

**Kerala Coastal Zone Management Authority**

**Sub-Committee on  
Integrated Island Management Plan  
CZMP-2019**

*Final Report*

2021

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## Preface

Kerala Coastal Zone Management Authority (KCZMA) is proceeding with the finalisation of the Coastal Zone Management Plan (CZMP-2019) conforming to the Coastal Regulation Zone Notification of 2019 (CRZ-2019). National Centre for Earth Science Studies (NCESS), an authorized agency, has prepared a draft of the CZMP-2019 (referred as pre-draft in this report). The CRZ Notification of 2019 mandates the preparation of Integrated Island Management Plans (IIMP) for each island demarcated in the CZMP within the ambit of the CRZ notification of 2019. Extensive discussions within and outside KCZMA at various levels recognise that preparing IIMPs for the numerous tiny backwater islands and enforcing a No Development Zone (NDZ) with a fixed size-independent setback of 20m as mandated in the CRZ-2019 notification will be hugely challenging. The KCZMA in a special meeting held on July 3, 2021, constituted a Sub-Committee<sup>1</sup> to examine the various aspects and the possibilities for finding solutions within the framework of the coastal regulation notification. The Sub-Committee consists of the following members:

1. Dr Chandanathil Pappachan Geevan
2. Dr P. K. Thulasidas
3. Ms Amrutha Satheesan
4. Dr Richard Scaria
5. Dr Dinesan Cheruvat

s/d

Date: November 28, 2021

All five members of the sub-committee

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<sup>1</sup> KCZMA Proceedings 08/A2/2019/KCZMA date: 23/07/2021 (Annexure-1)

## **Acknowledgements**

We thank the experts from NCESS who have participated in various discussions on the different aspects of preparing Integrated Island Management Plans for the backwater islands of Kerala, especially Dr K. K. Ramachandran, Scientist F (retd.) and Dr D. S. Suresh Babu, Scientist F. We sincerely thank the members of the Local Self-Government Institutions who facilitated our field visit to the *pokkali* and backwater island areas in Kadamakkudy, Varappuzha, Kottuvally and Ezhikkara Grama Panchayats of Ernakulam district in August 2021. We are thankful to the technical team who volunteered their valuable time to assist our geo-spatial case studies on the islands of Kannur district within the purview of the CRZ-2019 under the supervision of Dr Richard Scaria (member KCZMA).

We thank Dr Venu V (IAS), Additional Chief Secretary and Chairperson of KCZMA for wholehearted support. We deeply appreciate the interest shown by the KCZMA in undertaking a thorough review of all relevant aspects by this Sub-Committee. Our sincere thanks to Mr Suneel Pamidi (IFS), Member Secretary, KCZMA, Mr. Kalaiarasan P, Environmental Engineer, DoE&CC and other staff of KCZMA for the enthusiastic cooperation.

## Abbreviations

A&N	:	Andaman and Nicobar
AandN	:	Andaman and Nicobar ( <i>used in the official notifications</i> )
AR6	:	6 <sup>th</sup> Assessment Report of Intergovernmental Panel on Climate Change
CRZ	:	Coastal Regulation Zone
CVCA	:	Critically Vulnerable Coastal Areas
CZMP	:	Coastal Zone Management Plan
DEM	:	Digital Elevation Model
DoE&CC	:	Directorate of Environment and Climate Change, Government of Kerala
ESA	:	Ecologically Sensitive Areas
GIS	:	Geographic Information System
Gol	:	Government of India
GoK	:	Government of Kerala
ha	:	Hectares
HAT	:	Highest Astronomical Tide
HTL	:	High Tide Line
IAS	:	Indian Administrative Service
ICRZ	:	Island Coastal Regulation Zone
IFS	:	Indian Forest Service
IIMP	:	Integrated Island Management Plan
IPCC	:	Intergovernmental Panel on Climate Change
IPZ	:	Island Protection Zone
ITZ	:	Inter-Tidal Zone
KCZMA	:	Kerala Coastal Zone Management Authority
LECZ	:	Low Elevation Coastal Zone
LSGI	:	Local Self-Government Institution(s)
MoEF	:	Ministry of Environment & Forest, Government of India (now MoEF&CC)
MoEF&CC	:	Ministry of Environment, Forest & Climate Change, Government of India
MSL	:	Mean Sea Level
NASA	:	National Aeronautics and Space Administration (USA)
NCESS	:	National Centre for Earth Science Studies
NCSCM	:	National Centre for Sustainable Coastal Management
NCZMA	:	National Coastal Zone Management Authority
NDZ	:	No Development Zone
p/d	:	Pre-Draft
ppt	:	parts per thousand
SICOM	:	Society for Integrated Coastal Management
SLR	:	Sea Level Rise
SoI	:	Survey of India
SRTM	:	Shuttle Radar Topography Mission
TGA	:	Total Geographic Area
USA	:	United States of America

## **Executive Summary**

An important addition to the Coastal Zone Management Plan (CZMP) prescribed in the CRZ Notification of 2019 is the Integrated Island Management Plan (IIMP) as an integral part for all the demarcated islands within the ambit of the CRZ notification of 2019. The total number of islands demarcated under CZMP-2019 (pre-draft) for Kerala is 1,826, of which 90 percent are of total geographic area (TGA) less than 10 ha and only 53 or nearly 3 percent have TGA more than one square kilometre. It is obvious that preparing IIMP for the numerous tiny backwater islands and enforcing a No Development Zone (NDZ) with a fixed size-independent setback of 20m as mandated in the CRZ-2019 notification will be challenging. Given this context, this report has reviewed all the relevant provisions of various coastal regulations. The report discusses the concept of IIMP based on a macro planning framework, the notion of coastal setback used for defining NDZ, and the feasibility of applying NDZ to the backwater islands of Kerala. The report has attempted a critical review of the mapping of islands in CZMP-2011 (approved on Feb 28, 2019) and CZMP-2019 (pre-draft) with a view to improve the CZMP upholding the spirit of the primary intent of the law. We have pointed out certain major difficulties that will arise. The report examines some of the key requirements for appropriately demarcating backwater islands consistent with the goals of the regulation. We contextualise the requirements of IIMP for backwater islands of Kerala against the climate change risks faced by the densely populated Low Elevation Coastal Zones. The report also underscores the need for prioritising safe housing and adaptations to climate change risks. The report examines scientific, legal, and social dimensions involved in the preparation and implementation of IIMP for the backwater islands. The report is meant to serve as a starting point for a thorough and region-specific review of the IIMP framework.

# 1 Background

An important change to the Coastal Zone Management Plan (CZMP-2019) prescribed in the CRZ Notification of 2019 (CRZ-2019) is the requirement of Integrated Island Management Plans (IIMP) as an integral part of CZMP for the demarcated islands within the ambit of the CRZ notification of 2019. The setback line of 50m from HTL in CRZ-2011 was reduced to 20m in CRZ-2019. As per notification, IIMP must be prepared using the norms applicable to the islands of Lakshadweep and Andaman and Nicobar (A&N) in accordance with the Andaman & Nicobar and Lakshadweep Island Protection Zone Notification of 2011 (IPZ-2011, S.O. 20(E) 6 Jan. 2011). In 2019, MoEF&CC replaced the IPZ-2011 with the Island Coastal Regulation Zone (ICRZ-2019)<sup>2</sup> notification. MoEF&CC's announcement of the decision to amend the CRZ-2019 making the IIMP of CZMP-2019 compliant with the approach given in ICRZ-2019 (GoI Gazette Notification S.O. 4547(E), Nov. 1, 2021) came after the completion of the work on this report<sup>3</sup>. However, since the proposed amendment has not yet come into effect, we are keeping the discussion in this report on the CRZ-2019 as it is now (i.e., without the amendment). The ICRZ-2019 has two categories of islands based on Total Geographic Area (TGA) of the island: Group-I with TGA of 1,000 sq.km. or more and Group-II with TGA between 100 sq.km. and 1,000 sq.km. Four categories of regulation zones (ICRZ-I to IV) shall apply to these larger islands. For the rest of the islands, i.e., TGA less than 100 sq.km., the ICRZ-2019 requires IIMP to be prepared. A No Development Zone (NDZ) defined by a uniform setback of 20m is mandated for the IIMP of ICRZ-2019.

The total number of islands demarcated under CZMP-2019 (p/d) for Kerala is 1,826, of which 90 percent are of area less than 10 ha and only 53 or nearly 3 percent have TGA more than one square kilometre. The total area of the 1,826 islands covered by CZMP-2019 for Kerala is about 300 sq.km. In contrast, as per official data<sup>4</sup>, the total area the A&N Islands is 8,249 sq.km. consisting of 836 islands, islets and rocky outcrops. The population is 379,944 as per Census 2011. Of these only 38 are permanently inhabited<sup>5</sup>. Total area notified as forests is 7170.69 sq.km. which constitute 86.93% of the geographic area of these islands.<sup>6</sup> While a few large islands account for bulk of the total area, some of the smallest (uninhabited) islands have area of a few square kilometres. It seems maps (ICRZ and IIMP) as per ICRZ-2019 will be prepared only for 37 inhabited islands. Currently, maps are either ready or under preparation for 10 islands conforming to ICRZ with four regulation zones and IIMPs for 27 Islands. We infer from the information available on official websites of A&N Islands that the maps as per ICRZ-2019 has not being prepared for the very small islands. There are no IIMPs prepared as per IPZ-2011 or ICRZ-2019 for the extremely small islands of A&N comparable in size to the tiny backwater islands of Kerala. Therefore, there are no IIMPs for tiny islands that can serve as a template for IIMPs under CZMP-2019 for Kerala.

## 2 Islands under Coastal Regulation Framework

In this section we have included most of the provisions from the CRZ-2019, CRZ-2011, IPZ-2011, and ICRZ-2019 notifications relevant to IIMP to serve as a quick reference. To understand the aims and scope of the IIMP, we have also included some of the details from the annexures of these notifications where we consider

<sup>2</sup> MoEF&CC has not clarified if ICRZ-2019 will be applicable to CZMP-2019 instead of IIMP-2011.

<sup>3</sup> The Draft (Final) Report of this study was submitted on Oct. 28, 2021 and finalized after discussions on Nov. 8, 2021.

<sup>4</sup> Website of A&N Administration: <https://www.andaman.gov.in/about>

<sup>5</sup> As per official website of A&N Administration

<sup>6</sup> Dept. of Environment & Forest, A&N Administration, <http://ls1.and.nic.in/doef/WebPages/Forest.html>



it relevant. The portions given in a narrow a font different from that of the main text are excerpts from the relevant notifications and *reproduced exactly as in the original*.

## 2.1 CRZ-2011: Provisions Relating to Islands

The CRZ-2011 does not have the requirement of preparing IIMP. Section 2(i) of CRZ-2011 states that all the islands in the backwaters of Kerala shall be covered under the notification. The relevant parts of CRZ-2011 are given below:

### CRZ for Kerala (Section 2 of CRZ-2011)

In view of the unique coastal systems of backwater and backwater islands along with space limitation present in the coastal stretches of the State of Kerala, the following activities in CRZ shall be regulated as follows, namely:-

- (i) all the islands in the backwaters of Kerala shall be covered under the CRZ notification;
- (ii) the islands within the backwaters shall have 50mts width from the High Tide Line on the landward side as the CRZ area;
- (iii) within 50mts from the HTL of these backwater islands existing dwelling units of local communities may be repaired or reconstructed however no new construction shall be permitted;
- (iv) beyond 50mts from the HTL on the landward side of backwater islands, dwelling units of local communities may be constructed with the prior permission of the Gram panchayat;
- (v) foreshore facilities such as fishing jetty, fish drying yards, net mending yard, fishing processing by traditional methods, boat building yards, ice plant, boat repairs and the like, may be taken up within 50mts width from HTL of these backwater islands.

## 2.2 CRZ-2019: Relevant Provisions for Islands

### Section 3

3.0 Areas requiring special consideration in the CRZ.- Following coastal areas shall be accorded special consideration for the purpose of protecting the critical coastal environment and difficulties faced by local communities: -

3.1 Critically Vulnerable Coastal Areas (CVCA): Sundarban region of West Bengal and other ecologically sensitive areas identified as under Environment (Protection) Act, 1986 such as Gulf of Khambat and Gulf of Kutchh in Gujarat, Malvan, Achra-Ratnagiri in Maharashtra, Kanivar and Coondapur in Karnataka, Vembanad in Kerala, Gulf of Mannar in Tamil Nadu, Bhaitarkanika in Odisha, Coringa, East Godavari and Krishna in Andhra Pradesh shall be treated as Critical Vulnerable Coastal Areas (CVCA) and managed with the involvement of coastal communities including fisher folk who depend on coastal resources for their sustainable livelihood.

3.2 CRZ for inland Backwater islands and islands along the mainland coast.

3.3 CRZ falling within municipal limits of Greater Mumbai.

### Section 10.2:

#### CRZ for inland backwater islands and islands along mainland coast:

- (i) All the inland islands in the coastal backwaters and islands along the mainland coast shall also be covered under this notification.
- (ii) In view of the unique coastal systems of backwater islands and islands along the mainland coast, along with space limitations in such coastal stretches, CRZ of 20 meters from the HTL on the landward side shall uniformly apply to such islands and activities shall be regulated as under:-
  - (a) existing dwelling units of local communities may be repaired or reconstructed within 20 meters from the HTL of these islands, however, no new construction shall be permitted in this zone.
  - (b) foreshore facilities, such as fishing jetty, fish drying yards, net mending yard, fishing processing by traditional methods, boat building yards, ice plant, boat repairs and the like, may be taken up in CRZ limits subject to due environmental safeguards.
- (iii) Integrated Island Management Plans (IIMPs), as applicable to smaller islands in Lakshadweep and Andaman & Nicobar, as per Island Protection Zone Notification, 2011 number S.O. 20(E), dated the 6th January, 2011, shall be formulated by respective States or Union territory for all such islands and submitted to Ministry of Environment, Forest and Climate Change

and till the IIMPs are framed, provisions of this notification shall not apply and the CZMP as per provisions of CRZ Notification 2011 number S.O. 19(E), dated the 6th January, 2011, shall continue to apply.

## 2.3 Island Protection Zone (IPZ) Notification, 2011: Excerpts

The relevant sections from the IPZ notification S.O.20(E), dated the 6th January, 2011 are as follows:

### Section I

Environmental management for the Islands of Andaman and Nicobar (hereinafter referred to as the A and N) and Lakshadweep shall be managed as follows:-

- A. the entire island of A and N other than the four islands mentioned in sub-para B below shall be managed as per IIMPs;
- B. In view of the large geographical area of the islands of Middle Andaman, North Andaman, South Andaman and Greater Nicobar, these islands shall be managed as per the Island Coastal Regulation Zone (hereinafter referred to as the ICRZ).

According to Section II of IPZ-2011, the Islands of Andaman & Nicobar and Lakshadweep other than the four mentioned in sub-para I(B) and Lakshadweep shall be managed based on the IIMPs for which certain broad framework is laid down in the same section of the notification.

### Section II

The Islands of AandN and Lakshadweep other than the four mentioned in sub-para B and Lakshadweep shall be managed based on the IIMPs which will be prepared as per the following guidelines, namely:-

- (a) Preparation of Integrated Islands Management Plan,-
  - (1) the AandN Administration shall, within a period of one year from the date of this notification, for the purpose of integrated sustainable development of the AandN Islands Protection Zone, prepare the IIMPs, *interalia*, specifying therein the areas indicating all the existing and the proposed developments, conservation and preservation schemes, dwelling units including infrastructure projects such as, schools, markets, hospitals, public facilities, and the like;
  - (2) the Lakshadweep Islands Administration shall, within a period of one year from the date of this notification, for the purpose of integrated sustainable development of the Lakshadweep Islands Protection Zone, prepare the IIMPs, *interalia*, specifying therein the areas indicating all the existing and the proposed developments, conservation and preservation schemes, dwelling units including infrastructure projects such as, schools, markets, hospitals, public facilities, and the like;
  - (3) the Islands Administration may, if it consider necessary, take the help of research institutions having experience and specialisation in coastal resource management in the preparation of IIMPs taking into account the guidelines specified in Annexure-I to this notification.
  - (4) all activities in the Islands and the aquatic areas shall be regulated by the AandN Administration or the Lakshadweep Islands Administration, as the case may be, on the basis of IIMPs;
  - (5) the developmental activities in the Islands shall be included in the IIMPs in accordance with rules, regulations and building bye-laws of local town and country planning for the time being in force in the Islands;
  - (6) the requirements of the Ministry of Defence, if any, shall be incorporated in the IIMPs and all defence related projects shall be assessed by a Committee consisting of the Secretary in the MoEF, Secretary in the Ministry of Defence and the Chief Secretaries of the AandN Islands Administration, or as the case may be, the Lakshadweep Islands Administration;
  - (7) the IIMPs shall be prepared separately for each island, and, as may be required from time to time;
  - (8) ecologically sensitive areas as specified in item (a) of sub-paragraph (B) of paragraph III to this notification shall be taken into consideration while preparing the IIMP:  
Provided that if those areas are included in the National Parks or Sanctuaries notified under the provisions of the Wildlife (Protection) Act, 1972 (53 of 1972) shall separately mentioned in the plan and be regulated in accordance with the provisions of that Act.
  - (9) the activities permitted in the IIMP shall also be undertaken in accordance with the Forest (Conservation) Act, 1980 (69 of 1980), the Wild Life (Protection) Act, 1972 (53 of 1972), the Environment (Protection) Act, 1986 (29 of 1986) and the rules or notifications made or issued thereunder and after taking into consideration the Environment Impact Assessment, done under the provisions of the notification of the Government of India in the MoEF number S.O.1533(E), dated the 14th September, 2006;
  - (10) (a) the Island Administrations, after preparing the IIMPs shall widely publicise the plan and invite suggestions from the public and other stakeholders within a period of thirty days from the date of publication of the plans;  
(b) the plans shall be published by publishing it in at least two newspapers and website of the Administration;

- (c) the hard copy of the plan shall be made available to the public at the office of the Chairman and Member Secretary of the Union territory Coastal Zone Management Authorities (hereinafter referred to as the CZMAs), District Collector's Office and Office of the Pollution Control Committee;
  - (d) on receipt of the comments, the Island Administration shall make necessary changes in the plans and submit to Central Government in the MoEF for its consideration and approval;
  - (e) the Union territory CZMA and the National Coastal Zone Management Authority shall be responsible to address and dispose off any grievance arising out of preparation of the plan.
- (11) the Central Government in the MoEF, after receipt of the IIMPs, shall, after examining the plan if it is satisfied, approve within a period of sixty days from the date of its receipt;
- (12) all the activities under the IIMP shall be regulated in accordance with such Plan by the concerned authorities in the Islands.

As per **Section III**, the islands of Middle Andaman, North Andaman, South Andaman and Greater Nicobar shall be managed based on ICRZ have the following jurisdiction, namely:-

- A. (i) the land area from High Tide Line (hereinafter referred to as the HTL) to 500mts on the landward side along the sea front;
- (ii) ICRZ shall apply to the land area between HTL to 100 mts or width of the creek whichever is less on the landward side along the tidal influenced water bodies that are connected to the sea and the distance upto which development along such tidal influenced water bodies is to be regulated shall be governed by the distance upto which the tidal effects are experienced which shall be determined based on salinity concentration of 5 parts per thousand (ppt) measured during the driest period of the year and distance upto which tidal effects are experienced shall be clearly identified and demarcated accordingly in the ICRZ Plan.

The approach to preparing ICRZ is similar to that of CZMP for the mainland with four zones, ICRZ-I, II, III, and IV having different restrictions. Unlike the setbacks defined in ICRZ for the large islands, it is not explicitly specified in the notification. However, a setback of 50m was employed in the IIMP<sup>7</sup> for the Rutland Island, South Andaman District (area 137.7 sq.km.) prepared by NCSCM in January 2018<sup>8</sup>. NCSCM arrived at the setback of a uniform setback distance of 50m around the island as a conservation measure based on the guidelines in the notification and technical assessment using multiple factors. The executive summary of the IIMP prepared is given in Annexure 2.

## 2.4 Island Coastal Regulation Zone (ICRZ) Notification, 2019: Excerpts

In 2019, MoEF&CC brought out Island Coastal Regulation Zone notification of 2019 (ICRZ-2019) amending IPZ-2011 (ICRZ-2019 G.S.R. 35(E), Jan 17, 2019) in supersession of IPZ-2011. Subsequently, an amended version was notified on March 8, 2019. The notification states as follows:

... the Central Government, with a view to conserve and protect the unique environment of coastal stretches and marine areas, besides livelihood security to the fisher communities and other local communities in the coastal areas and to promote sustainable development based on scientific principles taking into account the dangers of natural hazards, sea level rise due to global warming, does hereby, declare the coastal stretches of the eight bigger oceanic islands in Andaman and Nicobar namely, Middle Andaman, North Andaman, South Andaman, Great Nicobar, Baratang, Havelock, Little Andaman, Car Nicobar Islands and the water area up to territorial water limits of the country, as the Island Coastal Regulation Zone (hereinafter referred to as the ICRZ) as under:

- (i) The land area from High Tide Line (hereinafter referred to as the HTL) to 200 meters on the landward side along the sea front for Group-I Islands and 100 meters on the landward side along the sea front for Group-II Islands.
- (ii) The eight bigger oceanic islands in Andaman and Nicobar (ICRZ Islands) shall be grouped as follows:  
Group-I: Islands with geographical areas >1000 sq.km such as South Andaman, Middle Andaman, North Andaman and Great Nicobar.

<sup>7</sup> While IIMP was applicable as per IPZ-2011, under ICRZ-2019, the Rutland Island with area of 137.7 sq.km comes under the ICRZ which has been prepared.

<sup>8</sup> Integrated Island Management Plan (IIMP) for Andaman & Nicobar Islands: IIM Plan for Rutland Island South Andaman District, NCSCM, January 2018.

Group-II: Islands with geographical areas >100 sq.km but < 1000 sq.km such as Baratang, Little Andaman, Havelock and Car Nicobar.

The requirement of IIMP for the small islands other than those listed under the ICRZ categories, i.e., those with TGA less than 100 sq.km., are mentioned in Section 6, of the ICRZ-2019 pertaining to the areas requiring special consideration. The guidelines for IIMP are given in Annexure-IV(B) of the notification. In view of the unique coastal systems and space limitations in these islands, a NDZ defined by a setback of 20 meters from the HTL on the landward side shall uniformly apply to such islands. As per notification, the NDZ shall not be applicable in such areas falling within notified Port limits. Development beyond the NDZ shall be governed by the respective IIMPs and local regulations.

The ICRZ-2019 defines the four zones in section 2. In sub-section 2(v), ICRZ-III is defined as the relatively undisturbed land areas (viz. rural areas etc.) that do not fall under ICRZ-II. The explanation given is as follows:

- 1) For Group-I Islands, the area up to 100 meter from the HTL on the landward side shall be earmarked as the No Development Zone (NDZ). Provided that the NDZ for development of eco-tourism activities shall be 50 m and the Andaman and Nicobar administration shall ensure that the concerns of the fishing community are fully protected.
- 2) For Group-II Islands, the area up to 50 mts from the HTL on the landward side shall be earmarked as the No Development Zone (NDZ). Provided that the NDZ for development of eco-tourism activities shall be 20 m and the A&N administration shall ensure that the concerns of the fishing community are fully protected.

Further, **subsection 2(vi)** states as follows:

“Land area up to 20 m from the HTL, or width of the creek whichever is less, along the tidal influenced water bodies in the CRZ III, shall also be earmarked as the NDZ and the distance upto which the NDZ is to be reckoned as the land area between HTL to 20 meters or width of the creek, whichever is less on the landward side along the tidal influenced water bodies that are connected to the sea and the distance upto which development along such tidal influenced water bodies is to be regulated shall be governed by the distance upto which the tidal effects are experienced which shall be determined based on salinity concentration of five parts per thousand (ppt) measured during the driest period of the year and distance up to which tidal effects are experienced shall be clearly identified and demarcated accordingly in the Island Coastal Regional Zone Plans (hereinafter referred to as the ICRZ Plans).

#### **Guidelines for preparation of Integrated Island Management Plan (IIMP) – Annexure-IV(B)**

- 1) The Integrated Island Management Plan shall be prepared based on scientific methodology and appropriate coastal protection structures constructed/proposed to be constructed shall be indicated in addition to activities planned in the area and got approved by the concerned authority in the UT administration. Thereafter it shall be forwarded to the NCZMA for final approval.
- 2) The entire island including the aquatic area shall be considered for framing of the Integrated Island Management Plan (IIMP).
- 3) Integrated Island Management Plans shall be prepared indicating therein all present and future developments, conservation and preservation schemes with frame of ten years.
- 4) The Integrated Island Management Plan shall address vulnerability to human life and property based on elevation, geomorphology, sea level trends and horizontal line displacement and indicate suitable areas that are safe for locating dwelling units, infrastructure, and the like, and appropriate safeguards measures to protect the life and property of the local communities, infrastructure from natural hazards shall be indicated in the Integrated Islands Management Plan.
- 5) All the existing roads including the internal roads shall be strengthened, as these roads shall serve for the purpose of livelihood, communication, rescue, relief and evacuation measures during natural hazards.
- 6) Adequate cyclone shelters shall be earmarked and constructed on elevated areas or on stilts adjacent to populated areas.
- 7) The existing and as well new schools, market areas and other public facilities (excluding public toilets) where large number of public congregate, shall normally be located on safe areas preferably in elevated areas or protected areas shall be suggested.
- 8) Along the seaward side sufficient bio-shield with local vegetation, trees including mangroves shall be planted and other soft protection measures.
- 9) Sand dunes, being natural barrier in the event of flooding, shall be conserved and maintained or regenerated by planting shrubs or through appropriate measures.
- 10) There shall be no restriction with regard to traditional fishing by local communities including installation of fish aggregating device as recommended by the Islands Administrations.

- 11) The mining of construction material, especially sand from deep sea bed (beyond fifteen meters depth), after undertaking proper scientific studies may be permitted in the Plan;
  - (i) The alternative construction material, such as, bamboo, local forest products may be identified and used;
  - (ii) the other materials, like, metal, hollow brick blocks, and the like, shall be imported from the mainland.
- 12) Emphasis shall be given for use of non-conventional energy resources especially, wind, solar and tidal energy, desalination, water recycling, and use of local products.
- 13) Early warning system shall be provided for cyclone, tsunami, and the like, and an evacuation and relief measure plan in case of disasters shall be built preferably into the Integrated Islands Management Plan.
- 14) Necessary provision shall be made in the Integrated Islands Management Plan for relocation and rehabilitation of people displaced due to natural disasters.
- 15) Integrated Islands Management Plan shall also include the areas under habitation and make plan for future development.
- 16) No developmental activities shall be permitted in the area under reserve forests, protected forests, national parks and sanctuaries notified under the Forests (Conservation) Act, 1980 (69 of 1980) or the Wildlife (Protection) Act, 1972 (53 of 1972) and the areas protected under the Environment (Protection) Act, 1986 (29 of 1986).
- 17) The dwelling units or infrastructure of local communities as are existing at the time of preparation of Plan shall not be displaced.
- 18) Repair of existing buildings or infrastructure including reconstruction activities shall be allowed.
- 19) IIMP shall be prepared in 1:25,000 scale map for macro level planning and 1:10000 scale or cadastral scale for micro level planning.
- 20) The High Tide Line demarcated by NCSCM, Chennai shall be used for all purpose while preparation of the Plan.

## 2.5 Highlights and Summary

We provide here a summary of the setback distance specified in the provisions applicable to islands in the different notifications. We must keep this in mind while examining the challenges of using the approach for IIMP mandated for islands in CRZ-2019. This is necessary before examining the feasibility of applying to the tiny backwater islands the IIMP norms for the islands of Lakshadweep and A&N with TGA less than 100 sq.km. prescribed in the IPZ-2011 or ICRZ-2019.

The gist of the norms for islands as per notifications of 2011 and 2019 are summarised in Table-1. While IPZ-2011 do not specify an TGA limit for the norms employing four regulation zones, that was applicable only to the inhabited large islands. Under ICRZ-2019, the zoning norms are applicable to the islands with TGA exceeding 100 sq.km. that are placed in two groups. For the smaller islands, IPZ-2011 did not specify any regulation zones or any NDZ defined by a setback for IIMP. ICRZ-2019 has, however, specified a setback of 20m to define NDZ under IIMP for the smaller islands. Nevertheless, the ICRZ and IIMP maps are being prepared only for the 37 inhabited islands out 836 islands of A&N Islands.

**Table 1: Highlight of the norms for islands as per notifications of 2011 and 2019**

Notification	ICRZ	IIMP	NDZ Setback from HTL
<b>CZMP-2011</b>	Not Applicable	Not Required	50 m for all
<b>CZMP-2019</b>	Not Applicable	Required	IIMP: 20 m
<b>IPZ-2011</b>	Four Zones: ICRZ-I to IV for specified large islands	Required for all the smaller islands	ICRZ: 500 m for 4 larger islands IIMP: Not specified explicitly, but as per scientific assessment
<b>ICRZ-2019</b>	Four Zones: ICRZ-I to IV for Islands with TGA more than 100 sq. km. Group-I: TGA > 1,000 sq.km. Group-II: TGA between 100 sq. km and 1,000 sq.km.	Required for all the smaller islands of TGA < 100 sq.km.	ICRZ: 100 m for Group-I ICRZ: 50 m for Group-II IIMP: 20 m for all smaller islands, TGA < 100 sq.km.

### 3 Concept of IIMP

We have seen in the preceding section the scope of IIMP as envisaged in the relevant notifications of 2011 and 2019. The IPZ-2011 which first introduced the concept of IIMP into India's coastal regulation framework was meant for the oceanic islands, many of which had TGA exceeding 100 sq.km. and a few more than 1,000 sq.km. When it comes to the backwater islands of Kerala, the maximum TGA is below 40 sq.km. and merely 3 percent of the 1,826 islands have TGA greater than one square kilometre. IIMP has been prepared for 37 out of 836 islands of A&N, excluding the tiny ones even though they are considerably larger than 90 percent of the backwater islands of Kerala.

#### 3.1 Andaman & Nicobar Islands

A factsheet brought out by MoEF&CC, SICOM and NCSCM for the 22<sup>nd</sup> Conference of Parties, United Nations Climate Change Conference in 2016 presents succinctly the concept of IIMP incorporated in India's coastal regulation. The primary focus of IIMP is on the conservation and preservation zones. According to this factsheet, the IIMP consist of guidelines for hazard preparedness, and adopting climate change adaptation and mitigation strategies for the Islands.

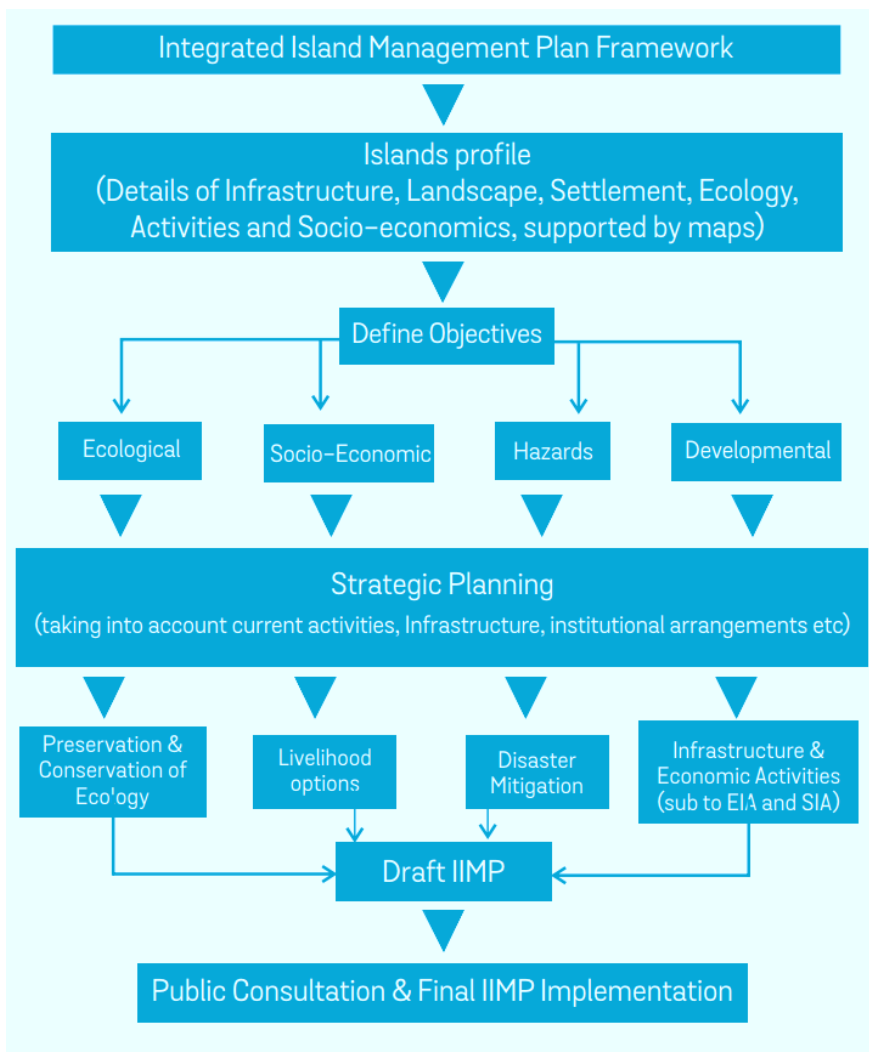


Figure 1: Integrated Island Management Plan – a framework for preparation (NCSM, 2016)

The major thrusts of IIMP are on the conservation and preservation zones which are basically the major coastal habitats of the oceanic island ecosystems. The aspects covered under IIMP include present and future developments, conservation, and preservation zones, as well as requirements such as dwelling units, basic amenities, infrastructure projects for people. The IIMP will include detailed spatial plan for all development activities covering a) entire island and associated ESA areas, b) area from HTL to 12 nautical miles seaward and c) NDZ demarcated on the landward based on HTL and elevation. The overview of IIMP presented in the factsheet is reproduced here (Fig.1).

There is a case study on the IIMP for a small island based on the plan made for Smith Island (North Andaman) which has a TGA of 24.7 sq.km. (Sridhar et al 2020). The paper informs that the IIMP was prepared by analysing status of land use and land cover, ESAs, developmental aspects, and hazard risk. Besides demarcation of NDZ, flagging conservation priorities, and considering ecotourism options, IIMP also takes note of global climate change scenarios. The paper provides a flow chart summarising the methodology for the preparation of IIMP and corresponding maps in 1:10,000 scale (Fig. 2).

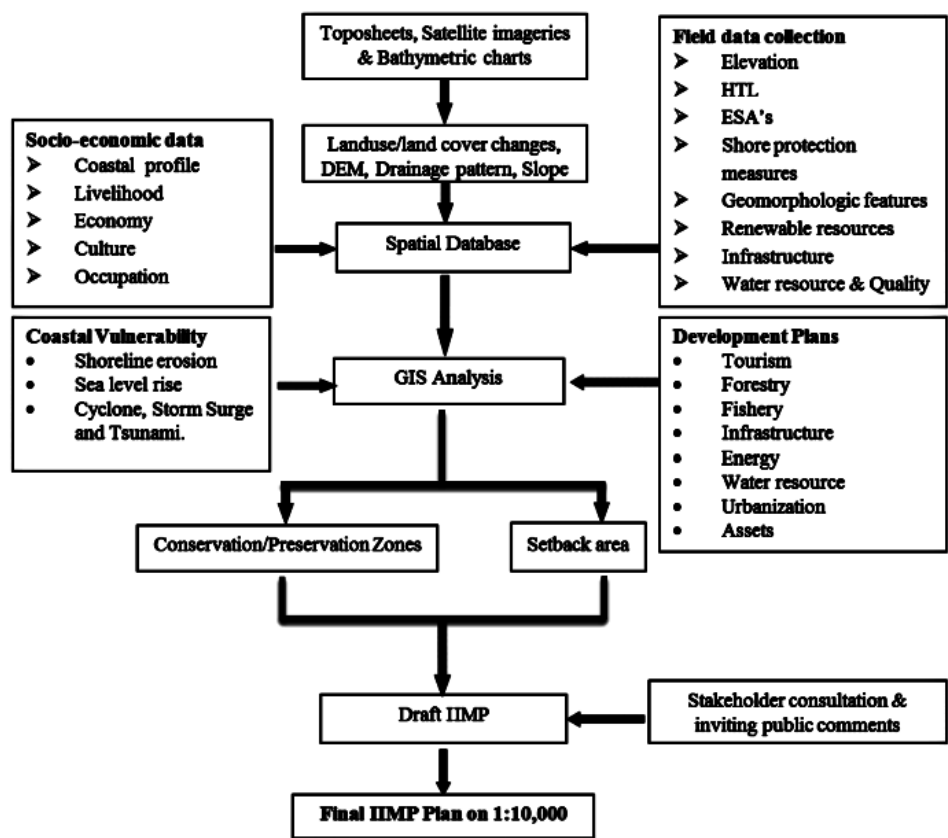


Figure 2: Methodology for IIMP (Sridhar et al, 2020)

Central to the approach used is biological conservation planning of islands having high ecological importance supporting high biodiversity. For small islands (TGA less than 100 sq. km.) there have been discussions on comprehensive island management planning (Yamano et al 2015, Hidayah et al 2016, Touhiduzzaman and Rahman 2017). However, it is difficult to find technical papers on IIMP for tiny backwater islands having TGA less than 10 sq.km. that are not considered important from a biodiversity perspective.

### **3.2 Applicability of IIMP to Backwater Islands, Kerala**

It is difficult to envisage either appropriateness or relevance of applying to the backwater islands the IIMP framework used for A&N Islands. Nearly 87 percent of A&N Islands is forest area and the population density for all islands is merely 46 persons per square kilometre compared to the densely populated coastal areas of Kerala. Prima facie, it seems quite an incongruous proposition to prepare ironclad or straightjacketed development options, land use and land cover plans, and so on for the backwater islands, almost all of which are densely populated developed areas. We do not intend to discuss all these in detail here. Suffice it to say that since these are developed areas and there are well-established governance systems responsible for development, disaster risk management, enforcing environmental laws, and decentralised governance, any approach that involves the notions of micro-planning from the top would be most inappropriate, infringing on the autonomy of both federal and decentralised institutions of local governance.

The IIMP framework employed for A&N Islands, which is essentially micro-planning from the top, seems potentially difficult to be in sync with the participatory and decentralised local level development. Centralised micro plans from the top of the kind prepared for A&N Islands will surely be out of step with the letter and spirit of the decentralised governance system mandated by the Constitution 73<sup>rd</sup> Amendment. In the case of the backwater islands, which are subject to the jurisdiction of respective LSGI, whatever form the IIMP takes should be limited strictly within the principles of the defining the category of applicable coastal regulations. Additionally, where relevant, guidelines can be given to the LSGI. More importantly, CRZ itself is purely a regulatory instrument conferring only such a restricted role on the national and state coastal zone authorities. CRZ does not envisage any other roles for NCZMA or SZCMA.

## **4 NDZ for Backwater Islands: Feasibility and Relevance**

### **4.1 Concept of Coastal Setback – Brief Overview**

Coastal setback lines or hazard zones are employed in coastal regulatory frameworks to ascribe the present and potential future coastal hazard for a particular area. The most important reason for defining a NDZ is to allow the functioning of natural coastal processes without either impacting on or by development. Such a setback line usually considers multiple factors such as longshore transport processes, shoreline change trends, geotechnical stability, biodiversity, presence of heritage sites, cultural/ scenic priorities, and expected climate change impacts (Clark 2018; Ramsay et al. 2012; Simpson et al 2012; Smith 2010; Pellach and Alterman 2020). One of the most used formula (in the original or modified forms) to estimate shoreline recession due to sea-level rise is that proposed by Bruun (1988). Essentially, all these apply to the coastal zones along the land-sea interface. Incidentally, while the coastal plans and NDZ usually incorporate demarcation of areas prone to shoreline change, especially erosion hotspots, that is not mandatory as per guidelines for preparing the CZMP. The discussion here is about the extremely small islands in the backwaters far away from the coast. Therefore, we must note that all the factors applicable along the land-sea boundary are not relevant to the backwater islands. Same is true when the setback lines prescribed for backwater islands are based on an approach applicable to the coast or oceanic islands.



The size of demarcated islands in CZMP-2019 (p/d) range from 40 sq.m (0.00004 sq.km) to 33.7 sq.km. From this, we can see that it is not feasible to apply the prescribed setback of 20m as per CRZ-2019 or 50m as per CRZ-2011 to the tiny islands. In fact, using a fixed setback distance from HTL without considering the size of the island does not seem justified in any manner. Therefore, in our view, a fixed setback line drawn 20m or 50m from the HTL is neither feasible nor appropriate for tiny backwater islands while it seems reasonable for islands larger than 100 sq.km. such as that of A&N or Lakshadweep.

The scientific reasoning behind applying the same setback criteria used for large island in the ocean to tiny backwater islands is difficult to explain to stakeholders or rationalize. The backwater islands are in no way comparable to large islands in the sea like A&N or the Lakshadweep. While the rationale for applying the setback of 20m (less than 100 sq.km) and above (more than 100 sq.km and less than 1,000 sq.km; above 1,000 sq.km) to large entities located in the sea is understandable, using the same yardstick for tiny backwater islands existing in vastly different geographic settings is difficult to justify when seen through the reasoning usually employed in defining setback norms. Our vigorous literature search did not yield setback norms of 20m or more for tiny estuarine islands.

#### **4.2 NDZ Area Relative to Total Area for Hypothetical Circular Islands**

The average being merely notional, we shall visualize the shape of an island with average area in different size classes as circular with the caution that the actual islands – big or small – are all highly irregular in shape. Many are elongated with portions that are extremely narrow. Visualizing the islands as circular<sup>9</sup> makes it easier to compare the setback distance from the HTL with the nominal radius of these circular islands. If the island is assumed to be circular with radius denoted by 'r' (Fig. 3), and the setback distance as 'a', the effective area of the island excluding the No-Development Zone will be that of a smaller circle of radius (r-a). Note that the setback zone being on the outer periphery, the NDZ demarcated will be that of the outer ring. The area of the NDZ is the area of the island less the area of the inner circle.

The NDZ is defined by the setback line measured from the HTL which forms the land-water boundary within the ambit of the coastal regulations for backwater islands. With the caution that a circular shape is an ideal approximation that maximises area for a given perimeter (any other shape with same perimeter will have less area), we can easily calculate the NDZ area for different setback distance. In the case of islands, we have three options for setback distance to define NDZ, a) 100m for islands with TGA > 1,000 sq.km. b) 50m for islands with TGA greater than 100 sq.km. and less than 1,000 sq.km. and c) 20m for TGA less than 100 sq.km. The computed NDA area as percentage of TGA according to these three setback distances are given in Table-2. We can see that as the TGA increases, for the same setback distance, the ratio of NDZ to TGA (percentage) declines sharply and becomes very large for smaller TGA even when the setback seems to be small.

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<sup>9</sup> A circle is the shape that encloses maximum area for a given perimeter and any other shape of the same area will necessarily have a larger perimeter.

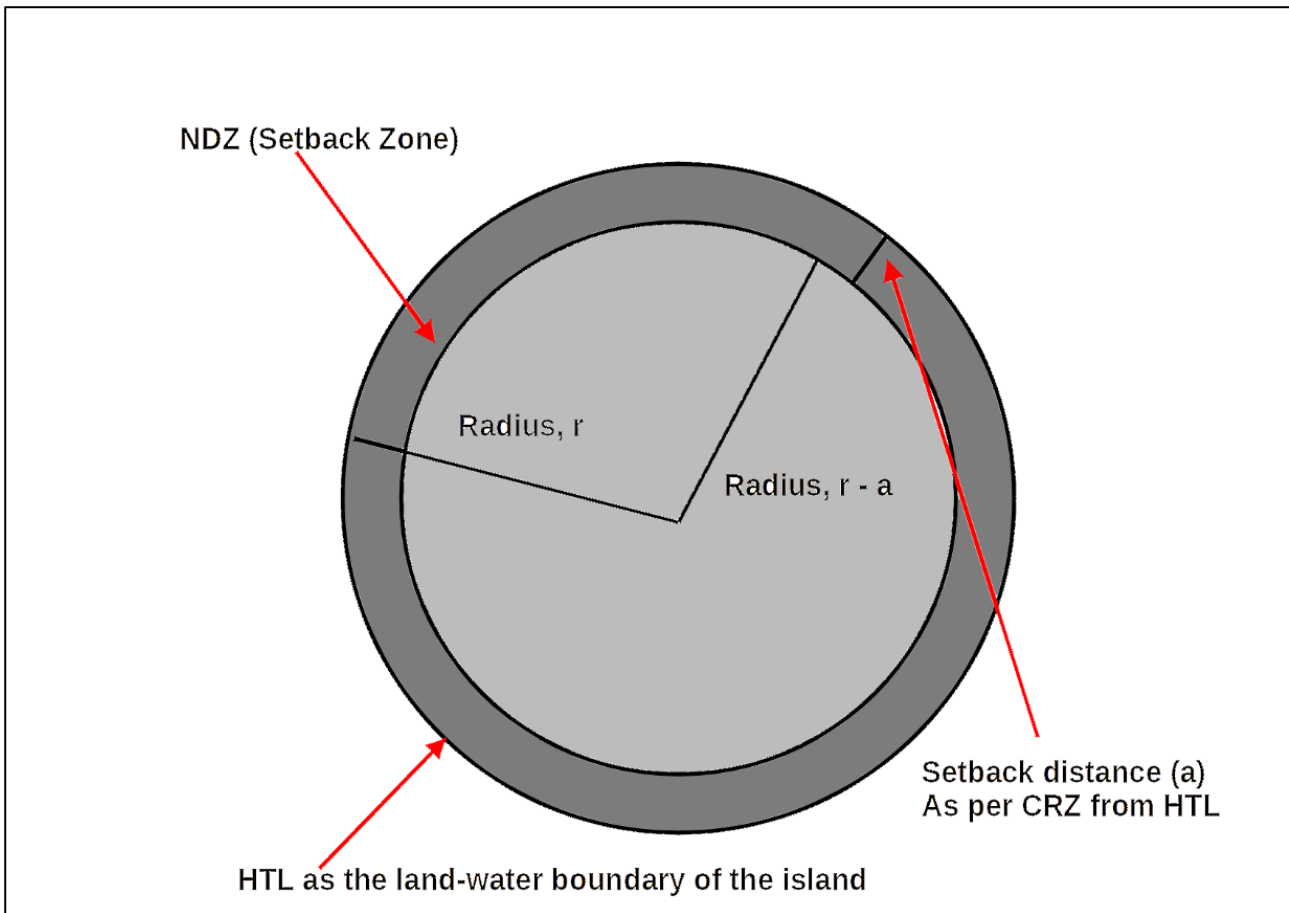


Figure 3: Schematic representation of an 'average' island

Table 2: NDZ Area relative to Total Geographic Area (TGA) for islands assumed to be circular

SN	Island TGA (sq.km)	Setback (m)	NDZ-Area (sq.km)	NDZ Area (%) of TGA
1	1	20	0.07	7.0
2	5	20	0.16	3.2
3	10	20	0.22	2.2
4	50	20	0.50	1.0
5	100	20	0.71	0.7
6	101	50	1.77	1.8
7	200	50	2.50	1.3
8	500	50	3.96	0.8
9	1000	50	5.60	0.6
10	1001	100	11.18	1.1
11	2000	100	15.82	0.8
12	5000	100	25.03	0.5

We can see from Table-2 that for the large islands, e.g., TGA of 5,000 sq.km, the NDA compared to TGA is just 0.5 percent when setback is 100m and for TGA of 1,000 sq.km with setback of 50m the NDZ is 0.6 percent of TGA. In the Table-3, we present the setback distances for small islands (TGA 1 ha to 100 ha) that can make the ratio of NDZ area to TGA comparable to that of the large islands with NDZ as per setback prescribed in the ICRZ-2019 or IPZ-2011. In the case of A&N Islands, for instance, the ICRZ and IIMP are prepared only for the inhabited and relatively large 37 islands, none of which is comparable to 95 percent of the backwater islands of Kerala. Table-3 clearly shows that only nominal setback distances will seem reasonable, especially when the total number is quite large.

**Table 3: NDZ to TGA (%) based on hypothetical setbacks for circular-shaped islands**

SN	Island TGA (ha)	Setback (m)	NDZ-Area (ha)	NDZ Area/ TGA (%)
1	1	0.5	0.02	1.8
2	5	1	0.08	1.6
3	10	1	0.11	1.1
4	50	2	0.50	1.0
5	100	2	0.71	0.7
6	100	20	6.96	7.0

## 5 Demarcated Islands in CZMP-2019 (p/d) – Size Variation

The data compiled from the CZMP-2019 (p/d) shows a highly skewed distribution of the demarcated islands by their size (Table-4). We assume that the TGA of demarcated islands in CZMP-2019 (p/d) is computed as the TGA from HTL, i.e., excluding the intertidal area of each island. The CZMP-2019 (p/d) do not provide a methodology section on the demarcation of islands. In the CZMP-2019 maps (p/d), the islands are not clearly shown by unique identifier and colour code. Without going into all those aspects of map-making, we assume that the TGA of islands corresponds to that of island with HTL as its land-water boundary because only the landward-side measurements from HTL are relevant for IIMP and defining the setback line for NDZ.

**Table 4: Demarcated Islands of All Coastal Districts – Size Variation**

	Island Area Hectares (ha)	Number (N)	Relative Frequency (%)	Total Area in ha (within size class)	Average Area in ha (within size class)
1	<= 2	1421	77.8	480.4	0.34
2	2+ to 5	139	7.6	443.0	3.19
3	5+ to 10	86	4.7	580.5	6.75
4	10+ to 20	55	3	763.1	13.87
5	20+ to 50	44	2.4	1,314.0	29.86
6	50+ to 100	28	1.5	1,983.0	70.82
7	100+ to 200	20	1.1	2,959.1	147.96
8	200+ to 500	20	1.1	6,531.9	326.60
9	500+ to 1K	8	0.4	5,097.7	637.21
10	1K+ to 2K	3	0.2	4,242.3	1,414.11
11	2K+ to 5K	2	0.1	5,690.8	2,845.42
	<b>Overall</b>	<b>1,826</b>	<b>100</b>	<b>30,086</b>	<b>16.48</b>

Note: 1 ha = 10,000 sq.m.

The size-wise distribution of demarcated islands shows that nearly 78 percent of the islands are not more than 2 ha in TGA with mean TGA of just 0.34 ha (3,400 sq.m) and 85.4 percent are not exceeding 5 ha with an average TGA of merely 0.6 ha (6,000 sq.m)<sup>10</sup>. If we approximate an island as a square, these two average areas would be a little less than 60m X 60m (circle of radius < 33m) and 77.5m X 77.5m (circle of radius < 44m), respectively. The number of large islands with area exceeding 1 sq. km is merely 53 out of a total of 1826 demarcated backwater islands in the CZMP-2019.

<sup>10</sup> Demarcated islands with area <= 5 ha: 1560; total area: 923.4 ha; average area: 0.6 ha. (Table-1, Rows 1 &2)

**Table 5: Demarcated Backwater Islands – District-wise Distribution**

	District	Island Area (ha)	Number	Minimum Area (sq. m)	Maximum Area (ha)	Average Area (ha)
1	Alappuzha	9,627	198	200	2323.3	48.6
2	Ernakulam	15,810	1074	40	3367.5	14.7
3	Kasaragod	990	43	800	381.8	23.0
4	Kannur	589	55	400	127.7	10.7
5	Kollam	1,174	169	100	485.8	6.9
6	Kottayam	118	66	400	16.8	1.8
7	Kozhikode	190	68	500	28.2	2.8
8	Malappuram	90	47	200	16.1	1.9
9	Thrissur	1,096	71	400	537.8	15.4
10	Thiruvananthapuram	400	35	200	73.5	11.4
	<b>Overall</b>	<b>30,086</b>	<b>1826</b>	<b>40</b>	<b>3367.5</b>	<b>16.5</b>

Note: Minimum area is in sq. m. (1 ha = 10,000 sq.m)

Data for all the districts show that about 90 percent of the islands are of area less than 10 ha and the average area in a few districts is between 2 ha to 3 ha (Table-5). The average area of the 1826 islands is merely 16.5 ha, which would be equivalent to a 400m X 400m square (circle of radius 230m). The smallest island of area 40 sq.m. demarcated is in Ernakulam District which is equivalent to the area of a square of side 6.3m or a circle of diameter 7.1m.

## 6 Demarcated Islands in CZMP-2019 (p/d): NDZ vs Size Variation

The setback specified in CRZ-2011 is 50m and 20m in CRZ-2019. The notional radii of the circular shapes having same area as that of the average for different size classes are given in Table-6. When the island is too small, the entire island becomes NDZ and for small sizes, the NDZ will be more than half that of total area. The area of the NDZ corresponding to CRZ notifications of 2019 and 2011 are also shown in Table-6.

**Table 6: Demarcated Islands – Size Variation vs Setbacks as per CRZ-2011 and CRZ-2019**

	Size Class Island Area (ha)	Relative Frequency (%)	Mean Area (ha)	Circular Shape Radius (m)	Setback-NDZ Area (%)	
					CRZ-2019 (20m)	CRZ-2011 (50m)
1	<2	77.8	0.3	33	85	100
2	2+ to 5	7.6	3.2	101	36	75
3	5+ to 10	4.7	6.8	147	25	57
4	10+ to 20	3.0	13.9	210	18	42
5	20+ to 50	2.4	29.9	308	13	30
6	50+ to 100	1.5	70.8	475	8	20
7	100+ to 200	1.1	148.0	686	6	14
8	200+ to 500	1.1	326.6	1,020	4	10
9	500+ to 1K	0.4	637.2	1,424	3	7
10	1K+ to 2K	0.2	1,414.1	2,122	2	5
11	2K+ to 5K	0.1	2,845.4	3,010	1	3
	<b>Overall</b>	<b>100</b>	<b>16.5</b>	<b>229</b>	<b>17</b>	<b>39</b>

Note: We have approximated shape of the average island as circular merely to illustrate the case. The islands are irregular in shape with many tiny islands not having the width of 20 m or 50 m.

As the size of the island increases the relative size of the NDZ compared to the island's area will decrease sharply (Fig. 4). As mentioned earlier, the islands are irregular in shape and the NDZ of small, irregular shaped

islands will be more than that of the regular circle. For many small islands, the width in many parts may be less than the setback prescribed in CRZ-2011 (50m) or CRZ-2019 (20m).

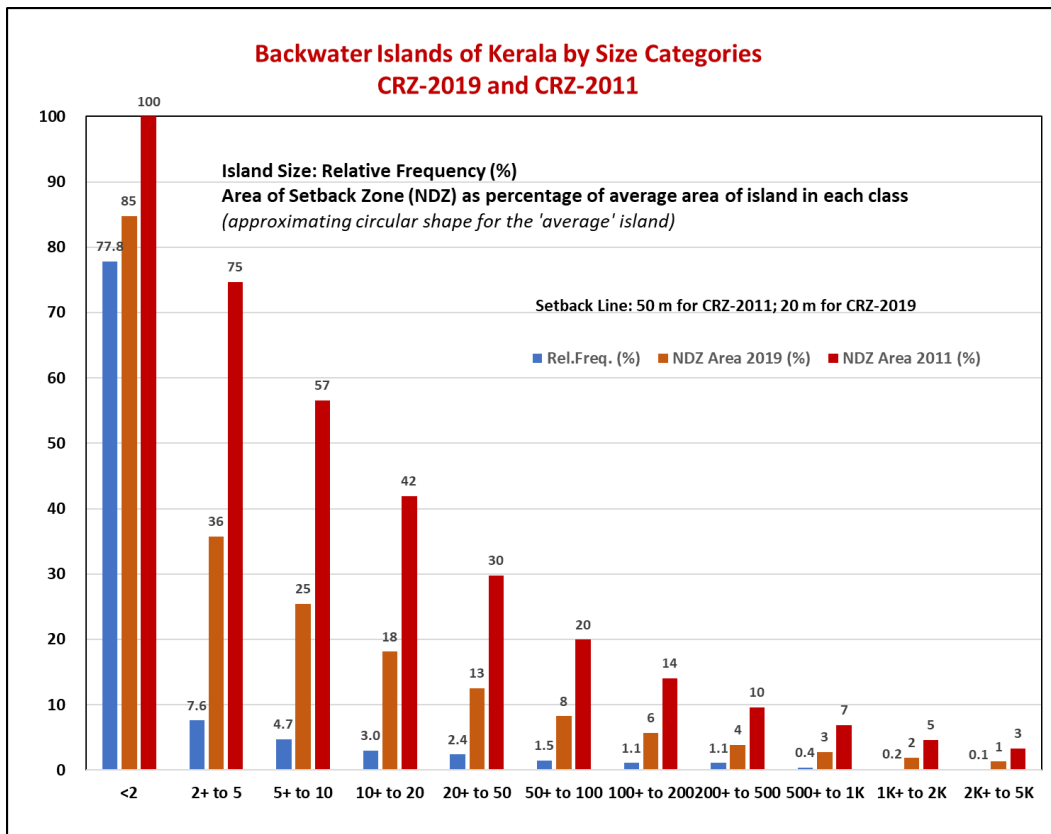
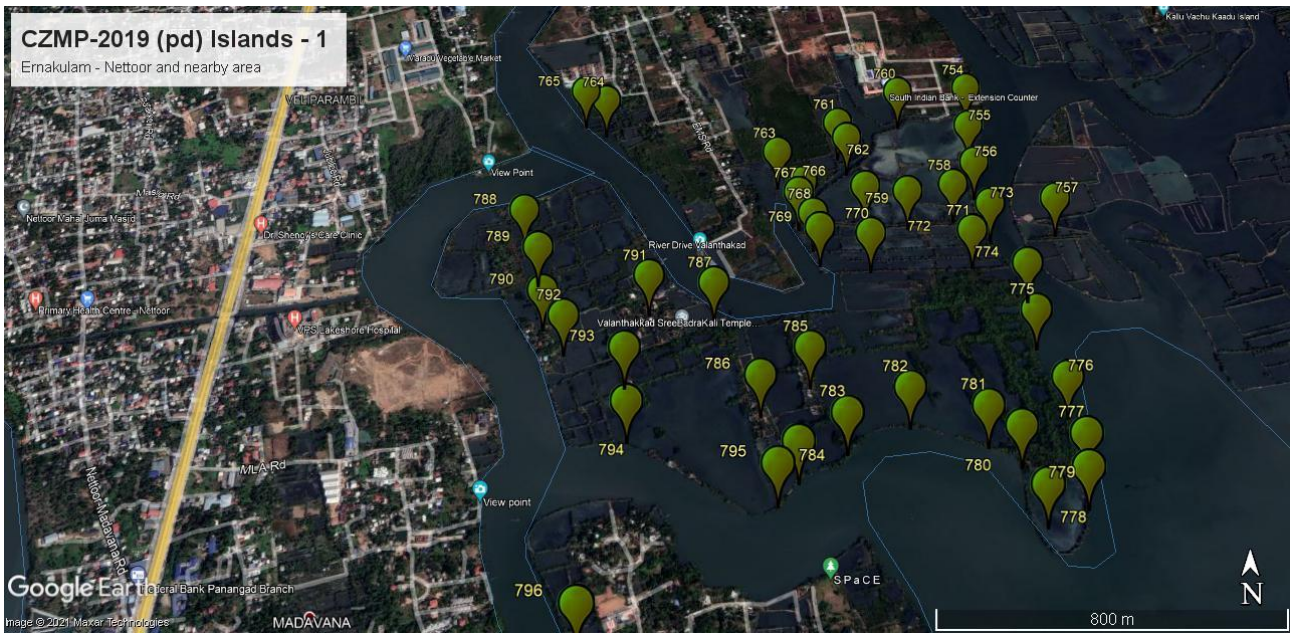


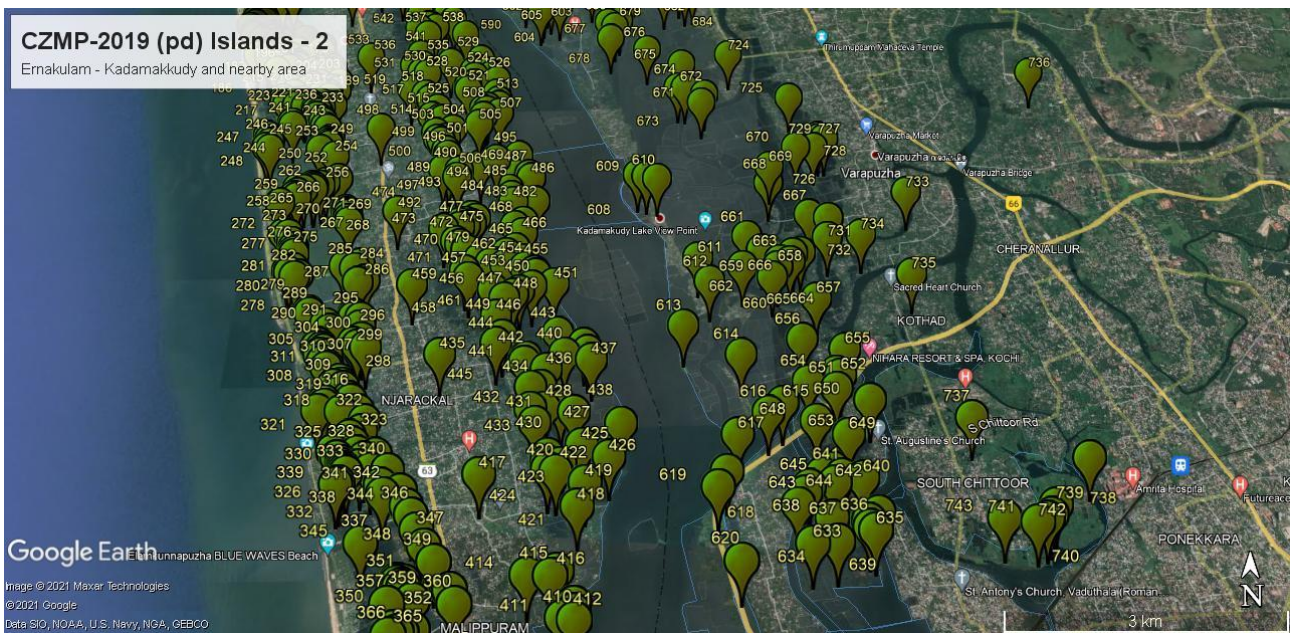
Figure 4: Backwater islands of CZMP-2019 (p/d): Size classes vs NDZ area as per CRZ-2019 and 2011

As mentioned earlier, the CZMP-2019 (p/d) does not have a section describing the criteria used for demarcation of islands. The smallest island demarcated is of 40 sq.m corresponding to a circle of radius nearly 3.6m or a square of side 6.3m. It is not clear what purpose will be served by identifying islands so small that their total length or width is less than the setback distance of 20m specified in CZMP-2019. As can be seen from Fig. 4, applying a large setback like 10m to 20 m seems reasonable only when both the overall length and width of an island is nearly 5km or more.

To get a sense of the distribution of the large number of tiny backwater islands demarcated in CZMP-2019, we have included a few examples from Ernakulam district using satellite imageries from Google Earth (Fig. 5 and 6). The first is of the vicinity of Nettoor. The second from the neighbourhood of Kadamakkudy, an area covered in the field visit by the sub-committee members in August 2021. These images show demarcated islands packed closely with areas that are not island. In the bulk of the cases, there is extremely narrow waterbody separating the demarcated islands and the land area that is not island.



**Figure 5:** Series of backwater islands in the vicinity of Nettoor (CZMP-2019 (p/d)); island and non-island adjacent areas are similar but subject to different CRZ restrictions as per CRZ category.



**Figure 6:** Dense distribution of tiny backwater islands in the neighbourhood of Kadamakkudy, Ernakulam district, as per CZMP-2019 (p/d)

In many cases, the width of water body bordering the island and non-island land area may be less than 20 meters. In such cases, while the setback for the non-island will be less than 20 m, that for the island would be 20m. Similarly, in many cases while the demarcated island will have a setback of 20m an adjacent land parcel which is similar except for not having water boundary on all sides may have setback more than 20m. In many instances, there is very little spatial separation between the backwater island and land parcel that is not an island.

The setback defined for tiny backwater islands certainly requires a review not merely in terms of the appropriate value but also the overall context in which the regulation zones should apply in the land bordering the

backwater systems. The norms must recognize the urgent need to ensure basic amenities in these areas where the land availability for proper housing is severely limited.

## 7 Demarcated Islands: CZMP-2011 vs CZMP-2019 (p/d)

The discussion so far naturally raises the question whether there are major differences between the islands identified in CZMP-2011 and in CZMP-2019 (p/d). It must be noted that the mapping exercises for CZMP-2011 and CZMP-2019 (drafts) were carried out respectively during 2017-18 and 2019-20, which means there are hardly two years separating the two CZMPs. Normally, we do not expect any significant differences unless there are differences in the approach adopted for demarcation. Until NCZMA approves the IIMP for CZMP-2019, the provisions of CRZ-2011 will continue to apply for the islands. That is another reason to examine if there are major differences between the two. This is necessary because it may take some time for the questions relating to IIMP for the backwater islands under CZMP-2019 to be resolved and until then CZMP-2011 will apply to the islands.

**Table 7: Differences: Islands in CZMP 2011 vs 2019 – Number, Total Area, and Average Area**

District	Number		Diff (%)	Total Area		Diff (%)	Average (ha)		Diff (%)
	2011	2019	2019 vs 2011	2011	2019	2019 vs 2011	2011	2019	2019 vs 2011
Thiruvananthapuram	43	35	-18.6	401	400	-0.3	9.3	11.4	+22.2
Kollam	184	169	-8.2	1,212	1,174	-3.1	6.6	6.9	+4.8
Alappuzha	474	198	-58.2	9,580	9,627	+0.5	20.2	48.6	+140.5
Kottayam	71	66	-7.0	125	118	-5.8	1.8	1.8	-2.3
Ernakulam	1,068	1,074	+0.6	12,097	15,810	+30.7	11.3	14.7	+29.5
Thrissur	63	71	+12.7	1,193	1,096	-8.1	18.9	15.4	-18.6
Malappuram	47	47	0.0	91	90	-0.9	1.9	1.9	-1.7
Kozhikode	57	68	+19.3	186	190	+2.1	3.3	2.8	-14.2
Kannur	74	55	-25.7	1,468	589	-59.9	19.8	10.7	-46.1
Kasaragod	49	43	-12.2	987	990	+0.3	20.1	23.0	+14.2
<b>All Districts</b>	<b>2,130</b>	<b>1,826</b>	<b>-14.3</b>	<b>27,340</b>	<b>30,084</b>	<b>+10.0</b>	<b>12.8</b>	<b>16.5</b>	<b>+28.4</b>

The data on the islands demarcated in CZMP-2011 and CZMP-2019 (p/d) are summarised in Tables 7 and 8. Overall, there is more than a 14 percent reduction in the number of islands in CZMP-2019 compared to CZMP-2011. There are major changes across districts. The increase in TGA of islands across districts is about 10 percent. It is significantly large in Ernakulam – increase of 31 percent and Kannur – reduction by 60 percent. Since the total number of islands have changed across districts, the average sizes of islands show considerable variation. While it is possible that some islands demarcated in CZMP-2011 as per mapping carried out in 2017-18 are no longer within the CRZ limits during the mapping in 2019-20, it is difficult to understand how large addition in area is possible in CZMP-2019. The increase in area of islands in Ernakulam district is 3,713 ha (+30.7%) while the reduction in Kannur is 879 ha (-60%).

The difference in areas of smallest islands across districts show considerable variation even though there is no significant difference in the smallest island demarcated across the state (Table-8). This indicates that there is no difference between CZMP-2011 and 2019 with regard to the scale at which islands have been demarcated. When we consider the area of largest island in each district, we see major difference only for two districts – Ernakulam and Kannur. In Ernakulam, the area of largest island in CZMP-2011 was 1,014 ha, while the largest island as per CZMP-2019 is of 3,368 ha. This is perhaps the most conspicuous instance of an

addition to CZMP-2019 that was not classified as an island in CZMP-2011. It is not clear why it was not demarcated as an island in CZMP-2011 if the island demarcation framework is the same.

**Table 8: Differences: Islands in CZMP 2011 vs 2019 – Minimum, Maximum, and Average Area**

District	Minimum-TGA (sq.m)		Diff (%)	Maximum-TGA (ha)		Diff (%)	Average (ha)		Diff (%)
	2011	2019	2019 vs 2011	2011	2019	2019 vs 2011	2011	2019	2019 vs 2011
Thiruvananthapuram	123	200	+62.6	73	74	0.0	9.3	11.4	+22.2
Kollam	68	100	+46.8	486	486	-0.0	6.6	6.9	+4.8
Alappuzha	39	200	+414.2	2,323	2,323	0.0	20.2	48.6	+140.5
Kottayam	354	400	+13.1	17	17	+0.1	1.8	1.8	-2.3
Ernakulam	42	40	-4.3	1,014	3,368	232.1	11.3	14.7	+29.5
Thrissur	374	400	+6.8	538	538	+0.0	18.9	15.4	-18.6
Malappuram	195	200	+2.7	16	16	-0.2	1.9	1.9	-1.7
Kozhikode	759	500	-34.1	28	28	+0.2	3.3	2.8	-14.2
Kannur	197	400	+103.0	845	128	-84.9	19.8	10.7	-46.1
Kasaragod	273	800	+192.7	382	382	0.0	20.1	23.0	+14.2
<b>All Districts</b>	<b>39</b>	<b>40</b>	<b>+2.8</b>	<b>2,323</b>	<b>3,368</b>	<b>+44.9</b>	<b>12.8</b>	<b>16.5</b>	<b>+28.4</b>

While the area of the largest island in Kannur district as per CZMP-2011 was 845 ha, the largest as per CZMP-2019 is of 128 ha. This means that the largest island of Kannur in CZMP-2011 is no longer included within the CRZ limits of CZMP-2019. While there may be technically sound basis for these changes, the reasons for such changes are not provided in the CZMP-2019 (p/d) or in response to queries about the methods and guidelines for demarcation of islands, particularly when there were marked differences in the demarcation of islands between the First Pre-Draft and Second Pre-Draft of CZMP-2019.

## 8 Case Studies from Kannur: CZMP of 2011 and 2019 (p/d)

We have examined the Kannur district in some detail to get more clarity on certain issues, which are:

- Are the differences between CZMP of 2011 (mapped in 2017-18) and 2019 (p/d, mapped in 2019-20) insignificant to render them almost irrelevant for all practical purposes?
- What is the status of islands and islets along the mainland coast, especially those listed in the CZMP-2011 but not demarcated in 2019 (pre-draft)?
- Could there be major difference between the approaches used in CZMP of 2011 and 2019 for identification and demarcation of islands?
- What would be the challenges of zoning and preparing IIMP if we take a few cases of tiny islands?

The approach adopted in the case studies consist of the following:

- Detailed examination of the CZMPs of 2011 (approved) and 2019 (p/d)
- Use of GIS platform<sup>11</sup> for working with the CZMP maps
- Use of the relevant toposheets (1:50,000 scale) to confirm spatial location of islands for the comparative study of the two CZMPs

<sup>11</sup> GIS platform used: (Arc GIS - 10.2)



- d) Use of the satellite imageries (updated in April 2021) available from Google<sup>12</sup> to visualise the present situation of islands and islets

The approved CZMP-2011 report does not include a list of islands. Separate maps of the islands demarcated in CZMP-2011 (p/d) are available from the official website of KCZMA. A separate list of islands demarcated in CZMP-2011 is available with KCZMA. We find that there is a substantial difference between the number of islands identifiable on the maps and those given in the list. Our observations are:

- As per list of islands for CZMP-2019 (p/d) report for Kannur district, there are 55 islands within the CRZ limits. Based on the geocoordinates in the list, we have been able to locate only 46 that can be demarcated as islands. The remaining nine do not appear to fit the description of a backwater island.
- On close examination of the CZMP-2019 (p/d) maps, we could identify only 50 islands. We also found some differences between the geocoordinates on the map and what is given in the list of islands.
- The CZMP-2019 (p/d) does not include four main coast islands and islets included in CZMP-2011.
- Examination of SOI toposheets (2005-2006) indicates that there are 57 islands in the areas within the CRZ limits.
- Inspection of Google image (April 2021) shows 124 islands within the CRZ limits of Kannur district of which 116 are in the backwaters and 8 along the main coast.

Our rapid review of the islands demarcated in CZMP-2011 and CZMP-2019 raises certain doubts about the demarcated islands. There are some islands that do not appear to be so on closer examination and several that are not included. Since our rapid appraisal is not comprehensive, our findings can only be considered as examples underscoring the need for a careful review of the demarcation of islands before finalisation of the CZMP-2019. To illustrate, we present the case of islands demarcated as 56, 57, 58 in CZMP-2011 and as 7, 8, 9 in CZMP-2019 (p/d).

Any polygon formed by the HTL is considered as an island as per the criterion used for demarcation. In the maps shown in Fig. 7 and 8 the identifiers of the islands are not given and all the features with the HTL enclosing it are demarcated as islands unless it falls in another category like mangroves. To understand all the markings on these maps, readers must refer to the CZMP map corresponding to the part D43V4/SE (identified as KL-73) of the CZMP maps.

Figures 7 and 8 show the relevant section from each of the corresponding CZMP maps and figure 9 is the same coverage as seen using satellite imagery from Google Earth of December 2020 (post-monsoon). Figure 10 shows the same coverage during a likely drier period, May 2017 (pre-monsoon). Comparison of the imageries of the relatively dry and wet periods shows that some of the water boundaries may not be a permanent feature. Clearly discernible in the CZMP of 2019 are the NDZ for backwater islands with 20m

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<sup>12</sup> Google Earth uses imagery mostly obtained by Landsat 8 satellite apart from those obtained by means of aerial photography. These imageries provide images with higher quality that too with greater frequency. The resolution of these images varies, e.g., 15 meters or better. These images are helpful in conjunction with other geo-spatial analysis to firm up the inferences.

setback and the NDZ for adjacent land parcels that are not islands. In some places the width water body separating the island from the other land parcels could be less than 20m.

We suspect this is somewhat typical of many land parcels having extremely uncertain water boundaries. In these cases, the width of adjacent water body could be less than 20m. We cannot be certain that every year water is present in the driest season or that water has 5ppt salinity in that season every year. These cases also highlight show another anomalous situation, which is that of areas adjacent that are not islands existing quite close to entities demarcated as islands. For the former, the setback could be greater or lesser than 20m depending on the width of the water body, while it will be a fixed value of 20m for the tiny part demarcated as an island. It is important to note that such anomalies are not rare.

The comparison of the maps and geo-spatial data shows that the differences between the islands in 2011 and 2019 are not necessarily insignificant as it may appear from the statistical summary. This could have important consequences if KCZMA is to use the CZMP-2011 island maps until MoEF&CC approves the IIMP for CZMP-2019. In practice it would be difficult to apply the setback rule for islands and non-islands when they are very close to each other. We have refrained from examining the difficulties likely to be encountered due to this in the processing of CRZ clearance applications covering land parcels demarcated as island and non-island existing in close proximity, in an almost indistinguishable manner.

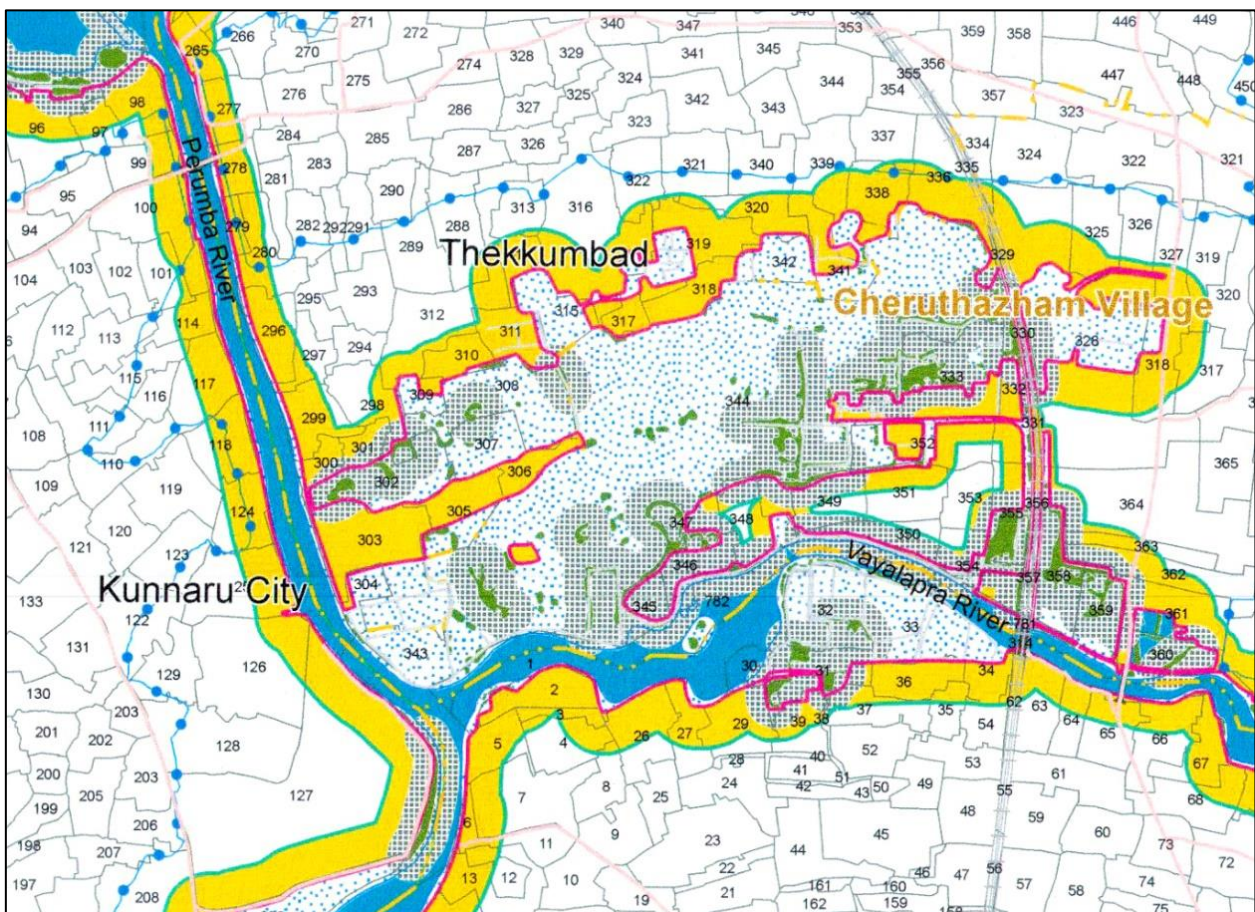
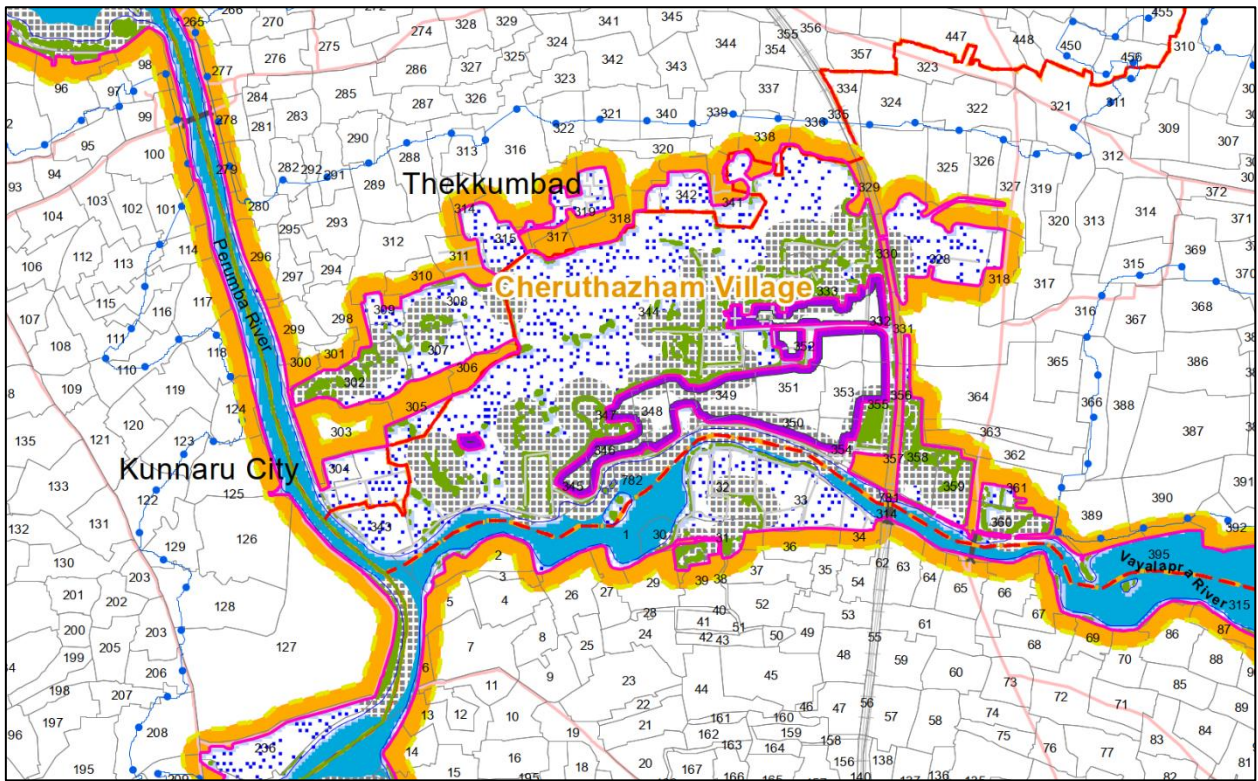
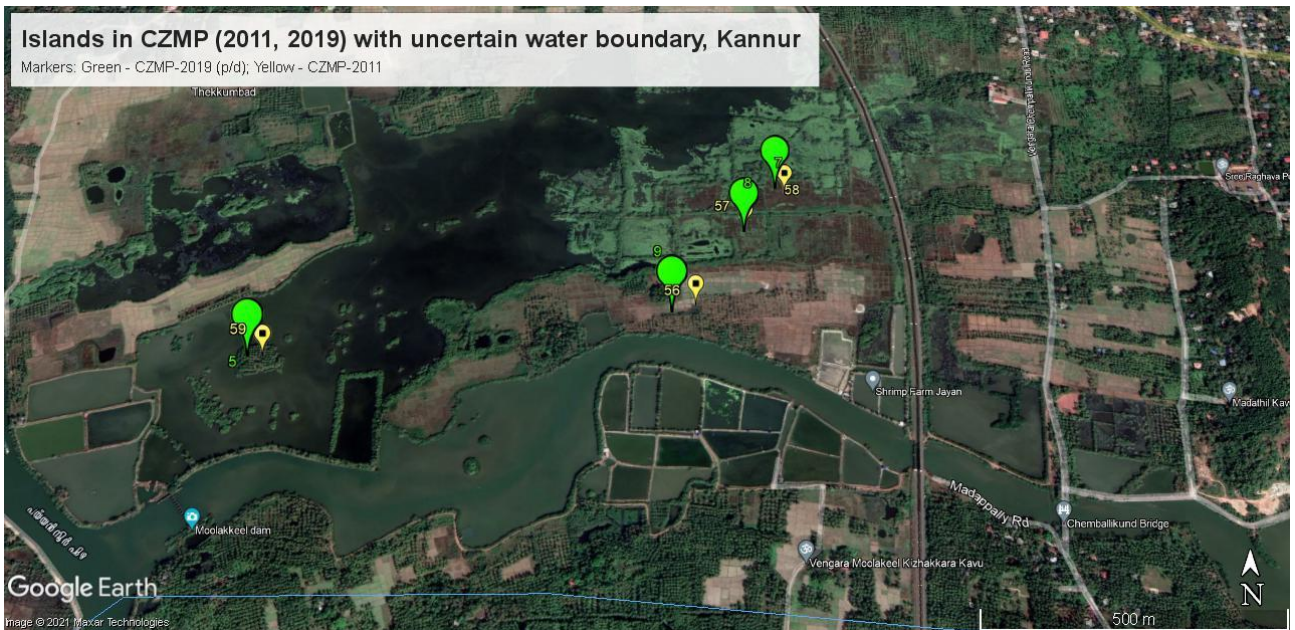


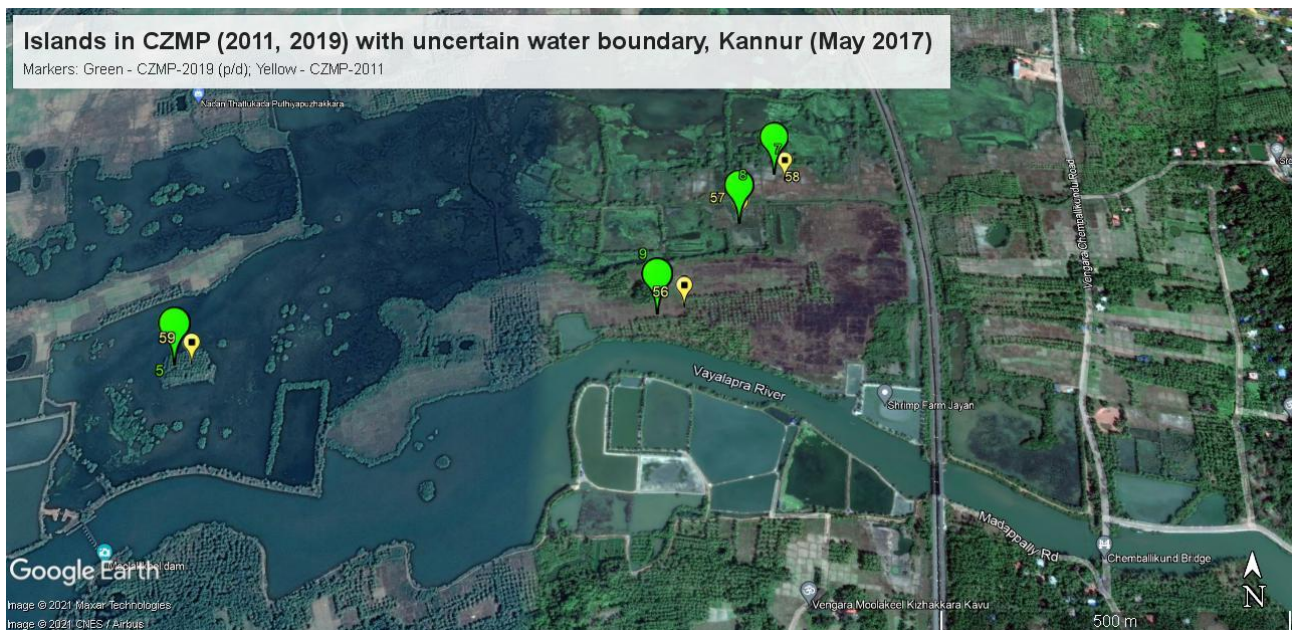
Figure 7: Islands 56 to 58, CZMP-2011 with uncertain boundaries



**Figure 8: Islands 7, 8, 9 of CZMP-2019 (p/d) with uncertain boundaries**



**Figure 9: Islands with uncertain boundaries, examples from Kannur; CZMP-2011 & CZMP-2019 (p/d), imagery of December, 2020**



**Figure 10: Islands with uncertain boundaries, examples from Kannur; CZMP-2011 & CZMP-2019 (p/d), imagery of May, 2017.**

## 9 Islands Along Mainland Coast

The CZMP-2019 has not provided a breakdown of the types of islands, while CZMP-2011 has. The four types of islands included in CZMP-2011 are:

- 1) Main Coast Island
- 2) Main Coast Islet
- 3) Estuarine Island, and
- 4) Islet within Inter-Tidal Zone (ITZ)

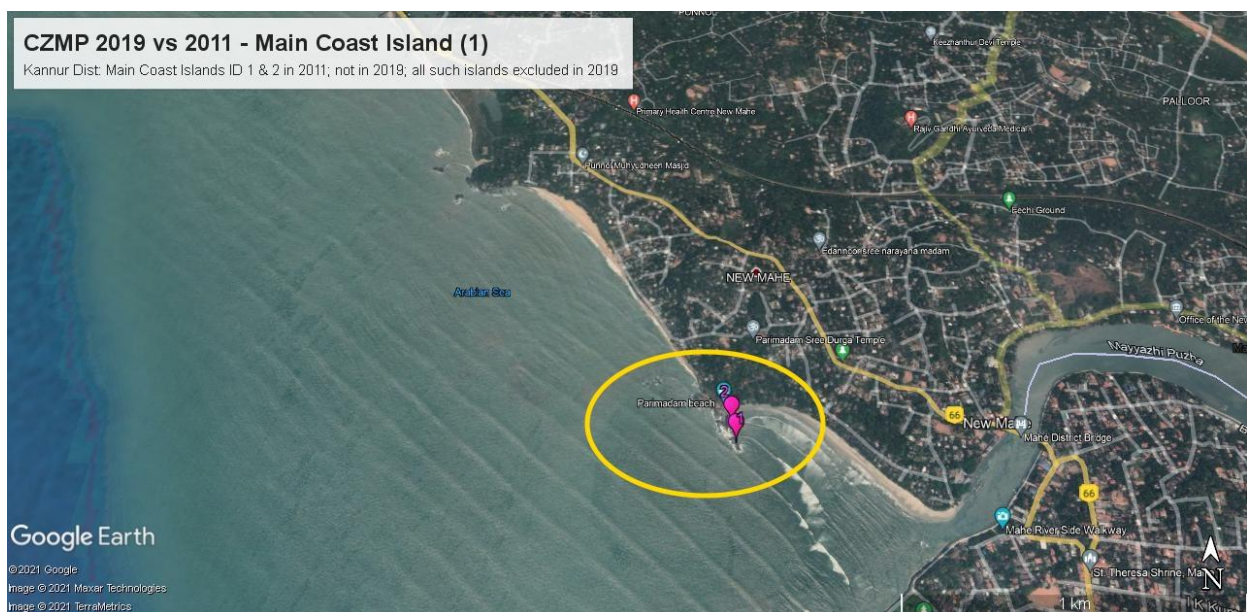
The CZMP-2011 for Kannur district included three main coast islands and one islet (total of four). The CZMP-2019 (p/d) completely excludes one main coast island (Rock Stone Azheekkal, 0.12 ha) and one main coast islet close to it (0.042 ha). We have shown these in Fig. 11. In other words, these islands listed in CZMP-2011 do not figure in the CZMP-2019 at all. Another main coast island (Dharmadom thuruth, 2.28 ha) listed in CZMP-2011 is included in CZMP-2019 (Fig. 12). A large main coast island of nearly 845 ha listed as an island in CZMP-2011 is not considered as an island in CZMP-2019 (p/d). Close look at the satellite imagery indicates that there are several main coast islets that are not included in any of the CZMPs.

The CRZ-2019 clearly states that it is applicable to islands in inland backwater and along mainland coast. From 1991 to 2019, there has been added attention on islands. However, in CZMP-2019 (p/d) most of islands and islets along the mainland coast have been excluded. Even a few of the main coast islands shown in CZMP-2011 have been excluded from CZMP-2019 (p/d). Our rapid assessment using freely available satellite imagery data and other spatial information shows that there could be about 20 or more main coast islands/islets present in several clusters along the main coast close to the places given below:

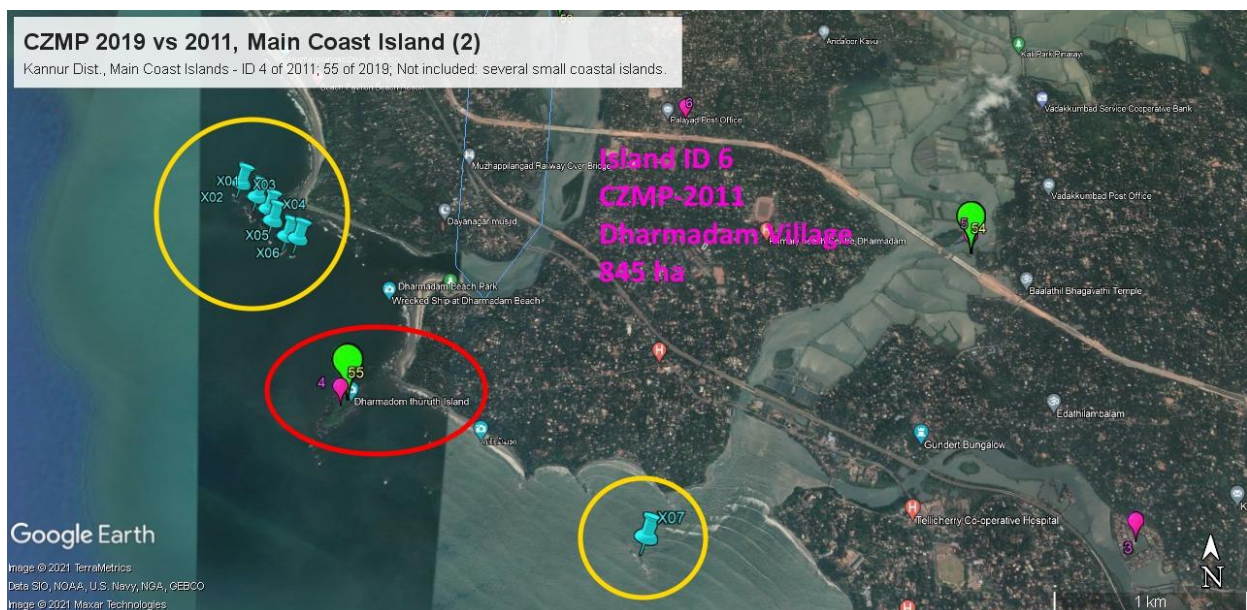
- 1) Parimadom (near Thalassery)

- 2) Muzhuppilangad (Kannur)
- 3) Dharmadom (Kannur)
- 4) Chombala (near Azhiyur, Kozhikode)
- 5) Punnol (near Thalassery)
- 6) Kovalam (Thiruvananthapuram)

Most of the main coast islands excluded from the CZMP are well known locally. They are prominent features along the main coast. All the islands/ islets/ rocky outcrops along the main coast must be identified and included in the final CZMP-2019. Some of these are currently places of importance for tourism and others may have the potential for ecotourism.



**Figure 11:** Two islands along the main coast demarcated in 2011, but excluded in 2019 (p/d) as seen in Google Earth™ data of 2021



**Figure 12:** Island along main coast ID 4 of 2011 and 55 of 2019. Dharmadam Village - Island ID 6 of 2011, not an island in 2019 (Google Earth™ data of 2021). Several islands along the coast are excluded (shown as X01 to X07) in both 2011 and 2019.

## 10 Criteria for Demarcation as an Island within the Scope of CZMP

An important task like the preparation of IIMP as per CRZ-2019 requires a technically sound framework that is transparent and replicable. No amount of emphasis would suffice for this. While there is a technical manual for demarcation of HTL, there is no comparable document or even a preliminary guideline for the demarcation of islands consistent with CRZ-2019. We would like to raise certain key concerns relating to the demarcation of backwater islands or the islands in the estuarine system and the coastal wetlands.

The most important concern is about the minimum requirements to qualify a geographic feature to be demarcated as an island irrespective of whether setback distance/NDZ is applicable or not. Our contention is that the elementary definition of an island as a 'piece of land surrounded by water' is inadequate for preparing maps like the CZMP. Firstly, it is necessary to clearly qualify the presence of water surrounding the piece of land to be demarcated as an island. There are both perennial and seasonal islands within the estuarine areas and the coastal wetlands. This aspect is quite pronounced in the specific context of Kerala. During the wet season, there would be large number of land parcels surrounded by water as the water level rises in these areas. We are referring here to the backwaters alone and not to either the main coast or the ITZ.

There is no doubt that the demarcation of backwater islands requires a proper criterion aligned with the purpose of the regulation going beyond the general definition of an island. The criterion must be unambiguous, and the results using that should be reproducible. The necessary condition is that of being surrounded by water. However, for the purposes of the CZMP, that do not seem sufficient. It is desirable that the condition for characterisation as island is subject to another set of strict criteria. The following may be considered as the qualifying criteria for a backwater island in addition to the general, necessary condition:

- a) Surrounding water has salinity of 5 ppt or more as measured during the driest part of the year across multiple years (*at least previous three*), and not merely in the year of mapping.
- b) Water surrounding is permanently present, i.e., 365 days across multiple years (*at least previous three*), not merely during the year of mapping.
- c) The width of water body separating it from any adjacent land, be it another island or not, during the dry season when measurable salinity is equal to or more than 5 ppt, should be more than the setback distance applicable to it.

*Only polygons of HTL formed when all the above criteria are simultaneously satisfied should be considered as islands for the purpose of CZMP.* The HTL determination must be such that the 5 ppt salinity of adjacent water body in the dry season is verified by at least one direct measurement when the CZMP is prepared and the status is confirmed for at least three previous years using available data.

About 90 percent of the islands demarcated in CZMP-2019 (p/d) are below 0.1 sq km and nearly 94 percent are of TGA less than 50 ha (0.5 sq.km). It is not feasible to apply any land-zoning principles to extremely small land parcels. Neither is it reasonable to undertake demarcation of all land parcels irrespective of size that are perennially surrounded by water, identifying the smallest among them as mapping technologies permit. Therefore, we would like to suggest that only land parcels with TGA of 50 ha (0.5 sq.km) and above should

qualify for demarcation as backwater islands. However, along the main coast all the identifiable islands and islets should be demarcated whether IIMP irrespective of size and the requirement of IIMP.

There is bound to be large errors in the determination of HTL of the backwater islands defined by the presence of 5 ppt salinity during the driest period of the year if a minimum size criterion is not used. It is not possible to take direct measurements of the salinity concentration for hundreds of tiny islands during the driest time. Invariably, HTL is defined by isohalines extrapolated from a limited dataset of salinity measurements representing relatively large homogenous waterbodies. However, this will not hold when the isohaline is extended to the large number of small islands, many of which are also close to freshwater streams flowing into the estuary, which can lower the salinity concentration even during the driest season.

The land-water interface defining the HTL of backwater islands is based on the 5ppt salinity criteria. That being the case, the use of satellite imagery also is unlikely to be helpful in demarcating the HTL. This is another reason to limit all determinations involving the use of isohalines based on extrapolations to entities subject to a size criterion that is reasonably large. Since the prescribed setback is 20m, the geometric accuracy of satellite imageries used to determine the land/water interface seems insufficient to arrive at accurate delineation of the HTL based on 5ppt salinity level in the surrounding water of the land parcel.

The starting point for defining a criterion for minimum size for demarcating islands is that IIMP as per ICRZ is applicable only to islands exceeding 100 sq. km. The backwater islands are considerably small in comparison to the oceanic islands. Further, the HTL is based on the surrounding waterbody having 5ppt salinity during driest part of the year. A reasonable minimum size must take note of the preponderance of extremely small backwater islands (see Section 3). Further, setback-based zoning should apply only to islands much larger than the minimum size, which we shall discuss in the next section.

## **11 Setback and Norms for Backwater Islands: Suggestions**

The MoEF&CC has not yet published separate guidelines for the preparation of IIMP as a part of CZMP-2019. In that context, the suggestions discussed here have to be taken up with the National Coastal Zone Authority (NCZMA). The major concern raised by Local Self-Government Institutions (LSGI) is the uncertainty regarding islands in developed areas that currently falls within CRZ-II. The islands falling within CRZ-II under CRZ-2011 should continue to be treated as within CRZ-II. Or, more generally, CRZ category should not change from CZMP-2011 to CZMP-2019 and only the revised setback criteria as per CRZ-2019 should be applied. In the case of all land parcels demarcated as islands in CZMP-2011 but not so in CZMP-2019, a thorough review should be carried out. Although, we have carried out a rapid review based on the CZMP-2019 reports, it will not be possible to make a comprehensive statement in this regard since we were constrained by the lack of access to the CZMP-2019 (p/d) spatial and non-spatial databases.

For the islands not falling within CRZ-II as per CRZ-2011, NCZMA should review the setback norm of 20m from HTL for NDZ. As per ICRZ-2019, the NDZ for large islands of TGA between 100 sq.km and 1,000 sq.km. is determined by a setback of 50m from the HTL and for islands smaller than TGA of 100 sq.km it is 20m. Further, IIMP maps are not being made for the very small islands with TGA of ten square kilometres or less.

That being the case, it is difficult to rationalize a fixed, size-independent setback line, 20m from the HTL, for the extremely small backwater islands, when the area of over 85 percent is less than 0.05 sq.km (5 ha). The tiny estuarine islands whose area is less than 10sq.km and either the overall length or breadth is 2km or less should be excluded from the application of setback with permissible activities restricted to those consistent with the goals of CRZ notification. A system of staggered setback ranging from 1m to 5m could be considered for the islands of area ranging from 10 sq.km to 50 sq.km. (Table 9), provided the both overall length and breadth exceed 2km.

**Table 9: Proposed Setback Scheme**

SN	Backwater Island TGA (sq. km)	Setback from HTL (metres)
1	Less than 10	NIL
2	10 to less than 20	1
3	20 to less than 30	2
4	30 to less than 40	3
5	40 to less than 50	4
6	50 to less than 60	5

We suggest that all the islands categorised as CRZ-II in CZMP-2019 should continue in that category and all other areas demarcated as islands in CZMP-2019 should be considered as CRZ-III with the suggested scheme for defining NDZ. In other words, those islands of area less than 10 sq.km. will not have NDZ and those of area above 10 sq.km. will have NDZ based on setback corresponding to its area as suggested in Table-9.

## 12 Climate Change Risks, IIMP and Backwater Islands

One of the central concerns in coastal regulation is the anthropogenic global climate change impacts related to sea level rise (SLR), storm surges, and extreme hydro-meteorological events. Somewhat differently from the situation of oceanic islands, the biggest concern in the coastal wetlands, including the *Pokkali / Kaipad* areas, the land adjoining backwaters, and backwater islands, is that of flood risk from a combination of SLR and extreme rainfall. The human settlements in coastal lowlands or more broadly the Low Elevation Coastal Zones (LECZ) are particularly at risk. These areas are also densely populated and growing rapidly.

The LECZ is defined as the contiguous area along the coast less than 10 meters above mean sea level (MSL). LECZ covering merely 2 percent of the world's land area is home to 10 percent of the world's population and 13 percent of the world's urban population (McGranahan et al 2007). LECZ of Kerala, within which the backwater islands are located, is quite similar. For example, based on the data provided in the CZMP-2019 (p/d) for Ernakulam district, the average population density of the villages under the CRZ-III category is 2,293 per sq.km. compared to the criteria of 400 per sq.km. used in India's Decennial Census 2011 to classify urban area. Undoubtedly, the coastal regulations applicable to the LECZ must also be informed by the risks and the imperatives of coping with them.

Almost all the land area of Kerala falling within the CRZ limits except small portions are within the LECZ. This includes both backwater islands, *pokkali / kaipad* coastal wetlands, and all the coastal settlements. The implementation of coastal regulation must recognise the climate change risks and adaptation challenges faced by communities in these areas. Establishing hazard shelters alone is not sufficient and the CRZ itself must be



flexible enough to allow reasonable adaptation measures and disaster resilient development consistent with the overall goals of the coastal regulatory framework.

An important aspect to be noted for the areas within LECZ of Kerala is that these areas have very little variations in the relative elevation. The geology and nature of the estuarine and backwater islands within the LECZ are quite different from that of the oceanic islands. They differ vastly in terms of geological characteristics. This report is not a place for a detailed technical discussion on these aspects. However, this must be kept in mind when we envisage IIMPs for the backwater islands. The fact that the CRZ limits for these areas are determined on the basis of 5ppt salinity of the surrounding waterbody during the driest season is not an insignificant detail. That becomes the only way since there are no other topographic characteristics or any of the typical signatures of tides on the land-water interface in these parts.

The HTL along the coast and for oceanic islands are on higher ground towards the landward side. In contrast, for the backwater islands and land bordering the backwaters, the HTL is towards the water side on the lower end of the land-water interface where salinity of 5ppt can be measured during the dry season, as per CRZ norms. The dry season is when freshwater inflow is minimum and tidal influence is maximum, which is also the season when the water depth is relatively low. The fluvial processes dominate while tidal effect has only marginal impacts on the landforms in the backwater region far away from the coast. Both landforms and waterbodies are subject to the interaction of water flow with the sediments brought down from the drainage basin (Skilbeck et al 2017; Leopold et al 2020).

On October 29, 2019 'Climate Central', an independent organization of leading scientists and journalists researching and reporting on changing climate and its impacts, released new findings from a coastal Digital Elevation Model (DEM). Their findings, based on the coastal flood risk assessments by NASA's Shuttle Radar Topography Mission (SRTM), showed that global vulnerabilities are much worse than previously understood (Climate Central 2019). The map projection employs real-time coastlines instead of mean sea level as the base data for calculating risks (Kulp and Strauss, 2019).

The projections by Climate Central indicate that large parts of central Kerala, including parts of Kuttanad region, the coastal wetlands and backwater islands of Ernakulam district, and parts of Thrissur districts, are under high-risk zone<sup>13</sup>. The recently released IPCC's 6<sup>th</sup> Assessment Report (AR6) says that one of the key developments since the IPCC's 5<sup>th</sup> Assessment Report of 2013-14 is the strengthening of the links between human-caused global warming and increasingly severe extreme weather. The increases in the frequency and intensity of hot extremes, marine heatwaves, and heavy precipitation, agricultural and ecological droughts in some regions, and proportion of intense tropical cyclones are likely to become larger in direct relation to increasing global warming (IPCC 2021)

The flood risk map for Ernakulam available from Climate Central's interactive website is shown in Fig. 13. Climate Central's maps of sea level rise and coastal flood are based on international peer-reviewed research. These maps are helpful tools to identify places that may require deeper investigation of risk. Outside of the

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<sup>13</sup> Maps available at Climate Central website, <https://coastal.climatecentral.org/> (accessed Oct. 20, 2021)

United States, maps are based on global-scale datasets for elevation and tides in addition to sea level rise projections. Areas lower than the selected water level and with an unobstructed path to the ocean are shaded red. The settings used for generating the flood risk map, as projection for 2030, are given in Annexure-3. The flood risk projection (Fig. 13) clearly shows that most of the backwater islands, the coastal wetlands including *pokkali* areas, and large parts of the adjoining low elevation areas are at risk of inundation for the scenario of consisting of SLR and flooding projections as per IPCC leading consensus based on latest reports (AR6), current trend of Green House Gas emission trajectory combined with the high-end result from sea-level projection range (95<sup>th</sup> percentile).

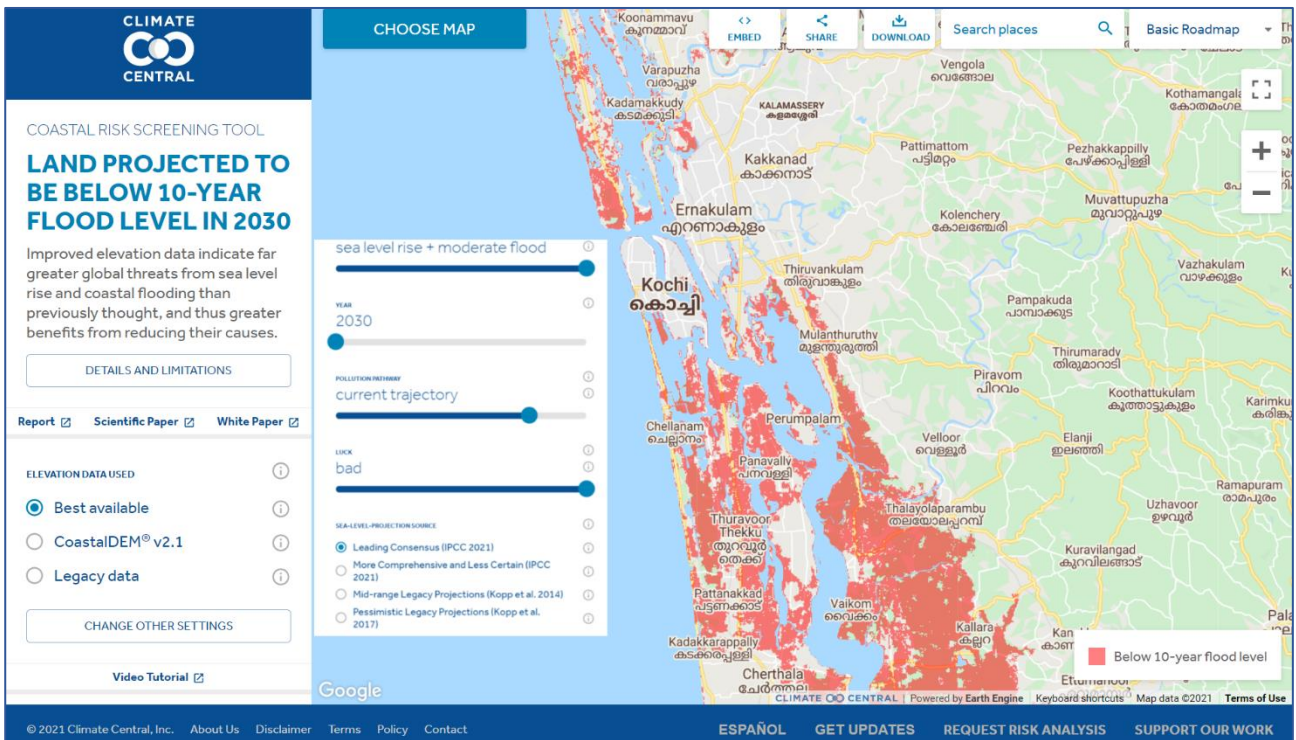


Figure 13: Flood Risk Map, as per Climate Central's interactive Coastal DEM

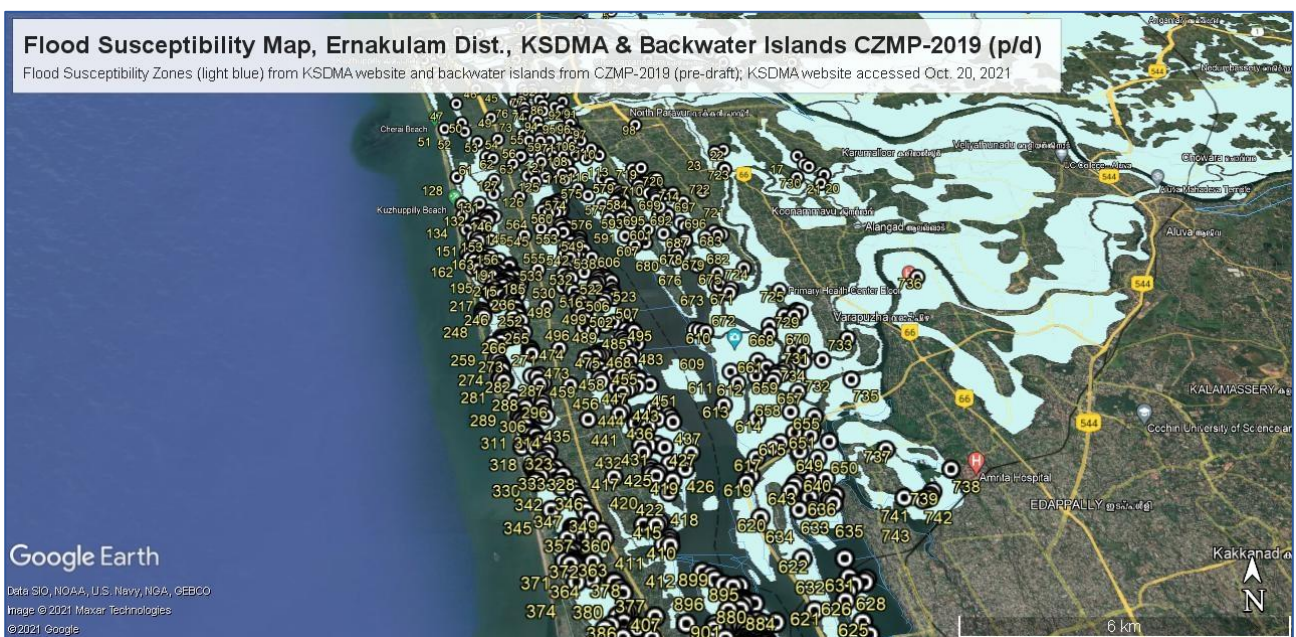


Figure 14: Backwater Islands as per CZMP-2019 (p/d) overlaid on Flood Risk map, KSDMA. Note: The numbered markings indicate backwater islands

The flood risk map of Ernakulam district available on Kerala State Disaster Management Authority's website overlaid with the backwater islands demarcated in CZMP-2019 (p/d) is shown in Fig. 14. These maps clearly show the need for preparing flood risk aware IIMP for the LECZ of Kerala and the importance of making all options open in it for adaptations to these risks. While the flood risk discussed so far is based on projections, the KSDMA flood zonation map is used in the disaster risk management plans and are based on actual flood data. The two maps provide a consistent picture.

The approach giving primacy to coastal setback is designed for areas where coastal processes are important (Anastasiou and Sylaios 2016, Williams et al 2018, Theron 2010). In our view, there are certainly adequate grounds to review the relevance of applying that to the backwater region where fluvial processes dominate. Both usefulness and appropriateness of employing setback as the primary instrument in environmental regulation, almost replicating the approach adopted for the coastal area requires reconsideration. The flood risk and the significance of fluvial processes must inform the application of coastal regulation to the backwater islands. Further, these considerations underline the urgent need for the regulation itself to facilitate multi-hazard resistant safe housing possible in these coastal lowlands.

### **13 Safe Housing in Backwater Islands Subject to CRZ-2019**

The CRZ notification restricts the plinth area to what existed three decades ago (i.e., 1991) and limits the overall height to 9 meters with maximum of two floors (ground + one floor). Multi-hazard resistant safe housing designs may require rebuild using location-appropriate safe designs. Such rebuilding may be in on raised platforms or stilts (pile or lake dwellings). The safe rebuilding may require the overall height to exceed 9 m and the plinth area more than what existed in 1991. The construction or reconstruction of multi-hazard resistant housing carried out as per norms do not pose any environmental threat. Disposal of debris in the backwater and reclamation of backwater are illegal. The state government and LSGI must ensure that all such provisions are strictly followed, and institutional arrangements can be strengthened for this.

The NDZ as per CRZ in the islands calls for a serious review considering the issues presented earlier, especially the simple fact that as per setback norms, in more than 98 percent of the islands NDZ make up more than 10 percent of the island area as per CRZ-2011 and over 95 percent as per CRZ-2019 (Table 6, Fig. 4). As per CRZ-2011, in over 93 percent of the islands, more than 40 percent of the area is under NDZ and in about 78 percent of the islands, entire area (100%) is under NDZ. As per CRZ-2019, in about 78 percent of the islands, more than 85 percent of the area is under NDZ and in 85 percent of the islands, more than 35 percent of the area will be in NDZ. All these are based on the approximation assuming a circular shape. The situation would be far worse in real life because circle is the shape with least perimeter for a given area. The total freeze on development, including that of not allowing any non-residential construction has a debilitating effect on the life of people without contributing in any way to protecting backwater ecology. It is necessary to review the provisions of CRZ incorporating a human rights perspective.

Many of the areas we visited during field visits relating to the work of KCZMA included backwater islands. We have seen that many dwellings are in urgent need of renovation due to safety concerns and make them cope with various hazards including climate change induced risks (flood, sea surges, cyclones). Considering the

recent experiences of coping with disaster situations as well as increasing risks from climate change driven hydro-meteorological hazards in Kerala, we have no hesitation in suggesting that LSGIs should also undertake a safety audit of all these small dwellings along with a re-verification exercise to determine plinth area of the dwellings in 1991. Possibility of developing appropriate designs for multi-hazard resistant housing for the poor in the NDZ of CRZ should be considered by the state government. The options for enabling settlements with adequate sanitation and disaster risk reduction planning should also be examined. The state government should consider taking necessary steps to identify unsafe houses within the NDZ of CRZ and prepare a framework for disaster risk resilient settlements.

KCZMA should request the NCZMA to suitably amend CRZ-2019 allowing the reconstruction/ renovation in excess of the plinth area in 1991 of the dilapidated dwellings of coastal dwellers in NDZ that may be needed to make them safer and multi-hazard resistant. An agency authorised by the state government can verify the safe housing design for reconstruction. The KCZMA can further scrutinise the applications on a case-to-case basis and allow cases where safe housing requires rebuilding exceeding the plinth area existing on or before 1991. The State Coastal Zone Authority should have the power to scrutinise and decide on the CRZ clearance taking the help of experts if the application for reconstruction in excess of the existing plinth area in 1991 is justified as per norms approved by the state government as standards for safe housing in multi-hazard risk prone areas.

We would like to emphasise that the discussion on the problems of safe and multi-hazard-resistant housing is valid for all those residing in the risk-prone NDZ of CRZ. Therefore, our recommendations relating to safe dwellings are applicable to all the residents in the NDZ of CRZ (all categories) who face severe constraints for rebuilding their dwellings as multi-hazard resistant houses. ***Safe housing for the poor and multi-hazard resistant rebuilding for disaster resilient housing in conformity with approved norms should be made a permissible activity even in NDZ of CRZ in those cases where the occupant has no other choice.*** The NCZMA should consider amending the CRZ-2019 to facilitate construction, renovation and rebuilding of safe, multi-hazard-resistant housing in NDZ of CRZ.

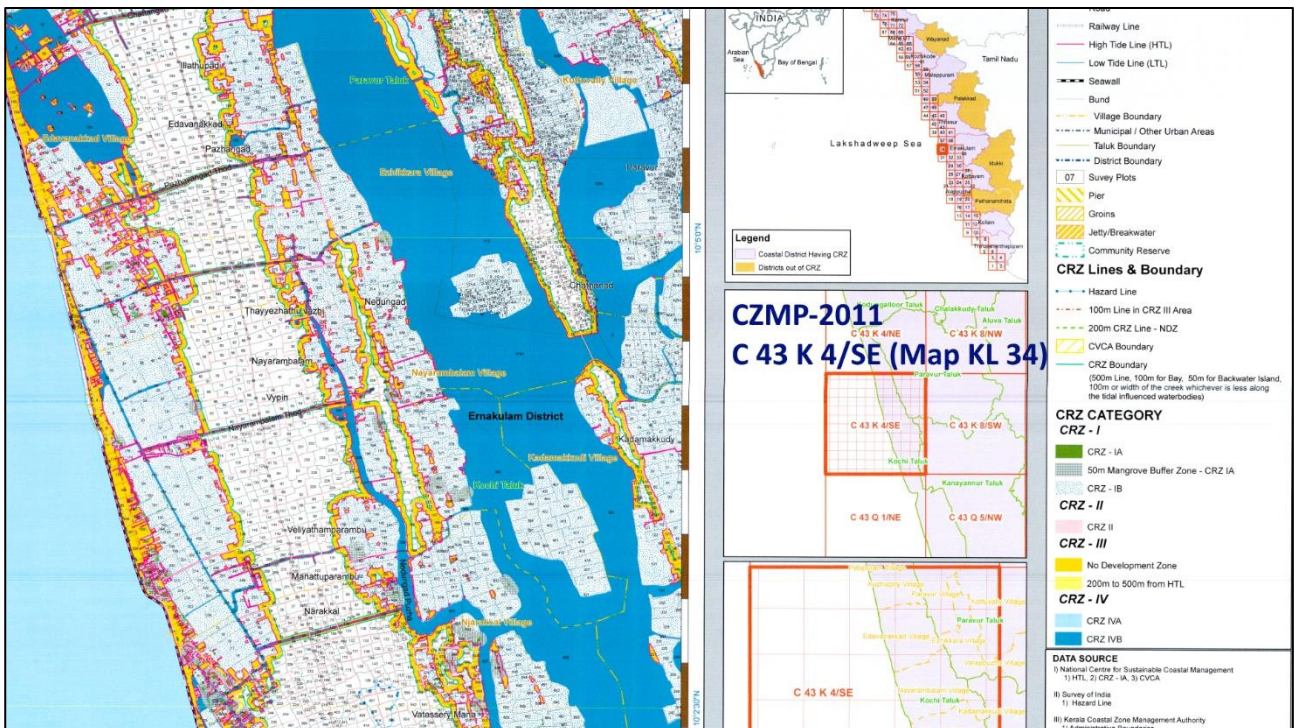
## **14 CZMP-2019 without IIMP and Time Frame for IIMP**

It goes without saying that the preparation of IIMP will remain pending until there is a guideline or directions issued by MoEF&CC or NCZMA. As noted in earlier part of this report, it is difficult to apply setback norms like 20 m of CRZ-2019 or 50 m of CRZ-2011 to the tiny backwater islands. If the guidelines are not available within a reasonable timeframe, the task of IIMP is likely to get postponed indefinitely in the absence of any time limits to complete the tasks. If CZMP-2019 is approved without IIMP, setback norm of 50m as per CRZ-2011 will become applicable to all the demarcated islands. This means a little over 300 sq.km of backwater islands will be subject to this odd situation.

Prima facie, this may seem like status quo, i.e., the CRZ category of areas demarcated as backwater islands in CZMP-2011 will continue to be in the same status. However, that may not be the case. This is because it would appear from a scrutiny of the maps that the islands were not demarcated in CZMP-2011 in the same way as it has been in CZMP-2019. On the KCZMA website, the maps of the islands (backwater and mainland)

prepared as part of CZMP-2011 are also available. The islands demarcated in these maps do not appear to be exactly the same as the islands in CZMP-2019 (p/d).

The status-quo of CZMP-2011 for backwater islands can be maintained only if the CZMP-2011 is used for islands instead of CZMP-2019. Portions from Map-34 (C-43-K4/SE) of CZMP-2011, Backwater Island Maps of CZMP-2011<sup>14</sup> and CZMP-2019 (p/d) covering many backwater islands near Kadamakkudy, the area visited by the Sub-Committee on August 15, 2021 are shown in Fig. 15, 16, and 17. All these maps had been prepared in 1:25,000 scale. It is not easy to decide from these maps whether NCESS has employed the same criteria in CZMP-2011 and CZMP-2019 (p/d) to demarcate the islands. A view of approximately the same area using imagery from Google Earth™ is given in Fig. 18.



**Figure 15: Section of CZMP-2011, Map KL-34, showing backwater islands near Kadamakkudy, Ernakulam District.**

The respective CZMP reports do not provide clarity on the criteria used to demarcate islands. We had also noticed there were major differences in the demarcation of islands between the First Pre-Draft and the current (2<sup>nd</sup>) Pre-Draft of CZMP-2019. We had requested NCESS to incorporate a section on the approach used for demarcation of islands. That must be included in the final version. There should be no doubt that the land-water boundary of each island is based on HTL, the area is that enclosed by the HTL and all the demarcated islands are those remaining above water during Highest Astronomical Tide (HAT).

It must be noted that demarcation of features in maps of islands are not necessarily covering all the smallest identifiable islands, but subject to the relevant technical or legal criteria. In other words, rather than the technical viability of finding the smallest, the demarcation exercise is necessarily limited to the scope of the relevant criteria. Therefore, the question here is not what the smallest feature identifiable is but what criteria has been used and what limits were used with regard to the legally required linear dimensions of the islands.

<sup>14</sup> These island maps are not mentioned as part of CZMP-2011

We are of the view that demarcation must be subject to relevant guidelines keeping in view the purpose of demarcation, which in our case is the application of setback norm of 20m from HTL. This implies that the eligible islands must satisfy certain minimum linear dimensions consistent with the setback norm.

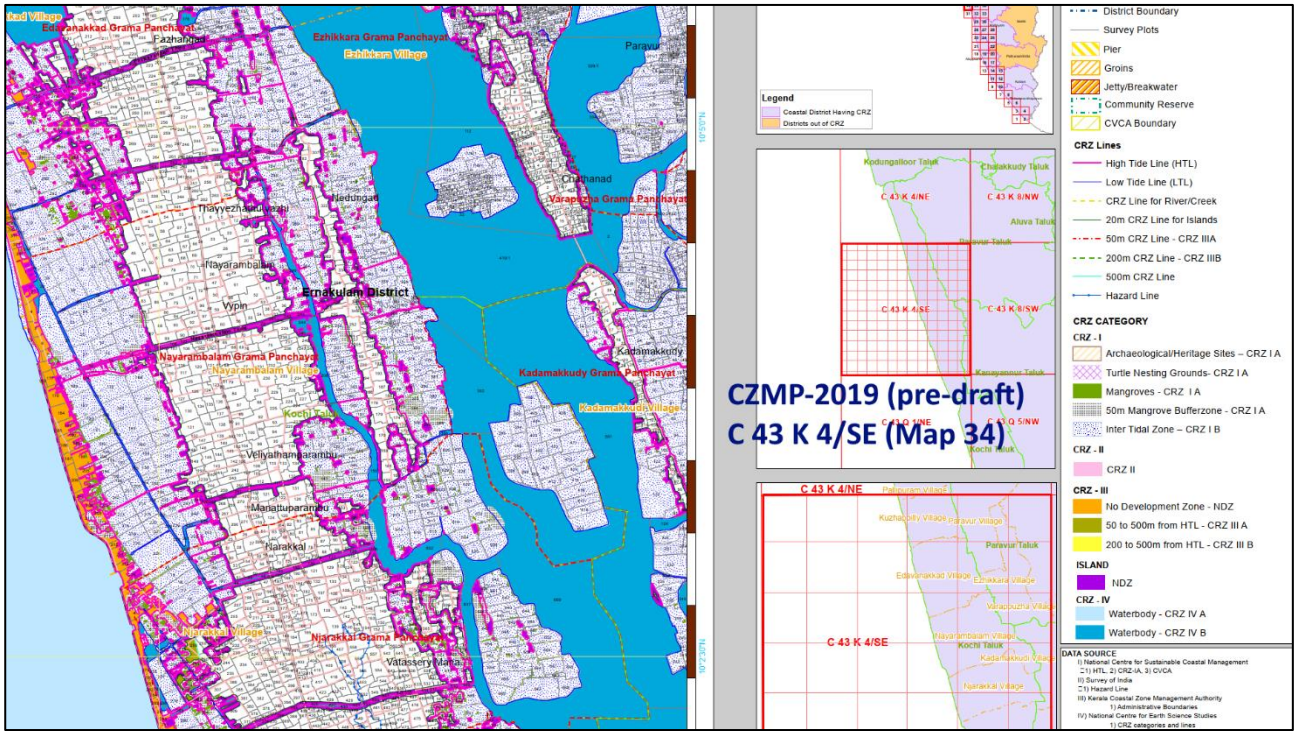


Figure 16: Section of CZMP-2019, Map KL-34, showing backwater islands near Kadamakkudy, Ernakulam District.

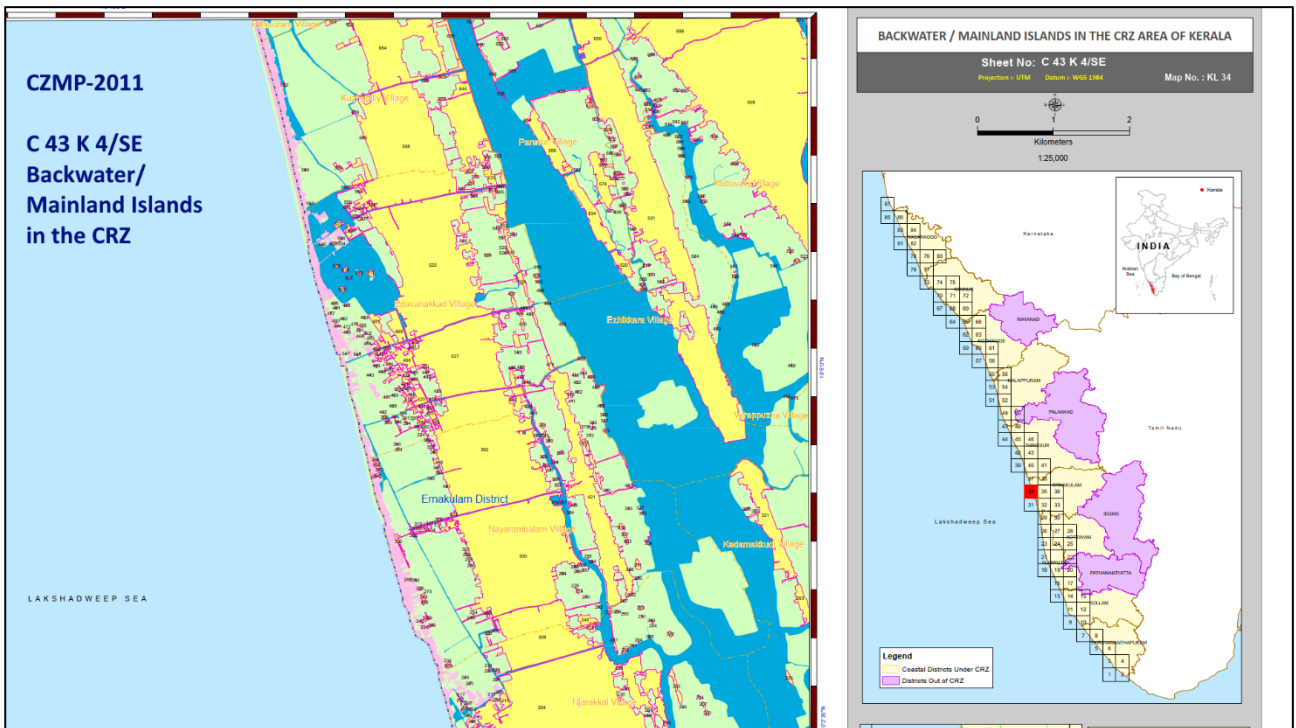
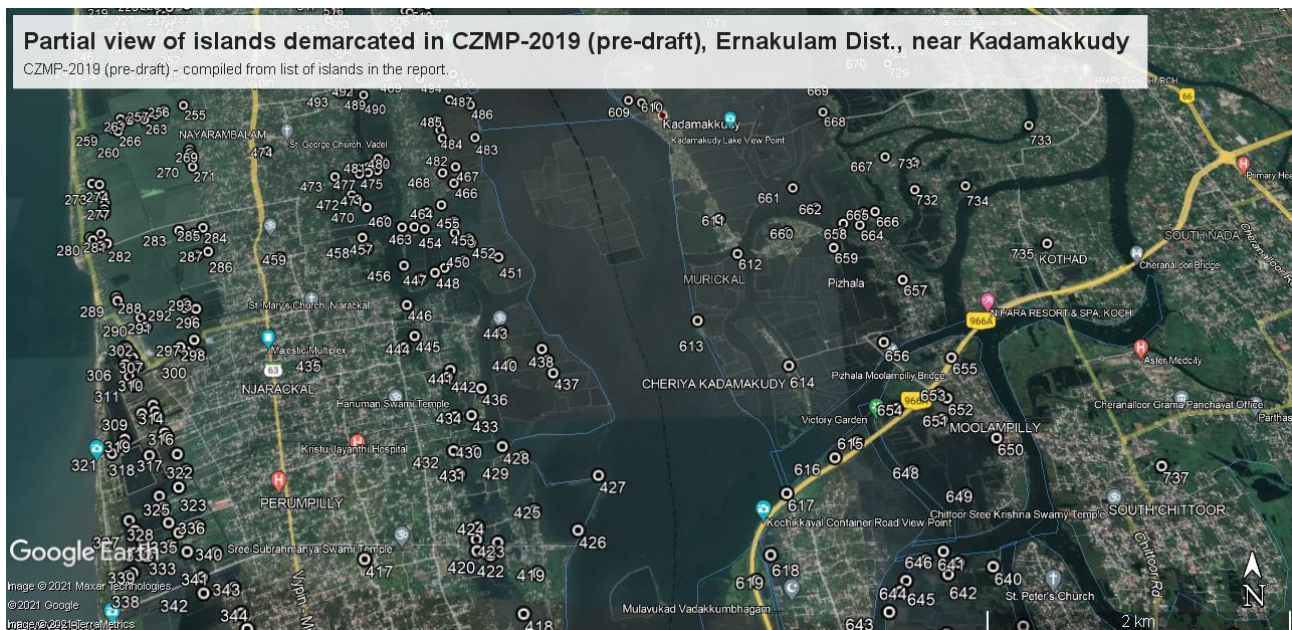


Figure 17: Section of the Map of Islands prepared for CZMP-2011, Map KL-34, showing islands near Kadamakkudy, Ernakulam District.



**Figure 18: Partial view of the backwater islands (numbers: island identifiers) listed in the CZMP-2019 (p/d) of Ernakulam district.**

These are questions that require clarification though a technical review. If KCZMA is to go ahead with CZMP-2019 without IIMP, then setback norms of 2011 will apply to islands. In that case, we should use the islands demarcated in CZMP-2011. Demarcation of islands for CZMP-2019 should await a review of the IIMP-related issues by the NCZMA and MoEF&CC. That review should be based on KCZMA's request for revising the setback norms and the need to exclude tiny islands from the ambit of setback norms.

## 15 Summary

From the above discussion on demarcated islands in CZMP-2019, the following conclusions follow:

- 1) The applicability of IIMP norms specified in the CRZ Notification 2019 (i.e., norms for Lakshadweep and A&N) seems highly impractical and inappropriate for most of these backwater islands of Kerala.
- 2) A different norm duly approved by MoEF&CC may be needed to prepare IIMP which must be taken up with MoEF&CC urgently since CZMP-2019 will be incomplete without IIMP.
- 3) If KCZMA is to go ahead with CZMP-2019 without IIMP, then setback norms of 2011 will apply to islands in which case the islands should be those demarcated in CZMP-2011 and a framework should be developed to deal with the discrepancies arising from the differences in the demarcation of islands between the two CZMPs.
- 4) All the islands and islets in the sea along the main coast, which may be 20 or more, should be demarcated without fail in CZMP-2019 when it is finalised fully in accordance with the CRZ-2019.
- 5) The islands falling within CRZ-II under CRZ-2011 should continue in the same category (CRZ-II).
- 6) It is difficult to rationalize a fixed, size-independent setback line, 20m from the HTL, for the extremely small backwater islands, when the area of over 85 percent is less than 0.05 sq.km (5 ha).

- 7) The tiny estuarine islands of area less than 10sq.km and either the minimum length (or breadth) is 2km or less should be excluded from the application of setback norm with certain activities prohibited as specified in Section 4 of CRZ-2019.
- 8) The CRZ-2019 norms applicable to CRZ-III can be applied to the tiny islands without invoking NDZ by applying the setback norms suggested in this report, where such islands are of area less than 10sq.km and either the overall length (or width) is 2km or less.
- 9) The NDZ can be applied to islands of area greater than 10 sq.km based on staggered setbacks ranging from 1m to 5m for area ranging from 10 sq.km to 50 sq.km., provided the minimum length (or breadth) exceed 2km.
- 10) The islands should be given unique identifier and colour code in the final version of CZMP-2019 and only those islands having land-water boundary defined by HTL should be included in the list.
- 11) The criteria employed for demarcation of islands falling within the CRZ-2019 which is not included in the CZMP-2019 (p/d) must be clearly described in the final version of CZMP-2019.
- 12) Separate maps of the identified islands in appropriate scale supplementing the standard CZMP maps are necessary.
- 13) Safe multi-hazard resistant safe housing must be made a priority in the all backwater islands and the NDZ areas of CRZ.
- 14) KCZMA should request the NCZMA to suitably amend CRZ-2019 allowing the reconstruction/ renovation in excess of the plinth area in 1991 of the dilapidated dwellings of coastal dwellers in NDZ that may be needed to make them safer and multi-hazard resistant.
- 15) Safe housing for the poor and multi-hazard resistant rebuilding for disaster resilient housing in conformity with approved norms should be made a permissible activity even in NDZ of CRZ in those cases where the occupant has no other choice.
- 16) The IIMP for the backwater islands in the LECZ of Kerala should recognize the importance of making all options open for adaptations to these risks in the context of emerging climate change risks, especially from sea level rise and extreme weather events.

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## **Annexures**

Annexure-1: Notification of the Sub Committee

**KERALA COASTAL ZONE MANAGEMENT AUTHORITY**

**Directorate of Environment & Climate Change**

4<sup>th</sup> Floor, KSRTC Bus Terminal, Thampanoor, Thiruvananthapuram - 695 001

Ph. 0471-239696, E-mail: [kczmasandtd@gmail.com](mailto:kczmasandtd@gmail.com)

**Proceedings of the Member Secretary**

(Present: SUNEEL PAMIDI IFS)

No 08/A2/2019/KCZMA

Dated:

Sub:- KCZMA – Preparation of Integrated Island Management Plan as per CRZ Notification 2019 – Sub-Committee constituted- Orders Issued

- Read :-
1. Notification No.G.S.R.37 (E) dated 18.01.2019 from Ministry of Environment Forest & Climate Change, Government of India
  2. G.O (Rt).No.80/2019/Envtd dated 20.08.2019
  3. Decision in item No.4 of the special meeting of KCZMA held on 03.07.2021

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**ORDER**

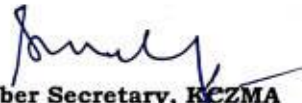
As per Clause 10.2(II) of the CRZ Notification 2019 read as 1<sup>st</sup> paper above, Island Management Plans (IIMPs) as applicable to smaller Islands in Lakshwadeep and Andaman & Nickobar, as per Island Protections Zone Notification, 2011 No.S.O.20(E) dated 06.01.2021, shall be formulated by respective States or Union Territory for all such Islands and submitted to Ministry of Environment Forest & Climate Change, Government of India (MoEF&CC) and till the IIMPs are framed, provisions of this Notifications shall not apply and the CZMP as per the provisions of CRZ Notification 2011 shall continue to apply.

The approach for the IIMP was discussed in the Special Meeting of KCZMA held on 03.07.2021. As per the predraft, Kerala has 1826 Islands, of which 78% are less than 2 ha and 85.4% are less than 5ha in area, It was decided to approach MoEF&CC for further clarity on the preparation of IIMP and also on approval of CZMP without IIMP. Hence, in the special meeting of KCZMA held on 03.07.2021 in item No.4, KCZMA

~~also~~ decided to constitute a Sub-Committee with the following members for submitting their recommendations on a broad approach to the preparation of IIMP for the Islands, which can be submitted before MoEF&CC.

1. Dr. Chandanathil Pappachan Geevan, Member (NGO), KCZMA
2. Dr.P.K. Thulasidas, Member (Expert), KCZMA
3. Smt. Amurtha Satheesan, Member (Legal), KCZMA
4. Dr. Richard Scaria, Member (Expert), KCZMA
5. Dr. Dinesan Cheruvat, Member (Expert), KCZMA

In the circumstances, a Sub-Committee is hereby constituted with the above members for submitting recommendations on a broad approach to the preparation of IIMP for the Islands for submitting before the MoEF&CC.

  
Member Secretary, KCZMA  
23/7/21

1. Dr. Chandanathil Pappachan Geevan, ARWA-52, Chandanathil, 2<sup>nd</sup> floor, Manakkaparambathu Lane, Azad Road, Kaloore, Kochi-682017, Kerala
2. Dr.P.K. Thulasidas, Senior Scientist and Head(Retd) Wood Science & Technology Division & Former TEAKNET Co-ordinator International Teak Information Network, Kerala, Forest Research Institute, Peechi- 680653, Kerala
3. Smt. Amurtha Satheesan, Assistant Professor, Mar Gregorios , College of Law, Nalanchira, Thiruvananthapuram
4. Dr. Richard Scaria, Assistant Professor, Department of Geography, Government College Chittur, Palakkad- 678104, Kerala
5. Dr. Dinesan Cheruvat, Director, National Institute of Fisheries, Administration and Management (NIFAM), East Kodungallur, U.C.College Post, Aluva, Ernakulam District- 683102, Kerala
6. PA to Chairman/ACS (Environment), KCZMA
7. PA to Member Secretary, KCZMA
8. SF/OC

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**Annexure-2: Executive Summary – Integrated Island Management Plan (IIMP) for Andaman & Nicobar Islands: IIM Plan for Rutland Island South Andaman District, NCSCM, January 2018.**

## **INTEGRATED ISLAND MANAGEMENT PLAN (IIMP) FOR ANDAMAN & NICOBAR ISLANDS**

# **IIM PLAN FOR RUTLAND ISLAND**

## **SOUTH ANDAMAN DISTRICT**

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**National Centre for Sustainable Coastal Management**  
***Ministry of Environment, Forests & Climate Change***  
**Anna University Campus Chennai - 600025**

**January 2018**

## Executive Summary

The Ministry of Environment and Forests, Govt. of India issued the Coastal Regulation Zone (CRZ) Notification, 2011 for the mainland and the Island Protection Zone (IPZ) Notification, 2011, to protect the coastal environment of the Andaman & Nicobar (A&N) and Lakshadweep group of Islands.

As per the IPZ Notification, 2011, Integrated Island Management Plans (IIMPs), are required to be prepared by the Andaman Administration for the smaller islands. The other islands having large geographical areas under the Island Coastal Regulation Zone (ICRZ) category (North Andaman, Middle Andaman, Long Island, Baratang, South Andaman, Neil, Little Andaman, Havelock Island, Car Nicobar and Great Nicobar Island), and ICRZ plans have to be prepared for these islands.

### 1. Preparation of IIM Plan for Rutland Island

The IIM plan for Rutland Island provides setback line from High Tide Line (HTL), preservation and conservation areas of fragile ecosystems, livelihood opportunities for inhabitants and strategies for sustainable development.

#### 1.1 Methodology

The IIM Plan has been prepared as per the guidelines stipulated in IPZ Notification, 2011 (Annex-I). The methodology adopted for determination of setback line has been described in Annexure- II. A majority of the information listed in the guidelines was collected from the island during field surveys. Primary data/ information collected during the field survey, *interalia*, includes elevation and High Tide Line (HTL) using standard methods. RTK GPS and Total Station instruments were used to determine the elevation of the islands at 0.6m up to the highest elevation in the island.

Information on aerial coverage of Ecologically Sensitive Areas (ESAs) such as mangroves, coral reefs, seagrasses, seaweeds, turtle nesting grounds etc. were collected using high resolution remote sensing data (LISS-IV (5.8m) of 2012-13) along with extensive ground verifications. The map on coral reef distribution prepared by Space Application Centre (SAC), Ahmedabad in 2007 was also taken into consideration for the present work.

### 2. Components of IIM Plan for Rutland Island

The IIM Plan of Rutland Island contains the following components:

- (i) Demarcation of Setback Area
- (ii) Existing Land Use
- (iii) Existing Residential Area
- (iv) Existing and Proposed Conservation & Preservation Areas
- (v) Proposed Prohibited, Regulated & Permissible Activities
- (vi) Existing and Proposed Infrastructure Development
- (vii) Conservation Management Plan for ESAs
- (viii) Water and Waste Management Plan
- (ix) Energy Management Plan
- (x) Tourism Management Plan
- (xi) Sustainable Livelihood Development Plan

#### 2.1 Demarcation of Setback Area

The coastal setback area is a 'No Development Zone', which refers to the stretch of coastal area (between HTL and Setback line) where developmental activities are prohibited or otherwise restricted. The criterion for determining the setback line is based on the approach adopted in Lakshadweep IIM Plan which was developed by Centre for Earth Science Studies (CESS), Trivandrum and accepted by a Committee of Experts.

The no-development setback or buffer zone in the island is determined on the basis of its differential exposure to anticipated sea level rise, which has been estimated as 0.6m by the end of this century. Since other hazards such as coastal erosion, which is mostly seasonal and do not have regular pattern, storm surge and tsunami are time varied and rare events, these hazards were not taken into account while determining the setback line. Based on the scientific approach outlined in the Annex-II, a uniform setback distance was assigned around the island as a conservation measure. The population in the island is safe from the impact of coastal flooding, tsunami, sea level rise, as they are located in the elevated areas.

Based on the topography, the maximum distance observed for the elevation of 0.6m is 50m from the HTL. Hence a NDZ of 50m is taken as a uniform setback distance around the island as a conservation measure.

## 2.2 Existing Land Use

The topography of the island is hilly and undulating with a maximum elevation of about 435m. According to the Forest Statistics 2009, the total geographical area of island is about 13,770 ha. Out of the total geographical area, the total forest area is 13,617 ha (98.80 %) and the non-forest area is 153 ha. (02.27%). The entire forest area of the Rutland Island is classified as Protected Forest which includes the mangrove forests as well. The major agricultural crops grown in the island are Paddy, Coconut, Arecanut and fruits and in addition to which, vegetables namely Brinjal, Ginger, Ladies finger, Tomato, Gourd and Pumpkin are also grown.

## 2.3 Existing Residential Area

The settlement in this island is concentrated on the north central part in Bamboo Nallah & Kichad Nalla, R.M. Point, Anarkali Basti and Southern side Bada Khari revenue villages. As per the Census data 2011, the Rutland Island has a population of 460 persons (Male: 262; Female: 198) and the total number of households being 130. Out of total population, the Rutland Island Revenue Village has a population of 76 (Male: 47; Female: 29) with 26 households; Bamboo Nallah including Kichad Nallah has a total population of 96 (Male: 54; Female: 42) with house hold being 32; Bada Khari (including Anarkali bashithi) having 169 population (Male:101; Female: 68) and 57 households. There are 221 literates in Rutland Island in which 145 are male and 77 are females. Total workers are 217 (male: 167; Female: 40). The population in this island is being reduced from the past ten years. As per the Census, 2001, the total population was 688 (Male: 410; Female: 278) and no. of house hold was 194. Rutland had a population of 772 persons in 1981 (Census), and it decreased to 562 persons in 1991 with 333 males and 229 females.

## 2.4 Existing and Proposed Conservation & Preservation Areas

Apart from the areas covered under protected forest, the ESAs and other important coastal geomorphological features of the island include coral reefs, mangroves, seagrass and seaweed beds, turtle nesting sites and sandy beaches. These areas were taken into consideration for preparing IIMP to protect the island's unique environment and its marine area (upto 12 nautical miles).

### a. Mangroves and Other Forests

Thick patches of mangroves are seen in Kalapahar creek, bagandagiri, north of Postman bay, Pandanallah creek and south of Ghasnallah beach which protects the land from natural hazard such as tsunami, cyclone, etc. it has been estimated that the total area of the mangrove in this Island is around 380 hectares .

### b. Coral Reefs

In Rutland Island, the coral reefs are narrow, linear and extensively developed as fringing reefs. The coastal topology of the island is gentle in slope, corals grow up to 8 m depth. The sandy shallow water is especially suitable for diverse coral fringing reefs. The reefs are dominated mainly by *Porites solida*, and *P. lutea* (48.16%) followed by encrusting *Montipora* (10.22%), *Hydnopora rigida* and *H. microconos* (8.29%) and *Acropora* (7.81%). In eastern side of the Rutland Island, the coral growth starts 50m from the shore, the reef slope is gentle and coral growth continues to a depth of 8m, beyond which the bottom is sandy. The coral cover was 26.9% in 2003, dominated by *Porites solida* and *P. lutea* (48.2%) followed by encrusting *Montipora* (10.2%), *Hydnophora rigida* and *H. microconos* (8.3%) and *Acropora* (7.8%).

### c. Turtle Nesting Sites and Sandy Beaches

Four species of sea turtles which include the leatherback turtle (*Dermochelys coriacea*), the hawksbill turtle (*Eretmochelys imbricata*), the green turtle (*Chelonia mydas*) and the olive ridley (*Lepidochelys olivacea*) are reported in the beaches of Rutland Island. Out of the various beaches of the island, Jahaji, Photonallah and Dhaninallah beaches are important turtle nesting sites. The peak leatherback nesting season is also the tourist season and tourism will have a major effect on turtle nesting in Jahaji beach. The Jahaji, Photonallah and Dhaninallah beaches are turtle nesting grounds. Green, Olive ridley, Hawksbill and Giant leatherback turtles visit these beaches for nesting. Rutland Island contains few sandy pocket beaches. Of these Jahaji, Woodmason, Thudnalla, Photonallah, Ghasnallah, Dhaninallah and Postman bay beaches are other important sighted as turtle nesting sites.

### d. Seaweed and Seagrass Beds

Seagrass and seaweed beds are found along the north western region of the island embedded between extensive coral reefs. Five species of seagrass namely *Halophillia ovata*, *Halodule pinifolia*, *Thalassia hemprichii*, *Cymodocea serrulata* and *Enhalus acoroides* have so far been recorded from Mahatma Gandhi Marine National Park (MGMNP). Due to government- approved

timber felling, the sediment load in coastal waters has increased and has adversely affected the distribution of seagrass in Rutland Island. Seaweeds occur in the north eastern side of the Rutland Island at 92°40'14.02"E 11°28'58.33"N which was determined from the field investigation.

With the above status, the following habitats are brought under the proposed conservation and preservation areas for the Rutland Island:

Conservation Areas	Preservation Areas
1. Mariculture	1) Mangroves and other forest area
2. Turtle nesting ground	2) Seaweed / Seagrass bed
	3) Inter-tidal zone
	4) Sandy beaches
	5) Marine National Park
	6) Coral reef with submerged rock.

The list of Mangroves, corals, seaweed and seagrass species found in the Rutland Island is given at Annex-III.

### 2.5 Proposed Prohibited, Regulated & Permissible Activities

In order to prescribe the activities that could be permitted, prohibited and regulated in the land and aquatic area, relevant provisions of the ICRZ of the IPZ Notification, 2011 was considered. The notification deals with NDZ as a separate area and prescribes prohibited and exceptional activities with a view of facilitation of conservation of NDZ area. The methodology for determining NDZ has been described in Annexure-II. In this regard, Para III (D) (3) (a) of IPZ Notification dated 6<sup>th</sup> Jan 2011 may be relevant for A&N also. As the notification does not describe NDZ aspects for A&N (Rutland Island, South Andaman) which is to be dealt under IIMPs, ICRZ provisions for prescribing prohibited and regulated activities felt to be ideal and could be used in IIMPs of A&N islands. Accordingly following classification along with details of prohibited, permitted and regulated activities are suggested. As the sea and landmass of the islands are inter-connected in terms of ecology, the entire island consisting of land and adjoining sea is considered as a single ecosystem. Accordingly, the island ecosystem is categorized into:

- (i) **Preservation Zone:** Reserve forest, mangroves, reef slope with live coral, seagrass bed, seaweeds, sandy beach and other zones that will be declared by Island Administration as and when existence of endangered/rare/vulnerable species of plants and animals are found.
- (ii) **Conservation Zone:** Setback area (No Development Zone - NDZ), Reef flat with dead coral.
- (iii) **Regulated Development Zone:** It includes beach (outside setback area -NDZ) and non- forest land part of the island which is undeveloped and sparsely populated.

Different zones such as conservation zone, preservation zone, buffer zone, regulated development zone, etc., would have different regulations and is briefly summarized in the report. The activities which are permitted in the No Development Zone (NDZ) (as given in IPZ 2011 Notification for ICRZ - I areas) are also given in the report.

### 2.6 Existing and Proposed Infrastructure Development

All the existing and the proposed development schemes for the coming 10 years (2011-21) have been mapped in consultation with the UT Administration of A&N. The existing scheme has government establishments including

- Primary School - 2 (36 children enrolled) Social Welfare (Anganwadi Centre) - 4 Hospital Sub Centre - 1
- EB Branch post office - 1 Letter Box - 1
- Forest police station or camp – 3

As far as other infrastructure is concerned, jetty and internal road are the existing major developments.

As per the details forwarded by the UT Administration (Letter No. CF/EPA/83/Vol.IX/344(A) dated 29th January, 2016), the following are the proposed developmental plans in Rutland Island.



## Proposed Developmental Plans for IIM Plan for Rutland Island

Sl.No.	Department of A&N	Proposed developmental plans	Remarks by NCSCM
1	Andaman Public Works Department (APWD)	Proposed sub-marine pipeline through Mahatma Gandhi Marine National Park, Rutland to Manjeri.	The location of the project has been indicated in the IIM Plan.
2	Directorate of Disaster management, A&N Administration	Establishment of Global Navigation Satellite System/ Strong motion network Emergency Communication undertaken by INCOIS.	Site location has been indicated in the IIM Plan.
3	Port Management Board	Extension of existing jetty at Rutland.	The location of the project has been indicated in the IIM Plan.

### 2.7 Conservation Management Plan

The framework for a conservation management plan for Rutland Island was developed after going through existing management documents, reports and research recommendations. Activities for capacity building, awareness creation and co-management have been discussed along with establishment of conservation measures and threats/stress factors. The following management interventions have been suggested for ESAs in Rutland Island.

#### I. Immediate Measures

- (i) The A&N Administration shall prohibit dredging, sand mining or any other activities like construction of foreshore facilities, laying of pipe lines, etc that are detrimental to the coastline and the coral reefs.
- (ii) The A&N Administration shall prohibit the dumping of any kind of waste, including untreated sewage and solid waste and shall put in place source segregation, collection, transportation, storage, processing and disposal, as per the provisions of the Solid Waste Management Rules, 2016 as amended.
- (iii) In the light of potential threats from various invasive alien species to the marine waters of Andaman and Nicobar Islands, the quarantine measures at the entry points shall be strengthened and standard operating procedures to handle eventualities shall be developed. This would include facilities for isolation and fumigation of plants and animals coming into the islands; training and posting personnel at both airport and seaport; monitoring of disease and pest outbreaks and providing solutions.

#### II. Short-term Measures

- (i) The Dept. of Environment and Forests, ANI is implementing a project, jointly with Zoological Survey of India (ZSI), for monitoring the coral reef health through permanent monitoring plots. It is recommended that the above ecosystem health assessment program shall assess and track the changes in reef communities in response to natural and anthropogenic stressors. Further, the above study shall also assess the conservation value of the reef ecosystems, based on which the highly sensitive areas shall be identified and notified under Environment (Protection) Act, 1986 so as to maintain the pristine nature of such areas.
- (ii) The ballast water discharge from the ships and tourist cruises should be strictly prohibited in order to protect the reef biodiversity from invasive organisms, in accordance with the provisions of Merchant Shipping Act (1958 & Amendments). The UT Administration shall put in place a scientific monitoring system to analyse the invasive species.
- (iii) The UT Administration shall take up an integrated approach involving all stakeholders in the islands to promote conservation of coral reefs and its biodiversity.

#### III. Long-term Measures

- (i) Keeping in view the conservation and protection of coral reef and its biodiversity in a long term, UT Administration along with MoEF&CC shall put in place a strong institutional mechanism for planning and implementing the above recommendations.
- (ii) Periodical studies shall be conducted to assess the land based impact to the coral reef ecosystem and take appropriate remedial measures for their protection.

- (iii) Detailed studies shall be conducted to identify the mangrove degraded locations in ANI and take appropriate measures for planting of mangroves in the degraded patches.
- (iv) The A&N Administration shall engage with the fishing community in order to formulate appropriate regulatory measures for sustainable fishing.
- (v) The A&N Administration shall identify and establish new protected areas and develop management strategies for such protected areas.
- (vi) Awareness on the importance and value of ESAs and associated biodiversity has to be created at all levels of the society including the students, officials and the general public, using appropriate methods/modules/tools.

## 2.8 Water and Waste Management Plan

Solid wastes that are generated in Rutland Island, from around 130 households are minimum, which include biodegradable and non-biodegradable wastes. This include house sweeping, kitchen waste, garden waste, agro waste, broken glass, metal, waste paper, plastic, cloths, rubber, waste from markets, etc. There is no information on quantity of waste generation and waste disposal mechanism in Rutland Island. The following strategies shall be considered for better solid waste management in Rutland Island:

1. The UT Administration shall put in place source segregation, collection, transportation, storage, processing and disposal, as per the provisions of the Solid Waste Management Rules, 2016 as amended.
2. The UT Administration shall prepare comprehensive data based on the waste generation as well as prevalent waste management practices by earliest. These data base should be regularly updated. NCSCM, Chennai may be involved in the exercise.
3. The UT Administration shall adopt suitable technology or combination of appropriate technologies with the approval of concerned UT Pollution Control Committee with the standards prescribed under the Rules.
4. The UT Administration shall make it mandatory for the commercial units such as tourism and other commercial establishments to put in place a waste management system as per the Solid Waste Management Rules, 2016 as amended.
5. For the management of building wastes, the relevant provisions of the Construction and Demolition Waste Management Rules, 2016, as notified by the MoEF&CC from time to time shall be followed.
6. Medical wastes generated from the primary dispensaries shall be strictly treated as per Bio-Medical Waste Management Rules, 2016.
7. The UT Administration shall put in place Plastic Waste Management Rules 2016, by MoEF&CC. In view of the island conditions, the UT Administration shall ban on use of plastic carry bags.
8. Considering the island ecology, ground water table and long rainy seasons, landfills may not be advisable. The UT Administration along with NCSCM shall explore various methods/ technologies for appropriate reuse and recycling of solid wastes including non-biodegradable wastes.

### I. Liquid Waste Management

The source of waste water in Rutland Island is limited which includes waste water from domestic uses (e.g from toilet, bathroom, washing of clothes and from kitchen) and there is hardly any industrial and commercial activity generating effluent. Waste water from domestic use requires biological or chemical treatment and disinfection before re-use. Treated water can be reused for garden watering, fodder raising and kitchen gardening.

At present, the island does not have sewage treatment facility. Since there is no industrial pollution and generation of domestic waste is in limited quantity, sewage management was not the priority. The following strategies shall be considered for better wastewater management in Rutland Island:

- 1) For effective management of water, focus should be on management at household level. In case it cannot be managed at household level, management at the community level should be done. As far as possible, water generated at household level should be managed such that zero or minimum community waste is generated.
- 2) For development of island specific sewage management system (STP, MBBR RBC or similar techniques), national institutes such as NCSCM should be involved for feasibility and pilot studies as well as regular monitoring of the progress.
- 3) Sewage management should incorporate Zero effluent (contaminant) discharge framework to the coastal waters. Treated water should be used for non-contact purposes whereas surplus recycled water can be disposed off by considering the bathymetry, mixing, biodiversity and other ecological conditions.
- 4) It will always be better to manage and treat domestic grey water generated in the house in the area/courtyard/land surrounding the house. Various technological options such as Kitchen Garden with piped root zone system, Kitchen Garden without piped root zone system, Leach pit and Soakage pit may be suitable for the purpose.

## **2.9 Energy Management Plan**

- The offshore wind and solar energy preliminary studies revealed that the high wind speed and solar radiation are available only for 6 months in a year, and are in opposite time periods. Therefore the development of hybrid power system is highly recommended for the establishment of uninterrupted power supply.
- Feasibility studies on biomass, OTEC, and tidal energy are required to identify suitable sites though the potential is limited.

## **2.10 Tourism Management Plan**

As the Rutland Island has great potential for tourism, eco-tourism can be promoted in this island. Tourism operations in protected areas need to be planned carefully through conducting detailed Tourism Carrying Capacity Studies and monitor regularly to ensure their long-term sustainability. The proposed tourism activities should ensure that

- No destruction of corals or disturbance to coral reef areas
- No construction of hard structures such as coastal protection structures anywhere along the coast
- No disposal of untreated sewage or effluent including the non-biodegradable waste into the sea water by the tourist and related activity.

For any tourism related developments and establishments, the “Guidelines for development of beach resorts or hotels in the designated areas of ICRZ-III and ICRZ-II/IIMPs for occupation of tourist or visitors with prior approval of the Ministry of Environment and Forests” given in the IPZ Notification, 2011, should be followed.

## **2.11 Sustainable Livelihood Developmental Plan**

Considering growth of current population in the island, which mostly depends on agriculture and other services, more livelihood options need to be explored. Living standard of the population can be enhanced by involving them in fishing if the people willing to do and in the proposed tourism related activities either as workers, skilled technicians or in boating for tourists. Necessary skill enhancement programmes need to be organized to the islanders to carry out these activities.

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### **Annexure-3: Coastal Areas of Ernakulam District Projected Below 10-Year Flood Level in 2030 by Climate Central - Coastal Risk Screening Tool**

We used the web-based interactive Coastal Risk Screening Tool of Climate Central to project the likely inundation of areas within LECZ of Ernakulam district in 2030 by climate change driven SLR and flood. The settings used for generating the projection are described here.

**Projection Type:** Sea Level Rise + Moderate Flood.

**Moderate Flood Level** is used to denote the water level at the shoreline that local coastal floods have a ten percent chance of exceeding each year.

**Leading Consensus** (IPCC 2021<sup>15</sup>): This represents the worldwide local sea level projections from the IPCC based only on contributing factors understood with "medium confidence" or better. Projected values depend on location, climate pollution pathway, and exactly how sensitive temperatures and sea level turn out to be to pollution and warming ("luck," in this tool's settings).

**Luck:** Bad, which stands for the high-end result from sea-level projection range (95th percentile).

**Current Trajectory:** Global emissions of heat-trapping pollution continue to rise, with annual emissions approximately doubling by the end of the century. This pathway is consistent with current operational climate policies and is expected to result in about 3.6° Celsius (about 6.5° Fahrenheit) of warming above pre-industrial levels by 2100. Technical name: SSP3-7.0

**Tideline** is used to denote the recent historical average of the highest daily local tide level or, technically, the mean higher high water (MHHW) line. Within the United States, NOAA's VDatum tool is used for MHHW values; elsewhere, modeled tidal increments are added to recent historical average sea surface heights measured by satellite. Tideline projections add projected sea level rise.

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<sup>15</sup> Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press.