Carrying Capacity of Beaches of Goa

for Providing Shacks & Other Temporary Seasonal Structures in Private Areas

Submitted to

Government of Goa

Prepared by

NCSCM

NATIONAL CENTRE FOR SUSTAINABLE COASTAL MANAGEMENT
Ministry of Environment, Forest and Climate Change
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Foreword

India is forging ahead with a high development agenda, especially along the long coastline, which inadvertently causes adverse impacts on the environment. Most of these activities are unplanned, leading to an imbalance in ecological sustainability. It is evident that developmental activities need to be regulated and managed, so that deterioration of the environment can either be minimized or avoided.

This can be achieved by estimating the carrying capacity of a system that enables better planning for development, concurrently safeguarding ecological and environmental and social concerns. The State of Goa is one of world's most renowned tourism destinations with several natural beaches along its 105 km coastline, with a tourist footfall of over 50,00,000 tourists per year. Despite such heavy human pressure on a limited coastal scape, the Government of Goa has attempted to maintain the integrity of its beaches by regulation and management measures.

However, a more systematic and scientific approach, was necessary to protect the ecological and environmental resources and to ensure livelihood sustainability. Based on such principles, the present study on carrying capacity of beaches and the adjacent private areas was undertaken by National Centre for Sustainable Coastal Management, Ministry of Environment, Forest and Climate Change.

Carrying capacity was determined using several international and national best practices to determine the scenarios and indicators for the assessment. Further, extensive field surveys were conducted along the entire coastal stretch of Goa. Field observations were validated through a series of consultation with members of various departments of the Government of Goa. For the very first time, use of high resolution aerial photographs (9 cm Ground Sampling Distance) of the coast of Goa was used to delineate sand dunes and the beach area available for tourism.

It is hoped that this study has addressed key issues on carrying capacity of the beaches and has the appropriate precautionary principles for effective tourism development that places high priority to environmental and ecological integrity and strengthening of local coastal livelihood of Goa.

Acknowledgement

NCSCM is thankful to the Secretary, Environment, Government of Goa for providing the necessary resources to undertake Beach Carrying Capacity Assessment, for various temporary structures along the Coast of Goa. The Goa Coastal Zone Management Authority (GCZMA) and the Department of Tourism, Government of Goa, have been very supportive in providing necessary information, and engaging in numerous discussions pertinent to fulfilling the objectives of this project. The support of the Department of Town and Country planning, Government of Goa is highly acknowledged for the important maps/ plans without which this assessment would not have been possible.

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The team members of NCSCM, whose dedication and hard work led to the timely completion of the study is acknowledged.

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Abbreviations

ACP	Aluminum Composite Panels
ALTM	Airborne Laser Terrain Mapper
BOD	Biological Oxygen Demand
CFA	Central Financial Assistance
CMFRI	Central Marine Fisheries Research Institute
COD	Chemical Oxygen Demand
CPVC	Chlorinated Polyvinyl Chloride
CRZ	Coastal Regulation Zone
DLCM	Destination Life Cycle Model
DoT	Department of Tourism
DST	Department of Science and Technology
ESAs	Ecologically Sensitive Areas
F.A.R	Floor Area Ratio
F.S.I	Floor Space Index
FRPs	Fiber-Reinforced Plastic
GCZMA	Goa Coastal Zone Management Authority
GOI	Government of India
GSPCB	Goa State Pollution Control Board.
GTDC	Goa Tourism Development Corporation
HTL	High Tide Line
IEX	Indian Energy Exchange
KLD	Kilo Liters Per Day
LPCD	Liters Per Capita per Day
MBBR	Moving Bed Biofilm Reactor
MBT	Mechanical Biological Treatment
MLD	Million Liters per Day
MoEF&CC	Ministry of Environment, Forests and Climate change.
MOT	Ministry of Tourism
MP	Marine Park
NCSCM	National Centre for Sustainable Coastal Management
NGT	National Green Tribunal
NOCs	No Objection Certificates
NP	National Park

NRI	Non-Resident Indians
OCI	Overseas Citizens of India
OPA	Other Protected Areas
PCC	Plain Cement Concrete
PHE	Public Health Engineering
PIL	Public-Interest Litigation
PPA	Power Purchase Agreement
PWD	Public Works Department
RCC	Reinforced Cement Concrete
RF	Reserved Forest
RPO	Renewable Purchase Obligation
STP	Sewage Treatment Plant
SWM	Solid Waste Management.
UDPFI	Urban Development Plans Formulation & Implementation
UPVC	Un-plasticized Polyvinyl Chloride
WLH	Wild Life Habitat
WTO	World Tourism Organization

Executive Summary

Assessment of carrying capacity for beaches of Goa for providing shacks &other temporary seasonal structures was undertaken on the basis of the order issued by Hon'ble National Green Tribunal (NGT) Western Zone Bench, Pune (Order dated 17th December 2014) to the Goa Coastal Zone Management Authority (GCZMA), and the task was assigned to National Centre for Sustainable Coastal Management (NCSCM), Ministry of Environment, Forest and Climate Change (MoEF & CC) by the GCZMA. This report addresses the beach carrying capacity qua shacks allotted on beach by the Government of Goa as well as the shacks and other temporary structures on private properties (i.e.) in the area between survey boundary on seaward side and 200m line in CRZ. The outcome of this study would also be relevant for grant of permissions for conduct of various events as well as water sports activities. The following factors were considered for assessing the carrying capacity:

Beach areas:

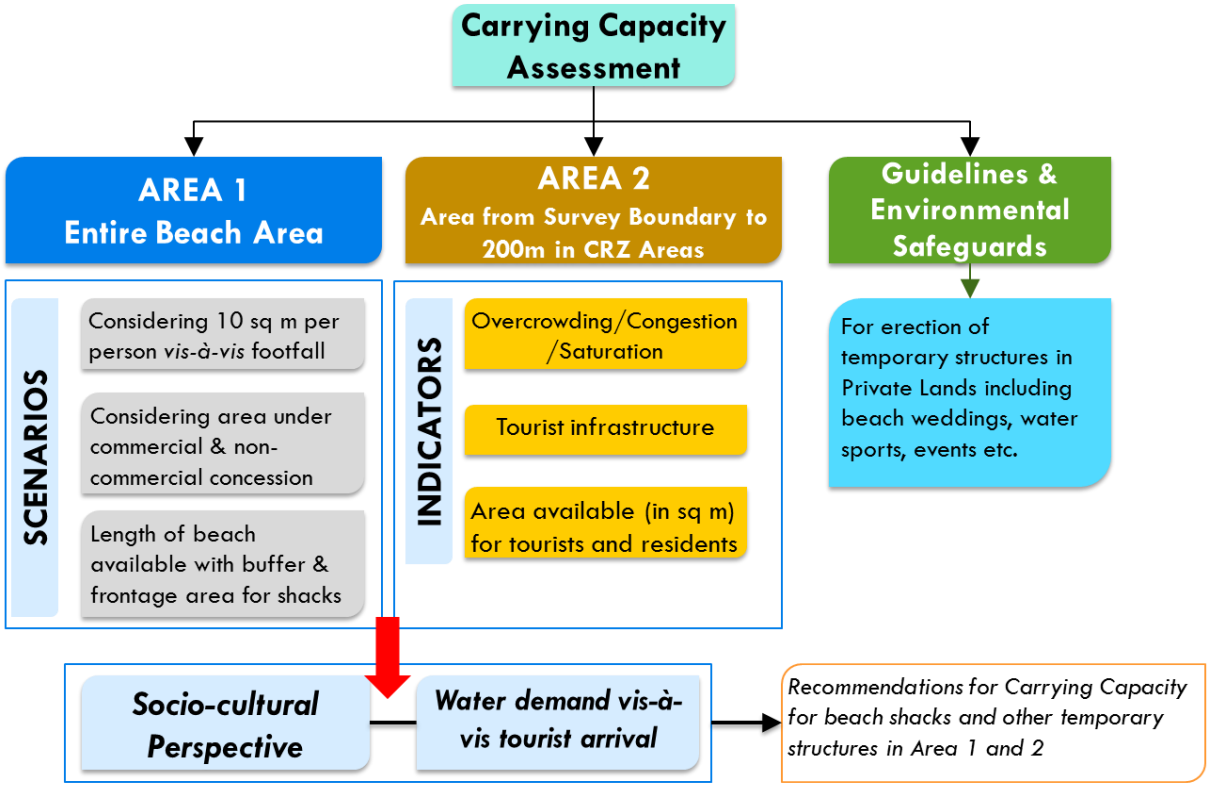
- Ecologically Sensitive Areas (ESAs) such as turtle nesting grounds etc.
- Other areas that include river mouth, creeks, erosion prone areas, fishing space, rocky headlands, etc.
- Area and length of beach available for erection of shacks after deduction of ESAs, villages with fishing activities, entry points, erosion prone areas, etc.
- Number of footfalls as estimated based on survey carried out by the Department of Tourism during peak and off season of 2015 – 2016
- The number of shacks allotted by the Department of Tourism on the beach stretches and areas occupied by shacks with appropriate buffers
- Appropriate distance between each shack and frontage area for accommodating deck beds

Shacks and other Temporary structures in private areas (Survey boundary to 200m in CRZ)

- Regional plan of Goa 2021
- Ecologically Sensitive Areas (e.g. sand dunes)and other no-development areas
- Assessment of potential area available within 200m in CRZ areas
- The maximum number of shacks and other temporary structures registered with the Department of Tourism in private areas
- UDPFI Guidelines of small and medium towns with specific reference to commercial areas
- Census of Goa 2011
- Infrastructure available and proposed by the Department of Tourism/Goa Tourism Development Corporation (GTDC)
- Guidelines for private shacks / huts / in the area between survey boundary and 200m in CRZ and environmental safeguards.

Methodology for Assessment of Carrying Capacity

The flowchart below provides the step-wise process of assessment undertaken in each category.

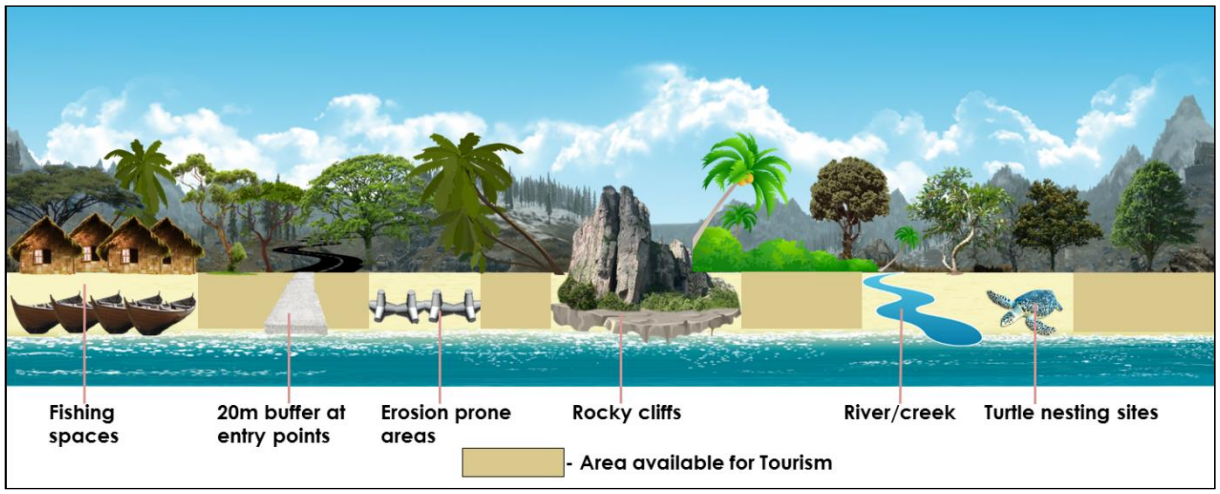


I. Area 1 (Beaches of Goa)

The beach stretches of Goa (headland to headland) has been considered for calculation of the beach area and the following two assessments have been made:

(a) **Carrying capacity w.r.t number of tourists (i.e. number of tourists that can visit a particular beach stretch)**
(b) **Carrying capacity w.r.t number of beach shacks (i.e. number of shacks that can be erected on the beach stretch in addition to those existing)**

(a) In order to determine the carrying capacity with regard to number of tourists, assessment was made considering the entire beach area available (area within the fair weather berm and survey boundary) and the average footfalls based on internationally accepted norms. All ESAs, erosion prone areas, river mouths/creeks, villages with fishing activities were deducted from the available beach areas and the final available space for tourists was determined.



Conceptual Drawing of Beach Area Available for Tourism:

The assessment was approached in the following ways:

Scenario		Approach
Scenario 1:	Considering 10 sq m. per person vis-a-vis footfalls	Considering the potential beach area available, the carrying capacity is calculated by dividing the beach area available by 10 (area required per person).
Scenario 2:	Considering Area under commercial concession and non-commercial concession	The carrying capacity of the beach was calculated by dividing the beach area under shacks by 7.5 (commercial concession) and the remaining beach area by 15 (non-commercial concession)
Scenario 3:	Length of the beach available with buffers between shacks and frontage areas	Considering potential beach length available for shacks (after deducting ESAs and other factors), the number of shacks that can be erected is determined.

(b) In order to determine the carrying capacity with regard to potential areas for shacks, only the beach areas which falls beyond the High Tide Line (HTL) to survey boundary has been taken into consideration. All ESAs, erosion prone areas, river mouths/creeks, fishing spaces are deducted from the potential areas and the final available space for shacks is determined.

II. Area 2 (area between survey boundary and 200m in CRZ)

In order to determine the carrying capacity of shacks and other temporary structures in private areas, a set of three indicators have been developed based on i) overcrowding, ii) tourist infrastructure and iii) area available for tourists and residents as given below.

Indicator	**Approach**
Indicator 1:	Overcrowding/congestion/ saturation – Number of beds per hectare (e.g. up to 50 beds/ ha for rural areas and up to 100 beds/ ha for urban areas)
Indicator 2:	Tourist infrastructure (No. of beds to population) (Rural - up to 0.5 and Urban up to 1)
Indicator 3:	Area available (in sqm) for tourists and residents (e.g. 50 sqm per person for rural and 25 sqm per person for urban areas)

As precise estimation of the 200m in CRZ area was not available, the existing secondary data available with the Department of Town and Country Planning were considered while developing the indicators for assessing the carrying capacity. This is bound to have minor differences between calculated values and actual ground scenario. In order to narrow down these differences, field observations were made in addition to receiving available inputs from various Departments of the Government of Goa.

III. Socio-cultural aspects and water availability

The socio-cultural aspects i.e. the ratio of local population to tourist has been used as an indicator to analyze the impact of tourist arrival on local population. The water demand during peak season for the tourists and the local population has been assessed based on secondary data provided by the Public Works Department (PWD).

IV. Establishment of guidelines and environmental safeguards for erecting private shacks and other temporary structures

The guidelines and environmental safeguards for erecting of private shacks/ huts/cottages/ temporary structures were based on Planning Principles, Ecological safeguards, Socio-economic considerations following international best practices.

V. Recommendations

(i) General:

- On application of the two internationally accepted concepts of carrying capacity, it is seen that the carrying capacity has exceeded at Coco beach, Vainginim beach in North Goa and Palolem beach and Agonda beach in South Goa. In view of the fact that carrying capacity has exceeded in Palolem, it is recommended not to allow any shacks and deck beds on this beach stretch As far as Agonda beach is concerned, the State Forest Department is monitoring nesting of Sea Turtles. Since no structures of any nature are permitted/ erected on this beach, and tourist visits are permitted only during day-time, as this will not have any adverse impact on sea turtle nesting.

- Temporary and Seasonal Structures are permitted in CRZ area except Ecologically Sensitive Areas as per the Coastal Regulation Zone Notification, 2011 with a specific provision for the State of Goa
- The State Government, through the Forest Department and Goa State Biodiversity Board shall endeavor to grow and maintain local species such as Spinifex sp., Ipomoea sp. along with dune parks with proper fencing. In addition, beach nourishment to counter sand depletion (especially along eroding beaches) shall be considered
- Turtle nesting sites have been identified as per the provisions under the CRZ Notification, 2011 and no shacks and/ or beach beds on these beach stretches are allotted at Agonda and Galigibag in Canacona in South Goa and in the area identified by the Forest Department at Morjim
- A satellite imagery-based study of shoreline change in Goa indicated that over a 32 year period, there is large variation in depositional and erosional processes along the coast of Goa. Specifically, the study indicated that net accretion occurs along river mouths. Along the coast however, deposition was observed in coastal stretches of Morjim, Baga, Campal, Miramar and Mobor. Erosion was specifically observed along the coast of Querim, Anjuna and Velsao
- The Goa State Pollution Control Board shall prepare a plan for monitoring the ground water quality in coastal areas
- The State Government shall encourage generation of power through installation of solar panels in hotels/ resorts/ huts and other temporary structures by adopting the Net Metering Policy. The hotels and resorts are also encouraged to install composting units/bio-gas plants
- The State Government shall endeavor to obtain a Blue Flag Beach Certification in a phased manner for appropriate beach stretches through a recognized certifying agency
- The infrastructure such as water supply and roads are adequate to meet the present and future requirements, nevertheless additional parking space needs to be provided. Public amenities such as DRDO-approved toilets & washrooms, showers and changing rooms required are to be provided on the popular beach stretches

(ii) Beach Shacks:

- Beach shacks shall be erected out of eco-friendly material such as bamboo/ wooden poles with thatched palm leaves or thatched bamboo matt roofing
- The final carrying capacity for shacks allotted on the beach area by the Department of Tourism, based on the precautionary principle will be the least among the three scenarios applied for calculation of carrying capacity

- The assessment of carrying capacity based on the principle of 10 sq m per visitor (footfall) indicates that the carrying capacity exceeded in Palolem, Agonda, Siridao, Vainginim and Coco beach.
- From the assessment of carrying capacity based on the commercial activities (Beach Shacks) and balance space available, it is seen that carrying capacity has exceeded in Palolem, Agonda, Siridao, Vainginim and Coco beach
- Assessment of carrying capacity based on length of the beach space available for erection of shacks, after deducting the entry point, ESA etc. , indicated that the carrying capacity exceeded at the stretch between Baga and Siquerim (-21 shacks) and Ozrant (-6 shacks). Applying the precautionary principle and considering the least available capacity based on the three concepts, it is recommended that no shack shall be allotted by Department of Tourism on the beach stretch at Palolem and Siradao. It is also noticed that there are large number of shacks and other temporary structures (huts/ tents/ cottages) in private lands in Palolem and hence would not justify the allotment of any shacks on the beach by the Department of Tourism
- No shacks are allotted by the State Government at Agonda, Vainginim and Coco beach. Similarly the number of shacks allotted by Department of Tourism at Ozrant should be restricted to 3 shacks as against earlier allotment of 8 shacks (-5) and shacks at Baga-Siquerim be restricted to 188 shacks as against the earlier allotment of 196 shacks (-8), although carrying capacity is available on Baga-Siquerim and Ozrant beaches based on the internationally accepted principle of 10 sq.m per visitor
- Beach weddings and other events shall not be permitted in ESA areas. However, it shall be permitted in other areas on a case to case basis with prior permission of the GCZMA

(iii) Shacks and Other Temporary Structures in Private Land:

- The developable area for temporary structures was derived from the maps ("Regional plan of Goa 2021" of the Department of Town & Country Planning). The area that falls under No development slopes, paddy fields/ khazans, rivers, nalas, ponds, sand dunes (based on data from NCSCM), archeological and heritage sites have been excluded and the potential area was derived. Out of this potential area, only 4% (UDPFI) was considered to be available for temporary structures.
- Based on the data available with the Department of Tourism, a majority of shacks and other temporary structures in private areas have been registered in those beach stretches of South Goa i.e. Polem, Galgibag, Agonda, Cola where there is no allotment of shacks by the Department of Tourism on the beach. The largest number of such temporary structures in private lands is on Palolem beach, where

the State Government was allotting 3 shacks on the beach and now it is recommended that Government shall not allot any shack on the beach

- The Calangute-Baga-Candolim-Siquerim belt has in total 1169 hotels with 11,693 rooms and 12,460 beds. In addition, there are 196 shacks allotted by the State Government on the Baga-Siquerim beach belt. Considering the availability of hotels and rooms, it is recommended that no additional temporary structures huts/ tents/ cottages may be permitted for erection in private areas. In case of other beach stretches in North Goa, i.e. Anjuna-Vagator and Pernem Taluka, the erection of shacks and other temporary structures huts/tents/cottages shall be permitted in private lands based on the guiding principles and following the procedures recommended
- Structures existing prior to 19th February 1991 could be permitted to carry out regulated commercial activities such as homestays, guest house and restaurants without any further increase in coverage or FAR/FSI, as it would not occupy additional vacant land in the coastal area
- As shacks, huts, cottages and tents are primarily meant for livelihood of the local inhabitants who are unable to construct hotels/restaurants, the hotels in these beach stretches shall not be permitted to erect more than one shack within their private land. Hotels could be permitted to provide deck-beds within the private areas/on beach, in the area available, after due approval from GCZMA and registration with the Department of Tourism
- GCZMA shall consider applications for erecting of beach shacks/ huts/ cottages/tents in private lands on case-to-case basis by carrying out physical inspection through empanelled engineers/ architects and verifying the site-feasibility vis-a-vis ascertaining the access and other environmental safeguard approaches and guidelines provided and shall not exceed the carrying capacity area derived

VI. Guiding Principles for Shacks/ Huts/ Other Temporary Structures in Private Land

The guiding principles for carrying capacity of beach shacks and private surveyed plots have been classified under four distinctive headings:

- **Planning Principles**: the concept of 33% developable area and 67% open spaces for recreational, safety and other activities have been considered in beach stretches as well as for each private plot within 200m in CRZ areas. 4% of the total developable area (excluding ESAs) was considered available for temporary structures in areas within 200m in CRZ.
- **Ecological safeguards**: ESAs such as turtle nesting sites on the beach stretch and sand dunes within 200m in CRZ are No-Go areas. This has already been demarcated and the maps are provided along with this report.

- **Environmental safeguards**: The key environmental safeguards that are taken into consideration are clean potable water, safe disposal of solid wastes, safe disposal of sewage, no extraction of groundwater, promoting use of renewable energy and fire safety.
- **Social considerations**: Beach areas adjacent to fishing villages shall be avoided for erection of private shacks and huts/ cottages/ tents and diversification of coastal livelihood is encouraged. Also the ratio of local population to tourist population has also been used as an indicator for assessing the social carrying capacity.

Guidelines for use of beach or private lands in CRZ area for recreational activities such as destination weddings, private parties, water sports activities, night bazaars/ flea markets, erection of fisherman huts, and beach safety scheme shall be followed. The guideline pertains to the use of material, location of site, permission from concerned authorities, solid waste management, noise management, accessibility and identification of appropriate areas for such events.

1. Introduction

1.1 Goa and its Geographic Setup

Goa, with a coastline of 105 kilometers, most of which are sandy beaches, attracts a large number of tourists both domestic and international. Goa is one of the most favored tourism destinations in India with a consistent ranking amongst the top states in terms of tourist arrivals. This steady and increasing inflow of tourists provides employment, income and business opportunities to the locals. The contribution of tourism to employment generation both direct and indirect is of immense importance to the State. Tourism has also contributed to the growth and development of many sectors in the State such as infrastructure, hotels, transport, housing, banking, travel agencies and tour operators. Presently, tourism contributes to approximately 34% of the State Gross Domestic Product, providing employment to nearly 30% of the total workforce (Economic survey 2011-12).

1.2 History of Tourism

Influenced by over 450 years of Portuguese rule and Latin culture, Goa presents a diverse representation of the country to international visitors. In 1961, 1439 visitors and 10,422 night lodgings came to Goa from as many as 39 countries, (Ave Cleto and Tensing 1994). Most prominent beaches of Goa include Anjuna, Calangute, Bagain North Goa and Colva & Palolem in South Goa. The tourist inflow increased steadily since 1980s resulting in significant growth and development of beach shacks. The trends and the composition of tourists are discussed in detail in Section 1.5 below. Tourism is generally focused on the coastal areas of Goa, with moderately low tourist activity inland. International tourists, mostly from Europe, arrive in Goa in winter whilst the summer and monsoon seasons see a large number of Indian tourists.Apart from being blessed with the natural beauty, the key definitionsin Goa's coastal tourism are described below:

1.3 REGULATED ACTIVITES

1.3.1 Beach Shacks

These are purely seasonal/temporary structures set up on public beaches to serve food and beverages to the public/tourists. They are usually made of eco-friendly materials like bamboo/wooden poles with thatched palm leaves/ thatched bamboo matroofing with modern materials like synthetics or nylon fabric and steel

Figure 1: Beach Shacks, Goa

framework, as required. These shacks operate during September to May every year, in accordance with the shack allocation process governed by Beach Shack Policy of the State Government (Tourism Department).Different sizes of beach shacks are specified by the Policy (e.g. 12m X 8m, 18m X 8m) depending on the beach width, public access and other factors. The statistics of Beach shacks are provided in **Annex 1**.

1.3.2 Non-Beach Temporary Shacks

These include all those purely seasonal/temporary structures which are set up to serve food and beverages to the public. They are located in CRZ areas within the village boundaries on surveyed land adjacent to public beaches. They are constructed using temporary material, and are usually set up between the months from September to May every year. Most of these structures are located in private properties, but a few could also be set up in land belonging to the Government.

1.3.3 Kiosks

These are temporary structures that can be dismantled, made using materials such as steel, bamboo and wood. They sell fruits, tender coconuts, packed food items, handicrafts, handlooms etc. These are set up in touristic locations from seaward side survey boundary to 500m in CRZ areas from September to May every year.

1.3.4 Wedding Tourism

Destination weddings on beaches have become hugely popular and successful in Goa. As per a rough estimate, it is observed that over 800 high-end weddings are being organized in Goa annually, mostly in four and five star properties located along the coastline. Destination weddings bring in high quality tourists who spend large amounts of money, benefitting local economy and providing livelihood to service providers like event management companies, floral decorators, sound and light personnel, caterers, musicians etc. Unlike Rajasthan where the backdrops of such weddings are Forts &Palaces, Goan destination weddings take place on beaches and adjacent coastal areas. It is also seen that many Non-Resident Indians (NRI) and Overseas Citizens of India (OCI), also come to Goa for organizing destination weddings. The destination wedding setup includes, setting up of Pandal-cum-Shamiana on the beach, temporary cabanas and kiosks, stage, sound & light decor etc.

1.3.5 Night Bazaars/ Flea markets

These are events and activities organized in coastal areas by private organizers, comprising of several kiosks selling handicrafts, textiles, artificial jewelry, food items, handlooms, curios/ antiques etc., or offering services such as tattooing for the tourists. The kiosks are fabricated using bamboo, wooden poles, cloth/fabric to create non-permanent structures. Night bazaars and flea markets attract both domestic and international tourists and are a permanent feature of Goan tourism. Some of the flea markets like the Anjuna flea market are world famous and are organized since the 1970s as a legacy of the hippies who visited Goa in large numbers during those years.

1.3.6 Events organized in coastal areas

Being a tourist destination, Goa attracts several events organized by both the private sector and the Government. These include music festivals, car & bike/ motorcycle events such as Indian Bike week and Rider Mania; and government organized events such as Grape Escapade, Carnivals, Food Festival, Heritage Festival, Cashew & Coconut Festival, etc. Such events attract both domestic and international tourists and are a permanent feature on the Goa Tourism Calendar of events. The events are given a lot of publicity by the Tourism Department on their website along with various press releases and advertisements. These events attract large numbers of people and are organized along the coastline. The Tourism Department has also formed a State Level Permission Committee to grant permissions for private events such as music festivals, car and bike festivals and other events organized by private parties. These events are classified as major events where more than 750 people are likely to attend and the number of days of the event exceeds three. Other events where number of participants is below 750 and the duration is less than three days are classified as minor events; for these, permission is given at level of the Tourism Department. The permission for major events is accorded by State Level Permission Committee headed by Principal Secretary (Tourism) after obtaining approval from the State Government.

1.3.7 Water Sports Activities

Water sports activities are very popular in Goa. Such activities are carried out in the beach areas of Sinquerim, Baga, Calangute, Vagator, Colva, Benaulim, Majorda, Morjim etc. The activities are regulated by the Captain of Ports and Department of Tourism. Watersports activities include jet skiing, para sailing, banana boat rides, dolphin sighting tours, kite surfing, etc. These activities provide good source of livelihood to many unemployed youth in the coastal belt, most of them belonging to traditional fishing community who have given up traditional fishing and have adopted water sports as the alternate means for their livelihood. Approximately 700 watersports operators have been registered with the Tourism Department all over Goa. The Department has designated certain areas on public beaches for placement of temporary kiosks as to enforce a queue system among watersports operators and to sell tickets only through such kiosks to the public. The statistics of water sports activity at North zone office is provided in **Annex 2**.

Figure 2: Water Sports, Goa

1.3.8 Lifeguard towers

In order to ensure security and safety of the tourists visiting the State, the Government has initiated a mechanism of beach lifeguards and beach safety. Goa is the only State to have such a functional and well trained unit of lifeguards posted on all the major beaches of the State. Hundreds of precious lives are saved by 711 lifeguards. As a part of lifeguarding activities, temporary towers made of steel and FRP are placed at key vantage points in public beach areas.

Figure 3: Life Guard Tower, Goa

Beach coastal security is becoming extremely important with both Central and State Governments placing high emphasis in ensuring that the coastal areas of the country are safe and secure. In order to provide effective surveillance and monitoring, a need was felt to install CCTV Cameras and other Wi-Fi equipment along with cabling to interconnect the surveillance devices. Such CCTV surveillance cameras are installed on steel poles which are erected in key vantage points so as to have a clear line of sight in order to provide continuous images for real time monitoring 24 x 7.

1.3.9 Fisherman Huts

Goa being a coastal state, traditional fishing activities undertaken by Ramponkars (traditional fisherman) are a common source of livelihood. Such traditional fishing activities have been undertaken from generation to generation. In some of the coastal fishing villages, traditional fishermen erect temporary huts on public beaches and within CRZ areas to store salted fish/fishing equipment, canoes and other fishing accessories.

1.3.10 Huts / cottages / tents in village boundaries within CRZ areas

These are temporary structures built on surveyed plots for providing inexpensive accommodation to tourists. Huts are mainly made of bamboo poles with a thatched roof, similar to that of the shacks. Cottages are made up of wood and other temporary structural frameworks whereas tents are basically pitched out of cloth or canvas material and have basic amenities for tourists to stay. They are generally arranged in a linear pattern, with semi-open verandah in front with a sloped roof; stilt type of construction is also adopted in some places. The huts usually measure 3m

Figure 4: Huts in Private Areas

by4m. The height of the structure is restricted to 5.5m. The provision of toilets facilities for these huts can be common for a group or individual (attached) depending on the plot owner.

1.3.11 Beach Beds

A beach bed is an outdoor day bed on a platform with a mattress. Protection albeit little is offered from the sun by the umbrellas provided for each of the beach beds. Facing the sea front, they are placed in front of the shacks on the beaches of Goa. The beach beds are usually given on hire on an hourly basis to the tourists by the shack owners. Apart from the food offered in the shacks, other services may include a massage for the customers.

Figure 5: Beach Beds, Goa

1.4 Role of Beach Shacks in Goa's Tourism Industry

Beach shacks – earlier, fishermen's settlements- have been in existence for more than forty years. They have been providing food and shelter close to the beach at reasonable rates to tourists visiting the beaches. Although shacks are seasonal, many Goans depend on them to earn a living. Shacks also help the State Government to earn revenue in the form of various taxes like luxury tax, VAT, excise duty and service tax, apart from license fees. They also provide revenue to the local village panchayats and municipalities.

Shacks in Goa are increasing in number every year mainly because of their affordability. Beach shacks serve fresh food at reasonable price; provide personalized service (Prakash, 2013). They were initially licensed by the local village Panchayats (Noronha et al, 2003) and since 1995, the State Government through the Department of Tourism, issues licenses to the beach shacks because their number has increased considerably (Kazi et al, 2004).

Goan shacks are seasonal as they are abandoned during the monsoon due to the inclement weather conditions and the seasonal erosion of the beaches (Noronha et al, 2003, and Prakash, 2013). Brammer et al. (2003) observed that since the arrival of hippy visitors to Goa in the 1960s, modern day mass tourism has put pressure on the society as well as the environment. The major issues with the local community are with regard to the use/abuse of land and beaches. Brammer et al.2003 also focused on the conflict between the small-scale entrepreneurs who seek a living from tourism through beach shacks and the beachfront star hotels and the role played by the State Government to protect the interest of both these groups. According to Sparks et al

(2003), restaurants are an important factor in the choice of a holiday destination for some tourists.

Tourism provides employment and increases the income of the locals. It has contributed to the growth in the number of beach shacks in Goa mainly because of their lower prices and good food. Tourists in Goa prefer patronizing shacks rather than the star hotels. Sawant et al (2013) have attempted to study the impact of tourism on the socio-cultural life of the local communities namely Dessai, Pagi, Velips and Toddy Tappers at Agonda, South-Goa. They observed that tourism directly provides economic benefits to people in the form of employment, income, investments and infrastructural development.

A considerable number of youth and adults belonging to these communities have either erected their own shacks or work part-time as waiters and cashiers in shacks in the village during the tourist season. However, they still continue their traditional occupation such as fishing, agriculture and toddy tapping, as tourism is seasonal. Therefore, tourism has not created any significant cultural change in the life of the villagers as there has been less interaction between the tourists and the locals. According to Kamat (2010), Goa's beach tourism has not yet reached the stagnation stage, but still the state should introduce new forms of tourism such as 'village tourism' with proper planning and structuring of tourism industry based on Destination Life Cycle Model (DLCM) for a better future.

1.5 Increase in coastal tourism in the State of Goa

Tourist arrival in Goa has witnessed a positive increase over the period of years. In 2014, Goa Tourism bagged the PATWA Award for the 'Best Destination in Relaxation, Water sports and Entertainment' at Berlin, Germany, (T.O.I. 2014). Goa has also bagged the 'Best Leisure Destination' by Conde Nast Traveler India's Readers' Travel Awards. The graph below shows the decadal growth of tourist inflow to Goa (Fig. 6).It can be seen that there is an increase in the number of both domestic and foreign tourists to Goa (Table 1). The graph below show the number of tourists visiting the coastal talukas (Fig. 6), compared to the total number of tourists visiting Goa. It can be seen that the major proportion of tourists visiting Goa is in the Coastal districts. The annual tourist arrival statistics during the year 2011 to 2015 is provided in the **Annex 3.**

Table 1: Month-wise Tourist Arrivals 2015

Month	Domestic	Foreign	Total
January	278766	63658	342424
February	168752	69009	237761
March	181681	58712	240393
April	414588	30798	445386
May	663388	17835	681223
June	220745	14040	234785

July	129642	5001	134643
August	168859	9201	178060
September	196799	22491	219290
October	699001	47592	746593
November	743941	80222	824163
December	890260	122921	1013181
Total	4756422	541480	5297902

Figure 6: Decadal growth of tourist inflow to Goa

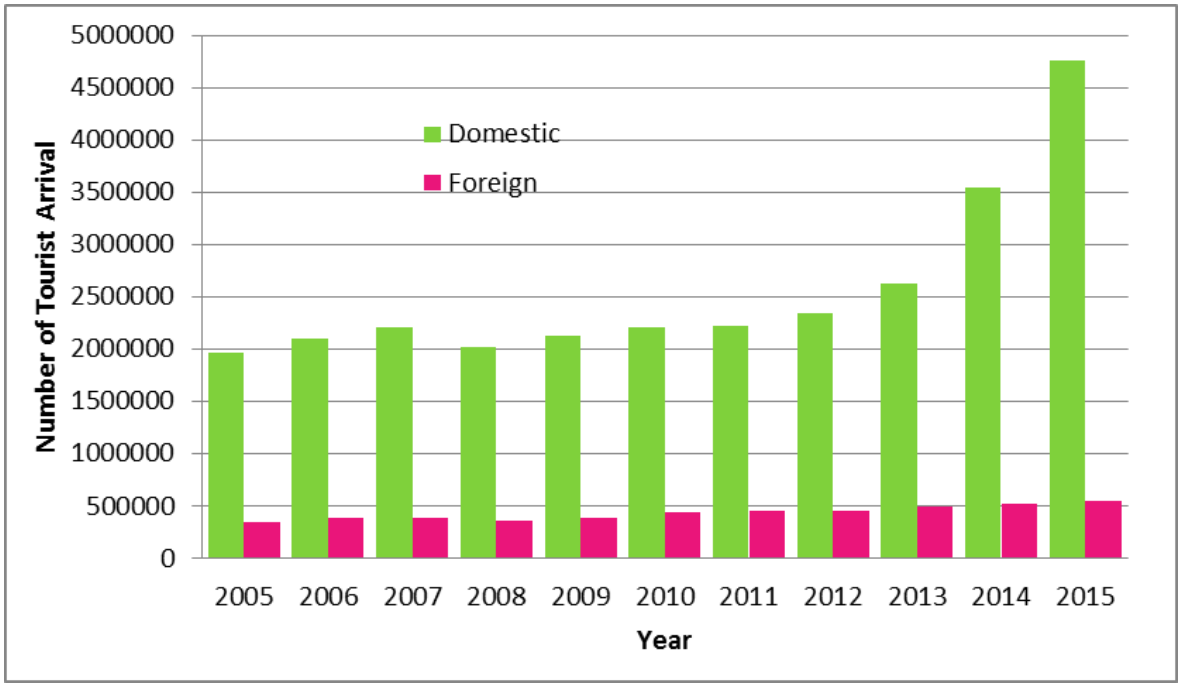


Figure 7: Annual a) Domestic Tourist Arrivals (Goa vs. Coastal Talukas)

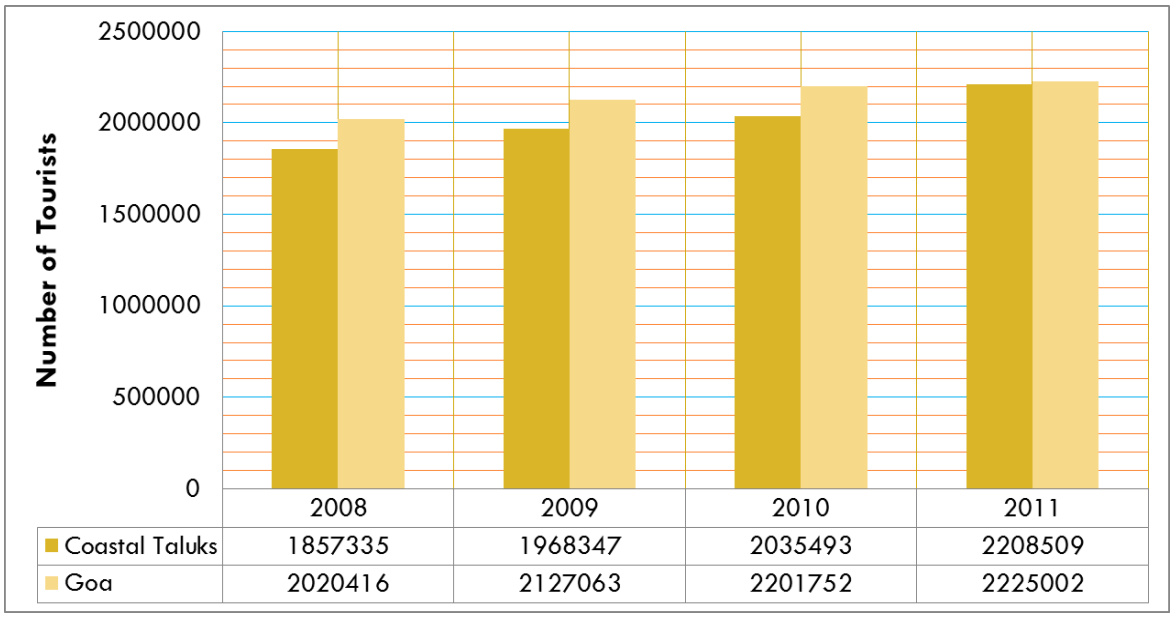
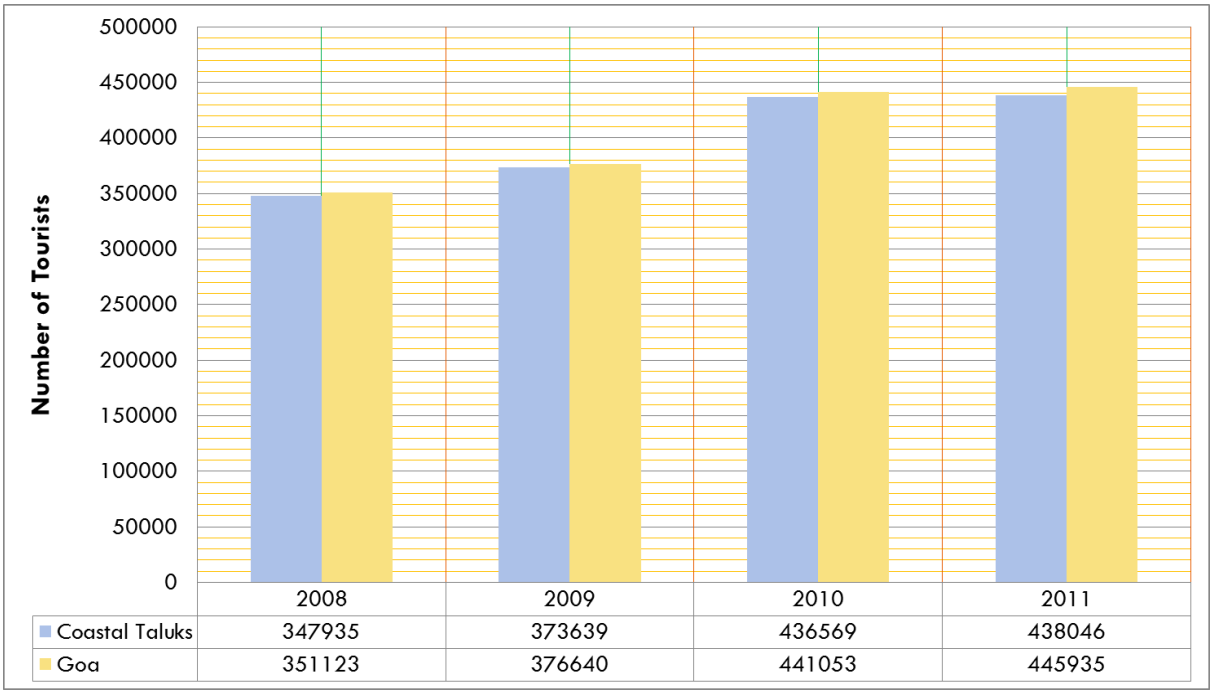


Figure 8: Annual b) Foreign Tourist Arrivals (Goa vs. Coastal Talukas)



1.6 Infrastructure availability

Goa was ranked the best state by the Eleventh Finance Commission for its infrastructure. It is also ranked at the top for the best quality of life in India by the National Commission on Population. The India Human Development Report 2011 ranked Goa as fourth in terms of overall human development. The sections below describe the infrastructure available in detail (Table 2).

Table 2: Total number of Hotels including Star Hotels, Paying Guesthouses as on 31st December 2015 ***(Source: Department of Tourism, Government of Goa)***

Category	No. of Hotels	No. of Rooms	No. of beds
A	80	6852	11446
B	239	7912	14125
C	461	6852	12609
D	2578	10151	18415
Total	3358	31767	56595

1.6.1 Present water supply scenario

Presently, water supply for the entire state of Goa is cateredby 7 regional water supply schemes (Implementation –PWD, Goa), as indicated in the Table3below: (Source: PWD, Goa)

Table 3: Regional Water Supply Schemes ***(Source: PWD, Goa)***

S.No.	Name of the scheme	Existing Capacity (MLD)	Taluka
1	Opa W.S.S	135	Ponda, Tiswadi
2	Assonora W.S.S	92	Bardez
3	Sanquelim W.S.S	52	Bicholim
4	Salaulim W.S.S	260	Sanguem, Quepem, Salcete, Mormugao
5	Canacona W.S.S	15	Canacona
6	Dabose W.S.S	15	Sattari
7	Chandel W.S.S	15	Pernem
	Total	584	

(a) Drinking water

All habitants have access to safe drinking water. There is uniform access to urban and rural (Tables 4 to 7) population and the supply levels are higher than Government of India (GoI) norms for water supply.

Table 4: Drinking water supply in urban and rural areas ***(Source: PWD, Goa)***

S.No.	*Particulars*	*GOI norms*	*Avg. Supply level*
1.	Rural areas	40 LPCD	82 LPCD
2.	Urban areas without underground sewerage	70 LPCD	143 LPCD
3.	Urban areas with underground sewerage	135 LPCD	143 LPCD

Table 5: Statistics of water consumption ***(Source: PWD, Goa)***

S.No.	*Water consumed statistics*		
1.	Total meter consumers (Nos.)	287446 Nos.	
2.	Daily average water consumed (Cu.m/day)	Hotels	27680
		Industries	20173
		Defense	7744
		Domestic	306020
		Public taps	3676
		Total	***365293***

Table 6: Existing capacity vis-à-vis present water demand and demand by 2025
(Source: PWD, Goa)

S.No.	*Taluka*	*Present Demand (MLD) Domestic &non-domestic (as on 2005)*	*Projected demand(MLD) Domestic and non-domestic (as on 2025)*
1.	Pernem	17	16*
2.	Bardez	70	90
3.	Tiswadi	57	70
4.	Bicholim	25	28
5.	Sattari	14	16

S.No.	Taluka	Present Demand (MLD) Domestic &non-domestic (as on 2005)	Projected demand(MLD) Domestic and non-domestic (as on 2025)
6.	Ponda	40	58
7.	Mormugao	100	160
8.	Salcete	90	110
9.	Quepem	20	21
10.	Sanguem	13	14
11.	Canacona	10	10*
Total		**456**	**593**

*Demand expected to reduce upon reduction in non-revenue water supply

Table 7: Proposed water supply after improvement in facilities **(Source: PWD, Goa)**

S.No.	Increase in treatment plant capacity (MLD)	
1.	New Treatment Plant at Ganjem	25
2.	New Treatment Plant at Moisal	10
	Sub Total	35
	Present Capacity	584

(b) Ground water extraction

The state government regulates ground water extraction under the Goa Ground Water Act, 2002 and Rules, 2003 through the Water Resources Department. Accordingly, the tankers supplying ground water are required to be registered with the Water Resources Department. There are about 300 tankers in North and South Goa, catering to the needs of industries, hotels and construction activities.

1.6.2 Solid waste management facility

A state-of-the-art facility using latest technology for solid waste management has been commissioned and made operational at Calangute by the Government of Goa, to treat and dispose the solid waste from coastal villages in North Goa. This modern facility is based on the Mechanical Biological Treatment (MBT) process with proper segregation, recycling and bio-methanation technology. The functioning of the plant and selection of technology has been made to address all issues of odour, unsightly garbage mounds and leachate generation. Electricity produced in-house from the organic fraction of the waste will be used to power the entire plant operation. The state government is proposing to establish similar SWM management facility at Bainguinim in North Goa and Cacora in South Goa in their action plan for SWM for Goa.

The solid waste management cell of the DST is collecting segregated non-biodegradable waste from the village panchayats and bailing the same presently at Verna industrial states. The bailed waste is thereafter transported to cement plants in Karnataka for co-processing. Some of the municipal council and village panchayats have established their own bailing facilities for segregated non-biodegradable waste for further transportation and co-processing in cement plants. This activity has

commenced since the year 2013 and approximately 6800 metric tonnes have been co-processed in cement plants. The bio degradable waste from hotels in coastal areas is disposed to piggeries; except the hotels in coastal belts of North Goa, which dispose the waste to the SWM facilities at Calangute. Some star hotels have established their own composting facilities.

1.6.3 Sewage and Wastewater Treatment Facility

Work for laying sewerage lines and commissioning of a Sewage Treatment Plant (STP) at Calangute and Baga is underway and nearing completion. It is likely to be commissioned in the upcoming tourist season. Similarly work for laying sewerage lines and commissioning of STP at Colva is underway. A majority of the hotels/guest houses have established a STP as per the norms laid down by the State Pollution Control Board. Small hotels/restaurants have constructed septic tank and soak pits for disposal of sewage, which is then disposed at the STP of the PWD through night soil tankers. The Goa Tourism Development Corporation is planning public toilets/conveniences at various locations on the coast and the details of the same are provided in the Annex-4& 5 attached to this report. The public conveniences will have a STP to treat sewage to the required standards as prescribed by the Goa State Pollution Control Board before disposal.

1.6.4 Power supply, demand / supply

As per the directives of Joint Electricity Regulatory Commission, the department has executed Power Purchase Agreement (PPA) for supply of 6MW solar power for 5 years to meet the backlog of solar Renewable Purchase Obligation (RPO). A PPA has also been executed with M/s SECI for supply of 25MW solar power for 25 years, which is anticipated to flow from the second week of May-2015. This will not only fulfill RPO but would also provide power to the state. The requirement of the state for the terminal year of 12th plan (FY2016-17) is anticipated to the tune of 600-650MW if mining and other related activities are resumed. The present peak demand is around 540MW and total availability from the grid is around 470 MW. The shortfall of power is met by purchasing it from the traders on short term basis. The State of Goa does not have a policy for power purchase (Net metering policy). The State Government shall formulate a policy for power purchase and encourage the private hotels and other commercial operators to install solar-based power generation units. The statistics of power availability and generation in Goa is provided in **Annex 6.**

1.7 Shoreline Change

Historical shoreline change analysis for the coast of Goa has been analyzed for the period from 1972 to 2010 (38 years). Multiple shorelines extracted from satellite images were used to calculate shoreline change rates using Digital Shoreline Analysis System (DSAS) model developed by United States Geological Survey (USGS) in an

ArcGIS environment. Overall for a coastal stretch of about 105 km, 35% of the coast is rocky terrain, 20% of the coast is stable, 27% is under erosion (i.e. 24% of erosion and 3% of artificial coast) and 17% of the coasts experiences accretion (Table 8). River mouths and port areas experience significant erosion characteristics. Pocket beaches of Goa are either stable or are accreting. The coast has seawalls (artificial coast) along the coast of Querim.

Table 8: Overall shoreline change statistics for Goa coast

Shoreline Classification	Length (km)	% Erosion and Accretion	Cumulative % of Erosion and Accretion
Length of Coastline (km)	105.03		
High Erosion Zone (km)	0.31	0.30	
Medium Erosion Zone (km)	3.97	3.78	
Low Erosion Zone (km)	21.01	20.00	24.08
Artificial Coast (km): Seawalls/ Riprap/Sand Bags	3.28	3.12	3.12
Stable Coast (km)	21.15	20.14	20.14
High Accretion Zone (km)	0	0	
Medium Accretion Zone (km)	4.67	4.45	
Low Accretion Zone (km)	13.34	12.70	17.15
Rocky Coast	37.3	35.51	35.51

1.8 Villages with fishing activities

The details of villages with fishing activities in North and South Goa are provided in Tables 9 and 10. There are 2,189 fishermen families with a population of 10,545 of which 1,388 families are in South Goa and 801 in North Goa. 98% of the fishermen families are traditional fishermen and South Goa accounts for 64% of the total fisher folk population whereas North Goa accounts for 36% of the fisher folk population of Goa. There are 2,370 active fishermen of which 1,505 are fulltime fishermen and 865 are part time fishermen. There were 2,666 crafts in the fishery sector of which 1,142 were mechanized, 1,297 motorized and non-motorized forms the rest. (Source: Marine Fishermen Census Goa, CMFRI, 2010)

Table 9: Statistics of Villages having fishing activities in North Goa

(Source: Marine Fishermen Census Goa, CMFRI, 2010)

Sr. No.	List of Places	Population (as per Census 2011)	Number of Fishing Canoes (data provided by Department Fisheries)	Number of Fishermen Families (data from CMRI report 2010)	Village-wise fisher Population (data from CMRI report 2010)
1	Keri	3243	7	36	160
2	Arambol	5322	82	105	474
3	Mandrem	8336	22	7	37
4	Morjim	6760	74	125	570

Sr. No.	List of Places	Population (as per Census 2011)	Number of Fishing Canoes (data provided by Department Fisheries)	Number of Fishermen Families (data from CMRI report 2010)	Village-wise fisher Population (data from CMRI report 2010)
5	Vagator-Chapora, OzraChapora and Anjuna	2243	11	66	369
6	Calangute	13810	235	30	148
7	Candolim	8500	65	8	40
8	Miramar (Donapula, Caranzalem and Vaiguinim	6003	208	85	439
9	Bambolim	1165	12		
10	Siridao	2417	74	90	548

Table 10: Statistics of Villages having fishing activities in South Goa

(Source: Marine Fishermen Census Goa, CMFRI, 2010)

South District					
Sr. No.	List of Places	Population (as per Census 2011)	Number of Fishing Canoes (data provided by Department Fisheries)	Number of Fishermen Families (data from CMFRI report 2010)	Village wise fisher Population (data from CMFRI report 2010)
1	Grant Mothers Hole, Vasco City and Baina	10505	271	116	683
2	Bogmallo	1433	50	23	109
3	Velsao, Arossim and Cansaulim	1520	174	66	348
4	MajordaUtorda	1703	3	Nil	Nil
5	Betabatim	945	11	Nil	Nil
6	Colva, Sernabati	3141	33	33	185
7	Benaulim	11919	77	107	507
8	Varca	5439	7	17	89
9	Mobor, Cavelossim	1955	16	18	70
10	Agonda	3801	56	153	677
11	Palolem	993	96	137	612
12	Galjibaga	Nil	9	33	192
13	Pollem/ Loliem	4797	13	20	87

1.9 Need for Carrying Capacity Assessment

This study is undertaken on the basis of the order issued by Hon'ble National Green Tribunal (NGT) Western Zone Bench, Pune (Order dated 17thDecember 2014) to the GCZMA, and the task was assigned to NCSCM by the GCZMA. This report seeks to determine the beach carrying capacity qua shacks allotted on beach by the Government of Goa as well as the shacks and other temporary structures on private properties (i.e.) in the area between survey boundary on seaward side and 200m line

in CRZ. The outcome of this study would also be relevant for grant of permissions for conduct of various events as well as water sports activities.

The State Government has a policy for allotment of shacks since the year 1996 – 1997. The issue of allotment of shacks was before the Hon'ble High Court at Bombay in Writ Petition no. 403 of 1997 and with MCA no. 572 of 1997 in W.P no. 492 of 1997. The Hon'ble High Court was pleased to order on 23rd December 1997 disposing this petition directing the State Government to frame fresh guidelines or formulate a fresh policy for allotment of shacks on Goa beaches for the year 1998 – 99 and subsequent years after taking into consideration all relevant facts and circumstances in public interest. Accordingly the State Government has been allotting shacks on the beach on the basis of its policy amended from time to time on account of various intervening directions of the Hon'ble Courts The existing policy of Government of Goa for allotment of shacks has been approved by the GCZMA and also placed before the Hon'ble High court and the same has been accepted (PIL WP No 9 of 2011 order dated 10/12/2013 and PIL W.P No, 167 of 2007 dated 10/12/2013 common order).

In Para 5 and 7 of the 'Order' of the Hon'ble High Court at Bombay at Goa Public Interest Litigation writ petition no. 9 of 2011 and Writ Petition No. 167 of 2007 and Public Interest Litigation Writ Petition No. 9 of 2011 states the following:

"5. In so far as point no.1 raised by learned Amicus Curiae is concerned, it was regarding issue as to Whether the beach, which is a public property covered under the Public Trust doctrine, can be exploited for commercial purposes and whether beach spaces can be privatized, even if it is for short or seasonal periods. However, during the pendency of these petitions, the Coastal Regulation Zone Notification 2011 ("the CRZ Notification, 2011" for short) has been notified and as per clause 8(V) 3(iii), as a special case, temporary structures have been permitted in the Goa CRZ. In that view of the matter in so far as point no. 1 raised by the learned Amicus Curiae is concerned, the same is taken care of."

"7. In so far as these issues are concerned, perusal of the policy would reveal that policy has earmarked number of shacks that will be permitted to be erected on each of the beaches and number of deck beds to be permitted in each of the shack. It can be further seen that Goa Coastal Zone Management Authority which is consisting of 11 experts in the field and also eminent citizen and appointed under Section 3 of Environmental Protection Act by Central Government has already accepted the said policy. We find that said authority must have applied its mind to the aspect as to how many number of shacks could be permitted on the particular beach so as to avoid over exploitation of the beaches. In that view of the matter, we find that policy takes care of point nos. 2 and 3."

Further, at Para 10 of the 'Order' passed by the Hon'ble NGT in Original application no. 03 of 2014 states the following:

"10. Admittedly, the shack policy was notified by Government of Goa in 2013, after obtaining necessary approval from GCZMA. The shack policy is for the period of 2013-2016 and identifies 240 locations in North Goa and 104 locations in South Goa and lays down the terms and conditions for granting of licenses for erection of temporary beach shacks on identified beach stretches. In par-A of the policy, it is clearly mentioned that " license shall be granted for erection of temporary shacks on identified beach stretches after joint inspection to be carried out by the officials of this department along with officials of GCZMA." We have also perused submissions made by the Respondent Nos.1 and 3 and noted that this policy was evolved as per directions of the Hon'ble High Court in (PIL) Writ Petition No.9 of 2011 and in Writ Petition No.167 of 2007. The order of Hon'ble High Court dated 10th December, 2013, is quite elaborate and recognizes that such policy has been framed.

Further the Hon'ble High Court also noted that as per Clause 8(v) 3(iii), as a special case temporary structures have been permitted in Goa CRZ. The Hon'ble High Court disposed of the Petition by granting liberty to any person to approach the Court, if it is found that policy is not being properly implemented or at any subsequent point of time, if any constitutional or statutory violations are found in the policy. The Respondent No.1 also submitted that this shack policy is under challenge before the Hon'ble High Court, therefore, various Writ Petitions Nos. 606 of 2013; 603 of 2013 and 683 of 2013, are pending for adjudication. Under these circumstances, we find that the prayer relating to challenge to the shack policy in the present Application cannot be entertained by this Tribunal so as to avoid any possible conflict of judicial decisions."

The Directions of the Hon'ble NGT in its order dated 17thDecember 2014 stated in para 17 is as follows:

"17. In view of above discussion, we are of the opinion that certain directions are required to be given to regulate such seasonal temporary structures in sustainable manner without affecting the pristine coastal environment of Goa, on basis of the principles of Precautionary principle as mandated under Section 19 and 20 of NGT Act, 2010. The Application is accordingly partly allowed with following directions:

1. *The seasonal temporary structures, as permitted under the CRZ Notification, shall be regulated by GCZMA by granting necessary permissions, incorporating details of the project, specific and general terms and conditions; and environmental safeguards in a comprehensive manner, subject to compliance of the guidelines formulated by GCZMA and other provisions of CRZ Notification.*
2. *GCZMA, shall immediately carry out a rapid survey to tentatively identify the sand dunes present in the villages with CRZ-I areas in the coastal areas of Goa and locate them on map, within a period of four (4) weeks and shall not issue any permission in such areas until detail survey conducted by NIO, is completed.*
3. *GCZMA, shall carry out study to assess the carrying capacity of different beaches in State of Goa, for providing such shacks and other temporary structures, in*

environmentally sustainable manner to protect the coastal environment, based on the 'precautionary principle' in next six (6) months and based on findings of this study, the permissions for the year 2015-2016, only shall be granted."

The CRZ Notification, 2011 in Para 3, makes a special mention of the State of Goa as follows:

CRZ of Goa:-

In view of the peculiar circumstances of the State Goa including past history and other developments, the specific activities shall be regulated and various measures shall be undertaken as follows:-

i *The Government of Goa shall notify the fishing villages wherein all foreshore facilities required for fishing and fishery allied activities such as traditional fish processing yards, boat building or repair yards, net mending yards, ice plants, ice storage, auction hall, jetties may be permitted by Grama Panchayat in the CRZ area;*

ii *Reconstruction, repair works of the structures of local communities including fishermen community shall be permissible in CRZ;*

iii *Purely temporary and seasonal structures customarily put up between the months of September to May;*

iv *The eco sensitive low lying areas which are influenced by tidal action known as khazan lands shall be mapped;*

v *The mangroves along such as khazan land shall be protected and a management plan for the khazan land prepared and no developmental activities shall be permitted in the khazan land;*

vi *Sand dunes, beach stretches along the bays and creeks shall be surveyed and mapped. No activity shall be permitted on such sand dune areas;*

vii *The beaches such as Mandrem, Morjim, Galgiba and Agonda has been designated as turtle nesting sites and protected under the Wildlife Protection Act, 1972 and these areas"*

Keeping in view the above facts and directions, the present study on carrying capacity of beaches of Goa for providing shacks and other temporary structures has been undertaken by the National Centre for Sustainable Coastal Management (NCSCM), Ministry of Environment, Forest and Climate Change.

2. Coastal/ Marine Ecologically Sensitive Areas (ESAs)

2.1 Introduction

Coastal Regulation Zone (CRZ) 2011 Notification, issued under the Environment Protection Act, 1986 provides for special protection and conservation measures for the coastal Ecologically Sensitive Areas (ESAs) and the eco-morphological features which play a significant role in maintaining the integrity of coasts. The CRZ Notification, 2011 lists 11 such Ecologically Sensitive Areas and geo-morphological features.

(a) Mangroves, in case mangrove area is more than 1000 sqm, a buffer of 50meters along the mangroves shall be provided;
(b) Corals and coral reefs and associated biodiversity;
(c) Sand Dunes;
(d) Mudflats which are biologically active;
(e) National parks, marine parks, sanctuaries, reserve forests, wildlife habitats and other protected areas under the provisions of Wild Life (Protection) Act, 1972 (53 of 1972), the Forest (Conservation) Act, 1980 (69 of 1980) or Environment (Protection) Act, 1986 (29 of 1986); including Biosphere Reserves;
(f) Salt Marshes;
(g) Turtle nesting grounds;
(h) Horse shoe crabs habitats;
(i) Sea grass beds;
(j) Nesting grounds of birds;
(k) Areas or structures of archaeological importance and heritage sites

2.2 ESAs in Goa

The ecologically sensitive areas that exist in Goa are as follows:

2.2.1 Sand Dunes

In physical geography, a dune is a hill of loose sand, built mainly by wind. Coastal dunes are mounds or hills of sand, without vegetation or are covered with vegetation, accumulated by wind action, located on the landward side of the beaches. Sand dunes are formed over many years when windblown sand is trapped by beach grass or other stationary objects. Dune grasses anchor the dunes with their roots, holding them temporarily in place, while their leaves trap sand promoting dune expansion.

Construction of beachfront homes and hotels can encroach on sand dune habitat[1]. Increased tourism, footfall, and removal of plant species can cause severe erosion of coastal areas. In this study sand dunes are mapped as per the CRZ Notification, 2011 and the landward extent of sand dunes within 200m in Coastal Regulation Zone is calculated to be 2.3 sq. km. Taluk-wise sand dune area within 200m in CRZ is shown in Table 11. Detailed maps representing sand dune covering an aerial extent landward up to 200m in CRZ with grid values and village boundary are attached as Annex to this report (**Annex 7**; Sheets 1 to 8).

2.2.1.1 Mapping of Sand Dunes

Sand dunes were identified and mapped using Digital Elevation Model (DEM) of Survey of India (SOI) (~25 cm vertical accuracy, 9cm planimetric accuracy) derived from aerial photographs using photogrammetric methods (Fig. 8). The following morphological features were used as criteria to delineate the dunes:

(a) shape of the dune
(b) height of the dune
(c) orientation of the dune
(d) form of the dune crests &
(e) vegetation cover

Further, a quantitative assessment of sand dunes was achieved using a three dimensional visual analysis of the orthophoto draped over DEM to extract the sand dune features. Using Image Station Stereo Display (ISSD) software, sand dunes were identified from aerial photos and the sand dune features were digitized. Spatial information on the sand dunes was organized in a geo-database format and maps were prepared using ArcGIS software. An abstract of methodology of sand dune mapping is explained in Fig 8. The sand dune extracted using the photogrammetric technique has been subjected to ground verification using GPS during October 2016.

Table 11: Sand Dunes along Goa coast within 200m in CRZ Area

Taluk	Panchayat	Area of Sand Dunes within 200m (in Sqm)
Bardez	Anjuna-Caisua	4183
	Calangute	46009
	Candolim	87949
Canacona	Poinguinim	559886
Salcete	Betalbatim	208409
	Colva	196776
	Cana-Benaulim	123149
	Varca	363438
	Cavelosim	613175
Mormugao	Cansaulim, Arossim, Culim	86217
	Pale-Valsao	31727
Total Sand dune area within 200 m		2320918

[1] http://des.nh.gov/organization/commissioner/pip/factsheets/cp/documents/cp-02.pdf extracted on 20 December 2016

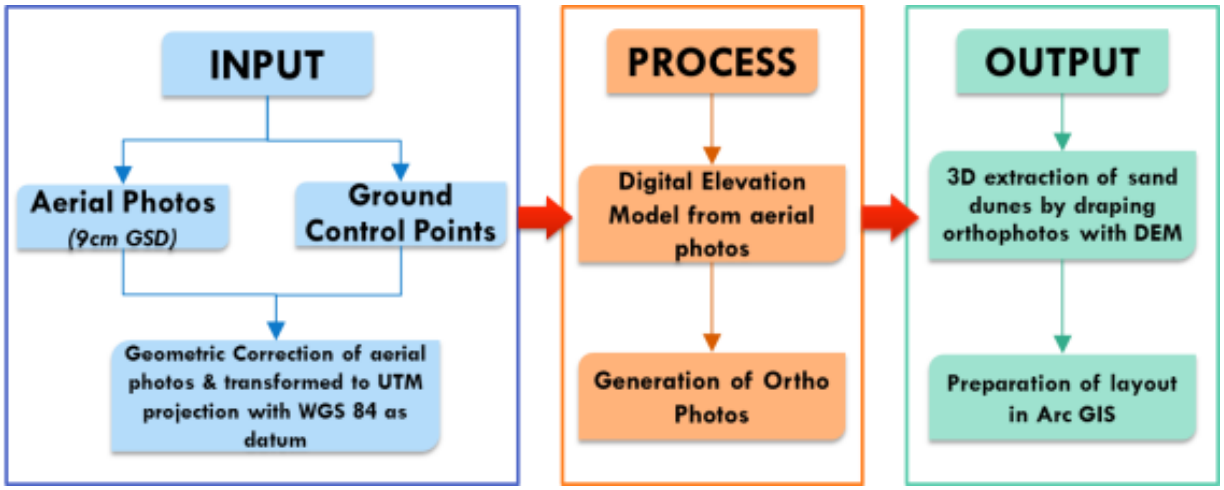


Figure 9: Methodology of Sand dune mapping using DEM

(a) Impact of Beach Shacks

The presence of beach shacks is a unique feature in Goan beaches as they are common all along the coast and on all major beaches, except at some beach stretches where they have not been permitted. These comprise simple huts, made of bamboo and coconut tree leaves and are purely temporary nature. In the past, there were few of them but at the moment, the ever increasing competition has resulted in their proliferation as almost 220 licensed shacks (and numerous unauthorized ones) can be seen for about 60 km of beach length (Collasso, 1997; D'Mello, 1997). Since the sandy beach is dynamic in nature, its profile keeps changing and adjusting itself towards equilibrium and the beach generally restores seasonally. Therefore, beach shacks which are seasonal and temporary, are not expected to induce any large scale damaging effects from the environmental point of view. The only major problem is their number which is on the rise (Mascarenhas, 1998).

(b) Influence of Recreation on Dunes

Activities of tourists are not restricted to a particular area and are observed almost along the entire coast particularly where sandy stretches and the dunes are found. Two dune areas, in Baga and in Candolim, are regularly used as a football ground by the villagers and also tourists. Although these recreational activities may not be termed as harmful to the dune environment, they do create ecological degradation in areas which are most frequented. Parking of vehicles on sandy areas, driving on the beach as often noticed, play fields on dunes, continuous movement by pedestrians and cyclists destroys dune vegetation, flatten dunes and renders the sand mobile. These factors induce shifting of sand and thus affect the stability of sand dunes (Mascarenhas, 1998).

2.2.2 *Turtle nesting grounds*

Goa has the distinction of having one of the earliest community based initiatives in sea turtle conservation. Olive Ridley turtle (*Lepidochelys olivacea*) is the major nesting species here. 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 Ridley (Giri and Chaturvedi, 2001). Nesting takes place between October and March each year (Dongre and Shambhu 2008, Giri, 2001; Kurian, 2013). The CRZ Notification, 2011 recognizes beaches such as Mandrem, Morjim and Galgibaga and Agonda as designated turtle nesting sites. The survey numbers and the maps have been provided by the forest department and have been enclosed in Annex - 8. Regular monitoring is being done on these sites. The statistics of Turtle nesting site of Morjim, Agonda, Galjibaga including sporadic nesting in Mandrem are provided in Annex- 9. All these areas have been excluded while determining the potential area for temporary structures.

***Table 12: Turtle nesting during season (November – May)* (Source: Department of Forest, Government of Goa)**

Beach	*2013-2014*	*2014-2015*	*2015-2016*
Morjim	4	8	6
Agonda	16	5	12
Galgibaga	23	3	6

Realizing that community participation is important for the success of conservation efforts, the Forest Department of Goa 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). While there are no beach shacks allotted at Galgibaga and Agonda, beach shacks are allotted by the Department of Tourism in Morjim except beach portion abutting Survey number 117 for the past two decades. The shacks in Morjim are allotted beyond this area with the following conditions/guidelines:

(a) No beach beds to be set up in intertidal zone
(b) Beach shacks should desist from installing any outdoor illumination. The indoor lighting should be muted and provided with opaque shields on the sea facing side
(c) Playing of loud music by the shacks beyond 6 p.m. and holding of beach parties to be prohibited
(d) Movement of any automobile on the beach to be prohibited
(e) It should be made incumbent upon the shack licensees to play a proactive role in ensuring conducive conditions to marine turtles, besides information sharing with staff of the Forest Department, which monitors the entire coast

Recently, the Goa Coastal Zone Management Authority (GCZMA) has developed a draft Sea Turtle Management Plan for Galgibaga Beach.

2.2.3 Archaeological and heritage sites

As per the CRZ Notification 2011 areas or structures of archaeological importance and heritage sites on land and underwater are categorized as CRZ I areas. The areas that fall within the archeological and heritage sites have been excluded while determining the potential areas for temporary structures.

2.2.4 Mangroves

In Goa, mangroves are present on the Mandovi and Zuari estuaries and Cumbarjua Canal. In addition, mangrove vegetation is also found on other parts of Galgibag, Talpona, Sal, Chapora and Terekhol river mouths and in Khazan lands. Goa has 16 true mangrove species belonging to 11 genera and 7 families. Mandovi River supports luxuriant mangrove forests with maximum species diversity in Goa. *Avicennia marina* grows in the estuarine mouth, *Aegicerascorniculatum, Kandeliacandel, Rhizophoraapiculata, R. mucronata and Sonneratiaalba* in the upstream region and *Acrostichumaureum, Acanthus ilicifolius, Derris heterophylla and Excoecariaagallocha* in the mid-estuarine region. In the present study, a total of 24 mangroves patches were mapped in Goa, spanning to an extent of 33.01km^2. Mangrove deforestation is comparatively less in Goa and has been surpassed by natural regeneration. *Avicenniaofficinalis* is the dominant mangroves species, representing 50% of Importance Value Index (IVI).

Figure 10: Mangroves of Goa

2.2.5 Coral Reefs

In Goa, coral reefs are confined only to the Grand Island (15°21'3.696"; 73°47' 4.102"). Live coral cover in Grand Island accounts for 50.8% of the benthic substrate. The coral life form diversity in Grand Island was observed to be moderate (Shannon-

Weiner index H' = 1.0 and included various life forms such as encrusting, massive, sub-massive and foliose type; of which foliose corals were the dominant forms. (D=0.41).

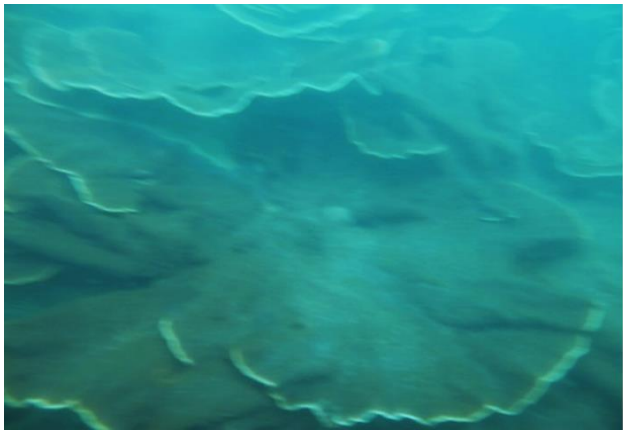


Figure 11: Turbinaria mesenterina

Figure 12: Gorgonians

Figure 13: Carijoa riisei

Figure 14: Dendrophyllia sp.

Coral species observed in Grand Island, Goa

The reef diversity comprised 15 species of corals, 196 species of fishes including commercial and ornamental fishes, 108 species of molluscs, 68 species of crustaceans, 4 species of mammals, 5 species of reptiles and major flora such as seagrasses (2 species) and seaweeds (143 species). *Favitessp, Turbinaria mesenterina, Dendrophyllia sp. and Turbinaria peltata*were the dominant coral species observed in Goa. The corals in Grand Island, Goa were found to be under conservation class 2 (80.2% of competitors; 19.8% of stress tolerators).

2.2.6 *Marine Protected Areas*

Chorao Island wildlife sanctuary is the only marine protected area in Goa (Fig. 2.4) with a total area of 1.78 sq km. This Sanctuary is crisscrossed with a network of water channels. The "Mangrove Scrub" type of vegetation that is found here occurs in small isolated areas along the banks of Mandovi and Mapusa rivers.

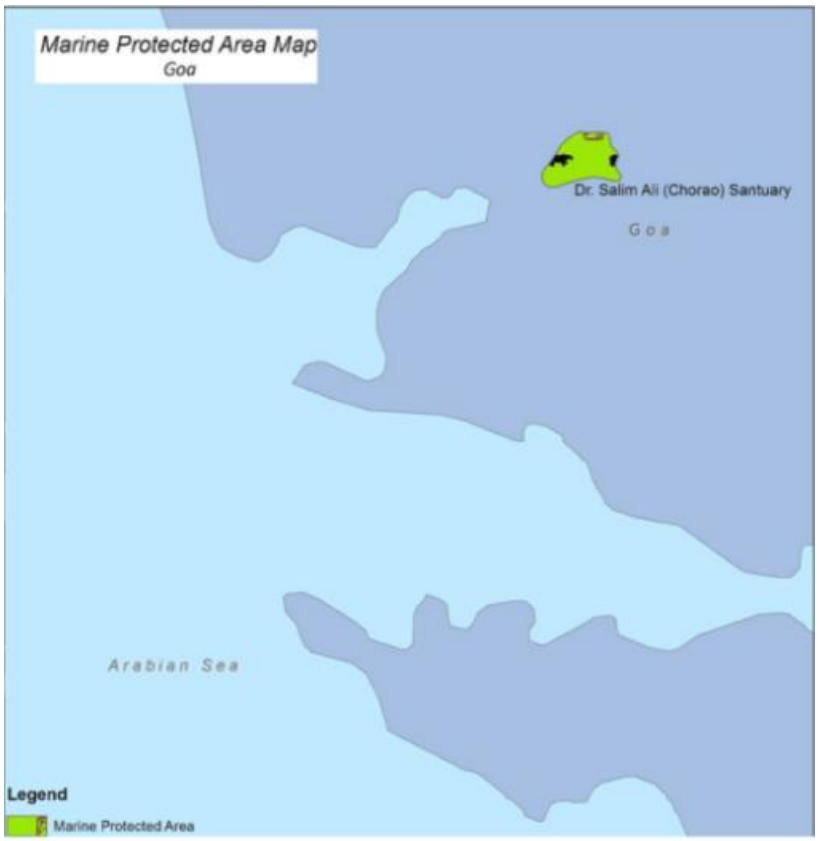


Figure 15: Marine Protected Area in Goa

2.2.7 *Restricted Areas as per Regional Plan of Goa*

For determining the potential area available for temporary structures in the private areas, the area that falls within the ECO 1 as specified in the TCP Regional Plan has been excluded.

3. Assessment of Carrying Capacity

3.1 Introduction

The study to assess "Carrying Capacity of Beaches in the State of Goa for providing Shacks and other Temporary Structures" was given to the National Centre for Sustainable Coastal Management (NCSCM). The State Government through the Department of Tourism has been allotting shacks on its beaches for almost two decades and has a well-defined shack policy since 1997. Beach shacks have been existing on Goan beaches since 1970s and have become a major source of livelihood for the local inhabitants of the coast.

The Department of Tourism has been issuing No Objection Certificate (NOC) for erection of purely temporary and seasonal structures customarily put up between the months of September to May in private areas prior to 1991. A policy for regulating beach shacks by the Department of Tourism is in place since 1997-98.

3.2 Concepts for beach carrying capacity

It was with concern, and recognition of the need to understand coastal systems in terms of developing sustainable tourism, that the concept of carrying capacity arose in the context of tourist areas[2]. The intention is to avoid saturation levels that put natural systems at risk and achieve users' level of satisfaction. In the case of beaches, their planning and management will depend on innumerable factors, but without doubt one that should be a condition in terms of utilization is the carrying capacity. The importance of this indicator is fundamental in that as the recreational use of a beach intensifies, the quality of satisfaction for the users can diminish[1].

Defining the carrying capacity of a beach is undoubtedly a complex issue, where consensus is hard to be achieved. Taking into consideration the factors such as beach topography, location of access points, parking availability, or the perception by users could actually be more important than the total sand area utilizable for recreational purposes. Since the distribution is not homogeneous all over the beach, the use of a standard density application is not appropriate.

[2]Silva et al. (2007). The Management of Beach Carrying Capacity: The case of northern Portugal. Journal of Coastal Research, Special Issue 50; 135-139.

3.2.1 Physical Carrying Capacity

Physical Carrying capacity is characterized as a measure of spatial limits of an area expressed by the maximum number of units that can be occupied in a sustainable way (Schwartz, 2005)[3]. In order to study the physical carrying capacity of a beach, it is crucial to accurately measure the available area for recreational purposes on each beach. Determining the physical capacity for certain activities can, however, become problematic when subjective elements are introduced. For example, the maximum number of people that can visit a beach depending on human perceptions and tolerance limits. However, the beaches are not limited only to the sand zone (UNEP, 2008)[4] and for this reason, water carrying capacity should be also accounted for, although some authors suggest some difficulties, for reasons which depend on the perception of security and risk tolerance (Schwartz, 2005).

3.2.2 Ecological Carrying Capacity

At its simplest, this is a measure of the population that an ecosystem can sustain, defined by the population density beyond which the mortality rate for the species becomes greater than the birth rate. The approach is widely adopted in fisheries science (e.g., Busby et al., 1996)[5]. In a recreational context, ecological carrying capacity can be defined as the stress that an ecosystem can withstand, in terms of changing visitor numbers or activities, before its ecological value is unacceptably affected. This approach raises the difficult question of defining ecological value and what constitutes an unacceptable change in it.

3.2.3 Social Carrying Capacity

This is essentially a measure of crowding tolerance. It has been defined as "the maximum visitor densities at which recreationists still feel comfortable and uncrowded" (De Ruycket al., 1997)[6]. In the absence of additional changes, beyond this density visitor numbers start to decline. The social carrying capacity can, however, be influenced by factors such as the recreational infrastructure, visitor attitudes, and socio-cultural norms.

3.2.4 Economic Carrying Capacity

This seeks to define the extent to which an area can be altered before the economic activities that occur in the area are affected adversely. It therefore attempts to measure changes in economic terms (Rees, 1992).

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[3] Schwartz, M. L., 2005. Encyclopedia of Coastal Science.24 Springer. Netherlands. 145-226p.

[4] UNEP – United Nations Environment Programme, 2008. Sustainable Tourism Development in Croatian Coastal Area–Pilot project Baska Voda. <http://www.papthecoastcentre.org/pdfs/Baska%20Voda%20Tourism.pdf>

[5] Busby, P.J.,Wainwright, T.C., Bryant,G.J., Lierheimer, L.J.,Waples,R.S., Waknitz, F.W., and Lagomarsino, I.V., 1996. Status review of West Coast Steelhead from Washington, Idaho, Oregon, and California. NOAA Technical Memorandum NMFS-NWFSC-27

[6] De Ruyck, M.C., Soares, A.G., and MacLachlan, A., 1997. Social carrying capacity as a management tool for sandy beaches. Journal of Coastal Research, 13: 822–830.

3.3 Study Area

The study area consists of:
(a) beach stretches where the State Government is allotting shacks on the beach and
(b) private areas adjacent to the beach stretches (between HTL and seaward survey boundary) that are utilized for erection of shacks and other temporary structures

3.3.1 Aspects Considered

The following aspects were considered for assessing the carrying capacity

(a) Beach areas:

- Ecologically Sensitive Areas (ESAs) for turtle nesting grounds
- Area and length of beach available for erection of shacks after deduction of ESAs, fishing villages, entry points, erosion prone areas, etc.
- Number of footfalls as estimated based on survey carried out by the Department of Tourism through an agency during peak and off season of 2015 -16
- The number of shacks allotted by the Department of Tourism on the beach stretches and areas occupied by the shacks with appropriate buffers
- Application of the principle of 33% of the potential area available
- Appropriate distance between each shacks and frontage area for accommodating deckbeds

(b) Shacks and other Temporary structures in private areas(Seaward survey boundary to 200 m in CRZ)

- Areas within survey boundary and 200m in CRZ
- UDPFI guidelines for small and medium towns with specific to commercial areas.
- Guidelines for private shacks/ huts/ in the area between seaward survey boundary and 200m in CRZ and environmental safeguards
- Ecologically Sensitive Areas ESAs such as Sand dune, Archaeological site, Reserve forest Area, etc.

Indicators used to develop Scenarios

The following indicators that indicate thresholds/ carrying capacity include:

(a) Overcrowding/congestion/ saturation – Number of beds per hectare (e.g. upto 50 beds/ ha for rural areas and up to 100 beds/ ha for urban areas)
(b) Tourist infrastructure (No. of beds to population) (Rural - up to 0.5 and Urban up to 1)
(c) Area available (in sq m) for tourists and residents (e.g. 50 sq m per person for rural and 25 sq m per person for urban areas)

3.4 Methodology for Assessment of Carrying Capacity

The chart below describes the details of assessments undertaken under each category.

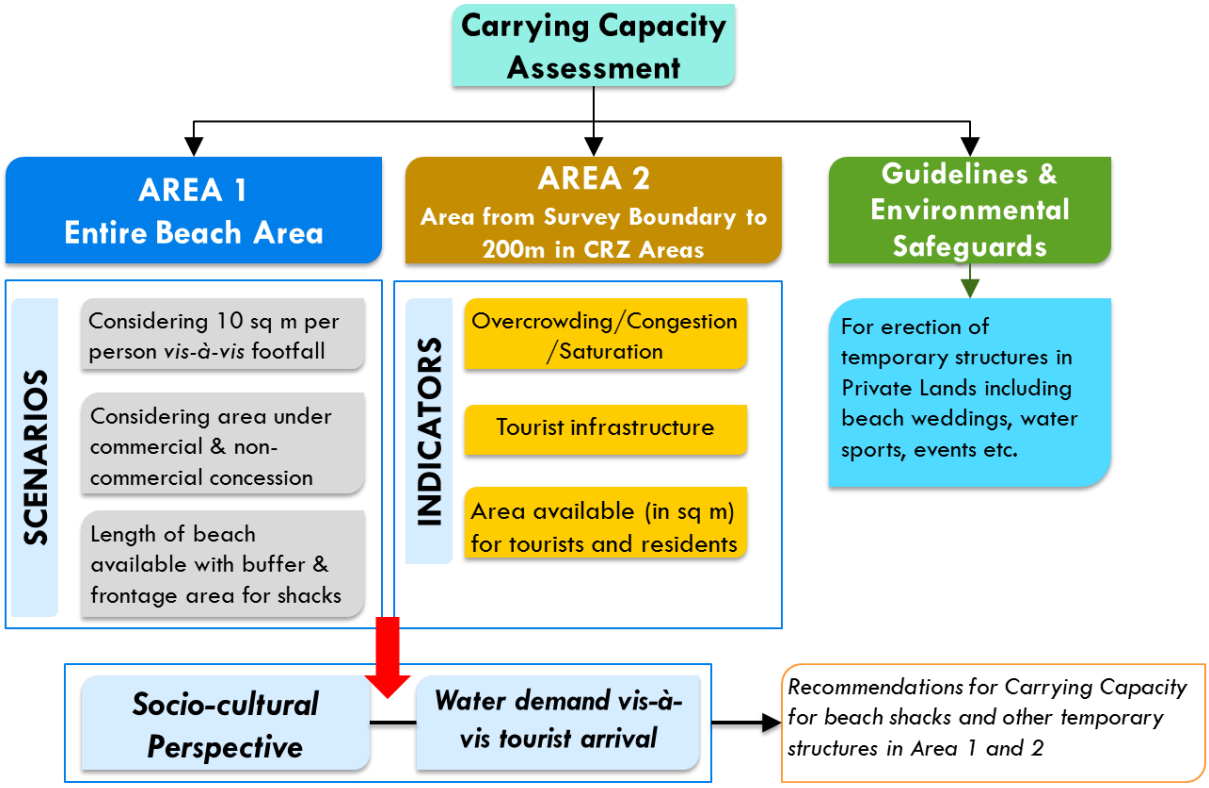

Figure 16: Methodology and approach for assessment of carrying capacity

Area 1 (Beaches of Goa)

The entire beach stretch of Goa has been considered for calculation of the beach area and the following two assessments have been made:

(c) **Carrying capacity w.r.t number of tourists (i.e.. number of tourists that can visit a particular beach stretch)**

(d) **Carrying capacity w.r.t number of beach shacks (i.e.. number of shacks that can be erected on the beach stretch in addition to those existing)**

In order to determine the **carrying capacity with regard to number of tourists,** assessment was made considering the entire beach area available and the average footfalls based on internationally accepted norms. All ESAs, erosion prone areas, river mouths/creeks, fishing spaces are deducted from the available beach areas and the final available space for tourists is determined.

To determine the carrying capacity with regard to potential areas for shacks, only the beach areas which falls beyond High Tide Line (HTL) during fair-weather season (Non-monsoon) has been taken into consideration. All ESAs, erosion prone areas, river mouths/creeks, fishing spaces are excluded from the potential areas and the final available space for shacks is determined.

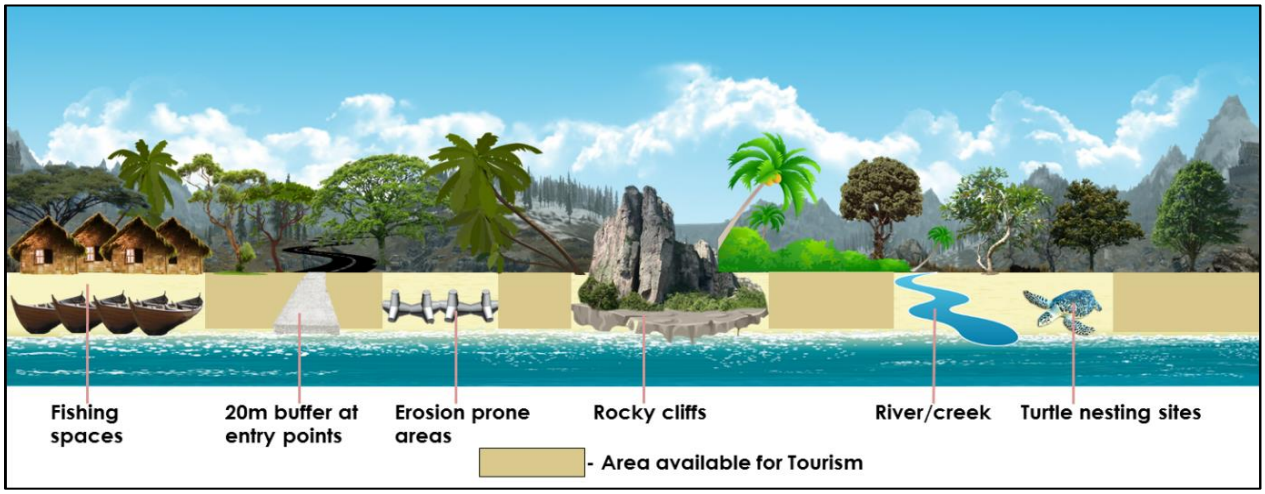

Figure 17: Conceptual drawing of beach area available for tourism

The assessment was approached in three different scenarios as explained in Table 13.

Table 13: Scenarios for beach carrying capacity

Scenario		Approach
Scenario 1:	Considering 10 sq m. per person vis-a-vis footfalls	Considering the potential beach area available, the carrying capacity is calculated by dividing the beach area available by 10 (area required per person).
Scenario 2:	Considering Area under commercial concession and non-commercial concession	The carrying capacity of the beach was calculated by dividing the beach area under shacks by 7.5 (commercial concession) and the remaining beach area by 15 (non-commercial concession)
Scenario 3:	Length of the beach available with buffers between shacks and frontage areas	Considering potential beach length available for shacks (after deducting ESAs and other factors), the number of shacks that can be erected is determined.

Area 2 (area between survey boundary and 200m in CRZ Area)

For determining the carrying capacity of shacks and other temporary structures in private areas, indicators have been developed based on overcrowding, tourist infrastructure and area available for tourists and residents as explained in Table 14.

Table 14: Development of indicators for carrying capacity of temporary structures in 200m CRZ areas

Indicator	Approach
Indicator 1:	Overcrowding/congestion/ saturation – Number of beds per hectare (e.g. upto 50 beds/ ha for rural areas and upto 100 beds/ ha for urban areas)
Indicator 2:	Tourist infrastructure (No. of beds to population) (Rural - up to 0.5 and Urban up to 1)
Indicator 3:	Area available (in sq m) for tourists and residents (e.g. 50 sqm per person for rural and 25 sq m per person for urban areas)

Carrying capacity with respect to the socio-cultural aspects and availability of water

The socio-cultural aspects i.e. the ratio of local population to tourist has been used as an indicator to analyze the impact of tourist arrival on local population. The water demand during peak season for the tourists and the local population has been assessed based on secondary data provided by the Public Works Department (PWD).

Establishment of guidelines and environmental safeguards for erecting private shacks

The guidelines and environmental safeguards for erecting of private shacks/ huts/ cottages/ temporary structures were based on Planning Principles, Ecological safeguards, Socio-economic considerations following international best practices.

3.4.1 Database used (Primary/Secondary)

Database used for determining carrying capacity for temporary structures in coastal areas of Goa comprises of data from both primary and secondary sources. Primary data was collected through extensive field surveys of the beach areas along the entire coast of Goa and for mapping of ESAs (particularly sand dunes) and demarcation of High Tide Line(HTL) by scientists of NCSCM.

The secondary data consists of the following:

(i) Tourism Policy adopted by the State Government for the period 2013-16.
(ii) Details of hotels, guest houses and shacks and other temporary structures in private areas registered with the Department of Tourism.
(iii) Footfalls on various beach stretches as assessed by the agency appointed by the Department of Tourism.
(iv) Details of parking, public conveniences, beautification, entrance plaza extra as provided by The Goa Tourism Development Corporation.
(v) Use of beach and other private areas in CRZ for wedding and other recreational purposes including events and parties, water sport activity, night bazar and flea markets as provided by The Goa Tourism Development Corporation.
(vi) Turtle nesting sites and yearly data of Turtle nesting's as provided by The Forest Department
(vii) Fishing canoes as registered with the Department of Fisheries, Government of Goa. CMFRI Census Report, 2010.
(viii) Economic Survey Reports of Goa.

3.4.2 Instrumentation (GIS and RS)

In order to study the physical carrying capacity of a beach, it is crucial to accurately measure the available area for recreational purposes on each beach stretch. The total

area and length of beach available for shacks were calculated based on the availability of sub aerial area of the beach stretch between two headlands. Using ArcMap and ERADAS IMAGINE software, available sub aerial beach area, entry points, ESAs, fishing space, of river/creek openings, etc. are extracted from aerial photographs, satellite images and Google image. Ground truth was carried out along the entire beach stretches of North and South Goa, using GPS and Distometer to evaluate the authenticity of the extracted data. Finally, the measurements and computation for each beach stretch was finalized using ArcMap software. The computation enabled zoning of the beach stretches according to the different ecologically sensitive area, fishing space, river/creek areas, eroding areas, and the available beach area for erection of temporary shacks.

3.4.3 Field survey & Transect Walks

NCSCM team undertook extensive field surveys along all the beaches of Goa. Primarily, the following tasks were performed during the survey:

i. Identification of existing beach shacks and other temporary structures
ii. Identification of existing entry points
iii. Identification of Ecologically Sensitive Areas (e.g. mapping of Sand dunes, turtle nesting sites etc.)
iv. Identification of fishing spaces

Based on the above methodology, carrying capacity was calculated and the results are discussed in the following chapters.

4. Analysis of Carrying Capacity

The carrying capacity of the beach area has been assessed in two ways i.e. with respect to a) tourist footfall and b) number of shacks. While assessing the carrying capacity in terms of tourist footfall, the beach area within the fair weather berm and the survey boundary have been taken into consideration. For assessing carrying capacity in terms of number of shacks and other temporary structures in private areas, the beach area available from HTL up to the survey boundary has been considered. For determining the distance between shacks, buffer for fire safety and other services has been taken into consideration. The following fire safety standards (Table 15) from various National and international agencies for various temporary structures was examined.

Table 15: National/ International Fire Safety Standards for Temporary Structures

FIRE SAFETY STANDARDS	DETAILS
NATIONAL STANDARDS	
Bureau of Indian Standards	4.5m on all sides between the temporary structure and the adjacent buildings or other similar structures
Goa State Fire Force	Margin of at least 3m should be kept on all sides away from any pre-existing walls or buildings
INTERNATIONAL STANDARDS	
Cambridgeshire Fire & Rescue Service, USA	6m - Minimum distance between marquees
U.S Department of Energy, Washington DC, USA	Separation distance/ width between re-locatable structure based on the height of the structure – for a structure of 6m, separation distance is 9m

After discussion with the various departments from Government of Goa, a buffer distance of **5m** between two adjacent shacks was recommended. For determining the area occupied by each shack, buffer distance of 5m (for fire safety and other services) between adjacent shacks and frontage length of 10m (for deck beds) was considered (Table 16).In private areas, the buffer between temporary structures can be maintained as 3m, and can be relaxed to 2m if materials used are fire resistant.

Table 16: Area required for beach shack including buffer distance and beach bed

Sr.No.	*Type of shack / Category*	*Size of shack*		*Frontage*	*Buffer between shacks*	*Total area including frontage and buffer (in sq.mts.)*
		Width	Length			
1	A	8m	12m	10m	5m	286
2	B	8m	18m	10m	5m	364

4.1 AREA 1: Area within the fair weather berm and the survey boundary

To calculate Area 1, the beach area during fair season was used to determine the carrying capacity in terms of tourist footfall and beach shacks. Three scenarios have been considered

1. Number of tourists that can be accommodated on the beach stretch with the concept of 10sqm per visitor
2. Area under commercial concession and non-commercial concession and
3. Number of shacks that can be erected as per the length of the beach available between HTL and survey boundary as a precautionary principle. In addition, 33% of the potential area available was considered for erection of shacks.

4.1.1 Scenario 1: Considering 10 sqm per person vis-à-vis foot falls

According to WTO (1988), a beach should not have more than 1000 people per hectare. Therefore each beach tourist should have at least 10 sqm of the beach area." In this scenario, the carrying capacity (in terms of tourist footfall) is determined based on the beach area available for tourism and dividing it by 10.

Further, to determine the area available for tourism, the entire beach area from the fair weather berm to the survey boundary was demarcated, the areas occupied by ESAs (turtle nesting sites, sand dunes), erosion prone areas, buffer at river mouth and creeks, buffer area of 20m width at entry points, and fishing spaces were deducted, and the remaining area available was accounted for tourism. The calculation for determining area available for tourism is provided in Table 17. On computing the area available for tourism, carrying capacity is assessed in terms of tourist footfall as given in Table 18.

Table 17: Determining the area available for tourism

Sr no.	Name of Beach (South to North)	Total Beach Area (sq.m)	Turtle Nesting Area (sq.m)	Sand Dune Area (sq.m)	Erosion Prone Area (sq.m)	River Mouth Area (sq.m)	Creek Area (sq.m)	Entry Points-20 m Buffer Area (sq.m)	Fishing Space Area (sq.m)	Net ESA Area (sq.m) (TNS, Sand dune, Erosion, Creeks and River Mouth)	No Go Area (Sq.m) (Net ESA + Fishing Space + Entry Points Buffer)	No Go Length (m) (Net ESA + Fishing Space + Entry Points Buffer)	Beach Area Available for tourism (Sq.m) (Total Beach Area - No Go Area)
1	Polem	20158.15	0	0	0	0	5461.07	650.97	0	5461.07	6112.04	153.82	14046.11
2	Galgibaga	75339.16	51550.68	0	0	14165.45	0	878.74	3288.22	51555.53	54843.75	2068.01	20495.41
3	Rajbag	38997.35	0	0	0	11873.28	5274.76	825.02	0	17148.04	17973.06	340.23	21024.29
4	Patnem	18343.5	0	0	0	0	0	626.58	0	0	626.58	20	17716.92
5	Colomb	4423.86	0	0	0	0	0	0	0	0	0	0	4423.86
6	Palolem	26050.31	0	0	0	0	3774.57	484.52	8678.25	3774.57	12629.29	813.94	13421.02
7	Agonda	83901.24	80070.83	0	0	8072.02	1304.01	992.8	6853.15	83901.24	83901.24	2973.43	0
8	Cola	9288.55	0	0	0	0	1519.95	272.81	1566.37	1519.95	3086.32	251.86	6202.23
9	Cabo De Rama	7200.97	0	0	0	0	4173.89	0	0	4173.89	4173.89	159.48	3027.08
10	Canaguinim	5999.21	0	0	0	0	3162.38	0	0	3162.38	3162.38	138.83	2836.83
11	Betul HL to Consaulim HL	1128790	0	0	0	13619.09	266822.1	29574.06	69207.39	280441.16	379222.61	7229.09	749567.06
12	Bogmalo	18592.46	0	0	0	0	3659.41	1446.05	5690.94	3659.41	9946.7	304.01	8645.76
13	Hansa	11739.86	0	0	0	0	0	693.28	0	0	693.28	29.71	11046.58
14	Baina	53196.95	0	0	0	0	2797.35	2623.27	26974.44	2797.35	30691.02	1174.02	22505.93
15	Grandmothers Hole	3034.89	0	0	0	0	0	247.05	0	0	247.05	20.11	2787.84
16	Vasco City	5462.35	0	0	0	0	0	706.19	5462.35	0	5462.35	273.54	0
17	Siridao	6344.01	0	0	0	0	0	0	1501.53	0	1501.53	213.3	4842.48
18	Bambolim	5850.15	0	0	0	0	0	0	0	0	0	0	5850.15
19	Vainguinim	2536.93	0	0	0	0	0	178.52	0	0	178.52	20.09	2358.41
20	Miramar	105077.4	0	0	0	0	17026.71	2461.43	28595.51	19488.14	50545.08	1231.39	54532.27
21	Coco	11105.54	0	0	0	0	4059.17	516.46	11105.54	4059.17	11105.54	533.76	0
22	Baga HL to Sinquerim HL	362855	0	0	5775.89	0	4875.25	14628.46	2760.41	5775.89	19894.35	510.61	342960.62
23	Anjuna	20079.16	0	0	0	0	0	1411.03	0	0	1411.03	81.14	18668.13
24	Ozra	15238.81	0	0	0	0	2424	1529.41	0	2424	3953.41	148.57	11285.4
25	Vagator-Chapora	23525.1	0	0	0	0	3333.05	421	0	3333.05	3333.05	83.79	20192.05

Sr no.	*Name of Beach (South to North)*	*Total Beach Area (sq.m)*	*Turtle Nesting Area (sq.m)*	*Sand Dune Area (sq.m)*	*Erosion Prone Area (sq.m)*	*River Mouth Area (sq.m)*	*Creek Area (sq.m)*	*Entry Points-20 m Buffer Area (sq.m)*	*Fishing Space Area (sq.m)*	*Net ESA Area (sq.m) (TNS, Sand dune, Erosion, Creeks and River Mouth)*	*No Go Area (Sq.m) (Net ESA + Fishing Space + Entry Points Buffer)*	*No Go Length (m) (Net ESA + Fishing Space + Entry Points Buffer)*	*Beach Area Available for tourism (Sq.m) (Total Beach Area - No Go Area)*
26	Morjim HL to Ashwem HL	129768.3	48769.8	0	0	27486.94	34581.66	7528.95	7203.01	83351.47	87956.06	2776.91	41812.28
27	Mandrem HL to Arambol HL	247751.2	133169.7	0	0	0	171000.4	16362.61	31074.14	174308.3	199237.56	3801	48513.68
28	Khalacha Wada	11085.65	0	0	0	0	7257.19	0	0	7257.19	7257.19	212.78	3828.46
29	Querim	38843.79	0	0	15795.42	0	0	1103.64	0	15795.42	16502.33	838.44	22341.46

Table 18: Determining the carrying capacity of tourist (10 sq. m/visitor)

S. No.	Name	Beach Area Available for tourism	Footfall (Nos)	Carrying capacity 10sqm/visitor of the beach area	Available Carrying capacity considering existing footfall	Remarks
1	Polem	14046.11	N.A	1404	N.A	Actual footfall needs to be assessed
2	Galgibaga	20495.41	N.A	2049	N.A	Actual footfall needs to be assessed
3	Rajbag	21024.29	N.A	2102	N.A	Actual footfall needs to be assessed
4	Patnem	17716.92	N.A	1771	N.A	Actual footfall needs to be assessed
5	Colomb	4423.86	N.A	442	N.A	Actual footfall needs to be assessed
6	Palolem	13421.02	2474	1342	-1132	***(-) indicates carrying capacity exceeded***
7	Agonda	0	700	0	-700	***(-) turtle nesting site***
8	Cola	6202.23	N.A	620	N.A	Actual footfall needs to be assessed
9	Cabo De Rama	3027.08	N.A	302	N.A	Actual footfall needs to be assessed
10	Canaguinim	2836.83	0	283	N.A	Actual footfall needs to be assessed
11	Betul HL to Consaulim HL	749567.06	7472	74956	67484	Additional Carrying Capacity available
12	Bogmalo	8645.76	261	864	603	Additional Carrying Capacity available
13	Hansa	11046.58	N.A	1104	N.A	Actual footfall needs to be assessed
14	Baina	22505.93	N.A	2250	N.A	Actual footfall needs to be assessed
15	Grandmothers Hole	2787.84	N.A	278	N.A	Actual footfall needs to be assessed
16	Vasco City	0	N.A	0	N.A	Actual footfall needs to be assessed
17	Siridao	4842.48	406	484	78	Additional Carrying Capacity available
18	Bambolim	5850.15	N.A	585	N.A	Actual footfall needs to be assessed
19	Vainguinim	2358.41	279	235	-44	***(-) indicates carrying capacity exceeded***
20	Miramar	54532.27	1316	5453	4137	Additional Carrying Capacity available
21	Coco	0	107	0	-107	***(-) indicates carrying capacity exceeded. It is a fishing village***
22	Sinquerim HL to Baga HL	342960.6	14931	34296	19365	Additional Carrying Capacity available
23	Anjuna	18668.13	608	1866	1258	Additional Carrying Capacity available
24	Ozra	15238.81	N.A	1524	N.A	Actual footfall needs to be assessed
25	Vagator-Chapora	23525.1	1234	2353	1119	Additional Carrying Capacity available
26	Ashwem HL to Morjim HL	41812.28	1430	4181	2751	Additional Carrying Capacity available
27	Arambol HL to Mandrem HL	48513.68	1785	4851	3066	Additional Carrying Capacity available
28	Kalacha	3828.46		382	382	Actual footfall needs to be assessed
29	Querim	22341.46	N.A	2234	N.A	Actual footfall needs to be assessed

4.1.2 Scenario 2: Area under commercial and non-commercial concession

In this scenario, the following assumptions based on studies by Silva et al., 2013 on management of beach carrying capacity: for the case of northern Portugal, where two types of uses are indicated.

- **Type 1: for Urban Beach with intensive use**: Available area of sand under commercial concession/ 7.5 sq m +Other Available area of sand not under commercial concession / 15 sq m.
- **Type 2:for Non-Urban (Rural) Beach with intensive use**: Available area of sand under commercial concession/ 15 sq m + Other Available area of sand not under commercial concession / 30 sq m.

Although Goa has both urban beach with intensive use and non-urban beach with intensive use, common assumptions were made as follows:

(a) The beach area occupied by beach shacks falls under commercial concession and was taken to be 7.5 sq m per tourist

(b) The beach areas which are not occupied by beach shacks classified under non-commercial concession and were assumed to be 15 sq m per tourist.

Carrying capacity (in terms of tourist footfall) was then determined by adding (a) and (b) above. Assessment of Carrying capacity of beach areas under commercial and non-commercial concessions with respect to tourist footfalls is provided in Table 19.

Table 19: Carrying capacity of beach areas under commercial and non-commercial concessions with respect to tourist footfalls

S.No.	Name of Beach (south toNorth)	Beach Area Available for tourism	Area occupied by beach shacks	Carrying capacity = (Area under commercial concession (beach shacks)/ 7.5sq.m +balance area/15sq.m) in No.	Footfall	Available carrying capacity	Remarks
1	Polem	14046.11	0	936	N.A	N.A	Actual footfall needs to be assessed
2	Galgibaga	20495.41	0	1366	N.A	N.A	Actual footfall needs to be assessed
3	Rajbag	21024.29	0	1402	N.A	N.A	Actual footfall needs to be assessed
4	Patnem	17716.92	0	1181	N.A	N.A	Actual footfall needs to be assessed
5	Colomb	4423.86	0	295	N.A	N.A	Actual footfall needs to be assessed
6	Palolem	13421.02	966	1789	2474	-685	***(-) indicates carrying capacity exceeded***
7	Agonda	0	0	0	700	-700	***(-) turtle nesting – however footfall provided by Tourism Department***
8	Cola	6202.23	0	413	N.A	N.A	Actual footfall needs to be assessed
9	Cabo De Rama	3027.08	0	202	N.A	N.A	Actual footfall needs to be assessed
10	Canaguinim	2836.83	0	189	178	11	Additional Carrying Capacity available
11	Betul HL to Consaulim HL	749567.06	27248	51787	7472	44315	Additional Carrying Capacity available
12	Bogmalo	8645.76	464	1002	261	741	Additional Carrying Capacity available
13	Hansa	11046.58	0	736	N.A	N.A	Actual footfall needs to be assessed
14	Baina	22505.93	464	1926	N.A	N.A	Actual footfall needs to be assessed
15	Grandmothers Holy	2787.84	0	186	N.A	N.A	Actual footfall needs to be assessed
16	Vasco City	0	0	0	N.A	N.A	Actual footfall needs to be assessed
17	Siridao	4842.48	644	916	406	510	Additional Carrying Capacity available
18	Bambolim	5850.15	0	390	N.A	N.A	Actual footfall needs to be assessed
19	Vainguinim	2358.41	0	157	279	-122	***(-) indicates carrying capacity exceeded***
20	Miramar	54532.27	0	3635	1316	2319	Additional Carrying Capacity available

S.No.	Name of Beach (south toNorth)	Beach Area Available for tourism	Area occupied by beach shacks	Carrying capacity = (Area under commercial concession (beach shacks)/ 7.5sq.m +balance area/15sq.m) in No.	Footfall	Available carrying capacity	Remarks
21	Coco	0	0	0	107	-107	***(-) indicates carrying capacity exceeded***
22	Sinquerim HL to Baga HL	342960.62	46648	66395	14931	51464	Additional Carrying Capacity available
23	Anjuna	18668.13	2254	3341	608	2733	Additional Carrying Capacity available
24	Ozra	15238.81	1488	1115	N.A	N.A	Actual footfall needs to be assessed
25	Vagator-Chapora	23525.1	288	1588	1234	354	Additional Carrying Capacity available
26	Ashwem HL to Morjim HL	41812.28	3542	6086	1430	4656	Additional Carrying Capacity available
27	Arambol HL to Mandrem HL	48513.68	3864	6833	1785	5048	Additional Carrying Capacity available
28	Kalacha	3828.46	N.A	0			
29	Querim	22341.46	1932	3285	N.A	N.A	Actual footfall needs to be assessed

4.1.3 Scenario 3: Length of the beach available for shacks with buffer and frontage areas

As the beach area beyond HTL is considered to be suitable locations for erection of shacks in terms of safety from waves and erosion, the beach areas between HTL and the survey boundary were considered. The beach area under ESAs, river mouth, creeks, fishing space and buffer area at entry points has been excluded from the available area. For the remaining beach areas, only the length of the beach was used for calculation. The total length that is available for erection of shacks is provided in Table 20

Table 20: Length of beach available for erection of shacks for Area-1(Beach Area)

Sl No.	Major Beach Name (South to North)	Beach length available for Shacks, after deducting ESAs, River mouth, creeks, erosion, fishing space, entry point buffer
1	Polem	565
2	Galgibaga	889
3	Rajbag	736
4	Patnem	692
5	Colomb	179
6	Palolem	727
7	Agonda	0 (ESA)
8	Cola	395
9	Cabo De Rama	181
10	Canaguinim	305
11	Betul to Cansaulim (Sancoale Railway Station)	19707
12	Bogmalo	181
13	Hansa	81
14	Baina	1533
15	Grandmothers Holy	208
16	Vasco City	285
17	Siridao	190
18	Bambolim	679
19	Vainguinim	216
20	Miramar	1708
21	Coco	340
22	Sinquerim to Baga	7135
23	Anjuna	1091
24	Ozra	101
25	Vagator-Chapora	907
26	Morjim	891
27	Ashwem and Mandrem	1195
28	Arambol and Kalacha	1973
29	Querim	1134

As the beach shacks are to be linearly placed along the beach, the potential number of shacks that can be erected is calculated by dividing the available beach length by the width of the shacks. Here the width of the shacks is taken to be 13m along with buffer i.e.8m (width) + 5m (buffer on both sides of the shacks). The area of the occupied shacks is taken to be 364 sq m (including buffer and frontage areas for deck beds). As a conservative approach only 33% of the potential area has been considered available for beach shacks. The beach carrying capacity in terms of shacks is given in Table 21.

Table 21: Beach carrying capacity with respect to number of shacks

Number of shacks that can be accommodated								
Sl No.	**Major Beach Name (South to North)**	**Beach length available for shacks**	**No. of shacks that can be accommodated = Length of the beach available / 13**	**Potential area to be occupied by shacks (area of 1 shack and deck beds (364 sqm) x no. of shack)**	**33% of the potential area (sqm)**	**Final number of shacks that can be erected in the potential area**	**Number of shacks allotted by Government of Goa**	**Available Carrying Capacity (Nos of shacks)**
1	Polem	565	44	16016	5285.28	15	0	15
2	Galgibaga	889	68	24752	8168.16	22	0	22
3	Rajbag	736	57	20748	6846.84	19	0	19
4	Patnem	692	53	19292	6366.36	17	0	17
5	Colomb	179	14	5096	1681.68	5	0	5
6	Palolem	727	56	20384	6726.72	18	3	15
7	Agonda	0	0	0	0	0	0	0
8	Cola	395	30	10920	3603.6	10	0	10
9	Cabo De Rama	181	14	5096	1681.68	5	0	5
10	Canaguinim	305	24	8736	2882.88	8	0	8
11	Betul to Cansaulim (Sancoale Railway Station)	19707.56	1516	551824	182102	500	101	339
12	Bogmalo	181	14	5096	1681.68	5	2	3
13	Hansa	81	6	2184	720.72	2	0	2

Number of shacks that can be accommodated								
Sl No.	**Major Beach Name (South to North)**	**Beach length available for shacks**	**No. of shacks that can be accommodated = Length of the beach available / 13**	**Potential area to be occupied by shacks (area of 1 shack and deck beds (364 sqm) x no. of shack)**	**33% of the potential area (sqm)**	**Final number of shacks that can be erected in the potential area**	**Number of shacks allotted by Government of Goa**	**Available Carrying Capacity (Nos of shacks)**
14	Baina	1533	118	42952	14174.16	39	2	37
15	Grandmothers Holy	208	16	5824	1921.92	5	0	5
16	Vasco City	285	22	8008	2642.64	7	0	7
17	Siridao	190	15	5460	1801.8	5	2	3
18	Bambolim	679	52	18928	6246.24	17	0	17
19	Vainguinim	216	17	6188	2042.04	6	0	6
20	Miramar	1708	131	47684	15736	43	0	43
21	Coco	340	26	9464	3123.12	9	0	9
22	Sinquerim to Baga	7417	571	207844	68588.52	188	196	-8
23	Anjuna	1091	84	30576	10090.08	28	8	20
24	Ozrant	101	8	2912	960.96	3	8	-5
25	Vagator-Chapora	907	70	25480	8408.4	23	5	18
26	Morjim	891	69	25116	8288.28	23	11	12
27	Ashwem and Mandrem	1195	92	33488	11051.04	30	10	20
28	Arambol and Kalacha	1973	152	55328	18258.24	50	12	38
29	Querim	1134	87	31668	10450.44	29	6	23

The carrying capacity for erection of Beach Shacks is available in all the Beach stretches except from Baga to Siquerim where it has exceeded by 8 shacks. Therefore the number of shacks may be restricted to 188 as against the earlier allotment of 196 shacks. The carrying capacity of beach shack has exceeded by 5 shacks in Ozrant, hence the number of shacks shall be restricted to 3 as against the earlier allotment of 8 shacks.

4.2 AREA 2: Area within the seaward survey boundary and 200m in CRZ

For determining the carrying capacity of temporary structures in private areas "Regional Development plan of Goa 2021"provided by the Town & Country planning Department, Goa was used extensively. For this study, the area that falls between the survey boundary and 200m in the CRZ Area is calculated. The areas under the following categories have been excluded while determining the potential areas for temporary structures:

- No Development slopes
- Paddy fields/Khazans
- River/Nallas/Ponds
- Sand Dunes
- Archeological and Heritage sites

As there are no existing landuse category for temporary structures and its distribution structure in development plans, the UDPFI norms (Table 22) of medium towns with specific to commercial areas was adopted.

Table 22: Proposed Land Use structure of urban centers in Plain areas.

	Percent of developed areas			
Land use category	**Small**	**Medium**	**Large cities**	**Metro Cities**
Residential	45-50	40-45	35-40	35-40
Commercial	2-3	3-4	4-5	4-5
Industrial	8-10	8-10	10-12	12-14
Public & semi-public	6-8	10-12	12-14	14-16
Recreational	12-14	18-20	18-20	20-25
Transport & communication	10-12	12-14	12-14	15-18
Agriculture &water bodies	Balance	Balance	Balance	Balance
Total developed areas	100	100	100	100

Source: UDPFI guidelines Vol 1, *Ministry of Urban Affairs and Employment*

As per the UDPFI guideline, the land-use structure for commercial activity varies from 2 to 3% for small towns to 4 to 5% for large and metro cities. For this study, an average

of 4% of the developable area has been considered as the potential area available for temporary structures.

4.2.1 Indicators Developed

As there are no comprehensive methodology/studies/research to determine carrying capacity especially for temporary structures, literature from various sources[7] were referred to derive an acceptable methodology which could be made applicable for this study. Based on literature survey, a set of three indicators were developed for assessing the carrying capacity in private areas as explained in Table 23.

Table 23: Indicators used to determine carrying capacity in Area 2

Indicator 1:	Overcrowding/congestion/ saturation – Number of beds per hectare (e.g. upto 50 beds/ ha for rural areas and upto 100 beds/ ha for urban areas)
Indicator 2:	Tourist infrastructure (No. of beds to population) (Rural - up to 0.5 and Urban up to 1)
Indicator 3:	Area available (in sq m) for tourists and residents (e.g. 50 sqm per person for rural and 25 sq m per person for urban areas)

Relevant section of various literature/Research pertaining to this study is given in **Annex 10.**

4.2.2 Limitation of data

As the method adopted is an indicative approach and exact data was not available, error or variation is likely to occur from the actual scenario. However to minimize the variation between the actual and the derived scenario, members from Pollution control Board (PCB), Coastal zone Management Authorities (CZMA), Department of Tourism, and other department of Goa government have been consulted to derive and adopt tentative data, which could be made applicable for this study.

For the assessment, although we have considered the study area as 200m within CRZ, the relevant data pertaining to it is not available. The various aspects where the exact data were not available for the study and assumption/tentative data that has been considered are mentioned below.

(i) **Population:** Data on population in coastal panchayats/villages within 200m was not available; therefore the entire coastal village panchayat data from Census 2011 was taken in this study.

[7] Coccossis, H., Mexa, A. and Collovini, A. (2002) Defining, measuring and evaluating carrying capacity in European tourism destinations; European Commission, 2002; http://ec.europa.eu/environment/iczm/pdf/tcca_en.pdf extracted on 26 December 2016

(ii) **Tourist footfall and number of beds:** The tourist footfall and the number of beds within the 200m was not available, the number of beds within the coastal taluks(as provided by the Department of Tourism) was used. As most of the hotels are located towards the coast, this assumption of data brings scenarios closer to the actual footfall.

(iii) **Commercial areas:** As the data of existing commercial areas within 200m is not available, therefore the area occupied by shacks and Huts (as per the record) was used.

4.2.3 Assessment of carrying capacity in terms of indicators within 200m in CRZ area

Carrying capacity was assessed based on indicators that were developed. Table 24 provides the detailed assessment of the indicators within 200m in CRZ areas.

Table 24: Assessing the carrying capacity in terms of indicators

District	Coastal Taluk	Coastal Panchayat	Developable area between survey boundary & 200m (in sq m)	Potential area available for temporary structures = 4% of the total area (in sq m)	Area occupied by Shacks and temporary structures based on the records available in the Department of Tourism	Balance Area Available	Population as per census 2011	Number of beds in Hotels	Number of beds in Temporary structures	Overcrowding (no. of tourist per sqm) (developable area)	Tourist infrastructure (No. of beds to population) (Rural - up to 0.5 and Urban up to 1)	No. of beds per hectare (0 - 50 Rural and 51 -100 urban)	Sqm area available for tourist and resident (50 sqm per person Rural and 25 sqm per person urban)	Recommendation
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
South Goa	**Canacona**	Loliem Polem	526963	21079	608	20471	4797	0	40	0.000076	0.0083	0.76	108.9	Rural, low intensive use, low-infrastructure area. Additional shacks, huts / Tents / cottages could be considered as it well within the criteria for carrying capacity limits (Column L, M and N).
		Poinguinim / Talpona/ Galgibag	494584	19783	160	19623	6625	60	20	0.000162	0.0121	1.62	73.8	Rural, low intensive use, low-infrastructure area. Additional shacks, huts / Tents / cottages could be considered as it well within the criteria for carrying capacity limits (Column L, M and N). ***However in Galgibag no additional shacks, huts / Tents / cottages should be permitted in view of the Turtle nesting sites***
		Nagarcem Palolem/ Patnem/ Colomb/ Raj Bagh	831153	33246	33088	158	32738	1020	2840	0.004644	0.1179	46.44		Urban intensive use with limited infrastructure. As the area is not fulfilling the criteria at column N and also close to the limit in Column M, ***No additional shacks, huts / Tents / cottages to be considered.***
		Agonda	442931	17717	10928	6789	3801	120	772	0.002014	0.2347	20.14	94.4	Rural, Medium intensive use, low-infrastructure area. ***No additional shacks, huts / Tents / cottages should be considered as this is a designated turtle nesting site***

District	Coastal Taluk	Coastal Panchayat	Developable area between survey boundary & 200m (in sq m)	Potential area available for temporary structures = 4% of the total area (in sq m)	Area occupied by Shacks and temporary structures based on the records available in the Department of Tourism	Balance Area Available	Population as per census 2011	Number of beds in Hotels	Number of beds in Temporary structures	Overcrowding (no. of tourist per sqm) (developable area)	Tourist infrastructure (No. of beds to population) (Rural - up to 0.5 and Urban up to 1)	No. of beds per hectare (0 - 50 Rural and 51 -100 urban)	Sqm area available for tourist and resident (50 sqm per person Rural and 25 sqm per person urban)	Recommendation
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
		Cola / Cabo de Ram	1138912	45556	2272	43284	5382	14	158	0.000151	0.0320	1.51	205.1	Rural, low intensive use, low-infrastructure area. Additional shacks, huts / Tents / cottages could be considered as it well within the criteria for carrying capacity limits (Column L, M and N)
	Quepem	Naquerim Quitol Canaguinim	436160	17446	-	17446	2062	0		0.000000	0	0	211.5	Rural, low intensive use, low-infrastructure area. Additional shacks, huts / Tents / cottages could be considered along with improvement in infrastructure
		Cavelossim-Mobor	373921	14957	1616	13341	1955	2219	40	0.006041			88.7	Rural, Medium intensive use, Medium-infrastructure area. As the area is not fulfilling the criteria at column L and M ,**No additional shacks, huts / Tents / cottages to be *considered.***
		Varca	289309	11572	864	10708	5439	1614	0	0.005579	0.2967			Rural, Medium intensive use, Medium-infrastructure area. As the area is not fulfilling the criteria at column M and N, ***No additional shacks, huts / Tents / cottages to be considered.***
		Cana-Benaulim	686444	27458	2544	24914	12413	2829	102	0.004270	0.2361	42.7	44.7	Urban intensive use with medium infrastructure area. Additional shacks, huts / Tents / cottages could be considered as it well within the criteria

District	Coastal Taluk	Coastal Panchayat	Developable area between survey boundary & 200m (in sq m)	Potential area available for temporary structures = 4% of the total area (in sq m)	Area occupied by Shacks and temporary structures based on the records available in the Department of Tourism	Balance Area Available	Population as per census 2011	Number of beds in Hotels	Number of beds in Temporary structures	Overcrowding (no. of tourist per sqm) (developable area)	Tourist infrastructure (No. of beds to population) (Rural - up to 0.5 and Urban up to 1)	No. of beds per hectare (0 - 50 Rural and 51 -100 urban)	Sqm area available for tourist and resident (50 sqm per person Rural and 25 sqm per person urban)	Recommendation
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
														for carrying capacity limits (Column L and N).
		Colva	346899	13876	2368	11508	6549	3130	62	0.009202			35.6	Rural intensive, infrastructure area. As the area is not fulfilling the criteria at column M and also close to the limit in Column L, ***No additional shacks, huts / Tents / cottages to be considered.***
		Betalbatim	162529	6501	768	5733	3551	950	24	0.005993	0.2743		35.9	Rural, Medium intensive use, Medium-infrastructure area. As the area is not fulfilling the criteria at column M, ***no additional tents/huts/cottages to be provided.***
		Majorda	319389	12776	848	11928	4831	1383	34	0.004437	0.2933	44.4	51.1	Rural, Medium intensive use, Medium-infrastructure area. ***No additional huts / tents / cottages should be considered*** however, shacks could be considered.
	Mormugao	Cansaulim Arossim Culim	397535	15901	288	15613	5617	704	0	0.001771	0.1253	17.7	62.9	Rural, low intensive use, low-infrastructure area. Additional shacks, huts / Tents / cottages could be considered as it well within the criteria for carrying capacity limits (Column L, M and N).

District	Coastal Taluk	Coastal Panchayat	Developable area between survey boundary & 200m (in sq m)	Potential area available for temporary structures = 4% of the total area (in sq m)	Area occupied by Shacks and temporary structures based on the records available in the Department of Tourism	Balance Area Available	Population as per census 2011	Number of beds in Hotels	Number of beds in Temporary structures	Overcrowding (no. of tourist per sqm) (developable area)	Tourist infrastructure (No. of beds to population) (Rural - up to 0.5 and Urban up to 1)	No. of beds per hectare (0 - 50 Rural and 51 -100 urban)	Sqm area available for tourist and resident (50 sqm per person Rural and 25 sqm per person urban)	Recommendation
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
		Pale-Valsao	535964	21439	288	21151	3510	126	0	0.000235	0.0359	2.4	147.4	Rural, low intensive use, low-infrastructure area. Additional shacks, huts / Tents / cottages could be considered as it well within the criteria for carrying capacity limits (Column L, M and N).
		Issorcim	190795	7632	544	7088	841	0	50	0.000262	0.0595	2.6	214.1	Rural, low intensive use, low-infrastructure area. Additional shacks, huts / Tents / cottages could be considered as it well within the criteria for carrying capacity limits (Column L, M and N).
		Chicolna - Bogmalo	388588	15544	432	15112	2680	450	36	0.001251	0.1813	12.5	122.7	Rural, intensive use, medium infrastructure area. Additional shacks, huts / Tents / cottages could be considered as it well within the criteria for carrying capacity limits (Column L, M and N).
North Goa	**Bardez**	Candolim	572051	22882	2416	20466	8500	6051	50	0.010665	0.7178		39.2	Urban intensive use, infrastructure area. As the area is not fulfilling the criteria at column M, and close to limit in colomn L and . ***No additional shacks, huts / Tents / cottages should be considered.***
		Calangute	661300	26452	7408	19044	13810	11369	368	0.017748	0.8499			Urban intensive use, infrastructure area. As the area is not fulfilling the criteria at column M, N and close to limit in

District	Coastal Taluk	Coastal Panchayat	Developable area between survey boundary & 200m (in sq m)	Potential area available for temporary structures = 4% of the total area (in sq m)	Area occupied by Shacks and temporary structures based on the records available in the Department of Tourism	Balance Area Available	Population as per census 2011	Number of beds in Hotels	Number of beds in Temporary structures	Overcrowding (no. of tourist per sqm) (developable area)	Tourist infrastructure (No. of beds to population) (Rural - up to 0.5 and Urban up to 1)	No. of beds per hectare (0 - 50 Rural and 51 -100 urban)	Sqm area available for tourist and resident (50 sqm per person Rural and 25 sqm per person urban)	Recommendation
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
														column L. ***No additional shacks, huts / Tents / cottages* should be considered.**
		Arpora-Nagoa	34131	1365	0	1365	4710	1807	0	0.052943	0.3837			Rural, Medium intensive use, Medium-infrastructure area. As the area is not fulfilling the criteria at column M and N, ***No erection of huts / tents/ cottages and shacks should be permitted at all.***
		Anjuna caisua	809324	32373	7888	24485	9636	2876	572	0.004260	0.3578	42.6	61.9	Urban intensive use, medium infrastructure area. Additional shacks, huts / Tents / cottages could be considered as it well within the criteria for carrying capacity limits (Column L and N).
	Pernem	Morjim	339350	13574	9568	4006	6760	365	386	0.002213	0.1111	22.1	45.2	Urban, medium intensive, low infrastructure area. ***No additional shacks, huts / Tents / cottages should be considered as this is designated turtle nesting site.***
		Mandrem/Ashvem	699345	27974	10352	17622	8336	283	898	0.001689	0.1417	16.9	73.5	Urban, medium intensive, low infrastructure area. No additional shacks, huts / Tents / cottages should be considered as this is a designated turtle nesting site.

District	Coastal Taluk	Coastal Panchayat	Developable area between survey boundary & 200m (in sq m)	Potential area available for temporary structures = 4% of the total area (in sq m)	Area occupied by Shacks and temporary structures based on the records available in the Department of Tourism	Balance Area Available	Population as per census 2011	Number of beds in Hotels	Number of beds in Temporary structures	Overcrowding (no. of tourist per sqm) (developable area)	Tourist infrastructure (No. of beds to population) (Rural - up to 0.5 and Urban up to 1)	No. of beds per hectare (0 - 50 Rural and 51 -100 urban)	Sqm area available for tourist and resident (50 sqm per person Rural and 25 sqm per person urban)	Recommendation
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
		Arambol	327267	13091	5568	7523	5322	0	390	0.001192	0.0733	11.9	57.3	Urban, medium intensive, low infrastructure area. Additional shacks, huts / Tents / cottages could be considered as it well within the criteria for carrying capacity limits (Column L, M and N).
		Paliem - Khalchawada	36626	1465	144	1321	2776	0	0	0.000000	0	0		Rural, non-intensive, low infrastructure area. As the area does not fulfil the criteria for column N and does not have an approach road ***.No additional shacks, huts/tents/ cottages should be permitted.***
		Querim	290882	11635	-	11635	3038	4	0	0.000014	0.0013	0.14	95.6	Rural, non-intensive, low infrastructure area. Additional shacks, huts / Tents / cottages could be considered as it well within the criteria for carrying capacity limits (Column L, M and N).

* Shacks, huts/ tents/ cottages to certain extent are also erected between 200 – 500m of CRZ areas. However, for calculating the area available for development (Column D), the area between seaward survey boundary and 200 m line in CRZ has been considered for calculating the carrying Capacity

** The highest number of shacks, Huts/ Tents/ Cottages registered with the Tourism Department during year 2012-2015 has been considered while calculating Carrying Capacity.

*** The hotels registered with the Tourism Department and the relevant numbers of Beds provided in these hotels was used to calculate carrying Capacity.

4.2.4 Summary of Results

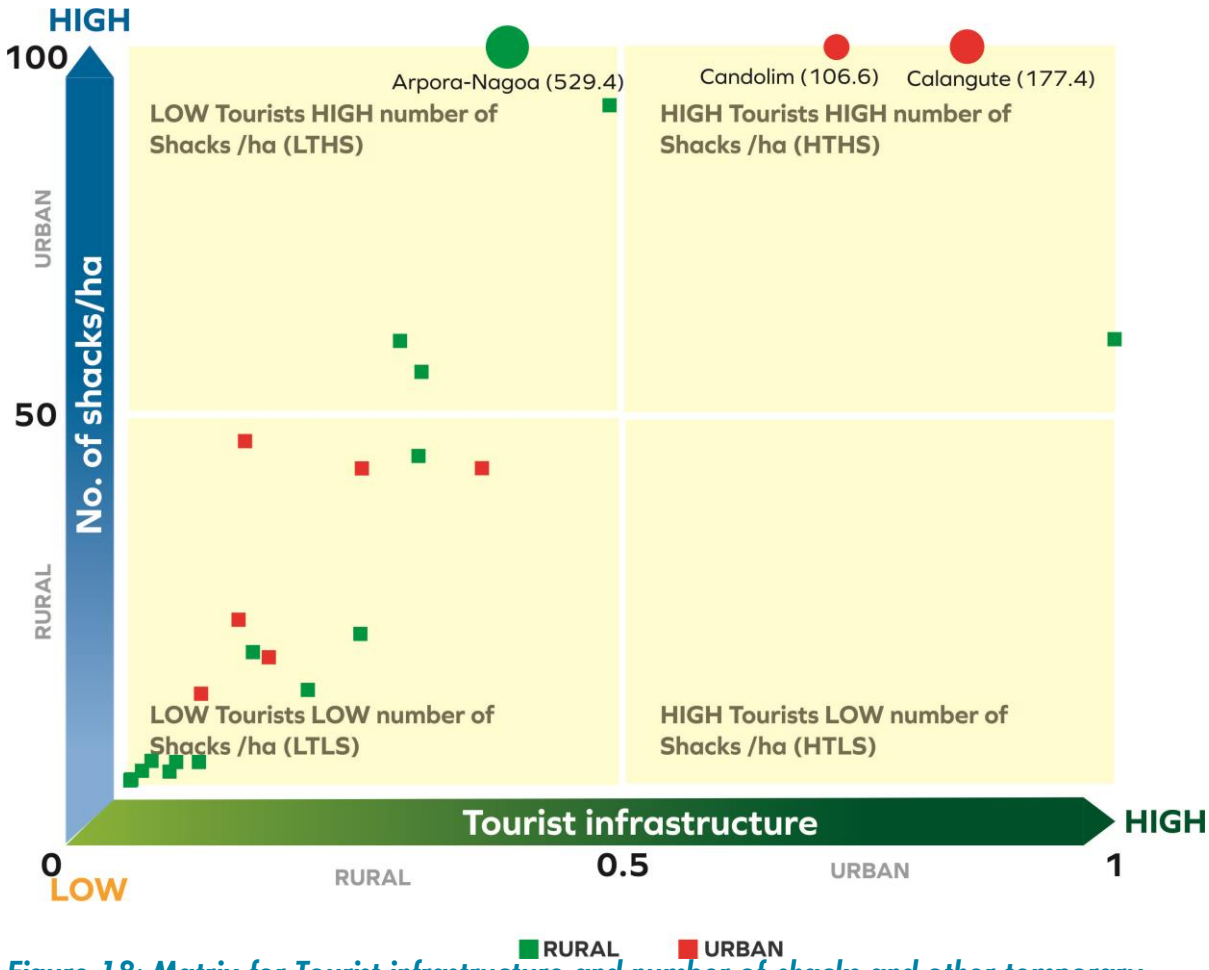

Figure 18: Matrix for Tourist infrastructure and number of shacks and other temporary structures/ hectare

Details of Matrix	Impact with respect to tourism activities	Management measures
Low Tourist Infrastructure and Low number of shacks/ha (**LT LS**)	Low development, low tourism related activities and low environmental impact	• Carrying Capacity available • Increase in tourist infrastructure, number of shacks to low/medium scale
Low Tourist Infrastructure and High number of shacks/ha: (**LT HS**)	Low development, Medium - High tourism related activities and High environmental impact	• Carrying Capacity exceeded • Improve tourist infrastructure, reduce/retain existing number of shacks
High Tourist Infrastructure and Low number of shacks/ha: (**HT LS**)	High development, low tourism related activities, medium environmental impacts	• Carrying Capacity available • Low/medium tourism activity based on environmental/

		ecological considerations
High tourist Infrastructure and High number of shacks/ha: (**HT HS**)	High development, high tourism related activities, high to very high environmental impacts	• Carrying Capacity exceeded • Retain/reduce existing number of shacks

Figure 17 provides a matrix comparing available tourist infrastructure and the number of shacks/ huts/ cottages and other temporary structures in urban and rural areas. The matrix provides for a minimum score of 1 for tourist infrastructure, while the threshold for number of shacks/ other temporary structures per hectare is 100. From the above matrix it is evident that Arpora-Nagoa (529 shacks/ temporary structures/ ha), Calangute (177) and Candolim (106) have far exceed the threshold of 100 and are indicated as outliers. All other beaches are well within the carrying capacity thresholds. Additionally, this matrix indicated that Arpora-Nagoa, which is a rural stretch, has number of shacks and other temporary structures far exceeding urban threshold.

4.3 Carrying capacity with respect to socio-cultural aspects and water availability

4.3.1 Socio-cultural concept

Based on the tourist arrival data made available from the Department of Tourism, the total number of tourists arriving during the month of December 2014 (i.e. peak season) is 6,82,580 (domestic) + 1,10,770 (foreign) = 7,93,350. The average tourist arrival per day is 25,991 and the average period of stay is 3 days. Considering the population of coastal talukas of Goa, which is 1064824, the ratio of local to tourist arrival is 14:1 as against the accepted norm of 2.5:1. Thus, it implies that a likelihood of socio-cultural impact due to tourist arrival is minimal on the local socio-cultural practices.

4.3.2 Water demand vis-a-vis peak tourist arrival

The population of State of Goa is 14,58,545 (as per Census 2011). Considering a demand of 135 liters per person per day, total water requirement works out to 196.9 MLD. The maximum arrival of tourist is in the month of December which is approximately on an average 25,000 tourist per day. Considering an average stay of 5 days in a given week, there are 1,25,000 tourist per day. Based on the available norms of 800 liters per bed per day, water requirement for tourists works out to 100 MLD. Hence, the total water requirement at peak tourist season per day is 296.9 MLD whereas, total treatment and supply capacity available in the coastal

talukas as per the PWD data is 517 MLD. And hence, it is sufficient to cater to present as well as future needs. In addition, there are private tankers supplying water from wells to Hotel and other industry to supplement their needs and these tankers are regulated by the Water Resources Department under the Goa Ground Water Regulation Act, 2002. The water consumption by hotels to the total consumption of 7.6% and the water consumption per bed is 489 litres/ day.

5. Guiding Principles for Shacks/ Huts/Tents/ Cottages and events in Private Lands

5.1 Guidelines for shacks, huts/ tents/ cottages:

The guiding principles for determining the carrying capacity of shacks and huts / tents/ cottages in private surveyed plots have been classified under four distinctive headings:

i) Planning Principles
ii) Ecological safeguards
iii) Environmental safeguards
iv) Socio-economic considerations

i) Planning Principles:

- 33% of coverage in a plot, in which shacks, huts / tents / cottages are proposed, should be permitted, based on the principle adopted in the CRZ Notification, 2011.
- Geocoding of all shacks and huts / tents / cottages in private areas shall be undertaken by GCZMA through any expert organization in order to monitor the area occupied by the shacks and huts / tents / cottages.
- For surveyed plots (private plots), the number of shacks and huts / tents / cottages should be determined on the case to case basis by applying precautionary principle so that the total area occupied by such shacks and temporary structures do not exceed the carrying capacity arrived for respective panchayat stretches in between survey boundary and 200 m in CRZ.

The criteria that are proposed for erection of shacks, huts/cottages/tents on private lands are detailed in Table 25.

Table 25: Criteria proposed for erection of shacks, huts/cottages/tents on private lands

S.No.	Criteria	Remarks
1.	Area of land in possession of applicant should not be less than 100 sq.mts	GCZMA should consider the number of shacks, huts / tents / cottages on case to case basis in between survey boundary to 200m in CRZ. However the total area occupied by such shacks, huts / tents / cottages should not exceed the carrying capacity arrived at for a particular space in private areas.
2.	Presence of ESAs	No-Go Areas
3.	Presence of fishing villages and creeks	No Activity Area
4.	Entry points to the beach	Buffer of 10m on either side of the entry point in private areas
5.	Availability of Road access and Water Supply	No shacks or huts/tents/cottages shall be permitted in properties which do not have road access
6.	Distance between shacks (e.g. *fire safety, accessibility*)	No existing policy; national & international standards provided
7.	The applicant shall submit Consent to Establish (CTE) obtained from the Goa State Pollution Control Board (GSPCB) as per the provisions under the Air / Water Acts. And upon approval of the GCZMA, obtain Consent to Operate from the GSPCB establishment of STP compulsory for erection of more than 25 huts/tents/cottages / tents / cottages.	As per provision of the CRZ Notification, 2011 as well as provisions under Water/ Air Acts.
8	Validity of NOC / Permission granted by the GCZMA	(i) Five years from the date of issuance for the relevant season from September to May. (ii) Certificate from Architect for removal of a structure(s) during monsoon (June to August) to be submitted on yearly basis. (iii) In case any violations reported / confirmed, NOC / Permission shall be withdrawn forthwith and not considered until the five-year period has expired.

- **Type of Material to be used:**

Shacks, huts, tents, cottages and huts/ tents/ cottages in private areas shall be erected using eco-friendly materials such as bamboos/wooden poles with thatched palm leaves/ thatched bamboo mat roofing as far as possible and for structural support wherever required GI-pipes / mild steel framed structures could be permitted. However, in case of paucity of wood the same may be erected out of the other modern materials such as synthetic, steel, nylon fabric etc. for the purpose of frame work due to unpredictable weather conditions. However the same shall not exceed 30% of the total material required. Use of concrete is banned. Grouting, plastering, laying of PCC/ RCC on the floor/ structure/ digging of soak pits/ digging and laying of pipes/ metal staircases grouted in cement etc. shall not be permitted as per the guidelines issued by the GCZMA.

- **Height of temporary Structures:**

Shack, huts, tents, cottages and huts/ tents/ cottages in private areas shall be at a maximum height of 9m including the height of boards displayed above the roof. Height of the temporary structures shall be limited to 9mt.

- **Architecture**

The architecture guidelines recommend construction of traditional tropical architecture made up of local materials and other materials which should stimulate the work of local artists, craftsman and trades people.

- **Approval:**

For seeking permission from the authority, the applicant/plot owner has to submit the plan, section, elevation, site plan, and survey plan, along with septic tank/soak pit / DRDO Eco/Bio-toilets or equivalents STP drawings including GPS co-ordinate and Google map from a registered architect/ engineer as well as the signature of the owner/ authorized representative.

ii) Ecological safeguards:

The ESAs such as sand dunes, turtle nesting sites, archeological and heritage sites, no development slopes, paddy fields/khazans, river, creeks, nallas etc., located on the beaches and along the coast are No-Go areas. This has already been demarcated on the maps.

iii) Environmental safeguards:

Environmental safeguards have been developed in response to the perception that it was becoming increasingly necessary to encourage tourism while conserving natural resources and protecting their cultural and milieu. This would enable Goa's market position as one of the world leaders in ecotourism and environmentally sensitive conventional tourism. Coastal vegetation should be maintained to maintain the natural

façade and to guard against coastal erosion. In addition, the following key environmental safeguards that are potential health hazards shall be considered:

- **Clean potable water**

Portable water requirement for domestic and tourist population has to be made available. The quality of water to be supplied should meet the national standard. Measures like Rain Water Harvesting should also be encouraged to have access to clean and potable water.

- **Safe disposal of solid wastes**

Separate bins for different types of solid wastes (source segregation of solid wastes) shall be provided by the operator. It will be the responsibility of the plot owner to dispose the waste generated from their plots to the respective bins. The municipality/ Village Panchayat or the contractor appointed by the Department of Tourism, as the case may be, shall collect waste from time to time and hand over the non-biodegradable waste to the Monitoring Cum Working Committee/ Solid Waste Management Cell of Department of Science and Technology for baling and transportation to cement plants. Solid waste to be transported to the Solid Waste Management Facility at Calangute by the Village Panchayats in North Goa whereas in South Goa it will be responsibility of the owner/ authorized representative to dispose the same by compositing/biogas plant or to transport to the piggeries for the bio degradable waste.

- **Safe disposal of sewage to sewage treatment plants and levy charges on use of public amenities**

The sewage generated (shack, huts, tents, cottages and huts / tents / cottages in private areas) from each plots are to be directed to a septic tank. The sewage tankers shall be deployed by the owner to collect the sewage at his own cost from time to time and dispose it to the nearest STP. Low water demand toilet (5litres per flush), Low volume showers and wash basins nozzles (1/3rd the conventional) and utilization of grey water for gardening shall be implemented. The GTDC should install public conveniences at locations on top priority in the locations as stated in the **Annexes 4 &5**of this report. The DRDO-developed eco/ bio toilets or equivalents should be considered for installation.

- **No extraction of groundwater**

Bore wells for water requirement of shacks and huts in private plots shall not be permitted.

- **Promote use of renewable energy**

Appropriate use of renewable energy such as solar and wind energy is recommended

- **Fire safety**

All temporary structures shall maintain a standard buffer of a minimum of 2m - 3m from huts / tents / cottages.

iv) Social considerations:

Fishing spaces along the Beach areas shall be avoided for private shacks and huts/ cottages/ tents to encourage coastal livelihood diversification. The ratio of local population to tourist population has also been compared to analyze the carrying capacity.

5.2 Procedure for considering application for shacks/ beach huts/ cottages in private areas

The owner of private property/ lessee shall submit an application accompanied by appropriate fees as prescribed by the GCZMA from time to time with the following details/ documents –

- Ownership documents / Form I-XIV / Leases Deed / Sale Deed
- Survey plan with HTL / 200 and 500m line marked on survey plan as issued by the DSLR
- Six copies of plan, elevation, section and site-plan of the proposed temporary structure (shack / huts / cottages and huts / tents / cottages) duly signed by the owner / authorized representative and a registered Architect / Engineer
- Duly filled Form-1 as prescribed in CRZ Notification, 2011
- Details of road access
- Copy of NoC / Registration issued by the local bodies / other State Government
- Consent to Establish issued by the Goa-PCB for the proposed temporary structure
- Copies, if any, of the previous permissions / NoC issued by the local authority / Government Department
- On receipt of a complete application with all documents prescribed above, a panel of registered engineers and Architects nominated by the GCZMA or its officials or expert members will conduct site-inspection and submit a technical report of the site conditions.

The said report will be placed before the GCZMA for its decision and the decision of the Authority for granting NoC / Rejection, as applicable be conveyed to the applicant. In cases where the Authority decides to grant NoC, the same will be conveyed along with four copies of the plans, duly stamped, by the engineer / authorized official of the GCZMA and Member Secretary of the GCZMA. The copies of the permission / NoC / Rejections shall also be conveyed to the GSPCB, Department of Tourism and the local body concerned.

The Authority may in cases where it feels necessary conduct inspection through the expert members for verifications / confirmation of the findings in the technical report the panel of registered engineers / Architects.

5.3 Guideline for use of beach or private area in CRZ for wedding and other recreational purposes:

(i) While encouraging **wedding tourism**, the following guidelines are recommended. However, such activities shall not be permitted in ecologically sensitive areas -sand dunes and designated turtle nesting sites:

1. The stage set up for beach weddings should be done without use of any cement, concrete or permanent material. Use of modular steel stages which can be easily assembled and dis-assembled should be adopted.
2. Care should be taken not to damage the vegetation of the area such as creepers and other flora.
3. Separate bins for different types of solid wastes (source segregation of solid wastes) shall be provided by the operator. It will be the responsibility of the plot owner to dispose the waste generated from their plots to the respective bins. The municipality/ Village Panchayat or the contractor appointed by the Department of Tourism, as the case may be, shall collect waste from time to time and hand over the non-biodegradable waste to the Monitoring Cum Working Committee/ Solid Waste Management Cell of Department of Science and Technology for baling and transportation to cement plants. Solid waste to be transported to the Solid Waste Management Facility at Calangute by the Village Panchayats in North Goa whereas in South Goa it will be responsibility of the owner/ authorized representative to dispose the same by compositing/biogas plant or to transport to the piggeries for the bio-degradable waste.
4. Department of Tourism currently issues permissions for organizing **weddings on public beach area.** The same should be issued after obtaining one time approval from GCZMA for the particular locations. The Department shall ensure that such beach wedding set up does not unreasonably block the free movement of public on beaches and no permanent damage should be caused to the beach and natural surfaces such as rock formations etc. should not be altered or changed in any manner. There shall be no digging or disturbance of sand on public beaches for putting up such temporary structures. The structures on public beach areas should not remain for more than 3 days per event, and the same should be dismantled and the beach must be restored to its original condition without keeping behind any debris/residue. Cleanliness of the beaches shall be the complete responsibility of organizers when such weddings are organized on

public beach areas. Tourism Department/GCZMA shall refuse permission to organizers in case of violation of any above terms and conditions.

(ii) The following guidelines are prescribed for setting up of **temporary structures while organizing destination weddings** within the village boundaries (surveyed land areas) within survey boundary to 200m in CRZ, the following measures are recommended:

1. The setup such as shamiana, pandal, temporary stage, food stalls and sitting arrangements shall be of purely temporary in nature, without causing any permanent damage to the environment.
2. Proper system of scientific garbage management and disposal shall be resorted to, by providing separate bins for bio degradable and non-bio degradable waste and the entire area is maintained clean and garbage free.
3. The noise decibel limit should be as prescribed by prevailing laws.
4. No alteration of natural surfaces such as rocks, etc. or destruction of natural vegetation should be permitted.
5. Encouragement to be given for tree plantation in such areas where the destination weddings are organized, and for increasing the green cover, so as to prevent surface run off and erosion in such areas where beach weddings are conducted.

(iii) The following guidelines are prescribed for setting up of temporary structures while **organizing events by Private parties** in CRZ areas. However, such activities shall not be permitted in ecologically sensitive areas and designated turtle nesting sites:

1. The event set up generally includes stage, sound, light décor, temporary kiosks, food stall, green rooms, temporary toilets, temporary fencing, barricading, etc. While setting up the above infrastructure for such events in CRZ areas, it is recommended that the set up will be purely temporary in nature which can be easily assembled and dis-assembled. There shall be no use of cement or concrete, and landscape should not be permanently altered in any manner. Once the event is over, the land shall be restored in original condition.
2. Permission may be given by concerned authorities to organize such events in CRZ II and CRZ III areas and plateaus / headlands located within 200 m in CRZ except areas identified as ESAs.
3. Incase special events are sought to be organized to popularize the culture, traditions and history of the State against the backdrop of archeological sites located within CRZ areas such as forts, etc., then such events shall also need prior permission from Department of Archives. No damage of any kind shall be caused to such archival monuments.
4. Separate bins for different types of solid wastes (source segregation of solid wastes) shall be provided by the operator. It will be the responsibility of the plot owner to dispose waste generated from their plots to the respective bins.

The municipality/Village Panchayat or the contractor appointed by the Department of Tourism, as the case may be, shall collect waste from time to time and hand over non-biodegradable waste to the Monitoring Cum Working Committee/ Solid Waste Management Cell of Department of Science and Technology for baling and transportation to cement plants. Solid waste to be transported to the Solid Waste Management Facility at Calangute by the Village Panchayats in North Goa whereas in South Goa it will be responsibility of the owner/ authorized representative to dispose the same by compositing/biogas plant or to transport to the piggeries for the bio-degradable waste.

5. In case any set up involves public beach area, then prior permission from the Tourism Department shall be obtained. However, while according permission, the Department shall ensure that no inconvenience is caused to free public movement.
6. Beach events which involve cordoning of specific beach areas should not be permitted on public beach, unless such events are organized by government departments in public interest.
7. All norms pertaining to sound pollution and management of decibel levels shall be strictly followed and monitored. Once the event is over, the entire set up on site shall be restored to its original condition.
8. It is recommended that the State Government identifies certain parcels of land belonging both to government/private owners and Institutions like Communidade, etc. where such events could be organized in a regulated manner and to provide supporting facilities such as potable drinking water, electricity connection, toilet facilities, garbage disposal facilities, etc. so that the foot print of the tourists and the public attending such events is restricted only to those designated areas. While designating such areas, it should be preferably be equipped with adequate parking facilities and proper approach roads.
9. In case of major events, the organizers should obtain prior permission from GCZMA and GCZMA shall inspect the area and convey its approval/rejection, subject to above guidelines. The event shall not be organized near ecological sensitive areas such as mangroves, sand dunes and turtle nesting sites etc.

(iv) The following guidelines are prescribed for setting up of **temporary structures while organizing watersports activities** along the coastal areas of the State. However, such activities shall not be permitted in ecologically sensitive areas and designated turtle nesting sites:

1. Kiosks for watersports activities should not exceed an area of 20sq.m and the kiosks shall not be installed using any cement or permanent construction.
2. The kiosks shall not be located adjacent to turtle nesting sites or sand dunes and an exact area for placing the kiosk shall be identified by a team comprising of GCZMA, Tourism Department, Capt. of ports and Coastal Police.

3. During the rainy season from 1st June to 15th September, such kiosks shall be dismantled and taken away without keeping any debris or residual matter on the public beach so as to prevent any obstruction to the natural process of sand accretion.
4. Similarly, the Tourism Department may allow temporary sheds to store watersports equipment in public beach areas without obstructing free flow of public.
5. Prior approval will have to be obtained from GCZMA annually for setting up of watersports sheds and kiosks on public beach areas.
6. Permission may be rejected by GCZMA in case the watersports kiosks are found to be violating any of the above norms.
7. Temporary sheds shall be constructed of natural material such as wood, thatched roof without any cement or concrete. The sheds shall be used by a community/association of watersport operators and permission will not be granted to any individual person.
8. Such temporary shed permission for watersports should be denied if the presence of such temporary sheds affects the aesthetics of the area and free movement of the public. Permission should be withdrawn / cancelled in case the watersports sheds are used for any other activity other than watersports equipment. Permission for the same shall be granted only on a need basis and shall not be claimed as a matter of right.
9. No disposal of grease/oil from watersports equipment shall be done in the sand or in seawater.
10. The servicing of the water sports equipment shall be done without causing any pollution on the public beach area. Unusable and condemned watersports equipment shall be promptly disposed or towed away from the public beach area.

(v) The following guidelines are prescribed for setting up of **temporary structures for Beach safety scheme.** However, such activities shall not be permitted in ecologically sensitive areas and designated turtle nesting sites:

1. Such towers may be permitted by GCZMA after undertaking proper site inspection.
2. The towers should be used only for manning by lifeguards and their equipment and shall not be used for any other purpose.
3. The towers shall not be located adjacent to ecological sensitive areas such as sand dunes, turtle nesting sites, mangroves, etc. a joint inspection of GCZMA and tourism officials shall be undertaken before according permission to such lifeguard towers.

(vi) **Erection of fisherman huts** may be permitted on case to case basis after proper inspection and approval by GCZMA. However, such activities shall not be permitted in ecologically sensitive areas and designated turtle nesting sites.

Such fishing huts shall be constructed by using wood, bamboo, thatched roof without use of cement and concrete. No effluents/oil, grease should be stored within the huts and the location shall be determined and approved after a joint inspection by GCZMA, Fisheries Department and Tourism Department. Such fisherman huts shall not be used for any other activities, failing which the permission shall be revoked from the GCZMA.

(vii) The following guidelines are prescribed for the **night bazaars/ flea markets**-

1. The event set up includes stage, sound, light décor, temporary kiosks, food stall, green rooms, temporary toilets, temporary fencing, barricading, etc. while setting up the above infrastructure for such areas in CRZ areas, it is recommended that the set up will be purely temporary in nature which can be easily assembled and dis-assembled. There shall be no use of cement or concrete, and landscaping should not be permanently allowed in any manner. Once the event is over, the land shall be restored in original condition. Permission may be given by concerned authorities to organize such events in CRZ II and CRZ III areas and plateaus / headlands located within 200min CRZ except areas identified as ESAs.
2. Separate bins for different types of solid wastes (source segregation of solid wastes) shall be provided by the operator. It will be the responsibility of the plot owner to dispose the waste generated from their plots to the respective bins. The municipality/ Village Panchayat or the contractor appointed by the Department of Tourism, as the case may be, shall collect waste from time to time and hand over the non-biodegradable waste to the Monitoring Cum Working Committee/ Solid Waste Management Cell of Department of Science and Technology for baling and transportation to cement plants. Solid waste to be transported to the Solid Waste Management Facility at Calangute by the Village Panchayats in North Goa whereas in South Goa it will be responsibility of the owner/ authorized representative to dispose the same by compositing/biogas plant or to transport to the piggeries for the bio degradable waste.
3. Flea markets and night bazaars shall not be organized on Public Beach area.
4. All norms, sound pollution and management decibel levels shall be strictly followed. Once the event is over, the entire set up on site shall be restored to original condition.
5. Adequate parking facilities and proper approach roads should be available for such markets. The event shall not be organized near ecological sensitive areas such as mangroves, sand dunes and turtle nesting sites etc.

6. Conclusion and Recommendations

6.1 General Conclusion and Recommendation:

1. The Coastal Regulation Zone Notification, 2011 with a specific provision for the State of Goa permits erection of purely temporary and seasonal structures customarily put up between the months of September to May.
2. The Ecologically Sensitive Areas e.g. Sand dunes, turtle nesting grounds have been spatially mapped for the entire coast of Goa
3. Sand dunes have been mapped and delineated using aerial photographs and field survey along the entire coast. The State Government, through Forest Department/Goa State Biodiversity Board shall endeavour to grow and maintain local species such as spinifex sp. Ipomoea sp. along with dune parks with proper fencing. In addition, artificial nourishment of beaches to counter sand depletion (especially along eroding beaches) should be attempted using locally available materials instead of hard structures such as sea-walls / stone embankments. Thus, a simple method of inducing accretion of sand to impede wind velocity is to be achieved by erecting 1m high wire mesh, wooden or geotextile fences perpendicular to the direction of prevailing winds.
4. The Turtle nesting sites have been identified as per the provisions under the CRZ Notification, 2011 and no shacks and / or beach beds on these beach stretches are allotted at Agonda and Galigibag in Canacona taluka of South Goa and in the area identified by the Forest Dept. at Morjim in Pernem taluka in North Goa.
5. The Goa Forest Department has initiated sea turtle conservation programme along the beach stretches of Morjim in the North Goa district, Agonda and Galgibaga in the South Goa district since the year 1997. The conservation efforts are being supported by the local community. The data annexed shows that there have been continuous records of turtle nestings on these beach stretches. There is fluctuating trends of nesting is seen on all beach stretches. In Morjim, 31 nests were recorded in the year 2000- 2001, and three nests in the years of 2008-2009 and 2010 - 11. The similar trend is seen in Agonda and Galgibaga too. The highest number in Agonda is – 13 in the year 2015 -2016 and 3 in the year 2005 – 2006 whereas, Galgibaga has shown highest number 10 in the year 2007 – 2008 and 2009 -2010 and lowest is 3 in 2013 – 2014 and 2014 – 2015. The sporadic turtle-nesting at Mandrem also needs to be observed and monitored.

6. The Goa Forest Department has appointed local volunteers to patrol the beaches from September to May. The nests are guarded with the net till the hatchlings are released safe into the water. Number of eggs and hatchlings released can be seen in the annexure. Sea Turtles have high natal homing (visit the same beach to nest) instinct. River mouths have been seen as most preferred nesting sites perhaps because of high and porous sand deposition. In Morjim, Temvaddo (Abutting Survey number 117) beach area has seen high frequency of nestings. The data and monitoring indicate that the Anthropogenic activities have not had any major impact on the nesting's and hatchings due to the effort of the Goa Forest Dept. and the local volunteers.
7. The Forest Dept. has recommended the specific conditions for allotment for shacks at Morjim which prohibits setting above deck beds/beach beds in inter tidal zones, installation of outdoor illumination, playing of loud music beyond 6 p.m., holding beach parties and movement of Automobile on the beach. The indoor illumination should be muted and provided with opaque shields on seaward side. With respect to Mandrem beach, since it is designated as Turtle Nesting site in the CRZ
8. Notification, 2011, similar conditions should be applied for shacks on Morjim Beach.
9. A satellite-imagery-based study of shoreline change in Goa indicated that, over a 32 year period, there is large variation in depositional and erosional processes along the coast of Goa. Specifically, the study indicated that along the estuaries there is net deposition. Along the coast, deposition was observed at Morjim, Baga, Campal, Miramar and Mobor, while erosion was specifically observed at Kerim, Anjuna and Velsao (*D'Souza.J and Nayak, 2004*).
10. The Water Resources Department (Groundwater Cell) / Goa State Pollution Control Board should prepare a plan for monitoring the ground water quality in the Coastal areas.
11. The State Government should encourage and lay emphasis on generation on power through installation of solar panels in Hotels/ Resorts/Huts and other temporary structures by adopting the Net Metering Policy. The hotels and resorts should be asked to install Bio gas plants / composting facilities based on availability of space and infrastructure. However, all 3, 4 and 5-starred hotels must install biogas plant / composting facilities. All Huts and Cottages exceeding 24 in number(norm adopted and implemented by the goa state pollution control board) should install sewage treatment plants, to meet the standard prescribing Environment Protection Rules, 1986. The GCZMA should consider setting up of adequately covered Transfer Stations for temporary storage of Solid Waste along / in near vicinity for better management of Solid Waste.

12. The State Government shall endeavour a blue flag beach certification in a phased manner for appropriate beach stretches through a recognized certifying agency.
13. The Infrastructure with regard to roads and water supply is adequate to meet the present needs and the future needs; however it will need continuous up gradation and improvement including maintenance. The state government has to encourage renewable energy generation in the tourism industry by adopting appropriate power purchase policy. Public Amenities such as washrooms, showers and changing rooms required are to be provided on the popular beach stretches along with additional parking space. The existing water consumption per bed is 489 as against 500 to 1000L per bed as per Sri Lanka report by US aid.
14. The hotels consume only 7.6 % of the total water from the Public Water Supply of the PWD and the water consumption per bed is 489 litres/ day as against WTO norm of 800 liters per bed.
15. The World tourism Organization conducted a tourism carrying capacity for Goa on the criteria of on the Environmental capacity infrastructure availability of labour and social impact in the year 1989 which concluded that arrival of 4.1 million tourist annually on popular beaches on peak use days, the space available per beach users is not likely to drop below 10 sqm. which is an internationally accepted norms. The tourist inflow than 1989 was below 1 million and the year 2014-15 it has reached to 4 million.
16. The State Government / GCZMA could review Carrying Capacity in five-year' time.
17. The State Government, through the Department of Tourism should initiate an exercise for identification, mapping and evaluation of commercial areas within 200m in CRZ areas.
18. A review of the present study could also be considered while finalizing Coastal Zone Management Plan (CZMP) for the State of Goa.

6.2 Specific Recommendations for Beach Shacks:

1. Out of the total 16 number of beach stretches in North Goa, the State Government allots beach shacks and deck beds only on 9 numbers of beach stretches. Similarly, out of 22 number of beach stretches in South Goa, the State Government allots beach shacks and deck beds only on 4 numbers of beach stretches.
2. On application of the two internationally accepted concepts of carrying capacity, it is seen that the carrying capacity has exceeded only at Coco beach, Vainginium beach in North Goa and Palolem beach and Agonda beach in South Goa. However, the state government does not allot any beach shacks on Coco beach, Vainginim beach and Agonda beach. The State government only allots

three shacks and deck beds on the beach stretch of Palolem. In view of the carrying capacity been acceded in Palolem, hence it is recommended to not allow any shacks and deck beds on this beach stretch.

3. The Beach shack shall be erected out of ecofriendly material like bamboo or wooden poles with thatched palm leaves or thatched bamboo matt roofing as far as possible. However in case of paucity of wood the same may be erected out of the other modern materials like synthetic , steel , nylon fabric etc., but not exceeding 30 % of the total material used, for the purpose of frame work due to unpredictable weather conditions. Use of concrete materials is absolutely banned. Grouting, plastering, laying of PCC/ RCC on the floor / structures/ digging of soak pits / digging and laying of pipes / metal staircases grouted in cement etc., shall not be permitted at any cost as per the guidelines issued by GZMA. DRDO-Eco/ bio toilets or equivalent shall be installed on the beach shacks so that the treated sewage meets the standards prescribed by the Goa State Pollution Control Board.
4. The carrying capacity studies is carried out using two internationally accepted norms, i.e.. 10sq. m per visitor based on the footfall assessment done by the Tourism Dept. and considering the area occupied for commercial activities (Beach Shacks and Deck Beds). The third principle adopted is based on the actual length of the beach available after deducting entry points fishing areas, ESA etc. between the HTL and the survey boundary as a precautionary principle, the and the length required for the Beach shacks with buffers (Width of the shack + buffer on both sides = 8+2.5+2.5=13) and thereafter considering 33% of the potential area available for erection of shacks on the beach.
5. The State Government is not allotting Shacks and / or beach beds on beach stretches in Polem, Xendrem, Talpona, Galgibag, Rajbag, Patnem, Colomb, Butterfly, Agonda, Cola, Little Cola, Kakolem, Cab-de-ram, Canaguinim, Bimbal, Hansa, Grand Mothers Hole and Vasco City in South Goa and at Bambolim, Odxel, Vainguinim, Donapaulo, Miramar-Caranzalem and Kalacha (Khalachawada, Arambol). The State Government should not open these Beach stretches for allotment of shacks on the beach. The beach stretches of Colva, Miramar, Dona Paulo in North Goa and Siquerim to Baga, Anjuna and Vagator-Chapora are covered in the mass tourism circuit.
6. Specific carrying capacity analysis for Xendrem, Talpona, Butterfly, Little Cola, Kakolem, Bimbal, Odxel, Dona Paulo beach has not been carried out as the Dept. of Tourism does not allot any shack on these beaches.
7. The assessment of carrying capacity based on the length of the beach available for erection of shack (area between HTL and Survey boundary considered as precautionary principle) after deducting the entry point, ESA and considering only 33% of this area. It indicates that the carrying capacity exceeded at Baga to Siquerim by 8 shacks and Ozrant by 5 shacks. Applying the precautionary

principle and considering the least available capacity based on the three concepts, it is recommended that no shack should be allotted by Dept. of Tourism on the beach stretch at Palolem. It is also noticed there are large number of shacks and other temporary structures (Huts/ Tent/ Cottages) in private areas in Palolem and hence would not justify the allotment of any shacks on the beach by the Dept. of Tourism. Similarly the number of shacks allotted by Dept. of Tourism at Ozran should be restricted to 3 shacks as against earlier allotment of 8 shacks (-5) and at Baga-Siquerim restricted to 188 shacks as agents the earlier allotment of 196 shacks (-8), even though carrying capacity available on Baga-Siquerim and Ozra based on the internationally accepted principle of 10sq.m per visitor.

8. On other beach stretches the study indicates that there is additional carrying capacity available, however the State Government should not allot any additional shacks on the beach stretch and should restrict the no of shacks as provided in the Tourism Policy 2013-16 and adopted for the year 2016-19.
9. Beach weddings and other events should not be permitted in ESA areas. However could be permitted in other areas including private areas based on case to case basis with the prior permission of the GCZMA.

6.3 Specific Recommendations for Shacks and Other Temporary Structures in Private land:

1. Out of total 16 numbers of beach stretches in North Goa, the shacks and other temporary structures in private areas are erected in 9 number of beach stretches and similarly out of 22 number of beach stretches in South Goa, shacks and other temporary structures are erected in 8 number of beach stretches as per the records available with the Department of Tourism.
2. Based on the data available on with the Dept. of Tourism it is seen, the majority of Shacks, huts / tents / cottages in private areas have been registered in those beach stretches in South Goa i.e. Polem, Galgibag, Agonda , Cola where there is no allotment of shacks by The Dept. of Tourism on the beach. The largest number of Shacks, huts / tents / cottages in Private areas is on Palolem where Government was allotting 3 shacks on the beach and now it is recommended that Government should not allot any shacks on the beach. The erection of shacks, huts/tents/cottages could be permitted in private areas based on the guiding principles and following the procedures recommended in Table 24 utilized for arriving at carrying capacity based on indicators.
3. The Calangute-Baga-Candolim-Siquerim belt has in total 1169 hotels with 11693 rooms/12,460 beds. In addition, there are 196 shacks allotted by the Government on the Baga-Siquerim beach belt. Considering the availability of Hotels and rooms, it is recommended that no additional shacks, huts/tents/cottages may be permitted for erection in private areas along the Baga-Siquerim belt. In case of other beach stretches in North Goa the erection

of shacks and other temporary structures huts/tents/cottages could be permitted in private areas based on the guiding principles and following the procedures recommended in Table 24 utilized for arriving at carrying capacity based on indicators.

4. Specific carrying capacity analysis for Xendrem, Talpona, Butterfly, Little Cola, Kakolem, Bimbal, Odxel, Dona Paulo beach has not been carried out as there is no intensive use for tourism except Donapaula. However no shacks/tents/cottage etc., is erected in Donapula, Caranzalem area.
5. Existing structures prior to 19th February 1991 could be permitted to carry out regulated commercial activities such as homestays, guest house and restaurants without any further increase in coverage or FAR/FSI, as it would not occupy additional vacant land in the coastal area in consonance with the CRZ Notification, 2011 with specific provision for the State of Goa.
6. As shacks, huts, cottages and tents are primarily meant for livelihood of the local inhabitants who are not in position to construct hotels/restaurants, the hotels in these beach belts should not be permitted to erect more than one shack within their private area. Hotels could be permitted to provide deck-beds within the private areas/on beach, in the area available, after due approval from GCZMA and registration with Tourism Department.
7. GCZMA should consider applications for erecting of beach shacks/huts/cottages/tents in private areas with 33% coverage / FAR / FSI on case-to-case basis by carrying out physical inspection through empanelled engineers/architects and verifying the site-feasibility vis-à-vis ascertaining the access and other environmental safeguard approaches and guidelines provided.

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ANNEX 1:
Statistics of Beach Shacks in North Goa

North Goa							
A stretch				**B Stretch**			
S. No.	**Name of the beach**	**Size of the Shack**	**No of Shacks**	**S. No.**	**Name of the beach**	**Size of the Shack**	**No. of Shacks**
1	Calangute						
	a. Saunta Vaddo	First four shacks at the entrance 12m X 8M Balance shacks 18 m X 8 m	25	1	Keri	18m X 8m	06
	b. Khobravaddo	18m X 8m	17	2	Arambol Khalchavado Madhlavado Girkarvado	18m X 8m	 6 4 2
	c. Umtavaddo	18m X 8m	16	3	Mandrem	18m X 8m	10
	d. MaddoVaddo	18m X 8m	11	4	Morjim Thembvaddo Vithaldasvado GaudeVaddo	18m X 8m	- 9 1 1
	e. Tivaivaddo	18m X 8m	17	5	Ozrant	18m X 8m	08
	f. Gauravaddo	18m X 8m	22	6	Anjuna	18m X 8m	07
2	Candolim			7	Vagator-Chapora	18m X 8m	05
	a. Ximer	18m X 8m	12	8	Siridao	18m X 8m	02
	b. EscrivaoVaddo	18m X 8m	10	9	Chapora	18m X 8m	02
	c. Camotimvaddo	18m X 8m	19				
	d. Murud	18m X 8m	12				
	e. Vaddi	18m X 8m	26				
	f. Dando	18m X 8m	09				

Statistics of Beach Shacks in South Goa

South Goa 104 nos.							
A Stretch				**B Stretch**			
S. No.	**Name of the beach**	**Size of the Shack**	**No of Shacks**	**S. No.**	**Name of the beach**	**Size of the Shack**	**No of Shacks**
1	Majorda	18m X 8m	10	1	Velsao	18m X 8m	02
2	Colva	18m X 8m	08	2	Arrosim	18m X 8m	04
3	Lounginhos (Colva)	18m X 8m	03	3	Uttorda	18m X 8m	07
4	Colmar (Colva)	18m X 8m	01	4	Thonvaddo (Betalbatim)	18m X 8m	07
5	Benaulim	18m X 8m	12	5	Ranvado (Betalbatim)	18m X 8m	02

6	Calvaddo	18m X 8m	03	6	Sunset beach (Betalbatim)	18m X 8m	01
7	Varca	18m X 8m	04	7	Ghonsua (Betalbatim)	18m X 8m	02
8	Fatrade (Varca)	18m X 8m	07	8	Sernabatim (Colva)	18m X 8m	03
9	Mobor (Cavelossim)	18m X 8m	06	9	Velludo (Benaulim)	18m X 8m	04
10	Khandivaddo (Cavelossim)	18m X 8m	11	10	Zalor	18m X 8m	04
				11	Palolem	18m X 8m	03

Source: Department of Tourism, Goa

ANNEX 2: Statistics of water sports activity received at North zone office tourist location wise

TOURIST AREA LOCATION	NEW	RENEWAL	GRAND TOTAL
Anjuna beach	7	42	49
Baga beach	17	195	212
Baina beach	0	1	1
Bambolim beach	0	1	1
Brittona	0	1	1
Calangute beach	44	238	282
Comoti vaddo	1	0	1
Campal	2	0	2
Candolim beach	13	50	63
Coco beach	6	69	75
Dona-paula	0	9	9
Khobra vaddo calangute	4	0	4
Mandovi river	1	3	4
Morjim beach	1	0	1
Nerul	1	0	1
Sauntavaddo calangute	0	2	2
Sinquerim	3	122	125
Taleigao	0	1	1
Tivai vaddo	0	1	1
Vagator-chapora beach	6	16	22
Vaiguinim	0	13	13
Grand Total	106	764	870

ANNEX 3: Tourist arrival statistics

Year	Domestics	Foreign	Total
2011	2225002	445935	2670937
2012	2337499	450530	2788029
2013	2629151	492322	3121473
2014	3544634	513592	4058226
2015	4756422	541480	5297902

ANNEX 4: Public conveniences across beach locations in Goa to be set up by GTDC (permanent and mobile toilets)

1. Introduction

The Goa Tourism Development Corporation Ltd. (GTDC) of the Department of Tourism (DoT), Govt. of Goa, has proposed to develop Public Conveniences across the State of Goa at the tourist locations situated along the beaches. In the first phase, it is proposed to provide 10 (ten) numbers of Permanent Toilets and 30 (thirty) units of Container-type Mobile Toilets comprising of shower rooms, changing rooms, drinking water points, lockers equipped with green technologies such as solar lighting etc.

The said public utilities shall be state-of-the-art in nature with the best of the technology including Sewerage Treatment Plant (STP) for effective waste collection and management for clean and beautiful Goa and to prevent dirtying of beaches due to public open defecation. The said project is being implemented with Central Financial Assistance (CFA) under the scheme of Swadesh Darshan of Ministry of Tourism (MOT).

2. Locations of the sites

Based on a detailed site study of estimated number of footfalls across various beach locations in Goa and requests obtained from various Panchayats, the locations of Public Conveniences were identified. The list of locations for setting up of Public Conveniences, both Permanent and Mobile Toilets, were provided in Annexure below. The locations were identified based on a joint survey conducted by Dept. of Tourism and GTDC on 6th October 2015. The setting up of Public Conveniences in the proposed locations, especially the Permanent toilets, is subject to availability of permissions from respective land owners.

3. SPECIFICATIONS AND GENERAL FEATURES OF PUBLIC CONVENIENCES

A. PERMANENT TOILETS

i. General Features

The permanent toilet facilities to be provided shall consist of:

- Gents: Toilets (3), Urinals (5), Shower / changing rooms (4), and Wash basins (4)
- Ladies: Toilets (4), Shower / changing rooms (4), and Wash basins (4)
- Other features: Handicap toilet (1), Locker room (1 each), and Drinking water facilities
- Sewerage Treatment Plant (at least 40 KLD) and Solar Lighting etc.

ii. Specifications

The technical specifications of these toilets are as follows:

Toilet Footprint size	Total Area of the Toilet Block is 188.31sq. m with a dimension of 24.30m x 6.50m of the actual toilet block & the passage of 14.96m x 2.03m
Flooring Type (Internal &External)	• Providing chequeres tiles at STP area. • Providing ceramic glazed wall tiles for toilets. • Providing vitrified unglazed porcelain **tactile** floor tiles buttons and liner. • Providing Anti-skid vitrified tiles of 600X 600 mm size for flooring

	in gents and ladies toilets. • Providing Jet Black granite for urinal partitions. Cherry Red Granite on wash basin Counters, and Elite Brown granite at entry point. • Providing Cherry Brown Colour un-polished granite slab of size 760mm X 760 for skirting. • Providing Shivkashi Granite in combination with kotah in floors at the entry points. • Providing Cherry Brown colour un-polished granite stone slab 20mm thick for riser and treads.
Wall Cladding (Internal Tiles & External Cladding)	Ceramic wall tiles for internal and for external aluminium composite panel for exterior walls (façade) and water tank structure.
Doors & Partitions (Materials)	Providing Durlax/Samsung make Aspiron Solid Surface (Coriun) door for main doors, handicap toilet doors, Pump room doors.
Ventilators (Perforated ACP Sheets)	Curtain wall with Aluminum Composite Panel Cladding, with open grooves external wall and water tank structure.
Structure (MS Box Structure)	The structure of toilet will be comprising of Structure hollow sections for columns to support the trusses of built up sections spaced at 4 to 4.5 meter Center to Center with ridge at 0.8 meters. The outer entry point will be covered by RCC sloping roofs.
Roofing	(Double Layer Galvalium Sheets) at Toilet Block and water tank.
Plumbing (Premium Quality):	Plumbing will be carried out CPVC pipes with sanitary fittings of reputed manufactures. The water supply from the PWD will be done by pumping from the underground tank of 10,000 its capacity and will be pumped to the overhead two tanks of 1500 its capacity. The sanitation will be done using the HDPE pipes and the effluent will be taken upto collection tank. The same will be pumped to the STP of 40 KLD capacity.
STP	Details of STP were provided below.
Electrical (LED Lights & Solar)	Using LED lights, and premium quality fixtures are used for estimation purpose.
Landscaping	External area consists of Bougainville mix color, Ixora chinensis Dianella casmanica and Readymade Mexican Lawn Carpet.

iii. Details of sewage treatment plant

a) Design Basic

Nature of Effluent Generated	Domestic
Design Flow	40KLD
Usage of Treated Water	**Gardening /Toilet flushing/dispose to drainage line (As per below mentioned quality)**

b) Raw/treated sewage quality

S. No.	Parameters	Units	Raw Sewage Inlet	Treated Water Outlet
1	pH	-	6.5-7.5	6.5-7.5
2	BOD	mg/lit	300	< 30
3	COD	mg/lit	500	<100
4	Total suspended solids	mg/lit	300	< 20

c) Treated water quality:

The guaranteed quality provided in above shall be achieved subject to:

- The feed quality is same as specified. In case of any change in the quality of Feed sewage the same may have implications on operating parameters or on end results of the system.
- The operation of Sewage treatment Plant is strictly done as per SMSEL O & M Manual and instructions.

d) Proposed process description

To have eco-friendly & natural treatment, this plant is designed based on MBBR technology. To achieve this concept, plant has certain unit operation & processes such as:

Pre Treatment

- Bar Screen

To remove large objects, such as rags and plastics from incoming sewage, bar screening is installed.

- Collection or Equalization Tank:

The sewage will get collected in equalization Tank after passing through bar screen. Aeration is provided in the tank to avoid the anaerobic condition. From this tank sewage will be pumped to aeration tank.

Secondary treatment:

- Aeration Tank:

This is the main section of the plant where degradation of organic pollutants (BOD/COD) takes place with help of aerobic micro-organism. To maintain the aerobic condition in the Bio reactor and to supply required oxygen to micro –organisms, air supply arrangement is provided by means of Aeration system which has very high oxygen transfer efficiency. To enhance the biological growth, floating media is added in the Tank.

- Settling Tank:

Gravity overflow from the Aeration Tank will be collected in the settling Tank, where activated sludge undergoes settling. Tube settler is used to increase the surface area of settling. Since this Tank is a hopper bottom type, hence there is no need of sludge scrapping mechanisms.

- Filter feed tank:

Supernatant from settling tank will allow to flow by gravity to the filter feed tank. To disinfect the harmful bacteria and to remove the refractory organics from the treated water, chlorination system is used.

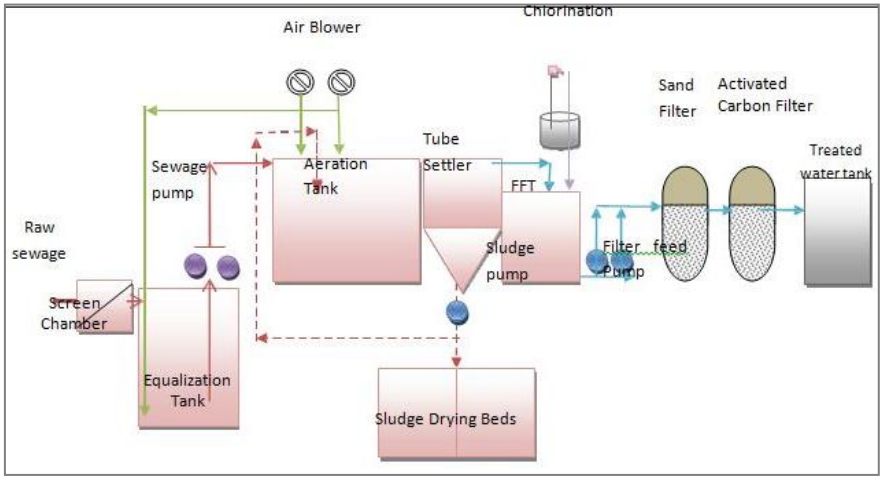
Tertiary filtration treatment

- Pressure Sand Filter

Water from Filter feed Tank is pumped into the PSF, in this unit water is further treated to remove the suspended particulate matter to desired level.

- Activated Carbon Filter
- Water from Pressure Sand Filter is then passed to Activated Carbon Filter. In this filter, traces of odor, color and pigments are removed.
- Backwashed water from sand & activated carbon filters will return back to collection tank.
- Sludge Disposal/dewatering system
- Sludge from the settling Tank will be re-circulated to Aeration Tank and excess sludge will pump to sludge drying bed. The sludge from sludge drying bed will be disposed of or used as manure.
- Water from sludge drying bed will return back to collection tank.

e) Treatment scheme



B. MOBILE TOILETS

i. General Features

The DRDO-approved mobile toilet facilities to be provided shall consist of:

- Gents Block: Gents Block: Toilets (4), Urinals (2), Changing rooms (2), Wash basins
- Ladies Block: Toilets (6), Changing rooms (2), Wash basins
- Other features: Handicap toilet (1)
- Provision of Solar Power System for mobile toilet lighting with appropriate size of Solar Panel 200 Wp with MS mounting frame

ii. **Specifications**

The technical specifications of these toilets are as follows:

Model	Model-1	Model-2
Toilet Footprint size	20ft. x 10 ft.	8ft. x 8 ft.
Flooring Type (Internal & External)	Anti-skid tiles 400 mm x 400 mm x 8 mm thick duly fitted with requisite adhesive based sheet not less than 20 mm thick	
Wall Panels, Outer & Inner Skin	The wall panels should be of 60 mm thick and should be insulated with EPS (expanded poly – strained) at minimum 20 Kg/m cube density. Outer skin material shall be of aluminum composite material of 3mm thick. Inner skin material should be laminated by Bakelite sheets 3mm thick, the ceiling should be plain BSL Bakelite sheets.	Wall panel 30 mm thick should be insulated with PU rigid frame foam (polyurethrene) at minimum 40 Kg/m cube density. Outer skin material shall be of **fibre** composite material with fire resistant resin of 3 mm. thick. Inner skin material – should be laminated by Bakelite sheets
Door and windows	Shall be of 30 mm to 40 mm extruded aluminum sections	
Wiring and electrification	The wiring and electrification should be concealed type with fire proof ISI Heavy duty wire of not less than 1.0 sq mm and 2.5 sq mm Multi stand copper wires	
Plumbing	The plumbing of the toilet should be of UPVC pipes and fittings and the shower, Taps all such materials should be of Jaguar premium or equivalent make. The sanitary fittings such as W.C., wash basin, sink etc.	
Structure (MS Box Structure)	The structure of toilet will be comprising of Structure hollow sections for columns to support the trusses of built up sections spaced at 4 to 4.5m center to center with ridge at 0.8m. The outer entry point will be covered by RCC sloping roofs.	
Roofing	Double Layer Galvalume Sheets at Toilet Block and water tank with Overhead container of minimum 2000 litres.	
Electrical (LED Lights & Solar lighting)	Using LED lights, and premium quality fixtures are used for estimation purpose. Solar panel to be 200 Wp or more with MS mounting frame suitable for roof top installation with 11.5 V/60 Ah Lithium Titanium Oxide (LTO) Battery	

Source: Department of Tourism, Goa

ANNEX 5: Proposed locations for setting up of public conveniences

The setting up of Public Conveniences in all the below mentioned proposed locations, especially the Permanent toilets, is subject to availability of permissions from respective land owners.

S.No.	Location, District	Type	Total Units	Survey No.	Land Ownership
1	Anjuna, North Goa	Permanent (01)	01	212	GTDC
2	Arambol, North Goa	Permanent (01) Mobile (01)	02	71/0	Private Owner
3	Ashvem, North Goa	Permanent (01) Mobile (01)	02	212	Private Owner
4	Baga, North Goa	Permanent (02) Mobile (07)	09	Adjacent to Survey no. 211 & 282	GTDC
5	Calangute, North Goa	Permanent (01) Mobile (09)	10	200/1	Dept. of Tourism
6	Candolim, North Goa	Permanent (01) Mobile (03)	04	Survey No. 146/1 & Survey No. 148/5	Various owners including Dept. of Tourism
7	Coco / Nerul, North Goa	Permanent (01)	01	120/1	Communidade of Nerul
8	Dona Paula, North Goa	Permanent (01) Mobile (01)	02	PT Sheet No. 185, Chalta No. 1-1 PT sheet No. 254, sub div 1	Dept. of Tourism
9	Fort Aguada, North Goa	Permanent (01) Mobile (01)	02	96	Various owners including Dept. of Tourism and Director of Lighthouses
10	Junaswada, North Goa	Permanent (01)	01	274	Forest Dept.
11	Mandrem, North Goa	Permanent (01)	01	Adjacent to Survey no. 288/10 and 289	Various Private Owners
12	Miramar, North Goa	Permanent (06)	06	NA	CCP, Panjim
13	Morjim, North Goa	Permanent (01) Mobile (01)	02	Adjacent to Survey no. 119/ 3A, 4A, 5, 118/1	Dept. of Tourism
14	Rua De Ourem Creek, North	Permanent (01)	02	45	Dept. of Tourism

	Goa	Mobile (01)			
15	Sinquerim, North Goa	Mobile (03)	03	105	Various Private Owners
16	Vagator-Chapora, North Goa	Permanent (03)	03	337/1	Various Private Owners including Dept. of Tourism
17	Agonda, South Goa	Mobile (1)	01	Adjacent to Survey no. 120/29 and 120/26	The Fabrica of Church Agonda One and other Private owners
18	Benaulim, South Goa	Permanent (02)	02	365/2	Private Owner
19	Betalbatim, South Goa	Mobile (01)	01	8	Private Owner
20	Betul, South Goa	Mobile (01)	01	115/35	Various Private Owners
21	Cavelossim, South Goa	Mobile (01)	01	109/1	Various Private Owners
22	Colva, South Goa	Permanent (01) Mobile (04)	05	25	Dept. of Tourism
23	Majorda, South Goa	Mobile (01)	01	61	Various Private Owners
24	Pololem, South Goa	Permanent (01) Mobile (03)	04	135/18	GTDC
25	Varca, South Goa	Mobile (01)	01	Adjacent to Survey no. 214/7 & 217/6	Private Owner
	Total	**Permanent (27)** **Mobile (41)**	**68**		

Source: Department of Tourism, Goa

Proposed Infrastructure Developments along the Coastline in Goa:

The development of infrastructure in all the below mentioned proposed locations, especially the Permanent structures, is subject to availability of permissions from respective land owners.

S.No.	Location, Taluka, District	Survey No.	Land Ownership	Nature of Infrastructure developments proposed to be undertaken
1	Anjuna, Bardez Taluka, North Goa	206(Part), 210/5, 211/2, 211/3, 211/4, 211/5, 211/6, 211/7, 211/8, 212/1, 212/2, 212/3, 212/4, 212/6, 212/7, 212/9, 212/10,212/11, 206	GTDC	Public Conveniences of 1no.s (Gents, Ladies and handicap) including toilets, urinals, shower / changing rooms, and locker rooms, Drinking water facilities, 40 KLD Sewage Treatment Plant, GIS mapping, Seating arrangement, Provision of Dustbins, Solar lighting, Development of Tourist Information Center, Parking lot, Provision of tourism Signages, and CCTV &WiFi facilities. Development of Property in Anjuna- Site Development, Parking Area, Entrance Plaza, Ticket Booth, Internal Pathways, Lighting
2	Arambol, Pernem Taluka, North Goa	71/0	Private Owner	Public Conveniences of 2no.s (Gents, Ladies and handicap) including toilets, urinals, shower / changing rooms, and locker rooms, Drinking water facilities, 40 KLD Sewage Treatment Plant, GIS mapping, Solar lighting, and Provision of tourism Signages,
3	Ashvem, Pernem Taluka, North Goa	212	Private Owner	Public Conveniences of 2no.s (Gents, Ladies and handicap) including toilets, urinals, shower / changing rooms, and locker rooms, Drinking water facilities, 40 KLD Sewage Treatment Plant, GIS mapping Solar lighting, Parking lot, Provision of tourism Signages, Development of Ashwem Beach Parking- Parking & Street Furniture.
4	Baga, Bardez Taluka, North Goa	281/l (Part) (House), 249/l (House), 282/1, 282/2, 282/3, 282/4, 282/5, 282/6, 282/7, 282/8, 282/9, 282/10, 282/11, 282/12, 282/13, 282/14, 282/15, 282/16, 282/17,	GTDC	Public Conveniences of 9no.s (Gents, Ladies and handicap) including toilets, urinals, shower / changing rooms, and locker rooms, Drinking water facilities, 40 KLD Sewage Treatment Plant, GIS mapping, Seating arrangement, Provision of Dustbins, Solar lighting, Development of Tourist Information Center, Provision of tourism Signages, and

S.No.	Location, Taluka, District	Survey No.	Land Ownership	Nature of Infrastructure developments proposed to be undertaken
		282/18, 282/19, 282/20, 282/21, 282/22, 282/23, 282/24, 282/25, 282/26, 282/27, 282/28, 282/29, 282/30, 282/31, 282/32, 282/33, 282/34, 282/35, 282/36, 282/37, 282/38, 282/39, 282/40, 282/41, 282/42, 282/43, 282/44, 282/45, 282/46, 282/47, 282/48, 283/1, 283/2, 282/3, 282/4, 281/1(Part), 281/2 (Part), 281/3, 280/15, 280/21, 280/22, 280/23, 280/24, 280/25, 280/26, 280/27, 280/28, 280/29, Adjacent to Survey no. 211 & 282,		CCTV &WiFi facilities.
5	Calangute, Bardez Taluka, North Goa	200/1, 175/1, 176/1, 176/2, 176//3, 176/13, 176/14, 176/16, 176/17, 176/24, 200/12, 187/8,11,10, 200/1,2,3	Dept. of Tourism (200/1) and the rest with GTDC	Public Conveniences of 10no.s (Gents, Ladies and handicap) including toilets, urinals, shower / changing rooms, and locker rooms, Drinking water facilities, 40 KLD Sewage Treatment Plant, GIS mapping, Seating arrangement, Provision of Dustbins, Solar lighting, Development of Tourist Information Center, Provision of tourism Signages, and CCTV &WiFi facilities. Beautification near Calangute market circle and taxi stand- Beautification & Site Development. Construction Of Parking Near Annex Building For Buses And Two Wheeler Parking At Calangute Residency- Parking & Beautification. Illumination of road from Calangute to Baga- Illumination
6	Candolim, Bardez Taluka, North Goa	Survey No. 146/1 & Survey No. 148/5, 146/1,2,3A,3B,4,4A,4B,5, 5A	Various owners including Dept. of Tourism	Public Conveniences of 4no.s (Gents, Ladies and handicap) including toilets, urinals, shower / changing rooms, and locker rooms, Drinking water facilities, 40 KLD Sewage

S.No.	Location, Taluka, District	Survey No.	Land Ownership	Nature of Infrastructure developments proposed to be undertaken
				Treatment Plant, GIS mapping , Seating arrangement, Provision of Dustbins, Solar lighting, Provision of tourism Signages, and CCTV &WiFi facilities. Construction of parking near the beach along with Garden area on Department Tourism land - Illumination
7	Coco / Nerul, Bardez Taluka, North Goa	120/1	Communidade of Nerul	Public Conveniences of 1no.s (Gents, Ladies and handicap) including toilets, urinals, shower / changing rooms, and locker rooms, Drinking water facilities, 40 KLD Sewage Treatment Plant, GIS mapping Solar lighting, Provision of tourism Signages,
8	Dona Paula, Tiswadi Taluka, North Goa	PT Sheet No. 185, Chalta No. 1-1 PT sheet No. 254, sub div 1	Dept. of Tourism	Public Conveniences of 2no.s (Gents, Ladies and handicap) including toilets, urinals, shower / changing rooms, and locker rooms, Drinking water facilities, 40 KLD Sewage Treatment Plant, GIS mapping , Seating arrangement, Provision of Dustbins, Solar lighting, Development of Tourist Information Center, Parking lot, Provision of tourism Signages, and CCTV &WiFi facilities.
9	Fort Aguada, Bardez Taluka, North Goa	96	Various owners including Dept. of Tourism and Director of Lighthouses	Upgradation & improvement of Helipad at Fort Aguada - Resurfacing, Fencing , Public Amenities, Café shops, Reception, Parking, Development of Aguada Jail as Tourist Destination- 1) Entrance Arch Development Cost, cleaning and Repairing of Two Statues, Entrance Foyer 2) Seating Arrangement, Paving & upgradation, Barracks Development (Restaurant with TIC + Reception Areas + Amenities) 3) Restoration of Aquifer - Develop Seating, Cleaning of spring source and water channel 4) Improvement to Water Fountain and Temple Area with Lighting and Seating 5) Admin Block (Admin For Management of Jail & Souvenir Shop 6) De-weeding and Cleaning of the full path leading to jail and remove the enclosure ,Side Wall Development 7) Entrance to Jail Area as a ticketing Counter 8) Light and sound show area Pavement with Seating arrangement. 9) One Cell

S.No.	Location, Taluka, District	Survey No.	Land Ownership	Nature of Infrastructure developments proposed to be undertaken
				development for Photography 10) Jetty renovation 11) Workshop Areas 12) Overall Illumination of the Jail Campus. Public Conveniences of 2no.s (Gents, Ladies and handicap) including toilets, urinals, shower / changing rooms, and locker rooms, Drinking water facilities, 40 KLD Sewage Treatment Plant, GIS mapping , Seating arrangement, Provision of Dustbins, Solar lighting, Development of Tourist Information Center, Parking lot, Provision of tourism Signages, and CCTV &WiFi facilities.
10	Junaswada, Pernem Taluka, North Goa	274	Forest Dept.	Construction of Footbridge at Junaswada Garden, Public Conveniences of 1no.s (Gents, Ladies and handicap) including toilets, urinals, shower / changing rooms, and locker rooms, Drinking water facilities, 40 KLD Sewage Treatment Plant, GIS mapping, Seating arrangement, Provision of Dustbins, Solar lighting, Development of Tourist Information Center, Parking lot, Provision of tourism Signages.
11	Mandrem, Pernem Taluka, North Goa	Adjacent to Survey no. 288/10 and 289, 211	Various Private Owners	Public Conveniences of 1no.s (Gents, Ladies and handicap) including toilets, urinals, shower / changing rooms, and locker rooms, Drinking water facilities, 40 KLD Sewage Treatment Plant, GIS mapping , Seating arrangement, Provision of Dustbins, Solar lighting, and Provision of tourism Signages. Providing of handicap friendly access and illumination across the Creek at Junaswada beach and Mandrem beach in Pernem- Access Bridges, Beautification of Alorna Fort at Alorna
12	Miramar, Tiswadi Taluka, North Goa	117/1 Part, 117/2 Part, 118/1 – A, 118/1-B, 118/1, 118/2, 117/1	CCP, Panjim	Public Conveniences of 6no.s (Gents, Ladies and handicap) including toilets, urinals, shower / changing rooms, and locker rooms, Drinking water facilities, 40 KLD Sewage Treatment Plant, GIS mapping Solar lighting, Provision of tourism Signages.

S.No.	Location, Taluka, District	Survey No.	Land Ownership	Nature of Infrastructure developments proposed to be undertaken
13	Morjim, Pernem Taluka, North Goa	Adjacent to Survey no. 119/ 3A, 4A, 5, 118/1, 48,56	Dept. of Tourism (Adjacent to Survey no.119/ 3A, 4A, 5, 118/1) and the rest with GTDC	Public Conveniences of 2no.s (Gents, Ladies and handicap) including toilets, urinals, shower / changing rooms, and locker rooms, Drinking water facilities, 40 KLD Sewage Treatment Plant, GIS mapping, Seating arrangement, Provision of Dustbins, Solar lighting, Development of Tourist Information Center, Parking lot, and Provision of tourism Signages. Development of Morjim Khind-Beautification of hills with development, Entrance plaza, , Small back office and ticket counter, Strengthening of the lake side wall, Public utility area, Yogashala, Kitchen, Cafeteria, Pergola, Viewing Pavillion sit-out, Meditation Kiosk
14	Rua De Ourem Creek / Panjim, North Goa	45, PTS 73/Property No. 2, 3, 4, 5, 6,	Dept. of Tourism (PT Sheet No. 45) and the rest with GTDC	Development of Betim Jetty (Strengthening of existing jetty with retaining wall and repairs, Beautification and illumination of the premises, Floating jetty of 50mts in length), Development of Panjim Jetty (Floating Jetty of 100mts in length). Construction of Multi-Level Car Parking, Development for the concept and implementation main arrival centre, other amenities etc. For Santamonica Jetty and its parking area at Panaji, Development of World Class Tourist amenities at Patto Creek, Panaji Goa-Developing of the creek-side promenade, Goa Haat, Exhibition Center, Kiosks, Restaurants, cafes, Gondola rides, Pathway development, Landscaping, Boat club, Fountain show , food street etc on lines of Clarke Quay Singapore. Public Conveniences of 2no.s (Gents, Ladies and handicap) including toilets, urinals, shower / changing rooms, and locker rooms, Drinking water facilities, 40 KLD Sewage Treatment Plant, GIS mapping , Seating arrangement, Provision of Dustbins, Solar lighting, Development of Tourist Information Center, Provision of tourism Signages, and CCTV &Wi-Fi facilities.

S.No.	Location, Taluka, District	Survey No.	Land Ownership	Nature of Infrastructure developments proposed to be undertaken
15	Sinqueri, Bardez Taluka, North Goa	105, 96	Various Private Owners (Survey No. 105) and the rest with GTDC	Public Conveniences of 3no.s (Gents, Ladies and handicap) including toilets, urinals, shower / changing rooms, and locker rooms, GIS mapping Solar lighting, and Provision of tourism Signages.
16	Terekhol, North Goa	2/63 (Part), 2/85, 2/93, 2/58 2/76(Part), 2/88(Part), 2/77(Part), 2/78(Part), 2/81(Part), 2/82, 2/80(Part), 2/84(Part), 2/86, 2/87, 2/90, 2/91, 2/94, 2/89, 2/92	GTDC	Repairs and Restoration of Terekhol Fort Wall Public Conveniences of 1no.s (Gents, Ladies and handicap) including toilets, urinals, shower / changing rooms, and locker rooms, GIS mapping, and Provision of tourism Signages, 25 temporary huts ,pathways, public rain shelter.
17	Vagator-Chapora, Bardez Taluka, North Goa	337/1, 341, 596/1, 596/4, 597/1, 597/4, 342/1, 597/5, 597/2, 597/6, 334/1, 334/2, 334/7, 335/1, 335/2, 335/3, 335/4, 335/5, 335/6, 335/7, 335/8, 335/9, 336, 337/1, 337/2, 337/3, 337/4, 337/5, 337/6, 337/7, 337/8, 597/1, 597/2, 597/3, 597/6, 597/7, 597/8, 597/9, 597/10, 338/1, 338/2, 338/3, 338/4, 338/5, 336/6, 338/7, 339/1, 339/2, 339/3, 339/4, 339/5, 339/6, 339/7, 339/8, 339/9, 339/10, 339/11, 339/12, 341/1, 596/4, 597 & 339, 597, 338, 337, 336 & 335 334/2, 7 (Part)	Various Private Owners including Dept. of Tourism (Survey No. 337/1) and the rest with GTDC	Public Conveniences of 3no.s (Gents, Ladies and handicap) including toilets, urinals, shower / changing rooms, and locker rooms, Drinking water facilities, 40 KLD Sewage Treatment Plant, GIS mapping , Seating arrangement, Provision of Dustbins, Solar lighting, Development of Tourist Information Center, Parking lot, Provision of tourism Signages, and CCTV &Wi-Fi facilities. <u>Vagator-Chapora Phase-1</u> Renovation of Existing Restaurants, Sewage Treatment Plant and 15 temporary and seasonal structures (Bamboo / wood) 26 Temporary and Seasonal structures (Bamboo / Wood), Soak pit and septic tank, Renovation of existing Restaurant, Public parking, Pathway for existing fisherman jetty, 3 temporary Public toilets and existing well. • Total area of the project = 22500 Sq.m. • Area of all temporary structures including toilets which are of temporary nature = 3161.44 Sq.m. • GCZMA approved project and plan in its 84th meeting held on 06/06/2013 and issued NOC / permission vide no. GCZMA/N/13-14/11/358

S.No.	Location, Taluka, District	Survey No.	Land Ownership	Nature of Infrastructure developments proposed to be undertaken
				dated 07/06/2013 • GCZMA approved pathway towards fisherman jetty in its 95th meeting held on 01/11/2013 and issued NOC/permission vide no. GCZMA/N/13-14/59/1025 dated 27/11/2013 <u>Vagator-Chapora Phase-2</u> Proposed rain shelter, 7 public toilets, 4 changing rooms, 4 shacks, Existing well, and 31 temporary structures / huts, Sewage Treatment Plant and proposed temporary shelter. • Total area of the project = 32116 Sq.m. • Area of all temporary structures = 8325 Sq.m. • GCZMA approved project and plan in its 97th meeting held on 09/01/2014 and issued NOC/permission vide no. GCZMA/N/13-14/70/1358 dated 27/01/2014
18	Agonda, Cancona Taluka, South Goa	Adjacent to Survey no. 120/29 and 120/26	The Fabrica of Church Agonda One and other Private owners	Public Conveniences of 1no.s (Gents, Ladies and handicap) including toilets, urinals, shower / changing rooms, and locker rooms, GIS mapping Solar lighting, and Provision of tourism Signages.
19	Baina, Vasco, South Goa	NA	NA	Beautification of Baina beach, Public Conveniences of 1no.s (Gents, Ladies and handicap) including toilets, urinals, shower / changing rooms, and locker rooms, Drinking water facilities, 40 KLD Sewage Treatment Plant, GIS mapping, Seating arrangement, Provision of Dustbins, Development of Tourist Information Center, Provision of tourism Signages, and CCTV &WiFi facilities.
20	Benaulim, Salcete Taluka, South Goa	365/2	Private Owner	Development of beachside amenities at Benaulim -Public amenities (Public Conveniences, signages, bins, seating, Tourist Information Centre etc.) Public Conveniences of 2no.s (Gents, Ladies and handicap) including toilets, urinals, shower / changing rooms, and locker rooms, Drinking water facilities, 40 KLD Sewage

S.No.	Location, Taluka, District	Survey No.	Land Ownership	Nature of Infrastructure developments proposed to be undertaken
				Treatment Plant, GIS mapping , Seating arrangement, Provision of Dustbins, Solar lighting, Development of Tourist Information Center, Provision of tourism Signages, and CCTV &Wi-Fi facilities.
21	Betalbatim, Salcete Taluka, South Goa	8	Private Owner	Public Conveniences of 1no.s (Gents, Ladies and handicap) including toilets, urinals, shower / changing rooms, and locker rooms, GIS mapping Solar lighting, and Provision of tourism Signages.
22	Betul, Salcete Taluka, South Goa	115/35	Various Private Owners	Public Conveniences of 1no.s (Gents, Ladies and handicap) including toilets, urinals, shower / changing rooms, and locker rooms, GIS mapping Solar lighting, and Provision of tourism Signages.
23	Cavelossim, Salcete Taluka, South Goa	109/1	Various Private Owners	Public Conveniences of 1no.s (Gents, Ladies and handicap) including toilets, urinals, shower / changing rooms, and locker rooms, GIS mapping Solar lighting, and Provision of tourism Signages.
24	Colva, Salcete Taluka, South Goa	25, 40/Part-I, 37/1, 37/2, 37/10, 37/11, 37/7, 37/3, 37/6, 37/4, 37/5, 37/8 – II, 37/8 -I, 38/1, 23/1, 38,25	Dept. of Tourism (Survey No. 25) and the rest with GTDC	Adventure Theme based development at Colva and Colva creek-Entertainment Park, Parking, Beautification, Public conveniences, signages, Landscaping, children's play area, Illumination, Seating, Tourist Info centre, portable WC's. Public Conveniences of 5no.s (Gents, Ladies and handicap) including toilets, urinals, shower / changing rooms, and locker rooms, Drinking water facilities, 40 KLD Sewage Treatment Plant, GIS mapping , Seating arrangement, Provision of Dustbins, Solar lighting, Development of Tourist Information Center, Parking lot, Provision of tourism Signages, and CCTV &Wi-Fi facilities.
25	Majorda, Salcete Taluka, South Goa	61	Various Private Owners	Public Conveniences of 1no.s (Gents, Ladies and handicap) including toilets, urinals, shower / changing rooms, and locker rooms, GIS mapping Solar lighting, and Provision of tourism Signages.
26	Pololem,	135/18	GTDC	Beautification of Nuvem Beach, Rajbag Beach, Khakol

S.No.	Location, Taluka, District	Survey No.	Land Ownership	Nature of Infrastructure developments proposed to be undertaken
	Cancona Taluka, South Goa			Beach, Khola Beach, Cabo-De-Rama Beach. Public Conveniences of 4no.s (Gents, Ladies and handicap) including toilets, urinals, shower / changing rooms, and locker rooms, Drinking water facilities, 40 KLD Sewage Treatment Plant, GIS mapping , Seating arrangement, Provision of Dustbins, Solar lighting, Development of Tourist Information Center, Parking lot, Provision of tourism Signages, and CCTV &Wi-Fi facilities.
27	Varca, SalceteTaluka, South Goa	Adjacent to Survey no. 214/7 & 217/6	Private Owner	Public Conveniences of 1no.s (Gents, Ladies and handicap) including toilets, urinals, shower / changing rooms, and locker rooms, GIS mapping Solar lighting, and Provision of tourism Signages.

Source: Department of Tourism, Goa

ANNEX 6: Statistics of power availability & generation in Goa

Present Central Sector Station wise allocation of power to Goa							
Station		**Peak Hrs (18.00 to 22.00)**			**Off Peak Hrs. (00 to 18.00 & 22.00 to 24.00)**		
		Share from firm Allocation (MW)	Share from unallocated Allocation (MW)	Total Allocation (MW)	Share from firm Allocation (MW)	Share from unallocated Allocation (MW)	Total Allocation (MW)
KSTPS	NTPC/Coal based	210	2.73	212.73	210	4.38	214.38
KSTPS-7		4.5	1.29	5.79	4.5	2.07	6.57
VSTPS-I		35	2.43	37.43	35	3.91	38.91
VSTPS-II		12	1.84	13.84	12	2.95	14.95
VSTPS-III		10	1.84	11.84	10	2.95	12.95
VSTPS-IV		11.2	2.58	13.78	11.2	4.13	15.33
SipatStage-I		20	5.1	21.09	20	8.19	28.19
SipatStage-II		10	1.75	11.75	10	2.81	12.81
MSTPS-I		11.2	2.58	13.78	11.2	4.13	15.33
KGPP	NTPC/Gas based	0	12.37	12.37	0	12.37	12.37
GGPP		0	12.63	12.63	0	12.63	12.63
KAPP		15	0.67	15.67	15	1.07	16.07
TAPP-3&4	NPCIL/Nuclear based	11	2.27	13.27	11	3.63	14.63
Total WR		***349.9***	***50.08***	***399.98***	***349.9***	***65.22***	***415.12***
RSTPS SR	NTPC/Coal based	100	0	100	100	0	100
Total	Coal/Gas/Nuclear	**449.9**	**50.08**	**499.98**	**449.9**	**65.22**	**515.12**

Besides above allocated share of Power from Ratnagiri Gas & Power Project Limited is 19.67 MW , however the power is not available from this plant due to minimum technical load requirement for operation of the plant due to non-scheduling of power by Principal (95%)

Beneficiary i.e. Maharashtra (MSEDCL).

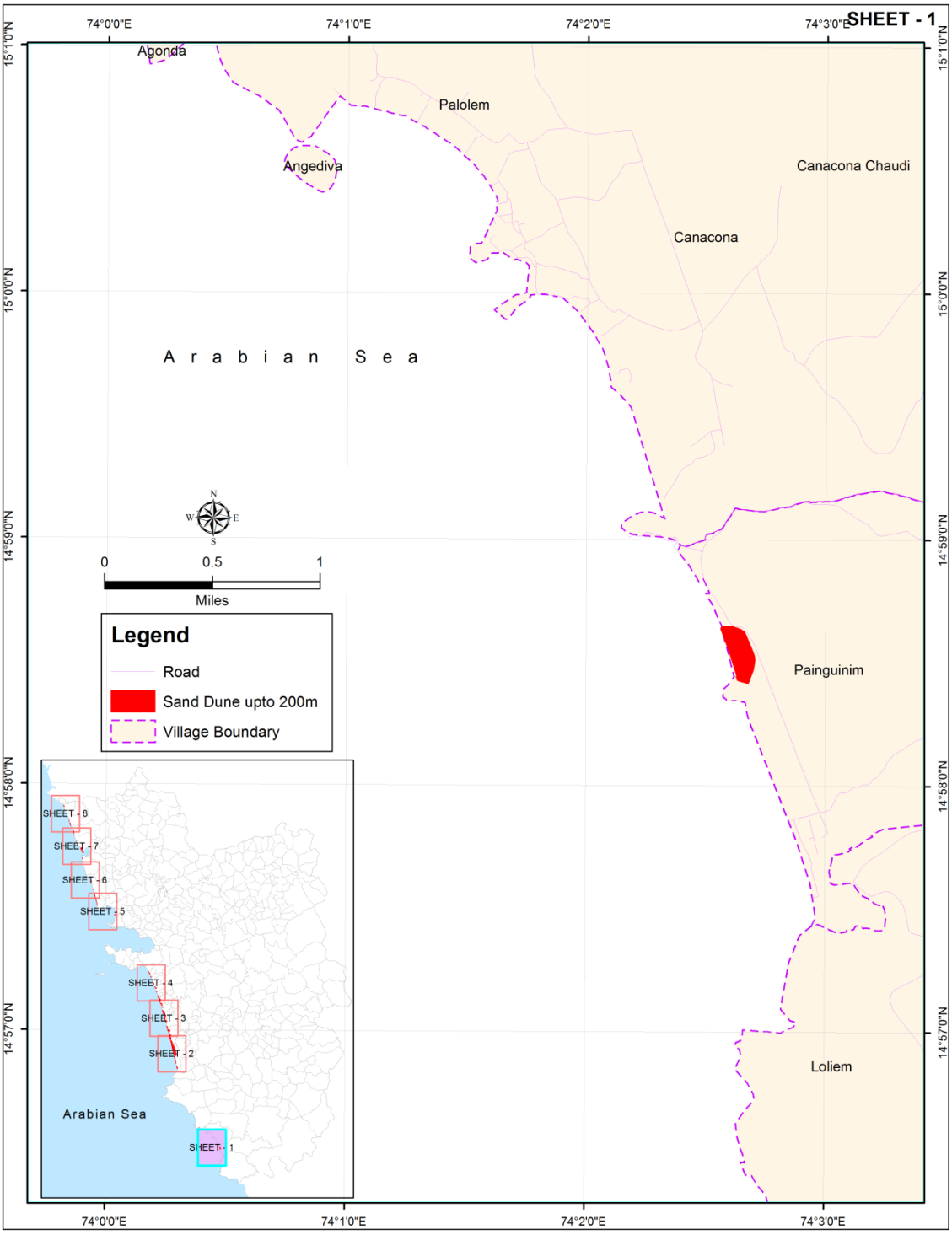
*This is only the share allocation , however actual availability varies on day to day basis depending on plant load factor of Station

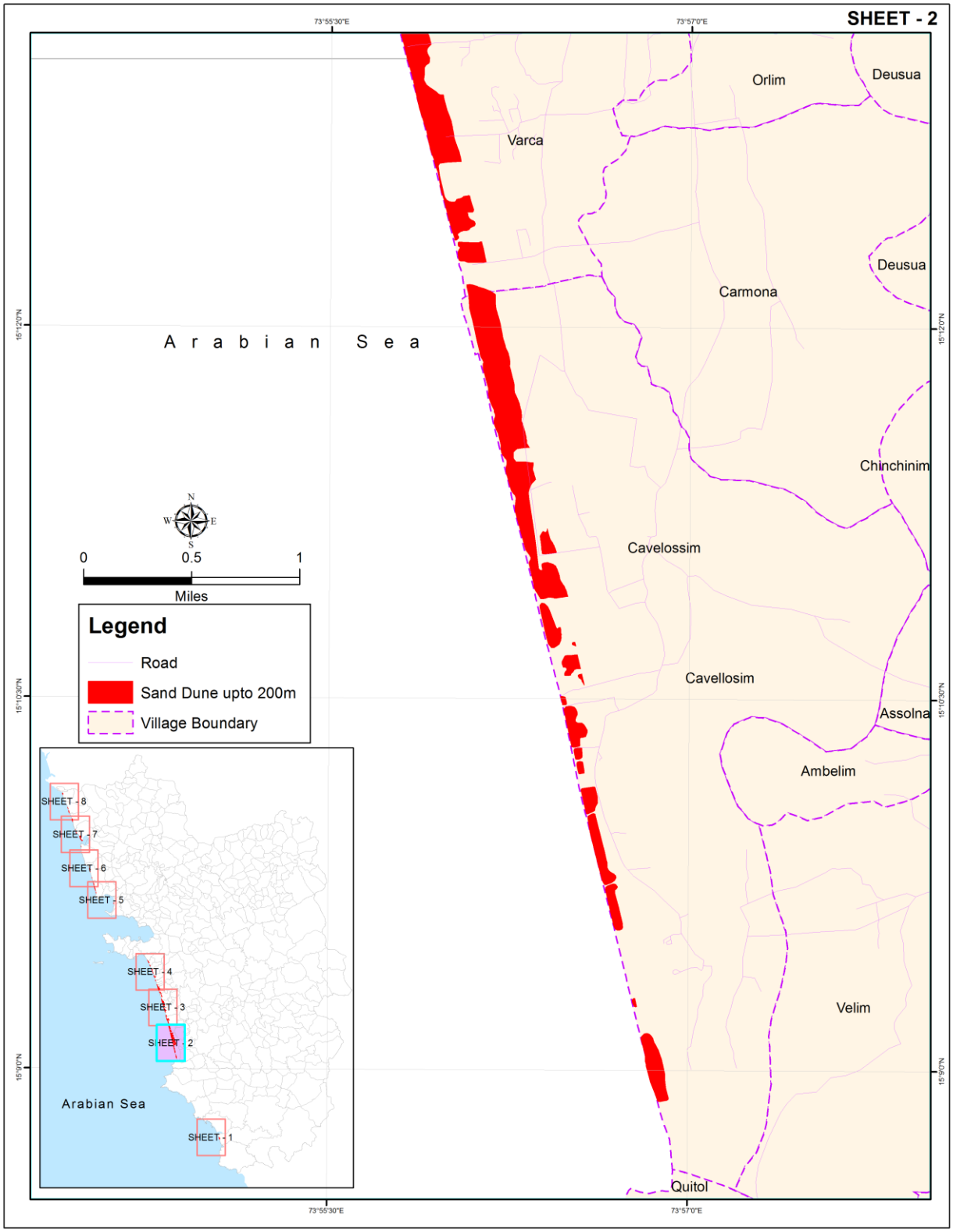
KSTPS	_ Korba Super Thermal Power Station	
VSTPS-I	_ Vindhyachal Super Thermal Power Station _ Stage-I	
VSTPS-II	_ Vindhyachal Super Thermal Power Station _ Stage-II	
VSTPS-III	_ Vindhyachal Super Thermal Power Station _ Stage-III	
KGPP	_ Kawas Gas Power Project	
GGPP	_ Gandhar Gas Power Project	
KAPP	_ Kakrapar Atomic Power Project	
TAPP-3&4	_ Tarapur Atomic Power Project-Stage 3 & 4	
KSTPS-7	_ Korba Super Thermal Power Station_ Stage-7	
VSTPS-IV	_ Vindhyachal Super Thermal Power Station _ Stage-IV	
MSTPS-I	_ Mauda Super Thermal Power Station _ Stage-I	
RSTPS SR	_ Ramagundum Super Thermal Power Station	

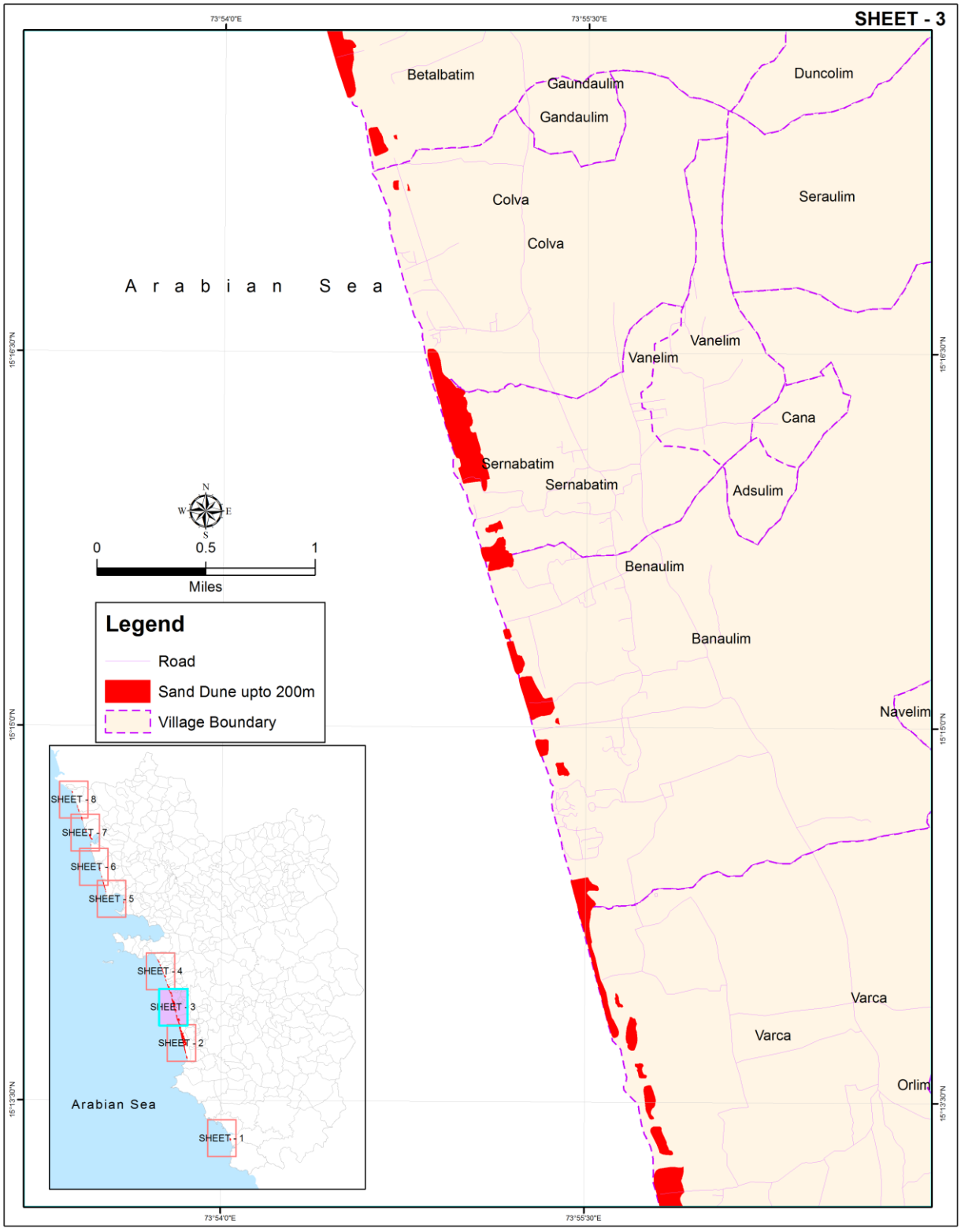
Present Internal Generation of power from Cogeneration Plants in Goa

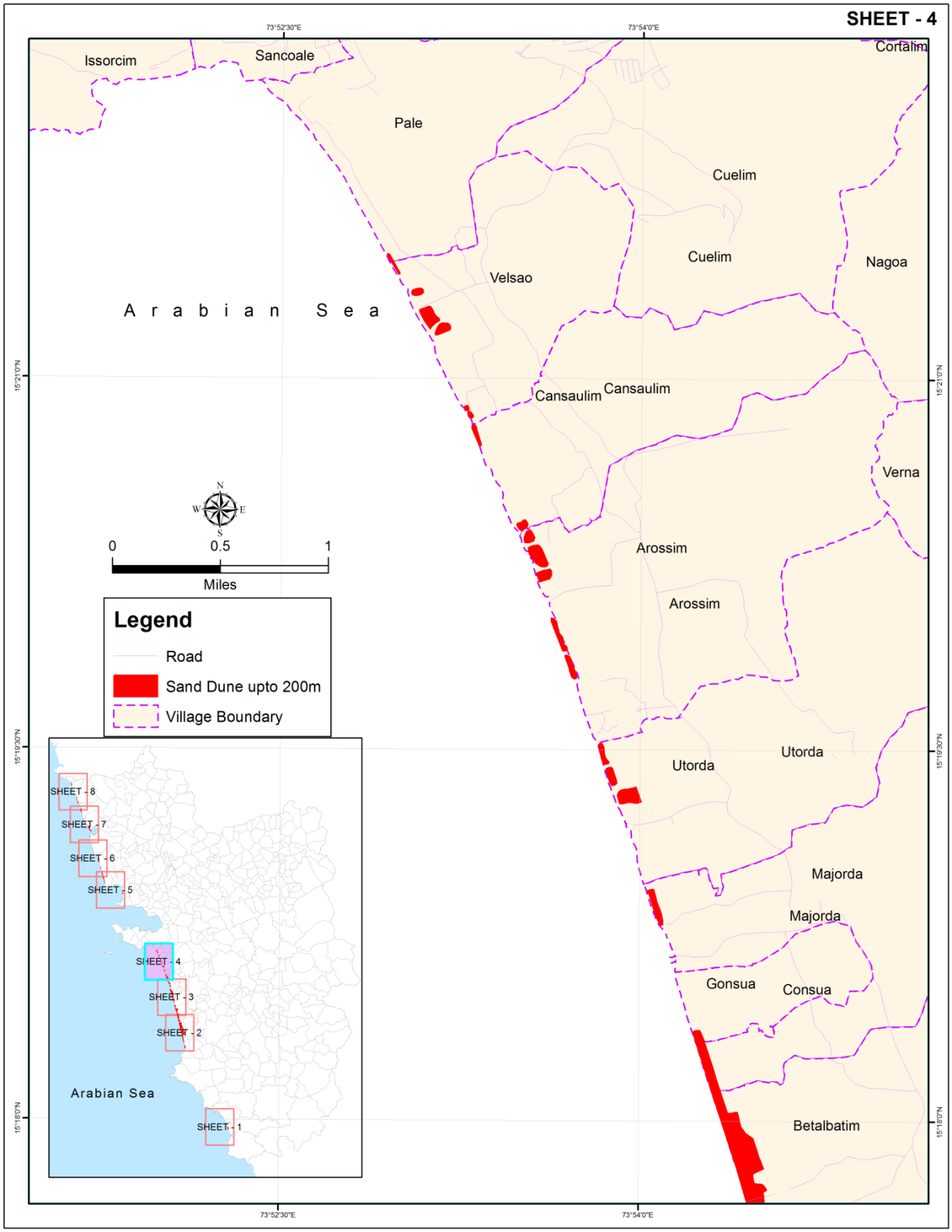
GEPL-	12 to 14 MW
GSPL-	1 to 2 MW
Sesa Goa	2 to 3 MW
Total	15 to 19 MW

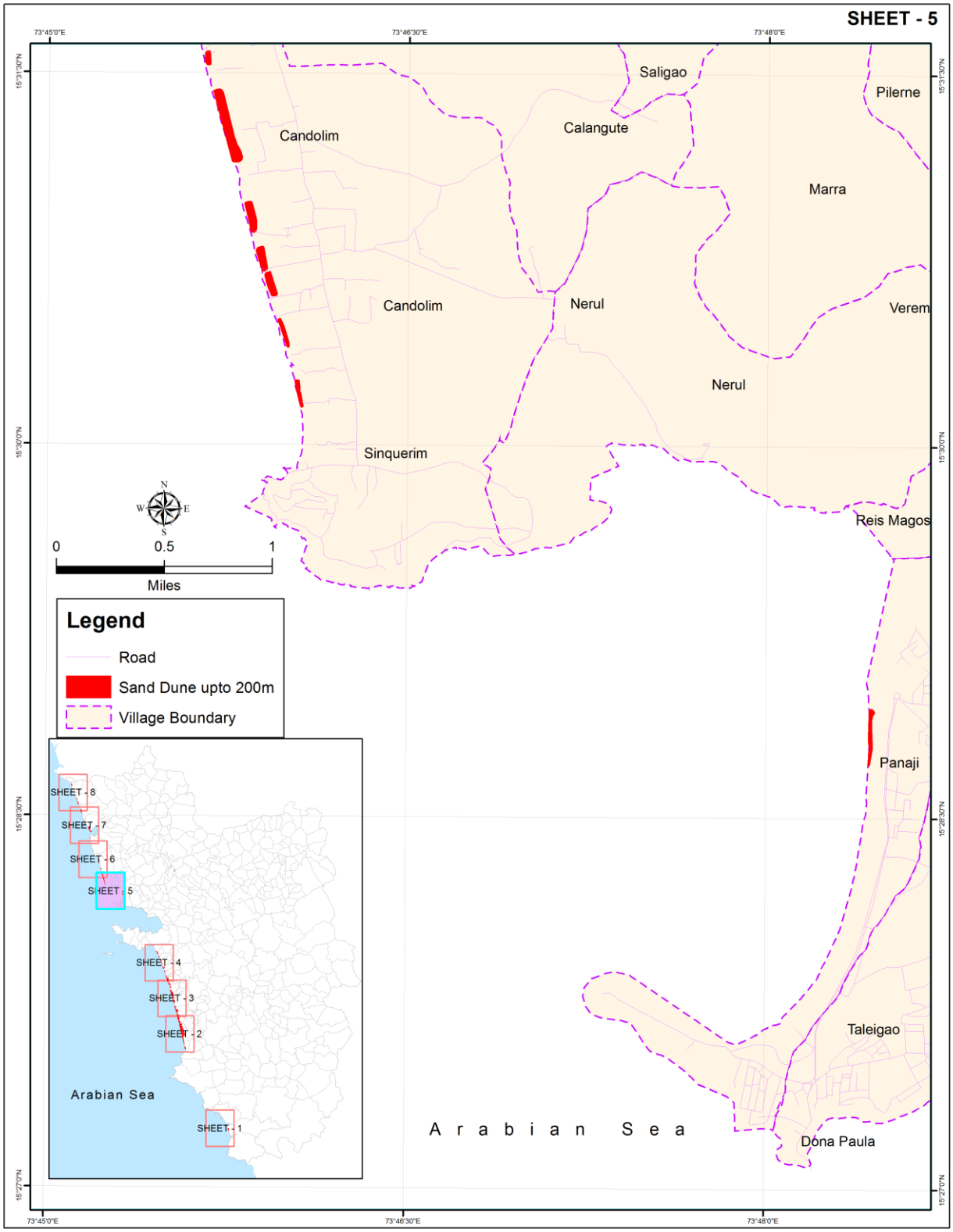
ANNEX 7: Mapping of sand dunes in coastal areas of Goa within 200m in CRZ areas

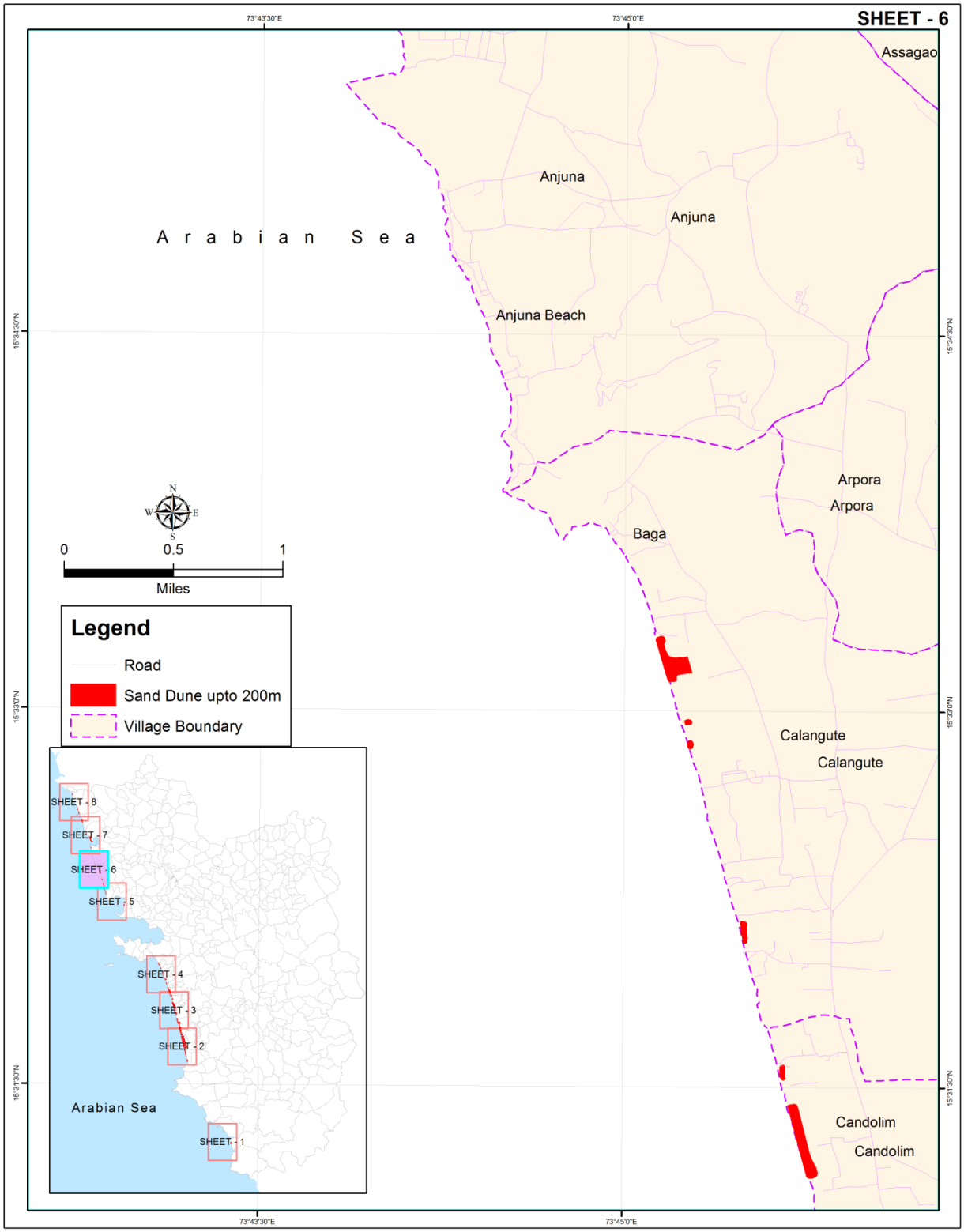


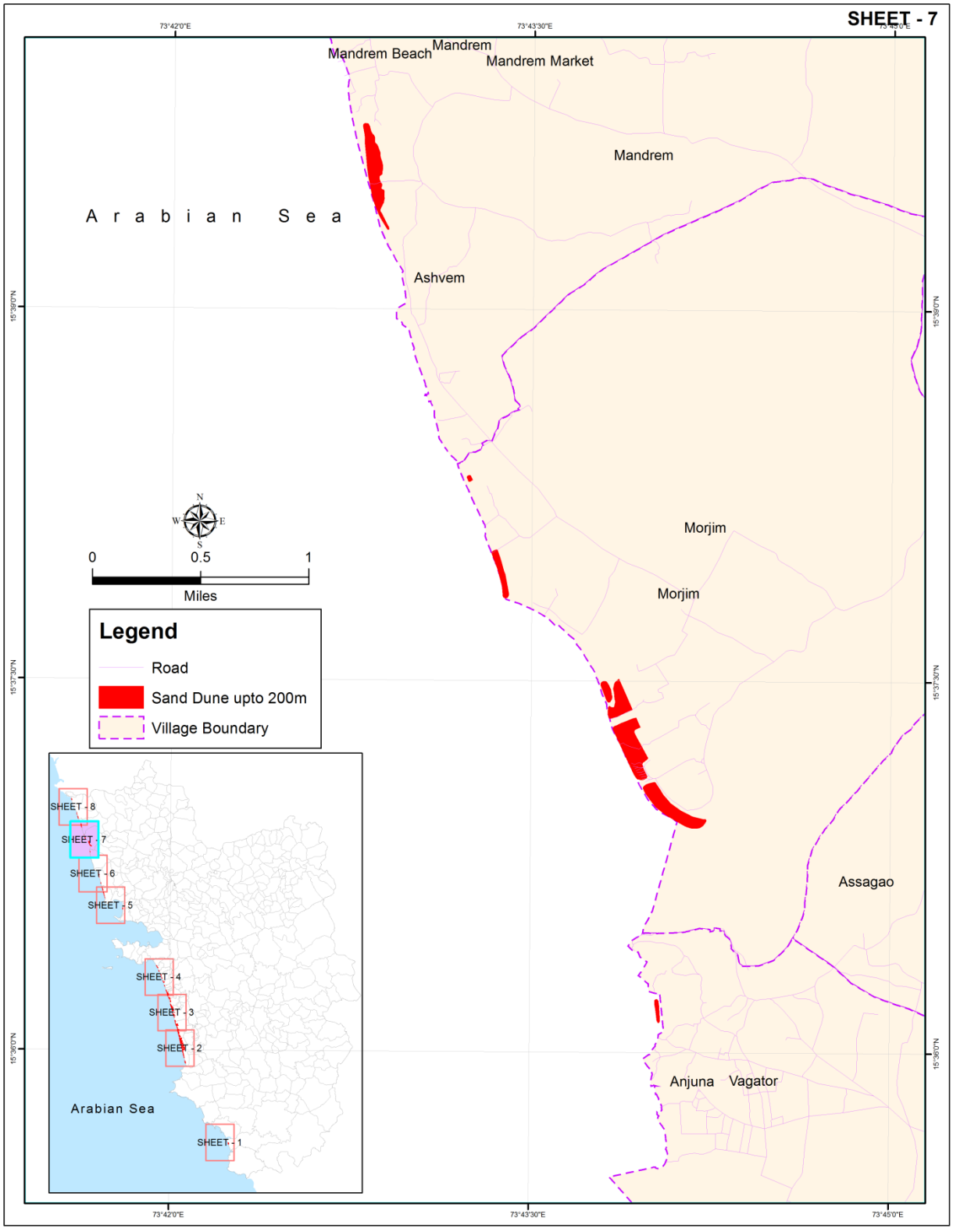

SHEET - 2
73°55'30"E
73°57'0"E
15°12'0"N
15°10'30"N
15°9'0"N
Orlim
Deusua
Varca
Deusua
Carmona
A r a b i a n S e a
Chinchinim
Cavelossim
Cavellosim
Assolna
Ambelim
Velim
Quitol
N
W
E
S
0
0.5
1
Miles
Legend
Road
Sand Dune upto 200m
Village Boundary
SHEET - 8
SHEET - 7
SHEET - 6
SHEET - 5
SHEET - 4
SHEET - 3
SHEET - 2
SHEET - 1
Arabian Sea

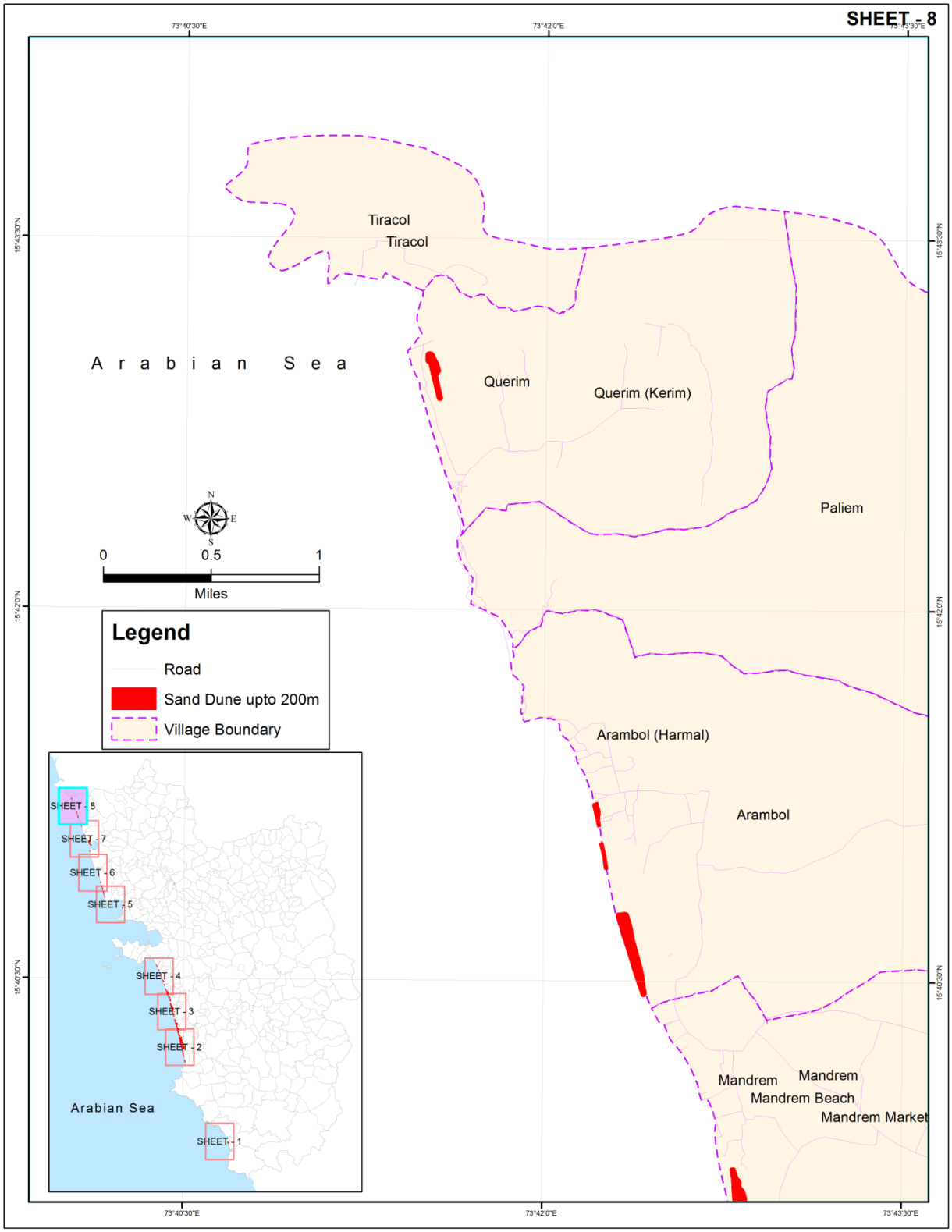

SHEET - 3
73°54'0"E
73°55'30"E
15°16'30"N
15°15'0"N
15°13'30"N
Betalbatim
Gaundaulim
Gandaulim
Duncolim
Colva
Colva
Seraulim
A r a b i a n S e a
Vanelim
Vanelim
Cana
Sernabatim
Sernabatim
Adsulim
Benaulim
Banaulim
Navelim
Varca
Varca
Orlim
N
W
E
S
0
0.5
1
Miles
Legend
Road
Sand Dune upto 200m
Village Boundary
SHEET - 8
SHEET - 7
SHEET - 6
SHEET - 5
SHEET - 4
SHEET - 3
SHEET - 2
SHEET - 1
Arabian Sea


SHEET - 4
73°52'30"E
73°54'0"E
15°21'0"N
15°19'30"N
15°18'0"N
Issorcim
Sancoale
Cortalim
Pale
Cuelim
Cuelim
Nagoa
Velsao
Arabian Sea
Cansaulim
Cansaulim
Verna
Arossim
Arossim
Utorda
Utorda
Majorda
Majorda
Gonsua
Consua
Betalbatim
N
W
E
S
0
0.5
1
Miles
Legend
Road
Sand Dune upto 200m
Village Boundary
SHEET - 8
SHEET - 7
SHEET - 6
SHEET - 5
SHEET - 4
SHEET - 3
SHEET - 2
SHEET - 1
Arabian Sea


SHEET - 5
73°45'0"E
73°46'30"E
73°48'0"E
15°31'30"N
15°30'0"N
15°28'30"N
15°27'0"N
Saligao
Pilerne
Calangute
Candolim
Marra
Candolim
Nerul
Verem
Nerul
Sinquerim
Reis Magos
Panaji
Taleigao
Dona Paula
A r a b i a n S e a
N
W
E
S
0
0.5
1
Miles
Legend
Road
Sand Dune upto 200m
Village Boundary
SHEET - 8
SHEET - 7
SHEET - 6
SHEET - 5
SHEET - 4
SHEET - 3
SHEET - 2
SHEET - 1
Arabian Sea


SHEET - 6
Assagao
Anjuna
Anjuna
Arabian Sea
Anjuna Beach
Arpora
Arpora
Baga
Calangute
Calangute
Candolim
Candolim
73°43'30"E
73°45'0"E
15°34'30"N
15°33'0"N
15°31'30"N
N
W
E
S
0
0.5
1
Miles
Legend
Road
Sand Dune upto 200m
Village Boundary
SHEET - 8
SHEET - 7
SHEET - 6
SHEET - 5
SHEET - 4
SHEET - 3
SHEET - 2
SHEET - 1
Arabian Sea


SHEET - 7
Mandrem Beach
Mandrem
Mandrem Market
Mandrem
Arabian Sea
Ashvem
Morjim
Morjim
Assagao
Anjuna
Vagator
73°42'0"E
73°43'30"E
73°45'0"E
15°39'0"N
15°37'30"N
15°36'0"N
N
W
E
S
0
0.5
1
Miles
Legend
Road
Sand Dune upto 200m
Village Boundary
SHEET - 8
SHEET - 7
SHEET - 6
SHEET - 5
SHEET - 4
SHEET - 3
SHEET - 2
SHEET - 1
Arabian Sea


SHEET - 8
Tiracol
Tiracol
Arabian Sea
Querim
Querim (Kerim)
Paliem
Arambol (Harmal)
Arambol
Mandrem
Mandrem
Mandrem Beach
Mandrem Market
N
W
E
S
0
0.5
1
Miles
Legend
Road
Sand Dune upto 200m
Village Boundary
SHEET - 8
SHEET - 7
SHEET - 6
SHEET - 5
SHEET - 4
SHEET - 3
SHEET - 2
SHEET - 1
Arabian Sea
73°40'30"E
73°42'0"E
73°43'30"E
15°43'30"N
15°42'0"N
15°40'30"N

ANNEX 8: Turtle nesting sites in Goa

GOVERNMENT OF GOA
Forest Department
Office of The Dy. Conservator of Forests
WILDLIFE AND ECO-TOURISM (SOUTH)
Aquem, Margao Goa – 403 601

Phone No:- 0832-2756980 *E-mail:-dcfwlsouth-forest.goa@nic.in*

No:-6/02/NGT/DCF/WL&ET(S)/2016-17/ 982 **Dated:-**27**/10/2016**

To,
The Director,
Department of Environment,
C/o. Goa Coastal Zone Management Authority,
Opp. Saligao Seminary,
Saligao, Bardez-Goa.

Director / Jt. Secretary (STE)
Inward No.:
Date :

Sub:- Request to provide the survey numbers along with other details of the Turtle Nesting Site of Agonda, Galgibag and Morjim…reg.

Sir,

I am to refer your letter No. GCZMA/GEN-MISC/16-17/498 dated 07/10/2016 on the above mentioned subject and to inform that the Turtle Nesting Sites of Agonda and Galgibag is designated sandy beach portion between the low tide level and high tide level of the sandy beach; and as such these areas do not have any survey Nos.

However, since the requisite information is required for studying the carrying capacity of these sites, the following adjacent areas to the Turtle Nesting sites which are sand dunes within CRZ-I and also are significantly important for Turtle Conservation, are as under:-

1. Galgibag Turtle Nesting Sites:- Survey Nos. 173, 176, 190, 191 of village Poinginium of Canacona Taluka.
2. Agonda Turtle Nesting Sites:- Survey Nos. 124, 125, 123, 121, 120, 118, 102, 101, 100, 96 and 151 of Village Agonda of Canacona Taluka.

The extract of the survey Nos. in form of maps is enclosed.

Further, the details of Turtle Nesting and Hatchlings released since 2005 to 2016 till date is enclosed for your consideration.

Yours faithfully,

(Sanjay K. Waradkar, IFS)
Dy. Conservator of Forests,
Wildlife & Eco-Tourism(S)
Margao-Goa.

Encl:- As above.

Copy to:-

1. The Dy. Conservator of Forests, (HQ), w.r.t. letter No. 2-61-WL-Galgibag-FD-Vol.IV/ 3510 dated 14/10/2016.

"स्वच्छ [illegible] नतळ गोंय"
Towards Clean and Greener India
Goa Forest Department 24 X 7 Helpline No: (North Goa) 0832-2228772, (South Goa) 0832-2750246
Please visit: www.forest.goa.gov.in

GOVERNMENT OF GOA
OFFICE OF THE DEPUTY CONSERVATOR OF FORESTS
WILDLIFE & ECOTOURISM (NORTH) DIVISION
1ST LIFT, 4TH FLOOR, JUNTA HOUSE,
PANAJI – 403 001 (GOA)

Phone: 0832-2229701 / Fax: 0832- 2422864
E mail: dcfwlnorth-forest.goa@nic.in

No. 1-312/WL&ET(N)/16-17/ 1841 Dated: 02/11/16

To
The Director,
Deptt. of Environment,
Opp. Saligao Seminary, Saligao,
Bardez, Goa 403 511

Sub: Furnishing of information on turtle nesting sites at Morjim.
Ref: This office letter no. 1-312/WL&ET(N)/16-17/1748 dated 20/10/16.

Sir,

Further to this office communication in the subject cited, I am to forward herewith the site plan of the area under management of the Forest department as turtle nesting area in Morjim coast of North Goa. In this connection, it is to emphasize that this area measuring about 40700 sq. mtrs has been treated as a 'No Development Zone' for the past two decades. Therefore, the sanctity of the area demarcated in the enclosed map has to be ensured.

In view of the fact that the process of allocation of shacks is currently underway, it will be advisable to obtain undertakings from all licensees to adhere to the guidelines as below,

i) No beach beds to be set up in the intertidal 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;

ii) The beach shacks to desist from installing any outdoor illumination. The indoor lighting should also be muted and provided with opaque shields on sea facing side;

iii) Playing of loud music by the shacks beyond 08.00 PM and holding of beach parties to be prohibited;

iv) Movement of any automobile on the beach to be prohibited;

v) It should be made incumbent upon the shack licensees to play a proactive role in ensuring conducive conditions to the marine turtles besides information sharing with staff of Forest department which monitors the entire coast.

Yours faithfully,

02/11/16

(Dr. A. Anil Kumar, IFS)
Dy. Conservator of Forests

Encls: a. a.

Copy to:
The Director, Department of Tourism, Paryatan Bhavan, Patto, Panaji for favour of information.

"Swachh Bharat, Swachh Goa"
"Clean India, Clean Goa"

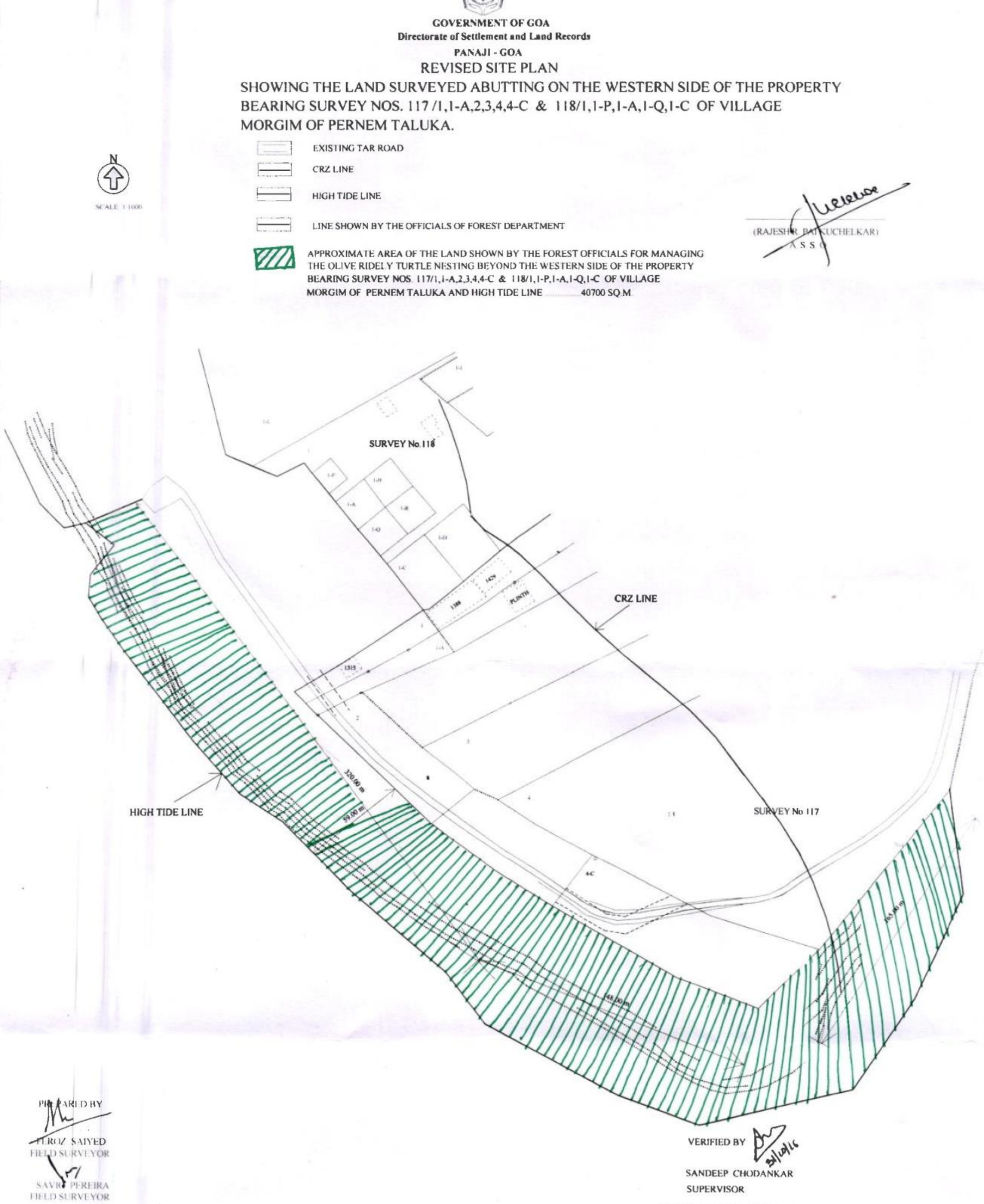
GOVERNMENT OF GOA
Directorate of Settlement and Land Records
PANAJI - GOA

REVISED SITE PLAN

SHOWING THE LAND SURVEYED ABUTTING ON THE WESTERN SIDE OF THE PROPERTY BEARING SURVEY NOS. 117 /1,1-A,2,3,4,4-C & 118/1,1-P,1-A,1-Q,1-C OF VILLAGE MORGIM OF PERNEM TALUKA.

- EXISTING TAR ROAD
- CRZ LINE
- HIGH TIDE LINE
- LINE SHOWN BY THE OFFICIALS OF FOREST DEPARTMENT
- APPROXIMATE AREA OF THE LAND SHOWN BY THE FOREST OFFICIALS FOR MANAGING THE OLIVE RIDELY TURTLE NESTING BEYOND THE WESTERN SIDE OF THE PROPERTY BEARING SURVEY NOS. 117/1,1-A,2,3,4,4-C & 118/1,1-P,1-A,1-Q,1-C OF VILLAGE MORGIM OF PERNEM TALUKA AND HIGH TIDE LINE .... 40700 SQ.M.

(RAJESHR. PAI KUCHELKAR)
A.S.S.O.



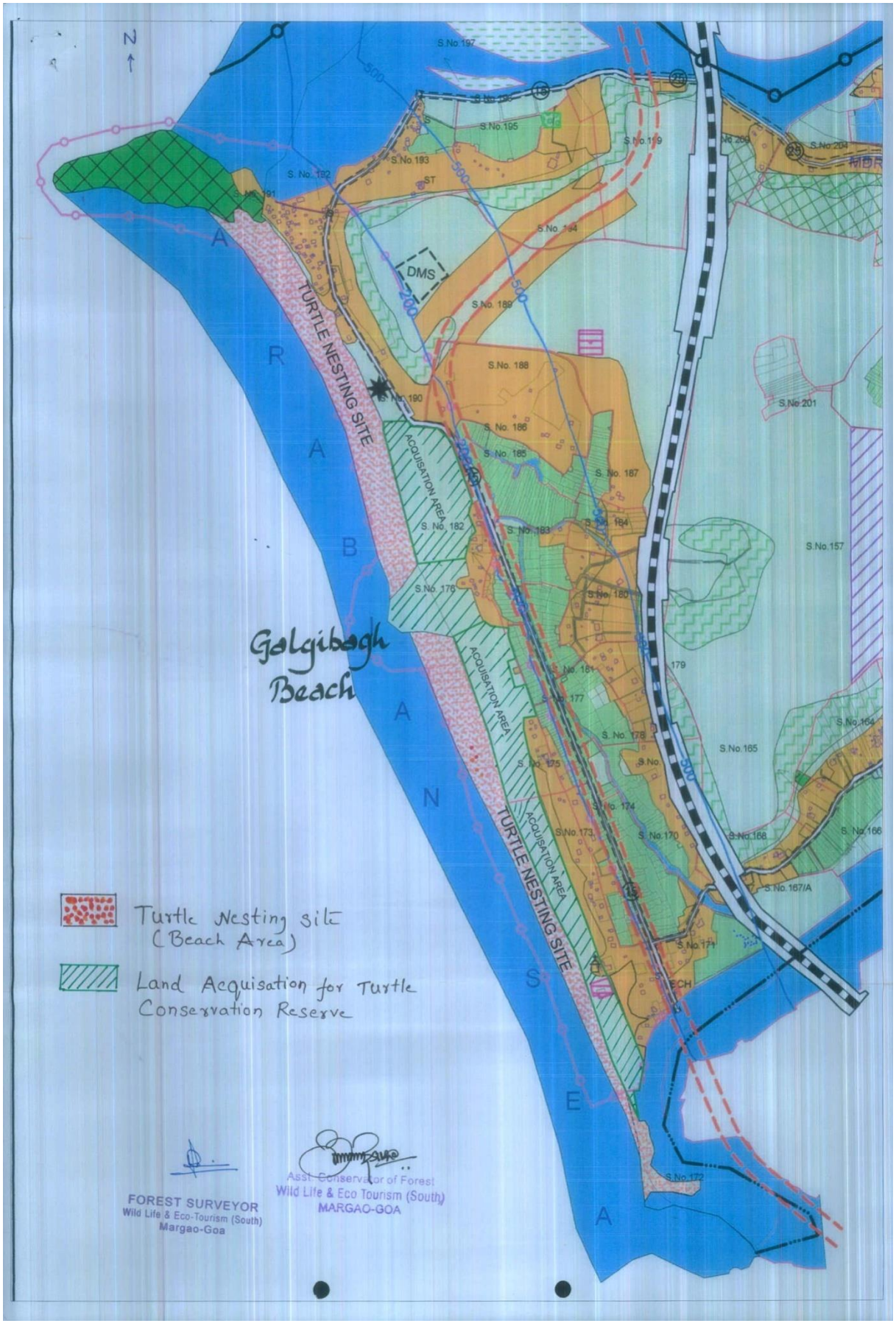
PREPARED BY
FEROZ SAIYED
FIELD SURVEYOR

SAVIO PEREIRA
FIELD SURVEYOR

VERIFIED BY
31/10/16
SANDEEP CHODANKAR
SUPERVISOR

FILE NO 7-1-MISC DSLR/2016/90

SURVEYED ON -28-10-2016


N
S.No.197
S.No.195
S.No.193
S.No.192
S.No.191
S.No.194
S.No.189
S.No.188
S.No.190
S.No.186
S.No.185
S.No.187
S.No.184
S.No.183
S.No.182
S.No.176
S.No.180
S.No.181
S.No.177
S.No.178
S.No.175
S.No.174
S.No.173
S.No.170
S.No.168
S.No.167/A
S.No.171
S.No.172
S.No.201
S.No.157
S.No.164
S.No.165
S.No.166
179
DMS
ST
SCH
TURTLE NESTING SITE
ACQUISATION AREA
ACQUISATION AREA
TURTLE NESTING SITE
Golgibagh Beach
Turtle Nesting site (Beach Area)
Land Acquisation for Turtle Conservation Reserve
FOREST SURVEYOR
Wild Life & Eco-Tourism (South)
Margao-Goa
Asst. Conservator of Forest
Wild Life & Eco Tourism (South)
MARGAO-GOA


N
AGONDA BEACH
TURTLE NESTING SITE
TURTLE NESTING SITE
DMS
DMS
SCH
SCH
MDR-51
H.C.
V.P.
Turtle Nesting site
(Beach Area)
FOREST SURVEYOR
Wild Life & Eco-Tourism (South)
Margao-Goa
Asst. Conservator of Forest
Wild Life & Eco Tourism (South)
MARGAO-GOA

ANNEX 9: Statistics of turtle nesting site of Morjim, Agonda, Galgibag and Mandrem

i. Turtle nesting during season (November – May)

Beach	2013-2014	2014-2015	2015-2016
Morjim	4	8	6
Agonda	16	5	12
Galgibag	23	3	6

Source: Department of Forest, Government of Goa

ii. Year Wise Break Up of Sea Turtle Nesting at Morjim

1997-98

Sr. No.	Pit No.	Date of laying eggs	Hatching Date	No. of eggs laid	Young one release	Young ones Dead	Eggs not Hatched	Nesting Period	Beach
1	1	26/09/1997	15/11/1997	159	125	26	8	51 days	Morjim
2	2	02/11/1997	21/12/1997	120	118	1	1	49 days	Morjim
3	3	02/11/1997	21/12/1997	156	151	0	5	49 days	Morjim
4	4	03/11/1997	19/12/1997	140	32	107	1	46 days	Morjim
5	5	11/01/1998	08/03/1998	53	30	21	2	57 days	Morjim

98-99

Sr. No.	Pit No.	Date of laying eggs	Hatching Date	No. of eggs laid	Young one release	Young ones Dead	Eggs not Hatched	Nesting Period	Beach
1	1	30/11/98	20/1/99	101	97	01	03	52days	Morjim
2	2	22/12/98	19/2/99	98	39	01	58	60days	Morjim
3	3	08/1/99	16/3/99	106	0	0	106	66days	Morjim
4	4	24/1/99	3/4/99	96	0	0	96	70days	Morjim
5	5	6/2/99	29/4/99	126	32	04	90	51days	Morjim
6	6	12/3/99	11/5/99	81	54	05	32	61days	Morjim
7	7	13/3/99	19/5/99	98	0	0	98	68days	Morjim
8	8	21/3/99	6/5/99	77	40	0	37	48days	Morjim

99-2000

Sr. No.	Pit No.	Date of laying eggs	Hatching Date	No. of eggs laid	Young one release	Young ones Dead	Eggs not Hatched	Nesting Period	Beach
1	1	13/10/99	26/11/99	121	92	15	14	45 days	Morjim
2	2	14/10/99	2/12/99	108	25	10	73	50 days	Morjim
3	3	21/10/99	14/12/99	120	00	00	120	55 days	Morjim
4	4	2/11/99	21/12/99	129	76	03	50	49 days	Morjim
5	5	2/11/99	21/12/99	134	119	00	15	49 days	Morjim
6	6	8/11/99	29/12/99	120	85	15	20	52 days	Morjim
7	7	28/11/99	18/1/'00	112	90	08	14	52 days	Morjim

8	8	30/11/99	22/1/'00	97	56	16	25	54 days	Morjim
9	9	13/12/99	2/2/'00	89	27	06	56	52 days	Morjim
10	10	14/12/99	8/2/'00	00	00	00	00	55 days	Morjim
11	11	19/12/99	23/2/'00	121	101	02	18	52 days	Morjim
12	12	31/12/99	23/2/'00	00	00	00	00	55 days	Morjim
13	13	21/1/00	14/3/'00	117	88	00	29	53 days	Morjim
14	14	6/2/00	1/4/'00	00	00	00	00	55 days	Morjim

2000-2001									
Sr. No.	**Pit No.**	**Date of laying eggs**	**Hatching Date**	**No. of eggs laid**	**Young one release**	**Young ones Dead**	**Eggs not Hatched**	**Nesting Period**	**Beach**
1	1	5/10/00	23/11/00	122	22	01	99	50 days	Morjim
2	2	10/11/00	31/12/00	93	83	01	09	52 days	Morjim
3	3	22/11/00	10/1/01	142	124	01	17	50 days	Morjim
4	4	26/11/00	15/01/01	100	83	00	17	51 days	Morjim
5	5	29/11/00	16/01/01	135	111	08	16	49 days	Morjim
6	6	8/12/00	27/01/01	108	83	08	17	51 days	Morjim
7	7	11/12/00	30/01/01	137	90	02	45	52 days	Morjim
8	8	15/12/00	7/03/01	131	99	05	38	55 days	Morjim
9	9	18/12/00	9/02/01	90	46	05	39	54 days	Morjim
10	10	18/12/00	09/02/01	139	126	02	11	54 days	Morjim
11	11	24/12/00	14/02/01	103	87	00	16	53 days	Morjim
12	12	24/12/00	15/02/01	142	106	18	18	54 days	Morjim
13	13	27/12/00	16/02/01	129	82	01	46	52 days	Morjim
14	14	27/12/00	13/02/01	107	80	02	25	53 days	Morjim
15	15	28/12/00	17/02/01	106	56	01	49	52 days	Morjim
16	16	28/12/00	17/02/01	143	127	01	15	52 days	Morjim
17	17	31/12/00	22/02/01	125	93	00	32	54 days	Morjim
18	18	1/1/01	22/02/01	133	122	01	10	53 days	Morjim
19	19	2/1/01	24/02/01	133	96	02	35	54 days	Morjim
20	20	9/01/01	2/03/01	117	93	02	22	53 days	Morjim
21	21	10/01/01	05/03/01	117	52	00	65	54 days	Morjim
22	22	13/01/01	07/03/01	102	65	00	37	54 days	Morjim
23	23	15/01/01	05/03/01	59	29	00	30	50 days	Morjim
24	24	17/01/01	10/02/01	112	65	02	45	53 days	Morjim
25	25	24/01/01	16/03/01	128	99	01	28	52 days	Morjim
29	29	25/01/01	06/03/01	17	10	00	07	51 days	Morjim
27	27	15/02/01	07/04/01	143	126	02	15	52 days	Morjim
28	28	18/02/01	07/04/01	131	88	07	36	49 days	Morjim
29	29	18/02/01	09/04/01	114	98	12	04	51 days	Morjim
30	30	7/03/01	05/05/01	112	00	00	112	60 days	Morjim
31	31	26/03/01	20/05/01	98	00	00	98	56 days	Morjim

2001-2002									
Sr. No.	**Pit No.**	**Date of laying eggs**	**Hatching Date**	**No. of eggs laid**	**Young one release**	**Young ones Dead**	**Eggs not Hatched**	**Nesting Period**	**Beach**
1	1	09/09/01	25/10/01	137	121	06	10	47 days	Morjim
2	2	3/10/01	19/11/01	72	57	02	13	48 days	Morjim
3	3	15/10/01	28/11/01	105	63	02	40	45 days	Morjim
4	4	23/11/01	15/01/02	20	00	00	20	54 days	Morjim
5	5	26/11/01	15/01/02	138	99	18	21	51 days	Morjim
6	6	26/11/01	16/01/02	133	00	00	133	52 days	Morjim
7	7	29/11/01	4/02/02	123	81	18	24	68 days	Morjim
8	8	3/12/01	24/01/02	97	38	47	12	53 days	Morjim
9	9	7/12/01	26/01/02	164	154	10	00	51 days	Morjim
10	10	14/12/01	5/02/02	107	64	19	24	54 days	Morjim
11	11	15/12/01	3/02/02	133	80	13	40	51 days	Morjim
12	12	18/12/01	3/02/02	149	124	15	10	48 days	Morjim
13	13	02/1/02	21/02/02	136	75	31	30	52 days	Morjim
14	14	03/01/02	25/02/02	133	105	02	26	54 days	Morjim
15	15	3/1/02	25/02/02	183	107	18	58	54 days	Morjim
16	16	4/01/02	26/02/02	112	85	15	12	55 days	Morjim
17	17	8/1/02	27/02/02	123	111	00	12	51 days	Morjim
18	18	17/01/02	7/03/02	133	125	05	03	50 days	Morjim
19	19	1/02/02	29/03/02	152	58	17	77	57 days	Morjim

2002-2003									
Sr. No.	**Pit No.**	**Date of laying eggs**	**Hatching Date**	**No. of eggs laid**	**Young one release**	**Young ones Dead**	**Eggs not Hatched**	**Nesting Period**	**Beach**
1	1	6/10/02	19/11/02	110	96	02	12	45 days	Morjim
2	2	29/10/02	17/12/02	101	83	11	07	50 days	Morjim
3	3	27/11/02	20/01/03	115	112	00	03	53 days	Morjim
4	4	2/12/02	22/01/03	93	78	05	10	52 days	Morjim
5	5	3/01/03	19/02/03	123	100	01	22	48 days	Morjim
6	6	30/01/03	20/02/03	101	63	21	17	51 days	Morjim

2003-2004									
Sr. No.	**Pit No.**	**Date of laying eggs**	**Hatching Date**	**No. of eggs laid**	**Young one release**	**Young ones Dead**	**Eggs not Hatched**	**Nesting Period**	**Beach**
1	1	30/09/03	16/11/03	146	121	00	25	47 days	Morjim
2	2	23/10/03	8/12/03	103	103	00	00	47 days	Morjim

3	3	22/11/03	10/01/04	116	62	23	31	50 days	Morjim
4	4	26/11/03	11/01/04	29	00	00	29	52 days	Morjim
5	5	27/11/03	17/01/04	86	86	00	00	52 days	Morjim
6	6	27/11/03	20/01/04	67	00	00	67	55 days	Morjim
7	7	10/12/03	27/01/04	111	75	01	35	49 days	Morjim
8	8	8/01/04	26/02/04	130	117	02	11	50 days	Morjim
9	9	24/01/04	16/03/04	116	98	05	13	52 days	Morjim

2004-2005									
Sr. No.	**Pit No.**	**Date of laying eggs**	**Hatching Date**	**No. of eggs laid**	**Young one release**	**Young ones Dead**	**Eggs not Hatched**	**Nesting Period**	**Beach**
1	1	14/11/04	5/01/05	131	125	04	02	53 days	Morjim
2	2	19/11/04	8/01/05	79	61	02	16	51 days	Morjim
3	3	4/12/04	21/01/05	118	74	27	17	49 days	Morjim
4	4	5/12/04	22/01/05	121	100	04	17	49 days	Morjim

2005-2006									
Sr. No.	**Pit No.**	**Date of laying eggs**	**Hatching Date**	**No. of eggs laid**	**Young one release**	**Young ones Dead**	**Eggs not Hatched**	**Nesting Period**	**Beach**
1	1	2/10/05	19/11/05	148	118	01	29	49 days	Morjim
2	2	28/10/05	15/12/05	82	57	00	25	50 days	Morjim
3	3	2/12/05	19/01/06	138	116	09	13	48 days	Morjim
4	4	15/12/05	3/02/06	131	98	00	33	51 days	Morjim
5	5	17/12/06	5/02/06	124	114	06	04	51 days	Morjim
6	6	28/12/05	16/02/06	114	51	14	49	51 days	Morjim

2006-2007									
Sr. No.	**Pit No**	**Date of laying eggs**	**Hatching date**	**No. of eggs laid**	**Young one release**	**Young ones dead**	**Eggs not hatched**	**Nesting period**	**Beach**
1	1	9/12/06	28/01/07	83	1	0	82	50 days	Morjim
2	2	18/01/07	8/3/07	89	15	2	72	50 days	Morjim
3	3	21/01/07	12/3/07	135	80	11	44	48 days	Morjim
4	4	26/01/07	16/03/07	118	70	2	46	50 days	Morjim
5	5	4/2/2007	24/03/07	105	84	0	21	49 days	Morjim

2007-2008									
S. No.	**Pit No**	**Date of laying eggs**	**Hatching date**	**No. of eggs laid**	**Young one released**	**Young ones dead**	**Eggs not hatched**	**Nesting period**	**Beach**
1.	1	08/11/07	15/12/07	138	114	24	00	47 days	Morjim
2.	2	21/12/07	12/02/08	100	75	00	25	53 days	Morjim
3.	3	25/12/07	10/02/08	109	74	00	35	47 days	Morjim
4.	4	15/01/08	06/03/08	127	79	48	00	51 days	Morjim
5.	5	19/01/08	13/03/08	128	112	02	14	54 days	Morjim
6.	6	31/01/08	24/03/08	139	00	00	139	53 days	Morjim

2008-2009									
S. No.	**Pit No**	**Date of laying eggs**	**Hatching date**	**No. of eggs laid**	**Young one released**	**Young ones dead**	**Eggs not hatched**	**Nesting period**	**Beach**
1.	1	26/10/08	09/12/08	113	51	04	58	45 days	Morjim
2.	2	24/01/09	24/01/09	119	67	5	47	48 days	Morjim
3.	3	19/02/09	19/02/09	156	110	2	44	48 days	Morjim

2009-2010									
S. No.	**Pit No**	**Date of laying eggs**	**Hatching date**	**No. of eggs laid**	**Young one released**	**Young ones dead**	**Eggs not hatched**	**Nesting period**	**Beach**
1.	1	15/10/09	30/11/09	147	89	14	14	46 days	Morjim
2.	2	08/11/09	24/12/09	122	112	3	7	47 days	Morjim
3.	3	18/12/09	06/02/10	130	95	3	32	51 days	Morjim
4.	4	23/12/09	08/02/10	120	109	0	11	48 days	Morjim
5.	5	09/01/10	24/02/10	121	107	2	12	47 days	Morjim

2010-2011									
S. No.	**Pit No**	**Date of laying eggs**	**Hatching date**	**No. of eggs laid**	**Young one released**	**Young ones dead**	**Eggs not hatched**	**Nesting period**	**Beach**
1.	1	11/12/10	01/02/11	150	64	33	53	53 days	Morjim
2.	2	09/02/11	31/03/11	11	81	11	19	51 days	Morjim
3.	3	26/03/11	27/03/11	81	00	00	81	63 days	Morjim

2011-2012									
S. No.	**Pit No**	**Date of laying eggs**	**Hatching date**	**No. of eggs laid**	**Young one released**	**Young ones dead**	**Eggs not hatched**	**Nesting period**	**Beach**
1.	1	20/11/11	07/01/12	103	54	01	48	49 days	Morjim
2.	2	23/11/11	10/01/12	130	101	00	29	49 days	Morjim
3.	3	11/12/11	31/01/12	75	59	04	12	51 days	Morjim
4.	4	13/12/11	03/02/12	102	98	00	07	53 days	Morjim
5.	5	15/12/11	07/02/12	114	93	05	16	52 days	Morjim
6.	6	19/12/11	14/02/12	103	76	05	22	51 Days	Morjim
7.	7	27/12/11	17/02/13	130	87	02	41	52 days	Morjim
8.	8	30/12/11	26/02/12	130	89	05	36	50 days	Morjim
9.	9	05/01/12	12/02/12	136	109	07	20	50 days	Morjim
10.	10	22/01/12	25/04/12	68	47	08	13	51 days	Morjim
11.	11	02/03/12	31/05/12	30	13	00	17	55 days	Morjim
12.	12	03/04/12	31/05/12	95	00	00	00	60 days	Morjim
13.	13	14/12/11	31/01/12	141	131	04	06	49 days	Mandrem
14.	14	047/02/12	30/03/12	132	88	16	28	53 days	Mandrem

2012-2013									
Sr.No.	**Pit No**	**Date of laying eggs**	**Hatching date**	**No. of eggs laid**	**Young one released**	**Young ones dead**	**Eggs not hatched**	**Nesting period**	**Beach**
1.	1	02/11/12	17/12/12	133	106	11	16	45 days	Morjim
2.	2	07/12/12	24/01/13	121	106	02	13	49 days	Mandrem
3.	3	18/01/13	10/03/13	80	14	02	64	51 days	Morjim
4.	4	14/02/13	03/03/13	134	106	02	13	49 days	Morjim
5.	5	04/03/13	20/04/13	130	118	05	07	47 days	Mandrem
6.	6	20/03/13	10/05/13	117	--	11	106	52 days	Mandrem
7.	7	21/03/13	09/05/13	116	51	20	45	51 days	Mandrem

2013-2014									
Sr.No.	**Pit No**	**Date of laying eggs**	**Hatching date**	**No. of eggs laid**	**Young one released**	**Young ones dead**	**Eggs not hatched**	**Nesting period**	**Beach**
1.	1	11/12/2013	28/01/2014	123	72	05	46	51 days	Morjim
2.	2	06/01/2014	23/02/2014	117	15	04	98	49 days	Morjim
3.	3	10/02/2014	04/04/2014	123	67	13	43	53 days	Mandrem
4.	4	24/02/2014	12/04/2014	78	08	Nil	70	48 days	Morjim

2014-2015									
Sr.No.	**Pit No**	**Date of laying eggs**	**Hatching date**	**No. of eggs laid**	**Young one released**	**Young ones dead**	**Eggs not hatched**	**Nesting period**	**Beach**
1.	1	14/12/14	22/01/15	125	75	06	44	40 days	Morjim
2.	2	21/01/15	08/03/15	132	46	08	8	49 days	Morjim
3.	3	29/01/15	19/03/15	123	72	13	38	50 days	Arambol
4.	4	04/02/15	24/03/15	123	118	04	01	49 days	Morjim
5.	5	25/02/15	14/04/15	130	19	55	56	49 days	Shifted to Morjim from Vagator-Chapora
6.	6	06/03/15	24/04/15	110	01	06	110	50 days	Morjim
7.	7	14/03/15	02/05/15	106			99	48 days	Morjim
8.	8	30/03/15	18/05/15	102			102	50 days	Morjim

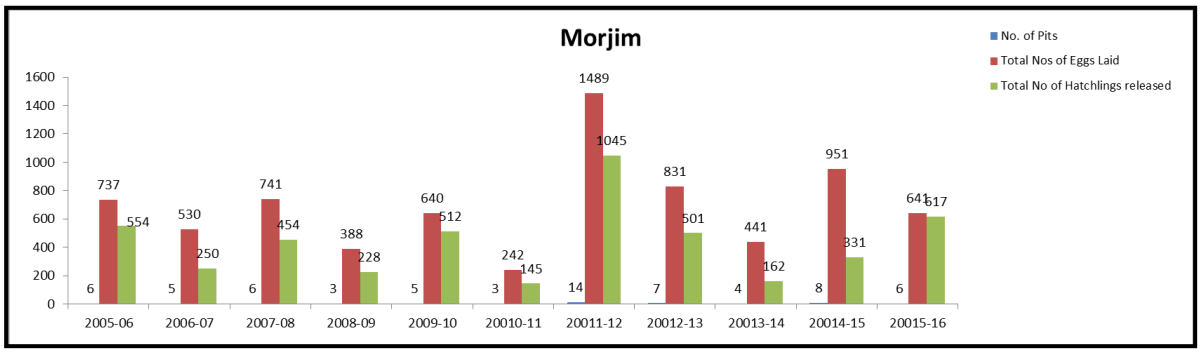
2015-2016									
Sr.No.	**Pit No**	**Date of laying eggs**	**Hatching date**	**No. of eggs laid**	**Young one released**	**Young ones dead**	**Eggs not hatched**	**Nesting period**	**Beach**
1.	1	31/01/16	05/03/16	123	99	18	06	35 days	Morjim
2.	2	10/02/16	17/03/16	135	135	28	34	37 days	Morjim
3.	3	18/02/16	28/03/16	105	105	09	13	41 days	Morjim
4.	4	06/03/16	22/04/16	114	114	35	38	48 days	Morjim
5.	5	06/03/16	22/04/16	98	98	06	28	48 days	Morjim
6.	6	07/03/16	23/04/16	66	66	--	48	48 days	Morjim

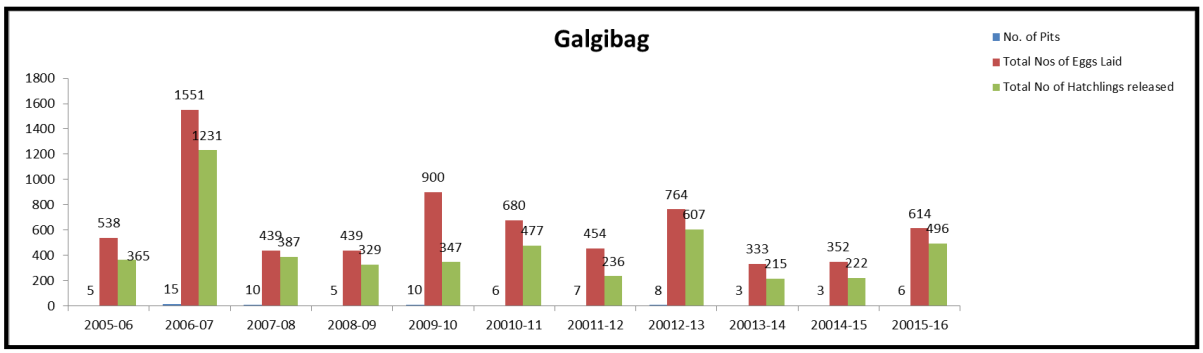
Turtle Nesting Status since 2005-16

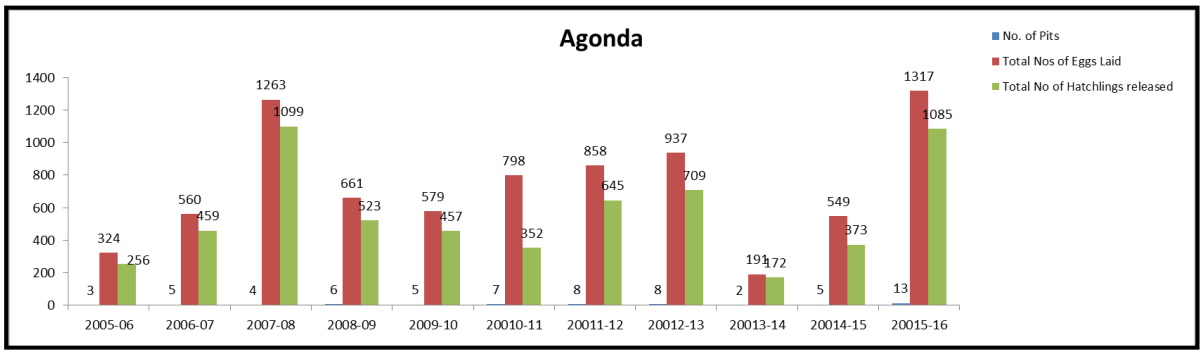
Galgibag											
Year	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
No. of Pits	5	15	10	5	10	6	7	8	3	3	6
Total Nos of Eggs Laid	538	1551	439	439	900	680	454	764	333	352	614
Total No of Hatchlings released	365	1231	387	329	347	477	236	607	215	222	496

Agonda											
Year	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
No. of Pits	3	5	4	6	5	7	8	8	2	5	13
Total Nos of Eggs Laid	324	560	1263	661	579	798	858	937	191	549	1317
Total No of Hatchlings released	256	459	1099	523	457	352	645	709	172	373	1085

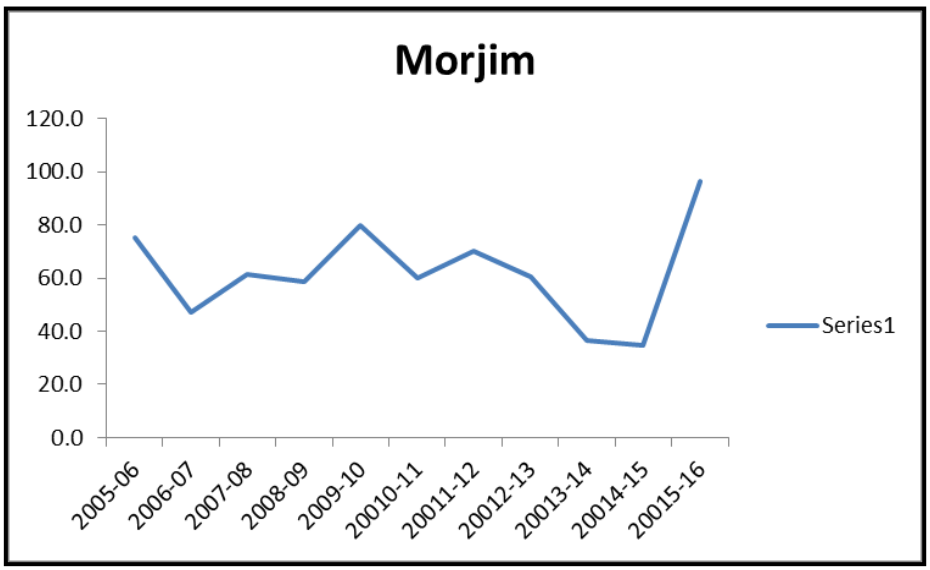
Details of Pits, No. of Eggs laid & no. of Hatchling released

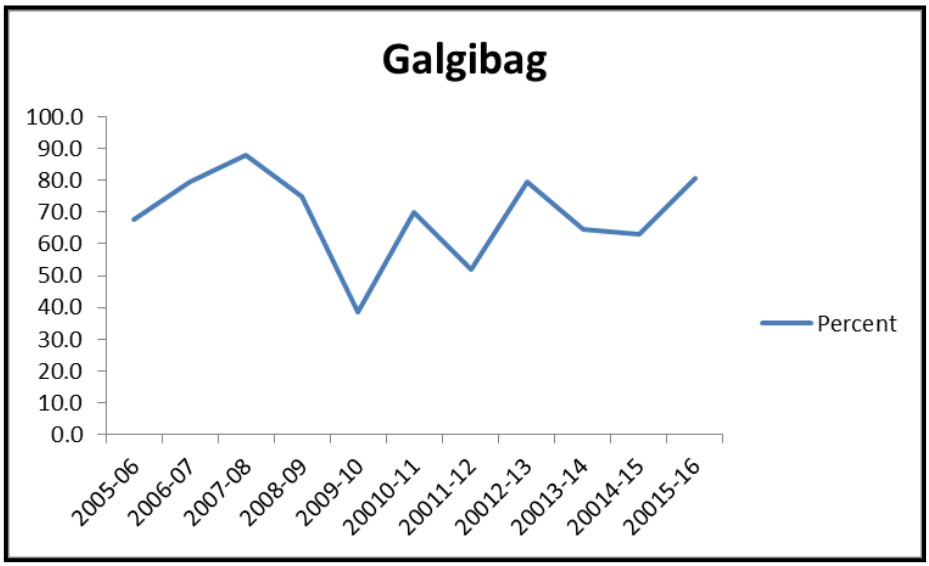


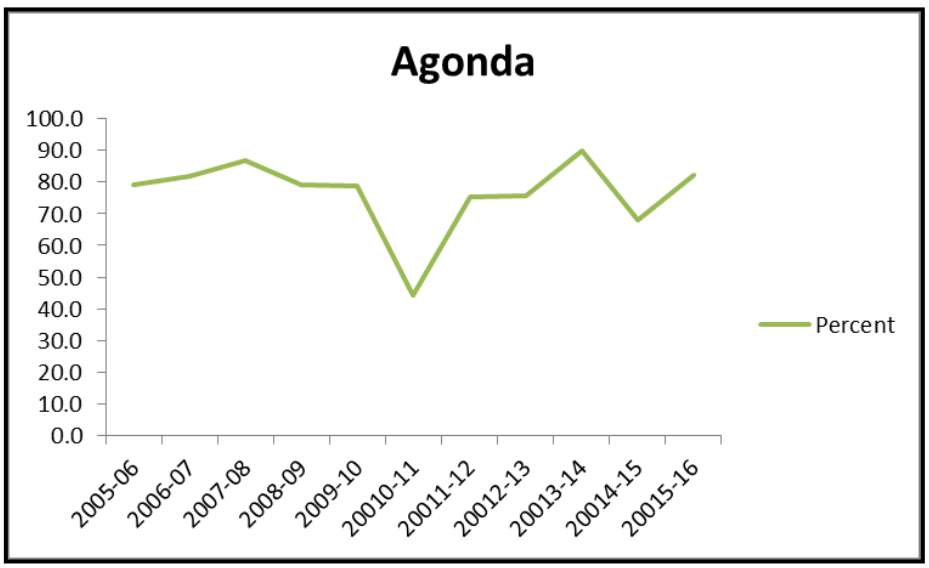




Trend indicating Survival Percentage of Sea Turtles







ANNEX 10: Basis for selection of Indicators of carrying capacity assessment using international best practices

A study conducted by Coccossis and Parpairis in a published report entitled – Tourism and the Environment: Some observations on the concept of carrying Capacity mentions a WTA report of 1983 which proposes planning capacity standards to be used a Indicators as well as Optimum Capacity Levels in different areas expressed as; Hotel density (*from 13 – 35 sq. mt. per person*) and overall Resort Density from 22 – 100 beds per hectare upto 200 – 1,000 beds per ha for urban type of resorts.

Priority Action Pan (PAP) RAC, 1991 prescribes among other aspects indicators such as number of beds per sq.kms. And Number of visitors per resident. It also prescribes a ratio of 1:1.4 (Resident to Tourist).

The report entitled Defining, measuring and evaluating Carrying Capacity in European tourism destinations published during December 2001 prescribes Tourism Carrying Capacity (TCC) indicator such as – overcrowding – i.e. Tourist flow - number of tourists per sq.mt. Tourist infrastructure, Tourist beds to permanent population, Sustainable tourism indicator of water consumption per bed: water consumption of a local resident (ratio), Land use, Number of beds to urbanized land per sq.mt.

Based on the publication on Environmental guidelines for Coastal Tourism Development in Sri Lanka, edited by Sulivan, K., et al (1995) prescribed following standards based on –

1. Infrastructure – water daily consumption per person for tropical beach resorts is 500 – 1,000 liters per day.
2. Tourist facility – open space (seaside resorts) – 20 to 40 sq.mt. per bed
3. Beach capacity – 20 to 50 m of beach per person.

Accordingly, the present study of Goa has assumed the average factor in respect of above-referred standards.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