

Valuing Biodiversity

The economic case for biodiversity
conservation in the

Maldives



Report produced for
Atoll Ecosystem Conservation (AEC) Project by IUCN

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Lucy Emerton, Saima Baig, Marie Saleem

April 2009

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List of Acronyms

ADB	Asian Development Bank
AEC	Atoll Ecosystem Conservation Project
EEZ	Exclusive Economic Zone
GDP	Gross Domestic Product
GEF	Global Environment Facility
IFC	International Finance Corporation
IUCN	International Union for the Conservation of Nature
MCS	Maldives Customs Service
MEEW	Ministry of Environment, Energy and Water (now Ministry of Housing, Transport and Environment)
MFAMR	Ministry of Fisheries, Agriculture and Marine Resources (now Ministry of Fisheries and Agriculture)
MFT	Ministry of Finance and Treasury
MHAHE	Ministry of Home Affairs, Housing and Environment
MIFCO	Maldives Industrial Fishing Company Ltd.
MPA	Marine Protected Area
MPND	Ministry of Planning and National Development (Department of National Planning)
MTCA	Ministry of Tourism and Civil Aviation (now Ministry of Tourism, Arts and Culture)
NBSAP	National Biodiversity Strategy and Action Plan
NDMC	National Disaster Management Centre
NDP	National Development Plan
NEAP	National Environment Action Plan
ODA	Overseas Development Assistance
Rf	Rufiyaa (US\$ 1 = Rf 12.75)
UNDP	United Nations Development Programme
WTTC	World Travel and Tourism Council

Foreword by the President

The Maldives enjoys some of the richest marine biodiversity anywhere in the world. The country's coral reefs are the seventh largest in the world, representing some 5% of the global reef area. Our 21,000 square kilometers of reefs are home to 250 species of coral, which teem with over 1,000 species of fish.

The Maldives' unique environment is the bedrock of our economy. Fisheries and tourism, our two largest industries, are heavily dependent on a healthy and diverse marine ecosystem. Together, these two industries provide three quarters of our jobs, 90% of our GDP and two thirds of our foreign exchange earnings. Moreover, healthy coral reefs help protect our islands from natural disasters and guard against the adverse affects of climate change.

In recent years, however, we have tended to neglect our natural environment, placing our long-term economic and environmental health in jeopardy. Biodiversity has often been taken for granted and environmental damage dismissed as a price worth paying for short-term profits.

This important and timely study demonstrates that the protection of the Maldives' biodiversity is not only important for the country's environmental health; it is also an economic and developmental imperative.

It is not just environmentalists and policy-makers who recognize the importance of environmental protection. The study shows that an overwhelming majority of Maldivians and tourists say they value the country's biodiversity. Moreover, they are willing to back up their words with deeds: the study highlights that locals and visitors would be willing to pay a combined total of Rf 235 million (US\$ 18.43 million) per year to conserve ecological biodiversity.

I hope the results of this study will spearhead new environmental projects to safeguard the Maldives' biodiversity. Only by protecting our fragile environment can we ensure long-term sustainability and bequeath our children with a country as vibrant, attractive and prosperous as the one we inherited.

Mohamed Nasheed
President of the Republic of Maldives

Message by the Minister for Housing, Transport and Environment

Maldives is an island nation where its inhabitant's entire livelihood depends on biodiversity. After many years Maldives is experiencing the negatives of unsustainable resource management, abandoning environmental conservation and undermining the significance of coastal and marine resources. Today, we face the bitter truth that our reef fish stocks are declining, shark population near extinction and many more.

The "Atoll Ecosystem Conservation" (AEC) project co-financed by the Global Environment Facility (GEF) and implemented through UNDP by Ministry of Housing, Transport and Environment is putting forward this report that demonstrates and quantify the value of Biodiversity and Atoll ecosystem conservation in the Maldives. In a time where planning and development decisions are made on economic grounds and more on the basis of the forces at play in the free-market system, this report will provide a sizeable substantiation base that will enable policy makers to strengthen the case for sustainable use of coastal and marine resources.

Evident in the report is the lack of consciousness and hence positive reception of the economic value of coastal and marine biodiversity conservation. This report will be a tool to increase consciousness by drawing unambiguous relation between Maldivian biodiversity and its economy.

It is my sincere hope that the evidence in this report steer to move towards marine biodiversity conservation. It would be unrealistic to ignore this and base our economic activities in ways that will degrade our ecosystem.

Mohamed Aslam
Minister for Housing, Transport and Environment
Republic of Maldives

Statement by the UNDP Resident Representative

Valuing nature is undoubtedly a complex task. Valuing the very diverse and extremely fragile natural systems that form the Maldives is definitely bound to yield exceptionally important information. That is precisely what this economic valuation report of the biological diversity of Maldives brings to us.

Often it is the Gross Domestic Product (GDP) or such economic indicators that determine the prosperity of a nation. For a nation such as Maldives, the natural resource base and the biological diversity of the ecosystems form the basis of its economic prosperity. As such, while the linkages of the natural systems to the economy are blatantly clear, the real monetary expression of this reality has not been calculated up until now.

The UN Development Programme (UNDP) is pleased to be partners with the Government of Maldives in working through the Global Environment Facility (GEF)'s co-funded "Atoll Ecosystem-based Conservation of Globally Significant Biological Diversity in the Maldives – Baa Atoll" (AEC) Project to produce this report which brings into light for the first time, the economic value of biological diversity of Maldives. Through UNDP, the International Union for the Conservation of Nature (IUCN) was commissioned under the AEC Project to undertake this study to develop "the economic case for biodiversity conservation in the Maldives." While IUCN took the lead for this study, it drew from various information sources to nourish this report. I commend the work that has gone into the production of this report by the IUCN, by the Government of Maldives, particularly the team from the Ministry of Housing, Transport and Environment, the AEC Project Team and the UNDP Maldives team who supported this collaboration.

It is my earnest wish that the information brought to light in this report be used to better manage the natural resources and sustain the natural ecological systems upon which the economy of this nation stands and upon which many Maldivian households rely on for their livelihood.

Patrice Coeur-Bizot
UNDP Resident Representative
Maldives

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The study relied heavily on Baa Atoll and Island Administration, residents and resort and dive operators, who gave generously of their information, time and hospitality during surveys. Particular thanks are due to field teams and AEC Baa Atoll staff.

Part of the analysis in this report is based on a thesis prepared by Mizna Mohamed (University of Canterbury/ Maldives Marine Research Centre).

Finally thanks are due to Mr. Ali Raza Rizvi, Head Ecosystem and Livelihoods Group, Colombo for his support and backstopping throughout the duration of the project.

Summary and conclusions

Biodiversity and human and economic wellbeing in the Maldives

In the last decade or so the world's coastal areas have received a lot of attention – attention that has been spurred on specifically by the Indian Ocean Tsunami in 2004. Subsequently, the undeniable linkages between coastal resources and economic and human wellbeing have become more apparent.

This is evident nowhere more so than in the Maldives – a nation of small islands dependent entirely on its coastal and marine resources, which contribute extensively to its economy and its people's livelihoods. There are few examples in the world where an entire nation's wellbeing is so strongly linked to its natural resource base. For such a country, any threat to its biodiversity means adverse impacts on its future development. Clearly then, there is a strong imperative to recognise and demonstrate that there is an economic – in addition to a biological and ecological – rationale to biodiversity conservation.

The stated commitment to conserve biodiversity

Efforts are being made in the Maldives to conserve the country's exceptional marine and coastal biodiversity. There are many environmental conservation policies and plans aiming to conserve this precious resource base. The current "Seventh National Development Plan 2006 – 2010" makes the links apparent by acknowledging the dependence of the Maldives economy on coastal and marine resources, and outlining a number of targets for improving environmental conditions in the country. The 2002 National Biodiversity Strategy and Action Plan also highlights the need to integrate conservation principles into national development plans and sectoral policies as well as calling for the adoption of appropriate economic valuation techniques and incentives for biodiversity.

The AEC Project

Recognising the importance of its natural resources, the Government of Maldives is undertaking the GEF Atoll Ecosystem Conservation Project through its Environment Ministry and with the support of UNDP Maldives. In addition to various other interventions, the project recognises the importance of providing an economic basis to biodiversity conservation. This report has been commissioned by this project and its main objective is to quantify and demonstrate the economic value of the Maldivian coastal and marine biodiversity; and to provide an economic rationale for biodiversity conservation. The intention is that the analysis depicted can be used by various stakeholders to make the economic case for conservation and sustainable development.

The impact of existing economic and environmental policies

Despite a stated policy commitment to environmentally sustainable development however, there is a lack of environmental integration across sectors; and more importantly biodiversity conservation is accorded only a minor priority in economic policy formulation, financial planning and programme implementation. Public investment in conservation, especially, remains extremely low. Over the last 5 years environmental spending has consistently accounted for less than 1% of all public sector budget allocations. Patterns of donor assistance present a similar picture: environmental spending constitutes just 3% of ongoing programme and project support to the Maldives.

At the same time the economic and policy instruments that are used to manage the economy, encourage investment, stimulate output and tend to overlook environmental goals. There are few economic incentives which encourage good environmental behaviour. Often existing policies and policy instruments actually present substantial financial and economic disincentives to investing in conservation-friendly products, technologies and practices. The agencies charged with biodiversity conservation face severe financial constraints in fulfilling their mandate. At the same time many households and businesses find it less profitable to do more to conserve biodiversity.

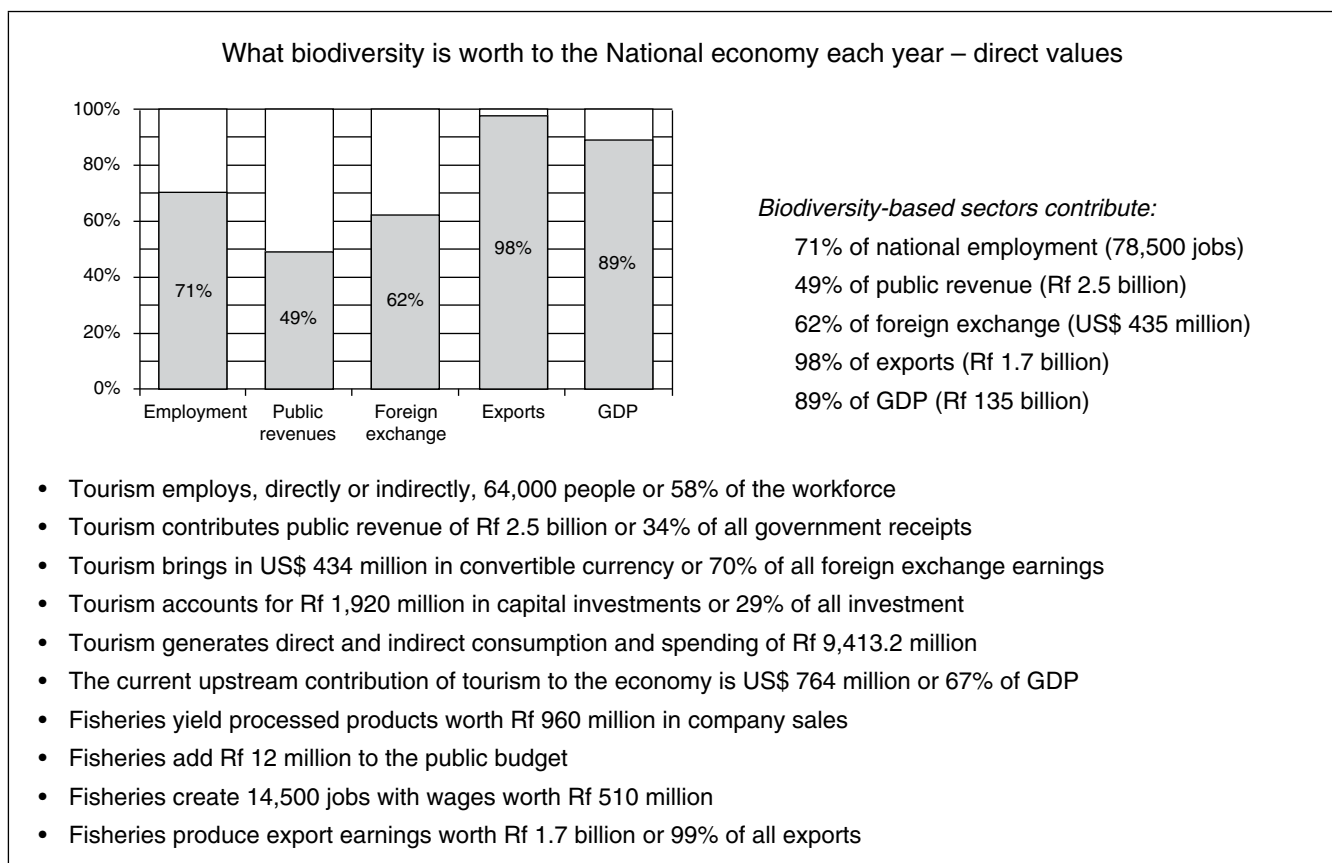
Given that the major part of the Maldivian economy depends on biological resources and natural ecosystems, the failure to integrate biodiversity into economic policies, strategies and budgets may undermine the very basis for sustained and equitable economic growth in the future.

In order to rectify this situation and to accord biodiversity more importance in economic decision making, it is crucial to present convincing evidence to planners and decision-makers in the public or private sector about the economic wisdom, and necessity, of conserving biodiversity. This report aims to redress the balance, and presents data which demonstrate the valuable contribution that biodiversity makes to the Maldives economy – at national, Atoll and household levels, and across different sectors and indicators.

The importance of biodiversity to the economy

Coastal ecosystems provide products and services that underpin people's well-being, such as the role they play in the provision of food security, livelihoods and health. These contributions to human wellbeing are made both directly through the products (provisioning services such as through fisheries, tourism, medicine and fuel etc) provided by marine and coastal ecosystems, as well as indirectly through the variety of life support and production support functions they generate (regulating and supporting services such as fisheries productivity and shoreline protection etc), and their intrinsic worth (or existence value) to people (cultural, spiritual, aesthetic services).

The information contained in this report underlines the fact that biodiversity constitutes the basis of most economic activity in the Maldives, and generates immense economic values. As such it forms a vital component of the country's wealth, capital and asset base – it enables the functioning and growth of the economy, underpins private profits, as well as assuring the economic survival and wellbeing of the Maldivian population.



What biodiversity is worth to the Baa Atoll economy each year – direct values



For local households, biodiversity-based activities contribute:

- employment worth Rf 78 million
- business earnings worth Rf 80 million
- fresh fish worth Rf 1.8 billion
- other biological resources worth Rf 19 million
- 47% of employment
- 47% of wages
- 51% of business earnings
- and occupy 61% of the population

- 40% of households have members employed in the tourism sector, earning Rf 68 million
- 60% of households are engaged in biodiversity-based business, which contributes 51% of all business earnings and generates income of Rf 80 million
- More than 40% of households engage in fishing with a catch worth Rf 1.8 billion
- 55% of households harvest other biological resources together worth well over Rf 19 million
- Fisheries generate processed products worth Rf 11 million in company sales
- Six tourist resorts entertain 45,000 tourists a year, selling bednights worth around US\$ 160 million
- Six dive centres generate income of around US\$ 2.3 million

Not only does coastal and marine biodiversity provide direct benefits to the economy and people, it also supports them indirectly through cost savings from shoreline protection and through the value of its very existence to local and global communities.

Indirect and Existence Values

- Total artificial replacement cost of coral reefs by building seawalls around 195 inhabited islands of the Maldives ranges between Rf. 20– Rf 34 billion (depending on the type of replacement measure)
- Total artificial replacement cost of coral reefs by building seawalls around 13 inhabited islands of the Baa Atoll ranges between Rf. 1– Rf 1.75 billion (depending on the type of replacement measure)
- Rf. 2 million per year for regulating and supporting services (indirect values) from Maldivian willingness to pay
- Rf. 1.8 million per year existence values from Maldivian willingness to pay
- Rf. 230 million existence value from global overseas willingness to pay
- Rf. 0.14 million annual indirect value and Rf. 0.05 million annual existence value for Baa Atoll residents
- Rf. 20.02 million annual existence value for tourists visiting Baa Atoll resorts

Changing “business as usual”

The data presented in this report confirms that biodiversity forms the foundation of economic activity in the Maldives – for the national economy, across sectors, and for household livelihoods. Biological resources and ecosystems are key components of development infrastructure. They provide the raw material, services and facilities required for the economy to prosper and grow, and for society to function effectively.

The Maldives’ rich biological and ecological asset base produces a flow of goods and services, which in turn generates economic benefits and cost savings for the government, businesses, households and the global community. If managed sustainably, biological resources and ecosystems will continue to provide these economically valuable services. In contrast, if they are degraded, over-exploited or irreversibly converted, such economic benefits will decline and be lost and will not be available to sustain growth in the future.

In addition to implementing conservation laws and policies, it is clear that planners and decision-makers in both conservation and development sectors need to take note of these values – in the interests of private profits as

well as economic development and growth for the economy as a whole. On the one hand biodiversity continues to be seriously undervalued in the budgets, policies and instruments that are used to manage the economy. On the other, many of the opportunities to benefit from the conservation and sustainable use of biodiversity as an engine for economic growth are being missed – conservation planners and managers tend to underestimate the economic potential of the resources which they are mandated to manage. By not seeing biodiversity and ecosystems as an economically productive sector, much of the long-term potential to generate funds, economic benefits and development gains are likely to be overlooked.

The review of economic and environmental policies and instruments highlights incentive gaps in relation to biodiversity conservation and shows that biodiversity conservation goals are not mainstreamed into development policies, strategies and plans at national, sectoral or Atoll levels. The review also indicates that there is a lack of positive incentives to encourage or reward for the conservation (rather than degradation) of biodiversity in the course of economic activities. There are also indications that in some cases incentive systems may serve as perverse incentives with respect to conservation.

Clearly there is a need to investigate thoroughly the ways in which existing economic and environmental instruments can be reformed so as to support biodiversity goals, and to look into the possibility of introducing new economic incentives for conservation. Such economic instruments could, if properly designed, serve to raise revenue, internalise biodiversity costs and benefits into private economic decisions and act as redistributive mechanisms.

The main opportunity to use economic instruments in support of biodiversity conservation in the Maldives seems to lie in reforming existing (and where appropriate introducing new) charges, fees and duties so as to reward environmentally-friendly behaviour and penalise sectors and industries for activities that lead to biodiversity loss or degradation. Two potential instruments could be 1) fees and charges for the use of biological resources or payments for ecosystem services; and 2) import tariffs.

A range of economic incentives which are targeted specifically at the local-level users and managers of biological resources and ecosystems also have a great deal of potential for application in the Maldives. In addition to instruments which aim to ensure compliance with environmental rules and regulations, these include:

- Allocation of a portion of any funding raised to the atoll, island or household level to be used to directly finance local initiatives, either on a grant or credit basis.
- The establishment of enterprise funds to enable the development of value-added or sustainable biodiversity business, and to support investments in environmentally-friendly technologies, equipment and products.
- The establishment of targeted incentive and payment systems, which reward directly for the provision of environmental goods and services through conservation at the local level, including direct participation and involvement in economic activities.

A shift in paradigm is thus clearly required — moving from approaches which fail to account for environmental costs and benefits, to those which recognise and invest in biodiversity and ecosystems as valuable and productive assets which are key to economic development and growth. A failure to do so may ultimately undermine many of the goals that the Maldivian government is striving for with so much time, energy and resources in order to: reducing poverty, and ensuring cost-effective, equitable and sustainable development for all.

1. Background to the report

The Atoll Ecosystem Conservation (AEC) Project

The Government of the Maldives is undertaking a project on the conservation and sustainable use of globally significant biological diversity¹ in Baa Atoll. The Atoll Ecosystem Conservation (AEC) project is being implemented by the Ministry of Environment, Energy and Water (MEEW), with the support of GEF and UNDP (At the writing of this report the MEEW had been converted to the Ministry of Housing, Transport and Environment subsequent to the general elections in November 2008).

The project is carrying out a wide range of activities to meet its objective of “the conservation and sustainable use of globally significant biological diversity in the Maldives’ Baa Atoll”. This is being done through an approach that seeks to mainstream ecosystem conservation and sustainable use across different sectors both nationally and locally. To achieve this objective the project has three main outcomes as follows:

- To mainstream biodiversity concerns into sectoral institutions and policies
- To conserve biodiversity in Baa Atoll through innovative practices
- To support local stakeholders to pilot sustainable natural resource management and livelihood development practices in Baa Atoll.

There is a need to make the case and present evidence that coastal biodiversity plays a key role in the economy and development of the country, across levels of scale, groups and sectors. Therefore, one important outcome of the project is concerned with mainstreaming biodiversity into sectoral institutions and policies. It has a particular focus on strengthening the linkages between government institutions concerned with economic development and environment conservation, and on raising the profile of biodiversity conservation (and its prioritisation as a key area for investment) among economic and financial planners.

To these ends, the project includes two activities which involve working to gather, analyse and disseminate information on the economic value of marine and coastal biodiversity as a base for sustainable economic and social development:

- Conduct workshops on environmental economics and its principles for decision makers at the national and atoll levels;
- Conduct targeted research to bring these principles to life and make them more relevant by quantifying benefits and values of biodiversity and ecosystem health.

This report has been prepared in support of these two activities. Its specific objective is to demonstrate and quantify the value of biodiversity and Atoll ecosystem conservation to the Maldives. It intends to provide a critical evidence base that can be used by the project and the Ministry of Environment to enhance the ability of policy makers, planners, and managers from sectoral agencies to incorporate economic and financial data on biodiversity into their decision making; and to strengthen the case for sustainable use of coastal and marine resources. The thinking behind the report is that there is a lack of awareness and hence appreciation of the economic value of coastal and marine biodiversity conservation. The aim is thus to increase this awareness by drawing explicit links between Maldivian biodiversity and its economy such that the economic benefits of coastal and marine biodiversity and the economic costs of biodiversity loss are brought to the forefront of government decision making.

How the report is laid out

The report presents and analyses data on the economic significance of biodiversity to the Maldivian economy and population:

- Section 2 presents a *brief snapshot of the Maldives biodiversity and economy as well as its stakeholders*. It is against this backdrop that the economic value of biodiversity, and efforts to conserve it, must be understood,
- Section 3 presents a *framework for understanding the economic significance of biodiversity to the Maldives economy*, which draws on the Millennium Ecosystem Assessment and Total Economic Value models.

- Section 4 looks at the *contribution of biological resources and ecosystems to the national economy of the Maldives*. It presents and analyses data on a range of development and economic indicators. It also looks at indirect and existence values of biodiversity benefits as estimated through shoreline protection services and willingness to pay surveys.
- Section 5 looks at the *economic significance of biological resources and ecosystems in Baa Atoll*. It presents and analyses data on the value of biodiversity for household livelihoods, and the private sector. It also highlights indirect and existence values through willingness to pay surveys.
- Section 6 identifies *financing mechanisms for biodiversity conservation*. It reviews the current status of funding, highlights financial constraints, and suggests additional mechanisms that can strengthen the financial sustainability of conservation.
- Section 7 identifies *economic incentives for biodiversity conservation*. It reviews existing economic and environmental policies, highlights needs to overcome disincentives and provide positive incentives for conservation, and suggests a range of economic instruments which can be used in support of biodiversity.
- The Data Annex presents *detailed statistical tables* which back up the analysis presented in the main text of the report.
- The section on References and Notes explains *key points in the text, and provides references* to publications. Additional references are presented in the final section.

Information used to compile the report

This report is based on both primary and secondary information sources.

As there are virtually no available data or studies dealing explicitly with the economic value of biodiversity in the Maldives, a considerable amount of existing information was subjected to new analysis and interpretation so as to make explicit the links between environment and the economy. Key sources of secondary data included government statistical records and project reports on the macroeconomy, different sectors, and development indicators. The *contribution of biodiversity to economic and development indicators* such as output, income, public revenue, export and foreign exchange earnings and employment was assessed overall and for major sectors of the national economy, and for households and the private sector in Baa Atoll. These data were supplemented and verified by interviews with experts in central government and Atoll authorities.

Information on *tourist willingness to pay fees and charges for the use and appreciation of biodiversity in Baa Atoll* was obtained from recent research carried out as part of a MA thesis². This study covered cash and in-kind contributions for diving, boating, fishing and other biodiversity benefits. It involved two of the six resorts in Baa Atoll, and analysed a total of 400 questionnaires³.

Primary data was collected through four surveys:

- *Private sector tourist operators on Baa Atoll*, to assess perceptions of biodiversity, and the scope and value of commercial activities carried out relating to nature tourism. This involved face-to-face interviews with hoteliers, resort owners and dive centre operators.
- *Households living on Baa Atoll*, covering basic socio-economic characteristics and levels and values of natural resource use and using both a questionnaire and open discussion. It covered between 13% and 16% of households on each populated island and involved a selected sample of 215 (out of a total Atoll population of 2,154⁴) households. Data were analysed at the Atoll and Island levels, and according to socio-economic status of the household⁵.
- *Maldivians resident in Baa Atoll*, asking their willingness to pay for the conservation of biodiversity and maintenance of their natural resource base. Based around a simplified contingent valuation method, this survey assessed average and total non-use values of marine and coastal biodiversity. It was administered alongside the household survey, covering the same 215 respondents.
- *Maldivians resident in Male'*, asking their willingness to pay for the conservation of biodiversity and maintenance of their natural resource base. Based around a simplified contingent valuation method, this survey assessed average and total non-use values of marine and coastal biodiversity. It was administered to 301 randomly selected respondents.

This study focuses on the value of coastal and marine biodiversity to the Maldives alone, and not globally. Certain economically important values are not considered because they accrue primarily to the global economy, and not at the national or local level. Unless otherwise stated, all values are calculated at current prices. Throughout the report values are expressed as gross figures. It should be noted that the figures presented in this report cannot all be added together to give a single figure for the total value of biodiversity at the national or Atoll level, as many are overlapping (e.g. government revenue are included in figures for tourism earnings and value of fish catch, household and commercial income from fish overlap, etc.). As a result while the direct contribution from tourism and fisheries towards key indicators is depicted, indirect values from shoreline protection and existence values from willingness to pay studies are shown separately.

Limitations of the Study

The study relied on a rapid assessment methodology and as such generating 'ball park' figures was the objective rather than exact and precise numbers through costly studies. Such ballpark figures are often immensely credible, cost effective and useful in raising awareness and profile of the ecosystems, and are easily understandable by decision-makers and the public. The study had to be completed in a short-time span with limited finances, and more extensive surveys of the area and site candidates were not feasible. Similarly, for the willingness to pay surveys, the intention was not to carry out a complex contingent valuation exercise resulting in detailed regression and theoretical modelling of demand curves for these ecosystem services, as this both lies beyond the timeframe and budget of this study, and will not be easily replicable in the future. Rather, simple willingness to pay surveys were undertaken to yield overall average values.

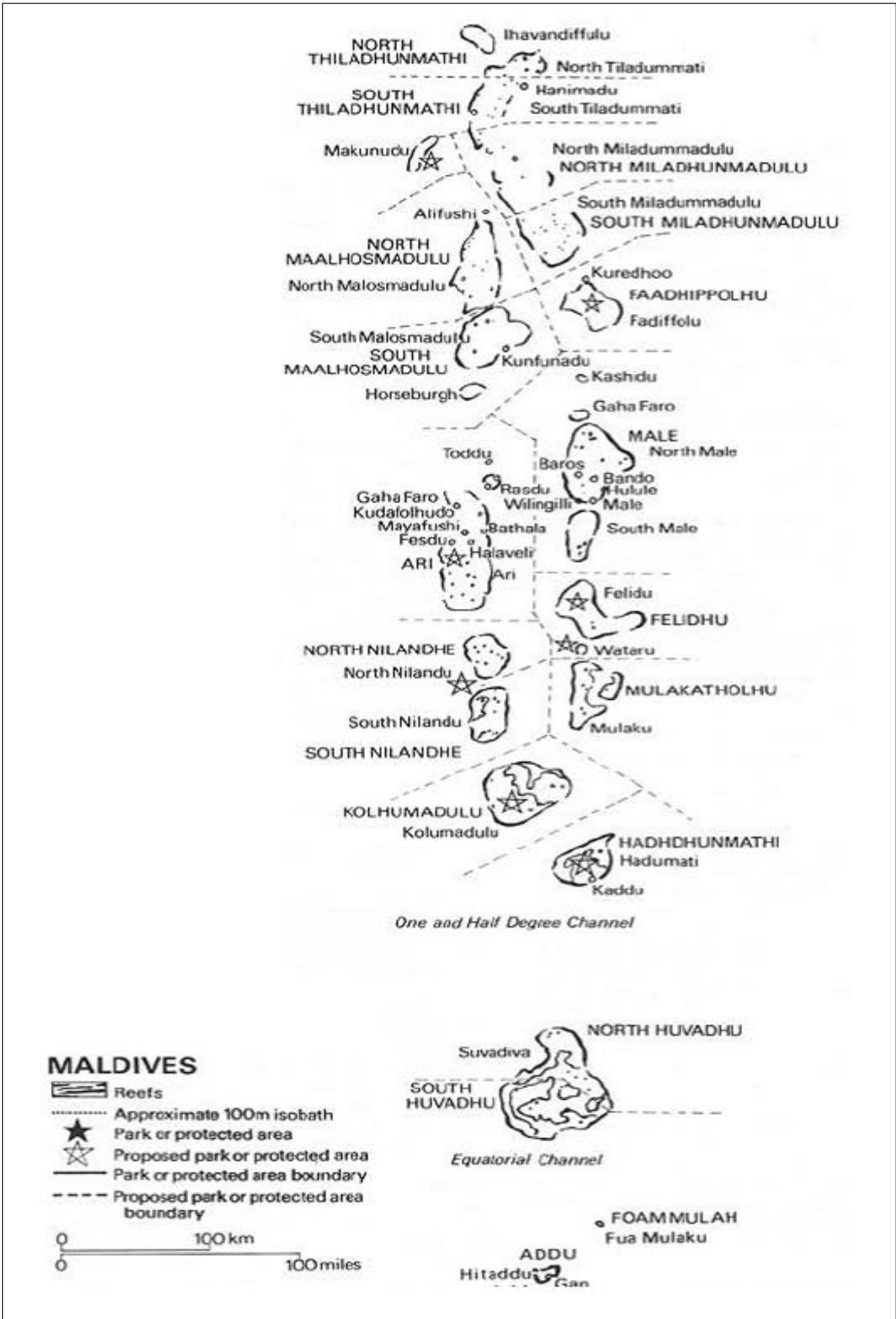
For the household survey, data cleaning reduced the number of usable responses to 200 (by excluding 15 questionnaires which indicated zero household income). Seven of the questionnaires included in the analysis were corrected for apparent errors in data records on fishing income or the value of fish catch consumed at home.

As with any such research, there are data limitations. While a lot of secondary data was available from government sources, there was some crucial data that was missing. For example, coastline length of inhabited islands in Maldives and in Baa was not available. For this reason the study relies on earlier estimates of replacement costs to depict indirect values at the national level. Due to this lack of data it was not possible to calculate the shoreline protection value at Baa Atoll level.

For primary data collection, again as is usually the case, over or under-reporting can be expected, especially since most of the respondents in the islands at Baa were women, who did not necessarily know financial and income details. They were also cautious to suggest financial amounts for the willingness to pay surveys. Also for example, while less than 1% of households stated the use of turtles and turtle eggs, it is possible that this is underreported as the taking of turtles is banned under a moratorium and the harvest of eggs is also discouraged.

Finally, for the purpose of tourist willingness to pay to assess existence values at Baa Atoll, a previous study was used (Mohamed, M., 2007, Economic Valuation of Coral Reefs: A Case Study of the Costs and Benefits of Improved Management of Dhigali Haa, a Marine Protected Area in Baa Atoll, Maldives. A thesis submitted in partial fulfilment of the requirements for the Degree of Master of Environmental Science at the University of Canterbury, Christchurch). This study however, estimated willingness to pay of tourists visiting Baa Atoll only; and specifically for the Dhigali Haa MPA. For the purpose of this study however, the information from the case study was considered sufficiently representative of tourists' willingness to pay for preserving marine and coastal biodiversity in the Maldives.

Figure 1: Map of the Maldives



Source: UN Common Country Assessment 2007

2. The context: A snapshot of the Maldives biodiversity and economy

The Maldives harbours a rich biodiversity. Its atolls are significant because they are by far the largest group of coral reefs in the Indian Ocean, with an area in excess of 21,000 km² and a total reef area of more than 3,500 km². Over 1,100 species of reef fishes and over 250 species of corals are found.

Among animal groups that are internationally threatened are populations of green (*Chelonia mydas*) and hawksbill (*Eretmochelys imbricata*) turtles; the Maldives is perhaps the most important feeding area for hawksbill turtles in the Indian Ocean. It is also home to globally significant populations of whale shark (*Rhincodon typus*), reef sharks and manta rays (*Manta birostris*), as well as at least 21 species of whale and dolphin. Other globally significant coral reef species include the Napoleon wrasse (*Cheilinus undulatus*), Giant Grouper (*Epinephelus lanceolatus*), giant clam (*Tridacna squamosa*) and black coral (*Antipatharia*). In addition to coral reefs, the Maldivian atoll ecosystems are comprised of a variety of other habitats including extensive shallow and deep lagoons, deep slopes, sandy beaches, and limited mangrove and seagrass areas.



Turtle



Manta ray

However, this rich asset is threatened due to human activities at the local level and more importantly from impacts of global warming. Since Maldives is a nation comprising of small islands; it is more vulnerable to environmental threats. Freshwater and land availability is low and poses immense problems for the local population. Groundwater is not suitable for drinking in a majority of the inhabited islands (162 according to the UN CCA 2007) and the country relies extensively on rainwater. The provision of drinking water to the population through desalination manifests in huge costs to the government.

One of the most serious land related problems is that of beach erosion, which is evident on a majority of the islands. Maldives coral reefs are the seventh largest in the world and represent as much as 5% of the world's reef area⁶. They not only provide coastal protection, but are the mainstay of both the fisheries and tourism sectors. They are however, under threat due to improper waste disposal and unsustainable coastal development practices, which are resulting in increased pollution and coral reef destruction. There is also evidence of overexploitation of several reef fish and other species.

Several government departments are responsible for ensuring the conservation and sustainable use of marine and coastal biodiversity in the Maldives, including the Ministry of Environment, Energy and Water (now the Ministry of Housing, Transport and Environment), the Ministry of Fisheries, Agriculture



Beach pollution

and Marine Resources, and the Ministry of Atolls Administration. A total of 26 Marine Protected Areas has been gazetted across the country (see Figure 2). For the most part these are relatively small, averaging only a few hectares in area. With the exception of traditional live bait fishing and recreational diving, all other activities are officially prohibited in MPAs. Two MPAs are located in Baa Atoll - Dhigali Haa (established 1999) and Olhugiri Island. The former is a rich reef area where grey reef sharks, white tipped reef sharks, barracudas, jacks and turtles were frequently sighted⁷. While barracudas and turtles can still be spotted, sharks have disappeared from the Maldives due to over extraction.



Whale Shark



Dhigali Haa Biodiversity

Maldives key economic indicators	
Human Development Index (of 177)	100
Population 2006	302,726
Economically active population 2006	128,836
Population below poverty line 2006	16%
GDP (Rf mill) 2006	9,440.7
GDP per capita 2008	US\$ 2,804
Tourism	27.1%
Transport and communications	18.3%
Manufacturing	6.8%
Fisheries	6.3%
GDP growth rate 2006	19.1%

In terms of economy and development, the Maldives is classified by the World Bank as a lower middle income country, with a Human Development Index ranked 100 out of 177 countries⁸ and a current per capita GDP of US\$ 2,804⁹. The national economy has long been dominated by fisheries and tourism, and tourism-related sectors such as transport and telecommunications. Construction, financial and business services also play an important role.

The economy of the country has grown at a steady pace for the last decade with an average growth rate of 7.9%, and per capita income rate increase from US\$771 to US \$2,514¹⁰. While per capita income is the highest in South Asia, poverty reduction remains a core element of government policy and of the current Seventh National Development Plan for 2006-2010.

Although the proportion of people living on less than Rf 15 a day (the national poverty line) has fallen more than half over the last decade (from 40% in 1997, to 28% in 2004, and 16% in 2005¹¹), the income inequality between Male' and the Atolls has increased over recent years.

The islands that comprise the Maldives are extremely remote, lying at a distance of some 700 km from Sri Lanka to the northeast, 500 km from India's Lakshwadeep Islands to the north, and around 3,000 km from Somalia's coastline to the west. The country contains 1,192 islands, spread over an archipelago more than 800 km long, a land and sea area of 115,400 km², and an exclusive economic zone of 859,000 km² (Figure 1). Just 194 of these islands are inhabited; of these only 33 have a land area greater than one square kilometre and 131 have a population of less than 1,000 people¹². The national population was estimated at 304,869 in 2007¹³ and over one third of this population lives in the capital city Male'.



Male

This extreme dispersal of the human population and the huge physical distances between settlements, combined with poorly-developed transportation systems, makes the provision of basic infrastructure and other public services very costly and the economy very limited in scope. As is the case in many other Small Island Developing States, the economy of the Maldives is characterised by its dependence on a narrow range of products and services, restricted comparative advantage, high transport costs, a tendency to be a price taker, and a small labour market with deficiencies in professional and institutional knowledge and experience¹⁴.

The Maldivian economy is an open one. Because it needs to import almost everything and to earn foreign exchange from exports to finance its imports, the trade regime is targeted at enabling the easy flow of goods and services in and out of the country. Although markets and prices are fairly liberalised, the state continues to play a strong regulatory and interventionist role in key industries and sectors, and the Rufiyaa remains pegged to the US Dollar.

There is a dynamic and growing private sector in the Maldives, including both domestic and foreign companies. A variety of fiscal and other incentives have been set in place aiming to encourage domestic and foreign investment. A recent enterprise survey carried out by the World Bank noted that there were very few entry barriers to business as compared to other countries in the region¹⁵, and the World Bank/IFC “Doing Business” report for 2009 has just ranked the Maldives as the easiest place to do business in South Asia for the fourth consecutive year¹⁶. The Maldives has a simplified tax system: there are no taxes on personal income, property, capital gains, business profit or sales, and there are also no taxes on exports (with the exception of tourism, an invisible export).

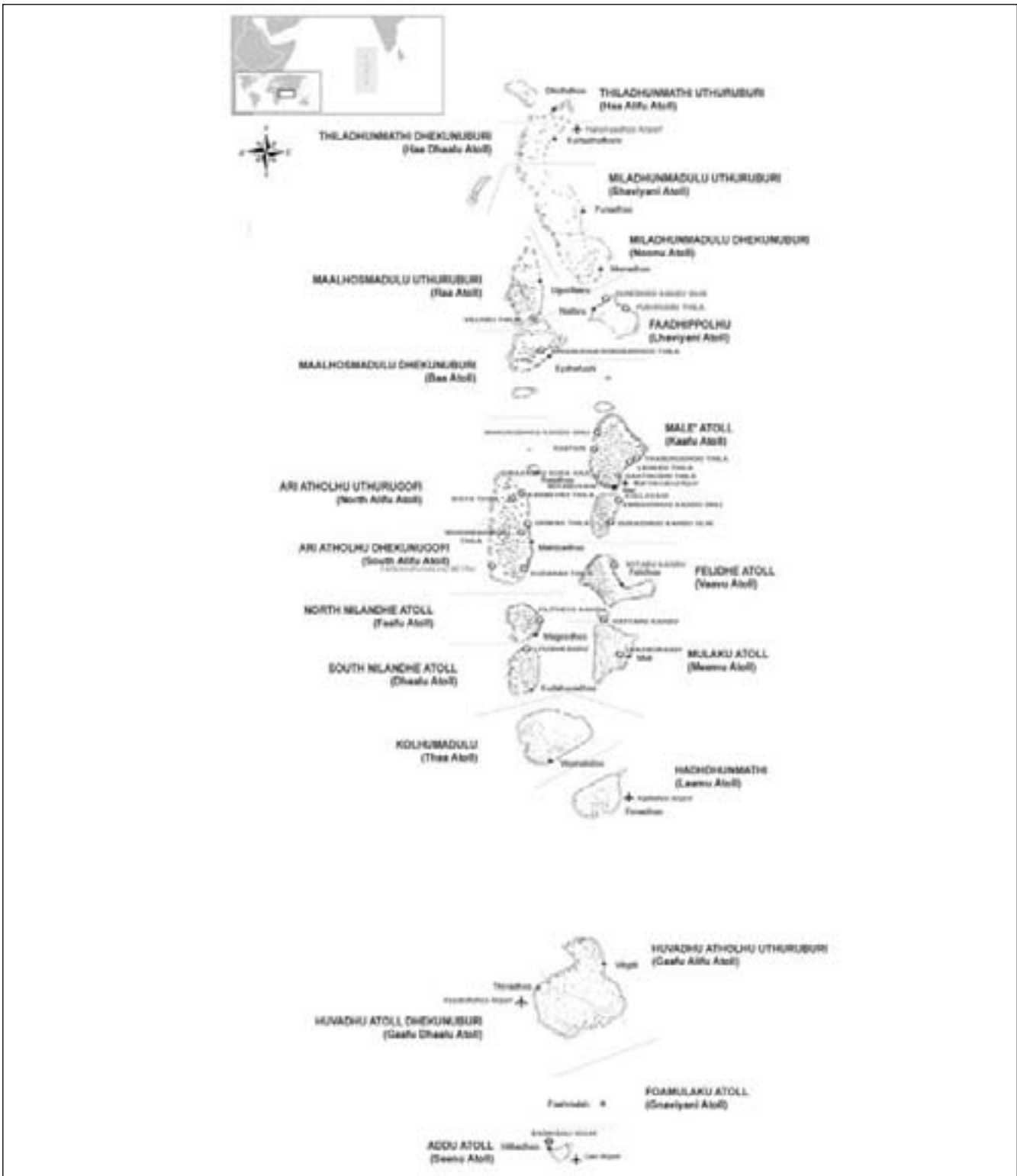
There however remains a massive over-dependence on just two sectors: tourism and fisheries, which themselves are focused on a relatively small number of markets – three quarters of tourists originate from Europe, and close to 90% of fish catch comes from tuna, (skipjack, and yellow fin)¹⁷. This narrow production base, combined with a heavy reliance on imports and a limited range of exports, makes the Maldivian economy highly vulnerable to external forces. A number of economic shocks have been registered over recent years most notably linked to the adverse impacts of the 11 September 2001 events on tourism, the devastation wrought by the Indian Ocean tsunami of late 2004, and the recent global economic downturn and increase in world oil prices.

Despite these setbacks, a GDP growth rate of 19.1% was registered in 2006¹⁸ and in 2007 the growth rate was 6.6%¹⁹. However, problems still remain: the country is currently facing a large fiscal deficit²⁰, and the substantial weakening of fiscal policy over the past three years is cited as the key source of risk facing the Maldives in the

short-term²¹. At the same time public expenditures are continuing to rise rapidly, and the trade deficit is widening (imports are rising more rapidly than exports)²².

Looking to the future, diversification of the economic base alongside broad social development and macroeconomic stability is seen as a particular priority in government policy²³. A major concern is however that any attempt at economic diversification is limited by the small size of the domestic market and large distance to international markets²⁴. Although in the short to medium term it is thought that the performance of the economy will remain dependent on tourism and to a lesser extent on fisheries, continued growth is anticipated to spur domestic demand for construction, transport, telecommunication, services, and imports²⁵. The recent Strategic Economic Plan for 2006-2010 recommends expanding the traditional core sectors of tourism, fisheries, and agriculture, and upgrading new economic sectors of information and communication technology, ports and logistics services.

Figure 2: Map of Marine Protected Areas in the Maldives



A look at key stakeholders

A stakeholder analysis was undertaken in December 2007 as part of the larger AEC project²⁶. This section draws on the information outlined in the analysis and looks at the stakeholders from an economic perspective.

The box identifies key stakeholder groups that have a stake, benefit or management impact on atoll ecosystem biodiversity, both at the national level and for Baa Atoll. Based on these as well as scoping at the national and atoll levels, a broad mapping of stakeholders has been carried out, highlighting their specific stake or interest, costs and benefits of conservation, participation or interest in conservation, historical involvement or impacts in biodiversity conservation and coastal/marine management. Particular attention has been paid to including different community stakeholders and associated livelihood aspects, government agencies (national and local) and associated management/development interests, private sector, and representatives of civil society engagement in biodiversity and coastal/marine activities. The analysis also suggests how the overall AEC project and in particular the valuation component can be utilised by the different stakeholders.

Historically, environmental functions were established in 1984 in the Ministry of Home Affairs. Later the environment section was put under the purview of the Ministry of Planning and Development. This subsequently became the Ministry of Planning and Environment, showing that environment was steadily taking a higher priority on the government's agenda. In 1998, the Ministry of Home Affairs, Housing and Environment was formed and had environment protection and management as part of its functions and also housed the Environment Research Center. In 2004, the Ministry of Environment and Construction (MEC) was formed and finally the Ministry of Environment, Energy and Water (MEEW)

was established. At the writing of this report the MEEW was converted to the Ministry of Housing, Transportation and Environment, after the November 2008 general elections. The Ministry now has housing and transportation as its major mandate. For the purpose of this report, it is referred to as the Environment Ministry from here on.

The Environment Ministry has the mandate to conserve marine and coastal biodiversity and promote sustainable economic and development practices. As such it is a major and an important stakeholder in the Maldivian biodiversity. Its activities and policies are likely to have immense impacts on the state of the country's natural resources and therefore on its economy. The ministry hosts the AEC Project and as such is specifically responsible for undertaking many activities at Baa Atoll, which include developing and implementing an ecosystem management framework. It needs to be actively involved in the national economic and development policy making processes to ensure cross-sectoral integration of environmental management, especially in fisheries and tourism sectors. It therefore needs training in EIA and in understanding the economic aspects of biodiversity conservation. It moreover needs to promote policies to establish new protected areas but also to manage current ones by providing wardens and other such services. This means that it faces direct costs from biodiversity conservation and requires funds to undertake conservation activities. Therefore, it would benefit from understanding the economic value of biodiversity, which would enable it to make the case for biodiversity conservation and garner support and financing for conservation activities; and to promote pro-poor conservation and sustainable development.

The Ministry of Fisheries, Agriculture and Marine Resources (MoFAMR) which is now the Ministry of Fisheries and Agriculture, has the mandate to conserve all living and non-living marine resources as well as conserving all natural resources on uninhabited islands in the country. It has the responsibility to set guidelines and develop policies to

Key Stakeholders

National Level

- Ministry of Housing, Transport and Environment
- Ministry of Fisheries and Agriculture
- Department of National Planning
- Ministry of Tourism, Arts and Culture
- Maldives Association of Tourism Industry (MATI)
- Environment Protection Agency
- Marine Resources Center (MRC)
- Ministry of Home Affairs

Baa Atoll Level

- Atoll Chief
- Atoll Development Committee (ADC)
- Island Development Committees (IDC)
- Women Development Committees (WDC)

Atoll/island communities

- Atoll communities
- Atoll based businesses
- Fishermen (Tuna and Reef)
- Farmers

Tourism (Private Sector)

- Resorts
- Safari boats/live-aboards
- Tourists

NGOs

- National NGOs
- Atoll/island NGOs

Media

ensure sustainable fishing and agricultural activities. However, there is a lack of appropriate management plans for fishery resources that also incorporate conservation and sustainable development aspects.

Fisheries are one of the most important sources of livelihoods for the people of Maldives and therefore the costs that would be incurred with fisheries loss would be extensive. Since the Ministry has the twofold objective of conservation as well as promoting sustained livelihoods from fisheries, it stands to be directly impacted. It can therefore, make the most use of the results of this study. It can apply them in developing a pro-poor reef resources management strategy and action plan for Baa and in promoting the ecosystem approach to fisheries in the Maldives. In particular the incentives and disincentives to conservation highlight important issues in fisheries management in the Maldives and in Baa Atoll.

The Ministry of Tourism and Civil Aviation (MoTCA) is now the Ministry of Tourism, Arts and Culture and is the main national institution for the tourism sector. It imposes rules and guidelines governing the operation of resorts and other tourist activities. It specifically has the mandate to set up and monitor compliance with environmental policies for the tourism sector, on the development and operations of resorts, dive sites, marinas and solid waste management and to develop standards for EIAs. In addition, it is responsible for the conservation of all flora and fauna on resort islands. Under the AEC project it is looking at developing new environmental guidelines for resort island selection; and review and if necessary update the mandate of the Tourism Advisory Board to include ecosystem management objectives; as well as developing the tourism component of AEC strategy and plans. It is through this ministry that the government earns a majority of its tourism revenue. It is thus the key ministry for increasing government financing for conservation, through implementing user fee/conservation fees that the WTP results highlight for tourists in the Maldives.

The Ministry of Planning and National Development (MPND) (now the Department of National Development) is responsible for urban planning, national development plans and atoll land use plans. It formulates policies on socio-economic development, develops standards for socio-economic services and infrastructure and most importantly undertakes social and economic research. Its plans, policies and activities impact the sustainability of marine and coastal biodiversity at all levels. Not only does the Department needs to work closely with the Environment Ministry in developing national policies and plans, it also needs to ensure that future National Development Plans are comprehensive and inclusive – and this study can provide it with useful initial information for that purpose.

There is also a Ministry of Atoll Development, which has been converted to the Ministry of Home Affairs and has the mandate to administer atoll and island level governance. This is an important Ministry because of the Maldives' broad distribution of islands and atolls with vast distances between them. Through its governance mandate, this Ministry is directly involved in the economic benefits that the atoll and island populations get from biodiversity and as such has a stake in conservation. In addition, this Ministry is well placed to work together with the Environment Ministry, Ministries of Fisheries and Tourism to use valuation information for policy making since in the Maldives islands and atolls are the basic units of planning and development. The Ministry also can play a major role in promoting the ecosystem approach at the atoll and island levels and developing pro-poor conservation projects.

Research centers such as Marine Research Center and Environmental Research Center undertake research that contributes crucial information to the sustainable development of coastal and marine resources. Both of these organizations can use the analysis from this report in future research. The Environmental Research Center is now the Environmental Protection Agency and will also have additional responsibilities under the new set-up. Furthermore the Education Development Center can ensure that the results of the analysis become part of the environmental and fisheries curricula.

At the Baa Atoll level there are also a number of important stakeholders who are intrinsically linked to atoll biodiversity. These include the Baa Atoll Chief and the Atoll Development Committee (ADC). The Atoll Chief is appointed by the President and heads the atoll administration and has the main role of all development and conservation activities at Baa Atoll. He is also the chair of the ADC, which comprises of representatives from the inhabited islands. The decisions taken and policies implemented by the Chief and the ADC or in fact their lack of action can have an impact on the coastal and marine ecosystem and on the livelihoods of the local populations.

Each Island also has an island chief who is responsible for island level governance, development and conservation. Island chiefs chair Island Development Committees and also facilitate the work of Women Development Committees.

Capacity of these individuals and organizations needs to be enhanced to enable them to fully integrate the ecosystem approach in their policies and development plans. The economic incentives and disincentives outlined in the report would be of particular use to them in making and implementing new policies and conservation oriented livelihoods development projects.

Most importantly there is the entire population of the Maldives and the Baa Atoll community, which includes the local fishermen, farmers and businessmen. Their livelihoods are not only almost entirely dependent on biodiversity mainly through fisheries and tourism employment, but also through other biodiversity related businesses. Furthermore, their health and nutrition are also completely reliant on natural resources. It is through the local population that the contribution of the fisheries sector into national accounts can be seen. In turn their activities at the local level have a huge impact on biodiversity.

These communities are an important source of information regarding the status of the ecosystem. While they are aware of the importance of the coastal and marine ecosystem of Baa, capacity building is required to make them understand the economic values of fisheries, shoreline protection and tourism. The AEC project is undertaking many activities together with the atoll and island administration, as well as local communities. The valuation analysis would be useful for ensuring that the livelihoods aspects are included in all the projects and the ecosystem approach; and permit ecosystem and livelihood issues to be addressed in a more comprehensive and inclusive way.

The next most important economic stakeholder is the tourism sector both in the Maldivian ecosystems and its economy. This sector includes the private tourist resorts, safari boats, and tourist themselves. While there are 90 resorts scattered around the various islands, Baa Atoll itself has 6. Approximately 90% of resort activities are dependent on the coastal and marine ecosystem as tourists mainly come to the Maldives for diving, snorkeling, and visiting the local islands. Tourists also hire safari boats, some of which are quite modest local boats adapted to the cruising needs. Others may have several rooms and offer facilities that are at par with resorts. These boats visit many islands and experience the local way of life. At end of May 2007, there were a total of 120 safari vessels registered with the Ministry of Tourism with a bed capacity of 1,642. While resorts and safari boats have adopted various measures to conserve the local biodiversity, they need to be involved in the overall conservation practices in far more coordinated way. They can also be enlisted to play a role in implementing sustainable financing strategies and plans for conservation. The preservation and conservation of coastal and marine resources is of particular importance to resorts, safari boats and tourist as the whole of the tourist trade is almost entirely dependent on these ecosystems. Their benefits are extensive but their losses would also be quite large if this biodiversity is degraded or even lost. These losses would ultimately have adverse impacts on the whole economy and the people.

There are approximately 500 NGOs registered with the Ministry of Home Affairs. These are however fragmented and lack coordination and communication. Many lack capacity and mostly work on youth related activities. Most of their funding is providing by the Maldivian government although some do receive funding from international donors. Baa Atoll also has a number of NGOs working on various initiatives, including conservation and sustainable development. Unfortunately, the visibility of their activities is minimal. In particular at the island levels they are seen as competitors by local authorities. Major capacity building is required for them as well as to provide an enabling environment so that NGOs and government can work together. To make the AEC project more inclusive these NGOs need to be involved in the activities taking place at the Baa Atoll and island levels. For this they need to be provided training to undertake conservation related activities as well as integrating the ecosystem approach into their own programmes.

The media is another important actor, which can be effectively utilized to promote the message of the ecosystem approach and in particular to relay the specific values of Maldivian and Baa Atoll biodiversity to a broader audience. This would be beneficial in building its own capacity as well as the capacity of all the other stakeholders.

Maldives is perhaps one of the key examples of the intrinsic link between biodiversity and all aspects of human development. All of the above stakeholders have a clear economic stake in conservation and sustainable development at all levels. They benefit from the country's rich resource base and also incur costs from its degradation; and as mentioned before these benefits and costs accrue to the country and its people. As such the AEC project (and the Environment Ministry) is well placed to ensure that all of these are effectively involved at all levels and contribute in their specific ways to the project.

3. How marine and coastal biodiversity are linked to economic and human wellbeing

For an island nation like the Maldives, the importance of coastal and marine ecosystems cannot be overstated. The entire economy of the country benefits from marine resources not only by using the raw materials provided by them, but also by utilising other services such as coastal protection and waste sinks. This huge and unique resource has intrinsic value today and in the future and can provide an array of unexplored future economic options (such as for industry, pharmaceuticals and agriculture). Therefore, it is necessary to quantify and understand the benefits received by using the marine and coastal resources and the costs that would be incurred due to the loss of marine and coastal biodiversity.



Marine Biodiversity

It is against the institutional, physical, human and economic backdrop of the Maldives that the management, use and value of its coastal and marine biodiversity must be understood²⁷. In economic terms, biological resources and natural ecosystems constitute the basic asset base or stock of natural capital, which enables the functioning and growth of the economy, as well as assuring the survival and wellbeing of the population. Maldives' rich biological and ecological asset base thus produces a flow of goods and services, which in turn generate economic benefits and cost savings for the government, businesses, households and the global community. If managed sustainably, biological resources and ecosystems will continue to provide these economically valuable services. In contrast, if they are degraded, over-exploited or irreversibly converted, such economic benefits will decline and be lost, and will not be available to sustain growth in the future. Given the special characteristics of the Maldives – its unusually narrow economy and small population, spread over such a large physical area, dependence on a very limited range of production and consumption activities – the conservation of these important natural assets is essential to continued economic prosperity.

In order to express and understand these linkages between biodiversity and ecosystems on the one hand, and economic development and human wellbeing on the other, this report uses a framework based on that presented in the 2005 Millennium Ecosystem Assessment²⁸, modified to incorporate the concept of total economic value²⁹.

The concept of total economic value (now used widely by environmental economists) overcomes many of the problems associated with traditional economic valuation models – which consider only the commercial use of environmental resources. It also incorporates the economic significance of non-market benefits, indirect values (ecological services which support and protect human life and production), existence values (the intrinsic worth of biodiversity and ecosystems which is not associated with their use), and option values (the premium placed on maintaining biodiversity and ecosystems for future uses and benefits, some of which are not even known now).

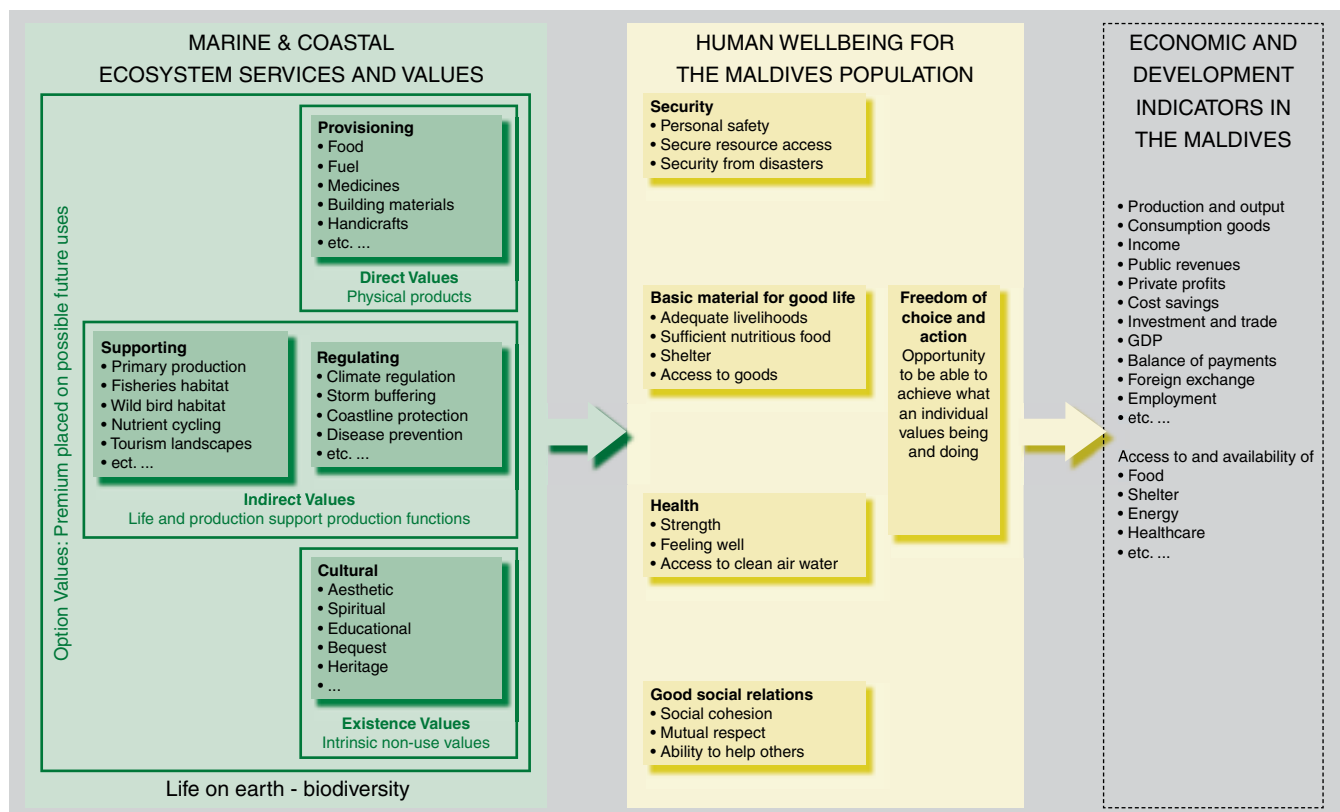
The now widely-known Millennium Ecosystem Assessment framework allows us to link these different components of total economic value to the various provisioning, supporting, regulating and cultural services that ecosystems and biodiversity provide, and trace through their impacts on human wellbeing, development and the economy. A summary of the links between biodiversity and ecosystem services, human wellbeing and economic development indicators in the Maldives, according to this framework, is provided overleaf in Figure 3.

As laid out in Figure 3, marine and coastal biodiversity and ecosystems in the Maldives generate important goods, services and economic values, including:

- *Provisioning services or direct values:* these include food, fuel, medicines, building materials, handicrafts and other products that are used and consumed by the Maldivian population and others.
- *Regulating services or indirect values:* these comprise processes and functions which protect and enable human settlement and economic activity in the Maldives, such as climate regulation, storm buffering, coastline protection, disease prevention and so on.
- *Supporting services or indirect values:* these include ecosystem services which underpin and maintain economic production in the Maldives, such as the provision of primary production, fisheries and wild bird habitat, nutrient cycling, tourism landscapes, and so on.
- *Cultural services or existence values:* these comprise the non-material aesthetic, spiritual, educational, bequest and heritage significance of the Maldives' biodiversity locally, nationally and globally.

Key economic goods and services obtained from biodiversity in the Maldives	
Coral reefs	Food
Mangroves	Building materials
Seagrass beds	Energy
Sandy beaches	Income
Wild birds	Employment
Fish	Medicines
Other marine animals	Other household goods
	Recreation and tourism
	Physical protection of settlements & infrastructure
	Support to wild animal breeding and productivity
	Cultural values
	National heritage

Figure 3: The links between biodiversity and ecosystem services, human wellbeing and economic development indicators in the Maldives



From Emerton, L., 2006, Counting Coastal Ecosystems as an Economic Part of Development Infrastructure. Ecosystems and Livelihoods Group Asia, World Conservation Union (IUCN), Colombo; Millennium Ecosystem Assessment, 2005, Ecosystems and Human Well-being: Synthesis. Island Press, Washington DC.

All of these services support and underpin human wellbeing for the Maldivian population, including their security, basic material for a good life, health, good social relations, and freedom of choice and action. In turn, they are manifested through a wide range of economic and development indicators, including production and output, consumption goods, income, public revenue, private profits, cost savings, investment and trade, GDP, balance of payments, foreign exchange, employment, and access to and availability of food, shelter, energy and healthcare.

The rest of this report considers the nature, scope and magnitude of these economic linkages and values in detail – for the Maldives as a whole and for Baa Atoll. Where possible it presents estimates of their monetary value. The study focuses on direct economic values (or provisioning services) and the economic and development indicators associated with them; on indirect values from the shoreline protection benefits of coral reefs (regulating and supporting services); and existence values (cultural services) as expressed through tourists' and Maldivian citizens' stated willingness to pay for conservation. For the purpose of clarity the following can be referred to:

Direct values: direct benefits from fisheries and tourism using market price method

Indirect values: shoreline protection benefits of coral reefs using the replacement cost method as well as willingness to pay of Maldivians for biodiversity conservation

Existence values: spiritual, cultural, and aesthetic values using willingness to pay of Maldivians and of tourists (contingent valuation method).

It should be noted that indirect values of fisheries productivity (effect on production) and for tourism (such as through handicrafts sold to tourist resorts etc) are also reflected in the estimations of tourist and fisheries benefits.

4. Biodiversity in the Maldives national economy

Biodiversity and ecosystems play an immense role in supporting the national economy of the Maldives. Tourism and fisheries – currently the mainstays of economic activity and growth – depend directly on the continued maintenance of a rich and diverse species base. Coastal and marine ecosystem services also protect, enable and underpin economic activities in these sectors, and afford physical protection to human settlements. Mangroves, coral reefs, lagoons and seagrass beds are, for example, key to maintaining the productivity of fisheries. The species they host combined with high quality marine and coastal landscapes provide one of the main attractions for the international tourists who visit the islands.

As well as generating significant values for the national economy directly, activities in the tourism and fisheries sectors (and therefore the biodiversity and ecosystems upon which they depend) have a substantial multiplier effect. Each is linked to a number of secondary and support industries. Tourism, for example, stimulates considerable economic activity in construction, financial services, manufacturing, transport, food, restaurants and entertainment sectors. It also supports a range of businesses running island tours, diving and snorkelling operations. The fisheries sector is associated with processing, canning, drying, fish meal and fish oil production industries, as well as with boat building and maintenance.

The income and revenue earned from the tourism and fisheries sectors by individuals, households and companies, as well as for the government, enables and motivates private and public consumption and expenditure across the country, keeping the economy buoyant and growing, and maintaining and improving the standard of living of the Maldivian population. The exports earnings and the inflows of investment funds make an important contribution to the country's foreign exchange reserves and balance of payments. In terms of household livelihoods, these two biodiversity-dependent sectors together account for a substantial proportion of Maldivians' employment, food and earnings.

The paragraphs below provide data about the nature and magnitude of these links between biodiversity, ecosystems and the national economy. It should be noted that this part of the analysis focuses on the direct benefits derived from the tourism and fisheries sectors.

Although there also exist other, biodiversity-based, economic activities they are not considered in this section of the report. Small-scale and subsistence-level activities based on biological resource harvesting (for example fuelwood, thatch, building materials and the production of various types of handicrafts), although important in some cases at the micro-level, do not form an important component of the national economy – they are however considered in detail in the analysis of household livelihoods in Baa Atoll in the next section of this report. Other industrial-level biodiversity-based activities include coral mining and sand mining (estimated to contribute around 0.5% of GDP³⁰). However, as serious questions have been raised about the environmental sustainability of these activities, and the focus of this report is on the values associated with the conservation and sustainable use of biodiversity, they are not included in the analysis.

Direct Values: The tourism sector

As of 2007 there were a total of 235 tourist establishments in the Maldives, including 90 resorts with a registered capacity of 17,903, 10 hotels with a combined capacity of 763, as well as 120 safari vessels with a capacity of

Tourist Resort



1,642. Tourist numbers have risen steadily over the last 30 years (except for a downturn during 2005 as a result of the Indian Ocean Tsunami): end-of-year tourist arrivals for 2006 were over 600,000, with visitors spending a total of 4.8 million bednights in the country, translating into an overall figure of 81% resort capacity³¹.

It is difficult to gauge the full scope of tourism-related employment through official data, as they do not explicitly consider employment in tourist establishments and support industries. According to available statistics, a total of 99 government staff were employed in the tourism sector³² and 12,090 people were working in hotels and restaurants³³ in 200.

Direct and indirect employment
64,000 people, or 58% of all jobs

A more comprehensive analysis has been undertaken by the World Travel and Tourism Council, through their Travel & Tourism Satellite Accounts³⁴. The results suggest that there are currently 32,000 people directly employed in the tourism industry, and an equal number working in tourism-associated jobs in other sectors (such as manufacturing, construction, government, financial services, transport and hospitality). Tourism, therefore, accounts for approximately 58% of national employment in the Maldives³⁵.

Public revenues
Rf 2.5 billion, or 34% of all receipts

The tourism sector generates considerable public revenue. Tax and non-tax payments are remitted to the government by industries engaged in tourist activities, including a bed tax levied on all tourists, lease rents charged for resort islands, and airport departure tax. A number of state-owned enterprises have also been formed to service the tourism industry, and at least a part of the revenue of Government hotels, Maldives Airport Company Ltd, Maldives Inflight Catering Services Ltd and Island Aviation Services Ltd can be attributed directly to biodiversity-based tourism. Annex Table 6 presents data on these different sources of public revenue, which in 2007 generated almost Rf 2.5 billion or 34% of all government receipts.

Foreign exchange earnings
\$434 million (Rf 5,536 m), or 70% of all forex

The foreign exchange earnings from tourism are substantial, and are mainly comprised of payments for lodgings and meals, purchase of local currency, and payment of taxes in convertible currencies by foreign enterprises. In 2006 just under US\$ 434 million (Rf 5,536 million³⁶) was taken as receipts from tourism-related exports, services and merchandise, representing around 70% of total foreign exchange earnings³⁷. Annex Table 8 shows these earnings, alongside the value of the Maldives' exports and imports.

Domestic capital investment
Rf 1,920 million or 29% of all investment

Capital investment too is significant. Considerable funds are invested in the equipment, infrastructure and property required to run and service the tourism industry. The World Travel and Tourism Council estimates that the tourism sector directly and indirectly accounts for around Rf 1,920 million in capital investment³⁸, a figure which is equivalent to 29% of all investment in the Maldives.

Travel & tourism consumption
Rf 9,413 million

In total, direct and indirect travel and tourism consumption generated by the Maldives is currently calculated at a massive Rf 9,413.2 million³⁹. This includes all spending by tourists on travel and tourism services (lodging, transportation, entertainment, meals, financial services, etc.) and goods (durable and non-durable) used for travel and tourism⁴⁰.

GDP
official sector contribution 27.5%; direct + indirect contribution 67%

We can therefore see that the economic value of marine and coastal biodiversity and ecosystems for tourism is immense. According to official statistics, the sector directly contributed 27.5% of GDP in 2007⁴¹, as shown in Annex Table 7. However, as discussed above, the total impact of the sector on the national economy is far greater than this. Taking into account both direct and indirect production, consumption and earnings (in other words including secondary and support industries in other sectors), the current upstream contribution of tourism to GDP is estimated to be US\$ 764 million (Rf 9,741 million) or 67% of GDP⁴².

Direct Values: The fisheries sector

Like tourism, the fisheries sector accounts for a substantial (although lesser) share of domestic earnings as well as exports in the Maldives. In 2006 the Maldivian fishing fleet was comprised of approximately 950 boats, of which the vast majority were mechanised madhoni (around 97%, accounting for a similar proportion of total catch); it is estimated that in total this fleet made more than 175,000 fishing trips⁴³. Foreign vessels, which are only allowed to operate in the wider EEZ to a 200 mile limit, add another 24 vessels and 8,000 fishing trips to this figure. The area within 75 nautical miles from the archipelago baselines of the islands situated at the outer edge of the Atoll is reserved for Maldivian boats. The total registered catch is estimated at just over 184,000 tons, dominated by Skipjack Tuna (75%), and by Yellowfin Tuna and other Tuna-related species (16%). Annex Table 14 presents data on fish catch by different species and types of vessel.

The commercial fishery generates substantial income for individuals and companies. In 2006, The state-run corporate enterprise MIFCO purchased a total of 65,000 tonnes of fish from Atolls around the Maldives worth around Rf 172 million (see Annex Table 13 and Table 14). An additional 4,500 tonnes were purchased by other companies⁴⁴ and around 2,500 tonnes sourced from the broader EEZ⁴⁵, at an estimated purchase value of around Rf 20 million. A wide range of processed fish products were sold by MIFCO over the same year, including fresh fish, canned and frozen tuna, fishmeal, Maldives fish and Katsuobushi fish, together generating earnings in excess of Rf 960 million.

Income
Processed products worth Rf 960 million

The government earns public revenue from the fisheries sector. Government revenue from MIFCO totalled Rf 9 million in 2007. According to Maldivian law, no taxes can be raised on fishing and the export of fish products, except on foreign parties. As mentioned above, foreign participation in fishing is currently limited to long-line operations in the EEZ.

Public revenues
Government revenue from MIFCO Rf 9 million
Government revenue from vessels in EEZ Rf 3 million
Total revenues Rf 12 million

Although disaggregated data are not available in official statistics about revenue raised from the foreign fleet operating in the EEZ, according to the Regulation for Issuing Licenses to Fish in the Exclusive Economic Zone of the Republic of Maldives such vessels are subject to a royalty of US\$ 50 per ton of fish landed as well as an annual licence fee of US\$ 10 per gross ton of the vessel.

In 2006 there were 24 vessels operating in the EEZ with an average Gross Registered Tonnage of between 200-300, landing and exporting 3,177 tons of mainly Yellowfin Tuna⁴⁶. This fleet therefore adds around Rf 3 million to public revenue, paid in convertible currencies.



Fisherman

The fisheries sector accounts for a significant share of employment in the Maldives. Records indicate that more than 10,500 people are employed directly in the fisheries sector and that there are almost 4,000 fisheries workers employed in other sectors⁴⁷. This figure is almost double than the 8,388 workers recorded in official statistics of employment by industry⁴⁸.

Income worth more than Rf 510 million a year (at current prices) is earned by these 14,500 employees, who together account for about a fifth of the national workforce and employment earnings. Detailed data on fisheries sector employment are presented in Annex Table 9.

Direct and indirect employment
14,500 jobs or 20% of workforce, earning income worth Rf 510 million

Household livelihoods
Rf 270 million home consumption and 4.3% of daily expenditures

In addition to formal sector employment, the fisheries sector is key to household livelihoods and many Maldivians participate in artisanal and small-scale fishing activities. It is estimated that around 20% of the population (or approximately 12,000 households) depend on fisheries as their main source of income⁴⁹, and that many more engage in fishing on an occasional or part-time basis.

Fish is a staple part of the diet for almost all Maldivians, and forms the primary source of protein. In 2006 around 27% of catch was consumed locally⁵⁰, giving a domestic market value of approximately Rf 270 million (using average current prices).

In addition to the portion of the catch which is retained for home consumption, expenditures on fresh fish and fish products comprise around 4.3% of household expenditure throughout the country, or an average of almost Rf 600,000 a day at current prices⁵¹. Purchases of fishery-related equipment (boats, sails and motors) accounted for an additional Rf 40,000 a day, or 0.3% of total expenditures country-wide. Annex Table 15 details the components of household fishery-related expenditures

Exports
Rf 1.7 billion or 99% of all exports

Fish and other marine products comprise one of the largest export sectors in the Maldives, worth more than Rf 1.7 billion in 2006 and accounting for 99% of exports⁵². The range of products for export is diverse, including fresh and chilled fish, frozen fish (which contributes almost half of earnings), dried and salted fish, sea cucumber, live reef fish, fish meal and other marine products such as steamed and smoked fish, shark fins, fish soup and shark-liver oil. Annex Table 11 and Table 12 show fisheries export earnings overall, and by product.

GDP
Rf 855 million or 8.5%

In combination, these indicators show that the fisheries sector plays a substantial role in the Maldives economy. Official records show that the fisheries sector contributes some Rf 855 million, or 8.5% of GDP (see Annex Table 10). Including all the values described in this section of the report would increase this contribution still further.

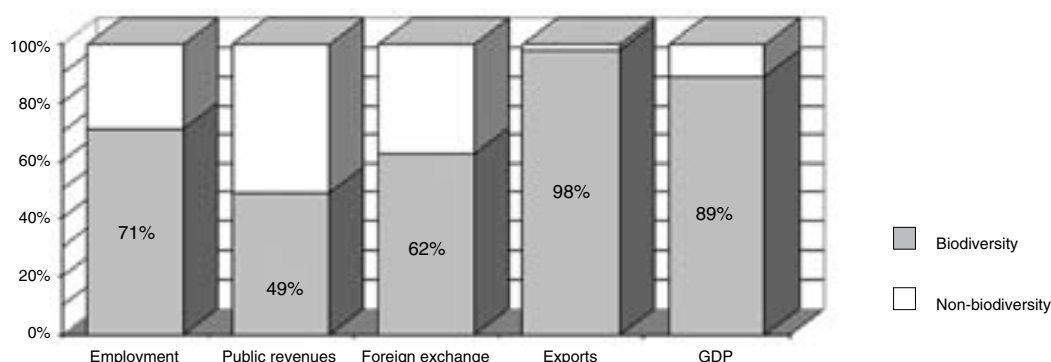
Biodiversity and the national economy: a summary of values

Table 1: Contribution of biodiversity to key Maldives national economic indicators, 2006

		Tourism (a)		Fisheries (b)		Biodiversity (a+b)		Total In Maldives+
		Amount	% of total	Amount	% of total	Amount	% of total	
Employment	No. jobs	64,000	58.1%	14,500	13.2%	78,500	71.2%	110,231
Public revenue*	Rf mill	2,500	48.3%	12	0.2%	2,512	48.6%	5,172
Foreign exchange	US\$ mill	434	62.1%	1	0.1%	435	62.2%	698
Exports	Rf mill	n/a	---	1,700	97.9%	1,700	97.9%	1,736
GDP**	Rf mill	9,741	82.0%	855	7.2%	10,596	89.2%	11,885

* tax and non-tax current revenue; ** at current market prices; + from MPND, 2007, Statistical Yearbook 2007. Ministry of Planning and National Development, Male'.

Figure 4: Contribution of biodiversity to key Maldives national economic indicators, 2006



Indirect Values - Costs of Marine and Coastal Biodiversity Loss

The above paragraphs clearly demonstrate that coastal and marine biodiversity supports multiple economic activities and provides direct benefits to the Maldives economy through tourism and fisheries. If this biodiversity is lost or depleted, some of these activities would decline and others would be completely lost, thus resulting in costs to the national exchequer. The marine and coastal ecosystems of the Maldives also provide indirect benefits through coastal protection, and as waste sinks. These also form a part of the economic value of the biodiversity in the form of avertive and mitigative costs. These costs can manifest in the following ways:

Production and consumption opportunities foregone: Since coastal and marine resources provide the raw material for production and consumption activities, if this biodiversity is lost the raw material available will also decline. As a result fisheries and tourism outputs will decline. This impact on current production and consumption would impact future economic opportunities.

Replacement, preventive or avertive expenditures: The ecological services provided by coastal and marine resources such as coastal protection, storm and erosion control and waste sinks would either decline or be completely unavailable. This would manifest in direct economic costs due to the expenditure necessary to provide artificial infrastructure to replace these services.

Shoreline Protection Value

All of the Maldivian islands are low lying with an estimated 80% being one meter or less above sea level, making them vulnerable to waves, storm surges, cyclones, and sea level rises⁵³. There is an estimated 1900-2300 km coastline altogether⁵⁴. Coastal erosion and accretion are an integral part of island formation in the Maldives and the inhabitants have over the years adjusted to this phenomenon. However, because of unsustainable practices due to population increase and other factors, coastal erosion now poses an acute problem. Dredging of sand and gravel from reef areas seems to be quite widespread and due to this as well as poorly designed coastal engineering structures, shoreline erosion is quite rampant and undermines coastal structures. Coastal erosion was reported in 109 islands and is visible in most islands and this has resulted in making the coastal infrastructure vulnerable⁵⁵, with 25 islands overall reporting severe erosion⁵⁶. The problem is also experienced by tourist islands, which are small unconsolidated islands and face the most risk. Substantial costs are already being incurred by tourist resorts to combat coastal erosion⁵⁷.

The ability of coral reefs to buffer the coast from waves and storms varies from location to location and depends on the reef's physical shape and size. However, estimates suggest that a typical coral reef can absorb up to 90% of a wave's force thus protecting the shore and infrastructure from erosion and damage⁵⁸. UNEP's post-tsunami valuation report highlights that natural shorelines and land surfaces exhibited much less damage than developed areas due to the tsunami. Studies⁵⁹ have also reported that historically (between 5500-4000 years BP) uninhabited reef islands formed and remained stable in the face of 2.5 m sea level rise. Therefore, if the reefs keep up with sea level rise then the negative impacts could be few. This suggests that reefs provide shoreline protection of one kind or the other but that this protection is dependent on the level of development.

Reef flats dissipate wave energy and protect the coast. The wider the reef flat the more protection is available. In addition, reefs also produce the sand that forms and replenishes the coastline and the beaches and also serve as breakwaters. In the face of decline or disappearance of this service provided by reefs, the country can expect to incur huge expenditure to provide these services artificially. Following are estimates from earlier studies depicting the cost of artificial replacement of shoreline protection and provide an indication of the kind of expenditure that Maldives can expect:

- According to a UNEP-WCMC report, in Indonesia, a hotel in West Lombok has spent an average of US\$125,000 per annum over seven years restoring its 250 metre-long beach following erosion as a result of offshore coral mining.
- Studies from Sri Lanka show that one square kilometer of coral reef prevents 2,000 m³ of coastal erosion annually⁶⁰.
- According to Cesar et al. worldwide coral reefs provide US\$ 9 Billion dollars of coastal protection⁶¹. Estimates of expenditure to artificially replace the shoreline protection ranged from US\$ 50,000 – US\$ 800,000⁶².
- Economic values of the coastal protection service in another study ranged from US\$ 2,000 – US\$1,000,000 per km of coastline (the range varies with the level of development along the coastline, population density and presence of tourism⁶³).

- Another study conducted in American Samoa shows that the cost of mining coral rubble is estimated at US\$ 470,000 to 2.3 million per year or between US\$ 90 and 450 per cubic yard. This is based on the fact that if the coral and sand had been untouched, costs of installing shoreline protection schemes of an average US\$ 1 million per year for 25 years around the Islands could have been delayed by 10 to 20 years. The assumptions are based on a 5% and 10% discount rate respectively and that the rubble has been taken at the rate of 100 cubic yards per week for the past 50 years and does not include the loss of tourism and recreation values. In addition, the study goes further and also calculates the annual value of corals in 25 years time for delaying the need for shoreline protection costs may be to the tune of US\$ 440,000 per year⁶⁴. This study can be used as a very close example since the islands in American Samoa are similar to those in the Maldives in that they are volcanic and also have similar reef formations. Most importantly, the study bases shoreline protection values on savings from delaying the following:
 - Replacement of existing shoreline protection schemes;
 - Installation of new shoreline protection schemes; and
 - Replacement of new shoreline protection schemes.

Various studies have estimated such replacement costs over the years. The following table depicts estimates from such studies as well as existing current actual expenditure incurred from Male’.

Table 2: Replacement Cost of various protection measures

Shoreline Protection of Coral Reefs			
	Replacement Measure	Cost US\$ billion	Rf billion
Male*	Tetrapod Seawall	0.06	1
200 inhabited islands**	Tetrapod Seawall	7	89
200 inhabited islands**	Boulders	1.8	23
Settlement areas only**	Boulders	1.1	14
200 inhabited islands**	Island elevation by 1 m	0.75	10
PDC Policy+		0.015	0.2

*from UNEP-WCMC 2006. **from Shaig, A, 2006 Population and Development Consolidation as a Strategy to Reduce Risk from Natural Disasters and Global Climate Change in Maldives. Unpublished MSc Thesis, James Cook University, Townsville. +Population and Development Consolidation Policy from UNEP 2005.

Shoreline Protection Value from earlier studies
Between Rf. 10 billion – Rf 89 billion based on the type of replacement measure

The costs depicted in Table 2 clearly indicate the huge costs that would be incurred if coral reefs declined or were completely lost and represent indirect values of coastal and marine biodiversity in the Maldives. The fact that replacing the shoreline protection function of reefs (and to a smaller extent mangroves) would manifest as a huge cost to the country can be seen in value of the seawall built all around Male’ from concrete tetrapods at a cost of US\$ 60 million (1.99 km²). This amounted to US\$10 million per kilometer and was done following the degradation of the natural reef⁶⁵. Furthermore, as part of the safe island programme (PDC Policy) communities living on smaller less inhabited and more vulnerable islands are being moved to 5 larger islands with better natural protection at a cost of US\$ 15 million⁶⁶.

The most relevant figures are those for building seawalls around the inhabited islands and range between Rf. 10 – Rf 89 billion (depending on the type of replacement measure). This, therefore, can be said to be the estimated range of shoreline protection value of coral reefs in the Maldives.

Additional calculations were also done as part of this study whereby costs of replacing the shoreline protection function of coral reefs was calculated for the Maldives (table 3). To calculate the total replacement and/or avertive cost of shoreline protection the coastal length (perimeter) of inhabited islands in Maldives and per unit cost of a particular replacement measure was used⁶⁷.

Tetrapod seawall around Male’



Table 3: Replacement cost calculated

Shoreline Protection of Coral Reefs			
Perimeter of Maldives 195 inhabited islands (m)	Replacement Measure	Cost US\$ billion	Rf billion
764,189	Cement-sand/concrete breakwater	1,576,566,859	20,101,227,456
	Rock boulders breakwater	2,733,099,482	34,847,018,400

The above table corroborates the calculations done in previous studies, although based on the latest per unit costs the new calculations show the cost of replacing the shoreline protection function of coral reefs to be higher than that estimated previously (for rock boulder breakwater). The calculations undertaken as part of this study show that artificial replacement of coral reefs ranges between Rf 20 billion – 34 billion, depending on the type of replacement measure. These values indicate the shoreline protection function of coral reefs through the replacement cost method.

Shoreline Protection Value
Between Rf. 20 billion – Rf 34 billion for cement-sand/concrete breakwater and rock boulders breakwater respectively

Indirect and Existence Values: Maldivian willingness to pay for biodiversity conservation

The contingent valuation method (CVM) was used to assess the willingness to pay of the local community, via cash or in-kind contributions for biodiversity conservation and the maintenance of their resource base. This is a method used to estimate economic values for a variety of ecosystem and environmental services. It is the most widely used method for estimating non-use values although it can also be used to estimate use values. For the purpose of this study the intention of carrying out a WTP exercise was twofold: firstly to assess indirect and existence values of marine and coastal biodiversity; and secondly to assess the potential to develop mechanisms to capture revenues and payments, including the possibility of an overall conservation tax to maintain natural resources. This section of the report uses the information generated to highlight the indirect and existence values of coastal and marine biodiversity to the Maldivians. Section 6 of the report once again uses the WTP exercise as a revenue generating mechanism.

For the national level values, WTP surveys were conducted in Baa Atoll and in Male'. In Baa Atoll, the willingness to pay survey was conducted in May 2008. All 13 inhabited islands were surveyed and a total of 213 questionnaires were completed. Individual households were randomly visited and asked if they would be willing to participate in the survey. They were given an introduction and background to the project before commencing the questionnaire.

In Male', the survey was carried out in July 2008 and pedestrians were approached to fill out the questionnaire. They were asked if they would be willing to participate in the survey before commencing with the survey. A total of 301 questionnaires were completed in Male'. The results of the surveys are detailed in the reports authored by Marie Saleem 'Results of Willingness to Pay Survey Carried Out in Baa Atoll and Male' (available from the AEC project).

Most of the respondents were women, who were cautious to answer questions regarding money, firstly because men handle household finances; and secondly because the WTP concept is new to the Maldivians, who felt that they might be making a commitment if they suggested an amount. The respondents from Male' were generally much younger than those interviewed in Baa Atoll. This is probably a reflection of the difference in the methodology used to survey in the two locations. In Baa Atoll, many of those in the younger age groups, especially men live away from home for education and/or livelihood purposes. Thus it is the older generations that remain on the islands. The overall education level was more than 75%, however about 45% from Baa had only basic literacy level. In Male', the highest majority of respondents had completed Grade 10 level and about 20% had attended a university or college.

The survey showed that the marine environment and associated biodiversity was very important for a large percentage of the population (65%) while it was important for 31% and not important only for 4% of the population. Comparison between Male' and Baa Atoll response showed that the marine environment was very important for almost three quarters of those interviewed in Baa Atoll and more than half for those in Male' (Annex Table 36). In addition, the not important category was higher for Male' (6.3%) while less than 1% of the respondents in Baa stated that the marine environment was not important for them.

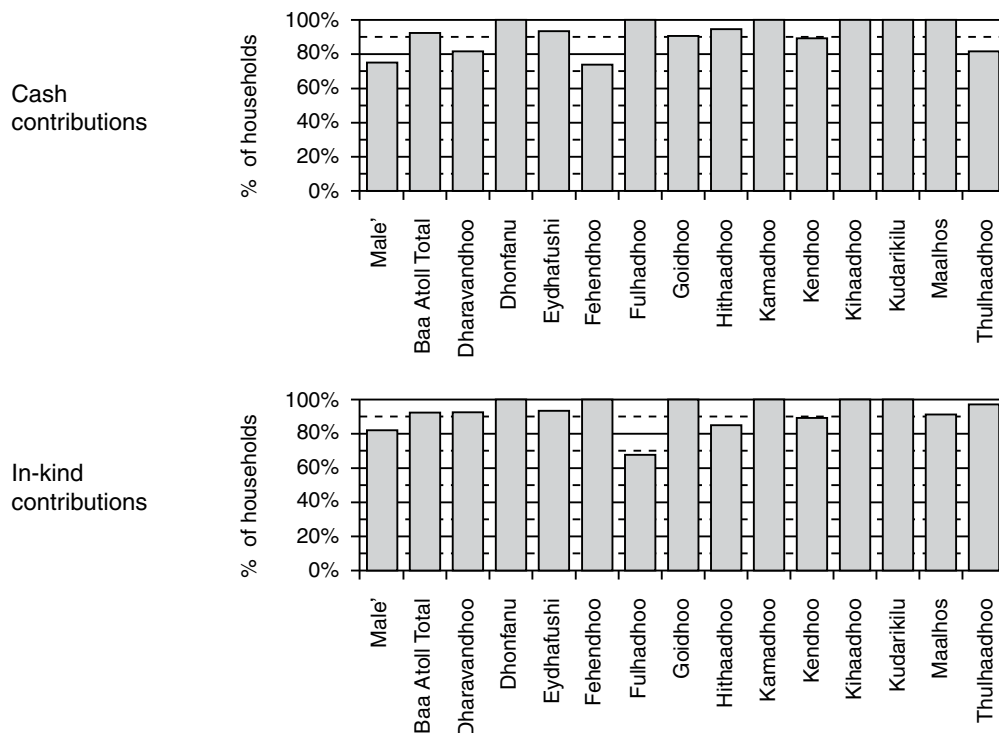
Importance of Biodiversity
72% in Baa and 59% in Male' consider biodiversity to be very important providing direct, indirect, and existence benefits

The benefits considered most important were indirect values at 34% and existence values 31%, while 15% considered the direct benefit of food provision as most important. Indirect values expressed include prevention of beach erosion, fresh air from the environment, means of controlling climate change and protection of the islands. Existence values were stated as the most beneficial by about 40% of the respondents from Male' (Annex Table 37).

Stated Value of Biodiversity
On average individual stated value of biodiversity was within the range of Rf 120-130. Overall this figure is Rf 0.39 million for Male' and Baa Atoll and Rf 6 million if extrapolated to the rest of the population

Most people showed willingness to finance biodiversity conservation through either a conservation fee or a user fee. Overall 80% of the respondents were willing to pay annually towards a biodiversity conservation fund. Over 90% in Baa and 74% in Male' declared that they would be prepared to make voluntary financial contribution towards biodiversity conservation (Figure 5). Among these 35% of the people were willing to pay Rf10, over 25% were willing to pay Rf100 and 8% were willing to pay Rf500. On average individual value of biodiversity was within the range of Rf 120-130, with most preferring to make this payment as an annual donation to a biodiversity conservation fund (Annex Table 39). Most respondents (a similar proportion in Baa Atoll and a higher proportion in Male') were, in addition to this, willing to contribute their time to assisting with biodiversity conservation activities such as awareness campaigns, tree planting, beach and reef clean ups (Annex Table 40).

Figure 5: Willingness of Maldivians to contribute to biodiversity conservation

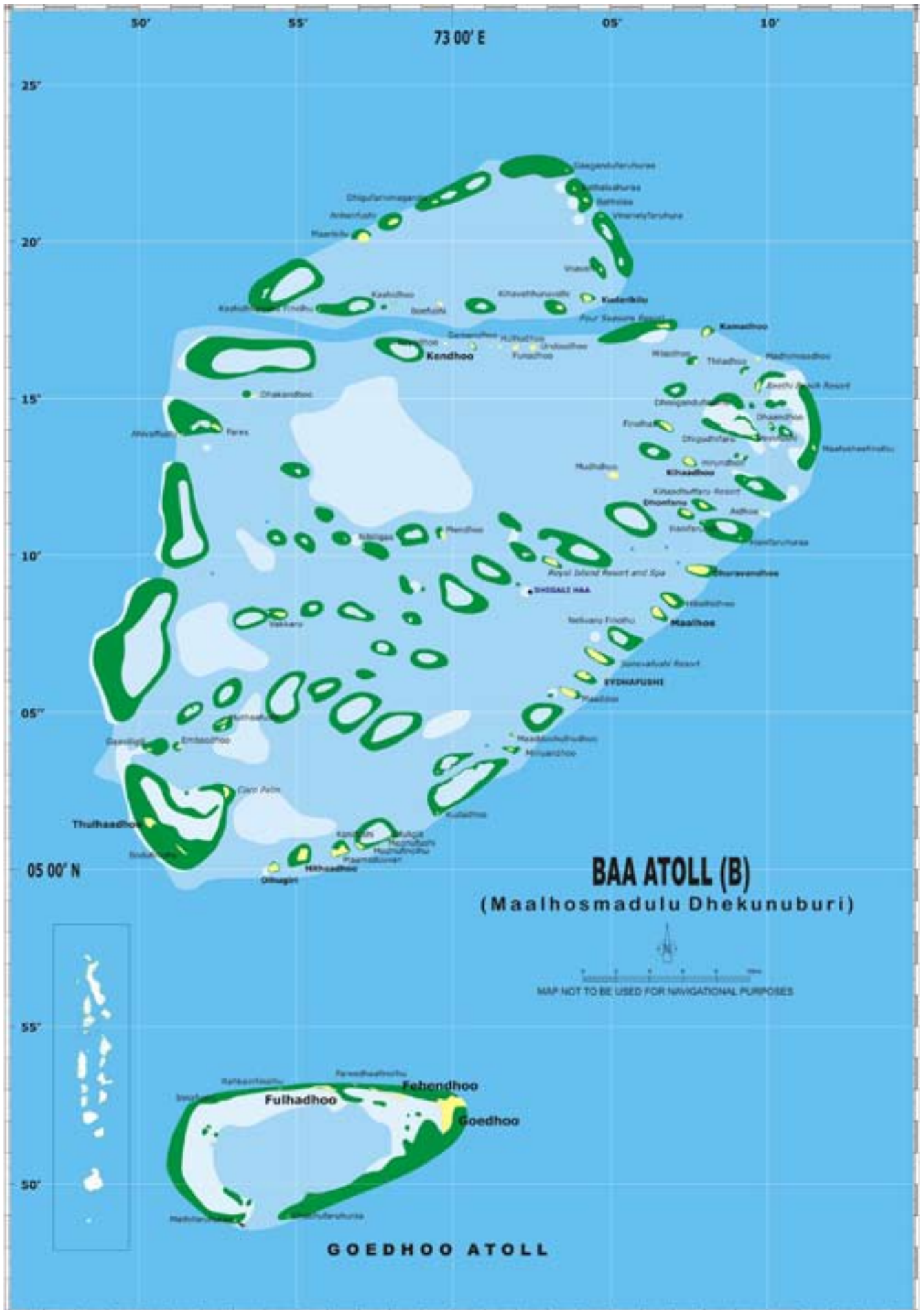


Indirect, and Existence Value
Rf. 2 million per year for regulating and supporting services from Maldivian willingness to pay
Rf. 1.8 million per year existence values from Maldivian willingness to pay
Rf. 230 million existence value from overseas willingness to pay

Overall the stated value of marine and coastal biodiversity at Baa Atoll and Male' amounts to approximately Rf 0.39 million per year (Rf 0.15 million estimated from respondents in Male' and 0.24 million from respondents in Baa Atoll). This amount if extrapolated to the whole country depicts a value of Rf 6 million per year and this value represents the indirect and existence value of coastal and marine biodiversity to Maldivians, with a small percentage included as direct value. Based on the proportion of respondents' preference, the indirect and existence values can be broadly estimated and extrapolated to the whole country at Rf. 2 million per year (indirect values including regulating and supporting services); and Rf. 1.8 million per year existence values.

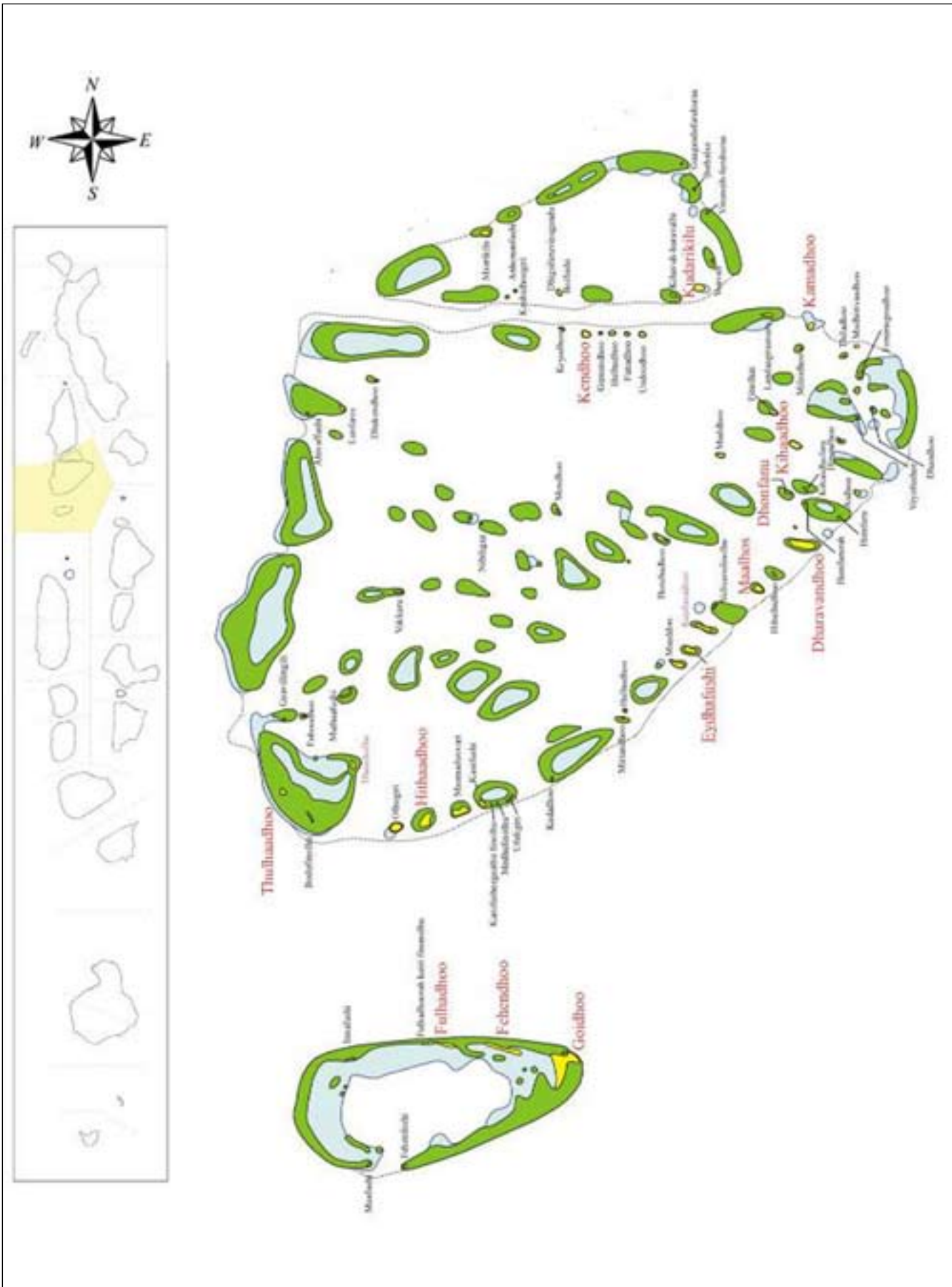
Overseas willingness to pay was adapted from an earlier study by Mizna Mohamed 'Economic Valuation of Coral Reefs: A Case Study of the Costs and Benefits of Improved Management of Dhigali Haa, a Marine Protected Area in Baa Atoll, Maldives'. Results from this survey if broadly extrapolated, show the additional existence value of Rf. 230 million from overseas willingness to pay.

Figure 6: Satellite image of Baa Atoll and its Islands



From NASA/GSFC/ASTER Science Team, http://www.nasa.gov/images/content/118308main_image_feature_349_ys_full.jpg, accessed 27/09/08. Image dated 16 June 2005.

Figure 7: Map of Baa Atoll and its Islands



From http://commons.wikimedia.org/wiki/Image:Baa_Atoll.png, accessed 10/09/2008.
 Map originally vector'ed by Hassan Waheed Aabaadhuge of Thinaadhoo Island.

5. Biodiversity in the Baa Atoll economy

According to the Ministry of Atolls Development, the resident population of Baa Atoll (currently estimated at 12,170 people or 2,154 households⁶⁸, spread over 13 inhabited islands – see Figure 6, Figure 7 and Annex Table 16) are engaged primarily in fishing (mentioned as a main activity in every one of the inhabited islands), supplemented by farming, thatch weaving, masonry, carpentry and various tourism related activities⁶⁹.

As is the case in most other parts of the Maldives, the economy of Baa Atoll and its 75 component islands is highly dependent on marine and coastal biodiversity, through the fisheries and tourism sector and other activities based on the harvesting and processing of biological resources.

In addition to fishing activities (including grouper, reef fish, sharks, tuna, bait fish, lobster, octopus and sea cucumbers), a wide range of non-fish biological resources are harvested and used by households at home and to sell. These include coral⁷⁰ and sand mining, firewood, turtles and turtle eggs, seabirds, shells, medicinal plants, wood for boat-building, wood for the production of lacquerware, palm fronds and materials for other handicrafts.

All of these uses are considered in the paragraphs below except for coral and sand mining: because these two activities are thought to be environmentally unsustainable – even though economically important at the household level. According to figures from the Ministry of Environment, Baa Atoll contributed 15% and 12% respectively of the total amount of reported coral and sand mined in the Maldives between 2000 and 2003⁷¹.

Baa Atoll is also a popular destination for international visitors, generating substantial revenue from tourism. At present there are six resorts in Baa Atoll – Reethi Beach Resort, Sonevafushi Resort, Club Valtur, Royal Island, Four Seasons Landaa Giraavaru and Coco Palm. Two more resorts are currently under construction.

It is difficult to obtain Atoll-level economic and development statistics, although some disaggregated data are available for selected fisheries sector indicators. A review of these figures provides some broad estimates of the economic significance of the fisheries sector to Baa Atoll's economy.

According to government statistics, the economically active adult population of Baa Atoll is 4,183 persons⁷², of whom 1,010 are fishermen⁷³. There are 3,601 people who are employed, of whom 354 are working in the fisheries sector⁷⁴.

Based on average wage rates⁷⁵, these employees together earn Rf 9.63 million a year. In total, the fisheries sector therefore comprises just under 10% of recorded employment in the Maldives, and occupies 33% of the economically active adult population, showing that fisheries accounts for a relatively higher proportion of economic activity than it does formal wage employment.

There is a fleet of 127 fishing boats in Baa Atoll, of which an average of 89 are engaged in fishing each month, making more than 12,500 fishing trips⁷⁶ (see Annex Table 18). The total recorded annual catch is approximately 2,600 tonnes, more than half of which is comprised of Skipjack (see Annex Table 18). At average current market prices, the annual value of this recorded catch is some Rf 12.94 million.

Around 570 tonnes of fresh fish were purchased by companies in 2006⁷⁷, just under 460 tonnes of which was bought by MIFCO (0.6% of MIFCO's total collections from Atolls) via its collection centre on Baa Atoll at a total price of just over Rf 1.7 million (Annex Table 20). In total, purchases of fresh fish by companies (including MIFCO) were worth approximately Rf 2.17 million in prices paid to Baa Atoll fishermen, and generated products with an estimated end-value of Rf 10.59 million to the purchasing companies⁷⁸.

The value of biodiversity-based activities carried out in Baa Atoll, to household livelihoods, the Atoll economy, and the private sector, are described in the paragraphs below. The section on household values summarises

Employment
Fishing occupies a third of the economically active adult population in Baa Atoll, accounting for 10% of recorded employment and generating wages of Rf 9.63 million a year

Income
The annual recorded value of fish catch for Baa Atoll is Rf 12.94 million, including sales to companies of Rf 2.17 million. Fish collected from Baa Atoll in turn generate earnings for companies of around Rf 10.59 million a year.

the findings of a survey that was carried out as part of this study, and is detailed in the report authored by Marie Saleem 'Results of a Household Survey of Baa Atoll' (available from the AEC project). Focused rapid research was carried out in May 2008, to assess the economic value of marine and coastal biodiversity in Baa Atoll. The aim was to calculate gross figures of the benefits that marine and coastal biodiversity provides to Baa Atoll and to each island in the Atoll. A questionnaire was developed for the household survey taking into account potential activities related to the environment carried out by the islanders of Baa Atoll. A list of the number of households on each island was generated and approximately 13% of the households from each island were surveyed through in-person interviews. In terms of household members, only those who have been sleeping, eating and living in the household were taken into account. Those living elsewhere on a permanent basis were not taken into consideration.

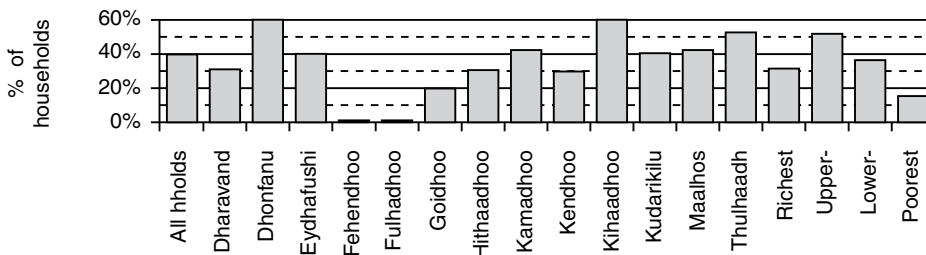
Direct Biodiversity values at the household level⁷⁹

Employment

Over the whole Atoll, almost 1,300 residents (40% of households) are employed in the tourist industry, which generates earnings of almost Rf 68 million a year.

The tourism sector provides important employment opportunities to the population of Baa Atoll. Over 40% of households have at least one family member engaged in work at a tourist hotel or resort (translating into 1,280 people working in tourism), earning wages of an average of Rf 100,000 a year, and contributing a fifth of all household wages (Annex Table 21). Most of these employees work at resorts in Baa Atoll itself, with just a quarter working elsewhere in the Maldives. There is considerable variation in employment rates between islands. Unsurprisingly, given the relatively long distance from resorts, the proportion of the population employed in the tourist sector is zero on the islands of Fehendhoo and Fulhadhoo. In contrast, more than half of households have at least one family member working in the tourist sector in islands which lie close to resorts, Dhonfanu, Kihaadhoo and Thulhaadhoo. Engagement appears to be correlated with household wealth, with the poorest households both participating much less and also earning far lower average wages than other households.

Figure 8: Baa Atoll household employment in tourism, by Island and wealth group

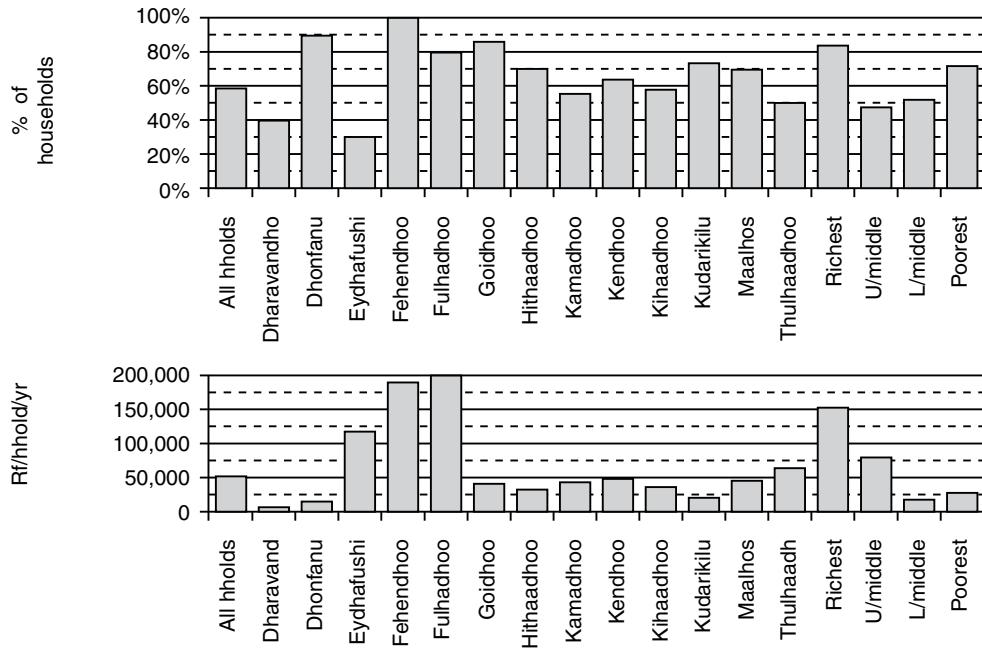


Business

Over the whole Atoll, more than 1,200 households are engaged in biodiversity-based business, generating earnings of Rf 80 million a year.

Marine and coastal biological resources form the basis of a great deal of business activity on Baa Atoll. This includes, most importantly, businesses based on thatch making (carried out by a third of households), fish marketing (more than a quarter of households), fish processing, and the production of lacquerware. Almost 60% of the Atoll population is engaged in some form of biodiversity-based business, which altogether generates an average of more than Rf 61,000 income a year. Among participants, biodiversity-based activities account for just over a half of all household business earnings (Annex Table 22). Although the rate of participation in biodiversity-based business is highest (around three quarters of households or more) among the richest and the poorest, as is its share in all business earnings (71% or more), it is notable that average earnings decline sharply as household wealth decreases.

Figure 9: Baa Atoll household participation and income from biodiversity-based business, by Island and wealth group



Baa Atoll survey analysis confirms that the fisheries sector dominates the output and income gained from biological resources at the household level. According to survey results fishing is the main occupation in Baa Atoll. Just over 40% of households engage in fishing, in most cases on a regular basis (Annex Table 25), with an average market value of Rf 1.75 million per year⁸⁰ (Annex Table 23). Income from the sale of fish account for the majority of this value, across most types of fisheries (Annex Table 26): although around a fifth of fishing households retain at least a portion of their catch for home consumption, on average this accounts for less than a tenth of total value. Tuna fishermen sell their catch to Male' fish market, fish processing companies (primarily MIFCO, who has a collection point on the Atoll) and to other islands, while reef fishermen primarily market their catch to nearby resorts.

Fishing
Over the whole Atoll, just under 900 households are engaged in fishing, to a total value of Rf 1.8 billion a year.

Participation in different types of fisheries varies between islands (Annex Table 24): a large proportion of fishermen engage in tuna fishing in most (although not all) parts of the Atoll, and bait fisheries and reef fisheries are also generally widespread. Participation in shark⁸¹, lobster, octopus and sea cucumber fisheries is much less common, and is concentrated around just a few islands. Both the rates of household participation in fishing and average value of catch are particularly high in Fulhadhoo, Goidhoo, Hithaadhoo and Kendhoo islands, and particularly low on Eydhafushi (perhaps not surprisingly, as this is the island where the Atoll administrative headquarters, and much of its business, are located). Both the richest and the poorest households show a much higher rate of participation

in fishing, although the value of the catch declines sharply as household wealth declines. One probable reason for this could be (and which is consistent with other findings on wealth and natural resource use) that the rich participate a lot in fishing because it is a lucrative trade – they tend to focus on the more commercial end of the industry so that their average earnings tend to be high. The poor also show a high participation because it is a traditional lifestyle, and relatively easily-accessible source of food and income. However, typically their average earnings are much less because (a) they lack access to boats and other equipment which maximise catch, and (b) they tend to focus more on the subsistence side of fishing than on the value-added commercial aspects.



Island Fishermen

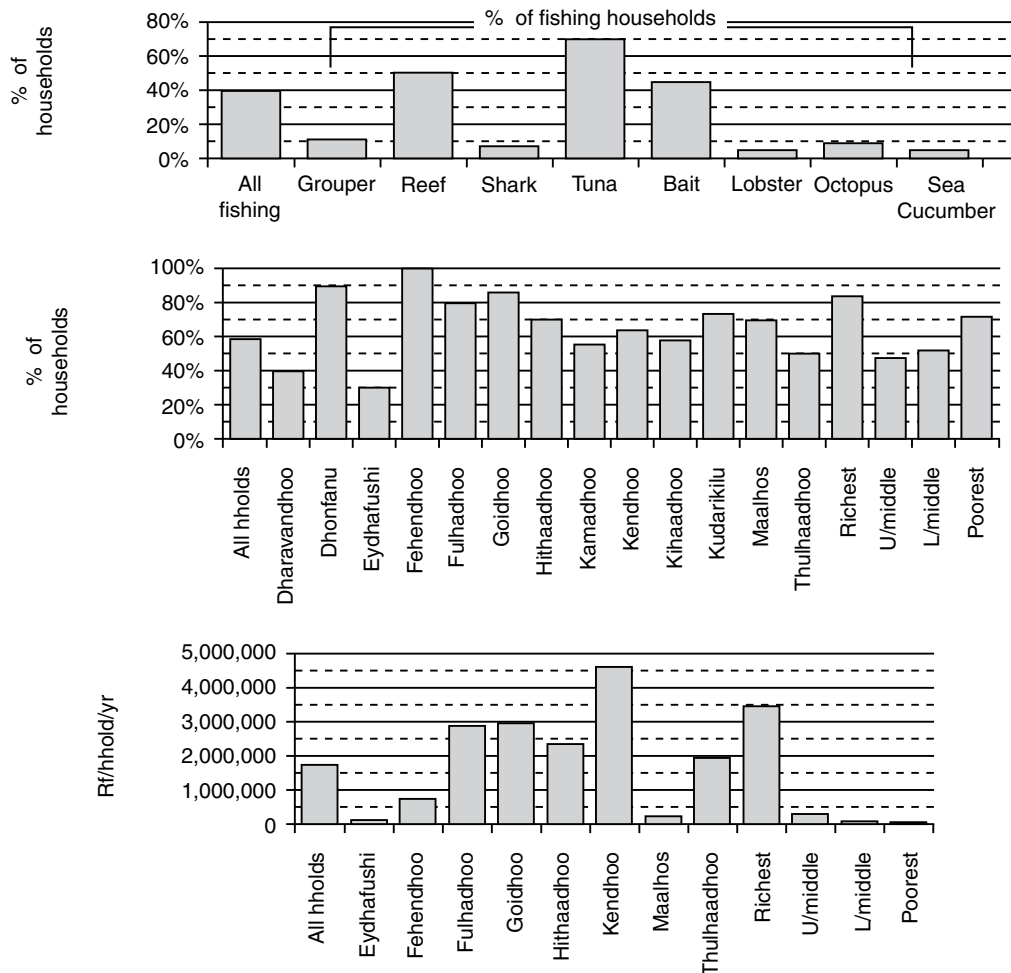


Line Fishing



Pole Fishing

Figure 10: Baa Atoll household participation and income from fishing, by Island and wealth group



Other biological resources

Over the whole Atoll, around 1,200 households are engaged in some form of non-fish biological resource harvesting, and that the partial annual value of this use is almost Rf 19 million.

A variety of other non-fish biological resources are harvested and used by households living in Baa Atoll, including firewood, turtles and turtle eggs, seabirds, shells, medicinal plants, wood for boat-building, wood for the production of lacquerware, palm fronds and materials for other handicrafts. These resources come from a variety of sites. On some islands there is a small enough population to mean that sufficient areas of natural vegetation remain for residents to harvest resources in close proximity to their dwellings. Several islands are however congested, and little natural vegetation remains (for example Thulhaadhoo, Dharavandhoo, Hithaadhoo and Eydhafushi); here, residents utilise the natural resources on nearby uninhabited islands.

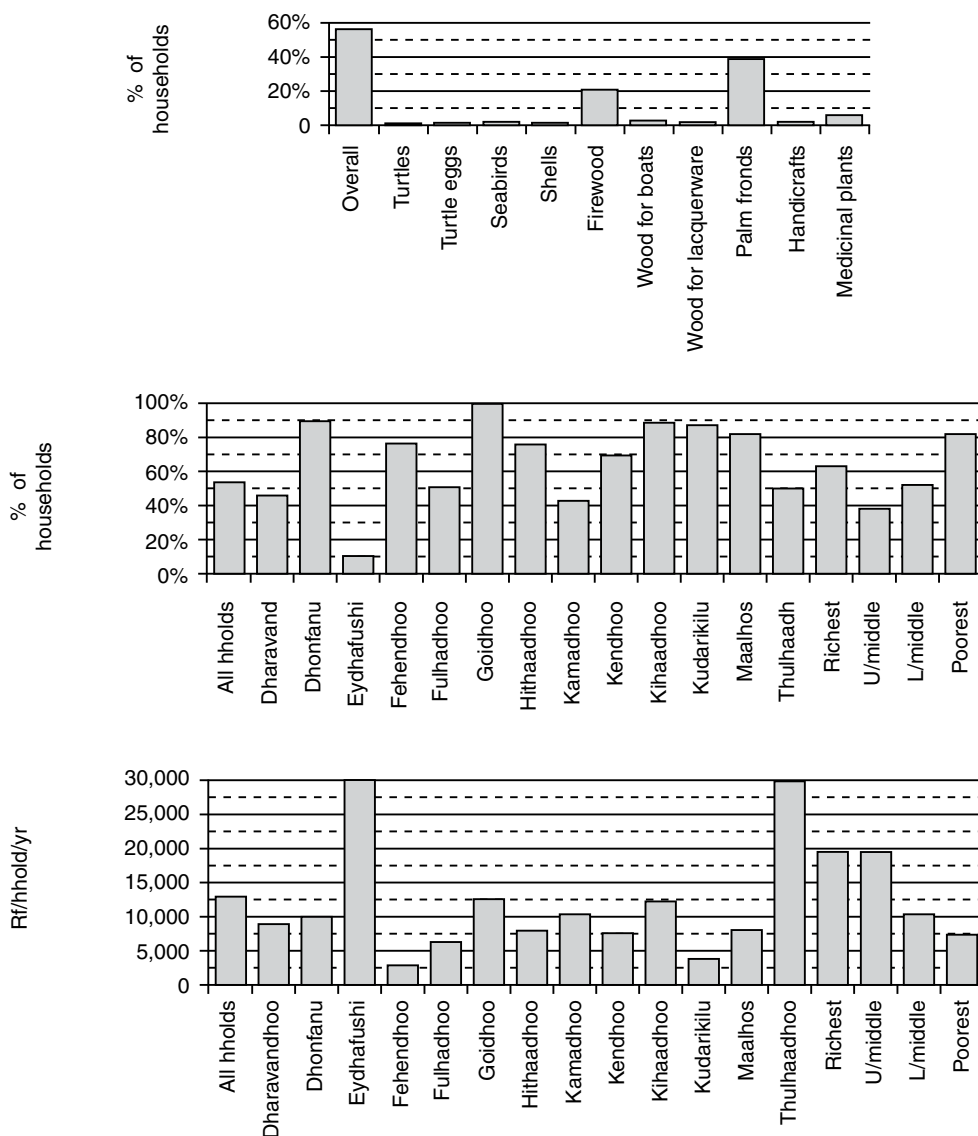
Just over half of households resident in Baa Atoll carry out at least some form of non-fish biological resource harvesting (Annex Table 27), generating combined average values of just over Rf 22,000 per household per year (Annex Table 28). Participation is especially high (more than 75% of households) in Dhonfanu, Fehendhoo, Goidhoo, Hithadhoo, Kihadhoo, Kudarikilu and Maalhos islands and particularly low on Eydhafushi (probably for same reason as low participation in fishing activities). By far the most widespread activities (in terms of both household participation and spread across different islands) are firewood collection and the harvesting of palm fronds. The production of lacquerware and collection of turtles is confined to one island – Thulhaadhoo, which is also one of only two islands where households state that they harvest turtle eggs, seabirds and shells.

Firewood, wood for boat building, seabirds and medicinal plants are harvested primarily for use at home, although the majority of lacquerware, palm fronds (sold to resorts for thatching purposes) and other handicraft materials are gathered for sale (Annex Table 30). As with engagement in fishing activities, both the richest and the poorest households show a much higher incidence of participation in non-fish biological resource harvesting although average income decreases sharply as household socio-economic status declines.



Lacquer Workshop

Figure 11: Baa Atoll household participation and income from non-fish biological resource harvesting, by Island and wealth group



Biodiversity values for private sector tourism operators

As mentioned above, there are six operational resorts on Baa Atoll: Reethi Beach Resort (Fonimagoodhoo Island), Sonevafushi Resort (Kunfunadhoo Island), Club Valtur (Kihaadhuffaru Island), Royal Island (Horubadhoo Island), Four Seasons Landaa Giraavaru (Landaa Giraavaru Island) and Coco Palm (Dhunikolhu Island). Each resort exclusively occupies its own island, and typically offers a range of activities to tourists including beach and water sports, snorkelling, diving and island tours.

Value of tourist accommodation
350,000 bednights worth US\$ 160 million (Rf 2 billion) gross: 10% of total for the Maldives

Aside from revenue remitted to central government, a limited amount of employment, and some sourcing of fresh foods (mainly fish) and souvenirs, most of the income earned from Baa Atoll tourism is restricted to the resort island itself and to overseas. Resorts are all-inclusive and cater to almost all tourist needs on-site, and the bulk of payments made are remitted to international tour operators and resorts' offshore headquarters. With a combined bed capacity of 1,240 and occupancy rates varying between 67% and 95%, stays at these establishments totalled more than 350,000 bednights in 2006: this accounted for 6.5% of all tourist bednights in Maldivian resorts (see Annex Table 31). In total these rooms were worth around US\$ 160 million or over Rf 2 billion over the year, just under a tenth of the country total⁸².

Value of tourism diving and snorkelling
US\$ 2.3 million (Rf 29 million) gross

Aside from resort bar and food sales (which are not included in this analysis), the main source of additional tourism income comes from charges made for off-island diving and snorkelling trips. Every resort has its own dive operation, provided by an independent company in all of the resorts except for Four Seasons Landaa Giraavaru (which has its own in-house facility). Dive centres typically share between 40-50% of their revenue with the resort in which they are based. In 2007, dive centre on Baa Atoll generated estimated gross revenue of just under US\$ 2.3 million (Rf 29 million), of which 52% was remitted to resorts and 48% retained by the dive operators themselves (see Annex Table 32).

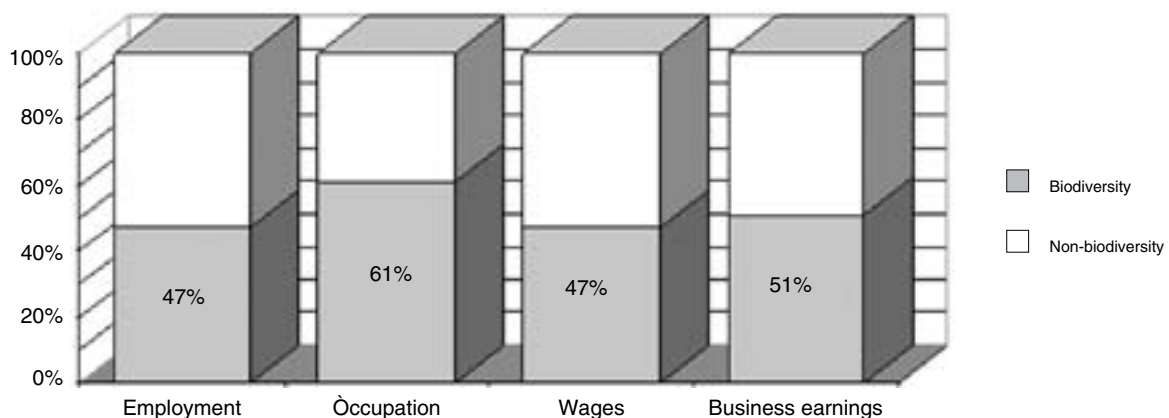
Biodiversity and the Baa Atoll economy: a summary of direct values

Table 4: Contribution of biodiversity to key household economic indicators in Baa Atoll, 2008

	No households	Average earnings (Rf/hhold/year)	Total Value (Rf mill/year)*
Tourist employment	1,280	99,926	67.91
Fisheries employment	364	26,456	9.63
Biodiversity-based business	1,239	61,425	80.28
Fishing	862	1,750,486	1,800.00
Non-fish biological resource harvesting	1,185	13,413	18.84

* total calculated from sum of disaggregated figures for % of households participating and average value per household in each island.

Figure 12: Contribution of biodiversity to key household economic indicators in Baa Atoll, 2008



Indirect and Existence Values for Baa Atoll

The shoreline protection (indirect) values of coral reefs in Baa Atoll were also calculated based on the total perimeter (38,474 m) of the 13 inhabited islands and the per unit cost of two replacement measures⁸³. As per the calculations the artificial replacement cost of building cement-sand/concrete breakwater is over Rf 1 billion and that of building rock boulder breakwater is Rf 1.75 billion for all of the 13 inhabited islands.

Replacement cost of shoreline protection
Cost of building concrete breakwater over Rf 1 billion
Cost of building rock boulder breakwater Rf 1.75 billion

Willingness to pay surveys were undertaken to assess the stated indirect and existence value of Baa Atoll biodiversity to residents as well as to tourists. These are detailed in the reports authored by Marie Saleem 'Results of a Willingness to Pay Survey Carried Out on Baa Atoll and Male'; and 'Economic Valuation of Coral Reefs: A Case Study of the Costs and Benefits of Improved Management of Dhigali Haa, a Marine Protected Area in Baa Atoll, Maldives' authored by Mizna Mohammad (both available with the AEC project).

The surveys show the marine and coastal environment to be important to 99% residents of Baa Atoll with more than half (54%) considering regulating services as the most important benefits, while 20% deemed cultural services to be the most important benefits. Human action was perceived as the major threat by 40% of the people (Annex Table 38).

Stated Biodiversity Values at Baa Atoll
85% of overseas visitors to Baa Atoll are willing to each contribute US\$ 35 (Rf 446) per visit towards marine and coastal conservation and 90% of Baa Atoll residents were willing to contribute Rf 123 per person
Altogether the value amounts to Rf 20.26 million for residents and tourists

The indirect, and existence value of biodiversity can be garnered from the WTP of the local population towards conservation. More than 90% of the respondents at Baa were willing to pay an average Rf 123 per person and 93% were willing to make in kind contributions for environmental conservation (Annex Table 36 and Table 37). Out of this 82% wanted to support a conservation fund while 14% preferred to pay a user fee (Annex Table 39). Survey results thus show that the indirect and existence values of biodiversity to Baa Atoll residents amounts to Rf 0.24 million annually. Based on the respondents' preference proportions, the stated value of regulating and supporting services (indirect values) can be broadly estimated at Rf. 0.14 million annually and existence value at Rf.0.05 million annually.

The WTP survey of tourists was carried out to assess a policy change for the improved management of Dhigali Haa MPA at Baa Atoll in an earlier study. The intended population for the survey was all the tourists visiting four resorts in Baa Atoll during the survey period. Four Seasons at Landaa Giraavaru and Sonevafushi Resort and Spa were not included in the survey. The results also indicate the existence value of marine and coastal biodiversity to tourists and 85% of tourists were prepared to contribute US\$ 35 (Rf 446) per visit as a conservation fee and US\$ 15 (Rf 191) as user fee for dives. This assessment increases the existence value of Baa Atoll biodiversity by Rf 20.02 million. Altogether Rf 20.26 million represents the indirect and existence value of Baa Atoll coastal and marine biodiversity.

Indirect and Existence Values at Baa Atoll
Rf. 0.14 million annual indirect value and Rf. 0.05 million annual existence value for Baa Atoll residents
Rf. 20.02 million annual existence value for tourists

6. Financing biodiversity conservation in the Maldives

The current status of biodiversity funding

Central government financial support and overseas donor assistance provide the main funding resources for biodiversity conservation in the Maldives, with a very limited amount of private sector funding support (much of which is provided indirectly or in kind, via resorts making efforts to ensure that the islands and coral reef dive areas used by their clients are kept in good condition).

Value of tourist accommodation
Rf 32.6 million in 2004 X(pre-tsunami), or 0.9% of all central government expenditure
Rf 94.95 million in 2007 (post-tsunami), or 0.7% of all government expenditure

Pre-tsunami statistics show that an average of Rf 29 million a year⁸⁴ was being spent on environmental protection by the central government⁸⁵; more than 80% of this figure was accounted for by current expenditures, and under 20% was capital spending (Annex Table 33). Environment has accounted for a similar proportion of total government expenditures over the last 3 years, although overall budgets have risen substantially in the post-tsunami period (Annex Table 34). This amount is very small as compared to other sectors: in terms of overall government expenditures, environmental protection has consistently accounted for less than 1% of the total for the last 6 years. Although the funding situation of the Ministry of Environment, Energy and Water has improved slightly over recent years, the 2007 budget breakdown shows that in terms of budget allocations it was ranked sixteenth out of 26 government agencies.

Overseas Development Assistance
US\$ 14.35 million (Rf 182 million) commitments under tsunami assistance or 1.6% of total
US\$16.30 million (Rf 208 million) commitments under general development assistance or 15.6% of total
In total, environmental spending is just 3% of all donor support to the Maldives

Overseas Development Assistance (ODA) is a significant part of the Maldivian government's revenue, accounting for over 40% of total government revenue in 2007 (and around 20% in the years preceding the tsunami)⁸⁶. ODA primarily supports capital budget investments, but a small proportion is also used to fund recurrent expenditures. As of the last quarter of 2007, donors had committed a total of just over US\$ 1 billion in development assistance for ongoing activities in the Maldives, around 90% of it for post-tsunami activities. Environment and natural resources accounted for 1.6% of ODA for activities under the National Recovery & Reconstruction Plan and 15.6% of funding under non-tsunami development activities, together worth US\$ 30.65 million (Rf 390 million). In total, environmental spending comprises just 3% of all donor support to the Maldives (see Annex Table 35).

A major problem is that these financial resources are not adequate to cover the costs of biodiversity conservation in the Maldives. The various government agencies responsible for conservation (most notably the Environment Ministry, Ministry of Fisheries, Agriculture and Marine Resources, and Ministry of Atolls Development and

Atoll/Island Authorities) state that they face persistent shortfalls in funding, and are unable to carry out activities of the types and to the levels which they deem necessary for effective biodiversity conservation.

As is the case in many other countries in the world, a variety of other financial constraints also beset marine and coastal biodiversity conservation in the Maldives, in addition to the inadequate amount of funding available. Financial sustainability extends beyond considerations of the absolute quantity of funds: it can be defined as the ability to secure sufficient, stable and long-term financial resources and to allocate them in a timely manner and in an appropriate form, so as to ensure that the full costs are covered and biodiversity is conserved effectively and efficiently⁸⁷. Five additional financial sustainability issues that arise in the context of marine and coastal biodiversity in the Maldives and Baa Atoll relate to the breadth of the funding base, the allocation of financial resources to the agencies mandated to conserve biodiversity, the composition of conservation expenditures, financial planning processes and procedures, and the distribution of conservation funding and benefits:

- Biodiversity conservation budgets in the Maldives rely almost entirely on just two sources – central government and overseas donors. This is not only inadequate to fulfil conservation needs, it constitutes an extremely narrow, and risky, financial base. Should one or both of these sources diminish or fail, this would have a devastating effect on conservation budgets – which would then have no other funds to fall back on. Without a more diverse portfolio, composed of a number of sources which can substitute for any shortfalls, where necessary, the funding base for marine and coastal biodiversity conservation will remain insecure in the long-run.

- The level of self-generated revenue from the sustainable use of biodiversity and from non-extractive uses remains extremely low in the Maldives. This is the case even where these goods and services (such as diving, snorkelling, fisheries productivity, etc.) generate extremely high economic values for their users and beneficiaries, and are subject to high levels of demand. Even where charges are levied on biodiversity-dependent products, services and activities (for example in the tourism and fisheries sectors), none of the revenue raised goes to the government agencies mandated with biodiversity conservation – even though biodiversity and ecosystem services play a key role in enabling the activities concerned. The funds flow either to the central Treasury or to other line agencies. Few attempts have been made to identify cases where charges and fees could (and should) be levied for biodiversity goods and services, and captured as funding for conservation. There are limited possibilities for government conservation agencies, individual conservation areas or Atolls to retain the revenue raised from biodiversity and to invest them in biodiversity conservation.
- The pattern of budget allocations and expenditures made does not necessarily ensure effective conservation. Of particular concern is the balance between capital and recurrent expenditures in conservation budgets in the Maldives. A review of government budgets to environmental protection over the last 3 years indicates that recurrent expenditures accounted for between 76% and 86% of the total, leaving just 14%-24% for essential capital investments (Annex Table 33). Biodiversity conservation is hampered by a lack of funding for key capital and infrastructure, as well as by low budgets for the non-staff recurrent expenditures such as equipment, maintenance, monitoring, patrolling and outreach activities that are key to effective conservation.
- There is a short-term and inflexible financial planning horizon. Budgets are prepared on an annual basis in the Maldives, with little consideration of future funding streams or funding security. There are often delays in the actual release of funds, and annual budget plans remain relatively rigid in terms of allowing for changes in expenditures or interchange between budget lines. These factors put conservation managers in a situation where they are unable to engage in forward financial and conservation management planning, or to be certain of what budgets will be received over the medium or long-term. It also means that funds cannot always be made available at the exact time that they are needed for (often urgent) conservation activities.
- The definition of costs and funding needs is narrow and excludes an important element – the indirect and opportunity costs of biodiversity conservation. Opportunity costs can be defined as the benefits or economic opportunities that are diminished or lost by choosing to conserve biodiversity, and include both the value of foregone output from prohibited resource uses and from potential conversion of the area to an alternative use, as well as possible congestion effects on other sites and stocks that remain available for extractive uses and alternative developments⁸⁸. They accrue mainly at the Atoll and household level. With conservation funding focusing primarily on covering the direct costs of the government agencies mandated to manage biodiversity, there has been little effort to balance or offset indirect and opportunity costs. This is not only inequitable, but also undermines effective conservation. As long as local users and managers perceive there to be net costs to them from conservation, they are unlikely to support it.

Tools for improving the financial sustainability of marine and coastal biodiversity conservation

A core element of any strategy to improve the financial situation and sustainability of marine and coastal biodiversity conservation is to look towards increasing existing sources of funding. As described in the paragraphs above, environmental protection currently accounts for an extremely low share of both government and overseas donor budgets. This is somewhat paradoxical given its demonstrable economic and development importance. Major efforts should be made to increase the priority and budgets, accorded to marine and coastal biodiversity conservation by government and donors. Here it should be noted that the 2002 National Biodiversity Strategy and Action Plan explicitly mentions the objective of building financial capacity for biodiversity conservation through increasing and augmenting annual government budget allocations. A first step would be clearly articulate and communicate to the Ministries of Finance and Treasury, Planning and National Development, Trade and Industries and other sectoral line agencies the high dependence of the Maldives economy, livelihoods and human wellbeing on biodiversity and ecosystem conservation.

It is clear that additional financing mechanisms need to be identified that can not just increase the amount of funding for marine and coastal conservation in the Maldives generally, and in Baa Atoll specifically, but also act to improve financial diversity, security and retention. A number of clear opportunities exist for generating these financial resources, and for ensuring that they are used to support more effective biodiversity conservation. These are described in the following paragraphs.

Voluntary contributions from overseas tourists
85% of overseas visitors to Baa Atoll are willing to each contribute US\$ 35 (Rf 446) per visit towards marine and coastal conservation

The tourist willingness to pay survey mentioned before found that more than three quarters of tourists from overseas to Baa Atoll resorts are in favour of making financial contributions to conservation via support to Dhigali Haa MPA. In principle, they are willing to pay either a one-off conservation fee (applicable to tourists visiting Baa Atoll) of an average of US\$ 35±5 (Rf 446 – 510) (85% of respondents), or a user fee solely for divers was US\$ 15±5 (Rf 191 – Rf 255) (74% of respondents), with the former preferred as a mechanism for revenue collection⁸⁹.

In total such a conservation fee could, if implemented, generate around US\$ 1.57(Rf 20.02) million in payments each year, based on current rates of just under 45,000 tourist visits a year for Baa Atoll⁹⁰.

Maldivian citizens' willingness to support biodiversity conservation
74% of Male' residents and 91% of Baa Atoll residents are willing to each contribute between Rf 123 and Rf 130 per year towards marine and coastal conservation
Slightly higher percentages are also willing to donate their time to supporting conservation activities

As mentioned earlier, surveys were carried out on the willingness of Maldivian residents in Male' and Baa Atoll, to pay for marine and coastal biodiversity conservation.

The surveys found that more than half of Maldivian residents in Male' and almost three quarters in Baa Atoll considered marine and biodiversity to be very important to them (and very few in either location considered it to be of no importance), particularly for the supporting and regulating services it provides to human production and settlements and due to its cultural value (Annex Table 36 and Table 37). The majority of respondents also believe that marine and coastal biodiversity is threatened, in particular due to human influences and inadequate waste management (Annex Table 38).

This concern with the environment is reflected in a very high willingness to provide material support to marine and coastal biodiversity conservation (see Figure 5). Almost three quarters of survey respondents in Male' and more than 90% in Baa Atoll declared that they would be prepared to contribute cash to conservation, on average Rf 120-130, with most preferring to make this payment as an annual donation to a

biodiversity conservation fund (Annex Table 39). Most respondents (a similar proportion in Baa Atoll and a higher proportion in Male') were, in addition to this, willing to contribute their time to assisting with biodiversity conservation activities such as awareness campaigns, tree planting, beach and reef clean ups (Annex Table 40).

Voluntary funding to conservation in Male' and Baa Atoll
Survey findings indicate that revenues of Rf 20.41 million a year could be raised for conservation from voluntary contributions from Maldivian citizens in Male' and Baa Atoll

If these sources of voluntary funding could be realised, they would constitute a significant contribution to the financial resources available for biodiversity conservation in the Maldives (additional funds of Rf 0.15 million a year from Male' respondents) and for Baa Atoll (Rf 20.26 million, which includes both Baa residents' and tourist willingness to pay). It is worth noting that even though the data generated by this study refer only to two sites (Baa Atoll and Male' Island) the stated individual voluntary contributions already equate to an amount of additional funding that is at Rf 20.41 million a year (Table 5) equivalent to 20% of the current annual government budget for environmental protection. Potential funding for Baa Atoll is worth some two and a half times more than current government budget allocations through the Ministry of Atolls Development (Annex Table 34).

Untapped biodiversity funding
If the willingness to pay findings of this study are more broadly extrapolated to all Maldivians and foreign tourists, voluntary contributions could generate additional conservation funding of Rf 234 million or US\$ 18 million a year – more than two and a half times the 2007 government budget

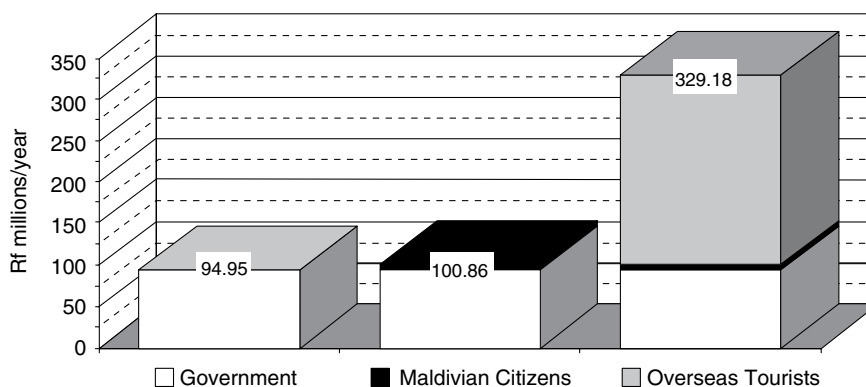
If the rest of the Maldivian population were willing to make donations at a similar level, this figure would rise to almost Rf 6 million a year from domestic sources alone⁹¹. Capturing overseas willingness to pay via a conservation fee levied on all tourists could, if findings from Baa Atoll are more broadly extrapolated generate conservation revenue of almost Rf 230 million a year.

Combined, these potential sources of funding of some Rf 234 million or US\$ 18 million a year is more than two and a half times the amount of budget currently allocated to all environmental protection activities in the Maldives. If even a part of this funding is realised it could still be potentially significant.

Table 5: Potential funding for biodiversity conservation from voluntary contributions (Rf million/year)

	From Male' and Baa Atoll only		Extrapolated to all tourists and Maldivians
	Baa Atoll	Male'	
International tourists	20.02	---	228.32
Maldivians	0.24	0.15	5.91

Figure 13: Potential funding for biodiversity conservation from voluntary contributions (Rf million/year)



A variety of mechanisms could be used to capture such willingness to pay. If cash was to be given on a voluntary basis, some form of biodiversity conservation fund could be constituted with which to absorb and administer these – and other – revenue. This would respond to the intention of establishing a national environmental conservation fund, as stated in the 2002 National Biodiversity Strategy and Action Plan for the Maldives (see next section). It is however unclear whether current laws and financial regulations in the Maldives permit funds to be raised and then earmarked for conservation, or whether such funds are permitted to be allocated through normal annual budgets. It should also be noted that survey respondents' willingness to donate money is in many cases contingent on their being assured that such funds would really be used for on-the-ground conservation measures. Another option would be to institute mechanisms to collect these fees as mandatory payments – for example as a conservation levy on tourists or Maldivian citizens, paid directly or as a surcharge to existing charges and fees (similar considerations to those mentioned above also hold).

A number of additional conservation finance mechanisms should also be mentioned, which have potential for use in the Maldives, and which warrant further investigation. These are dealt with only briefly and selectively in the bullet points below, as a proper scoping and feasibility exercise on sustainable financing for marine and coastal biodiversity conservation would be required to investigate these in detail:

- A wide range of uses are made of marine and coastal biological resource and ecosystem services, but – even where charges and fees are levied for these activities – payments do not accrue to the government agencies that are responsible for biodiversity conservation. Significant funding could be raised through instituting or sharing user fees (for example from divers and snorkelers), or as some form of cross-sectoral transfer of revenue from the tourism and fisheries sector to environment as payment for ecosystem services provided.
- To date, little attempt has been made to solicit funds from the private sector for conservation – despite their dependence on biodiversity for business profits. A range of opportunities exist for raising funds, ranging from advertising and corporate sponsorship, through cost-sharing and in-kind contributions for conservation equipment and activities, to direct payments for goods and services used or consumed.
- Currently there is little capacity or requirement for sustainable finance planning among conservation managers. Although the concept of management planning for specific sites or areas of high conservation importance is gaining currency in the Maldives, such efforts are rarely accompanied by the development of a financial plan. In other parts of the world, business planning is increasingly seen as a routine component of conservation management and Marine Protected Area planning⁹². The development of capacity among conservation managers in the Maldives to develop medium-term financial plans or business plans, alongside conservation plans, could provide a valuable tool for enhancing the financial sustainability of marine and coastal biodiversity conservation

As mentioned above, distributional concerns are also key to the financial sustainability of biodiversity conservation. Mechanisms for ensuring that sufficient benefits accrue at the Atoll and household level, and that the indirect and opportunity costs of conservation are covered, have been dealt with in the next section of this report.

7. Economic incentives to conserve biodiversity in the Maldives

How existing economic and environmental policies influence biodiversity

There is a strong stated aim to mainstream biodiversity into economic policy and planning in the Maldives. The government of Maldives has ensured that environmental protection and sustainable development are key elements of the Vision 2020. Recognising the economic significance of the country's natural assets, successive national development plans have emphasised the need for sound environmental practices. The current Seventh National Development (NDP) Plan 2006 – 2010 acknowledges the dependence of the economy on coastal and marine resources. One of the twelve goals laid out in the Plan relates specifically to conservation (“protect the natural environment and make people and property safer”), and contains targets concerned with conserving the environment, improving solid waste management and protecting coral reefs. The plan also recognises the reliance on tourism alone as one of the challenges faced by the country and outlines the policy of expanding into other areas. Most importantly the NDP does point to the importance of the marine and coastal environment and has set a series of targets to ensure conservation of the country's natural resources, including having solid waste management facilities in 75% of the islands, giving protected status to 5% of coral reef areas, and access to safe drinking water to all.

The overriding focus of the plan remains, however, on achieving economic growth and equitable income distribution, and few references are made to the ways in which economic and environmental policies and policy instruments can be harmonised in order to promote sustainability, and provide incentives for producers, consumers and investors to conserve biodiversity in the course of their economic activities.

The population of the country is dispersed over many islands, which poses a challenge to development. The cost of providing and maintaining services and infrastructure thus becomes very high, compounded by a poorly developed transportation system. The government is thus pursuing the Population and Development Consolidation Programme, whereby populations living on environmentally vulnerable islands or islands with fewer than 1000 people, will be provided incentives to resettle in other islands.

Although a wide range of instruments has been developed to promote production, investment and trade in priority sectors of the Maldives economy, there are no specific environmental investment incentives:

- For example the Foreign Services Investment Bureau currently emphasises that a priority will be given to promoting investment activities that, among other criteria, are environmentally-friendly. The investment incentives offered (such as exemption or relief on taxes and other facilities, lack of restrictions on the repatriation of earnings and profits, and waiving or reductions in certain import tariffs⁹³) do not however differentiate between environmentally sustainable activities and other investments.

In relation to trade incentives:

- The current import tariff regime⁹⁴ does contain some – albeit very limited – provisions for products which are considered to be potentially harmful to the environment: higher rates (200%) are set for plastic bags and packaging and there is a prohibition on the import of used vehicles over 3 years old, both justified on environmental grounds.
- However, in most other areas, import duties make no distinction between goods and technologies on environmental grounds: for example the import duty levied on diesel-based and wind-based electricity generation equipment is identical at 20%, while a higher tariff (of 25%) is imposed on the import of solar panels.
- The categories of goods for which duty-free entry is permitted or duty reductions are allowed focus heavily on those required for construction and expansion of the tourism, fisheries and garment manufacture sectors, and make no explicit efforts to encourage the import of energy-efficient, waste-minimising or environmentally friendly products and technologies.
- There are currently no direct duties imposed on goods intended for exports, with the exception of indirect taxes on tourism and a duty of 50% duty on ambergris. On conservation grounds, there is however a complete ban on the export of certain marine products⁹⁵.

The Maldivian economy is relatively liberalised, and many of the subsidies formerly made to key sectors and industries have been dismantled over recent years. The few subsidies that remain are focused primarily on

social sectors such as food, medicines and water (the estimated budget for these subsidies in 2008 is Rf 535.3 million⁹⁶). Temporary subsidies are also allowed for establishing and operating regional sea ports. Energy remains a subsidised sector of the economy, with price interventions on oil imports and energy subsidies to consumers. Although there are plans for a subsidy regime to renewable energy projects⁹⁷, this has not yet been implemented.

With regard to environmental policies, the Environment Protection and Preservation Act (EPPA) was adopted in 1993, aiming to preserve land and water resources, flora and fauna, as well as beaches, lagoons, reefs and all natural habitats. A total of 26 marine sites are protected and only diving and bait fishing are allowed in these sites, although monitoring and enforcement is lacking (MRC). Another 5 areas have also been declared as protected areas under the EPPA. 23 species of birds are protected out of which 17 are sea birds. The napoleon wrasse, dolphins, turtles, whales, sharks, tritons, and black coral are all protected. An EIA Act was enacted in 1994, which has been instrumental in over-viewing development projects and undertaking EIAs for them. According to UNEP (2005) 93 development projects have been subjected to EIA's since 2000. However, there is a lack of implementation due to weaknesses in the legal and regulatory framework for example, compliance to the EIA Act 1994 and since 2001, 74 coastal modification projects have been undertaken without formal EIAs⁹⁸. There is also a lack of EIA expertise and many times Ministry of Environment staff themselves act as consultants and prepare the EIAs, reflecting a conflict of interest.

Freshwater is the one of the scarcest resources in the country. There is almost no surface water and the traditional sources of water are shallow groundwater aquifers. While almost all islands have groundwater aquifers, the availability of water depends on net rainfall recharge, size of the island, vegetative cover, etc. Since these factors differ from island to island the quality of water also differs. Additionally, there are issues of contaminations and many islands are faced with polluted groundwater. Rainwater use was initiated in 1930s and subsequently desalination was introduced in 1980s⁹⁹. According to the Agriculture Master Plan 2006 (information taken from Island Fact Sheets 2004):

No. of islands with water suitable for drinking: 39

No. of islands with water not suitable for drinking: 162

Islands where groundwater is not suitable due to salt water intrusion: 54%

Islands where groundwater is not suitable due to pollution: 46%

To address the issue of safe water provision to the populace and to provide adequate sanitation facilities the Water and Sanitation Authority has issued a Water and Sanitation Policy. The Policy identifies the provision of safe drinking water as equally important as any other economic activity and outlines many challenges that must be overcome to meet the targets. Interestingly some tourist resorts still do not have a sewerage treatment plant. However, all new resort facilities are required to have one.

The Environment Ministry (Ministry of Housing, Transport and Environment since November 2008) has also issued a Solid Waste Management Strategy, which recognises the lack of a national approach to solid waste management. The Strategy estimates that solid waste generated in the country will increase by 30% from 248,000 tonnes in 2007 to 324,000 tonnes in 2012. The primary target of the strategy is thus to reduce the amount of waste generated by 25% through recycling, reuse, and influencing consumer preferences. The Strategy also aims to develop an awareness programme, promote the development of island waste management plans, construct island waste management centres and provide equipment. However, currently the system of waste management relies on collecting waste from tourist and a few inhabited islands and depositing them at a designated island. In many other inhabited islands solid waste is not collected at all. This shows that while there is sufficient recognition and acknowledgement of environmental conservation in government policy, more efforts are required towards implementation.

Land is another precious resource for the Maldives and the demand for land increases with a rising population and need to expand economic activity. Clearing of forest areas has increased to make room for housing and/or to get timber. This is compounded with beach erosion being faced by many islands (including tourist resorts). The MEEW has recently issued a regulation banning the cutting of trees¹⁰⁰. Furthermore, migration to Male' for better job prospects has also added to the problem. While the Government's Population and Development Consolidation Policy is one step to address this, there is still a need for integrated land use policies, and development of conservation plans.

The Fisheries Law is in place and aims to ensure that the Ministry of Fisheries and Agriculture conserves and manages marine and fisheries resources. It has developed a Law on Fisheries, which allows for comprehensive and integrated marine resources management¹⁰¹. However, the main objective of the Ministry is to promote fisheries and develop the fishing industry, since this forms a major source of livelihood for the people. As a result conservation of marine resources tends to get sidelined. Supplementary to regulations for fisheries, economic tools need to be assessed to promote sustainable fishing by providing economic incentives and alternative livelihoods to the fishermen populations.

Maldives Tourism Act provides for the determination of zones and islands for the development of tourism in the Maldives: the leasing of islands for development as tourist resorts, the leasing of land for development as tourist hotels and tourist guesthouses, the leasing of places for development as marinas, the management of all such facilities; and the operation of tourist vessels, diving centers and travel agencies, and the regulation of persons providing such services¹⁰². According to this law an island is leased to a private party for a certain period of time (maximum 25 years or 35 years for investment of US\$ 10 M or more), after which the lease can either be extended or the island returned to government control. In cases where the agreement is not terminated prematurely by the lessee, the government pays a monetary value for the infrastructure on the island after depreciation. The Act also outlines procedures for registering and licensing of tourist hotels, guesthouses and tourist vessels. Marinas and diving centers are also subject to leasing and registration respectively. The Ministry of Tourism and Civil Aviation leases and releases islands for resort development and where the Government is not the lessee leasing is done through a bidding process. Recently 35 new islands have been released for development as tourist resorts.

The Third Tourism Master Plan is now in place and like the previous plans recognizes the inextricable links between tourism and coastal and marine biodiversity. As such it stresses on sustainable development of tourism. It emphasizes the importance of developing tourism in harmony with nature; facilitating private sector investment; developing human resources; increasing employment opportunities; diversifying markets and products; and spreading the economic benefits of tourism across the entire archipelago more equitably. The Tourism Law (1979 and 1999) introduces more extensive environmental controls on resorts and coastal development including mandatory EIAs, to be implanted by the Ministry of Environment with support from Tourism Advisory Board. The government's stated commitment towards biodiversity conservation can thus be seen in its policies. But once again effective implementation and management of these policies and incorporation of economic tools (such as payment for ecosystem services) and incentives is required to ensure a much more sustainable tourism sector.

The first National Environment Action Plan was formulated in 1989 and aimed to establish a comprehensive environmental strategy. NEAP II (1994) reflects this need even further and establishes a comprehensive framework for sustainable development and natural resource management. The Sustainable Tourism Master Plan, Agenda for Integrated Reef Resource Use and Integrated Atoll Development Plan all have incorporated environmental resource management into their programmes¹⁰³. However, one of the MDGs that the country is lacking in is to ensure environmental sustainability. The National Environment Action Plan (NEAP)¹⁰⁴ provides the overarching policy framework for environmental protection in the Maldives. Although economic tools are not explicitly mentioned in the actions, policies and measures it contains, the NEAP has an overarching focus on promoting sustainable economic development.

The National Biodiversity Strategy and Action Plan (NBSAP) was produced in 2002 and one of its main objectives is to build capacity through governance strengthening. The NBSAP highlights the need for incorporating biodiversity conservation into the national development processes. In addition, it also recommends strengthening legal and policy frameworks, improving in-situ conservation and establishing long term financing mechanisms. One of the eleven objectives and set of actions of the 2002 National Biodiversity Strategy and Action Plan¹⁰⁵ is the adoption of economic incentives including the use of economic valuation and natural resource accounting, as well as economic instruments such as the user pays principle, tradable permits and export quotas. Another relates to building financial capacity for biodiversity conservation through contributions from the annual government budget, the establishment of an environment conservation fund, and international funding sought from relevant donor agencies. A third states the intention to achieve the better integration of biodiversity conservation into the national development process, including the development and adoption of suitable economic instruments to ensure that the value of biodiversity is adequately reflected in national development activities.

There is no specific agriculture policy. According to the Agriculture Master Plan, agriculture potential is concentrated in 36 islands and only 33 of these have land areas in excess of 1 sq. km, and 3 islands have an area larger than 3 sq km. Only about 10 percent of the total land area is suitable for farming. The Master Plan also highlights that recently watermelon, cucumber and papaya were introduced for the domestic market and tourist resorts. On some other islands breadfruit, banana, taro, cassava and sweet potato are grown and they are significant food sources for the people. Other crops such as mango, papaya, water melon, melon, pumpkin, cucumber, eggplant, chilli pepper, leaf cabbage, and small red onion are commercially produced on some inhabited islands and on uninhabited islands leased for agriculture. However, coconut is the dominant crop which is produced and consumed throughout the country. Agriculture's contribution to the national GDP declined from around 7% in 1984 to 3.6% in 1995 and then to 2.7% in 2003. About 3% of the labour force is employed in the agriculture sector. According to the Master Plan, land is leased for commercial purposes and the rights and responsibilities of tenures differ for different activities. However, there are no written laws regarding the assignment of agricultural land on inhabited islands.

From the above paragraphs it is evident that there is an environmental protection act and many comprehensive sectoral policies; however there is little implementation especially in areas such as solid waste management, water and sanitation and land use. Ministries often apply varying policies and directives for land allocation, which results in lack of coordination and consistency. It is clear that while these policies target the host of environmental problems being faced by the country, their implementation is not clear since any changes that should have occurred have not been measured. As mentioned above monitoring of projects with regards to EIA is weak and as a result non-compliance is rarely addressed. Because there is a lack of benchmarking, monitoring and compliance measurement, penalties are rarely imposed. There is no capacity at island or atoll level for monitoring and conservation activities and there is little awareness. Government departments have limited staff and expertise due to which there is a lack of field offices. Licenses are issued for various purposes such as tourism (by the Ministry of Tourism), construction and land reclamation (by the Department of National Planning), and natural resource use (by Ministry of Fisheries). Natural resource use licenses include those for sand and coral mining, tree cutting and marine resource use. However, according to UNEP (2005) there are no licensing criteria and licenses are issued on a case by case basis for natural resource use.

Despite the emphasis given to the development of economic incentives in the NBSAP, economic and environmental policies, instruments and regulations in the Maldives tend to focus on command and control measures of penalties and enforcement rather than on providing positive economic incentives and enabling economic instruments for biodiversity conservation:

- Thus the 1993 Environmental Protection and Preservation Act of the Maldives establishes fines for environmental non-compliance and breaches of the law, ranging from Rf 500,000 for minor offences to Rf 100 million for serious transgressions; it also enables the government to claim compensation from the perpetrators of activities which potentially or actually cause environmental damage. The 2007 Environmental Impact Regulations associated with this Act do not however specifically mention requirements for environmental compensation or the funding of ecosystem restoration.
- Likewise, fisheries sector regulations¹⁰⁶ are focused primarily on stimulating production and make little or no mention of environmental concerns. The exception seems to be provisions in the 1987 Fisheries Act of the Maldives which allow the Ministry of Fisheries to prohibit fishing for a specified period or to establish special sanctuaries in instances where there is a special need for the conservation of marine species. Fisheries regulations also ban, on environmental grounds, the use of fishing nets in Maldivian waters.
- The 2002 Maldivian Land Act allows for the allocation of land for various purposes and uses, including for environmental protection. However, although it specifies the various taxes and charges that must be paid on the sale of land and property, there is no differentiation of this tax on environmental grounds, and no provisions for environmental fines or penalties.
- The 1999 Maldives Tourism Act introduces extensive environmental controls on resort development and operations (including the development of environmental management plans for islands used for tourism), and sets general fines for non-compliance with the law. It does not however distinguish environmental fines and penalties, and contains only limited mention of biodiversity conservation aside from highlighting the requirement to obtain government permission and to abide by regulations when activities involve felling trees, dredging lagoons, reclaiming land or causing any other permanent changes to the natural environment of islands.
- The 1999 Maldives Recreational Diving Regulations are concerned primarily with the certification and safety of divers, equipment and boats, but contain some mention of environmental protection. They underline the

need for divers to take reasonable care to protect the marine environment, its associated living organisms and their habitats, and ban activities which are stated in the Environment Protection and Preservation Act to be detrimental to marine protected areas and protected species and their habitats. No specific mention is made of fines or penalties for damage caused to the marine environment from diving activities.

The review of economic and environmental policies and instruments provided above makes it clear that, currently, economic instruments for biodiversity conservation remain extremely rudimentary in the Maldives – despite this being a stated objective of the NBSAP. In particular, it highlights three incentive gaps in relation to biodiversity conservation which are provided by the current economic and environmental policy framework:

- Despite the dependence of the economy and its growth on biological resources and natural ecosystems, biodiversity conservation goals are not mainstreamed into development policies, strategies and plans at national, sectoral or Atoll levels.
- Although economic disincentives to degrading or depleting biodiversity exist via the punitive measures that are created through general environmental penalties and fines, there is a notable lack of positive incentives to balance these which would act to encourage or reward for the conservation (rather than degradation) of biodiversity in the course of economic activities.
- Although there are few or no environmentally-damaging subsidies in the Maldives, in some cases the incentive systems which are offered in order to stimulate economic activity and expand production (for example in the tourism, fisheries and industrial sectors) may serve as perverse incentives with respect to conservation – because they encourage investors and producers to carry out activities in ways and at levels which harm biological resources and ecosystems.

Economic instruments that can act as incentives for biodiversity conservation

Clearly there is a need to investigate thoroughly the ways in which existing economic and environmental instruments can be reformed so as to support biodiversity goals, and to look into the possibility of introducing new economic incentives for conservation. Such economic instruments could, if properly designed, serve three purposes:

- Raise revenue that can be invested in biodiversity conservation by government.
- Internalise biodiversity costs and benefits into private economic decisions by encouraging producers, consumers and investors to engage in environmentally-friendly behaviour (by making it more profitable for them to do so) and discouraging them from carrying out activities that lead to biodiversity degradation or loss (by making it less profitable, or more costly, to do so). It is worth mentioning that this is something that the AEC project is attempting to pilot at Baa Atoll.
- Act as redistributive mechanisms which would ensure that a sufficient level of economic value from conservation accrues locally, to the primary harvesters, users and managers of biological resources and ecosystems. As well as providing economic incentives for conservation, this could have the additional benefit of creating more sustainable livelihoods and development opportunities at the household, island and atoll level.

Unlike in other countries (where differential tax and subsidy rates are often used to promote environmentally-friendly products, practices and consumption patterns, and to discourage environmentally damaging ones), there is very limited potential under existing conditions to use fiscal incentives for biodiversity conservation in the Maldives. This is because taxes and tax revenue are currently a relatively insignificant part of government economic policy and budgetary revenue (there are no personal income, property, capital gains, business profit, sales or land taxes, and tax revenue excluding import duties account for only a very small proportion of government revenue). As there are currently also few price interventions in the Maldives economy, and limited public financial resources, it is unlikely that conservation subsidies would be acceptable to government.

The main opportunity to use economic instruments in support of biodiversity conservation in the Maldives would seem to lie in reforming existing (and where appropriate introducing new) charges, fees and duties so as to reward environmentally-friendly behaviour and penalise for activities that lead to biodiversity loss or degradation. There are at least two types of market-based and trade instruments which could be used in the Maldives – focusing on the sectors and industries that use and impact on biodiversity, and based around the principles of user-pays or polluter-pays:

- Fees and charges for the use of biological resources (for example for fisheries and tourism activities) or payments for ecosystem services (for example support to fisheries productivity, tourism landscapes or the protection of

settlements), have been discussed in the section above. As well as serving to raise revenue for conservation, these instruments also provide a way of regulating or managing the demand for biological resources, and encourage users to reduce pressures on particular species, stocks or sites.

- Import tariffs are a special case of economic instrument which are particularly important in the Maldives context – both because they are already an important tool for economic management and public revenue generation, and also because of the unusually high dependence of Maldivian industries and businesses on imports. A key goal would be to differentiate duty rates based on environmental criteria, allowing exemption or relatively lower tariffs on some items, and relatively higher duties on others. Reform of the existing import tariff regime could thus act to discourage the import and use of products, technologies and equipment that pose a potential threat to biodiversity, as well as encourage those which avoid or minimise negative biodiversity impacts.

As mentioned above, being cognisant of local opportunity costs and making it a priority to ensure that economic benefits arising from the conservation and sustainable use of biodiversity are distributed equitably are key to both conservation and economic development goals. A range of economic incentives which are targeted specifically at the local-level users and managers of biological resources and ecosystems have a great deal of potential for application in the Maldives. In addition to instruments which aim to ensure compliance with environmental rules and regulations, these include:

- Allocation of a portion of any funding raised to the atoll, island or household level to be used to directly finance local initiatives, on either a grant or credit basis.
- The establishment of enterprise funds to enable the development of value-added or sustainable biodiversity business, and to support investments in environmentally-friendly technologies, equipment and products.
- The establishment of targeted incentive and payment systems, which reward directly for the provision of environmental goods and services through conservation at the local level, including direct participation and involvement in economic activities.

Data annex

Biodiversity and the national economy

Table 6: Government revenue from tourism 2002-2007 (Rf millions)

Year	Bed tax	Resort lease rent	Government hotels	Maldives Airport Company Ltd*	Maldives Inflight Catering Services Ltd*	Island Aviation Services Ltd	Total tourism revenue	% of total government revenue
2002	305.2	577.9	1.5	36.3	7.2	4.5	932.5	36%
2003	359.8	539.9	1.5	62.8	8.2	8.5	980.6	33%
2004	412.2	522.7	2.4	71.9	8.2	15.7	1,033.1	31%
2005	345	566.8	3.2	85.5	0.0	2.1	1,002.6	26%
2006	506.6	1,328.2	3.0	31.2	9.8	11.3	1,890.0	36%
2007	534.3	1,792.1	3.1	87.5	9.8	17.7	2,444.5	34%

From MPND, 2004, Maldives Statistical Yearbook 2004. Ministry of Planning and National Development, Male'; MPND, 2005, Maldives Statistical Yearbook 2005. Ministry of Planning and National Development, Male'; MPND, 2007, Maldives Statistical Yearbook 2007. Ministry of Planning and National Development, Male'; MTCA, 2007, Tourism Yearbook 2007, Ministry of Tourism and Civil Aviation, Male'. *50% of total revenue ascribed to tourism

Table 7: Contribution of the tourism sector to GDP 2002-2007 (Rf millions)

Year	Tourism contribution	% of total GDP
2002	2,162.60	30.9
2003	2,482.50	32.7
2004	2,688.80	32.3
2005	1,798.50	22.7
2006	2,559.7	27.1
2007	2,789.7	27.5

From MPND, 2004, Maldives Statistical Yearbook 2004. Ministry of Planning and National Development, Male'; MPND, 2005, Maldives Statistical Yearbook 2005. Ministry of Planning and National Development, Male'; MPND, 2007, Maldives Statistical Yearbook 2007. Ministry of Planning and National Development, Male'; MTCA, 2007, Tourism Yearbook 2007, Ministry of Tourism and Civil Aviation, Male'.

Table 8: Foreign exchange earnings from tourism 2002-2006 (US\$ millions)

Year	Tourism Receipts	Exports, FOB	Imports, CIF
2002	337.08	90.40	390.20
2003	401.57	112.52	468.95
2004	470.93	122.40	639.30
2005	286.64	103.80	742.00
2006	433.70	135.07	922.92

From MTCA, 2007, Tourism Yearbook 2007, Ministry of Tourism and Civil Aviation, Male'.

Table 9: Employment and earnings generated by the fisheries sector 2002/03

	Average wages (Rf/month)	Number of people	Annual income earned (Rf mill)
People employed in the fisheries sector			
Professional, Technical workers	17,000	185	37.66
Clerical workers, etc	2,152*	77	1.99
Agriculture and fisheries workers, etc	3,050	10,038	367.38
Production workers, etc	2,063	359	8.89
Fisheries workers employed in other sectors			
Agriculture, Hunting And Forestry	1,237	3,006	44.63
Manufacturing	840	338	3.41
Hotels And Restaurants	1,900	83	1.90
Financial Intermediation	2,152*	46	1.19
Public Administration And Defence	900	117	1.26
Other Community, Social; Personal Services	1,450	88	1.54
Activity Not Specified	1,336	182	2.92
Total fisheries		14,519	473
Fisheries as % of all employment		18%	20%

From MPND, 2003, Household Income and Expenditure Survey 2002-03. Ministry of Planning and National Development, Male'. * data on wages not available so average used. It should be noted that these values are based on 2002/03 prices; to convert them to 2006-07 values an inflator of 1.08 is used, based on Consumer Price Index changes laid out in the Statistical Yearbooks.

Table 10: Contribution of the fisheries sector to GDP 2002-2006 (Rf millions)

Year	Primary production	% of total GDP	Secondary processing	% of GDP	All fisheries	% of GDP
2002	494.7	7.1	838	3.0	1,332.7	10.1
2003	498.0	6.6	204.1	2.7	702.1	9.3
2004	508.1	6.1	24.4	2.5	532.5	8.6
2005	596.0	7.5	247.8	3.1	843.8	10.6
2006	590.1	6.3	257.9	2.7	848.0	9.0
2007	592.9	5.9	262.4	2.6	855.3	8.5

From MPND, 2007, Maldives Statistical Yearbook 2007. Ministry of Planning and National Development, Male'. Ministry of Planning and National Development, Male'; MFAMR, 2004, Fisheries Statistics 2004. Economic Research and Statistics Services, Ministry of Fisheries, Agriculture and Marine Resources, Male; MFAMR, 2006, Fisheries Statistics 2006. Economic Research and Statistics Services, Ministry of Fisheries, Agriculture and Marine Resources, Male.

Table 11: Marine products export earnings 2002-2006 (Rf mill)

Year	Private	% of total exports	Government	% of total exports	Total	% of total exports
2002	322.84	41%	173.13	45%	495.97	43%
2003	473.74	50%	505.03	100%	978.78	68%
2004	576.20	58%	579.14	100%	1,155.35	73%
2005	701.90	97%	610.44	100%	1,312.34	98%
2006	848.79	97%	861.20	100%	1,709.99	99%

From MPND, 2007, Maldives Statistical Yearbook 2007. Ministry of Planning and National Development, Male' MFAMR, 2004, Fisheries Statistics 2004. Economic Research and Statistics Services, Ministry of Fisheries, Agriculture and Marine Resources, Male; MFAMR, 2006, Fisheries Statistics 2006. Economic Research and Statistics Services, Ministry of Fisheries, Agriculture and Marine Resources, Male.

Table 12: Marine products export earnings 2006 (Rf '000)

	Private	Government	Total
Fresh or Chilled Tuna	359,424.23	80,783.06	440,207.29
Fresh or Chilled Yellowfin Tuna	156,880.76	78,281.36	235,162.12
Fresh or Chilled Yellowfin Tuna Loins	136,202.59	897.48	137,100.07
Fresh or Chilled Yellowfin Tuna Fillets	11.62	0	11.62
Fresh or Chilled Skipjack	63.08	0	63.08
Fresh or Chilled Skipjack Loins	0.62	0	0.62
Fresh or Chilled Bigeye Tunas	65,834.69	1,604.22	67,438.91
Big Eye Tuna Loins (Fresh Or Chilled)	405.19	0	405.19
Belly Flap (Yellowfin Tuna) Fresh or Chilled	25.68	0	25.68
Fresh or Chilled Reef Fish	16,385.83	38.29	16,424.12
Grouper (Fresh or Chilled)	14996.38	1.49	14,997.87
Marlin (Fresh or Chilled)	959.69	0	959.69
Marlin Loin (Fresh or Chilled)	57.8	0	57.8
Reef Fish (Fresh or Chilled)	346.37	36.8	383.17
Reef Fish Loins (Fresh or Chilled)	0.91	0	0.91
Reef Fish Fillets (Fresh or Chilled)	20.77	0	20.77
Shark (Fresh or Chilled)	0.05	0	0.05
Kurumas (Fresh or Chilled) "Seer"	3.86	0	3.86
Frozen Fish	309,091.16	547,904.98	856,996.14
Yellowfin Tuna (Frozen)	58,139.75	31,642.90	89,782.65
Yellowfin Tuna Loins (Frozen)	0	1,472.55	1,472.55
Grouper (Frozen)	1.61	0	1.61
Grouper Fillets (Frozen)	1.64	0	1.64
Reef Fish Fillets (Frozen)	0.12	0	0.12
Skipjack (Frozen)	248,587.23	513,270.83	761,858.06
Frozen Bigeye Tuna	1,452.67	1,518.71	2,971.38
Marlin (Frozen)	781.91	0	781.91
Shark (Frozen)	10.17	0	10.17
Reef Fish (Frozen) Not Specified	116.06	0	116.06
Dried Fish	97,575.22	15,371.70	112,946.92
Skipjack (Dried)	97,406.59	15,371.70	112,778.28
Fish Chips (Skipjack , Tuna) Dried	150.41	0	150.41
Reef Fish (Dried)	18.23	0	18.23
Salted Dried Fish	31,893.93	0	31,893.93
Skipjack (Salted Dried)	22,186.72	0	22,186.72
Reef Fish (Salted Dried)	680.31	0	680.31
Vahoo (Salted Dried)	46.35	0	46.35
Rainbow Runner (Salted Dried)	3,525.61	0	3,525.61
Jack (Salted Dried)	642.48	0	642.48
Marlin (Salted Dried)	580.09	0	580.09

Dolphin Fish (Salted Dried)	211.42	0	211.42
Green Job Fish (Salted Dried)	332.71	0	332.71
Shark (Salted Dried)	3,294.14	0	3,294.14
Dog Tooth Tuna (Salted Dried)	287.03	0	287.03
Belly Flap (Yellowfin Tuna) Salted, Dried	13.39	0	13.39
Belly Flap (Bigeye Tuna) Salted, Dried	10.62	0	10.62
Tuna Belly Flap (Salted Dried)	28.21	0	28.21
Yellowfin Tuna (Salted Dried)	36.16	0	36.16
Barracuda (Salted Dried)	18.72	0	18.72
Sea Cucumber	12,707.46	0	12,707.46
Sea Cucumber (Dried)	12,707.46	0	12,707.46
Canned Fish	0	146,263.39	146,263.39
Tuna (Prepared, Preserved)	0	92,499.21	92,499.21
Yellowfin Tuna (Canned, Prepared & Preserved)	0	1,182.94	1,182.94
Skipjack (Prepared, Preserved)	0	52,581.24	52,581.24
Live Reef Fish	18,895.87	0	18,895.87
Live Ornamental Fish	8,800.93	0	8,800.93
Grouper (Live)	10,094.94	0	10,094.94
Fish Meal	0	20,244.42	20,244.42
Flours, Meals And Pellets Of Fish, Etc, Unfit For Human Consumption	0	17,921.51	17,921.51
Fish Meal (Fit For Human Consumption)	0	1,327.44	1,327.44
Fish Meal (Frozen & Cooked Fit For Human Consumption)	0	995.47	995.47
Other Marine Products	2,812.86	50,597.03	53,409.89
Tuna Loins (Steamed)	0	5,107.31	5,107.31
Skipjack Loins (Steamed)	0	45,471.16	45,471.16
Skipjack (Smoked)	19.61	0	19.61
Tuna (Smoked)	0	0	0
Shark Fins (Dried)	2,412.03	0	2,412.03
Marlin (Smoked) Thalapath (Hibaru)	1.76	0	1.76
Shells of Mollusk, Crustaceans	10.37	0	10.37
Shark Fins (Frozen)	57.12	0	57.12
Fish Soup	0	18.56	18.56
Shark-Liver Oil	311.97	0	311.97
Total	880,680.53	1,007,466.27	1,888,146.79

From MPND, 2007, Maldives Statistical Yearbook 2007. Ministry of Planning and National Development, Male'; MFAMR, 2004, Fisheries Statistics 2004. Economic Research and Statistics Services, Ministry of Fisheries, Agriculture and Marine Resources, Male; MFAMR, 2006, Fisheries Statistics 2006. Economic Research and Statistics Services, Ministry of Fisheries, Agriculture and Marine Resources, Male.

Table 13: Fish purchases and sales by MIFCO 2006 (Rf million)

	Fish purchases from Atolls											MIFCO earnings
	Haa Alifu	Shavi-yani	Raa	Baa	Lhavi-yani	Kaafu	Gaaf Alifu	Gaaf Dhaalu	Fuah Mulah	Addu	Total	
Dec	4.43	0.18	0.39	-	0.59	6.45	0.97	2.48	0.82	2.81	19.12	55.62
Nov	0.41	-	0.32	0.03	0.56	0.27	1.46	0.73	0.28	1.24	5.30	124.46
Oct	2.06	-	1.61	0.17	2.79	5.75	7.38	3.66	1.41	6.21	31.04	71.61
Sep	0.31	-	0.19	0.13	0.66	0.15	1.41	1.43	0.16	1.94	6.37	103.41
Aug*	4.18	-	0.95	0.31	1.16	3.69	7.47	7.44	0.81	10.41	36.41	138.24
Jul*	-	-	0.06	0.15	0.33	0.10	2.01	0.95	0.11	1.06	4.77	81.24
Jun	-	-	0.33	0.82	1.79	1.43	11.06	5.25	0.59	5.85	27.11	19.61
May	0.11	-	0.20	0.03	0.51	0.25	0.47	0.34	0.12	1.26	3.29	48.45
Apr	0.43	-	0.81	0.11	2.05	4.14	1.91	1.36	0.50	5.01	16.31	84.24
Mar	0.05	-	-	-	0.01	0.15	0.93	0.39	0.36	0.84	2.73	49.26
Feb	0.18	-	-	-	0.06	2.59	3.73	1.55	1.46	3.30	12.86	88.53
Jan	-	-	0.01	-	0.02	0.16	3.84	0.66	0.25	1.47	6.43	98.97
Total	12.15	0.18	4.87	1.74	10.52	25.13	42.66	26.23	6.86	41.40	171.74	963.63

From MPND, 2007, Maldives Statistical Yearbook 2007. Ministry of Planning and National Development, Male; MFAMR, 2004, Fisheries Statistics 2004. Economic Research and Statistics Services, Ministry of Fisheries, Agriculture and Marine Resources, Male; MFAMR, 2006, Fisheries Statistics 2006. Economic Research and Statistics Services, Ministry of Fisheries, Agriculture and Marine Resources, Male. *No data available for July and August 2006 so figures estimated, based on data from July and August 2005 weighted and adjusted to 2006 levels.

Table 14: Fish catch 2000-2006 (tons)

	2000	2001	2002	2003	2004	2005	2006
Mechanised Masdhoni	113,768	123,442	156,956	145,897	154,560	180,030	179,099
Skipjack	79,455	87,847	113,652	103,864	109,438	131,121	137,538
Yellowfin tuna	12,139	14,540	21,502	19,546	22,441	21,461	19,628
Other tuna related species	5,990	6,485	6,793	7,135	6,356	8,094	5,580
Other Marine Fishes	16,184	14,570	15,010	15,352	16,325	19,353	16,353
Sail Masdhoni	362	430	2,241	5,168	8	59	70
Skipjack	173	157	1,617	4,395	1	28	31
Yellowfin tuna	16	24	202	360	1	9	14
Other tuna related species	82	89	254	214	3	14	10
Other Marine Fishes	91	159	168	199	3	8	14
Vadhu dhoni	639	494	467	578	990	959	937
Skipjack	55	36	50	35	306	445	462
Yellowfin tuna	29	12	23	11	134	160	130
Other tuna related species	239	180	161	146	175	181	117
Other Marine Fishes	316	266	233	386	375	173	227
Rowing Boats	42	73	60	60	173	514	402
Skipjack	0	3	2	5	4	315	261
Yellowfin tuna	0	3	2	1	7	31	82
Other tuna related species	12	11	6	9	10	5	3
Other Marine Fishes	30	56	50	45	151	162	56

EEZ	3,521	2,213	3,139	3,165	2,546	3,010	3,177
Skipjack	-	-	1	0	1	0	0
Yellowfin tuna	3,521	668	2,796	2,978	2,234	2,860	3,083
Other Marine Fishes	-	1,545	342	187	311	150	93
Miscellaneous	631	532	524	547	308	1,409	474
Skipjack	0	0	0	30	0	151	165
Yellowfin tuna	0	0	0	17	0	50	17
Other tuna related species	16	12	5	4	0	7	7
Other Marine Fishes	615	520	519	495	308	1,201	285
Total	118,963	127,184	163,388	155,415	158,583	185,980	184,158
Skipjack	79,683	88,044	115,322	108,329	109,749	132,060	138,458
Yellowfin tuna	15,706	15,247	24,525	22,914	24,818	24,571	22,954
Other tuna related species	6,339	6,778	7,219	7,508	6,543	8,302	5,718
Other Marine Fishes	17,236	17,115	16,322	16,664	17,473	21,047	17,029

From MPND, 2007, Maldives Statistical Yearbook 2007. Ministry of Planning and National Development, Male'; MFAMR, 2004, Fisheries Statistics 2004. Economic Research and Statistics Services, Ministry of Fisheries, Agriculture and Marine Resources, Male; MFAMR, 2006, Fisheries Statistics 2006. Economic Research and Statistics Services, Ministry of Fisheries, Agriculture and Marine Resources, Male.

Table 15: Household expenditure on goods and services 2002/03 (Rf/day)

Types of expenditures	Total Maldives	Male'	Atolls
Fish			
Fish, live	140	140	0
Kalhubila mas, Skipjack tuna fresh or chilled	270,128	99,203	170,925
Mushimas fresh or chilled	9,062	1,214	7,848
Giulhu, hibaruru, maniya, vella fresh or chilled	64,220	15,059	49,161
Boavadhila mas, cuttle fish fresh or chilled	180	180	0
Dried Fish, hikki mas	24,655	2,483	22,173
Smoked fish, valho mas	42,805	16,933	25,872
Mas packets salted or dried	5,207	3,587	1,620
Canned fish	64,078	29,155	34,923
Fried fish	79	0	79
Fish paste, rihaakuru	70,872	13,277	57,595
Other Fish, otherwise prepared or preserved; cavia	32	32	0
Cuttle fish, boavadhila mas, frozen	60	60	0
Boats of all kinds			
Dhoni / Speed boat	32,875	86	32,788
Other major durables for recreation and culture			
Sails for boats	3	0	3
Outboard motors for boats	4,228	0	4,228
Fisheries related goods and services total	588,625	181,409	407,216
Fisheries related goods and services as % of all expenditures	4.6%	3.2%	5.6%

From MPND, 2003, Household Income and Expenditure Survey 2002-03. Ministry of Planning and National Development, Male'. It should be noted that these values are based on 2002/03 prices; to convert them to 2006-07 values an inflator of 1.08 is used, based on Consumer Price Index changes laid out in the Statistical Yearbooks.

Biodiversity and the Baa Atoll economy

Table 16: Baa Atoll registered population and area, March 2007

	Households	Population	Average household size	Area (ha)
Fehendhoo	64	251	3.9	20.6
Fulhadhoo	68	306	4.5	31.5
Kihaadhoo	82	408	5.0	12.6
Kamadhoo	114	430	3.8	14.5
Kudarikilu	98	541	5.5	13.7
Dhonfanu	99	472	4.8	12.6
Maalhos	98	554	5.7	23.2
Goidhoo	104	672	6.4	113.54
Kendhoo	161	1064	6.6	26.4
Dharavandhoo	179	966	5.4	45.5
Hithaadhoo	217	1173	5.4	25.2
Thulhaadhoo	449	2522	5.6	4.97
Eydhafushi	424	2811	6.6	22.2
Total	2,154	12,170	5.6	366.51

Population and area from http://www.atolls.gov.mv/atolls.asp?atoll_letter=F, accessed 15-09-08; number of households calculated using average household size from Maldives, Population and Housing Census 2006. Excludes resort and industrial islands.

Table 17: Fuelwood use in Baa Atoll, 2006

	% of hholds	no. of hholds
Fehendhoo	7%	13
Fulhadhoo	39%	39
Kihaadhoo	15%	63
Kamadhoo	24%	15
Kudarikilu	12%	8
Dhonfanu	35%	36
Maalhos	19%	42
Goidhoo	10%	11
Kendhoo	37%	60
Dharavandhoo	29%	24
Hithaadhoo	19%	18
Thulhaadhoo	16%	16
Eydhafushi	6%	26
Total	17%	369

From MPND, 2007a, Maldives, Population and Housing Census 2006. Ministry of Planning and National Development, Male'

Table 18: Fishing trips and catch by type of vessel in Baa Atoll, 2006

	No vessels	No vessels engaged in fishing/month	No fishing trips	Catch (tonnes/year)
Mechanised masdhoni	93	83	11,856	2,554.56
Mechanised vadhu dhoni	34	6	812	33.65
Sailing vadhu dhoni	25			
Mechanised rowboat	3			
Rowboats	43			
Total	198	89	12,668	2,588.22

From MFAMR, 2006, Fisheries Statistics 2006. Economic Research and Statistics Services, Ministry of Fisheries, Agriculture and Marine Resources, Male

Table 19: Fishing catch by month and species in Baa Atoll, 2006

	Catch (tonnes)
January	235.39
February	284.54
March	240.14
April	151.95
May	73.86
June	135.19
July	297.45
August	355.05
September	261.78
October	280.27
November	153.13
December	139.47
Catch total	2,588.21
Skipjack	1,409.11
Yellowfin Tuna	390.26
Dogtooth Tuna	1.73
Little Tuna	104.89
Frigate Tuna	304.91
Other species	377.30

From MFAMR, 2006, Fisheries Statistics 2006. Economic Research and Statistics Services, Ministry of Fisheries, Agriculture and Marine Resources, Male

Table 20: Fish purchases in Baa Atoll by MIFCO 2006

	Weight (tonnes)			Price paid by MIFCO (Rf '000)			Value of Baa Atoll in MIFCO earnings**
	Baa Atoll	Total all Atolls	Baa Atoll as % of total	Baa Atoll	Total all Atolls	Baa Atoll as % of total	
Dec	-	2,803	0.0%	-	19,118	0.0%	-
Nov	34	5,300	0.6%	34	5,300	0.6%	793
Oct	127	6,371	2.0%	169	31,041	0.5%	391
Sep	149	4,767	3.1%	127	6,371	2.0%	2,057
Aug*	27	3,291	0.8%	308	36,412	0.8%	1,169
Jul*	-	2,729	0.0%	149	4,767	3.1%	2,532
Jun	-	6,426	0.0%	816	27,112	3.0%	590
May	-	7,401	0.0%	27	3,291	0.8%	397
Apr	71	11,217	0.6%	107	16,314	0.7%	555
Mar	26	4,976	0.5%	-	2,729	0.0%	-
Feb	23	7,685	0.3%	-	12,858	0.0%	-
Jan	-	8,483	0.0%	-	6,426	0.0%	-
Total	456	71,448	0.6%	1,736	171,740	1.0%	8,484

From MPND, 2007, Maldives Statistical Yearbook 2007. Ministry of Planning and National Development, Male; MFAMR, 2004, Fisheries Statistics 2004. Economic Research and Statistics Services, Ministry of Fisheries, Agriculture and Marine Resources, Male; MFAMR, 2006, Fisheries Statistics 2006. Economic Research and Statistics Services, Ministry of Fisheries, Agriculture and Marine Resources, Male. *No data available for 2006 so figures estimated, based on data from July and August 2005 weighted and adjusted to 2006 levels. ** calculated using proportional share of the value of Baa Atoll collection in all MIFCO earnings.

Biodiversity in Baa Atoll household livelihoods

Table 21: Employment in the tourist sector

	Employment in tourist sector			Other employment		Average share in all wages*
	% hholds	Average earnings (Rf/year)	Average number of persons in household employed	% hholds	Average earnings (Rf/year)	
All hholds	40%	99,926	2	62%	85,096	19%
By island						
Dharavandhoo	32%	167,338	2	58%	189,826	15%
Dhonfanu	60%	88,000	2	20%	48,000	30%
Eydhafushi	40%	93,941	1	81%	84,760	20%
Fehendhoo	0%	---	---	25%	50,160	0%
Fulhadhoo	0%	---	---	83%	70,092	0%
Goidhoo	20%	90,000	2	30%	58,840	0%
Hithaadhoo	31%	50,660	1	56%	103,138	8%
Kamadhoo	43%	68,000	1	71%	45,540	25%
Kendhoo	31%	100,800	2	75%	70,947	8%
Kihaadhoo	60%	77,667	2	50%	65,280	27%
Kudarikilu	44%	86,565	1	56%	65,256	17%
Maalhos	45%	176,640	2	82%	66,927	34%
Thulhaadhoo	54%	96,585	1	56%	70,989	28%
By income category						
Richest	33%	109,957	1	62%	145,938	18%
Upper-middle	52%	126,174	2	70%	98,021	30%
Lower-middle	37%	75,475	2	69%	62,595	11%
Poorest	17%	22,500	1	13%	29,240	100%

From 2008 Baa Atoll Household Survey data. *For households with members working in the tourism sector.

Table 22: Biodiversity in business earnings

	Business based on fisheries (e.g marketing and processing)		Business based on thatch and lacquerware		Business based on processing other biological resources	
	Average earnings (Rf/year)	% hholds	Average earnings (Rf/year)	% hholds	Average earnings (Rf/year)	% hholds
All hholds	84,618	28%	25,162	36%	67,350	4%
By island						
Dharavandhoo	6,000	5%	9,137	37%	---	0%
Dhonfanu	22,200	20%	9,640	90%	---	0%
Eydhafushi	96,733	21%	136,080	12%	---	0%
Fehendhoo	253,333	75%	2,700	25%	---	0%
Fulhadhoo	184,800	83%	51,360	33%	---	0%
Goidhoo	60,000	30%	12,760	90%	84,000	10%
Hithaadhoo	56,000	38%	4,533	38%	36,000	6%
Kamadhoo	---	0%	13,800	29%	50,800	43%
Kendhoo	99,900	25%	10,313	50%	13,200	13%
Kihaadhoo	31,750	40%	19,500	40%	---	0%
Kudarikilu	63,000	22%	5,600	67%	---	0%
Maalhos	11,100	18%	16,320	64%	240,000	9%
Thulhaadhoo	62,853	38%	74,400	13%	---	0%
By income category						
Richest	101,367	25%	39,429	26%	92,100	5%
Upper-middle	26,650	14%	13,024	42%	31,200	2%
Lower-middle	37,275	35%	15,764	48%	---	0%
Poorest	37,275	35%	15,764	48%	---	0%

	Non-biodiversity business		All biodiversity business		
	Average earnings (Rf/year)	% hholds	% households engaging in biodiversity business	Average earnings (Rf/year)	Share of biodiversity in all household business earnings
All hholds	185,632	54%	58%	61,425	51%
By island					
Dharavandhoo	127,333	63%	42%	8,745	22%
Dhonfanu	13,750	40%	90%	14,573	75%
Eydhafushi	398,497	67%	30%	119,308	21%
Fehendhoo	14,700	50%	100%	190,675	81%
Fulhadhoo	20,080	50%	83%	205,344	81%
Goidhoo	44,073	70%	90%	42,093	62%
Hithaadhoo	14,363	50%	75%	33,267	65%
Kamadhoo	183,333	43%	57%	45,000	47%
Kendhoo	190,810	38%	63%	50,850	67%
Kihaadhoo	356,800	30%	60%	34,167	64%
Kudarikilu	73,218	56%	78%	22,800	77%
Maalhos	90,150	36%	73%	47,055	65%
Thulhaadhoo	129,441	54%	51%	65,740	49%
By income category					
Richest	978,416	43%	86%	156,229	74%
Upper-middle	199,526	70%	49%	81,727	34%
Lower-middle	20,567	43%	53%	19,046	55%
Poorest	12,791	48%	74%	27,741	71%

From 2008 Baa Atoll Household Survey data.

Table 23: Value of fishing for home consumption and sale

	All fishing		Home consumption		Fish sales	
	% hholds participating in fishing	Average value (Rf/year)	% fishing hholds retaining catch for home use	Average value (Rf/year)	% fishing hholds selling catch	Average value (Rf/year)
All hholds	40%	1,750,486	20%	21,433	31%	1,832,852
By island						
Dharavandhoo	16%	n.d.	11%	n.d.	5%	n.d.
Dhonfanu	30%	n.d.	20%	n.d.	20%	n.d.
Eydhafushi	23%	116,183	23%	9,726	19%	124,200
Fehendhoo	50%	800,000	25%	2,880	50%	798,560
Fulhadhoo	100%	2,889,600	50%	60,480	83%	2,877,504
Goidhoo	60%	3,000,000	40%	31,200	20%	2,984,400
Hithaadhoo	50%	2,361,000	19%	60,480	44%	2,345,880
Kamadhoo	43%	n.d.	43%	n.d.	14%	n.d.
Kendhoo	50%	4,608,000	19%	n.d.	44%	4,608,000
Kihaadhoo	40%	n.d.	10%	n.d.	30%	n.d.
Kudarikilu	44%	n.d.	11%	n.d.	33%	n.d.
Maalhos	36%	176,400	18%	168	27%	176,316
Thulhaadhoo	49%	1,950,160	13%	24,041	46%	2,067,134
By income category						
Richest	76%	3,438,000	33%	29,770	86%	3,289,689
Upper-middle	41%	277,705	23%	18,315	32%	341,969
Lower-middle	25%	58,933	11%	2,720	16%	57,120
Poorest	57%	14,400	30%	1,440	35%	12,960

From 2008 Baa Atoll Household Survey data.

Table 24: Proportion of fishing households who engage in different types of activities

	All fishing	Grouper	Reef	Shark	Tuna	Bait	Lobster	Octopus	Sea Cucumber
All hholds	40%	11%	50%	8%	70%	45%	5%	8%	5%
By island									
Dharavandhoo	16%	33%	67%	0%	0%	0%	0%	0%	0%
Dhonfanu	30%	0%	100%	0%	33%	33%	0%	0%	33%
Eydhafushi	23%	10%	20%	10%	90%	70%	0%	0%	0%
Fehendhoo	50%	50%	0%	0%	100%	50%	0%	50%	0%
Fulhadhoo	100%	83%	17%	0%	17%	17%	17%	33%	0%
Goidhoo	60%	0%	50%	0%	67%	0%	0%	0%	0%
Hithaadhoo	50%	0%	25%	0%	100%	25%	0%	0%	0%
Kamadhoo	43%	0%	100%	0%	0%	0%	33%	33%	33%
Kendhoo	50%	13%	88%	38%	75%	38%	13%	13%	25%
Kihaadhoo	40%	0%	75%	0%	50%	50%	0%	0%	0%
Kudarikilu	44%	0%	100%	0%	25%	50%	0%	0%	0%
Maalhos	36%	0%	100%	0%	75%	75%	25%	25%	0%
Thulhaadhoo	49%	0%	32%	11%	100%	74%	0%	0%	0%
By income category									
Richest	76%	38%	19%	13%	94%	50%	13%	13%	6%
Upper-middle	41%	13%	60%	7%	70%	50%	7%	10%	10%
Lower-middle	25%	0%	67%	5%	52%	33%	0%	5%	0%
Poorest	57%	0%	38%	8%	69%	46%	0%	0%	0%

From 2008 Baa Atoll Household Survey data.

Table 25: Proportion fishing households who carry out activity on a regular basis

	Groupers	Reef	Shark	Tuna	Bait	Lobster	Octopus	Sea Cucumber
All hholds	78%	53%	67%	68%	39%	25%	17%	50%
By island								
Dharavandhoo	0%	50%	---	---	---	---	---	---
Dhonfanu	---	67%	---	100%	0%	---	---	0%
Eydhafushi	100%	50%	100%	78%	71%	---	---	---
Fehendhoo	0%	---	---	50%	0%	---	100%	---
Fulhadhoo	100%	0%	---	0%	100%	0%	0%	---
Goidhoo	---	67%	---	75%	---	---	---	---
Hithaadhoo	---	0%	---	63%	50%	---	---	---
Kamadhoo	---	33%	---	---	---	0%	0%	100%
Kendhoo	0%	43%	100%	50%	33%	0%	0%	50%
Kihaadhoo	---	100%	---	0%	0%	---	---	---
Kudarikilu	---	75%	---	100%	100%	---	---	---
Maalhos	---	25%	---	0%	0%	100%	0%	---
Thulhaadhoo	---	67%	0%	89%	29%	---	---	---
By income category								
Richest	83%	67%	50%	80%	38%	0%	0%	100%
Upper-middle	50%	50%	100%	57%	33%	50%	33%	33%
Lower-middle	---	50%	100%	73%	43%	---	0%	---
Poorest	---	60%	0%	67%	50%	---	---	---

From 2008 Baa Atoll Household Survey data.

Table 26: Proportion of fishing households who sell all or part of their catch

	Groupers	Reef	Shark	Tuna	Bait	Lobster	Octopus	Sea Cucumber
All hholds	100%	53%	83%	79%	8%	25%	17%	75%
By island								
Dharavandhoo	100%	0%	---	---	---	---	---	---
Dhonfanu	---	33%	---	100%	0%	---	---	0%
Eydhafushi	100%	0%	0%	78%	0%	---	---	---
Fehendhoo	0%	---	---	100%	0%	---	100%	---
Fulhadhoo	100%	0%	---	0%	0%	0%	0%	---
Goidhoo	---	33%	---	50%	---	---	---	---
Hithaadhoo	---	50%	---	88%	0%	---	---	---
Kamadhoo	---	33%	---	---	---	0%	0%	100%
Kendhoo	100%	71%	100%	83%	67%	0%	0%	100%
Kihaadhoo	---	100%	---	50%	0%	---	---	---
Kudarikilu	---	75%	---	100%	50%	---	---	---
Maalhos	---	75%	---	33%	0%	100%	0%	---
Thulhaadhoo	---	67%	100%	89%	0%	---	---	---
By income category								
Richest	83%	100%	100%	80%	0%	0%	0%	100%
Upper-middle	100%	44%	50%	81%	7%	50%	33%	67%
Lower-middle	---	50%	100%	91%	14%	---	0%	---
Poorest	---	60%	100%	56%	17%	---	---	---

From 2008 Baa Atoll Household Survey data.

Table 27: Household participation in non-fish biological resource use

	At least one activity	Turtles	Turtle eggs	Seabird	Shell collection	Firewood collection	Wood for boats	Wood for lacquerware	Palm fronds	Other handicrafts	Medicinal plants
All hholds	55%	1%	1%	2%	1%	21%	3%	2%	39%	2%	7%
By island											
Dharavandhoo	47%	0%	0%	0%	0%	5%	0%	0%	37%	0%	5%
Dhonfanu	90%	0%	0%	0%	0%	10%	10%	0%	90%	0%	0%
Eydhafushi	12%	0%	0%	0%	0%	7%	5%	0%	5%	0%	0%
Fehendhoo	75%	0%	0%	0%	0%	25%	0%	0%	50%	0%	0%
Fulhadhoo	50%	0%	0%	0%	0%	33%	0%	0%	33%	0%	0%
Goidhoo	100%	0%	0%	0%	0%	90%	0%	0%	90%	0%	10%
Hithaadhoo	75%	0%	0%	0%	6%	19%	0%	0%	56%	6%	13%
Kamadhoo	43%	0%	0%	0%	0%	0%	0%	0%	43%	0%	0%
Kendhoo	69%	0%	0%	6%	0%	31%	6%	0%	50%	0%	31%
Kihaadhoo	90%	0%	0%	0%	0%	10%	0%	0%	90%	10%	10%
Kudarikilu	89%	0%	0%	0%	0%	33%	0%	0%	78%	0%	11%
Maalhos	82%	0%	9%	0%	0%	18%	0%	0%	82%	0%	9%
Thulhaadhoo	49%	5%	3%	8%	3%	26%	5%	10%	3%	5%	3%
By income category											
Richest	67%	5%	0%	10%	0%	52%	5%	0%	33%	0%	10%
Upper-middle	42%	0%	1%	3%	1%	11%	4%	3%	26%	4%	3%
Lower-middle	55%	1%	1%	0%	0%	20%	1%	1%	45%	1%	8%
Poorest	83%	0%	0%	0%	4%	22%	4%	4%	61%	0%	9%

From 2008 Baa Atoll Household Survey data.

Table 28: Average value of non-fish biological resource use for participating households (Rf/hhold/year)

	All activities*	Turtle eggs	Wood for boats	Palm fronds	Lacquerware
All hholds	23,225	1,245	14,763	10,633	70,750.00
By island					
Dharavandhoo	9,333	---	---	9,333	---
Dhonfanu	11,477	---	---	9,965	---
Eydhafushi	30,994	---	21,500	35,420	---
Fehendhoo	44,760	---	---	3,180	---
Fulhadhoo	14,010	---	---	6,450	---
Goidhoo	51,518	---	---	13,088	---
Hithaadhoo	14,532	---	---	8,389	---
Kamadhoo	10,425	---	---	10,425	---
Kendhoo	8,228	---	---	6,753	---
Kihaadhoo	12,771	---	---	12,771	---
Kudarikilu	28,109	---	---	3,917	---
Maalhos	13,182	90	---	8,498	---
Thulhaadhoo	52,582	2,400	1,288	5,130	70,750.00
By income category					
Richest	19,608	---	264	19,608	---
Upper-middle	19,587	90	2,144	11,891	108,000.00
Lower-middle	11,194	---	---	9,942	60,000.00
Poorest	7,766	2,400	---	8,204	7,000.00

From 2008 Baa Atoll Household Survey data. * The value of all activities is the average of the non-fish biological resources as stated by the respondents.

	Fuelwood*
All hholds	10,444
By Islands	
Dharavandhoo	-
Dhonfanu	1,512
Eydhafushi	977
Fehendhoo	41,580
Fulhadhoo	7,560
Goidhoo	38,430
Hithaadhoo	6,143
Kamadhoo	-
Kendhoo	548
Kihaadhoo	-
Kudarikilu	24,192
Maalhos	4,673
Thulhaadhoo	10,163
By income category	
Richest	45,381
Upper-middle	49,686
Lower-middle	35,469
Poorest	64,176

*Fuelwood values calculated by using the replacement price of LPG at Rf 21/kg in the islands. It is assumed that 1 kg of LPG equals 1ft³ of firewood for burning.

Table 29: Proportion of households engaging in non-fish biological resource use who carry out activity on a regular basis

	Turtles	Turtle eggs	Shell collection	Firewood collection	Wood for lacquerware	Palm fronds	Other handicrafts	Medicinal plants
All hholds	50%	50%	50%	68%	100%	83%	75%	62%
By island								
Dharavandhoo	---	---	---	0%	---	71%	---	0%
Dhonfanu	---	---	---	100%	---	89%	---	---
Eydhafushi	---	---	---	67%	---	100%	---	---
Fehendhoo	---	---	---	100%	---	0%	---	---
Fulhadhoo	---	---	---	0%	---	100%	---	---
Goidhoo	---	---	---	89%	---	100%	---	100%
Hithaadhoo	---	---	0%	67%	---	67%	100%	0%
Kamadhoo	---	---	---	---	---	100%	---	---
Kendhoo	---	---	---	80%	---	88%	---	80%
Kihaadhoo	---	---	---	0%	---	89%	100%	100%
Kudarikilu	---	---	---	67%	---	100%	---	100%
Maalhos	---	0%	---	50%	---	78%	---	0%
Thulhaadhoo	50%	100%	100%	70%	100%	0%	50%	100%
By income category								
Richest	0%	---	---	73%	---	71%	---	100%
Upper-middle	---	0%	100%	63%	100%	79%	67%	50%
Lower-middle	100%	100%	---	71%	100%	89%	100%	57%
Poorest	---	---	0%	60%	100%	79%	---	50%

From 2008 Baa Atoll Household Survey data.

Table 30: Proportion of households engaging in non-fish biological resource use who sell all or part of their harvest

	Turtle eggs	Shell collection	Firewood collection	Wood for lacquerware	Palm fronds	Other handicrafts	Medicinal plants
All hholds	50%	50%	2%	100%	97%	100%	8%
By island							
Dharavandhoo	---	---	0%	---	100%	---	0%
Dhonfanu	---	---	0%	---	100%	---	---
Eydhafushi	---	---	0%	---	100%	---	---
Fehendhoo	---	---	0%	---	100%	---	---
Fulhadhoo	---	---	0%	---	100%	---	---
Goidhoo	---	---	0%	---	100%	---	0%
Hithaadhoo	---	100%	0%	---	100%	100%	0%
Kamadhoo	---	---	---	---	100%	---	---
Kendhoo	---	---	0%	---	75%	---	20%
Kihaadhoo	---	---	0%	---	100%	100%	0%
Kudarikilu	---	---	33%	---	100%	---	0%
Maalhos	100%	---	0%	---	111%	---	0%
Thulhaadhoo	0%	0%	0%	100%	100%	100%	0%
By income category							
Richest	---	---	0%	---	100%	---	0%
Upper-middle	100%	0%	0%	100%	100%	100%	0%
Lower-middle	0%	---	6%	100%	95%	100%	14%
Poorest	---	100%	0%	100%	100%	---	0%

From 2008 Baa Atoll Household Survey data.

Baa Atoll tourist operations

Table 31: Baa Atoll resort capacity, bednights and gross value of rooms 2006

	Number of resorts	Bed capacity	Average occupancy*	Bednights 2006	Gross value of rooms (US\$ mill/year)**
Reethi Beach Resort		200	95%	69,350	4.99
Royal Island Resort & Spa		304	75%	83,220	8.99
Kihaadhuffaru Resort		200	75%	54,750	81.30
Sonevafushi Resort		130	75%	35,588	7.71
Coco Palm Dhunikolhu		200	90%	65,700	14.78
Four Seasons Resort Maldives at Landaa Giraavaru		206	67%	50,377	42.17
Total Baa Atoll resorts	6	1,240	79%	358,985	159.94
Total all resorts in Maldives	89	17,802	85%	5,485,255	1,698
Baa Atoll as % of all resorts	6.7%	7.0%		6.5%	9.4%

From MTCA, 2007, Tourism Yearbook 2007. Statistics & Research Section, Planning Department, Ministry of Tourism & Civil Aviation, Male'; Baa atoll survey data. *Baa Atoll occupancy rates based on actual figures, MTCA 2007 average resort occupancy of 84.8% in 2006 applied to resorts on other Atolls; **assuming double occupancy and using average published full-board prices based on actual figures for Baa Atoll and national average applied to resorts on other Atolls, room charges adjusted to 65% of published rack rates to account for discounts and special offers to individuals and on tour operator block bookings.

Table 32: Baa Atoll revenue from dive centres 2007 (US\$ '000/year)

	Payment to resorts	Retained by dive centre	Total earnings
Soleni Dive Centre	223.38	335.07	558.45
Delphis Dive Centre	122.64	122.64	245.28
Valtur Dive Centre	175.20	262.8	438.00
Sea Explorer Dive Centre	119.13	178.71	297.84
Four Seasons Dive Centre	394.20	0	394.20
Ocean Pro Dive Centre	135.49	203.23	338.72
Total	1,170.04	1,102.45	2,272.49

From Baa atoll survey data.

Government and donor funding to biodiversity

Table 33: Government expenditures on environmental protection 2002-2004 (Rf millions)

	2002	2003	2004
All central government expenditure			
Total	3,135.5	3,529.2	3,779.1
Environmental protection	23.0	25.3	32.6
Environment as % of total	0.7%	0.7%	0.9%
Central government current expenditure			
Total	2,109.4	2,345.7	2,657.9
Environmental protection	19.8	20.4	24.6
Environment as % of total	0.9%	0.9%	0.9%
Central government capital expenditure			
Total	1,026.1	1,154.1	991.0
Environmental protection	3.2	0.7	7.7
Environment as % of total	0.3%	0.1%	0.8%

From MPND, 2004, Statistical Yearbook 2004. Ministry of Planning and National Development, Male'. Figures from 2006 and 2007 excluded from analysis, as they are considered to be unusual in terms of central government, due to the needs for post-tsunami reconstruction over this period.

Table 34: Breakdown of government atoll development and environmental protection budget
2006-2008 (Rf millions)

	2006 Expenditure	2007 Revised Estimates	2008 Projected
Ministry of Atolls Development	411.24	394.30	379.58
Maalhosmadulu Dhekunuburi	11.07	13.43	13.10
Ministry of Environment, Energy and Water	82.84	94.95	148.34
Ministry of Environment, Energy & Water	49.92	53.31	87.58
Environment Section	4.58	5.58	8.03
Maldives Energy Authority	-	1.02	1.01
Maldives Water and Sanitation Authority	3.84	2.32	3.22
Department of Meteorology	20.18	24.75	30.82
Environment Research Centre	4.32	7.96	17.67
Development Project Loans	806.12	1,581.01	1,924.30
Total expenditures	7,345.60	9,460.84	12,000.31
Ministry of Environment Energy & Water as % of total	0.7%	0.6%	0.7%

From MFT, 2008, Budget in Statistics for the Financial Year 2008. Ministry of Finance and Treasury, Male'.

Table 35: Donor commitments funding status as of October 2007 (US\$ million)

	Donor commitments
Tsunami activities under National Recovery & Reconstruction Plan	
Environment and Natural Resources	14.35
Total	902.28
Environment and Natural Resources as % of total	1.6%
Non-tsunami development activities	
Environment	16.30
Total	104.82
Environment as % of total	15.6%
All donor commitments	
Environment	30.65
Total	1,007.1
Environment as % of total	3.0%

From NDMC, 2007, Funding update on Official Development Assistance Government of Maldives – October 2007. National Disaster Management Centre, Male'.

Willingness to pay for biodiversity conservation

Table 36: Perceived importance of marine and coastal biodiversity

	Very important	Quite important	Not important
Male'	59%	35%	6%
Baa Atoll Total	72%	27%	1%
Island not stated	81%	19%	0%
Dharavandhoo	88%	13%	0%
Dhonfanu	70%	30%	0%
Eydhafushi	70%	28%	2%
Fehendhoo	50%	50%	0%
Fulhadhoo	100%	0%	0%
Goidhoo	80%	20%	0%
Hithaadhoo	70%	30%	0%
Kamadhoo	100%	0%	0%
Kendhoo	69%	31%	0%
Kihaadhoo	50%	50%	0%
Kudarikilu	50%	50%	0%
Maalhos	80%	20%	0%
Thulhaadhoo	65%	31%	4%

From 2008 Conservation Willingness to Pay Survey data.

Table 37: Perceived benefits of marine and coastal biodiversity

	Provisioning services / direct values				Supporting & regulating services/ indirect values	Cultural services / existence values	
	Resource use	Food	Income	Tourism	Ecosystem services	Cultural and existence	Bequest for future generations
Male'	1%	18%	6%	4%	17%	38%	1%
Baa Atoll Total	7%	11%	3%	1%	57%	20%	0%
Island not stated	10%	0%	0%	0%	52%	39%	0%
Dharavandhoo	0%	31%	0%	6%	38%	31%	0%
Dhonfanu	20%	10%	10%	0%	60%	0%	0%
Eydhafushi	2%	0%	0%	0%	87%	9%	0%
Fehendhoo	0%	25%	25%	0%	0%	50%	0%
Fulhadhoo	0%	0%	33%	0%	67%	0%	0%
Goidhoo	0%	0%	20%	0%	40%	40%	0%
Hithaadhoo	10%	25%	0%	5%	35%	25%	0%
Kamadhoo	33%	17%	17%	0%	33%	0%	0%
Kendhoo	0%	19%	0%	0%	56%	19%	0%
Kihaadhoo	10%	10%	0%	0%	40%	30%	0%
Kudarikilu	17%	17%	0%	0%	33%	33%	0%
Maalhos	10%	10%	10%	0%	50%	20%	0%
Thulhaadhoo	12%	15%	0%	0%	69%	4%	0%

From 2008 Conservation Willingness to Pay Survey data.

Table 38: Perceived threats to marine and coastal biodiversity

	Humans	Waste disposal	Pollution	Climate change	Habitat destruction
Male'	38%	22%	9%	8%	4%
Baa Atoll Total	40%	18%	3%	7%	7%
Island not stated	26%	23%	0%	13%	6%
Dharavandhoo	75%	13%	6%	0%	0%
Dhonfanu	40%	30%	0%	0%	20%
Eydhafushi	37%	9%	2%	4%	7%
Fehendhoo	75%	0%	0%	0%	0%
Fulhadhoo	67%	33%	0%	0%	0%
Goidhoo	60%	10%	10%	0%	10%
Hithaadhoo	15%	20%	5%	15%	5%
Kamadhoo	17%	33%	0%	17%	0%
Kendhoo	19%	38%	0%	19%	6%
Kihaadhoo	80%	0%	0%	0%	10%
Kudarikilu	50%	33%	0%	0%	17%
Maalhos	60%	10%	0%	0%	10%
Thulhaadhoo	38%	23%	12%	4%	8%

From 2008 Conservation Willingness to Pay Survey data. Other threats mentioned by respondents include deforestation, soil erosion, coral & sand mining, sea level rise, lack of political will, tourism, lack of awareness, species extinction and low development.

Table 39: Willingness to contribute cash to a marine and coastal biodiversity conservation fund

	Willing to pay	Amount willing to pay per year							Preferred payment	
		Average*	Rf 10	Rf 50	Rf 100	Rf 500	Rf 1000	> Rf 1000	Annual contribution	User fee
Male'	74%	130	27%	24%	35%	7%	4%	3%	77%	23%
Baa Atoll Total	91%	123	45%	18%	17%	8%	4%	1%	82%	14%
Island not stated	90%	178	43%	11%	25%	14%	0%	4%	79%	11%
Dharavandhoo	81%	32	54%	8%	15%	0%	0%	0%	62%	23%
Dhonfanu	100%	90	50%	10%	30%	10%	0%	0%	80%	20%
Eydhafushi	93%	124	44%	28%	12%	5%	7%	0%	93%	5%
Fehendhoo	75%	217	0%	33%	33%	33%	0%	0%	100%	0%
Fulhadhoo	100%	203	33%	0%	33%	33%	0%	0%	100%	0%
Goidhoo	90%	143	44%	33%	11%	0%	11%	0%	67%	33%
Hithaadhoo	95%	23	74%	21%	5%	0%	0%	0%	79%	21%
Kamadhoo	100%	107	67%	0%	17%	17%	0%	0%	83%	17%
Kendhoo	88%	164	43%	21%	0%	14%	7%	0%	93%	0%
Kihaadhoo	100%	94	40%	20%	30%	10%	0%	0%	70%	30%
Kudarikilu	100%	32	67%	17%	17%	0%	0%	0%	83%	17%
Maalhos	100%	293	10%	20%	30%	10%	20%	0%	90%	0%
Thulhaadhoo	81%	93	33%	14%	24%	10%	0%	0%	71%	29%

From 2008 Conservation Willingness to Pay Survey data. * extremely high stated amounts (Rf 25,000 or more) removed so as not to skew averages.

Table 40: Willingness to make in-kind contributions to marine and coastal biodiversity conservation

	Willing to contribute	Activities willing to contribute to					
		Awareness campaigns	Tree planting	Beach clean up	Reef clean up	Other activity	One day's fishing profits
Male'	84%	64%	57%	38%	23%	4%	5%
Baa Atoll Total	93%	82%	95%	95%	61%	4%	14%
Island not stated	84%	100%	100%	100%	81%	0%	12%
Dharavandhoo	94%	67%	93%	93%	67%	13%	13%
Dhonfanu	100%	50%	90%	90%	80%	0%	10%
Eydhafushi	93%	95%	100%	100%	58%	2%	16%
Fehendhoo	100%	50%	100%	75%	50%	0%	25%
Fulhadhoo	67%	50%	100%	100%	50%	50%	0%
Goidhoo	100%	80%	100%	100%	90%	10%	30%
Hithaadhoo	90%	67%	83%	94%	50%	0%	11%
Kamadhoo	100%	100%	100%	100%	50%	17%	0%
Kendhoo	88%	71%	93%	93%	50%	0%	7%
Kihaadhoo	100%	70%	90%	80%	60%	10%	0%
Kudarikilu	100%	67%	83%	83%	33%	0%	17%
Maalhos	90%	89%	100%	89%	22%	11%	11%
Thulhaadhoo	96%	88%	96%	100%	60%	0%	24%

From 2008 Conservation Willingness to Pay Survey data.

References and notes

- ¹ Biodiversity in the document not only refers to species, but also to ecosystems and ecological processes.
- ² Mohamed, M., 2007, Economic Valuation of Coral Reefs: A Case Study of the Costs and Benefits of Improved Management of Dhigali Haa, a Marine Protected Area in Baa Atoll, Maldives. A thesis submitted in partial fulfilment of the requirements for the Degree of Master of Environmental Science at the University of Canterbury, Christchurch.
- ³ The survey originally included four of the six resorts in Baa Atoll, and 800 questionnaires. Four hundred questionnaires from two of the surveyed resorts were however lost, and could not be analysed.
- ⁴ Calculated from the latest population data presented on <http://www.atolls.gov.mv/>, and island average household sizes presented in MPND, 2007a, Maldives, Population and Housing Census 2006. Ministry of Planning and National Development, Male'.
- ⁵ A composite indicator based on household total value of production, ownership of consumer durables and per capita cash income was used to group survey respondents into four categories: richer (11% of the sample), upper-middle (36%), lower-middle (41%) and poorest (12%).
- ⁶ United Nations 2007. Common Country Assessment 2007: Republic of Maldives. United Nations System in the Maldives, Male'.
- ⁷ Mohamed, M., 2007, Economic Valuation of Coral Reefs: A Case Study of the Costs and Benefits of Improved Management of Dhigali Haa, a Marine Protected Area in Baa Atoll, Maldives. A thesis submitted in partial fulfilment of the requirements for the Degree of Master of Environmental Science at the University of Canterbury, Christchurch.
- ⁸ UNDP, 2007. Human Development Report 2007. United Nations Development Programme, New York.
- ⁹ MPND, 2008, Maldives at a Glance July 2008. Ministry of Planning and National Development, Male'.
- ¹⁰ UN CCA 2007 *op.cit*
- ¹¹ Government of Maldives 2006, Seventh National Development Plan 2006-2010: Creating New Opportunities. Ministry of Planning and National Development, Male'.
- ¹² World Bank, 2006, The Maldives: Sustaining Growth & Improving the Investment Climate. Finance and Private Sector Development Unit, South Asia Region, The World Bank.
- ¹³ MPND, 2008, Maldives at a Glance July 2008. Ministry of Planning and National Development, Male'.
- ¹⁴ World Bank 2006 *op. cit.*
- ¹⁵ World Bank 2006 *op. cit.*
- ¹⁶ World Bank and IMF, 2008, Doing Business 2008: Making a Difference, The World Bank and the International Finance Corporation, Washington DC.
- ¹⁷ ADB, 2004, Country Economic Review Maldives. CER: MLD 2004-13, Asian Development Bank, Manila.
- ¹⁸ Government of Maldives 2006 *op. cit.* This unusually high increase in GDP is most likely linked to the increased spending, investment and foreign exchange inflows which occurred after the Indian Ocean tsunami disaster.
- ¹⁹ ADB, 2008, Asian Development Bank and the Maldives: a Fact Sheet. Asian Development Bank, Manila.
- ²⁰ ADB 2008 *op. cit.*
- ²¹ World Bank, 2007, Maldives Country Assistance Strategy. Report No. 41400 – MV, South Asia Region, The World Bank.
- ²² ADB 2004 *op. cit.*
- ²³ Government of Maldives 2006 *op. cit.*
- ²⁴ World Bank 2007 *op. cit.*
- ²⁵ ADB 2004 *op. cit.*
- ²⁶ Haleem A. Stakeholder Analysis Report, Atoll Ecosystem Conservation Project. 2008
- ²⁷ Due to the physical and geographical characteristics of the Maldives, “biodiversity” and “coastal and marine biodiversity” are used synonymously in this report.
- ²⁸ Millennium Ecosystem Assessment, 2005, Ecosystems and Human Well-being: Synthesis. Island Press, Washington, DC.
- ²⁹ Emerton, L., 2006, Counting Coastal Ecosystems as an Economic Part of Development Infrastructure. Ecosystems and Livelihoods Group Asia, World Conservation Union (IUCN), Colombo.
- ³⁰ MPND 2007, *op. cit.*

- ³¹ MTCA, 2007, Tourism Yearbook 2007. Statistics & Research Section, Planning Department, Ministry of Tourism & Civil Aviation, Male’.
- ³² MPND 2007a *op. cit.*
- ³³ MPND, 2007, Maldives Statistical Yearbook 2007. Ministry of Planning and National Development, Male’.
- ³⁴ WTTC, 2008, Travel & Tourism Satellite Accounts for the Maldives, World Travel and Tourism Council, London. Travel & Tourism Satellite Accounts are analogous to the national income accounts routinely published by government statistical offices worldwide. The WTTC/Oxford Economics 2008 Tourism Satellite Accounting research constructs such accounts for 176 countries and follows the standardised United Nations’ methodology for measurement of Travel & Tourism’s economic impact on personal consumption, business spending, capital investment, government expenditures, exports and imports, culminating in quantification of the contribution to gross domestic product and employment.
- ³⁵ Total employment is registered as 110,231 in the Statistical Yearbook 2007.
- ³⁶ An exchange rate of US\$1=Rf 12.75 has been used for conversion.
- ³⁷ MTCA 2007 *op. cit.*
- ³⁸ WTTC 2008 *op. cit.*
- ³⁹ WTTC 2008 *op. cit.*
- ⁴⁰ WTTC 2008 *op. cit.*
- ⁴¹ MPND, 2004, Maldives Statistical Yearbook 2004. Ministry of Planning and National Development, Male’; MPND, 2005, Maldives Statistical Yearbook 2005. Ministry of Planning and National Development, Male’; MPND 2007 *op. cit.*; MTCA 2007 *op. cit.*
- ⁴² WTTC 2008 *op. cit.*
- ⁴³ MPND 2007 *op. cit.*
- ⁴⁴ Only four private fisheries zone operators and the government-owned MIFCO are permitted to collect and export skipjack tuna
- ⁴⁵ Fishing in the EEZ is long-line and is dominated by foreign companies. MIFCO is the only Maldivian company currently engaged in long-line fishing in the EEZ, and its operations are as yet very limited.
- ⁴⁶ MPND 2007 *op. cit.*
- ⁴⁷ MPND 2007a *op. cit.*
- ⁴⁸ MPND 2007 *op. cit.*
- ⁴⁹ ADB, 2007, Maldives: Sources of Growth. Asian Development Bank, Manila.
- ⁵⁰ MFAMR, 2004, Fisheries Statistics 2004. Economic Research and Statistics Services, Ministry of Fisheries, Agriculture and Marine Resources, Male; MFAMR, 2006, Fisheries Statistics 2006. Economic Research and Statistics Services, Ministry of Fisheries, Agriculture and Marine Resources, Male.
- ⁵¹ MPND 2003 *op. cit.*
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- ⁶⁵ UNEP-WCMC 2006. *Op.cit*
- ⁶⁶ UNEP 2005 *op.cit*.
- ⁶⁷ Estimates of unit costs for each replacement measure were provided by the MPND and Environment Ministry.
 Unit cost for cement-sand/concrete breakwater/revetment – MRF 26, 304 per linear metre
 Unit cost for rock boulders breakwater/revetment – MRF 45, 600 per linear metre
 Unit cost for cement-sand/concrete breakwater/revetment – MRF 3200 per m³
 Unit cost for rock boulders breakwater/revetment – MRF 16, 000 per m³
- ⁶⁸ Calculated from the latest population data presented on <http://www.atolls.gov.mv/>, and island average household sizes presented in MPND, 2007a, Maldives, Population and Housing Census 2006. Ministry of Planning and National Development, Male'.
- ⁶⁹ A proportion of the population originating from Baa Atoll is engaged in employment on other Atolls and in the capital city Male'.
- ⁷⁰ Although coral mining is officially banned, some mining does take place at a small level and is depicted in official records
- ⁷¹ Mohamed 2007 *op. cit*.
- ⁷² MPND 2007a *op. cit*.
- ⁷³ MPND 2007 *op. cit*.
- ⁷⁴ MPND 2007a *op. cit*.
- ⁷⁵ At average wage rates for the fisheries sector (excluding professional technical workers), from MPND, 2003, Household Income and Expenditure Survey 2002-03. Ministry of Planning and National Development, Male'.
- ⁷⁶ MFAMR 2006 *op. cit*.
- ⁷⁷ MPND 2007 *op. cit*.
- ⁷⁸ Using average prices per kg paid by MIFCO, and average end value of products sold by MIFCO.
- ⁷⁹ The Atoll-wide figures presented in the boxes in this section are calculated from the sum of disaggregated figures for % of households participating and average value per household in each island.
- ⁸⁰ Although the number of households participating in fishing according to the survey (862 households) is not inconsistent with official statistics (1,364 people), the value of the catch as stated in the household survey gives widely different figures from official statistics. The recorded annual fish catch from Baa Atoll is just under 2,600 tonnes according to official statistics (MPND 2007, MFAMR 2006), whereas – using an average fish price of Rf 5/kg – data from the household survey suggest that the annual catch as stated by households is almost 140 times higher than this (some 360,000 tonnes). Although it is to be expected that official statistics will incorporate some level of under-reporting by fishermen, as well as excluding some portion of catch, the magnitude of difference is somewhat surprising and shows extensive over-reporting by respondents.
- ⁸¹ Shark fishing is banned in Baa Atoll, under a moratorium from the government.
- ⁸² These values do not necessarily accrue within the Maldives; much of these revenue are remitted to tour operators and resort companies based overseas.
- ⁸³ Estimates of unit costs for each replacement measure were provided by the MPND and Environment Ministry.
 Unit cost for cement-sand/concrete breakwater/revetment – MRF 26, 304 per linear metre
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- ⁹⁰ Just under 360,000 tourist bednights are spent each year in Baa Atoll resorts (see Annex Table 30), and the average length of stay for visitors to the Maldives is 8 days (MPND 2007 *op. cit.*).
- ⁹¹ It is assumed that Maldivian survey results reflect household willingness to pay. If respondents were in fact expressing their own individual willingness to pay, the total figure would be much higher than this.
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