



Zonation System for the Baa Atoll Plan of Management



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Baa Atoll
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ACRONYMS

AEC	Atoll Ecosystem Conservation Project
BAMP	Baa Atoll Management Plan
CBD	Convention on Biological Diversity
DNP	Department of National Planning
EPA	Environmental Protection Agency
IUCN	International Union for the Conservation of Nature
MHTE	Ministry of Housing, Transport and Environment
MFA	Ministry of Fisheries and Agriculture
MRC	Marine Research Centre
UNESCO	United Nations Educational, Scientific and Cultural Organisation

DEFINITIONS

Commercial fishery:

A fishery resource exploited solely for economic gain.

Artisanal fishery:

A fishery resource exploited for both economic gain and personal/family use.

Subsistence fishery:

A fishery resource exploited only for personal/family use.

ACKNOWLEDGEMENT

Information detailed in this zonation plan for Baa Atoll has been developed through community stakeholder discussion with Baa Atoll government representatives and residents, Baa atoll resort staff, the national government ministries (MHTE and MFA) and their research entities (MRC and EPA), Department of National Planning (DNP) and the scientific literature provided to the AEC. Special thanks are extended to CDE Pvt Ltd for their assistance in producing the zonation maps.

1.0

BAA ATOLL

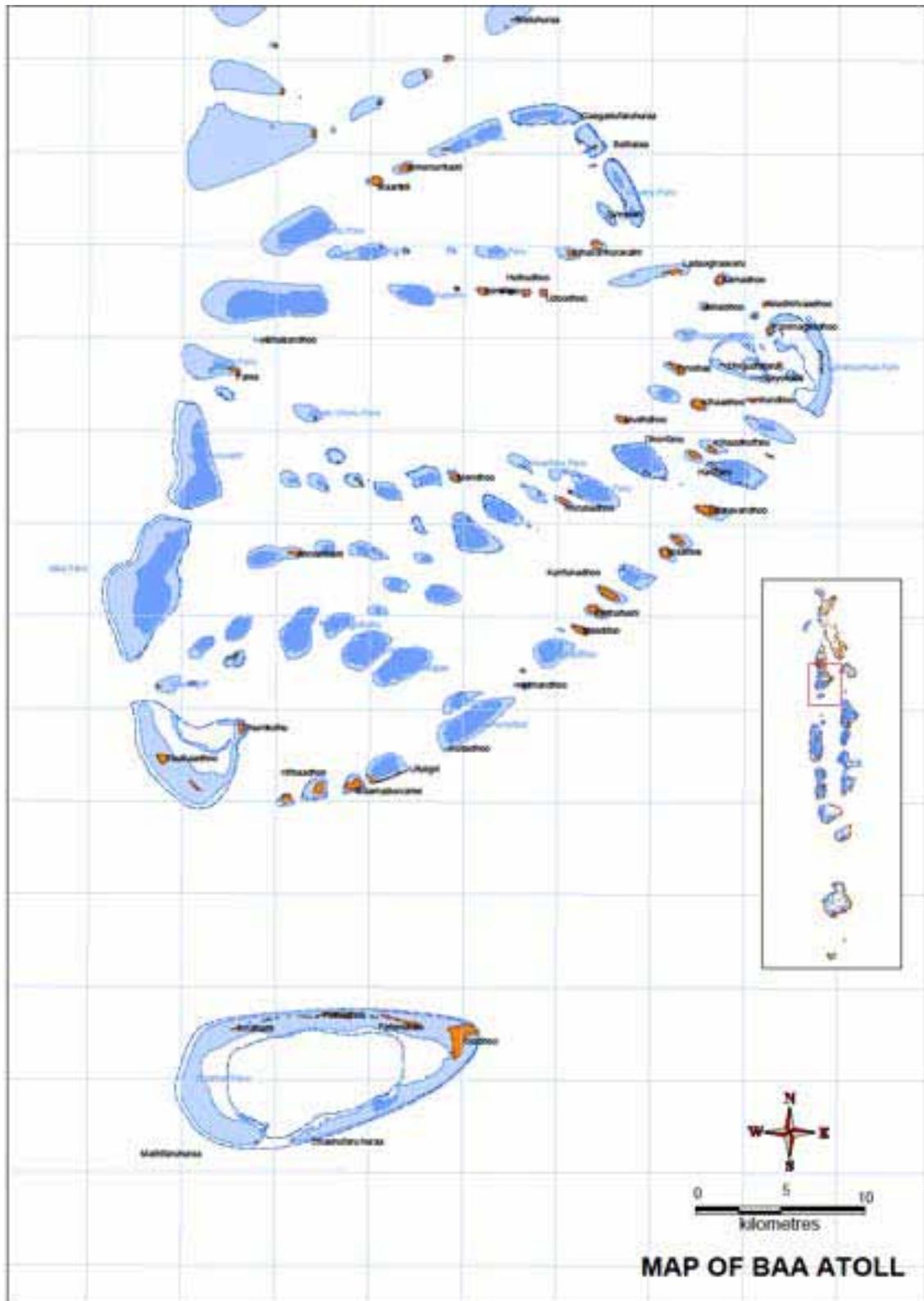
Baa Atoll, previously known as South Maalhosmadulu Atoll is located in the west of the central part of the Maldives (Figure 1). The atoll is approximately 1,200 km² in area and is approximately 63 km long (4°48'S to 5°22'N) and 38 km at its widest point (72°48'E to 73°11'E). The atoll is situated just north of the Kashidhoo Kandhoo channel that geographically divides the northern chain of atolls. Its neighbouring atolls include Raa to the north, Lhaviyani to the east and North Male in the south east.

Baa atoll including Goidhoo atoll which lies 12 km south of the main island group is comprised of seventy five islands covering a total land area of 5.5 km² of which thirteen are inhabited with a combined population of approximately 11,000 people. Six islands have been developed as resorts whilst four more are planned or under construction with the remaining 53 islands uninhabited. Eydhafushi is the administrative centre and capital island of Baa.

The atoll receives seasonal swell from both the south east and from the west that break on the outer rim of the atoll, which consists of a series of narrow islands on the eastern part of the atoll and a few larger reef systems on the western side. The rim of the atoll is largely open with numerous passes. The atoll has a number of patch reefs, thilas, giris and faroes.

There is one existing marine reserve, Dhighaliha, created in 1995 and located 5°08'N 73°02'E, and the island of Olhughiri is a terrestrial protected area and was designated in part to protect one of only two roosting sites for the Frigate bird within the nation. Neither site has received any form of active management nor are well known or understood by the local communities.

Figure 1. Location of Baa atoll in relation to the Maldives.



BAA ATOLL CONSERVATION PROGRAMME

The Baa Atoll Conservation Programme (BACP) encompasses all the islands, waters and resources (biological and non biological) of Baa Atoll with an outer perimeter that extends one (1) nautical miles from the outer reef zone of the atoll. BACP has been developed through a comprehensive stakeholder consultative process and is being implemented in line with the Ecosystem Approach of the Convention on Biological Diversity (CBD). This is “A strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way”. This approach is highly relevant to the nation’s development objectives and is directly linked to the ongoing process of constitutional reform of the Maldives. The key ecosystem management approach of this strategy includes;

- People (societal choice), rather than biodiversity are at the heart of natural resource management,
- Decentralises management and governance to the lowest appropriate level,
- Extends biodiversity management beyond protected areas, to whole ecosystems (biological and non biological),
- Maintenance (long term) of ecosystem structure, function and services,
- Management systems developed at appropriate spatial and temporal scales and ecosystems managed within their limits of their function,
- Engages the full range of sectoral interests in an integrated way,
- Integrates conservation and sustainable use, and
- Recognises that (climate) change is inevitable, and promotes adaptation strategies to deal with change.

The long term goal of the BACP is to ensure the ecosystem of Baa Atoll remains healthy, productive and resilient into the future.



2.1

Laws and Regulations

The BACP is governed by a number of legal instruments which include National Legislative Framework, a number of Policy Frameworks and Mandates, Administrative Frameworks and International agreements. This includes;

2.1.1 National Legislative Framework

Provides guidance for the sustainable use, management and conservation of the country's natural resources, and to protect these resources from degradation and over-exploitation. The two main national legislative frameworks are:

- The Fisheries Law (1970).
- The Environmental Protection and Preservation Act (1993).

Additional laws and regulations that are relevant to biodiversity conservation include :

- Uninhabited Islands Law.
- Tourism Act (1999).
- Civil Aviation Act (2001) and regulations (2007).
- Regulation on sand and aggregate mining (2000).
- Ban on coral mining (1990).

2.1.2 Policy Frameworks and Mandates

The main types of in situ conservation methods employed in the Maldives include:

- Marine protected areas,
- Uninhabited islands,
- Resort islands (only 20% of land is used and the remaining 80% is left as wilderness),
- Agricultural islands where wilderness areas have been demarcated; and
- Areas protected by taboos (e.g. presence of jinni).

These policy frameworks and mandates are managed under the following initiatives :

- The National Strategy for Biodiversity, adopted in 2001, addresses protection and conservation of special habitats, ecosystems and species.
- The Seventh National Development Plan (NDP7) was the first national development plan with extensive input relating to biodiversity conservation.
- The NDP7 is superseded by the ruling Maldives Democratic Party's (MDP's) election Manifesto and Action plan. Provisions within this Manifesto for general environmental and biodiversity conservation.
- The Third National Environment Action Plan provides provisions to protect and preserve the environment and to sustainably manage the country's natural resources. Biological diversity conservation and integrated reef resources management is a priority action.
- The National Adaptation Programme of Action (NAPA) on Climate Change emphasises the need to preserve and protect coral reefs to enhance the adaptive capacity of the natural environment against climate change impacts.
- A Maldives Protected Areas System project implemented from 2000 to 2004 to develop guidelines and build the capacity for protected areas management in the Maldives.
- The Integrated Reef Resources Management programme of the MRC also provides methodologies and systems for the sustainable use of marine biodiversity in the Maldives.

2.1.3 Administrative Mandates

There is no single agency designated as the responsible agency for biodiversity conservation. However, the environment sector of the Ministry of Housing, Transport and Environment (MHTE) is granted the broad responsibility to assess and manage the environmental resources of Maldives. There is however an overlapping mandate to manage marine resources and inhabited islands of Maldives for Ministry of Fisheries and Agriculture (MFA). Furthermore there are a number of additional ministries and agencies responsible for biodiversity conservation which include;

- The Ministry of Home Affairs, (MHA) though the Atoll and Island Offices, have the mandate to manage all forest and terrestrial resources on inhabited and uninhabited islands.
- The Ministry of Tourism (MoT) is responsible for the monitoring and the management of the environment related to all tourist resort island.

- The National Commission for the Protection of the Environment (NCPE) is a major consultative instrument consisting of key government sectors with a broad mandate for the protection and management of nationally significant issues. NCPE advises the government on all aspects of environmental management.

2.1.4 International Commitments

The key international commitments by Maldives in relation to conservation of biodiversity include;

- Convention of Biological Diversity.
- Cartagena Protocol on Bio-Safety.
- International Plant Prevention Convention.
- Convention on the Law of the Sea.

Other International Commitments include;

- Basel Convention on Trans-boundary Movement of Hazardous Wastes.
- United Nations Framework Convention on Climate Change.
- Kyoto Protocol to the UNFCCC.
- Vienna Convention on the Protection of the Ozone Layer.
- Montreal Protocol on Substances that Deplete the Ozone Layer (including ratification of the 1989 London Amendments).

International Agreements in Consideration include;

- Convention on International Trade in Endangered Species (CITES).
- Ramsar Convention on Wetlands.
- Bonn Convention on Migratory Species (CMS).

2.1.5 Current Legal Challenges and Issues

The major legal issues currently facing the nation is to determine how the existing legal mandates will be changed once the new Decentralisation Bill comes into affect or is discarded. There is a significant debate going in the parliament regarding the introduction of a new decentralised system of administration, which proposes to merge existing 20 atolls to form 7 new Provinces (February 2010). The powers proposed for the Province Offices are significant and would introduce new legal mandates to the Province Offices and, proposed elected Atoll and Island Councils. Some of the potential changes could be summarised as follows:

- The ownership of resources and their allocation for various uses. These include economic developments, conservation and mining.

- Management of all natural resources within the provincial jurisdiction.

In summary, key findings on the legal instruments and policy frameworks associated with the BACP currently included;

- The main legal instrument for designating Marine Protected Areas or conservation zones is the Environmental Protection and Preservation Act (EPPA).
- The agency equipped with the mandate to designate conservation zones is the Ministry of Transport, Housing and Environment (MTHE).
- Conservation of specific marine species overlaps with the Fisheries Act.
- Extraction and utilisation of marine resources, including capture and export is controlled under the Fisheries Act but a specific site may be designated a protected area under the EPPA, overriding the Fisheries Act.
- If an uninhabited island falls within a proposed zone, the Uninhabited Island law comes into affect but may be over ridden by EPPA if the area is designated as a Protected or Conservation zone.
- If a resort island falls within a designated zone, the Tourism Law is applicable. Regulations relating to the resort island boundary are not finalised. The draft proposal states a 700 m zone from the existing island shoreline should be designated as the resort boundary. There is no clear guideline as to whether an area within a resort boundary could be designated as a conservation zone. However, the EPPA gives the legal mandate to the MTHE to over ride the Tourism Law.
- The key policy planning frameworks for designating a conservation zone are the National Strategy for Biodiversity, Third National Environment Action Plan and, Maldives Democratic Party's (MDP's) election Manifesto and action plan.

2.2

Main Threats to Baa Atoll Ecosystems

Non-sustainable human activities are the root cause of the damage and degradation to Baa Atoll's ecosystem including its biological and non biological resources. Through stakeholder workshops and consultation the Atoll Ecosystem Conservation Project (AEC) project identified the main threats to the atolls ecosystem and resources. These threats form the basis of the BACP which include strategies to directly address these activities and their impacts on the biodiversity and function of Baa atolls resources. The direct threats include;

Type of Threat	Cause of Threat	Current Issues
Damage to habitats	Construction	Harbour developments Hanifaru development proposal Resorts and other infrastructure Mariculture proposals
	Sand/coral mining Anchor damage	Erosion on many islands Widespread coral damage
Overharvesting	Over-fishing	Declines of sharks, groupers and some other reef fish, bait fish, spiny lobster, sea cucumbers, turtles
	Cutting trees	Damage to mangroves, bird roosting sites
Disturbance	Resort use of sandbanks Tourists pursuing mega- fauna	Seabird colonies abandoned. Manta rays and whale sharks disturbed.
	Activity on Beaches	Turtle and Bird nesting disturbed.
Pollution	Disposal of waste at sea Sewage disposal	Pollution of beaches and reefs. Nutrient enrichment of freshwater lens and reefs.
Alien species	Predation on native species	Rats eating breeding seabirds / eggs, coconuts.
	Invasion into habitats	Alien invasive plants on islands and marine organisms (e.g. sponge).
Climate change	Greenhouse gases	Sea level rise Increased swells and storms Coral bleaching

Due to the projects time frame, goals and budget allocations the above main threats were prioritised through a consultative stakeholder process in terms of three criteria, which included;

- Conservation Importance,

- Urgency, and
- Ease with which it can be addressed.

The following list sorts the strategic threats into High, Medium and Low priority actions. The biodiversity/ecosystem conservation priority issues include :

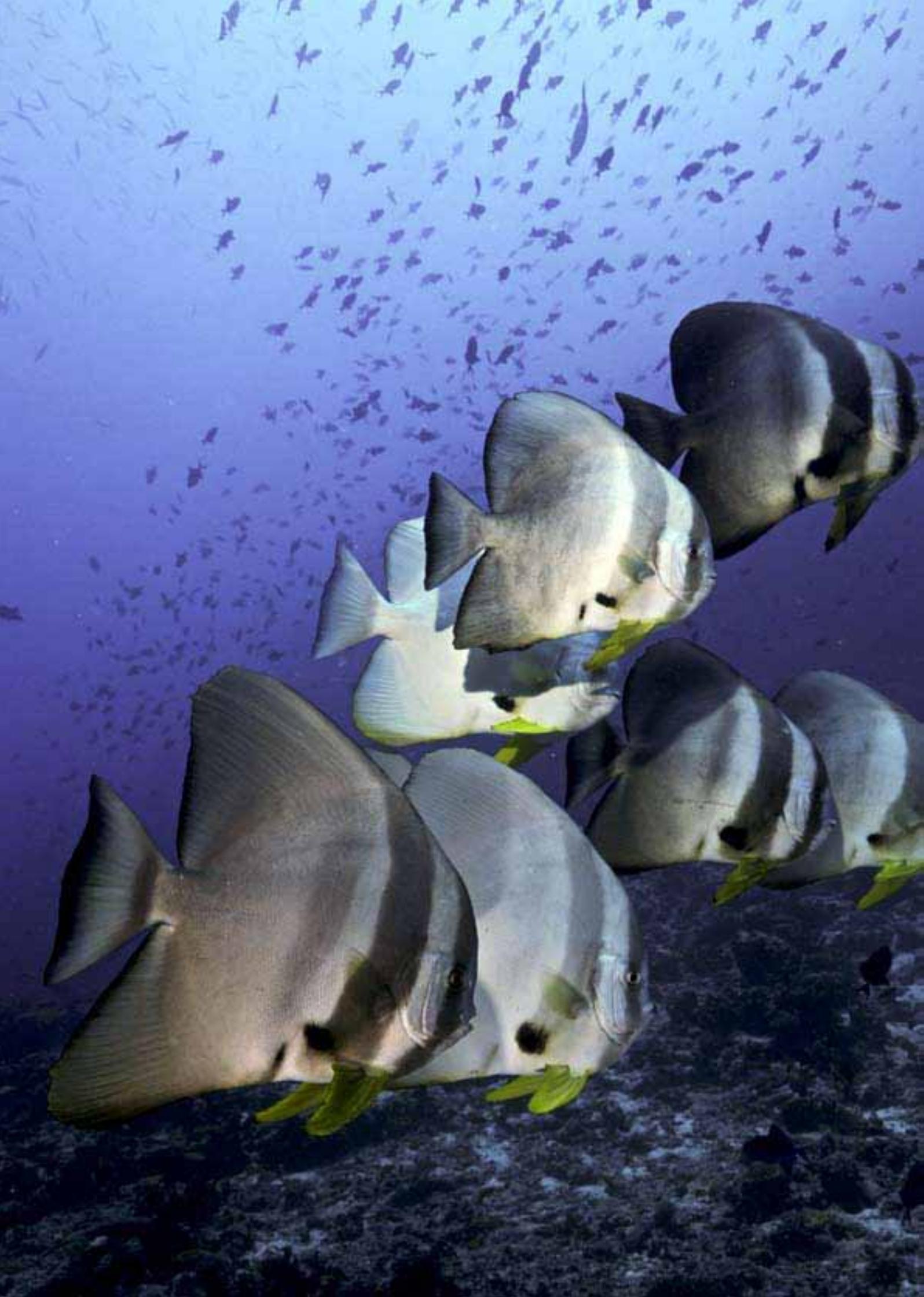
High Priority	Medium Priority	Low Priority
<ul style="list-style-type: none"> ● Shark-fining/overfishing ● Hanifaru development proposal ● Seabird nesting / roosting sites ● Turtle egg collection (and catching adults) on beaches 	<ul style="list-style-type: none"> ● Sea cucumber over-fishing ● Catching turtles at sea ● Alien invasive species on islands ● Rat predation on breeding seabirds (&turtles) ● Spiny lobster over-fishing ● Grouper over-fishing ● Pollution from solid wastes ● Recreational reef angling by resorts ● Marine mega-fauna disturbance by tourists ● Shipwrecks and oil spills ● Mangrove mismanagement ● Reef damage from anchoring / diving ● Wildlife captured as pets ● Loss of natural habitats/ landscape 	<ul style="list-style-type: none"> ● Ornamental fish over-fishing ● Mariculture ● Pollution from sewage ● Other reef fish overfishing ● Bait fish over-fishing ● Alien invasive species (marine)

2.3

Management Goals

The seven (7) management goals developed for the BACP contribute to the conservation and preservation of the atoll by providing a framework for achieving sustainable resource management of human activities. These include :

Type of Threat	Cause of Threat
1. Conservation	<ul style="list-style-type: none"> ● Protect, conserve, manage and, where possible, restore the natural biodiversity and cultural values of the atoll.
2. Community Engagement	<ul style="list-style-type: none"> ● Develop community awareness, understanding and appreciation of the biological and physical diversity of the atoll, and promote community involvement in, and support for, its protection, conservation, management and restoration. ● Support communities to develop sustainable livelihoods
3. Governance and Institutional Arrangements	<ul style="list-style-type: none"> ● Facilitate the ownership and management of the BAMP to be local and improve coordination of governance, regulations and interagency cooperation and coordination at all levels of government.
4. Zoning and Codes of Practices	<ul style="list-style-type: none"> ● To incorporate modern resource management practices to form a comprehensive and integrated resource Management Plan.
5. Information, Data Management and Monitoring	<ul style="list-style-type: none"> ● Better understand the potential and real impacts resulting from resource use. ● Implement a data collection and analysis program that provides for a much greater understanding of the impacts of use and management activities within the atoll. ● Clarify the roles and responsibilities of local and national management agencies / groups for monitoring
6. Conservation Financing	<ul style="list-style-type: none"> ● Establish long term funding system to ensure the BAMP activities are implemented in a timely fashion and develop alternative avenues to acquire financing to maintain and further develop innovative community based conservation and livelihood programs and activities that are compatible with the BMAP goals.
7. Climate Change	<ul style="list-style-type: none"> ● The precautionary principle should be adapted and integrated into all management activities to recognise climate change (sea level rise, increased unpredictable weather patterns- sea water temperature increases, large swell and more frequent storms) potential impacts on the long term management of the atolls biological and non biological resources and resource users.



3.0

UNESCO WORLD BIOSPHERE RESERVES

Through an intensive stakeholder consultative process it was agreed to adopt and utilise the United Nations Educational, Scientific and Cultural Organisation (UNESCO) protocols for a World Biosphere Reserve to develop the zonation strategy for the BACP. The Atoll Ecosystem Conservation Programme (AEC) was tasked on behalf of all stakeholders to lead the process to acquire the UNESCO World Biosphere Reserve status.

UNESCO coordinates a world network of over 500 Biosphere Reserves in 105 countries. These are sites recognized under UNESCO's Man and the Biosphere Programme, which innovate and demonstrate approaches to conservation and sustainable development. Biosphere Reserves have three key functions:

1. Conservation,
2. Learning and Research, and
3. Sustainable Development.

Biosphere reserves are vehicles for knowledge-sharing, research and monitoring, education and training, and participatory decision-making. The designation is about encouraging and facilitating people to work together, to live in and manage the whole area for a sustainable future. They possess unique features in terms of their natural environment (biodiversity and landscapes/seascapes) and have a long term community commitment to sustainability through education, the economy, arts and culture.



BAA ATOLL ZONATION SYSTEM

The BACP is a multiple use marine and terrestrial area that provides for a wide range of anthropogenic uses (e.g. commercial, artisanal, subsistence, recreational and tourism) and is based on a over riding conservation objective to ensure long term ecological sustainability. Therefore the atoll and its biological and non biological resources are protected, but managed through a zonation system that provides provisions for different uses and activities to be undertaken in the different zones whilst minimising detrimental threats and user conflicts. The BACP also provides mechanisms that actively support sustainable livelihood initiatives that established sustainable use and management of resources.

The development of the Baa atoll zonation system included a combination of biological knowledge (scientific and anecdotal) and stakeholder (community, government and private sector) involvement. The zonation system like the BACP is a “living” system and requires regular evaluations and modifications to ensure the long term objectives are met. Spatial zoning is an important and required tool for managing human activities across whole ecosystems. In a large and complex ecosystem like Baa Atoll, human activities need to be carefully managed to ensure that use of resources are sustainable, that sensitive biological and non biological features are protected (at least temporally e.g. fish spawning aggregation sites) and that degraded habitats and resources are restored.

The zonation system developed for Baa atoll has adopted the UNESCO World Biosphere Reserve zonation criteria and protocols. This includes a three tired zonation approach which includes;

- Core Areas (highly protected and managed areas where only non-damaging, non-extractive use is allowed),
- Buffer Zones (managed areas where some types of activities are allowed), and
- Transitional Areas (multiple use areas where sustainable activities are allowed)

Table 1. The total area of the three zone types and their equivalent IUCN category within the Baa Atoll.

Zone	Equivalent IUCN Category	Area (km ²)	Area (hectares)
Core Area	IA, IB, II	39.17	3917
Buffer Zone	IV, V	39.17	1824
Transitional Area	VI	1398 (land 10.4) (Reef 300) (Atoll 1,087)	139,800

In addition, the BACP has provided additional management tools to ensure the sustainability of this plan are fully realised. This includes a number of specific activities that are to be banned in the atoll (Atoll Wide Bans), species specific management plans and Codes of Conduct which in unison with national laws and regulations provides a platform for the long term sustainable development of Baa atoll resources and communities. These management tools have been developed based on best scientific and anecdotal information available, information provided by stakeholders and incorporate international standards of best practises using the precautionary principle.

Furthermore, the island and reef resources allocated through a leased arrangement to the resort operators within Baa atoll due to their agenda of ensuring their environments are actively maintained for guest use act by default as semi marine and terrestrial protected and managed areas. Thus these areas contribute to the BACP atoll wide goal of sustainably managing the resources of the atoll.

4.1

Core Areas

Core Areas are clearly defined management areas that have a high ecological significance in terms of marine and terrestrial biodiversity, have a high natural value to Baa atoll, the nation and to the communities whom use the atoll resources. Core Areas are allocated the highest levels of conservation to ensure the natural ecological systems and organisms are fully protected. Key management objectives include;

- The preservation of habitats, ecosystems and species in as undisturbed a state as possible,
- To maintain genetic resources in a dynamic and evolutionary state,
- To maintain established ecological processes and functions, and
- To permit public access and manage visitor use for educational, cultural and recreational purposes at a level which will maintain the area in a near natural state.

All Core Areas prohibit the commercial, artisanal and subsistence extraction of all biological and non biological resources. However, certain activities (e.g. tourism and picnics) and uses can be allowed if these activities are consistent with the Core Areas conservation objectives. These activities require stringent management systems, codes of conduct and due diligence from all users to ensure the goals of Core Areas are achieved. All anchoring of any boat (unless in an emergency) is prohibited. Table 2 details activities that are allowed and prohibited within Core Areas.

The boundary for all Core Areas extends 100 metres from the reef edge and includes all marine and terrestrial biological and non-biological resources enclosed within the boundary. All atoll wide bans and management restrictions detailed in the BAMP are applicable to all Core Areas.

Eleven (11) individual Core Areas have been developed for Baa atoll, these include :

Core Areas	Rationale
CA 1. Nibiligaa Islands and reef, Mendhoobinmathee Faru, Kam-buru Faru and Mendhoo Island and reef.	<ul style="list-style-type: none"> ● Very high biodiversity and standing population of hard and soft corals and associated marine invertebrates and vertebrates. ● Nest sites for green and hawksbill turtles. ● Nest and roosting sites for the Lesser, Black-Napped, Greater Crested and Brown Noddy Terns and the Lesser Frigate bird.
CA 2. Dhigaliha (existing MPA) and Dhigaliha Giri Reef.	<ul style="list-style-type: none"> ● High biodiversity and standing population of hard and soft corals and associated marine invertebrates and vertebrates. ● Is registered as a Dive Protected MPA, has a high tourism value and previously supported a large population of pelagic finfish and sharks.
CA 3. Hanifaru Reef including the island.	<ul style="list-style-type: none"> ● High biodiversity marine region possessing a unique dynamic water circulation system that during western monsoons, aggregated for feeding (whale sharks and manta rays) and mating (manta rays) in high numbers of endangered mega fauna animals (whale sharks and manta rays). Therefore this site is biologically and biodiversity significant for the Baa Atoll, Maldives and globally. ● Similarly this area has a very high tourism value for mega fauna and recreational diving and snorkelling. ● Nest sites for green and hawksbill turtles. ● Occasional roosting site for the Black– Napped Tern, Lesser and Brown Noddy terns.
CA 4. Angaafaru Reef including Dhonfanu thila and Dhigu thila.	<ul style="list-style-type: none"> ● High biodiversity marine region and standing population of hard and soft corals and associated marine invertebrates and vertebrates. ● Reef system is directly associated with the unique dynamic water circulation system of Hanifaru that during western monsoons aggregated for feeding high numbers of endangered mega fauna animals (whale sharks and manta rays). This reef site is therefore biologically and biodiversity significant for the Baa Atoll, Maldives and globally for mega fauna animals. ● This marine area has a very high tourism value for mega fauna and recreational diving and snorkelling. This core area includes the internationally acclaimed dive site of Dhonfanu thila and “shark alley”. This site located on the southern section of the Angaafaru reef was renowned for the resident population of sharks. Unfortunately the population currently of sharks utilising this site has all but gone due to commercial fishing. ● Roosting site for the Roseate and black Napped Terns.

Core Areas	Rationale
CA 5. Maahuruvalhi Reef including the passes of Ahivahfushi Kanndu and Maahuruvalhi Kandu.	<ul style="list-style-type: none"> ● High biodiversity and standing population of hard and soft corals and associated marine invertebrates and vertebrates (especially fin fish). ● High populations of IUCN red listed species including (Napoleon fish (<i>Cheilinus undulatus</i>), Hawksbill turtle (<i>Eretmochelys imbricata</i>) and groupers (<i>Plectropomus</i> sp., <i>Variola</i> sp., <i>Cephalopholus</i> sp.). ● It is known as a grouper may be a fish aggregation site for reproduction.
CA 6. Bathalaahuraa reef and island including the channels and island of Gaagandufaruhuraa to the north and the north island and reef of Vinaneyfaruhura to the south.	<ul style="list-style-type: none"> ● Very high biodiversity, diverse habitat and standing population of hard and soft corals and associated marine invertebrates and vertebrates. ● Nest sites for green and hawksbill turtles. ● Includes known grouper aggregation spawning sites. ● Gaagandufaruhuraa Island is a roosting site for the Black-Napped, Lesser and Brown Noddy terns.
CA 7. Hulhudhoo Island and Reef.	<ul style="list-style-type: none"> ● Very high biodiversity and standing population of hard and soft corals and associated marine invertebrates and vertebrates. ● Nest sites for green and hawksbill turtles. ● Roosting site for the Lesser Frigate bird and fruit bats.
CA 8. Olhughiri Island excluding the reef.	<ul style="list-style-type: none"> ● Is registered as a terrestrial MPA, which has a high tourism value. ● Has the only nesting population of Lesser frigate birds within Baa Atoll and associated vegetation. ● Nest sites for green turtles. ● Roosting site for fruit bats.
CA 9. Goidhoo Island Mangrove Forest.	<ul style="list-style-type: none"> ● Highest biodiversity and largest mangrove forest within Baa atoll and one of the largest mangrove ecosystems within the nation. ● High biodiversity and population of mangrove associated invertebrates and vertebrates. ● Popular roosting site for local and migratory birds including the Ruddy Turnstone and Northern Shoveler during the north-east monsoon period.
CA 10. Mathifaruhurra Island.	<ul style="list-style-type: none"> ● Nest sites for green and hawksbill turtles. ● Roosting and nesting sites for the Black-Napped, Roseate, Lesser Noddy and Brown Noddy terns.
CA 11. Muthaafushi Island and reef and Muthaafushi Thila.	<ul style="list-style-type: none"> ● High biodiversity and standing population of hard and soft corals and associated marine invertebrates and vertebrates. Thila has high populations of large fin fish including sharks (one of the remaining locations within the atoll that sharks can be found) and pelagic species. ● Nest sites for green turtles. ● Roosting sites for the Black-Napped, Roseate and Lesser Noddy terns.

Appendix 1 provides a visual diagram of each Core Area and its corresponding Buffer Zone.



4.2

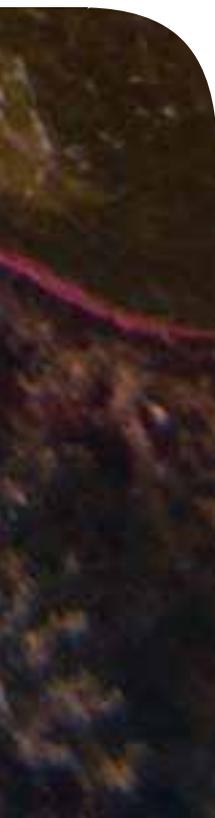
Buffer Zones

Buffer zones are defined management areas that by definition (UNESCO) provide conservation and protection support services for Core Areas that maximise biological connectivity whilst allowing the communities and atoll user's access to appreciate and enjoy these zones. These areas in their own capacity have a high ecological significance in terms of marine and terrestrial biodiversity, ecosystem functions and have a high natural value to Baa atoll. Key management objectives include;

- The maintenance of habitats, ecosystems, species and ecological processes to ensure long term protection of resources,
- To permit public access and manage low impact tourist/visitor use for educational, cultural and recreational purposes at sustainable levels, and
- Permit small scale, strictly managed extractive livelihood activities that are low impacts, sustainable and are reliant on these ecosystems.

Buffer Zones prohibit the commercial extraction of all biological and non biological resources. However can provide for a range of artisanal and subsistence extractive and non extractive activities that are compatible with the Core Area conservation objectives. Table 2 details activities that are allowed and prohibited within Buffer zones.

Buffer Zones permit the extraction of pelagic fishing through trolling and the collection of bait fish (net fishing) only for Baa atoll based pole and line boats but prohibits the extraction of reef fish and reef biological and non biological resources. Tourism (e.g. diving, snorkelling) and public access (e.g. picnics) to buffer areas for recreational purposes that are non extractive are permitted. These activities require stringent management systems, codes of conduct and due diligence from all users to ensure the goals of this zone are achieved. All anchoring of any boat (unless in an emergency) on reef associated bottom substrate is prohibited. Anchoring on sand



is permitted.

The boundary for each Buffer Zone has been developed through a consultative process with stakeholders and has been specially designed to accommodate its supporting function of the Core Area. Therefore the sizes of buffer zones vary and include all marine and terrestrial biological and non biological resources enclosed within the boundary. All atoll wide bans and management restrictions detailed in the BACP are applicable to all Buffer Zones.

Appendix 1 provides a visual diagram of each buffer zone associated with the Core Areas.

4.3

Transitional Areas

Transition Areas are defined management areas that provide for long term sustainable resource (biological and non biological) utilisation and livelihood activities (commercial, artisanal and subsistence) whilst ensuring these resources are conserved through an integrated ecosystem management programme. Transitional Areas have a long history of economic and tradition interaction with people and form the basis of communities in Baa Atoll. These areas in their own capacity have ecological significance in terms of marine and terrestrial biodiversity, ecosystem functions and natural value to Baa Atoll. Key management objectives include :

- The balanced maintenance of habitats, ecosystems, species and ecological processes with community livelihood requirements to ensure long term sustainable use and protection of all biological and non biological resources,
- Permit through sustainable management plans the commercial, artisanal and subsistence extraction of biological and non biological resources, and
- Permit public access for educational, cultural, recreational, tourism and livelihood purposes.

Transition Areas are the least restrictive management zone allowing most reasonable uses of biological and non biological resource extraction (commercial, artisanal and subsistence) and use. Table 1 details activities that are allowed within Transition Areas. All activities require management systems, codes of conduct and due diligence from all users to ensure the goals of this zone are achieved. All anchoring of any boat (unless in an emergence) on reef associated bottom substrate is prohibited. Anchoring on sand is permitted.

The Transition Area boundary includes all areas and resources (biological and non biological) within Baa Atoll that are outside Buffer Zones and Core Areas and extends 1 nautical miles from the outer reefs of the atoll. The Transitional Area has been developed through a consultative process with stakeholders and has been specially de-

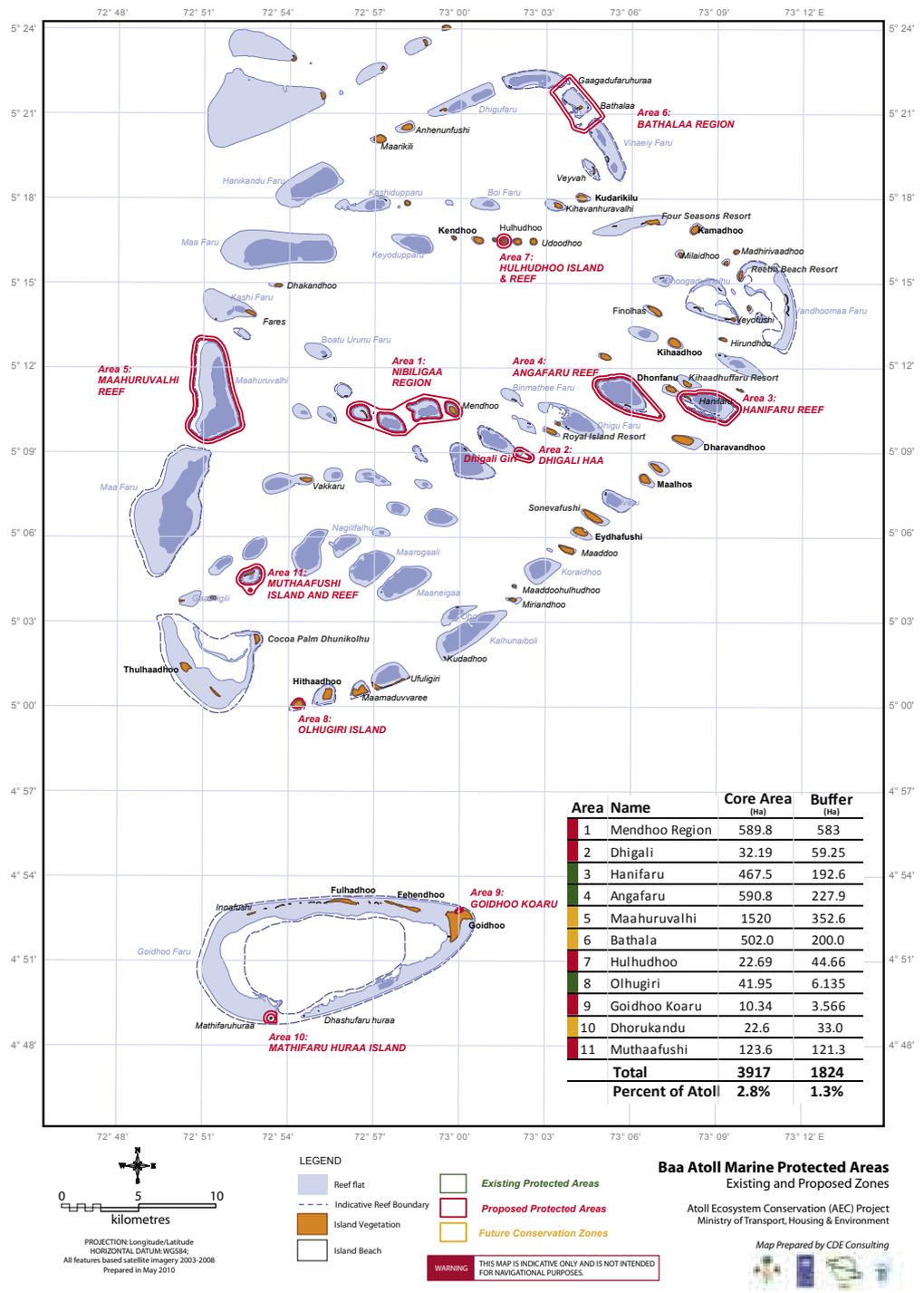
signed to provide supporting functions to the Buffer Zones and Core Area whilst ensuring sustainable livelihood activities can be undertaken. All atoll wide bans and management restrictions detailed in the BACP are applicable to the Transition Area.

Table 2. Summary of Activity Guide for Baa Atoll Zonation System

Activity	Transition Zone	Buffer Zone	Core Area
Tourism/Recreational use Marine: diving, snorkelling	√	√	√
Tourism/Recreational use Terrestrial: picnic, Site seeing	√	√	√
Fishing - trolling pelagic	√	√	X
Fishing tourism - trolling pelagic	√	X	X
Fishing Bottom Line (reef fish)	√	X	X
Fishing - tourism bottom line (reef fish)	√	X	X
Traditional Bait fish collection- Pole and Line – (*Baa atoll boats only)	√	√ * restrictions	X
Fishing gill nets	X	X	X
Fishing finfish breeding aggregation sites	X	X	X
Spear fishing	X	X	X
Destructive fishing (dynamite, chlorine, cyanide)	X	X	X
Anchoring (all boats)	√ * restrictions	√ * restrictions	X
Shell collection – commercial/artisanal	X	X	X
Shell collection – subsistence	√	X	X
Sea cucumber fishery	X	X	X
Shark fishery	X	X	X
Live fish collection – commercial	√ * restrictions	X	X
Aquarium trade (vertebrate and invertebrate) commercial	√ * restrictions	X	X
Lobster fishery – commercial/artisanal/subsistence	√ * restrictions	X	X
Turtle egg/adult harvest - Commercial	X	X	X
Turtle egg/adult harvest - Subsistence	X	X	X
Sea birds & egg harvesting	X	X	X
Sand Extraction Commercial	√ permit	X	X
Sand Extraction Subsistence	√ permit	X	X
Coral Extraction Commercial	√ permit	X	X
Coral Extraction Subsistence	√ permit	X	X

Activity	Transition Zone	Buffer Zone	Core Area
Waste Disposal at sea (boat or shore)	X	X	X
Palm frond Collection	√	√ * restrictions	X
Coconut Collection	√	√ * restrictions	X
Agriculture	√	X	X
Aquaculture	√	X	X

Figures 2. A map of Baa atoll including the Core Area, Buffer Zones and Transitional Areas.







4.4

Atoll Wide Resource Bans

Atoll Wide Resource Bans have been incorporated into the Baa Atoll Conservation Programme (BACP) to ensure unsustainable resource (biological and non-biological) extraction activities are prohibited. Adherence to these bans will provide (medium to long term) a mechanism that prevents further population decline and degradation of these resources. Thus providing an environment conducive to ensure biological resource populations mature, reproduce and repopulate the environs of Baa Atoll and non biological resources are sustainably managed.

The majority of AWRB are existing national regulations and are directly related to unsustainable commercial resource exploitation. All AWRB should be regularly reviewed and mechanisms should be in place to ensure monitoring programmes are developed and the status of a resource ban can be altered. Changes in the status of a resource ban will need to be based on scientific data and developed with key stakeholder participation.

Further development of a legislative framework that can incorporate additional unsustainable resource extraction activities and methodologies to manage these actions is required. Increased public awareness, acceptance and enforcement protocols are required to ensure these Bans are fully acknowledged and implemented.

Table 2: Atoll Wide Resource Bans.

Atoll Wide Ban	Rationale
Destructive Fishing Practises (e.g. Dynamite, Chlorine, Cyanide)	<ul style="list-style-type: none">● The use of these destructive fishing techniques is illegal in the Maldives and therefore should be specifically banned in Baa Atoll. These fishing methods are extremely detrimental to the all living organisms, alter the abiotic structural complexity of reefs and negatively affect the long term ecosystem functions of a reef.

Atoll Wide Ban	Rationale
Destructive Vessel Practises (Anchoring)	<ul style="list-style-type: none"> ● Enforce the regulations that ban the dumping of garbage (solid and liquid) into the waters of Baa atoll from all vessels (local and tourism) within 1 nautical miles from land. ● Increased awareness programmes associated with convenient and practical dumping options must be developed to ensure compliance. Penalties should be considered for offences. This programme should be an integral component of Baa Atolls waste/garbage land use management plan.
Unsustainable Fishing Practices (e.g. Gill nets, spear fishing)	<ul style="list-style-type: none"> ● Commercial uses of gill nets although not illegal under the current fisheries legislation are a non selective fishing gear and therefore are an unsustainable fishing practise. Commercial use of larger mesh nets in Baa atoll is predominately used to fish for sharks (surface, mid water or bottom) whilst smaller mesh nets are used to capture (semi commercial and subsistence) a wide range of reef finfish, especially those that undertake tidal, daily and/or seasonal migrations. The use of gill nets should be banned and alternative sustainable fishing gears/methods adopted. ● The national legislation prohibiting the use of spear guns and “slings” should be enforced. Hand held “slings” are used in Baa atoll to target reef fish by a number of fishermen for small scale commercial fishing and subsistence purposes.
Shark Fishing	<ul style="list-style-type: none"> ● Commercial species of sea cucumbers have been heavily exploited in the recent past in Baa Atoll resulting in extremely low stock populations of all commercial species. A total ban on all commercial and subsistence extraction of sea cucumbers must be implemented to prevent total stock population depletion and allow natural stock recovery. ● Through specific stock population assessments (e.g. every 2-3 years) this ban should be reviewed. Through adherence to appropriate management plans the commercial exploitation of sea cucumbers can be a sustainable fishery.
Turtle and Turtle Egg Harvesting	<ul style="list-style-type: none"> ● All species of turtles are listed under the IUCN Red List of Threatened Species and the their IUCN status are; Critically Endangered Eretmochelys imbricata - Hawksbill turtle & Dermochelys coriacea - Leatherback turtle; Endangered Chelonia mydas - Green turtle & Caretta caretta - Loggerhead turtle and Vulnerable Lepidochelys olivacea- Olive Ridley turtle. ● The commercial and artisanal capture of all species of turtles (mature and juvenile) and the collection of their eggs is unsustainable. Resulting in stock population declines and therefore all capture activities should be prohibited. ● The long term ban on the commercial and artisanal collection of turtles and turtle eggs must be implemented to ensure the long term survival of each turtle species population, the safeguarding of critical habitats (marine and terrestrial) and ensure sustained recovery of depleted stocks. ● Compliance to the national legislation prohibiting the collection of turtles should be enforced.

Atoll Wide Ban	Rationale
Fishing Finfish Aggregation Sites	<ul style="list-style-type: none"> ● The commercial (live reef fish trade), artisanal and subsistence extraction of commercially valuable marine finfish species (live fish trade, fresh or frozen) during their seasonal/annual spawning aggregation is unsustainable. Resulting in large stock population declines in all finfish species targeted. Therefore all fishing activities undertaken on aggregations sites should be prohibited. This includes the groupers (Serranidae) including <i>Plectropomus</i> sp., <i>Epinephelus</i> sp., <i>Variola</i> sp., <i>Cephalopholus</i> sp., the Napoleon fish (<i>Cheilinus undulatus</i>) and a large number of emperors (Lethrinidae) and snappers (Lutjanidae). ● Currently specific temporal and spatial data on species aggregation sites are being investigated (MRC). Once data is attained an atoll wide and specific species management plan will be developed to ensure the long term management of these finfish species.
Seabird Disturbance and Harvesting.	<ul style="list-style-type: none"> ● Baa Atoll supports a number of sea bird species roosting and nesting sites located on the atoll's sand cays and vegetated islands. Several of these sites are unique to the Maldives (e.g. frigate bird roosting sites on Olhughiri Island). Past island and sand cay development and usage patterns has dramatically increased the disturbance and degradation of these terrestrial sites. Resulting in sea bird colonies abandoning breeding and nesting sites and a significant decrease in sea bird populations. ● Increased rat populations on bird nesting islands have contributed significantly to the decrease in hatching survival and the bird populations. In addition, the capture of birds for pets (e.g. frigate) needs to be addressed. ● Specific management protocols must be implemented to ensure the long term survival of each bird species population and the safeguarding of critical habitats (roosting and nesting) to ensure sustained recovery of depleted stocks.
The capture of Marine Mega Fauna	<ul style="list-style-type: none"> ● Baa atoll has globally significant stocks of Whale sharks (<i>Rhincodon typus</i>) and Manta rays (<i>Manta birostris</i>). Both species are listed under the IUCN Red List of Threatened Species with whale sharks registered as "vulnerable" and manta rays registered as "Near Threatened". ● The commercial capture of Whale sharks and Manta rays for the international shark fin trade is unsustainable and traditional capture of whale sharks for oil is no longer required and therefore the capture of these animals should be prohibited. ● Specific management protocols and codes of practises must be implemented to ensure the long term survival of these species population and the safeguarding of critical habitats (e.g. Hanifarufu feeding site) to ensure sustained maintenance of current stock populations.

Atoll Wide Ban	Rationale
Collection of wild Resources for the “Curio Trade”	<ul style="list-style-type: none"> ● The extraction or capture of reef associated resources (e.g. Mollusc shells, turtle shells, black coral) from the wild for commercial enterprise by Baa atoll residents, resort operators or tourist for the “curio or trinket tourist market” is an unsustainable practise and should be prohibited. The tourist industry in Baa atoll (resorts and safari vessels) needs to continue to enforce a ‘look, no touch, no take” policy and extend this policy to the purchase of local resource products. ● All resources used for commercial purposes (large or small operations) must be managed to ensure the long term economic and environmental sustainability of the enterprise. ● Products cultured or sustainably harvested through a permitting process based on a sustainable management plan should be further developed and supported by the local resort operators and guests (e.g. cultured pearl oyster products, handicrafts).
Mangroves	<ul style="list-style-type: none"> ● Mangrove trees and forest are rare in the Maldives with several small but significant forest located with Baa atoll (e.g. Goidhoo and Olhughiri islands). They are important for ecosystem biodiversity and function (e.g. support nursery grounds) and physical protection of islands and communities. ● The harvesting of Mangrove trees for wood and other purposes is an unsustainable practise and should be prohibited. ● Specific management protocols must be implemented to ensure the long term ecosystem function of each mangrove forest including consideration for small scale replanting options and the safeguarding of critical habitats to ensure sustained recovery and long term survival of these habitats.

There are a number of anthropogenic activities undertaken within Baa atoll that are detrimental to the long term sustainability of the atolls biodiversity however are important community development necessities to ensure the communities of Baa atoll's well being, health and prosperity are maintained and developed. Therefore increased protection through enhanced management protocols through government regulated permits supported by appropriate laws and legislation are required to sustainably address these issues. This includes but not limited to :

Atoll Wide Ban	Rationale
Live Rock and Coral Collection	<ul style="list-style-type: none"> ● The large scale and/or commercial removal of live rock or living coral for any purpose alters and degrades the biodiversity of the reef, its ecological systems and reduces the ability of the reefs structural integrity and physical resilience to natural and man made events. Similarly small scale physical removal of live rock and coral has the same affects except on a smaller scale. ● Therefore the remove of live rock and/or coral is detrimental to the reef biological and non biological processes and will degrade reef systems and its biodiversity. ● However under certain circumstances the removal of live rock and coral (large or small scale) are unavoidable and are important requirements for the long term sustainable development of Baa atoll (e.g. harbour). ● Therefore the removal of live rock and coral must be carefully managed on an individual basis through a strict permitting process utilising best practises to reduce and possibly mitigate all negative impacts. The adherence and enforcement of the nation's laws and regulations associated with these activities should be fully adopted and implemented.
Sand Dredging and/or Mining	<ul style="list-style-type: none"> ● The large scale and/or commercial extraction of sand from beaches, islands and the lagoon and its associated environmental issues (e.g. suspended sediments) for any purpose alters and degrades the biodiversity of the habitat, its ecological system functions and can reduces the ability of the islands and reefs structural integrity and physical resilience to natural and man made events. Sand removed from beaches and vegetated islands have the potential for larger impacts on the environment and biodiversity than those extracted from lagoon floors. Similarly small scale physical removal of sand has the same affects except on a smaller scale. ● Therefore the remove of sand is detrimental to island and reef natural processes and is detrimental to the biodiversity of these systems. ● However under certain circumstances the extraction and need for sand is unavoidable for communities living in remote atoll systems and therefore is an important requirement for the long term sustainable development of Baa atoll. ● Sand replenishment is constantly renewed through natural processes (considerably faster than coral) and therefore is a renewable resource. The controlled extraction of sand must be carefully managed on an individual basis through a strict permitting process whilst implementing best codes of practises that minimise and/or mitigate negative impacts. Adherence and enforcement of the nation's laws and regulations associated with these activities should be fully adopted and implemented.

In addition to the above there are a number of commercial and artisanal anthropogenic activities that are undertaken within Baa atoll that may need additional management protocols developed, however there are insufficient data currently available to determine the current status of the resources and the threats. These include;

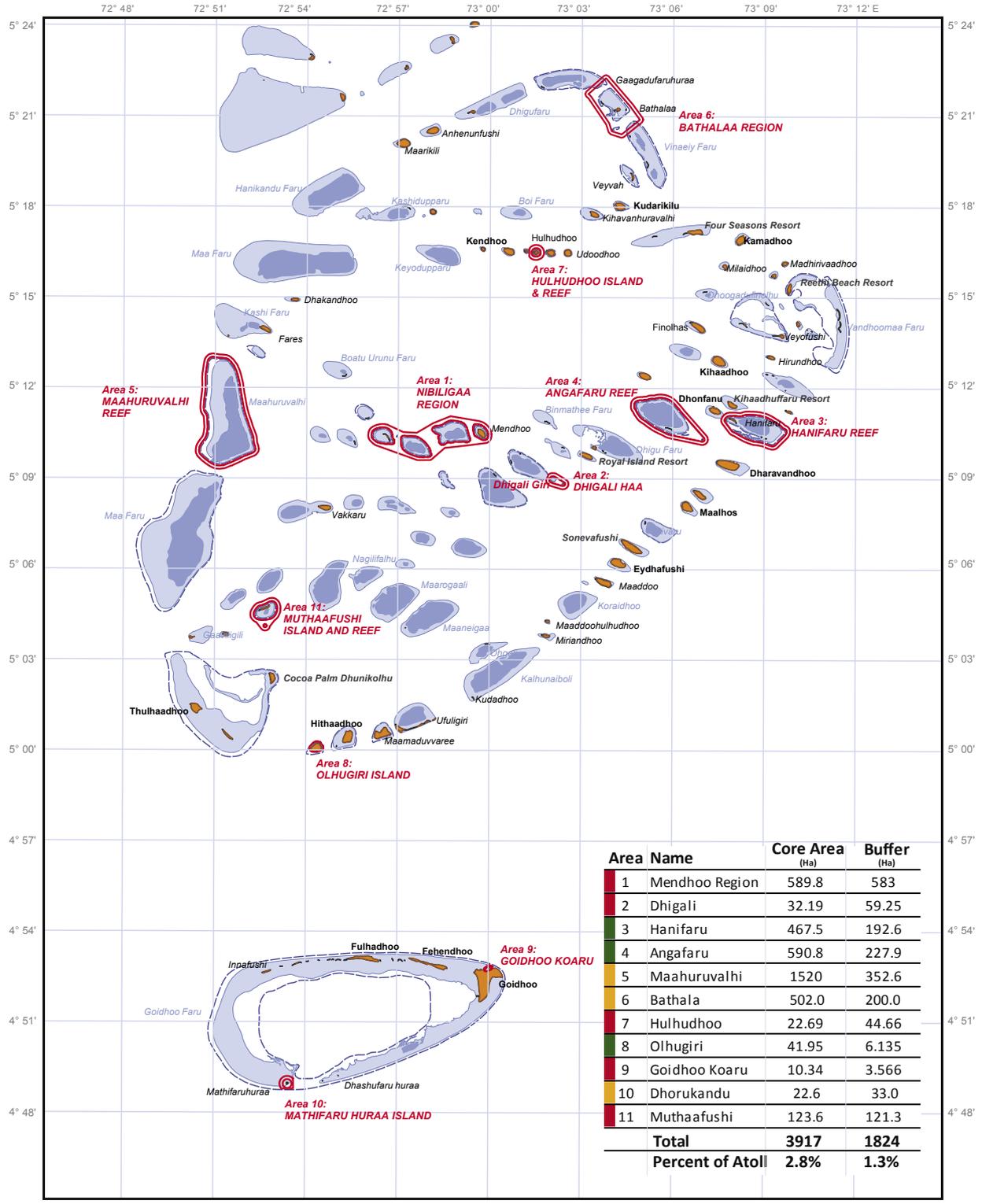
Atoll Wide Ban	Rationale
Lobsters (crayfish)	<ul style="list-style-type: none"> ● These animals are commercially harvested for the live food trade associated with resorts in Baa atoll and neighbouring atolls (e.g. north Male atoll). A specific marine assessment detailing current stock populations of each commercially harvested species and consumption rate of the resorts is required.
Bait Collection	<ul style="list-style-type: none"> ● The commercial collection of a range of bait fish species for use associated with Baa atolls “pole and line” tuna fishery has and remains an important livelihood for the communities of Baa. Access to fish stocks throughout the atoll is important however management protocols need to be considered to ensure fish stock populations and the reef associated environments remain healthy. Anecdotal information indicates that bait fish populations have decreased in Baa, the exact cause of this is unknown and is most likely a combination of environmental degradation and fishing activities. ● A range of fishing methods are used to capture bait fish some of which should be reviewed and management protocols developed to ensure bait fish stock populations are not over exploited. In particular the use of large lights to attract fish and the use of anchors which cause physical damage to the reef reducing structural complexity of the reef directly reducing habitat for bait fish and other marine organisms. ● The development of management plans that ensure all users of resources are accommodated would ensure the development of this industry without being detrimental to the goals of the atolls long term sustained development. MRC as part of its 2010-2011 work program will develop a number of management guidelines to ensure this industry is developed sustainably. These guidelines should be accessed and relevant sections incorporated into the Baa Atolls management plan.
Aquarium Fish Collection	<p>The commercial collection and subsequent export of aquarium fish and invertebrates can contribute considerable revenue to the economic prosperity of Baa atoll and the nation. The industry is in its infancy in Baa atoll and justifiable concerns have been raised to the long term sustainability of this industry, which animal it should and should not allowed to extract, the potential economic conflicts with other current economic generating livelihood and incomes in Baa (e.g. tourist diving and snorkelling) and perceived global ramifications associated with the Maldivian world tourist destination.</p> <p>Further assessments and stakeholder discussions need to be undertaken to delineate the development of this industry. Irrespective of the out come of these debates and consultation the marine aquarium trade if undertaken professionally, in accordance with national laws and codes of best practises by responsible company's economic returns appear profitable.</p> <p>The development of management plans that ensure all users of resources are accommodated would ensure the development of this industry without being detrimental to the goals of the atolls long term sustained development. MRC as part of its 2010-2011 work program will develop a number of management guidelines to ensure this industry is developed sustainably. These guidelines should be accessed and relevant sections incorporated into the Baa Atolls management plan.</p>

A close-up photograph of a fish, likely a species of surgeonfish or damselfish, characterized by its vibrant red and white horizontal stripes. The fish has a large, prominent eye and a long, pointed snout. Its dorsal fin is highly spiny and extends along its back. The background is a blurred, natural underwater environment with green and brown tones.

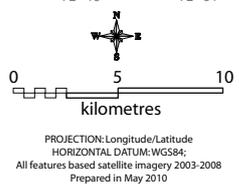
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APPENDICES

Appendix 1. Diagrams of each Core Area and its corresponding Buffer Zone.

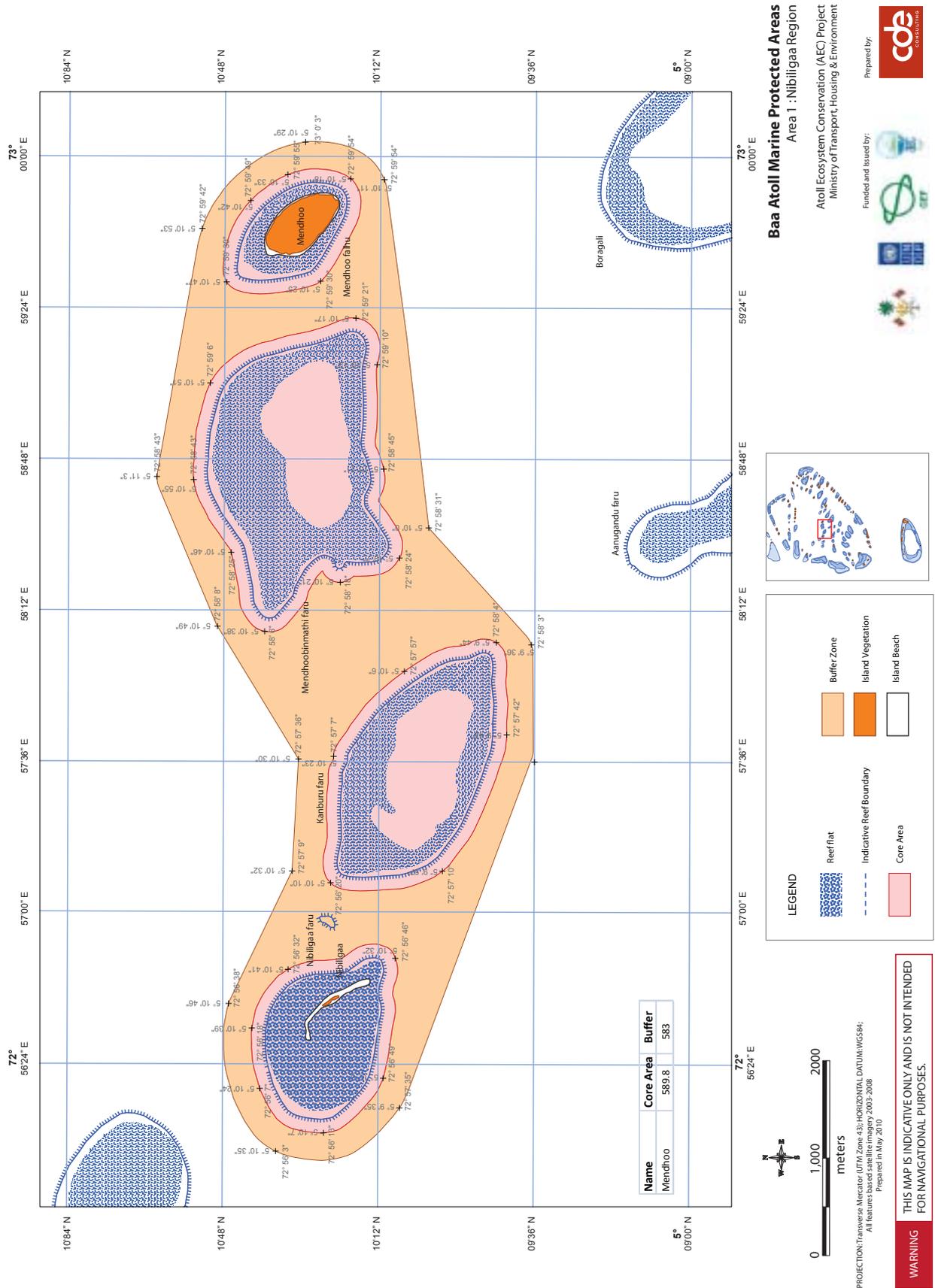


Appendix 1. Zonation System for the Baa Atoll Plan of Management



Baa Atoll Marine Protected Areas
Existing and Proposed Zones
Atoll Ecosystem Conservation (AEC) Project
Ministry of Transport, Housing & Environment
Map Prepared by CDE Consulting

Core Area 1. Nibiligaa Region



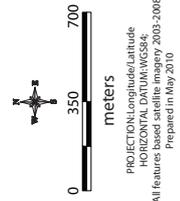
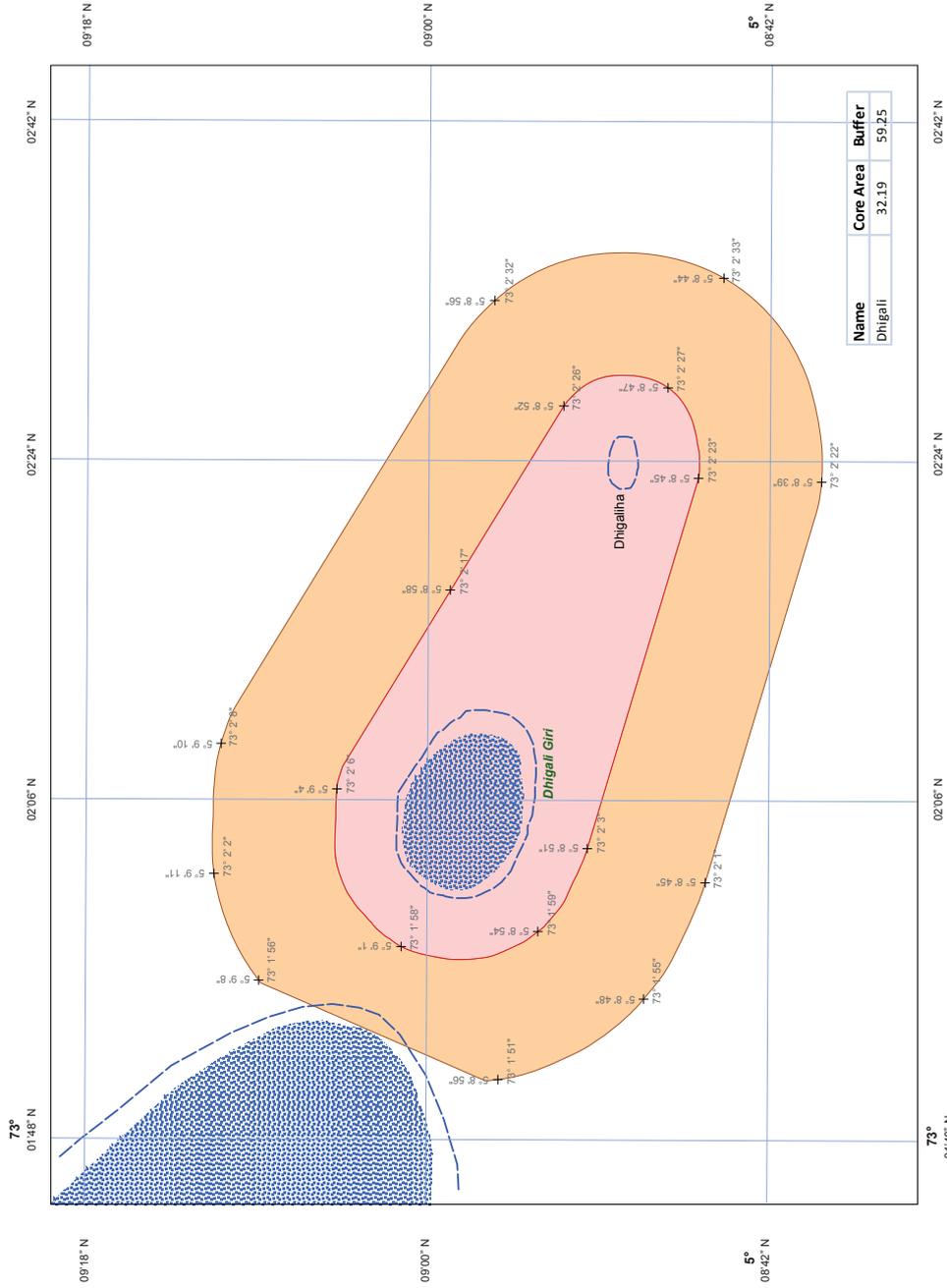
Baa Atoll Marine Protected Areas Area 1: Nibiligaa Region

Atoll Ecosystem Conservation (AEC) Project
Ministry of Transport, Housing & Environment



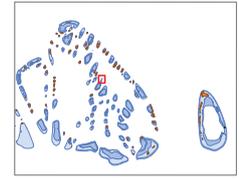
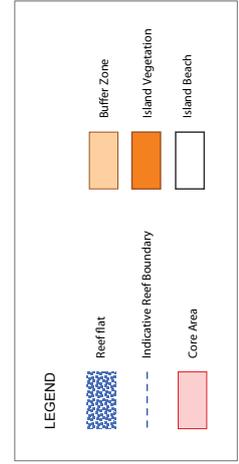
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Core Area 2. Dhigaliha Region



PROJECTION: Longitude/Latitude
HORIZONTAL DATUM: WGS84
All features based on satellite imagery 2003-2008
Prepared in May 2010

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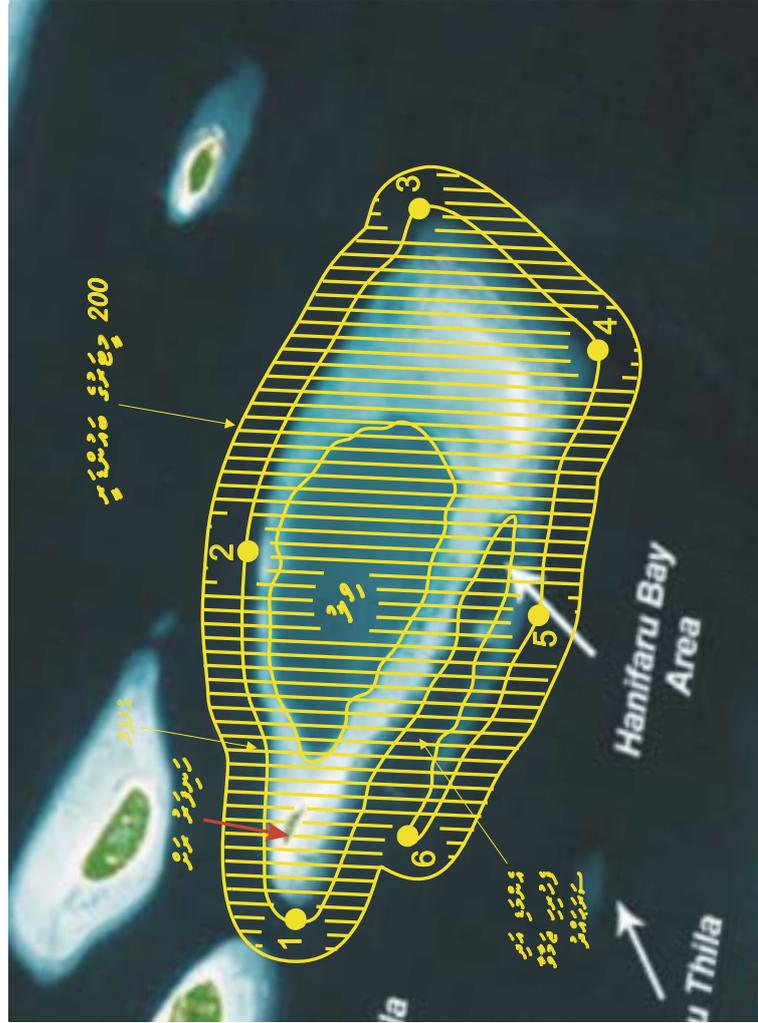
Baa Atoll Marine Protected Areas
Area 2 : Dhigaliha Region

Atoll Ecosystem Conservation (AEC) Project
Ministry of Transport, Housing & Environment

Funded and issued by:

Prepared by:

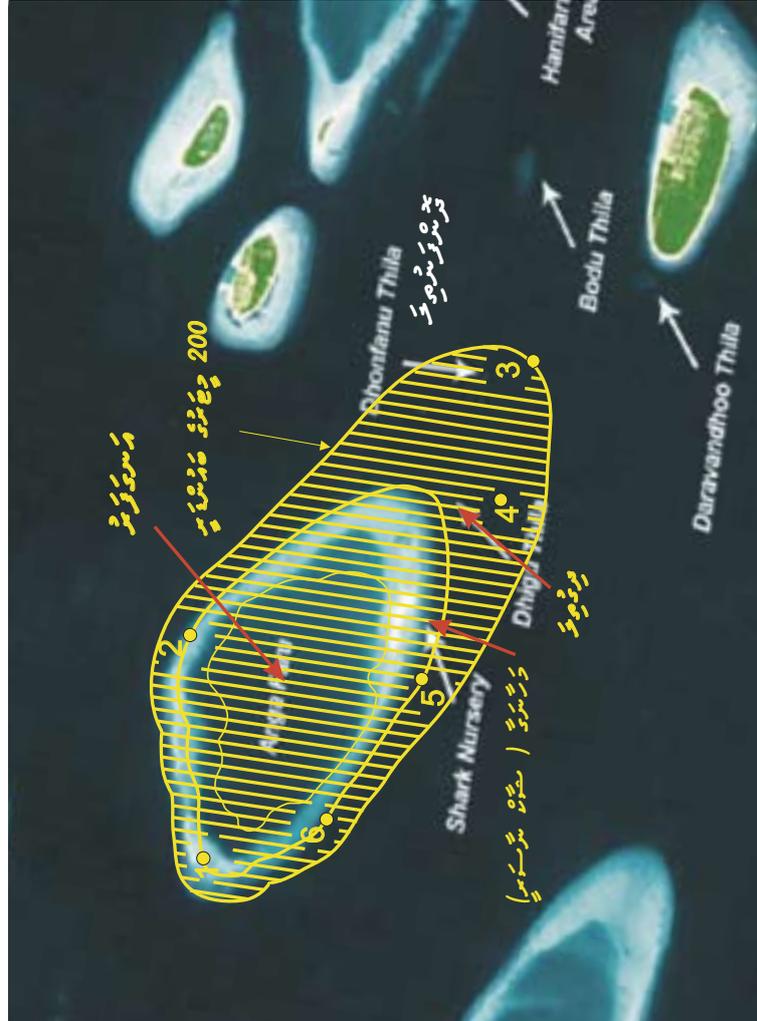
Core Area 3. Hanifaru Region



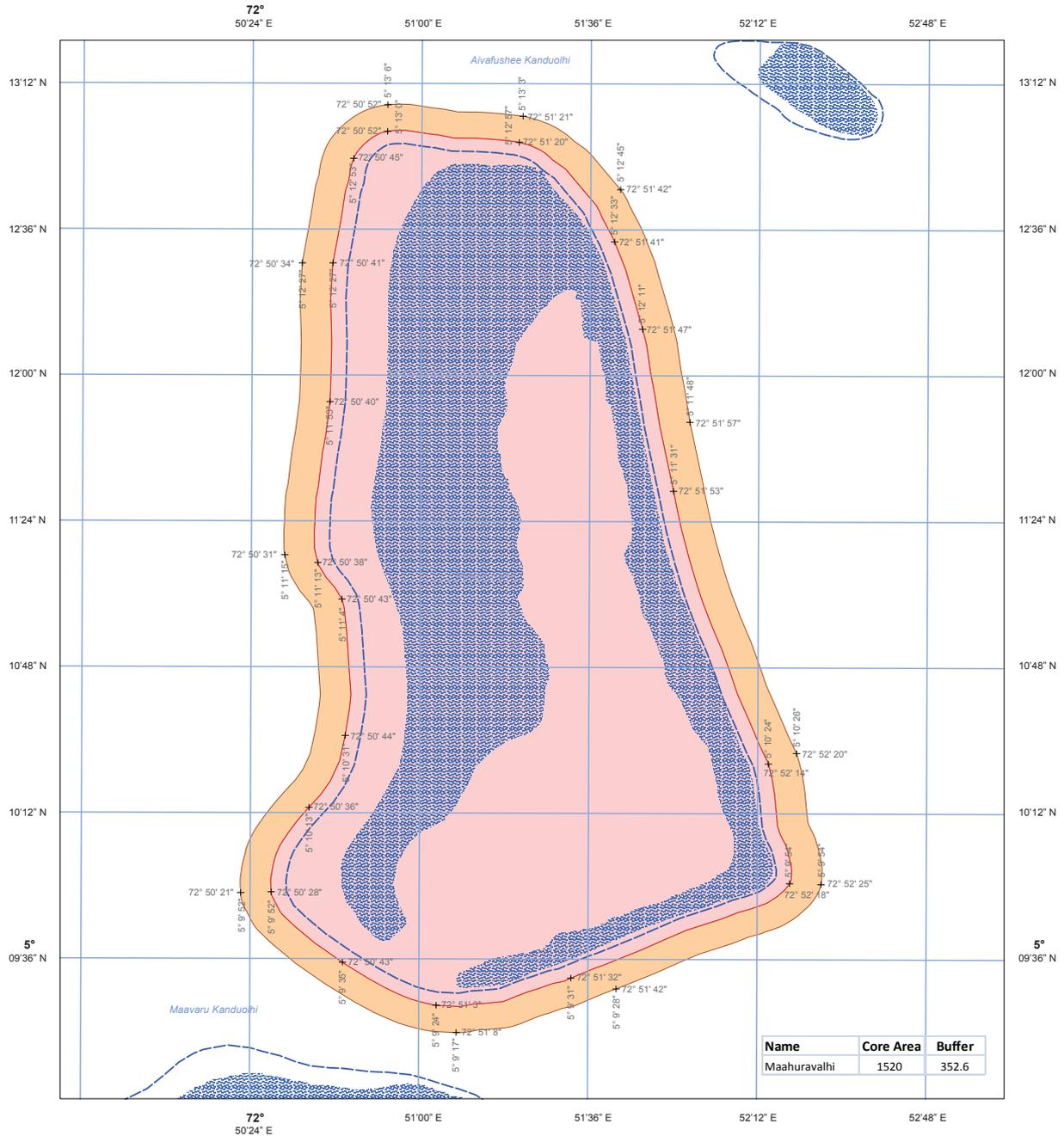
1. 5 10' 58.18"N, 73 07' 46.53"E
2. 5 11' 03.33"N, 73 08' 46.54"E
3. 5 10' 33.64"N, 73 09' 40.81"E
4. 5 10' 09.15"N, 73 09' 16.10"E
5. 5 10' 18.78"N, 73 08' 36.88"E
6. 5 11' 36.63"N, 73 08' 00.84"E

Core Area 4. Angafaru Region

1. 5 11' 30.16"N, 73 04' 48.71"E
2. 5 11' 38.87"N, 73 05' 44.65"E
3. 5 10' 18.50"N, 73 06' 57.48"E
4. 5 10' 18.20"N, 73 06' 26.58"E
5. 5 10' 37.50"N, 73 05' 38.17"E
6. 5 11' 05.84"N, 73 04' 58.82"E



Core Area 5. Mahuravalhi Reef Region



PROJECTION: Transverse Mercator (UTM Zone 43); HORIZONTAL DATUM: WGS84;
 All features based satellite imagery 2003-2008
 Prepared in May 2010

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LEGEND

- Reef flat
- Indicative Reef Boundary
- Core Area
- Buffer Zone
- Island Vegetation
- Island Beach

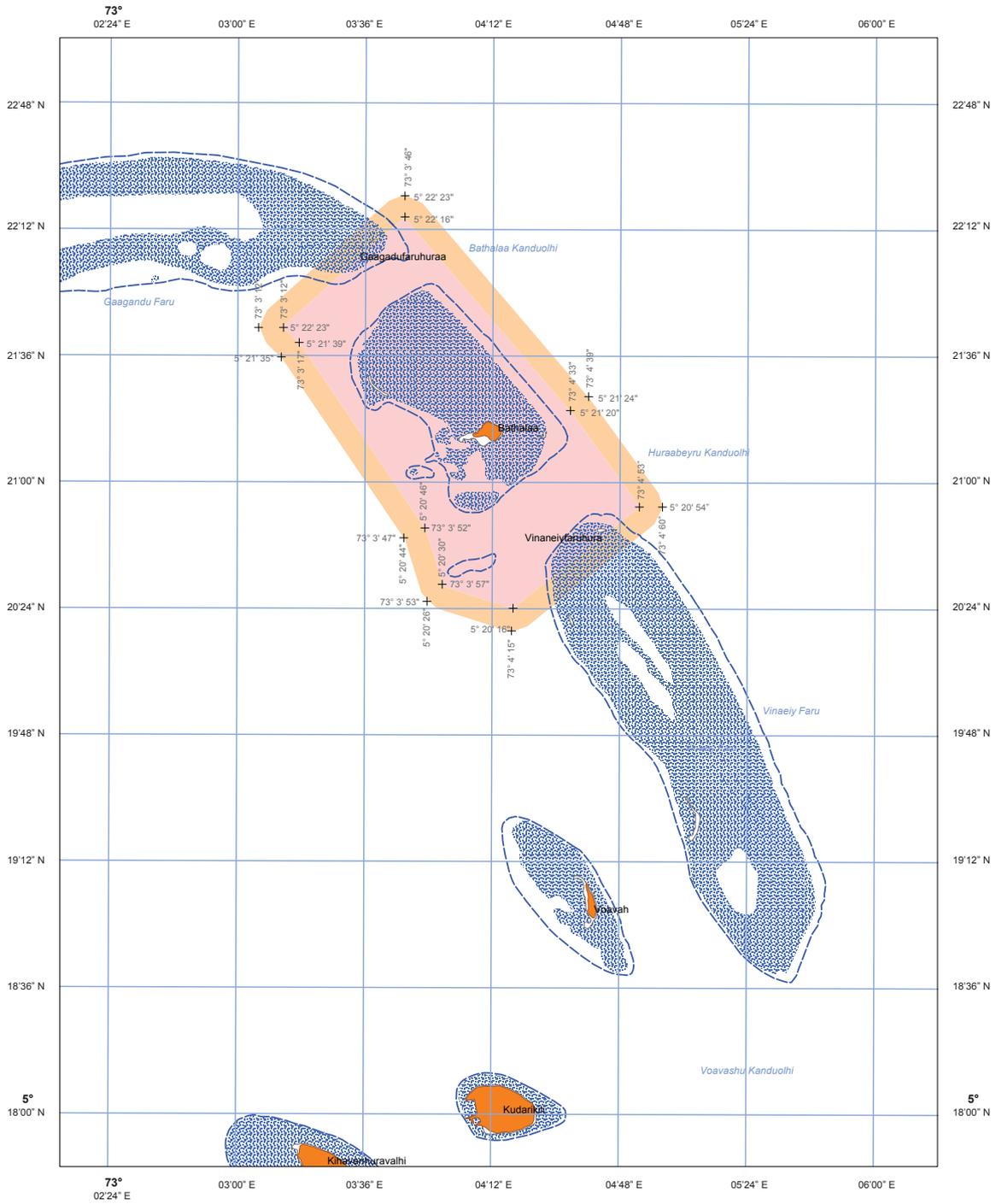
Baa Atoll Marine Protected Areas
 Area 5 : Mahuravalhi Reef Region

Atoll Ecosystem Conservation (AEC) Project
 Ministry of Transport, Housing & Environment

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Core Area 6. Bathalaa Region

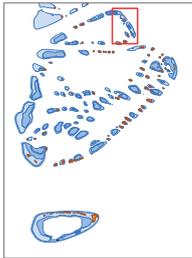


PROJECTION: Transverse Mercator (UTM Zone 43); HORIZONTAL DATUM: WGS84;
 All features based satellite imagery 2003-2008
 Prepared in May 2010

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LEGEND

- Reef flat
- Indicative Reef Boundary
- Core Area
- Buffer Zone
- Island Vegetation
- Island Beach



Baa Atoll Marine Protected Areas Area 6 : Bathalaa Region

Atoll Ecosystem Conservation (AEC) Project
 Ministry of Transport, Housing & Environment

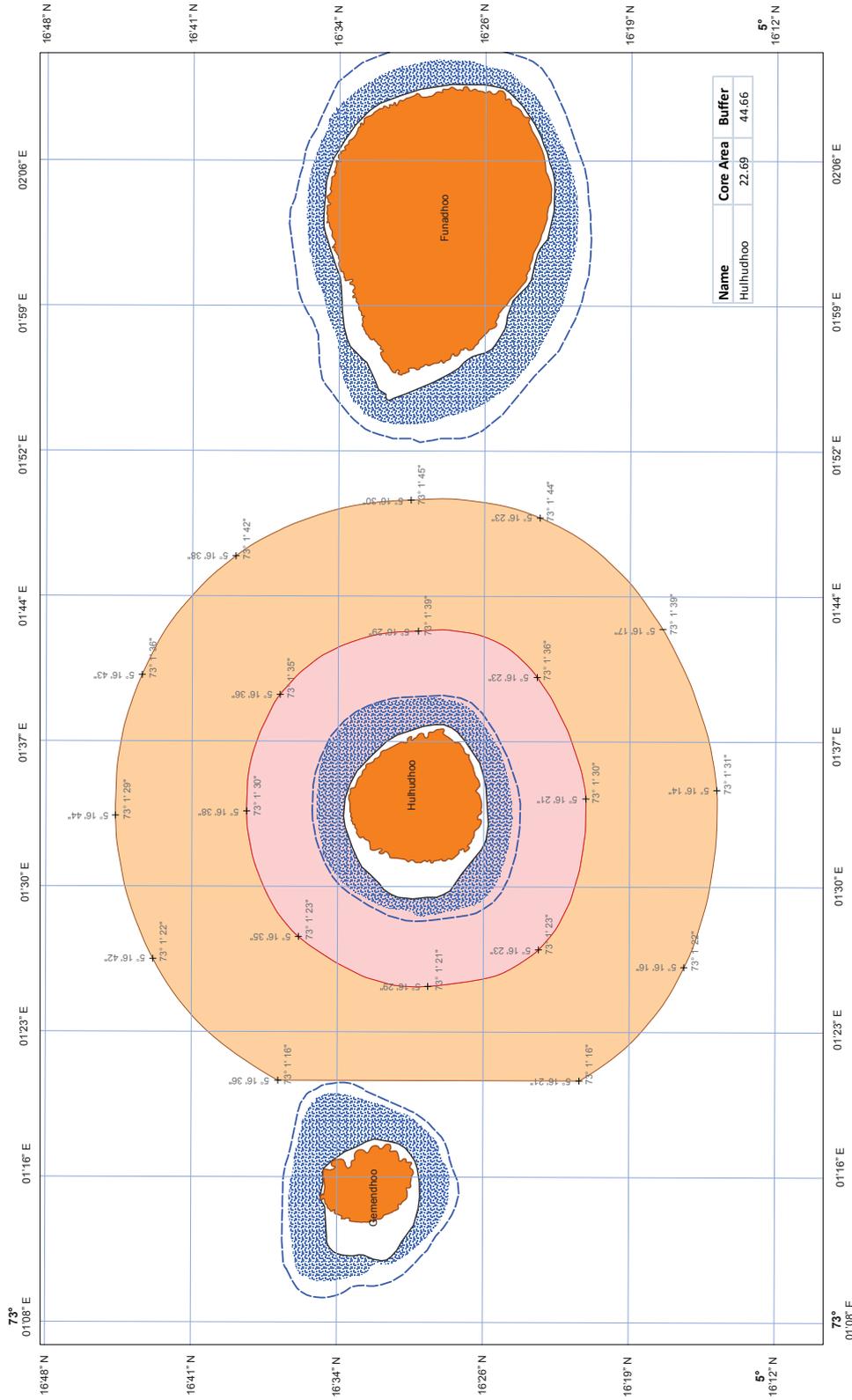
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Core Area 7. Hulhudhoo Island and Reef.

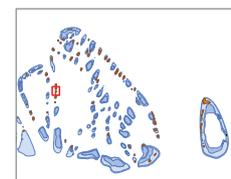


Baa Atoll Marine Protected Areas
 Area 7: Hulhudhoo Island and Reef

Atoll Ecosystem Conservation (AEC) Project
 Ministry of Transport, Housing & Environment

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LEGEND

- Reefflat
- Indicative Reef Boundary
- Core Area
- Buffer Zone
- Island Vegetation
- Island Beach

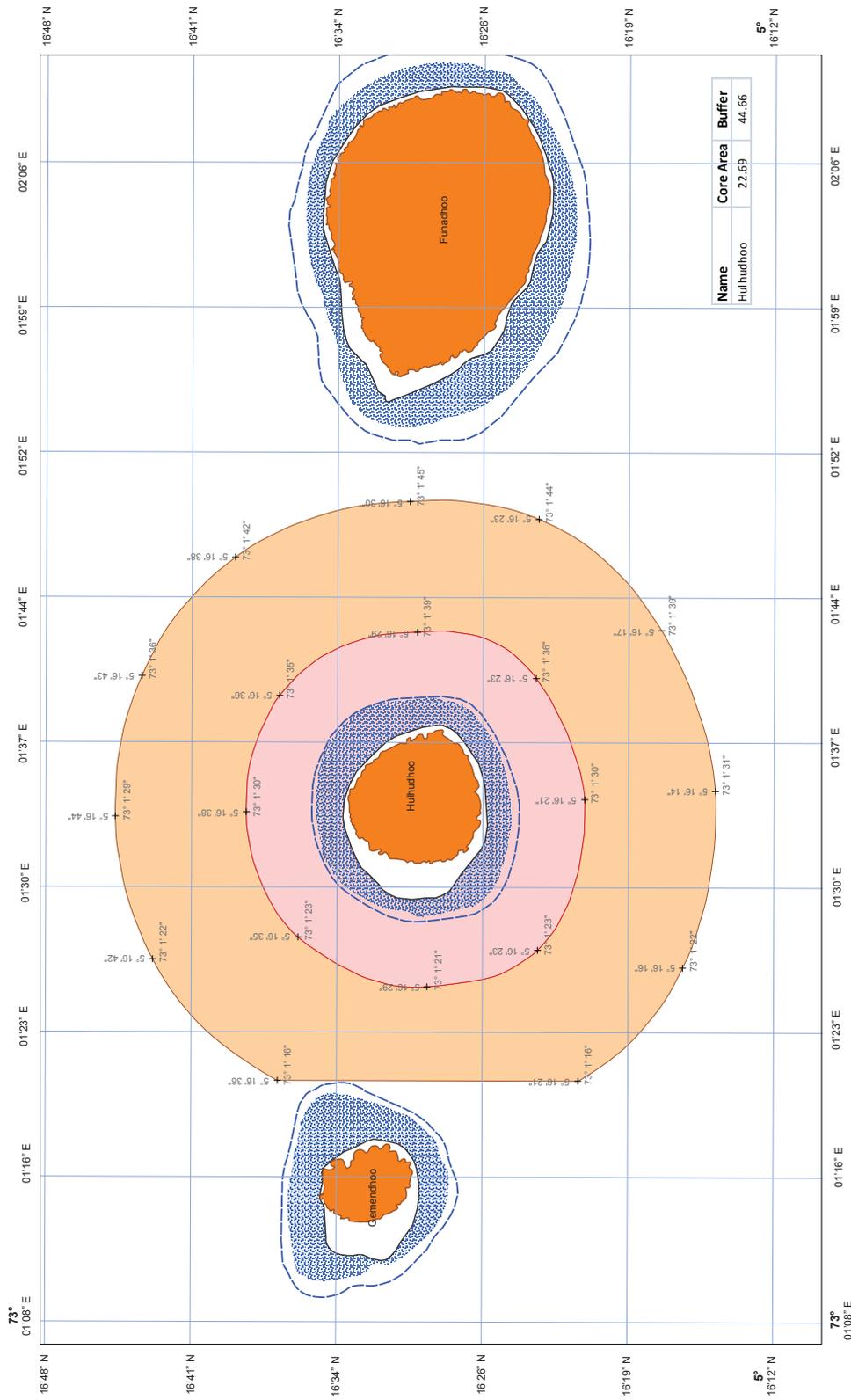
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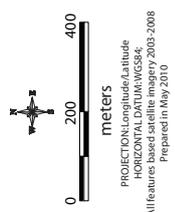
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PROJECTION: Longitude/Latitude
 HORIZONTAL DATUM: WGS84
 All features based satellite imagery 2003-2008
 Prepared in May 2010

Core Area 8. Olhughiri Island



Name	Core Area	Buffer
Hulhudhoo	22.69	44.66



LEGEND

- Reef flat
- Indicative Reef Boundary
- Core Area
- Buffer Zone
- Island Vegetation
- Island Beach



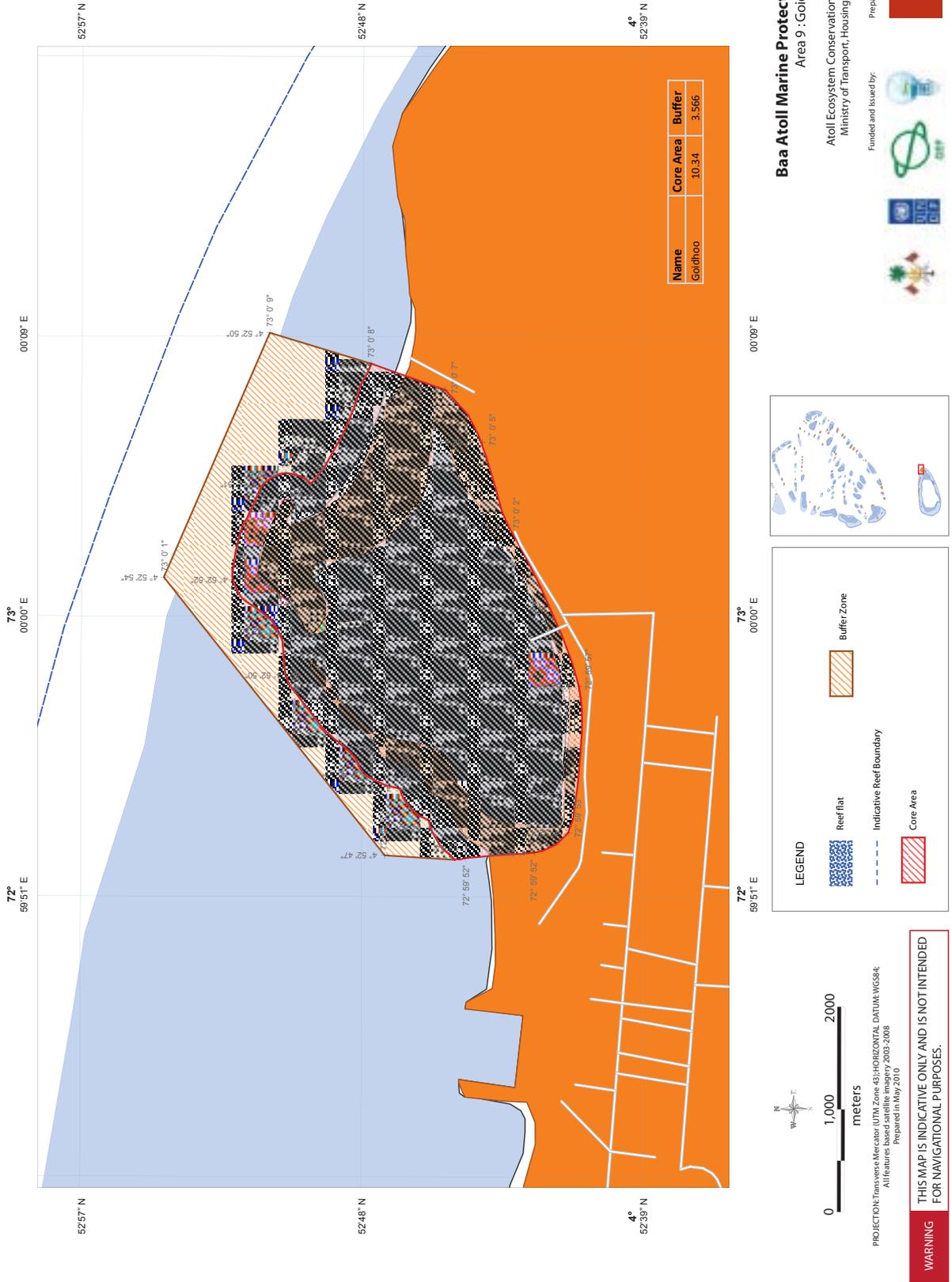
Baa Atoll Marine Protected Areas
Area 7: Hulhudhoo Island and Reef

Atoll Ecosystem Conservation (AEC) Project
Ministry of Transport, Housing & Environment

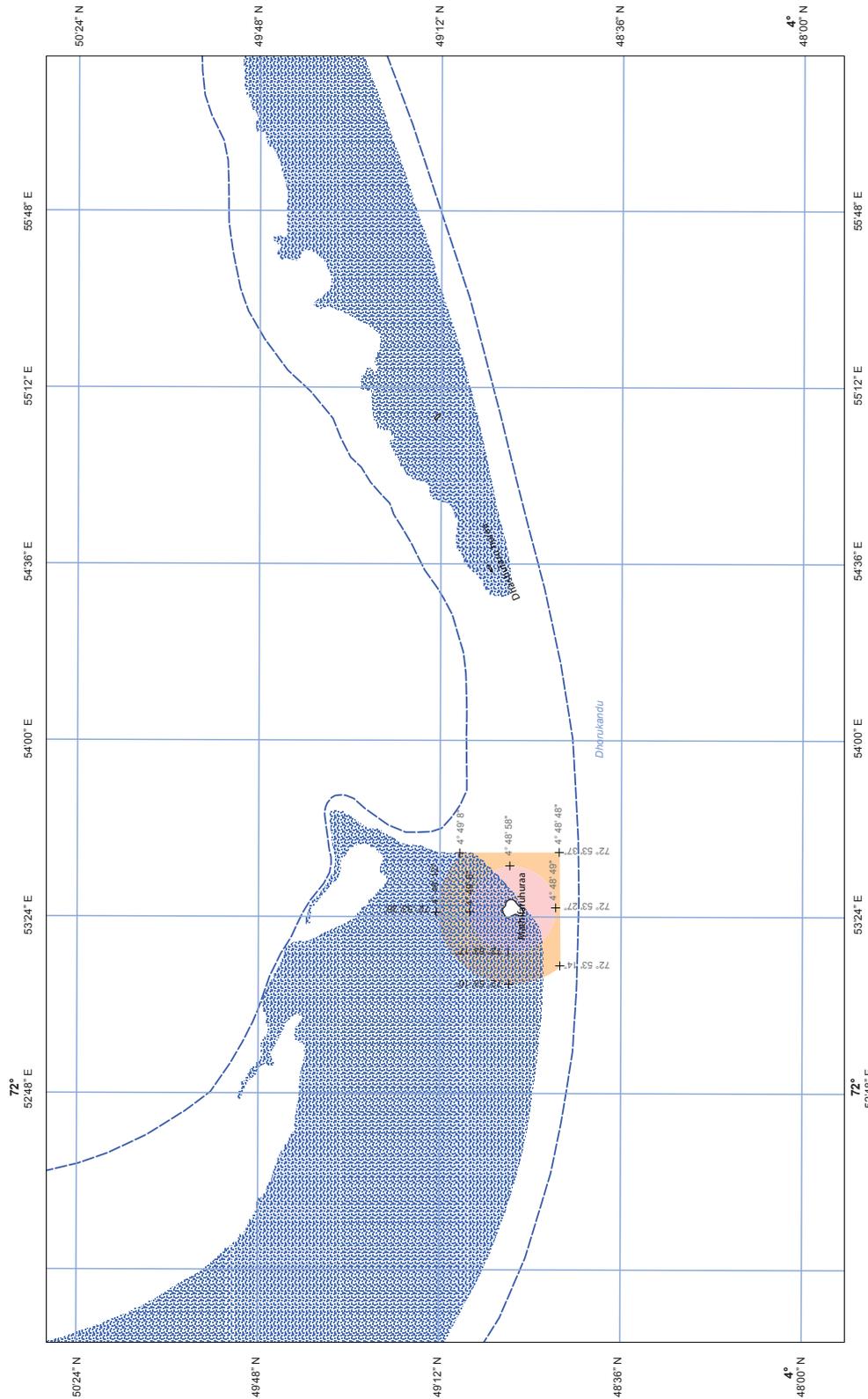


WARNING
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Core Area 9. Goidhoo Koaru



Core Area 10. Mathifaru Huraa Island



LEGEND

- Reef flat
- Indicative Reef Boundary
- Core Area
- Buffer Zone
- Island/Vegetation
- Island Beach

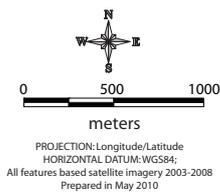
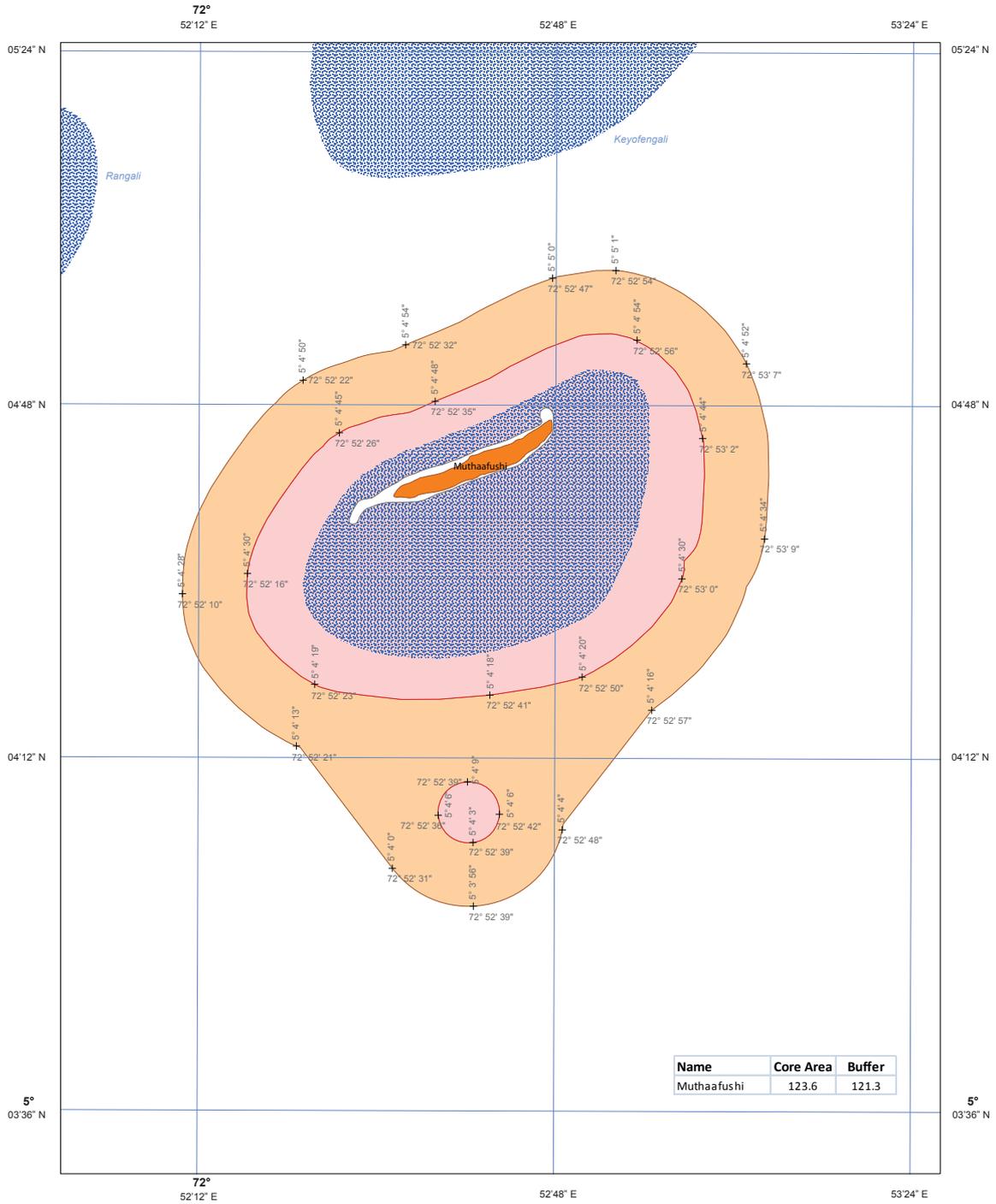
Baa Atoll Marine Protected Areas
Area 10: Mathifaru Huraa Island
Atoll Ecosystem Conservation (AEC) Project
Ministry of Transport, Housing & Environment



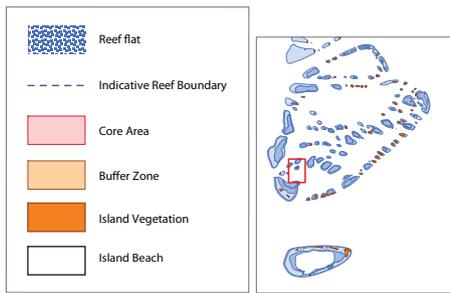
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THIS MAP IS INDICATIVE ONLY AND IS NOT INTENDED FOR NAVIGATIONAL PURPOSES.

PROJECTION: Transverse Mercator (UTM Zone 43) HORIZONTAL DATUM: WGS84
All features based satellite imagery 2003-2008
Prepared in May 2010

Core Area 11. Muthafushi Island and Reef



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Baa Atoll Marine Protected Areas Area 11 : Muthafushi Island and Reef

Atoll Ecosystem Conservation (AEC) Project
 Ministry of Transport, Housing & Environment

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Zonation System for the Baa Atoll Plan of Management

**Zonation System for the
Baa Atoll
Plan of Management**