

# Integrated Island Management Plans (IIMPs) for Lakshadweep Islands

## KADMAT ISLAND

*Submitted to*

Lakshadweep Administration



Centre for Earth Science Studies

Thiruvananthapuram – 695 031

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## 1. Background

1.1. As the island communities strive to raise their standards of living with increased connectivity and changing life style with threatened fragile natural ecosystem '*Integrated Island Management Plans (IIMP's) for Lakshadweep islands*' was prepared for the UT Lakshadweep Administration by Centre for Earth Science Studies. The preparation of IIMPs was in accordance with the guidelines provided in the Island Protection Zone (IPZ) Notification, 2011 of Ministry of Environment and Forests, Government of India (Enclosure-1).

1.2. The IIMP encompasses the existing and proposed developments, conservation and preservation zones, dwelling units including the infrastructure projects such as schools, markets, hospitals, public facilities, etc., The IIMP consists of a detailed spatial plan for all the development activities covering

- (i) the entire island area landward from High Tide Line (hereinafter referred to as the HTL);
- (ii) land area between HTL and Low Tide Line (hereinafter referred to as the LTL) which will be termed as the Intertidal zone;
- (iii) the lagoon area within the territorial water limit (12 Nautical miles or 20 km).

The activities permissible (see Annexure-I) and the no-development setback determination criteria (see Annexure-II) are as prescribed by the MoEF.

1.3. Majority of the listed information in the guidelines were collected from the islands during the different field visits. The digital data base on cadastral scale 1:4000 scale maps were utilized for mapping the different physical characteristics of the island. Locational information of the islands such as dwelling units including the infrastructural facilities was collected using Global Positioning System (GPS). Areas indicating the dwelling units including the infrastructure projects were mapped. The conservation and preservation zones were mapped separately. The entire island including the Lagoon aquatic area has been considered for the plan preparation. The data on coral reef classification of the lagoon waters mapped at eco-

geomorphologic level during 2007 utilizing the high resolution satellite imageries viz., IRS P6 LISS III/LISS IV Mx were used with limited field check-up and has an accuracy at 90% confidence level<sup>1</sup>. The entire field data were incorporated in ARC-GIS platform and IIMP is prepared in 1:4000 scale. Though the MoEF guidelines direct to prepare the IIMP in 1:10,000 scale, the final map is prepared in 1:4000 scale for better clarity of the plan, considering the smallness of the island. These maps once approved can also be enlarged at 1:2000 scales for each panchayat ward of the island for offering better clarity.

1.4. The major thrusts of IIMP in the islands are the conservation and preservation zones which are basically the major coastal habitats of the island ecosystems. The management of these habitats is based on well understood linkages among human activities and changes within a natural system. The known uses of the coastal habitats are classified as non-extractive, extractive and transformative. Non-extractive uses refer to activities such as recreation, research and education which do not involve removal of material from the habitats or do not have serious impacts. Extractive uses involve removal of renewable resources such as fish, ground water, mangrove wood, etc. Transformative uses (such as coral extraction, waste disposal without treatment, etc) result in negative changes in habitat characteristics and function. Sometimes there is a degree of overlap among the uses. The major coastal habitats of the island are coral reefs, sea grass beds, sand dunes, lagoons, sandy beaches, and the like.

In the islands the extensive coral reef formation is seen both inside and outside the lagoon waters. Normally coral reefs are present in the depths exceeding 1-2 m depth in the lagoons and are beyond the wave breaker zone. In the outer reef areas it is present up to 30 to 40 m depth. The biophysical survey of coral reefs conducted during 1999-2002 period by the Lakshadweep Administration has indicated presence of live corals in the ranges of 14% to 24%. The areas bordering the above zones are declared as buffer zones. The remaining areas can be called as Non-coral reef areas. Similar classification applies to sea grass areas also.

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<sup>1</sup>Bahuguna and Nayak, 1998. *Coral reefs of the Indian coast. – Scientific Note, Space Application Centre, Ahmedabad.*

1.5. In the IIMP weightage is also given for upgrading the physical and social infrastructure in the island. For social infrastructure there should be adequate primary health care facilities with a minimum of beds / high schools / primary schools / nursery schools / madrassas, safety in fire control and telecommunication of required standards. A general college / ITI with hostel facilities is possible in only one of the larger Islands. If on stilts and of 2 stories these could also double up as emergency / cyclone shelters. Primarily, existing provisions have to be upgraded in terms of land built space and facilities. Organized open spaces for settlement and neighborhood (ward) level parks / play grounds exist and are being upgraded often with built facilities / equipment for different resident age groups. The same applies to the island level sports ground.

1.6 In terms of physical infrastructure, potable water is generally in short supply in most Islands. Desalination plants fill up the gap in Kavaratti, Agatti and Minicoy. This facility is to be installed in all islands. For sewage disposal two pit flush septic tanks are in place. Oxidation ponds offer alternatives according to soil conditions. Solid waste disposal / management pose problems and alternatives to sea dumping / Incineration needs being explored. Electricity is generated through diesel. These needs being supplemented by alternate sources, of which solar panels and windmills are favored alternatives.

1.7 Demand for new private housing / households is not in the UT as the decadal growth rate has been and continues being well below the national average. In fact the bulk of the demand for new housing is in the government sector through standardized houses and at two storeys'. Private houses are being constantly upgraded and incrementally extended through permanent material and often at two storey's. In this scenario, households seek direct access from roads or common pathways. They seek better social / physical infrastructure, other amenities and better livelihood avenues. Also, as land is primarily with the community, home stay facilities are possible only through expansion of houses and not through new houses within the habitation zone. Even these should have the majority concurrence of the grama sabha before being processes.

1.8. The IIMP is thus prepared keeping in view the directions in the Notification dated 6.01.2011 issued by MoEF (Enclosure-2) and the order dated 11.05.2012 (Enclosure-3) of the Hon'ble Supreme Court. The preparation of IIMP should be in the context of the Environment (Protection) Act, 1986 and the development of tourism shall be after considering its impact on the livelihood of the island population and other related vulnerability issues as per the directions of Supreme Court contained in Enclosure-3. The following are the main components considered while preparing the IIMP:

- i. Land use zones strong on conservation / protection related issues so as to promote the sustainable development of the UT;
- ii. A supporting list of non-compatible / prohibited uses within each land use zone;
- iii. A simple set of building bye-laws and related development control regulations with provisions for building, fire safety, health, sanitation, etc.

1.9 The High Power Committee constituted as per the direction of Hon'ble Supreme Court (See Enclosure-3) have examined in detail the criteria for fixing the coastal setback area, i.e. '*No Development Zone*' (between High Tide Line and Setback line) where developmental activities are either restricted or prohibited. The objects of providing such a No Development Zone (NDZ) as provided in the CRZ Notification are the following: (Details in Annexure)

- i. Protection of life and property against erosion, storm surge and sea level rise due to global warming.
- ii. Protection of ecologically vulnerable coastal habitats, special, natural or scenic sites.
- iii. Ensuring public access to the beaches
- iv. Avoidance or minimising the cost of investment on coastal protection work and adoption of eco-friendly methods.
- v. Prohibition or regulating the different types of activities taking place in the coastal zone to maintain the balance between developmental goals and environmental objectives.

## **2. IIMP for Kadmat Island**

2.1 Kadmat is the longest island in the Lakshadweep Archipelago next to Agatti and has a large lagoon in the west with abundant coral growth. The overall shape of the island is like of a cylindrical bottle with a tapering neck pointing southwards. The island has good beaches with a land area 3.12 sq.km. People from Amini used to come to Kadmat during monsoon for cultivation. Cultivation of dry grains like Ragi, Jowar and Loba was recorded.

### **2.2 Extent of Setback Area**

2.2.1. The coastal setback area is a '*No Development Zone*', which refers to the strip of coastal zone (between the High Tide Line and Setback line) where developmental activities are either restricted or prohibited. The criterion by which the setback line is demarcated is outlined in Annexure-III. The setback or buffer zone in the island is determined based on its differential exposure to natural hazards, availability of free space and whether the island is habitation or non-habitation area.

2.2.2. The setback line for Kadamat island is determined on a scientific basis by dividing the island into different segments as explained in Annexure-III. In the Kadamat island habitation area or developed area are mostly clustered on the northern and central part compared to the sparse settlement on the extreme southern part of the island. Thus it is possible to have a different setback distance for the habitation and non-habitation areas. Based on the scientific approach as outlined in the Annexure-III a lesser setback distance is assigned for the habitation area, whereas the portion of the island which has sparse settlement or non-habitation with more open space is provided with a broader setback distance as a conservation measure.

2.2.3. With the above approach the non-habitation area or a sparsely settled area of the island is provided a minimum setback distance of 25 m. The area which is thickly populated or habitation area is provided a minimum 20 m setback distance. The setback zones are demarcated in the Plan.

### **3. Highlights of Kadmat IIMP**

The IIMP in the island (see Map-1) is discussed on the matrix of uses of permitted / prohibited activities within the major landuse category such as lagoon, habitation and non-habitation areas. The present IIMP is proposed for the ten year period 2011-21. The plan can be revisited as and when required and accordingly updated. Even its perspective can be changed to beyond 2021. Some of the major aspects relevant to each of these categories are also highlighted below.

#### *3.1 Existing Land Use*

Kadmat is an elongated island. The pressure of population on the island is comparatively lower in comparison to the other islands. A high sand ridge runs down on western side of the island. Along the middle of the island is a solid lime substratum where limestone used to be cut for building purposes. The land generally rises from 4 to 4.5m in elevation. On the eastern side of the island there are patches of land with an elevation of 3 to 4m above MSL. On the western side of the island, land is slightly higher at places in patches with an elevation of 4.5 to 5m above MSL and very few patches with an elevation of 2.3 to 3m above MSL. The residential clusters are well distributed all over the island, mixed with other related activities. A very small percentage of public- semi public land use is mostly located on the northern and western coast of the island. There are no defined green areas in the island.

### *3.2 Existing Residential Area*

According to the 2011 census report, there are 5389 persons in the island. The sex ratio is 961 females per 1000 males. Total number of households is 887. A lot of patches of vacant land are distributed throughout the island mostly on the southern side of the island. Out of the total land area of 310 Ha, 232 ha of the island is under built category (74.83%) while 66.5 ha is under open spaces (21.45%) and 11.5 ha is under roads and transportation (3.70%).

### *3.3 Existing and Proposed Conservation and Preservation Schemes*

The areas under conservation and preservation are the major ecosystems such as coral reefs, sea grass beds, sand dunes, lagoon waters including the religious/cultural establishments/monuments, major institutions and natural resources of the island. The major settlement in the island is also a zone where the ground water zones are located. This area with the main sand dune/sand dump systems of the island needs to be conserved for the recharge of ground water. Corals are the other major ecosystem of the islands. Based on the survey it has been concluded that the island coral biodiversity is satisfactory. The lagoon bottom is fairly rich in coral growth. There are many types of corals in the Kadmat lagoon but most of them are dead. Surveys showed a decline in live coral cover to about 7%. The terrestrial habitat is much altered due to mining lime and sandstones. Western side of the Kadmath Island consists of extensive reef flat. One of the remarkable feature in the reef flat was the abundance of mushroom corals.

Lagoon waters encompass colony of live corals and this has to be preserved against the threat of land-based pollutants. Further the dredge and fill activities related to the port development also affects the lagoonal water circulation. Therefore excavation of lagoonal bottom shall be restricted to maintain the navigational channel only. In the management option a buffer zone above the HTL has been suggested to control sewage and storm drainage effluents from the island, safeguards against runoff soils from the island, etc. The beaches are the nursing ground for some of the endangered species such as birds, crabs, turtles,

etc..If developments on the lagoon shore are not planned properly it can lead to a variety of short and long-term ecological and economic losses. The institutions under the conservation category are mosques, madrasas, lighthouse, airport and jetties. schools, tourism destinations and fish landing centres in and around the jetties are also demarcated as conservation zones.

### *3.4 Existing and Proposed Developments*

All the existing and the proposed development schemes for the coming 10 years have been mapped in consultation with the Lakshadweep Administration. The major existing schemes among the 120 government establishments are electrical sub division office, veterinary office, sub treasury, legal metrology office, govt. press, harbour works, PWD store etc. While the proposed development schemes are 88 in number which includes passenger hall, civil station, LPG store, panchayath bhavan, indoor stadium, govt. school, ayush dispensary, Incinerator, IRB, SDO Office, police station, fire station etc All of the proposed development schemes are coming outside the setback line or NDZ which are all permissible activities.

### *3.5 Existing & Proposed Infrastructure Facilities*

A concrete road runs through the centre covering the entire length of the island but Kadmat does not have a well developed all weather cement concrete road network. The island shows a marginally higher percentage share in passenger traffic by ship in the total island to island traffic, followed by island to mainland traffic and mainland to island traffic. The progress in the field of education is relatively low. Health care infrastructure is also not well developed.

### *3.6 Existing & Proposed Tourism (Resorts and Recreational facilities)*

Tourism sector has enormous potential in Kadmat island as it houses the maximum variety of tourist huts among the islands. Some of the existing facilities are restaurants, tourist-sports complex, scuba diving training institute, etc. At present

the tourism potential has not been explored fully but it has the potential to grow as a major destination for domestic tourists on the southern part of the island. The tourism in the Lakshadweep islands could be developed as a priority by considering the existing infrastructure facilities and closeness between the islands. Further care is required for the development-based on carrying capacity of island, which refers to the capacity of an ecosystem to sustain specified resource uses. The power requirement for the tourist center can be met from the solar energy farm. The beach tourism is to be allowed in an area where the beaches are traditionally accreting/stable and has been identified on the southern part of the island subject to conditions and also as stipulated in LICRZ (1997).

- all the tourism related projects shall be based on the assessment of the carrying capacity of the island by the Lakshadweep Administration, which refers to the capacity of an ecosystem to sustain specified resource uses.
- the tourism activity should not permit for the destruction of corals;
- no disposal of untreated sewage or effluent including the non-biodegradable waste into the lagoon waters by the tourism related activities

### *3.7 Shore Protection*

Kadamat has a total shore length of 18.37 km. The long-term shoreline changes in the Kadmat island shows that about 30% of the coastline is affected by erosion, 53% of the coastline shows accretion and only 16% of the coastline does not show any change. Shore protection structures with tetrapods, hollow concrete blocks and coir bags filled with pebbles/shingle are built in many locations in the island. Though these structures are effective to a great extent in controlling erosion the beauty and accessibility to the beach is reduced. Hence atleast in the tourism potential areas aesthetically designed measures such as submerged reefs, beach nourishment, etc., be adopted.

### *3.8 Existing & Proposed Sewage Treatment*

As per the 2011 census data Kadmat island has a population of 5389 persons i.e 8.8% of the total population of the U.T of Lakshadweep. The steadily increasing population, high residential density and ongoing development activities is resulting

in a rate of sewage generation beyond the capacity of natural treatment and assimilation. Sewage treatment facility is non-existent in the island. Detailed studies need to be undertaken to identify the gap between sewage and solid waste collection and disposal and mechanisms thereof.

### *3.9 Existing & Proposed Drinking water facility*

The fresh water resources are limited in the island and indiscriminate exploitation of the resource results in shrinkage of fresh water lenses and ultimately leading to saline intrusion. The conservation and protection of fresh water resources from pollutants is very important. Many rain water harvesting units have been established in the island.

### *3.10 Non-conventional energy system*

At present power is mainly generated through diesel sets. Installed capacity has been increased from 5270 KW to 8120 KW and through this uninterrupted power supply is being provided in the islands. Diesels generator sets are highly polluting. Diesel has to be brought from the mainland through barrels. During the transport of diesel from the main land there is every chance of spillage and leaking leading to the pollution of land and groundwater. Noise and air pollution are also caused during the operation. The plant is located in the densely populated areas compounding the pollution effects on the people. There is a growing demand of power for fishery and tourism related industry. To meet the growing requirement of power in the island the administration is planning to bridge the gap through non-renewable energy systems.

## **4. Permission for Development Activities in the Different Land use Zones**

Based on the existing landuse pattern the Kadmat island is broadly classified into three broad land use zones viz., lagoon zone, habitation zone and non- habitation

zone. The lagoon zone is further divided into Preservation zone and Conservation zone. This is basically a '*Prohibited Use Zone*' wherein the development activities are to be permitted and regulated only through the Administrator, bearing in mind the fragile eco-system to be protected and as highlighted in the IIMP. The habitation zone comprising predominantly the northern and central portion of the island is Regulated Development Zone (RDZ-I). This is a '*Regulated Zone*' with a setback area, which is a no-development zone (NDZ) incorporated in the IIMP map. Most of the islanders reside in this zone. Therefore the incremental and sustainable growth of this zone is to be undertaken in their interest with a control by the Panchayat / Grama Sabha for developments in habitation plots / areas. The third zone which is Regulated Development Zone (RDZ-II) is less habitation area which is mostly on the southern portion of the island which has mixed land use characteristics. This is also a '*Tourism Potential Regulated Zone*' with a no-development zone (NDZ) incorporated in the IIMP. The population density of the zone is considerably lower than RDZ I and therefore new land uses are infused for regulated tourism and related employment opportunities. Utilizing the different land use zones in the island a simplified Development Control Regulations (DCR's) and Building Bye-laws are provided in the Annexure-III. Permission of LCZMA, Lakshadweep Environment clearance and approval from the Island District Panchayat are to be obtained wherever is applicable as provided in the Annexure-II.