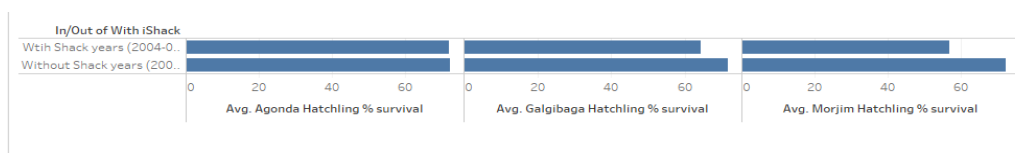




Trend in hatchling survival percentage per season from 2000 to 2020 in Mojim, Agonda and Galgibaga

Trend in Average Nests and Unhatched eggs/ Dead hatchlings during years with Shacks and without Shacks.

In/Out of With iShack	Avg. Agonda Total nests	Avg. Agonda Unhatched Dead eg..	Avg. Galgibaga Total nests	Avg. Galgibaga Unhatched Dead eggs / young ones	Avg. Morjim Total nests	Avg. Morjim Unhatched Dead eggs / young ones
With Shack years (2004-05 to 2020)	9.8	264.8	6.3	195.8	6.9	317.1
Without Shack years (2000-01 to 2003-04)	12.5	250.3	21.3	580.3	16.3	573.5





9. Operational Management Plan

Objective 1. Reduce direct and indirect causes of marine turtle mortality

Programme	Activity	Implementation Agencies	Sites/ States	Timeline
1.1 Identify and document the threats to marine turtle populations and their habitats	Collate and organise existing data on threats to marine turtle populations Establish baseline data collection and monitoring programmes to gather information on the nature and magnitude of threats Determine those populations affected by incidental capture in fisheries, and other sources of mortality	Fisheries Department, Forest Department, GCZMA, GSBB, Department of Tourism NIO, ICAR, WII, NCSCM, NGOs	For the State of GOA	To be initiated in 2021; to be repeated every 5 year thereafter
1.2 Determine and apply best practice approaches to minimizing those threats to marine turtle populations and their habitats	1.2 Determine and apply best practice approaches to minimizing those threats to marine turtle populations and their habitats	Fisheries Department, Forest Department, GCZMA, GSBB, Department of Tourism NIO, ICAR, WII, NCS CM, NGOs	For the State of GOA	To be initiated in 2021 and to be continued thereafter



Objective 2. Protect, conserve and rehabilitate marine turtle habitats

Programme	Activity	Implementation Agencies	Sites/ States	Timeline
2.1 Establish necessary measures to protect and conserve marine turtle habitats	Identify areas of critical habitat such as migratory corridors, nesting beaches, inter-nesting and feeding areas. Designate and manage protected/ conservation areas, sanctuaries or temporary exclusion zones in areas of critical habitat, or take other measures (e.g. modification of fishing gear, restrictions on vessel traffic) to remove threats to such areas c) Develop incentives for adequate protection of areas of critical habitat outside protected areas d) Undertake assessments of the environmental impact of marine and coastal development and other human activities that may affect marine turtle populations and their habitats e) Manage and regulate within each jurisdiction the use of beaches and coastal dunes, for example location and design of buildings, use of artificial lighting, and transit of vehicles in nesting areas f) Monitor and promote the protection of water quality from land-based and maritime pollution, including marine debris, that may adversely affect marine turtles g) Strengthen the application of existing bans on the use of poisonous chemicals and explosives in the exploitation of marine resources. h) Mainstream the turtles and their habitats conservation into the production sectors with active participations of industrial sectors including financial supports from their CSR Fund.	Fisheries Department, Forest Department, GCZMA, GSBB Department of Tourism	For the State of GOA	To be initiated in 2023 and to be continued thereafter

Programme	Activity	Implementation Agencies	Sites/ States	Timeline
2.2 Rehabilitate degraded marine turtle habitats	Re-vegetate, where appropriate, frontal dunes at nesting beaches, with indigenous flora as far as possible, in order to provide visual barriers to coastal development and to restore appropriate beach temperature regimes Remove casuarinas from the important nesting beaches c) No plantation on Sand Dune d) Remove debris that impedes turtle nesting and hatchling production e) Enhance recovery of degraded coral reefs f) Enhance recovery of degraded mangrove and seagrass habitats	Fisheries Department, Forest Department, GCZMA, GSBB	For the State of GOA	To be initiated in FY 2023 and to be continued thereafter



Objective 3. Improve understanding of marine turtle ecology and populations through research, monitoring and information exchange

Programme	Activity	Implementation Agencies	Sites/ States	Timeline
3.1 Conduct studies on marine turtles and their habitats targeted to their conservation and management	Conduct baseline studies or gather secondary information on marine turtle populations and their habitats Initiate and/or continue long- term monitoring of priority marine turtle populations in order to assess conservation status Characterise genetic identity of marine turtle populations d) Identify migratory routes through the use of tagging, genetic studies and/or satellite tracking e) Carry out studies on marine turtle population dynamics and survival rates f) Conduct research on the frequency and pathology of diseases of marine turtles g) Promote the use of traditional ecological knowledge in research studies h) Review periodically and evaluate research and monitoring activities	Fisheries Department, Forest Department, GCZMA, GSBB	For the State of GOA	To be initiated in 2021 and end by 2023
3.2 Conduct collaborative research and monitoring	Identify and include priority research and monitoring needs in National and sub-regional action plans Conduct collaborative studies and monitoring on genetic identity, conservation status, migrations, and other biological and ecological aspects of marine turtles	Fisheries Department, Forest Department, GCZMA, GSBB	For the State of GOA	To be initiated in 2023 and to be continued thereafter
3.3 Analyse data to support mitigation of threats and to assess and improve conservation practices	Prioritise populations for conservation actions Identify population trends Use research results to improve management, mitigate threats and assess the efficacy of conservation activities (e.g. hatchery management practices, habitat loss, etc.)	Fisheries Department, Forest Department, GCZMA, GSBB Department of Tourism NIO, ICAR, WII, NC SCM, NGOs	For the State of GOA	To be initiated in 2023 and to be continued thereafter

Programme	Activity	Implementation Agencies	Sites/ States	Timeline
3.4 Exchange information	Standardise methods and levels of data collection and adopt or develop an agreed set of protocols for inter alia monitoring of nesting beaches, feeding ground studies, genetic sampling, and collection of mortality data Determine the most appropriate methods for information dissemination c) Exchange at regular intervals scientific and technical information and expertise among nations, scientific institutions, non- governmental and international organisations, in order to develop and implement best practice approaches to conservation of marine turtles and their habitats d) Disseminate traditional knowledge on marine turtles and their habitats for conservation and management e) Compile on a regular basis data on marine turtle populations of regional interest	Fisheries Department, Forest Department, GCZMA, GSBB Department of Tourism NIO, ICAR, WII, NCSCM,NGOs	For the State of GOA	To be initiated in 2023 and to be continued thereafter

Objective 4. Increase public awareness of the threats to marine turtles and their habitats, and enhance public participation in conservation activities.

(National Marine Turtle Action Plan 2021-2026)

Programme	Activity	Implementation Agencies	Sites/States	Timeline
4.1 Establish public education, awareness and information programmes	Setting up of turtle clubs at taluk or district or state levels Declaration of National Marine Turtle Day may be coinciding with mass nesting season Collect, develop and disseminate education materials d) Establish community learning/ information centres e) Develop and implement accurate mass media information programmes f) Develop and implement guidelines for hatchery programmes for conservation and environmental education	Fisheries Department, Forest Department, GCZMA,GSBB Department of Tourism NIO,ICAR,WII,NC SCM,NGOs	For the State of GOA	To be initiated in 2023 and to be continued thereafter

	g) Develop and conduct focused education and awareness programmes for target groups (e.g. policy makers, teachers, schools, fishing communities, media) h) Encourage the incorporation of marine turtle biology and conservation issues into school curricula i) Organise special events related to marine turtle conservation and biology (e.g. Turtle Day, Year of the Turtle, symposia, Track-a-turtle)			
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Programme	Activity	Implementation Agencies	Sites/States	Timeline
4.2 Develop alternative livelihood opportunities for local communities to encourage their active participation in conservation efforts	Identify and facilitate alternative livelihoods (including income generating activities) that are not detrimental to marine turtles and their habitats, in consultation with local communities and other stakeholders. Undertaking turtle based tourism programme like Turtle Festival Bring in ecotourism (turtle tourism) and interpretation centres in an organized fashion.	Fisheries Department, Forest Department, GCZMA, GSBB Department of Tourism NIO, ICAR, WII, NC SCM, NGOs	For the State of GOA	To be initiated in 2023 and to be continued thereafter
4.3 Promote public participation	Involve stakeholders, and local communities in particular, in planning and implementation of conservation and management measures Encourage the participation of Government institutions, non-governmental organisations, the private sector and the general community (e.g. students, volunteers, fishing communities, local communities) in research and conservation efforts Implement, where appropriate, incentive schemes to encourage public participation (e.g. T-shirts for tag returns, public acknowledgement, certificates) National Marine Turtle Seminar needs to be conducted annually to review the entire issues related to conservation of marine turtles in India.	Fisheries Department, Forest Department, GCZMA, GSBB Department of Tourism	For the State of GOA	To be initiated in 2023 and to be continued thereafter

Objective 5. Enhance national, regional and international cooperation. (National Marine Turtle Action Plan 2021 - 2026)

Programme	Activity	Implementation Agencies	Sites/States	Timeline
5.1 Enhance mechanisms for cooperation and promote information exchange	Develop regional database of relevant information in relation to marine turtles conservation and management	Fisheries Department, Forest Department, GCZMA, GSBB	For the State of GOA	To be initiated in 2023 and to be continued thereafter
	Identify and strengthen existing mechanisms for cooperation at the sub-regional level			
	Develop/strengthen a website and/or newsletter to facilitate networking and exchange of information			
	d) Develop/strengthen a web- based information resource for marine turtle conservation (including data on populations, nesting, migration, on-going projects)			
	e) Create a directory of experts and organisations concerned with marine turtle conservation			
	f) Develop networks for cooperative management of shared populations, within or across sub- regions, and, where appropriate, formalise cooperative management arrangements			
	g) Cooperate where possible in the establishment of transboundary marine protected areas using ecological rather than political boundaries			
	h) Develop a streamlined format for reporting and exchanging information (through the IOSEA MoU) on the state of marine turtle conservation at the national level			
	i) Creation of network of NGO's in supporting forest departments marine turtles conservation. For example, coordination with Turtle Action Group (TAG) etc.			
	Encourage IOSEA MoU signatory States that have not already done so to become Parties to the Convention on Migratory Species (CMS)	Fisheries Department, Forest Department, GCZMA,GSBB	For the State of GOA	To be initiated in 2023 and to be continued thereafter
	Establish relationships with regional fisheries bodies with a view to obtaining data on incidental capture and encourage them to adopt marine turtle conservation measures within EEZs and on the high seas			

Programme	Activity	Implementation Agencies	Sites/ States	Timeline
5.2 Strengthen and improve enforcement of conservation legislation	Review domestic policies and laws to address gaps or impediments to marine turtle conservation Cooperate in law enforcement to ensure compatible application of laws across and between jurisdictions (including through bilateral/multilateral agreements and intelligence sharing) c) Include turtle breeding/foraging habitats as important marine habitat. d) Constitution and Periodic review on the National Marine Turtle Action Committee e) State Level Marine Turtle Action Committee under the chairmanship of the Chief Secretary. f) Development of compensation schemes for loss of fishing gear due to incidental capture of marine turtles. g) Promotion of TED and by-catch reduction policy and smart gear use. h) Establishment Marine Biodiversity Cell to implement various conservation action plans related to marine biodiversity including marine turtles i) Mapping and monitoring of important turtle nesting sites in context with CRZ	Fisheries Department, Forest Department, GCZMA, GSBB	For the State of GOA	To be initiated in 2023 and to be continued thereafter

*Goa Forest Department and Department of Environment & CC will make necessary provision in the budget to achieve the objectives set out set out in this management plan.

10. Hatchery Management

There should be ongoing threats to eggs in the natural environment for nests to be moved to a hatchery, as there are disadvantages to this practice. Hatching success in hatchery nests may be far lower than that of natural nests on the beach if poor hatchery management practices are employed, and sex ratios of hatchlings can be skewed if the nest temperatures within a hatchery differ from those on the natural beach. Operating a hatchery following best practice guidelines requires trained personnel and sufficient resources to protect and monitor nests throughout the nesting season (Mortimer, 1999; Shanker et al., 2003).

It is also recommend that hatchery managers periodically review the need for nests to be moved from their natural location, as changes in predator density and poaching activities may occur over time, removing the need for hatcheries to protect nests. Nests demonstrating a high hatching success and with a low risk of egg loss from depredation, poaching, tidal inundation, erosion, microbial invasion, etc should remain where they are laid.

A summary of best management practices for sea turtle hatcheries.

	Best Practice	Supporting Literature
Hatchery location	• Choose a location at least one vertical metre above the highest high tide line and distant from tidal creeks, streams, river mouths etc. to reduce risk of inundation or flooding and embryo mortality. • Minimise distance between nesting beach and hatchery to reduce transport time and potential for embryo mortality. • Provide a diversity of nest microhabitats (e.g. shade, slope) to reflect conditions on the nesting beach and avoid potentially skewing sex ratios of hatchlings. • Change location of hatchery every year to avoid accumulation of organic material and high microbial load. Change location of hatchery every year to avoid accumulation of organic material and high microbial load.	Mortimer et al. (1999), Shanker et al. (2003), Ahmad et al. (2004); Spanier (2010); Maulany et al. (2012)
Hatchery construction (incl shading)	• Enclose hatchery in fence constructed of chain link, wire mesh, barbed wire, cane, bamboo or slats as available. • Reinforce the base of the fence with 1-2m of 0.5cm-1.0cm mesh, buried to 50cm deep to prevent entry of burrowing predators. • Minimise the risk of lethal nest temperatures, especially late in incubation, by partially shading the hatchery with a material such as shade cloth or coconut thatch, or shading individual nests with thatch baskets. Permanently shaded hatcheries should monitor their nest temperatures to reflect those of in situ nests, to avoid skewing hatchling sex ratios from natural.	Mortimer et al. (1999), Shanker et al. (2003), Ahmad et al. (2004)
Egg collection	• Minimise movement and use of lights until turtle begins laying, to minimise disturbance and the risk the turtle will return to the sea without nesting. • Catch eggs as they are being laid by hand or into a clean plastic bag (be careful not to disturb the turtle by touch or movement during oviposition), or mark location of nest with a length of rope or coloured tape reaching from eggs to beach surface and remove eggs once turtle has finished nesting. Do not probe for nests with a stick or other Implement, to avoid destroying eggs.	Mortimer et al. (1999), Shanker et al. (2003), Ahmad et al. (2004)
	• Rebury eggs in hatchery within 2-3hr of oviposition to minimise embryo mortality. • Eggs to be transported short distances more than 2hr after oviposition should be removed from the nest without vertical or horizontal rotation and egg orientation indicated by marking the top of eggs with a soft pencil. Original orientation should be maintained during transport. • Transport of eggs for long distances and/or long travel times may require low-temperature or hypoxic environments to maintain embryo viability. • Transport eggs in rigid containers to minimise rolling and potential embryo mortality.	Mortimer et al. (1999), Shanker et al. (2003), Ahmad et al. (2004); van de Merwe et al. (2006); Rusli & Booth (2016)
Reburial of nests	• Rebury eggs in a location within the hatchery that mimics the natural nest environment. • Dig hatchery nest to the same depth as the natural nest. • Mimic the shape of natural sea turtle nests (usually flask shaped with a narrower neck than base). • Place eggs Individually into the nest; do not 'pour' eggs from a bucket or bag.	Mortimer et al. (1999), Shanker et al. (2003), Ahmad et al. (2004); Maulany et al. (2012)

	• Cover the eggs with moist sand removed during nest construction; do not expose eggs to dry sand as there is a risk of desiccation. • Incubate a single clutch in the same hatchery nest; do not split clutches between nests, or combine clutches from different nests.	
Nest density	• Maintain a density of 1 nest/m² to minimise the effects of adjacent nests on temperature and respiratory gas availability, and allow space for hatchery workers to move.	Mortimer et al. (1999), Shanker et al. (2003), Ahmad et al. (2004); Maulany et al. (2012)
Nest enclosures	• Protect nests from predators by constructing cylindrical nest enclosures of rigid material ~60cm in diameter. (Avoid rigid wire as it can injure hatchlings.) Bury 10cm into sand for burrowing predators and cover with mesh or net for aerial predators.	Mortimer et al. (1999), Shanker et al. (2003), Ahmad et al. (2004)
Hatching release	• Predict emergence date, often 45-55 days after oviposition. The characteristic 'caving in' of sand above the nest indicates emergence will usually begin within 2-3 days. • Check enclosures every 30-60mins from afternoon to dawn and at other times when hatchlings may emerge (e.g. on overcast days and after rain) around the predicted emergence date. • Release hatchlings as soon as possible to prevent exhaustion, desiccation, loss of vigour, possible injury, or death from predators. • Release hatchlings in groups if possible to improve survival probability; however, early emergers should not be held until more hatchlings emerge as this practice can result in loss of vigour. • Randomise clutch release sites hundreds of metres apart to avoid creating fish feeding stations off the beach, which increases the risk of predation. • Allow hatchlings to crawl from the dune across the beach and enter the ocean unassisted to facilitate imprinting. • Manage observers to ensure hatchlings are not injured or their progress to the sea impeded; parallel lines ~20m apart on the beach give a mark for people to stand behind while hatchlings crawl between lines. • Ensure artificial lights are shielded during hatchling emergence and release, and after they enter the ocean to minimise disorientation. • If hatchlings emerge in heat of day or immediate release is not possible, hold hatchlings in a soft, damp cloth or sack in cool, dark place. Do not hold hatchlings in water as they will enter their 'swim frenzy' period and deplete energy reserves needed for survival and dispersal.	Mortimer et al. (1999), Wyneken (2000); Pilcher & Enderby, 2001; Shanker et al. (2003), Ahmad et al. (2004); van de Merwe et al. (2013)
Hatchery records	• Number each nest in the hatchery and associate with a standard data record form. • Complete a data sheet or data book entry for each nest, including information such as date of oviposition, clutch size, date of emergence, number of hatchlings, and (if recorded) SCL, weight, and scalation pattern. • Collect data from emerged hatchlings restrained in enclosure e.g. emergence date, and hatchling straight carapace length (SCL), weight and scalation pattern if possible.	Mortimer et al. (1999), Shanker et al. (2003), Ahmad et al. (2004)
Monitoring and evaluation	• Calculate incubation period as number of days between oviposition and emergence.	Mortimer et al. (1999), Schäuble et al. (2002);

	• Excavate nest 2-3 days after the majority of hatchlings have emerged and calculate: a) Hatching Success= (Number of hatched eggs/Total number of eggs) x 100 b) Emergence Success= (Number of naturally emerged hatchlings/Total number of eggs) x 100 • Monitor nest temperature and hatchling sex ratio from a statistically valid proportion of nests in hatchery and compare with data from the natural beach/es for your population of sea turtles.	Shanker et al. (2003)
Education and awareness	• Create educational materials (e.g. posters) for visitors to the hatchery to raise awareness about sea turtle biology and conservation. • Encourage students and local wildlife enthusiasts to volunteer at the hatchery if possible.	Shanker et al. (2003)
Personne	• Train employees and volunteers in sea turtle biology, conservation, and hatchery management techniques. • Provide access to general articles and manuals about sea turtle biology and hatchery practices. • Run or co-manage the hatchery with the local community when possible. • Collaborate with other community programmes in same area or elsewhere on the coast when possible.	Shanker et al. (2003)

The plan offers a scope for collaboration and joint actions with multiple stakeholders to address sustainability and conservation issues related to turtles and turtle nesting beach habitats. Through the effective implementation of the management system and plan, it is envisaged to:

- Secure the important seascape, landscape and riverine areas/ routes for safety and conservation of sea turtles arriving at the nesting grounds or using the nearshore waters of the beaches for feeding/ foraging/ congregation Mitigate threats in the plan areas to the survival of turtles due to natural hazards, including climate change.
- Address anthropogenic threats arising from socio-economic and developmental aspects, including pollution.
- Encourage investment and innovation in processes and systems that can secure and enhance the conservation of turtles and turtle nesting beach areas in Goa.
- Establish a multi-stakeholder represented and empowered Turtle Nesting Beach Management Committee (TNBMC) specifically including the shack/resort owners and local fishing community, for each of the selected nesting sites/beaches that would be the key executing and managerial body for achieving the goals of the management system.

This plan is intended for the key Institutions management (Department of Forest, Govt. of Goa) that is mandated and authorized for conservation management measures for sea turtles in Goa and has the scope for establishing and implementing Sea Turtle Nesting and Habitat Management Plan in Goa. It also aims to support the Goa Coastal Zone Management Authority (GCZMA), Dept. of Environment and Climate Change, beachfront facility and service providers, property owners and stakeholders to identify positive actions that they may take to contribute to protecting and conserving turtles and nesting habitats.

Based on the existing sea turtle nesting conservation practices and analysis of the nesting records, it is observed that from 2002-2003 till around 2016-2017, the total number of nests on all four nesting sites per season has been generally below 10 (average value). This could be perhaps due to changing land use pattern post 2003. The survival rate of hatchlings has been erratic (ranging from 82% to 30%) which may indicate that there are still unaddressed aspects related to nest conservation and scope to improve egg recovery, rescue, rehabilitation and effective hatchery supported hatchling survival success rates. The nests have ranged from 31 to 3 during few years, which indicates that such high and low scenarios may occur. The reasons for the

same need to be further explored and hence an offshore congregation study, identifying migratory routes by tagging the adult female individual whocomes to nest may be pursued. Overall, it is suggested that hatchling survival rates level (70% and above) can be consistently achieved and management efforts must aim towards that.

The plan recommends general and beach-specific management measures to be implemented for protection and conservation of sea turtle nesting habitats in Goa, enabling sustainability practices and processes for development of beaches, and engaging various stakeholders to contribute to such conservation measures.

11.Purpose of the Sea Turtle Nesting and Habitat Management Plan

The primary purpose of Sea Turtle Nesting and Habitat plan is to guide the formulation and establishment of the protection and management measures/procedures (environmental, social and economic) to be implemented by the Department of Forest, Government of Goa with support from the proposed Turtle Nesting Beach Management Committee, the personnel and stakeholders involved in the conservation of turtles and their nesting habitat.

While the protection/conservation measures are meant throughout the year; the specific critical time is during the nesting season (generally November to April).

The purpose of plan is to:

- Provide guidance for the formulation of a management framework and system to be followed in the seascape, landscape (beach) and riverine areas for the protection and conservation of turtles and their nesting habitats;
- Identify measures to be followed for operations of the various facilities, activities, products, services, infrastructure in and around the beach nesting area
- Provide opportunities and guidance to stakeholders using the beach space and beach ecosystem services including the coastal waters to take positive action for the conservation of sea turtles and their nesting habitats.
- Ensure that commitments to minimise negative environmental impact in and around turtle nesting areas are met;
- Monitor and document environmental concerns and impact of appropriate protection measures
- Serve as a reference document for the key management and turtle nesting management committee when planning and/or conducting specific activities;
- Strengthen the implementation of existing applicable legislative requirements for turtle conservation and its nesting areas.

11.1 Scope of the management plan.

The focus of the plan is the protection of turtle nesting beach habitat. However, to ensure effective conservation and management of the nesting areas, it is important to build the management scope to cover the seascape, landscape and any adjoining river, rivulets, creeks etc. The scope shall also be to influence and engage multiple stakeholders who use or depend on the beach space and beach ecosystem services for their socioeconomic needs and are in a position to positively contribute for conservation of turtles and their nesting habitats.

The management scope will be further be in line with the proposed Turtle Nesting Management Policy for the nesting site and beach. The following criteria may be used to explore the scope:

Impact of the activities/operations that influence the environmental quality or performance of environmental management on the beach.

Current and long term impact on the physical and biological environment and habitat of the turtle

nesting areas/site (which are also legally considered as Ecological Sensitive Areas under CRZ Notification 2011 - ESAs).

Compliance status with statutory requirements and other environmental, sustainability and conservation commitments.

Interested stakeholders and users of the beach and how do they affect the beach environment or can be affected by the beach environment or beach operations.

11.2 Key management responsible System

The Department of Forest, Govt. of Goa is the apex Management Authority or the key management formally mandated and authorized to manage the turtle nesting beach / site. As part of its commitment and leadership to achieve and maintain a high degree of quality and mitigate / manage the potential negative risks to the environment, health and safety at the beach and also to strengthen opportunities and processes for sustainability and eco-friendliness, it proposes a Turtle Nesting for Morjim beach.

The Department of Forest provides leadership and formulates the overall Turtle Nesting Management Policy of the beach, sets the environmental and sustainability objectives, provides guidance on formulating operational plans and controls towards achieving the management objectives, enables assistance to mobilize resources and overall monitor, measure, evaluate the performance of the turtle nesting and accordingly take any preventive and corrective actions.

11.3 Sea Turtle Nesting Habitat Management Policy

The key management authority recognizes that the socio-economic activities, commercial facilities, operations, services, products used in and around the turtle nesting beach habitat can impact the beach morphology, biodiversity, quality of air, water, soil and other ecosystem and environmental of the beach. Hence, the main interest is therefore to conserve the environment and strengthen sustainability process thereby minimize, reduce or mitigate environmental impacts of beach operations and secure the safety of the turtles, nests and nesting habitat. Following are few suggestions that the Apex Nodal Authority (the Goa Forest Department may follow or impose on violators)

- Comply with all applicable compliance obligations, legal rules and regulations related to conservation of turtles and turtle nesting sites; including applicable environmental regulations/guidelines issued by the central, state and local administration.
- The endeavor would be to adopt best practices and standards/guidelines that help us make efforts towards high survival rates of turtle nests and hatchlings. Conserve the natural resources, environment friendliness and sustainability aspects of the turtle nesting beach areas.
- To enable and support the beach space stakeholders like the shack operators, resort owners, transport providers, etc. to comply with applicable Environment, Health and Safety laws, regulations including those applicable for sustainable or responsible tourism.
- To motivate, capacity build beach stakeholders like the shack operators, resort owners etc. to be vigilant and aware of any risks to the environment which may occur in and around the turtle nesting areas as a result of their activities.
- To adopt a participatory and scientific approach towards turtle nesting beach management by involving relevant stakeholder representatives to identify, decide and implement appropriate management measures for effective conservation of turtles, nesting sites and overall beach habitat.
- Towards the above, establish a Turtle Nesting Beach Management Committee (TNBMC) with multi-stakeholder representation from local community, shack operators, hospitality owners, experts, government departments, civil society etc.
- Formulate appropriate codes of conduct for beach users in order to prevent littering, use of single

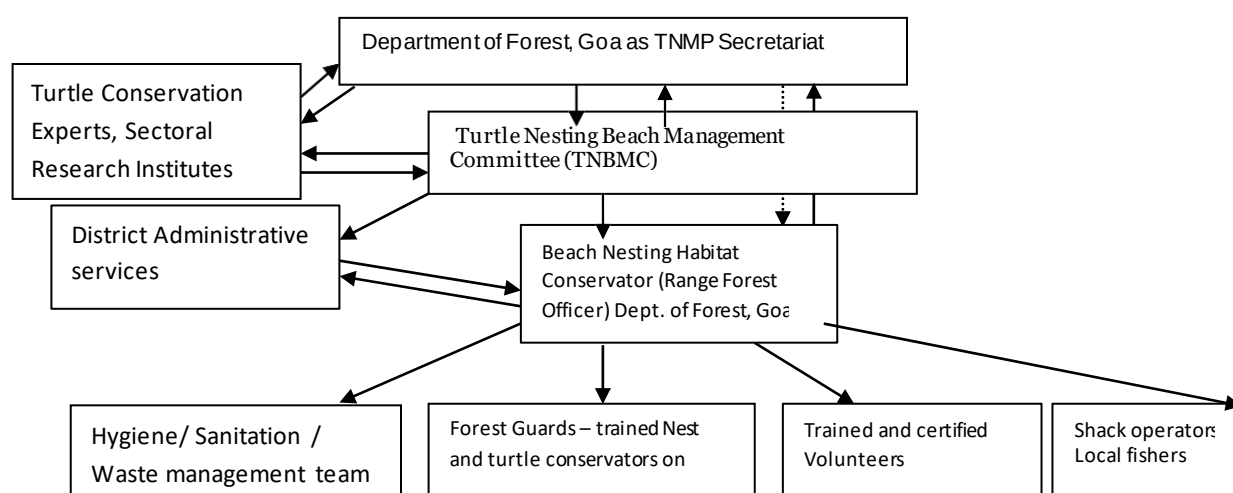
use plastics, dumping, and any other activities that may create an environmental hazard and negatively affect the turtle nesting conservation and management performance.

- Create a rescue and rehabilitation centre for turtles at the beach.
- Identify setbacks, maintain buffer zones, appropriate local vegetation on the beaches and also formulate and maintain applicable buffer areas/ setbacks for the facilities, infrastructure set up on the beaches.
- Implement measures to minimize waste, including applying monitoring procedures to ensure that the nesting beach and nearshore waters remain free of debris and pollution.
- Conduct regular lighting assessments to identify sources of light pollution, and strive to eliminate artificial light visible from the beach during nesting season.
- Implement a system that removes potential obstacles to sea turtle nesting to ensure safe, secure and unhindered nesting process.
- Reduce incidences of false nesting due to obstacles on the beach.
- Discourage vehicles on the nesting beach and require hand-raking of debris.
- Avoid pets, horse riding, stray animal movement on the beach.
- Avoid sea-based sport activities (recreation and adventure) in the beach area and around its nearshore waters, especially during the nesting season.
- Support sea turtle research.
- Report all incidents of sea turtle harassment or harm.
- Work with the local administration to issue suitable orders/notifications to achieve such management objectives.
- Encourage beach users, shack operators, resort owners, facility and service providers in and around the turtle nesting beach area to adopt as much possible environment friendly products, building materials, clean energy, recyclable products and wherever possible using locally available environment friendly products and services.
- In association with the relevant authorities review the tourist activities, including those stakeholders/parties associated with the development of Morjim beach and formulate, communicate and implement appropriate environment, health, safety, sustainability guidelines and management strategies through the Turtle Nesting Beach Management Committee [TNBMC].
- Work towards developing a corporate sustainability/CSR programme for the turtle nesting beach.
- Take measures to promote community involvement and social responsibility and work with local residents/stakeholders on a long-term relationship with them, consider their interest and engagement opportunities that may stimulate the local economy through Turtle conservation based tourism branding, operations, services or products.
- No public events or mass gathering events/functions shall be permitted on the beach.
- Work with other local organizations, environmental organizations, etc. for strengthening the environmental, social or sustainable development measures and encouraging good will and citizen support for turtle conservation.
- For the public and private beach related works/activities, we shall try to the extent possible to identify contractors/outsourcing parties and work allocations to such parties who have set benchmarks in environment, safety, sustainability and prefer them having requisite certifications to this effect. We shall strive towards developing a sustainable procurement policy.

- Make all our personnel associated with Morjim turtle nesting beach area aware of the potential environmental impacts related to the beach activities and requirements of this environmental policy.
- Encourage the team members involved in turtle nesting conservation and beach management to provide their feedback/input on environmental, sustainability and social responsibility aspects.
- The management and beach operating staff and other associate shall be committed to preserving and protecting the quality of beach area's environment. All our human resources and external contractors whose work related to turtle nesting and beach conservation shall be expected to support the turtle nesting management goals.
- Monitor, measure, evaluate our environmental management performance and compliance to our Turtle Nesting Beach Management Policy including taking preventive and corrective actions. We shall strive for continual improvement of our policy, environmental and sustainability plans, implementation effectiveness and overall performance.
- Document and make available our Turtle Nesting Beach Management Policy and management performance in our reports. Wherever appropriate/applicable and upon request this shall also be accessible to interested stakeholders/parties/citizens.

11.4 Roles and responsibilities for implementing Management Plan

To enable effective turtle conservation and nesting management system, it is important to create opportunities for participatory approaches and ownership across multiple stakeholders. Keeping this approach and principle, the TNMP proposes to establish The Turtle Nesting Beach Management Committee (TNBMC) comprising of representation of key local level stakeholder groups and local administrative functionaries who are in position to positively contribute for the sustainable conservation of the turtle nesting beach habitat and protection of the turtles. This mechanism would further strengthen the existing turtle conservation management measures, particularly for increased community level ownership, citizen involvement, participatory and scientific consultative decision making processes for sea turtle and nesting habitat conservation in the applicable sites in Goa.



The Key Management authority for all four notified sea turtle nesting beaches of Goa is the Goa Forest Department. It is the mandated and legal entity under the Wildlife Protection Act, 1972 to manage and conserve sea turtles in India. Through the Goa Forest Department, the TNMP proposes to establish a participatory management framework and approach to enhance the effectiveness of turtle conservation and turtle nesting habitat. In order to implement and maintain the TNMP and systems, the following structure, roles and responsibilities are proposed

11.5 The Turtle Nesting Beach Management Committee (TNBMC):

To enable local level multi-stakeholder involvement, coordination, accountability, transparency, monitoring and evaluation support for the TNMP. It will support in providing advisory and management decisions inputs for effective turtle nesting management. The committee in consultation with the Goa Forest Department shall primarily formulate the environmental policy and objectives, targets to be achieved and making available adequate resources to implement the TNMP. They shall also periodically monitor, measure and evaluate the TNMP performance and compliance. Directions for preventive and corrective actions and making improvements in the TNMP shall also be undertaken by TNBMC. They may delegate authorization to personnel as per roles and responsibilities. If required, TNBMC may delegate separate specialists/supervisors/personnel(s) to assist Beach Conservator (Range Officer responsible for daily operational management and compliance with TNMP at beach). The TNBMC shall also closely coordinate with the Goa Forest Department and advisory/consultancy services from experts/research institutes for technical support.

11.6 The Beach Nesting Habitat Conservator (Range Officer): shall be a personnel/trained person authorized by the Goa Forest Department and responsible for ensuring efficient utilization of resources to implement the management plan effectively on ground. She/he shall maintain and control processes and systems for proper performance, regular monitoring and informing appropriate authorities and team members about issues, challenges and solution while implementing TNMP. The beach conservator shall be closely supported on ground by trained guards of Forest Department and certified trained volunteers for scientific and careful handling of turtles, turtle nests, eggs, hatchlings etc. as per scientific and legal protocols. They will also be supported by designated personnel/representative from the local fishing community and shack owners/resort owners for effective management of beach activities and nearshore water areas so as to provide optimal conditions for safe turtle nesting and conservation of the beach habitat. A dedicated waste management/sanitation team may be engaged for cleanliness of beaches, particularly during the nesting season. Outsourced agencies may also be involved in the team/process for delivery of services.

The Beach Nesting Conservator and TNBMC may also take the support services of the District Administration for effective implementation and sustenance of management plan.

The above proposed management structure and participatory decision making process enables to provide a holistic conservation of the turtle nesting beach habitat and not just the demarcated beach nesting space. The scope caters to future requirements of turtle nesting space needs and strengthening sustainability processes in and around the beach area.

11.7 Interdepartmental networking and cooperation

Though, the primary responsibility of conservation of sea turtles and its habitat rest with the Goa Forest Department, to make the conservation effort more robust and effective, following role and responsibility is suggested

Department	Role and Responsibility
Goa Forest Department	Sea Turtles are Schedule species under the Wildlife Protection Act, 1972. It is a primary responsibility of the Goa Forest Department to protect the species and its habitat. The department shall comply with all the legal provisions and manage the habitat scientifically. The Department shall have exclusive page on sea turtle conservation on its website. All essential contact numbers and conservation initiative are mentioned on the web-page.
Department of Tourism	Promotion of tourism and allotment of shacks is under the administrative preview of this department. While allotting the shacks, the department shall ensure that all conditions prescribed by the Goa Forest Department shall be fully complied with. The Department shall organise training and orientation to the shack operators in association with the Goa Forest Department on Dos and Don'ts on the beach. The department shall ensure that the waste collection and disposal shall be done scientifically. Shacks have been mandated to

	have toilet facilities. It is observed that due to inadequate swage collection system, the shack owners are indulged into releasing the sewage into dunes directly. This not only creates health and environment issues on the beach but may become hazards to the turtle nests.
Department of Environment and Climate Change	Protection of environment is the primary responsibility of the Department. The Department shall organise and support education and awareness activities for the locals, tourists, students and teachers. The Department in consultation with Department of Tourism and Forest Department promote turtle tourism activities by enacting schemes of homestays, providing incentives for green activities etc.
Department of Education	Education and awareness is an important tool for achieving sustainable development. Schools are teaching Environmental Education in all levels of education system. Teachers must be trained issues of sea turtle conservation. Teachers can plan an important role in evolving community based turtle tourism by undertaking surveys and discussion with the locals. Students can be involved in undertaking documentation and research work related to sea turtle conservation. The beaches of Mandrem, Morjim, Agonda and Galgibaga may be declared as No Plastic Zones through a gazette notification
Goa Police Department	The Marine Police shall support Volunteers in night patrolling on these designated beaches. The entire stretch of Goa's coastline is a sporadic sea turtle nesting site. The Marine Police can play an important role in conserving sea turtle by patrolling beaches. If nest is found on non-designated beaches. They can inform Goa Forest Department so that the nest can be shifted to a safe site.
Village Panchayat	Village Panchayat is the local governing body. The representative of Panchayat must encourage locals to initiate livelihood generating activities around turtle tourism. The Panchayat shall in consultation with the Department of Tourism, ensure that there is proper sewage collection system. Permission for any physical structure in CRZ area must be given after due consultation with the Goa Coastal Zone Management Authority (GCZMA). Panchayat must work in tandem with Goa Forest Department in implementing the conservation programme.
Department of Fisheries	One of the core activity of the department is to promote fishery in both marine and inland waters. The Department can aid the Forest Department in identifying congregation areas in the offshore waters. This can be used for effective management.
Captain of Ports	Ensure that the barge/ship movement do not hamper the turtle migration in the waters. The Department can also help Goa Forest Department in identifying congregation areas in the offshore waters.
Goa Waste Management Corporation (GWMC)	GWMC can train the staff of the contractors in scientifically handling the waste collected on the beaches.
Goa Tourism Development Corporation (GTDC)	The Corporation can promote community based tourism concept. Home stays, providing dedicated places for sale of locally made food and beverages and also articles. Corporation can also play an important role in bridging gap between the locals and resort owners of any conflict arising out of business interest.
Goa Coastal Zone Management Authority (GCZMA)	It ensures that all CRZ provisions are complied with letter and spirit. Authority shall organise orientation programme for shack and resort owners on CRZ notifications
Goa State Pollution Control Board (GSPCB)	All business establishments must obtain necessary permissions under the Air and Water Act. The board officials conduct surprise checks of its compliances.

12. Sea Turtle Nesting Habitat Management Plan

It is important to design the Sea Turtle Nesting and Management Plan for conservation of turtles and their nesting habitat by keeping in view the natural behaviour of sea turtles, their life cycle, their needs during conglomeration, foraging, feeding, nesting, hatching phases. Together with this, the existing and future anthropogenic use/activities of coastal waters (marine space) and beach space (intertidal and terrestrial space), including coastland would determine the risks posed to turtles and their nesting habitat. Hence, adopting sustainability practices, reducing negative impacts, and creating positive actions are critical contributions desired from multi-stakeholders using and dependent on the coastal and marine space and ecosystem services for ensuring long term conservation of turtle nesting habitats.

The Turtle Nesting Habitat Safety will outline the scientific protocols, methods, processes for safe handling and monitoring of turtles, their nests, eggs, hatchlings. The specific objective is to offer maximum protection and assistance in a scientific and caring manner for the turtle survival, health and rejuvenation during its terrestrial life cycle period – especially covering nesting, hatching and life on the beach. The scope is also to scientifically manage the nearshore waters for foraging, feeding and migration requirements of the turtles and hatchlings during the nesting season.

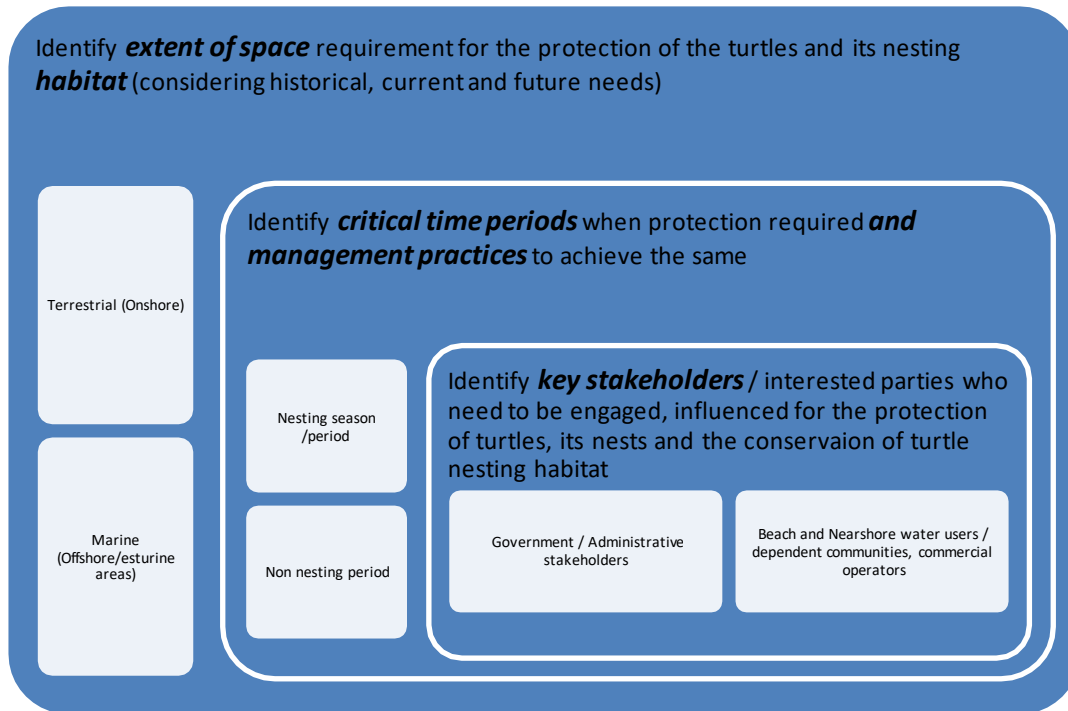
The best management practices shall be adopted for the safety of turtle nest and management of the beach. Suitable mitigation measures shall also be identified for the same.

This management is recommended to carry out a complete assessment, evaluate, monitor, identify and control all potential hazards and risks arise during the nesting phase of the turtles on the beach. The management needs to ensure that the turtles, nest, eggs and hatchlings are managed as per standard protocols and as per applicable legal norms.



The TNBMC may adopt, adapt and design suitable management criteria for safety of nests and turtles.

12.1 Conceptual criteria for designing management elements



12.2 Extent of turtle nesting habitat plan

(Geographical area/space)

The aim of the sea turtle nesting habitat conservation plan is to protect, conserve the turtles and their habitat while enabling sustainable development in and around the turtle nesting beaches of Morjim, Mandrem, Agonda and Galgibag.

It is therefore proposed that:

Each of the beaches shall have clear demarcation of the extent and boundary of the geographical/spatial space where the management plan shall apply such as NO TAKE Zone, Sustainable Tourism Zone and Fisheries Livelihoods Zone.

This will cover the terrestrial and marine/estuarine areas of the beach.

Terrestrial boundary: Shall be considered from the low tide line (LTL) upto high tide line (HTL) and further landward upto at least 500 meters from HTL. The intertidal areas will also be part of the terrestrial area.

Sand-dunes are integral and a vital ecosystem for turtle nesting. Sea turtles prefer to move as much towards the toe of the sand dune and even further to lay their eggs. Hence, the sand dune area / spots are very vital to protect, conserve and nourished. Hence, on the turtle nesting beaches, a mapping of the sand-dunes and its morphology; especially the areas of embryo dune, fore-dune, mature dune shall be identified, demarcated, updated periodically.

The sand dunes shall be considered as “no entry” areas for recreation or any other physical activity. The fore-dune and back-dune native vegetation shall be protected and conserved.

The toe area of sand dune shall be considered as a “no walking – no entry” area to reduce risk of compaction of the critical nesting spots and protect physical damage to sand dune by beach users. Such a “no entry area”

along the length of the sand dune shall be maintained as “3 to 5 meter” from toe of sand-dune towards the beach/seawards side.

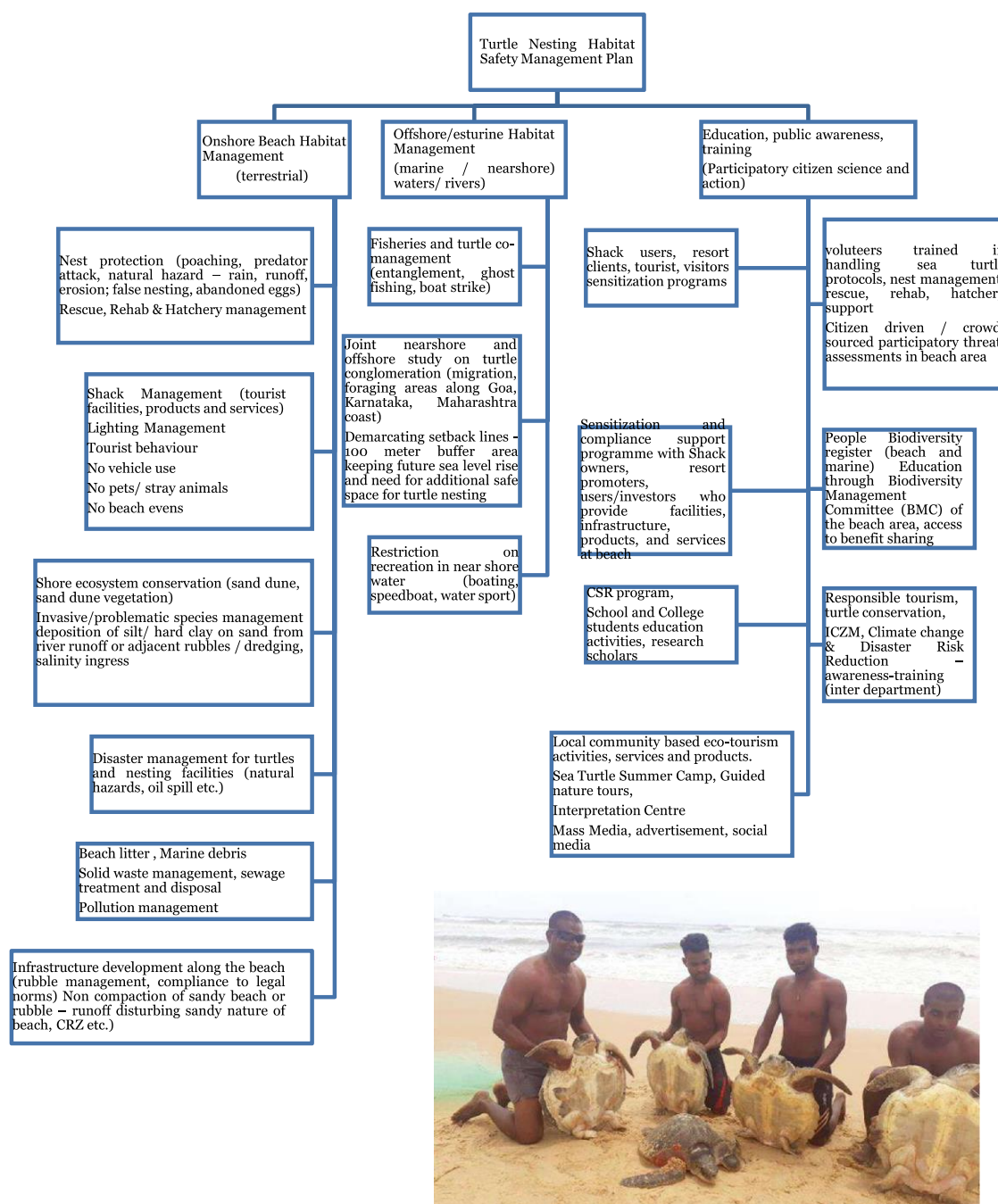
The entire length of the beach wherever the turtles are nesting shall be considered for application of this plan. The precise boundaries shall be identified based on where the turtle nests have been found/located. At least, 3 to 5km. continuous shoreline length of the beach may primarily be considered as the turtle nesting beach habitat space in each location.

Marine and estuarine boundary: Shall be considered from the tide line (LTL) upto at least 500 meter seaward side from LTL. The mouth of estuarine, creek areas shall also be considered as part of the boundary.

The sea turtle nesting habitat plan shall apply in all the CRZ categories falling within the geographical/spatial space where the plan is proposed for implementation. This may mean that the area under turtle nesting habitat management may not just fall in CRZ1, but also in CRZ 3, CRZ2, CRZ4 areas which may be in the beach stretch.



12.3 Chart of the Management plan



12.4 Onshore Beach Habitat Management (terrestrial)

1. Nesting space/habitat protection and conservation

Beach nesting space and habitat: As per CRZ 2011, the beach stretch of Mandrem, Morjim in the North and Agonda and Galgibaga in South are recognized as the turtle nesting sites and are protected under the Wildlife Protection Act, 1972.

Based on historical nesting data and trend, identify extent of sea turtle nesting area along the length and width of the beaches. Consider trends of false nesting, analysis of lifecycle and behavioural aspects of the particular turtle species arriving for nesting on the beach. Demarcate the nesting habitat and buffer area required for effective nesting space requirement and habitat management.



The Olive ridley is considered to be the most abundant sea turtle in the world. Among the five species which occur in India, only olive ridley is found to be nesting along the Mandrem, Morjim, Agonda and Galgibaga coastline. These turtles typically nest on ocean beaches near the river mouth, above the high tide line and the front of the primary dune.

The Apex Nodal Authority (The Goa Forest Department) must earmark and communicate the above boundary and sensitive nesting areas through maps and display boards so that beach visitors and users are aware about the importance of the specific beach and are encouraged to adopt sustainability and safe code of conduct on the beach, overall strengthening turtle nesting habitat management and conservation.

1.2 Nesting period and time:

As per the available data of sea turtle arrival for nesting, starts from the month of October to April. However, it has been noticed that the nesting arrival is now more during November – December. Such shifts may be temporary but it has an impact on nest survival and hatching percentage. Therefore The Goa Forest Department should consider monitoring the trends in the onset and end of nesting season, preference time of turtle species to crawl on the shore to lay eggs (e.g. day, dusk, night, as per moon phase, tide influence/ time etc.; time duration while laying clutches, incubation time of eggs and emergence of hatchlings.

2. Nest protection and monitoring

Trained personnel shall accurately mark the nests with GPS location and name it as per scientific nomenclature or recording protocol. Include metadata observation describing the nest and its immediate surroundings, particularly the distance from any nearest shacks, facilities, sand dune berm, HTL etc. Take photographs of the nest during day time. Maintain database in digital records also.

An app may be developed to later visualize and geo-reference data. Safeguard the nest with appropriate use of guards and ensure that there is a clear display board or warning signal to day time beach visitors about the presence of nest and not to disturb it.

Track false nesting crawls, photo document those and try to check abandoned eggs or nests laid too close to the sea, intertidal area etc. Rescue such eggs and relocate to hatchery as per standard protocol. Maintain database for false nestings also. There should be a combination of day time and night time patrol of the beach.

Database recorded for the beach may reveal which species are nesting, how many nesting activities there are, the proportion of activities which result in egg laying, nest location, nesting season, nesting success and threats. Threats include categories such as nest depredation, inundation, anthropogenic disturbance etc. All of these allow the assessment of the nesting population status and help define priority areas and times for monitoring and protection.

Standard protocols and SOPs must be documented and appropriate checklists, recording sheets/ /documentation maintained regarding nest protection, handling, monitoring, recording, including for egg handling, transportation, relocation, hatchery related activities. Review the database and update accordingly what all needs to be recorded. The database and analysis must help in evaluating the success of nesting management, risk mapping, safe areas and vulnerable areas on the beach, geo- reference the data and overall improve and take corrective actions for turtle and nesting habitat conservation.

3. Rescue, Rehab & Hatchery management

Rescue and rehabilitation is a scientific task. There are many incidences where sea turtles have been washed ashore with their injuries. The Department of Forests at this moment has no dedicated team of Veterinary Doctors to treat injured turtles in a hygienic condition and release them into the water. It is strongly recommended that a dedicated Rescue and rehabilitation centre should be established with all advance facilities of treatment, care and rehabilitation.

Turtle strandings, or injured turtles, diseased shall be cared for, rescued and rehabilitated by trained personnel and as per scientific protocols. A rescue and rehabilitation centre may be established at the beach for the

survival, health of eggs laid due to false nesting, or carried away on shore, or in intertidal area due to rain or waves, erosion, natural hazards etc. Similarly hatchlings that are injured or require care shall be rescued and rehabilitated as per scientific protocols.

Rescue and rehabilitation centre should be established one each in North and South Goa. The funds for this may be sought from ICZMP project.

4. Setting up of turtle hatcheries for ex-situ conservation

The Goa Forest Department, of late, has adapted the practice of nest relocation to a hatchery where the hatchlings are subsequently released into the sea. While these initiatives are definitely helpful, there is no systematic or proper management of the hatcheries. There have been several guidelines for hatcheries elsewhere in the world especially that hatchling sex ratio are dependent on the temperatures that they develop in and this raises concern.

The Department has adopted in-situ conservation approach on all beaches. Looking at the sporadic nesting trends and continued involvement of community members, volunteers for turtle conservation, recording and reporting nesting, there is scope to attend to several beaches. This would require strengthening of nest handling, transportation and enhanced hatchery management and capacities. Therefore the existing hatchery at Morjim may be strengthened. As of today, the fishing nets are being used to guard the nests. It is suggested that under the ICZMP project, a proper protocol be developed and implemented along with any physical infrastructure, training and capacity building components.

Volunteers shall be trained, skilled and certified in various processes of scientific handling of turtles, nests, eggs, hatchlings, track identification, interpretation capabilities, rescue and rehabilitation and thus a cadre of trained volunteers be available, developed to assist and support the Beach Conservation (Range Officer) in charge of the nesting beaches.

1. The representative of forest department Government of Goa North Goa had put forth the initiatives and proposed activities of forest department for effective management of turtles in Goa.
2. The guidelines for protection of turtle shall be published widely to all general public, tourist and shack owners and other stakeholders shall be made aware of the turtle nesting sites and its protection.
3. As per the DCF WL North Goa all white lights near turtle nesting sites should be banned or marked and only red lights shall be allowed at turtle nesting sites as turtle get disoriented due to white lights.
4. The turtle nesting sites are notified under environment Protection Act, 1986.
5. Proper signage directing all the tourist and shack owner should be put on all the turtle nesting sites. Proper information regarding turtle and turtle nesting sites in Goa need to be informed to all the tourist and other stakeholders, proper guidelines should be published on all the official websites of all the concern Government department such as Tourism Dept. Forest Dept. GTDC, Department of Environment any other concerned Department website.
6. All the shacks owners and other stakeholders shall be educated about turtle nesting sites and its guidelines.
7. All the nesting sites which are shown on CZMP 2011 be declared as Silence Zone under noise rules applicable and in force for the State of Goa.
8. No beach, beds to be set up in the inter tidal zone. The existing practice in Morjim is to lay the beach beds very close to the waterline leaving little scope for the turtles to move up.
9. The beach shacks to desist from installing any outdoor illumination. The indoor lighting should also be muted and providing with opaque shield on sea facing side.
10. Playing of loud music by the shacks beyond 6.00pm and holding of beach parties to be prohibited.

11. It should be made incumbent upon the shacks licensees to play a proactive role in ensuring conducive condition to the more turtles besides information sharing with staff of Forest Department which monitor the entire coast.
12. Pursuant to noise pollution rules 2000, the turtle nesting sites as identified in CZMP 2011 Goa shall be treated as silence zone and noise limits as prescribed for silence zone shall be applicable to the turtle nesting site.

5. Beach space and Shack management

Tourism is Goa's main industry and the force driving its economic growth. Tourists are primarily concentrated to the coastal ecology, especially the sandy beaches, rarely venturing outside. The main attraction for foreign tourists is the tropical climate while domestic tourists are found to be attracted by the image of Goa, which seems almost mystical, provides the promise of freedom and possibility of experiencing a western lifestyle.

The nesting season coincides with that of tourism season in Goa and hence, leading to the issue of conflict of beach space use. The question of who has a first right to use the space is an ethical one. Identifying a dedicated space without conflict for a peaceful coexistence makes it more mystically than it needs to be. All nesting sites in Goa have unfortunately experienced the conflict of space use. The Goa Forest Department has organized several meetings and consultations with the stakeholders. The villagers on all villages have cooperated with the Goa Forest Department in achieving sea turtle conservation aim. All issues of livelihoods and apace have been satisfactorily resolved.

The Goa Coastal Zone Management Authority has been assigned the task of evolving a management plan. The GCZMA in association with the Goa Forest Department, local stakeholders and other line departments must identify beach spaces and divide them into go and no go areas. Current practice at Morjim beach is that a 600 meter stretch near the river mouth in Tembvaddo area is exclusively earmarked as No –Take Area (Turtle conservation reserve). No activity of any nature that possibly hampers the nesting behaviour is allowed. Whereas northern space towards Vithaldas Vaddo is allocated for make shift shacks for a commercial livelihood activity. This arrangement is working well without any conflict for several years now. Identifying exclusive space as conservation reserve does not mean turtle lay their eggs only in these areas, turtle do lay eggs all along the beach stretch but nests laid in Sustainable Tourism Zone are scientifically relocated in the reserve so that protection is guaranteed.

Shacks permitted in the “Sustainable Tourism Area”, where commercial activities are permitted, must be strictly monitored and as per the suggested norms and guidelines. It is suggested that there must be at least 20 meters distance from each of the shacks. This requirement is to provide sufficient space without any physical barriers for sea turtle to roam around in search of nesting space in case she comes in this area for nesting. The current numbers of shacks allotted on beaches such as Morjim and Mandrem shall continue to run their business in accordance with the general and specific guidelines prescribed in this plan. In Agonda and Galgibaga, the Government of Goa has decided not to permit any tourism shacks on the beach. This shall continue.

Turtle have tendencies to crawl beyond the HTL and lay nests on the dunes. It is important that while erecting the make-shift shack, no changes in beach morphology are done. In addition to it, all conditions prescribed by the Goa Forest Department must be followed.

In the area designated as No-Take Area, no activity which has possibility of hampering nesting behaviour is allowed. In addition, all conditions prescribed by the Goa Forest Department must be followed.

The Galgibaga beach area is now under the control of Goa Forest Department. The Department has nominated Dakshin Foundation, a Bengaluru based NGO to develop its management plan. In case, the Department wants to adapt a different approach for Galgibaga, they may be allowed but with the approval of GCZMA.

The management of beach space must be inclusive. The Department of Forests and other line departments such as Department of Tourism, Goa Tourism Development Corporation, Captain of Ports, Coastal Police, Electricity Dept. must work with the community and beach shack owners. Any conflict must be addressed in a cooperative way. There must be an effective coordination between all these departments.

As per the Beach Carrying Capacity Report, the area within NDZ is allowed to be used for putting up of temporary huts. However, as mentioned in the report, Agonda has exceeded its carrying capacity and no new temporary structures be allowed. In Morjim area abutting conservation reserve has been excluded and no temporary shacks are allowed. Mandrem does not have effective in-situ conservation, it is proposed that a 600 meter beach length is identified and designated as Conservation reserve. Once the area is earmarked, area abutting this may be excluded from temporary shacks and huts. Galgibaga is under the control of Goa Forest Department. Management plan for this area is under development. The department may communicate to the GCZMA of their plan.

There exists a sea turtle management plan prepared by the Department of Environment, Govt. of Goa which is approved. All recommendations done in that report shall be in addition to what is prescribed for the beaches of Agonda and Galgibaga.

In order to make the shack and resort owners partner in conservation, who are operating their business within 10sq kms of radius from nesting sites must be asked to contribute atleast one percent of their profit towards sea turtle conservation. They may, on their own organise education and awareness activities, provide material requirement or run interpretation facilities including the rescue and rehabilitation centers. These commercial entities can also organise skill building activities of locals and provide essentials for poor.

12.5 Guidelines for Shacks in Mandrem and Morjim

Structure

The guidelines given herewith are for a temporary structure to be erected in the CRZ zone . The definition of temporary structure being – a structure constructed with material, to last for a specific period and specific purpose, for a limited time after which the structure is to be dismantled.

The guidelines given herewith are for a temporary seasonal shacks structure to be erected in the CRZ zone. The definition of temporary seasonal shack being – a structure constructed with material, to last for a specific period and specific purpose, for a limited time after which the structure is to be dismantled.

Shacks on stilts with minimum clear height of 1 metre between underside of the floor and ground level to be permitted. A mandatory distance of 20 meters must be maintained between each shacks in Morjim and Mandrem



Conditions:

1. The columns/pillars extending into the ground shall be supported by a horizontal base plate or a precast base/shoe for the distribution of load.
2. No leveling of the ground/sand shall be done while positioning the stilted structure. The structure shall be raised sufficiently such that the ground/sand beneath remains in a relatively undisturbed state except for the pillars. (specific for turtle nesting areas)
3. The floor will either be the natural ground or a raised plinth comprising of floor beams and such support structure overlaid with fibre cement boards or equivalent material as a base for the flooring finish.
4. The main structure shall comprise of columns/pillars and horizontal beams at the eaves level as well as at the platform/plinth level. This structure maybe of timber, bamboo or metal. It is important that the construction methodology followed should be such that the structure can be dismantled easily.
5. The roof structure maybe made of timber or bamboo. This structure would be covered with thatched roof or terracotta tiles (such as Mangalore tiles). An addition of cosmetic boards or waterproofing material maybe allowed under this roofing material. However externally only thatched roof or a terracotta tile roof appearance is desired in keeping with the local context.
6. The roof shall be a pitched roof with no portion as a flat terrace or flat roof with a minimum slope of 15 degrees.
7. The height of the structure shall be governed as per the existing CRZ regulations.
8. Wall panels shall be made of timber, thatch or any other alternative material such as WPC or fibre cement sheets.
9. Railings if any shall be made of timber or bamboo.
10. Overhead tanks shall be concealed under the sloping roof.
11. All electrical wiring must be in conduits and completely insulated from the structure.
12. A water supply and sewage system layout must be included as part of the design proposal to the CRZ authorities.
13. Fire fighting equipment such as fire extinguishers shall be suitably located and clearly marked.
14. No masonry shall be used in the construction of the plinth or any part of the sub and super structure.

Lighting Management

At nesting beaches, light pollution is known to modify sea turtle behavior. Artificial lighting on beach side can discourage egg-bearing females from coming ashore to nest. Introduction of artificially produced light into areas where it is neither needed nor desired. Beachfront lighting strongly affects sea turtle hatchlings, misdirecting them inland and away from the sea. Therefore, by depositing her eggs in lighted areas, the female may also endanger the lives of her hatchlings. Hatchlings immediately orient themselves towards the ocean under natural (unlit) conditions, because the brightest direction is the open horizon of the sea. When artificial light becomes the brightest horizon, hatchlings can become either misdirected (move in the wrong direction) or disorientated (unable to orient in one constant direction), causing the hatchlings to suffer high levels of mortality due to predation and dehydration.

- Conduct lighting inspections, annually, and respond promptly to recommended corrective measures.
- All exterior fixtures – anywhere on the property – that produce light visible from the nesting beach should be shielded, directed only where light is needed, generally placed as low as practicable.

- Use long wavelength lamps (e.g., red/amber LEDs, low pressure sodium) and black baffles.
- Ban on bright white light, such as metal halide, halogen, fluorescent, mercury vapor, and incandescent lamps – and never use where such light could be visible from the beach. Only red light shall be allowed.
- Turn off balcony lights when not in use.
- Use ornamental vegetation to block and reduce light leakage to the nesting beach.
- Emphasize timers and motion sensitive lights to reduce beachfront lighting and operational costs.
- Prohibit campfires or fire pits on the beach or in line-of-sight of the beach during nesting season.
- Commit to reducing the amount of light that reaches the nesting beach from hotel rooms, restaurants, and other interior spaces.
- When possible, use blackout curtains or shadescreens.
- Turn off lights when not in use.

Regulation of beach developmental activities for safe and sustainable development

Habitat and coastal land use management - conservation lies with multiple departments of the Govt. of Goa such as Department of Environment and Climate Change, Goa Coastal Zone Management Authority (GCZMA), Goa Tourism department, Goa State Pollution Control Board (GSPCB), Captain of Ports and Goa State Biodiversity Board.

While conservation and protection of beaches is utmost importance, at the same time ensuring the livelihood of the locals by involving them in conservation efforts is a management challenge. The document suggests some of the management strategies state must adapt to ensure conservation and enhancement of local livelihood along the nesting beach stretch.

Enabling effective interdepartmental co-ordination

Though the Department of Forest is mandated under the Wildlife Protection Act, 1972 to protect wildlife and its habitat, without the support of line department who also have stake and responsibility the conservation will not be successful. For a better co-ordination and networking, it is suggested to have periodic meeting and data sharing among line department. The fisheries department is asked to share data of any bycatch of sea turtle in the fishing nets. Also share offshore congregation of turtles if found. The Coastal and Marine Police do patrol beaches, the Department of Forests must also train the police personal in rescue, rehabilitation and reporting protocols of sea turtle conservation.

A dedicated page on Sea Turtle Conservation initiative must be hosted on the Website of Goa Forest Department, Department of Tourism and Department of Environment & Climate Change, Government of Goa.

(Offshore conservation (marine/estuarine))

Nearshore water space and habitat:

The Olive ridley is considered to be the most abundant sea turtle in the world. Among the five species which occur in India, only olive ridley is found to be nesting along the Mandrem, Morjim Agonda and Galgibaga coastline. These turtle typically nests on ocean beaches near the river mouth, above the high tide line and the front of the primary dune. The beaches of Mandrem, Morjim, Agonda and Galgibaga are declared protected under the Coastal Zone Regulation (CRZ), Notification 2011. The Goa Forest Department, Goa Coastal Zone Management Authority (GCZMA), Department of Environment and local community and NGOs have taken up protection of turtle nests of Olive ridley in above mentioned beaches.

Based on the nesting data it seems that there may be totally upto 30 female turtles that may be using the beaches along the North and South Goa and with a possibility of around 10 female turtles visiting each beach during the season.

It is therefore important to identify the extent of near shore sea water area and marine habitat that is used by the sea turtles for its feeding, foraging, conglomeration, migration needs as it arrives for nesting and also when it stays in the nearshore water after laying the clutches. eg. the female turtle may be remaining for a month in the nearshore waters of the beach where it may have laid its first clutch and can possibly return/re-emergence for laying one more clutch within the nesting season. Hence, for the beach specific species, estimate the clutch frequency, remigration intervals/time and inter-nesting intervals.

Research and monitoring of the nesting behaviour

Sea turtles have a high natal homing behaviour. Means, the female come to the same beach where it was born to lay her eggs. It is paramount importance to ensure the beach stretch especially its geo- morphological features are kept intact so that the nesting area is not disturbed. The community as well as higher education institutions in Goa can be roped in undertaking small research activities to map and study the coastal morphological change and suggest restoration measures if require so that the beach stretch is suitably kept for yearly nesting. Locals, especially, the fishermen have tremendous knowledge and data bank of shore changes vis a vis turtle nesting arrivals. Coordinated efforts must be made to document such traditional knowledge.

A month prior to the nesting season, the male and female turtles migrate to the offshore waters and congregate for mating. Such congregation sites are vulnerable as mechanical fishing boats operate in such places and unknowingly, these turtles may be caught into the net and subsequently killed. There are many incidences turtles being caught entangled in nets along the coastal stretches of Goa.

In order to ascertain possible congregation sites in the offshore waters and their migratory path, it is important that the Forest Department undertake by study by involving scientific institutions such as Goa University, NIO and WII, Dehra Dun. This will help in reducing the mortality of adult turtles therefore ensuring high nesting numbers on the designated beaches in Goa or other nearby coast of Maharashtra and Karnataka. The Department can also involve fishing boat operators and Department of Fisheries in this

Currently, there are no coordinated research efforts done by the Goa Forest Department. Research data is a primary requisite for improving conservation efforts. It is suggested that the Department collates all data gathered so far with respect to nesting number, hatching success, community involvement and innovative conservation efforts adapted and publish a paper or a book so that the efforts are known and used for future conservation initiatives. A dedicated team from the Forest Department may be set up to exclusively work on marine and coastal resource conservation.

Education, training and awareness

Community involvement in Sea Turtle Conservation:

Community has been in forefront of sea turtle conservation in Goa. It is their effort which has led to today's conservation success. It is must be ensured that they are part of conservation intuitive. In order to get them on board, frequent meetings, consultations must be held so that community say in conservation is ensured. All turtle designated beaches are fishing zones. Fishermen require beach space for their daily activities. Conservation by definition is "Wise use of nature and natural resources". Fishers are primary stakeholder and beneficiary of sea turtle conservation. Their participation is a key towards greater success. Department's conservation strategy must take their requirement into consideration in order to avoid any conflict that might arise during the implementation phase.

How can the turtle nesting phenomenon be used as an opportunity to boost turtle tourism and enhance the livelihood of locals is something that the Department must think and evolve a community based turtle tourism plan and implement it. There are examples in Maharashtra, Odisha where community has started community based turtle tourism and running it successfully. It is to suggest that as part of Integrated Coastal Zone

Management Plan, a World Bank supported project, the Department of Forest must visit these beaches along with locals to study the business plan and adapt to Goa's nesting beaches. Goa being a known tourism destination, turtle tourism will certainly boost local economy at the same time ensures conservation of beach space for turtles to nest.



Training and Education

Training and education is an integral part of any management activities. The Goa Forest Department has about 15 paid turtle volunteers/turtle guards who are working for the last 15 odd years. To enhance their scientific and management skills, the Department of Forests must organise periodic trainings to their employees including the Turtle Guards, Forest Guards, Foresters, RFOs and ACFs. Turtle not only visit these designated beaches alone but there has been a record of sporadic nesting all along the coastline of Goa. The Department of Tourism has appointed Life Guards whose duty is to protect tourists from drowning. It is to suggest that the Department of Tourism must also impart training to these Life Guards in rescue, rehabilitation and reporting of the sea turtles. These employees will become additional force for effective coordination and implementation of turtle conservation.

The department must have a dedicated education officer to operate interpretation centre. Locals may be trained to conduct educational activities, night trails following all conservation protocols. As a yearly activity, every year, a turtle fest must be organised during the nesting season with various community based turtle conservation programmes. The Goa Tourism Development Corporation may be involved in festival management with technical support and guidance from Goa Forest Department and ICZMP Project Management Unit. Local resorts and shack owners can contribute in hosting this event.

Community Benefit sharing and incentivization

Community living around the nesting sites are the primary beneficiaries of the conservation. They, in some way have, compromised on their space and lifestyle in order to allow the conservation to happen. They must be compensated for their sacrifice and commitments. The Goa Government must give preference to the locals in all economic and livelihood activities arising out of turtle conservation. Under the ICZMP project, locals must be empowered and supported in undertaking turtle tourism activities. All resorts falling within village boundary of Mandrem, Morjim, Galgibaga and Agonda must contribute towards livelihood enhancement of locals especially the fishers.

The local Turtle Guards who are appointed by the Goa Forest Department should be recognized for their dedicated efforts of turtle conservation.

Beach Specific Recommendations

Mandrem beach, North Goa: A 2.6 km stretch of beach has been known for sporadic nesting. The nesting has been monitored by the Goa Forest Department since 2000. The protection staff monitors the beach during

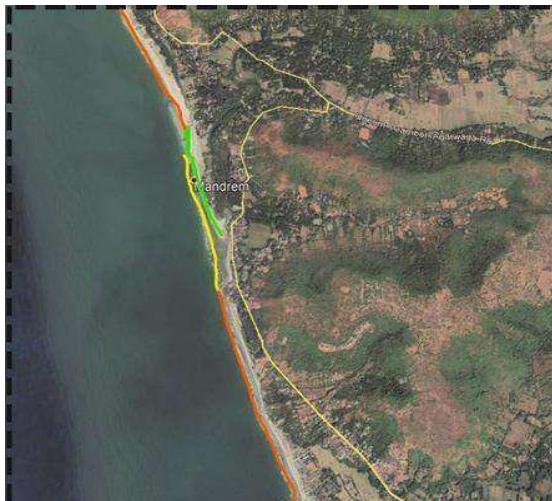
the nesting season. Initially, the nests were protected in-situ. But, of late, the eggs are being relocated to the hatchery located in Morjim for better protection. Nests laid on the mouth of the creek (Ashvem) near the property of Mr. Denzil Sequeira are kept as it is since Mr. Sequeira monitors them and gives the required protection to these nests. The Goa Forest Department has maintained nesting records for the years 2011-2014 and 2017-2020.

Tourism has been a major revenue source for the villagers in Mandrem. The locals have been customarily putting up temporary seasonal shacks on this beach. The CRZ Notification, 2011 recognises this right and allows such structures on the beaches as a special consideration for the state of Goa. The Department of Tourism has allotted 10 such shacks on Mandrem beach stretch, with certain conditions stipulated by the Goa Forest Department.

Morjim beach, North Goa: The Goa Forest Department has demarcated a stretch of Morjim beach (approximately 660 meters length) at the Chapora river mouth as NO-TAKE Zone exclusively for the positioning of a turtle hatchery. The stretch extending towards the north has been earmarked as a Sustainable Livelihoods Zone where in certain tourism related activities such as erecting seasonal temporary shacks, allowing tourists to access beach and water for swimming etc with strict guidelines and conditions. This arrangement has so far worked in favour of sea turtle conservation. It is noteworthy, that the sea turtle conservation efforts were initiated on all four designated beaches by the local community. There is huge sense of pride of sea turtles among locals. The Goa Forest Department has maintained records of nesting since the year 1997.

Tourism has been a major revenue source for the villagers in Morjim. The locals have been customarily putting up a temporary seasonal shack on this beach. The CRZ Notification, 2011 recognises this right and allows such structures on the beaches as a special consideration for the state of Goa. The Department of Tourism, has allotted 11 such shacks on a designated stretch of Morjim beach. These shacks have been provided with certain conditions stipulated by the Goa Forest Department.

Management approach recommended for Morjim and Mandrem nesting beaches Management Zoning:
Three management zones have been proposed



Mandrem beach



Morjim beach

Legends

-  NO-TAKE Zone
-  Sustainable Tourism Zone
-  Fisheries Livelihoods Zone

NO-TAKE Zone

1. The area is possession of the forest Department in Mandrem ,Morgim,Agonda and Galgibaga for hatching of turtle eggs is the designated area of No take Zone. This zone must be maintained as a sacrosanct space. While tourist will be permitted to enter this space, no extractive activities will be permitted over-here. No shacks will be permitted, riding of bikes, parties, bright lighting etc will be prohibited. The beach ecology including sand dunes will be maintained and enriched by the plantations of native beach vegetation species.
2. Turtle nesting and hatching periods will be given special concern and strict guidelines issued by the Forest Department will have to be adhered by.
3. The Goa Forest Department shall deploy adequate number of staff to monitor nesting and provide adequate protection through-out the nesting season (October to May).
4. The Goa Forest Department shall set up a Marine Turtle interpretation centre at Morjim, Mandrem, Agonda and Galgibaga to facilitate education and awareness activities for tourists and general public.
5. The site selection for hatchery must be done in accordance with standard guidelines. The hatchlings shall be allowed to crawl from the nests to the sea.
6. The Depart of Environment and Climate Change shall declare entire beach stretch as no littering and plastic free zone.
7. Schools and colleges around nesting sites must be encouraged to undertake research, documentation, monitoring and education on turtles with the support from concerned government and private establishments.
8. All domestic animals entry to this stretch of beach shall not be allowe.

Sustainable Tourism Zone

1. Areas other than the possession of the forest Department in Mandrem, Morgim, Agonda and Galgibaga for hatching of turtle eggs is the designated area of No take Zone and areas identified as fisheries livelihood is a sustainable tourism zone. This constitutes the areas where tourism is permitted. The allotted number of shacks will be permitted in this zone following strict guidelines. This including turning off lights and sounds particularly during the turtle nesting and hatching periods. The positioning of shacks will be based on the DSLR maps only by maintaining a mandatory distance of 20 meters between each shack and the shacks will be placed on stilts as per the guidelines attached. The seasonal shacks permitted by the Government on the beach, sea-facing shacks, bar and restaurant in private property shall close their operation no later than 8p.m. In other areas that do not encompass the above which include street lights, private huts, resorts other measures such as directional lighting will be imposed. Temporary beach activities permitted for shacks during the day time such as deck beds, beach umbrellas, tables, chairs etc. should be removed and staked properly in respective establishments before sunset.
2. All shacks and other establishments along the beach stretch shall promote marine conservation outreach activities. Nesting any found in this stretch, the same should be informed to the Forest Guards deployed on the beach for safe relocation to the NO-Take Zone.
3. Tourism enterprises following best practice should be incentivized and an award must be constituted by the Tourism Department.
4. Capacity Development for various stakeholders especially the tourism establishments shall be undertaken by Government departments such as Goa Forest Department, GCZMA, Fisheries Department, Biodiversity Management Committees etc.

5. Certain activities such as watersports, motorcycle activities shall be prohibited on all four nesting beaches.
6. Smaller shanties, road side stalls etc. must be brought under common management and must be well regulated and promoted and brought under the purview of the village Biodiversity Management Committee.
7. Waste and sewage generated by the tourist operations including shacks must be properly managed and safely discharged, which include the use of bio toilets. This can be done in close coordination of the Goa Waste Management Cooperation.
8. The tourism department must ensure that all these conditions are adhered to. To facilitate this process a Task Force could be constituted to make sure the above guidelines are implemented. This task force may include independent scientists, forest department officials, members of the biodiversity management committee, GCZMA member, shack owners, police etc.
9. Temporary huts permitted within NDZ shall abide by all general conditions and legal compliances, in addition the conditions laid in the beach carrying capacity report.
10. Resorts situated on the landward side may organize wedding events, parties with restrictions of light and sound pollution. They shall and not use the beach space for organizing or conducting any of such activities. All such events shall not be allowed after 10 pm till 6 am. Directional lighting must be used.
11. Silence zone should be notified with 20 mtr. buffer all around the hatchery site in procession of Forest department. Noise monitoring guidelines issued by the Central Pollution Control Board shall be applicable. The Goa State Pollution Control Board shall monitor the compliance.
12. The litter collected must be scientifically disposed of. A technical guidance in this regard may be obtained from Goa Waste Management Corporation.
13. All activities and engineering structures that can trigger or aggravate beach erosion shall not be permitted on the entire beach stretch of Mandrem, Morjim, Agonda and Galgibaga.
14. The ICZMP plan shall consider this beach site for community development projects and promote turtle tourism.
15. In order to provide adequate parking space and an access road for pedestrian on the landward side of the shack (Sustainable Tourism zone area only) especially in Morjim may be developed. Approached road shall not be built using tar or cement.
16. Tourism department shall assume proper signage at turtle nesting site.

Fisheries Livelihoods Zone

1. The area in which the traditional fisherman are carrying out fishing activities is identified as Fisheries Livelihood Zone. This zone has been envisioned keeping in mind the livelihoods needs of the small-scale and artisanal fishing communities including the ramponkars, the magkars etc. While these communities maybe allowed to continue with their way of life, no disturbing tourist activity will be permitted. The beaches in this zone maybe used to berth their boats, dry nets, fish etc.
2. Access for traditional fishers (Rapankars) for fishing and their allied activities shall be allowed all along the beach stretch and estuarine areas.
3. Agonda beach, South Goa:

The beach stretch of approximately 2.8 kms is preferred nesting site of Olive Ridley turtles. The Goa Forest Department has a record of nesting since the year 2000. The entire beach stretch has been designated as NO-Take Zone. No shacks on the beach is permitted. The Government of Goa has taken a decision to not to

allow beach shacks on the beach stretch. However, there are shacks/huts on private properties being put up in vicinity of the nesting area. The establishments shall abide by all guidelines prescribed in this plan document.

Resorts situated on the landward side may organize wedding events, parties with restrictions of light and sound pollution. They shall and not use the beach space for organizing or conducting any of such activities. All such events shall not be allowed after 10 pm till 6 am. Directional lighting must be used.

The Goa Forest Department has deployed its protection staff to monitor the beach for nesting. There has been continuous reporting of nesting on this beach since the year 2000. As that of Morjim and Mandrem, locals from this village also initiated community led sea turtle conservation under the guidance of parish priest. Rev. Fr. Mariano of Galgibaga Church. The villagers are sensitive enough on the issues of sea turtle conservation. The Goa Forest Department periodically organizes education and awareness programs for locals and tourism stakeholders.

4. Galgibaga beach, South Goa

One of the most pristine beaches of Goa. The Galgibaga beach stretch (which includes Talpona beach) have been a regular nesting site for Olive Ridley's since the year 2000. Both beaches have now been acquired by the Goa Forest Department for protection. The Department has a plan to declare these beaches as Conservation Reserve under the Wildlife Protection Act, 1972. The Government has taken a decision of not allowing beach shacks on this beach too. There are no private shacks as the area is under the Goa Forest Department.

Since the Galgibaga beach stretch and the adjoining land are to be declared a Conservation Area under the Wildlife Protection Act 1972, the management shall follow the guidelines stipulated by the Act itself.







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