BEFORE THE NATIONAL GREEN TRIBUNAL, WESTERN ZONE BENCH, PUNE

APPEAL NO. 06/2025 (WZ)

Colva Civic and Consumer Forum …Applicant

Versus

Goa Coastal Zone
Management Authority & Ors …Respondent

AFFIDAVIT-IN-REPLY ON BEHALF OF RESPONDENT NO. 1 (GCZMA)

I, Shri Sachin Desai, major of age, holding the post of Member Secretary, Goa Coastal Zone Management Authority (**"GCZMA"**) i.e., Respondent No 1 herein, having office at 4th Floor Dempo Towers, Patto, Panaji, Goa, do hereby make solemn affirmation and state as under:

1. I say that I am holding the post of Member Secretary, GCZMA. I say that I am filing the present affidavit based on the records available with my office and that I am competent to depose in this case.

2. I say that I am filing the present Affidavit-in-Reply for the purpose of opposing the relief sought in the present appeal. Nothing in the aforementioned Appeal filed by the Appellant be deemed to have been admitted for mere want of specific denial. Nothing may be deemed to have been admitted for want of *traverse seriatim*. I crave leave of this Hon'ble Tribunal to file an additional Affidavit, if found necessary.

3. I say that the present appeal challenges the No Objection Certificate dated 18.10.2024 (**"Impugned NOC"**) and the Direction dated 16.10.2024 ("**Impugned Direction**") issued by the Answering Respondent. I say that vide the Impugned NOC the Answering Respondent has granted approval to Respondent No. 3 (M/s Hermitage Builders Pvt Ltd) for proposed erection of temporary 10 nos wooden cottages having a total built up area of 798.30 sq mts, 01 Shack/Restaurant having a total built up area of 131.50 sq mts, 01 toilet and 01 kitchen having a total built up area of 91.00 sq mts, 01 watchman shed having total built up area of 45 sq mts, 01 staff toilet having a total built up area of 15 sq mts made of wood and/or natural/biodegradable material, in property bearing Survey No. 16/4 of Sernabatim Village, Salcette Taluka, Goa, subject to the conditions specified therein.

4. I say that the Respondent No 3 was previously granted approval dated 23.12.2020 by the Answering Respondent to erect 10 Wooden Cottages, One Shack/Restaurant, toilet, kitchen, watchman shed, staff toilet reception and one restaurant in Survey No. 16/4 of village Sernabatim, Salcete Goa but the same was quashed and set aside by this Hon'ble Tribunal by common Judgment and Order dated 28/09/2022 passed in Appeal No. 13 of 2022 (WZ) and Appeal No. 21 of 2022 (WZ), on the limited ground that at the time of giving permission, GCZMA had not considered the "beach carrying capacity".

5. I say that the subject property is situated at Sernabatim and forms part of the coastal stretch extending from Betul HL to Consaulim HL. I further say that the report titled "Carrying Capacity of Beaches of Goa", specifically identifies the stretch between Betul HL and Consaulim HL at Serial No. 11 of Table 19 thereof. I say that the remarks column pertaining to the said stretch expressly records that "Additional Carrying Capacity available". The said finding clearly indicates that the concerned coastal stretch has not exhausted its permissible carrying capacity and that there exists scope for accommodating additional development and/or tourism-related activities in accordance with the applicable statutory provisions, regulations and planning norms.

Annexed hereto is a copy of the relevant extracts of the "Carrying Capacity of Beaches of Goa" report marked as "**Annexure A**"

6. I say that the Impugned Direction and the Impugned NOC have been issued after due consideration of the aforesaid findings, including the determination that the coastal stretch between Betul HL and Consaulim HL possesses additional carrying capacity, as recorded in the "Carrying Capacity of Beaches of Goa" report.

Annexed hereto are picture of the area where the subject temporary structures are permitted to be erected marked as "**Annexure B**".

NOTARY G. S. KUBAL North Goa Goa

7. I say that in view of the above, the present appeal is liable to be dismissed.

8. I say that what has been stated in Paras 1 to 7 are true to my own knowledge and/or are based on documents/records available with the Respondent and the contents of the same are true and correct and nothing material has been concealed herein.

Solemnly Affirm on Oath
Place: Panaji, Goa
Date: 03.06.2026

DEPONENT

Solemnly affirmed beforeme by
Sachin Desai,
Member Secretary
Reg. No. 08/25148 Date 3/6/26
known / identified to me by.

G. S. KUBAL
Notary (Govt. of India)
Panaji-Goa, India

NOTARY
G. S. KUBAL
North Goa, Goa
Reg. No. 13331
Exp. Dt. 16/08/2027
GOVERNMENT OF INDIA

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NOTARY
G. S. KUBAL
North Goa, Goa

Annexure A

270

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
Government of India

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:

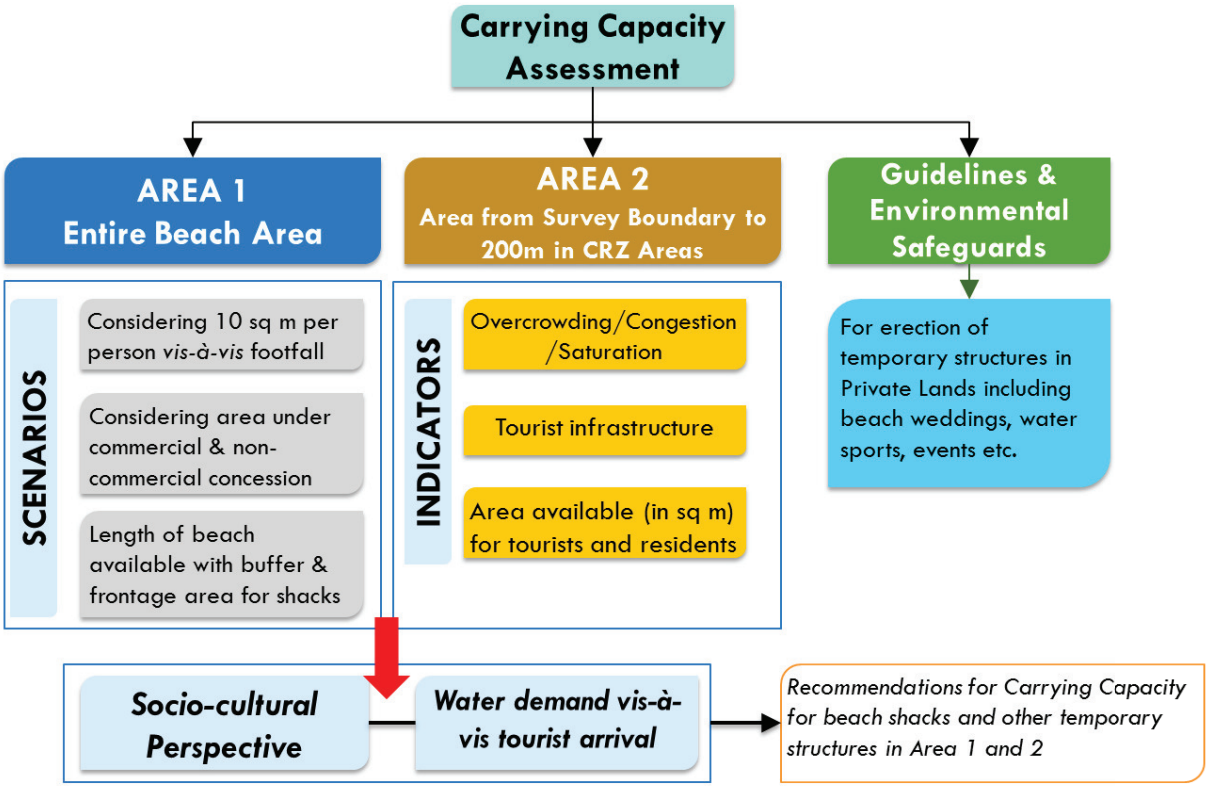
- Ecologically Sensitive Areas (ESAs) such as turtle nesting grounds etc.
- Other areas that include river mouth, creeks, erosion prone areas, fishing space, rocky headlands, etc.
- Area and length of beach available for erection of shacks after deduction of ESAs, villages with fishing activities, entry 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.

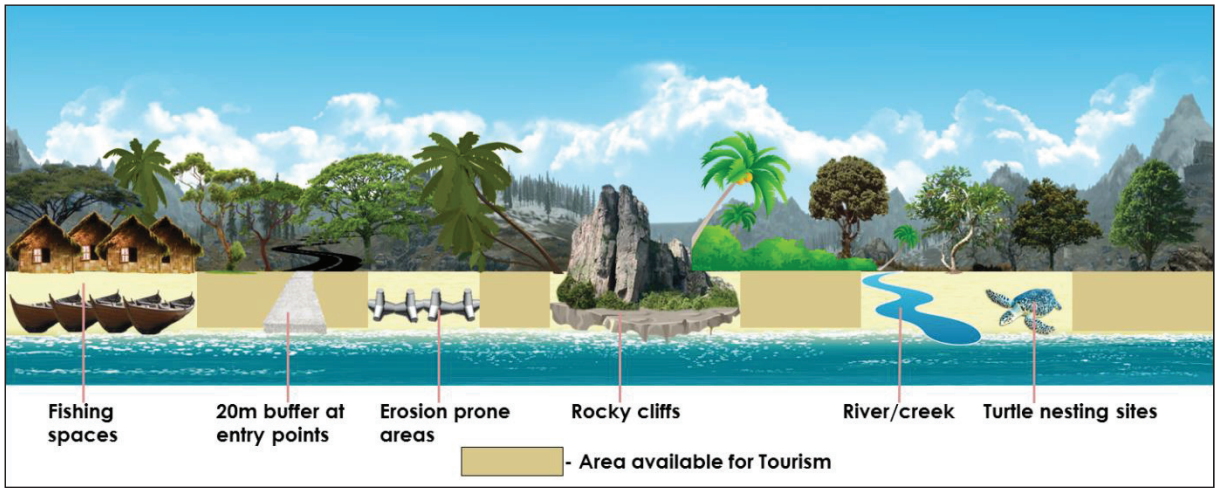


I. Area 1 (Beaches of Goa)

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.

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

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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

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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

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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***

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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

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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).

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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

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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).

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* 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

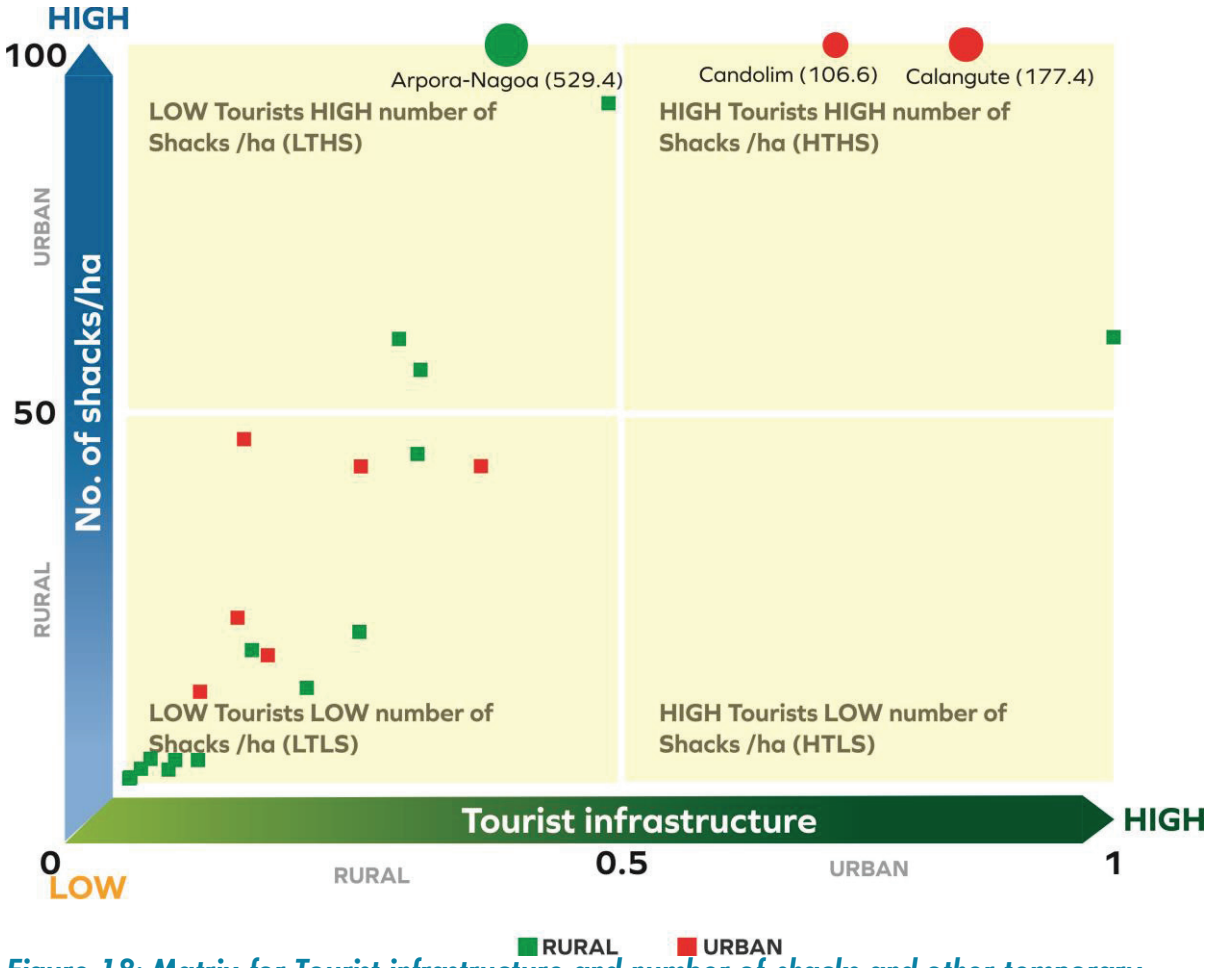

Figure 18: Matrix for Tourist infrastructure and number of shacks and other temporary structures/ hectare

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.

ANNEXES

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